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Terada et al.

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(54) **TOILET DEVICE, METHOD FOR CONTROLLING A TOILET DEVICE, AND CONTROL PROGRAM OF A TOILET DEVICE**

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**E03D 9/00**             (2006.01)  
**G08C 17/02**            (2006.01)

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(2013.01); **E03D 9/00** (2013.01); **G08C 17/02**  
(2013.01)

(58) **Field of Classification Search**  
CPC ..... E03D 9/00  
See application file for complete search history.

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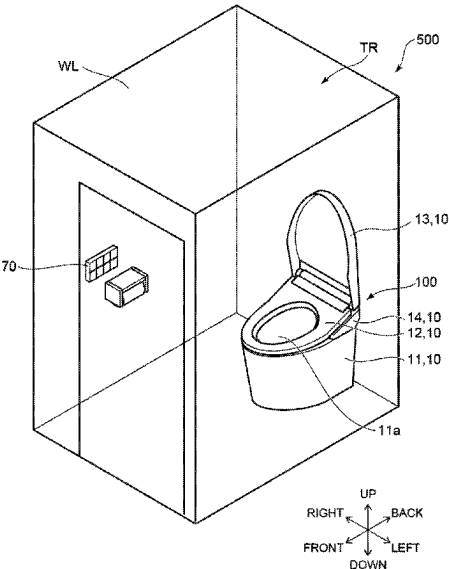
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(57)             **ABSTRACT**

A toilet device includes a toilet unit including a toilet seat, a biological information measuring part configured to measure biological information of a user, a wireless communication part configured to wirelessly communicate with a personal digital assistant of the user, and a controller configured to transmit the biological information to the personal digital assistant of the user; the controller is configured to switch from a transmission suspension period to a transmission period from a start of the user using the toilet unit and a transmission of the biological information by controlling switching between the transmission period and the transmission suspension period.

**6 Claims, 15 Drawing Sheets**



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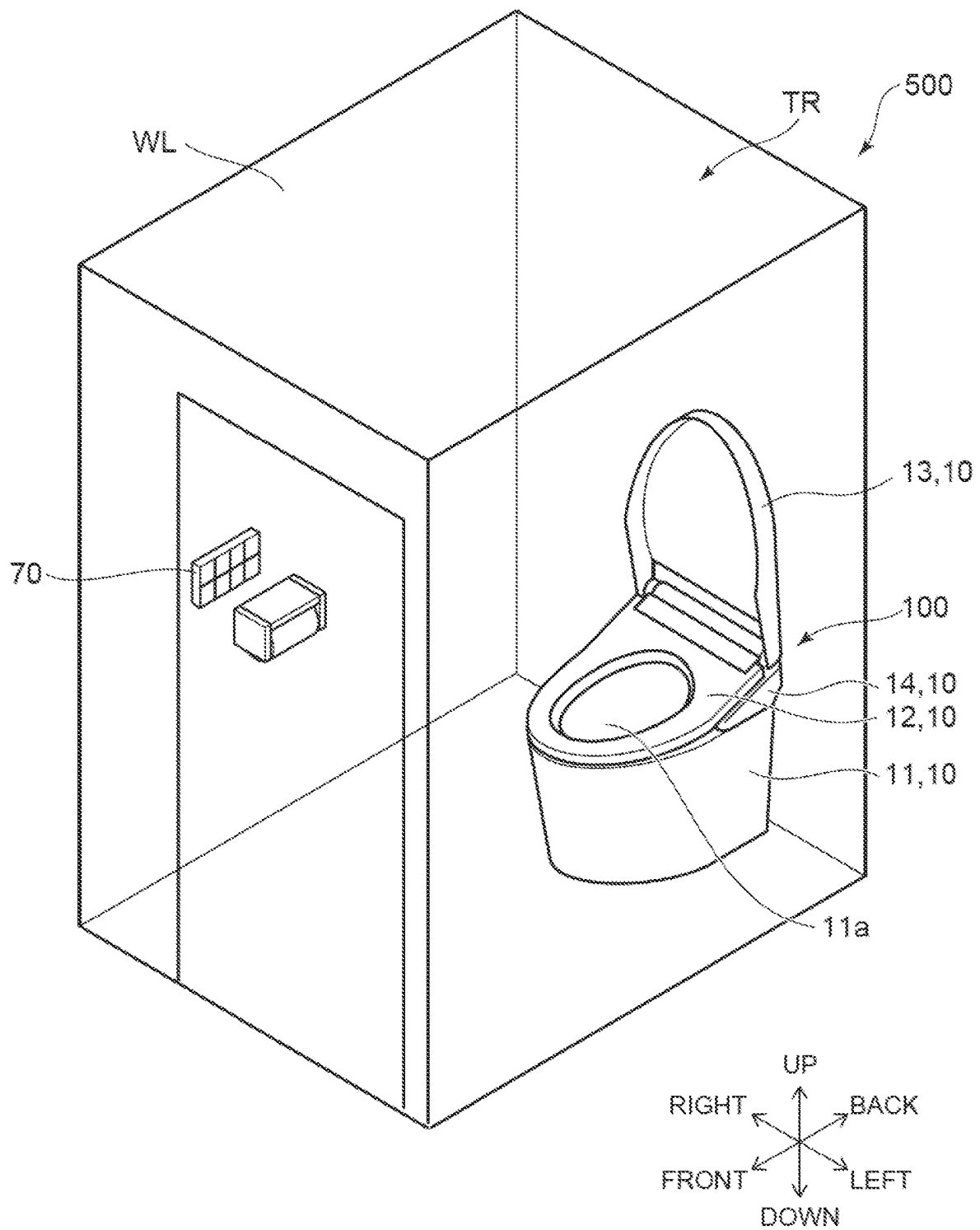


FIG. 1

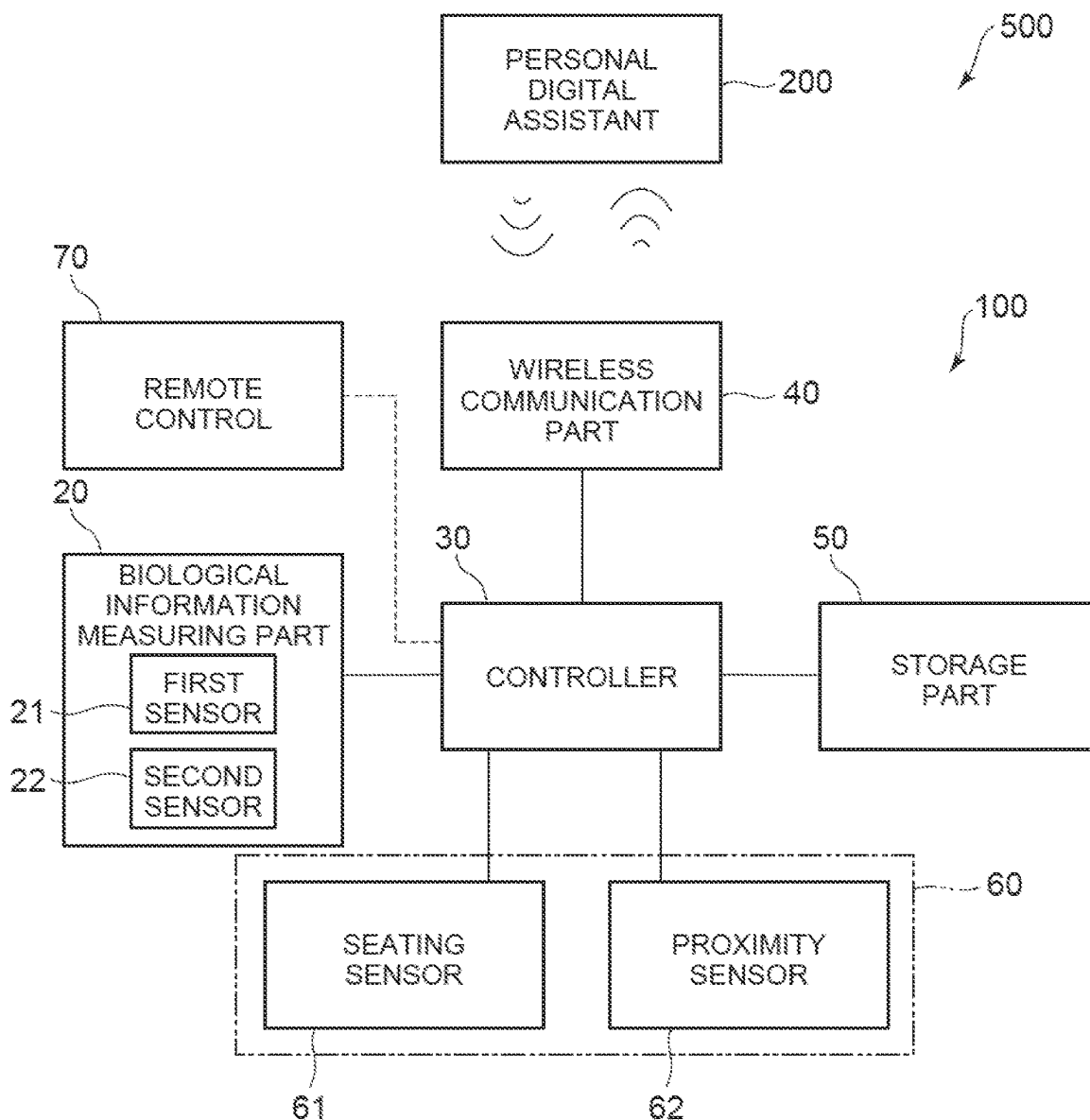


FIG. 2

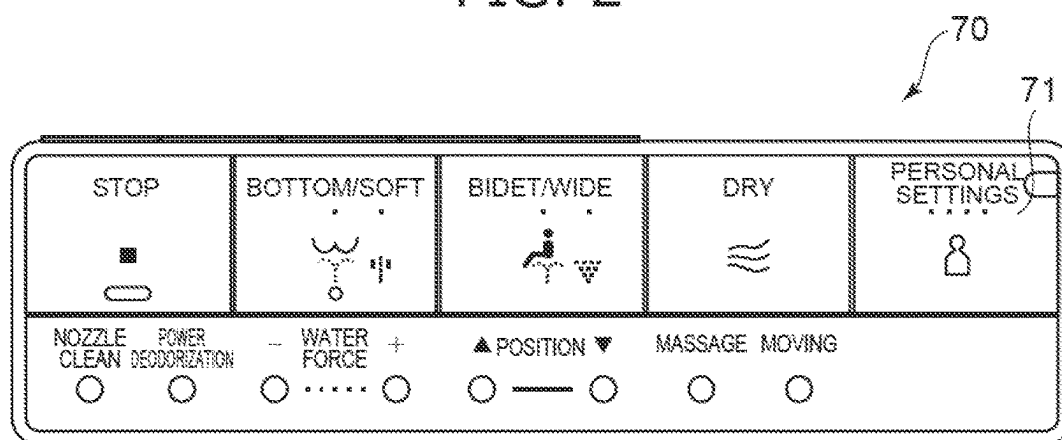


FIG. 3

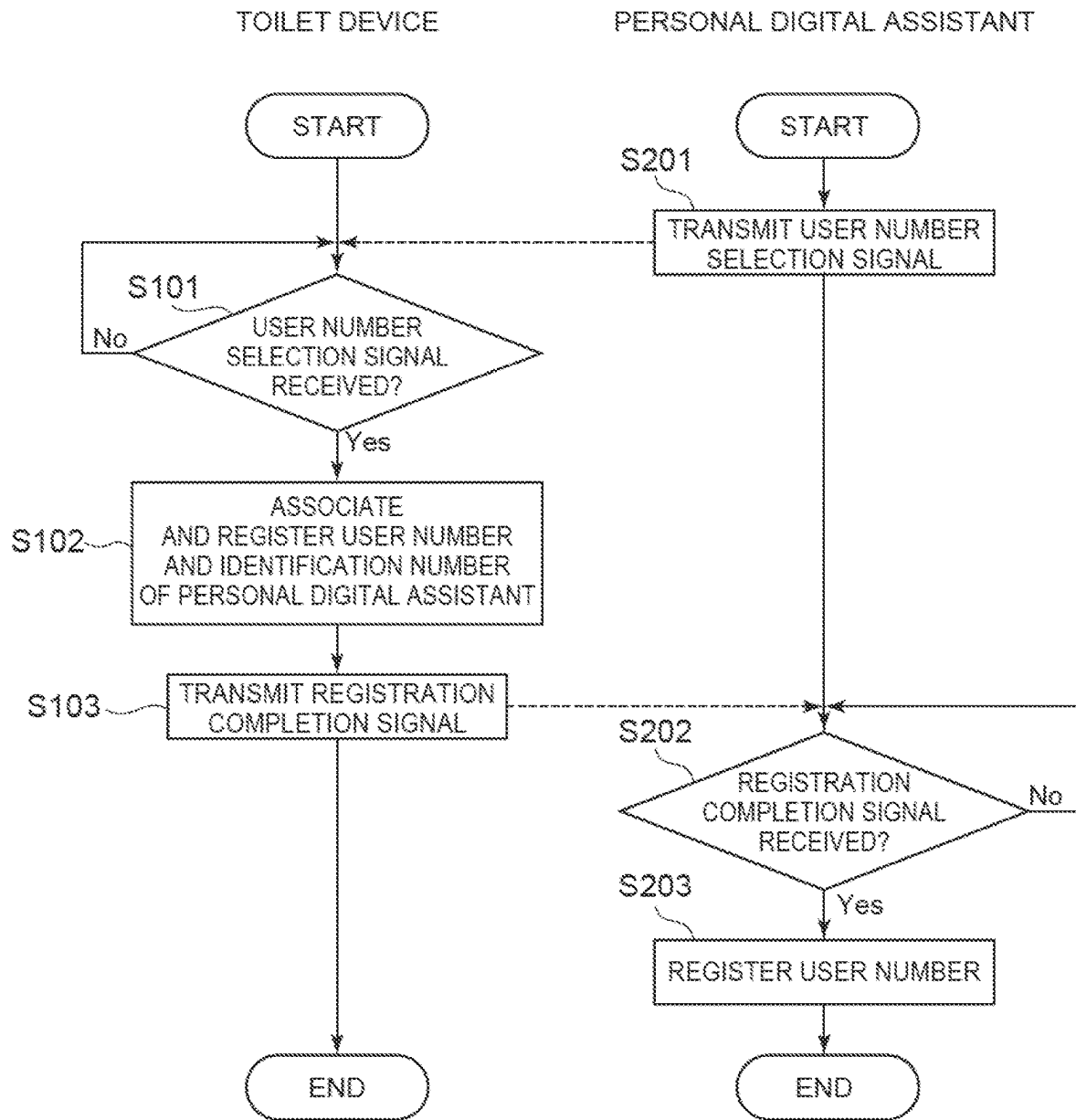


FIG. 4

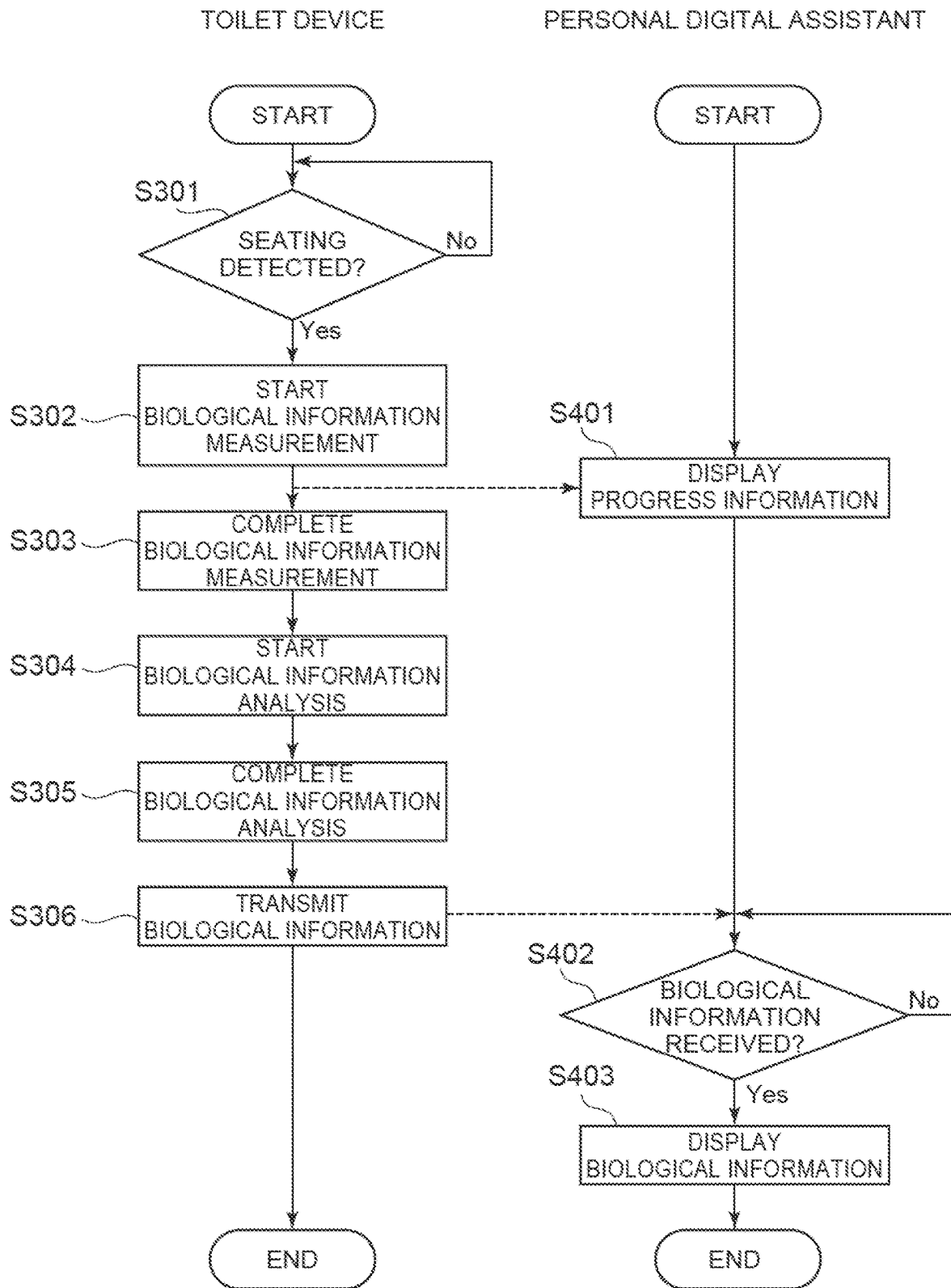
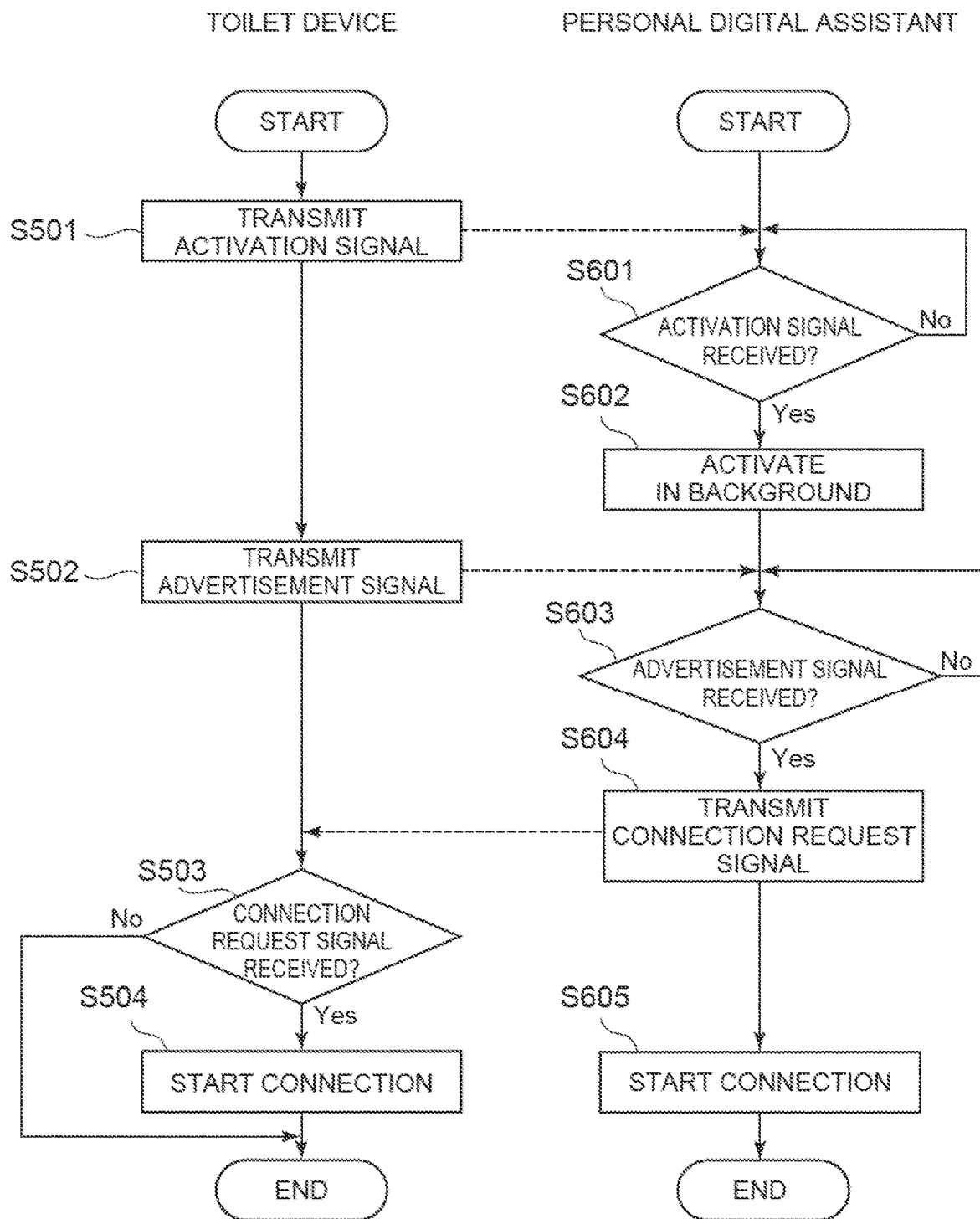
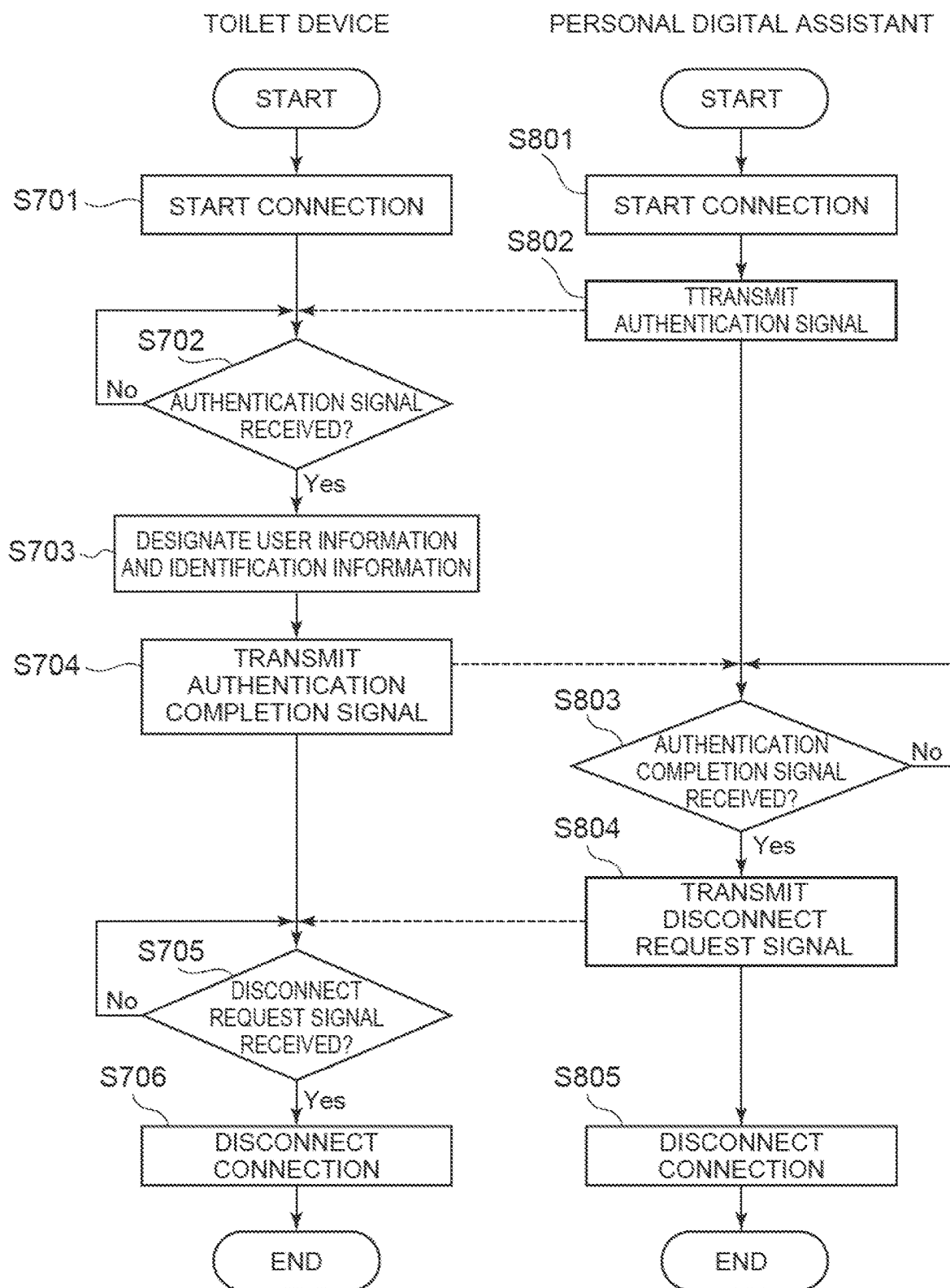


FIG. 5







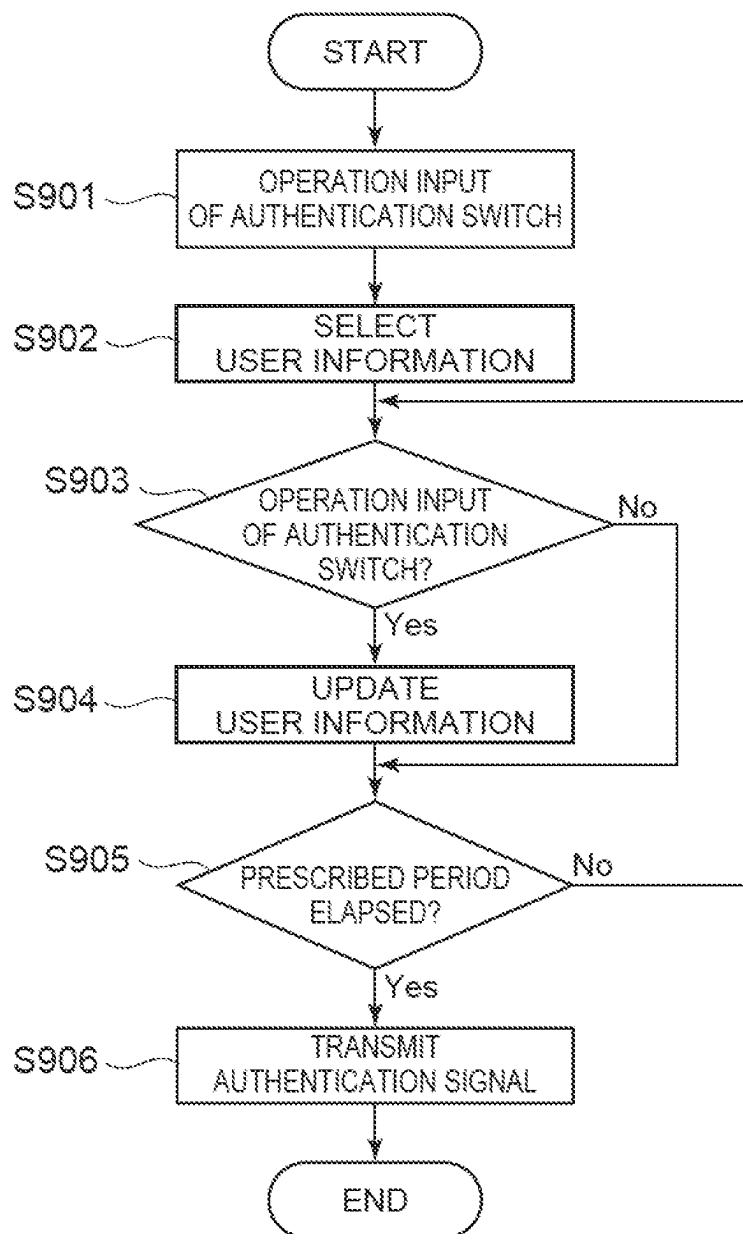
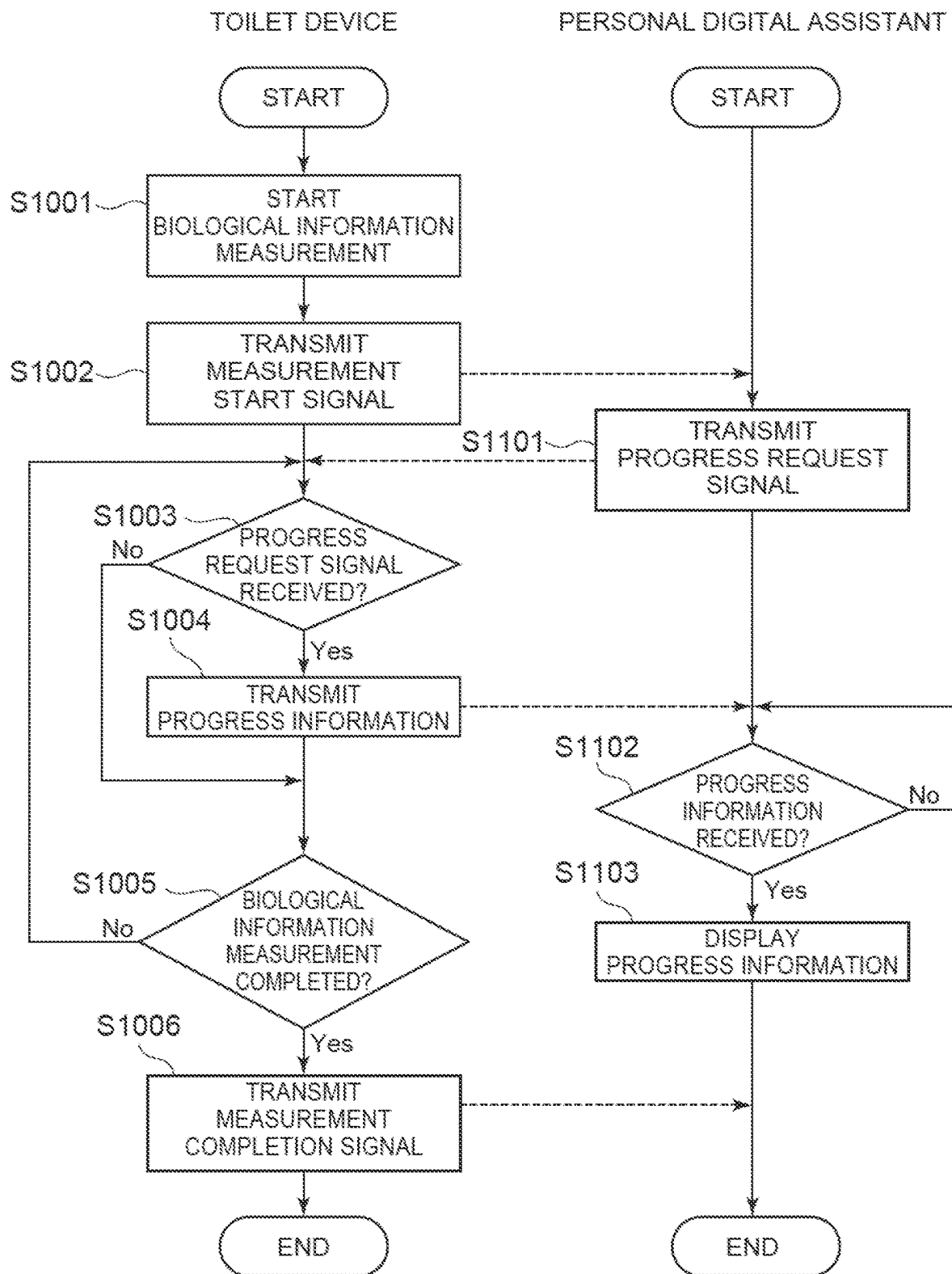


FIG. 8



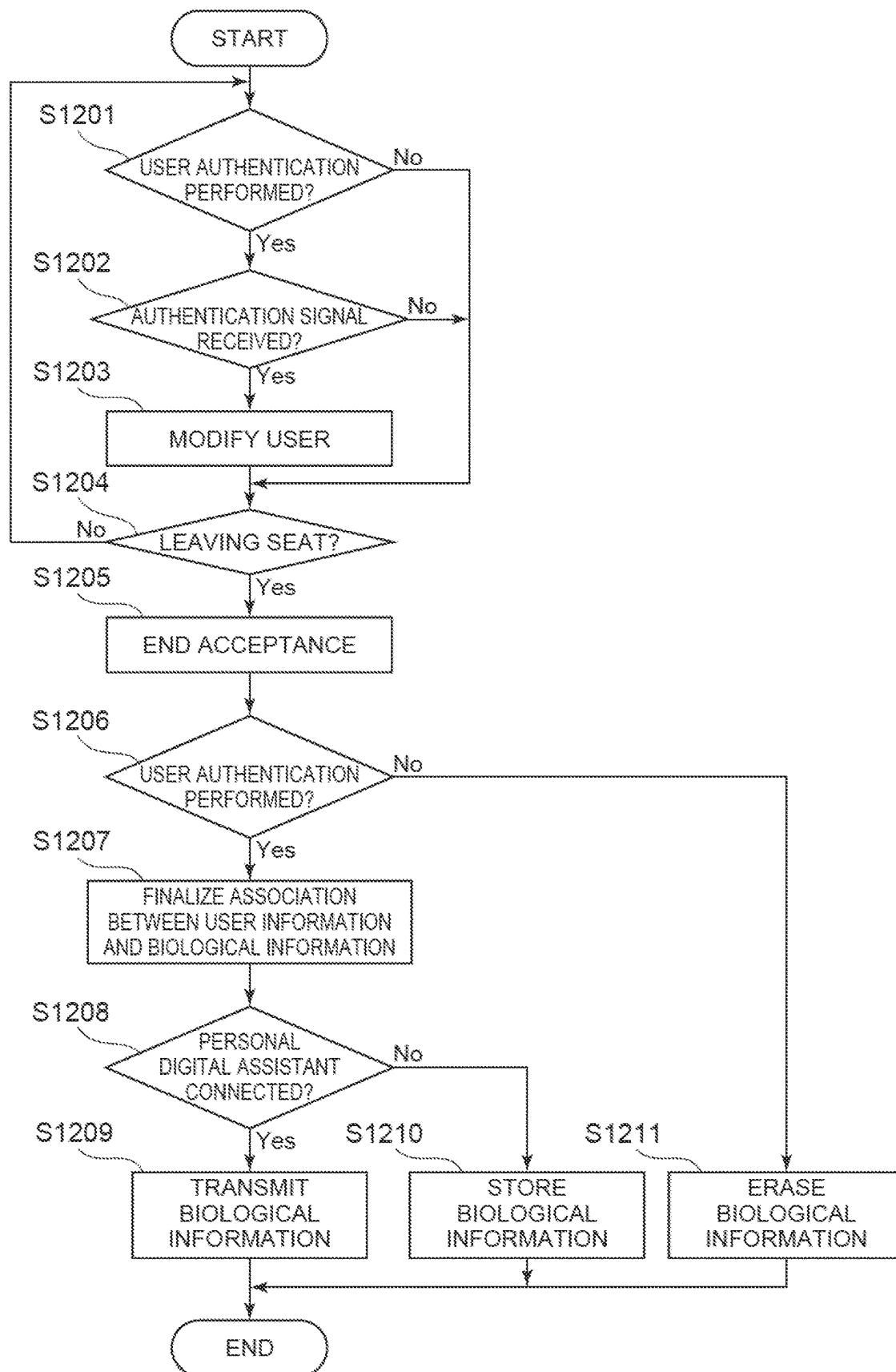


FIG. 10

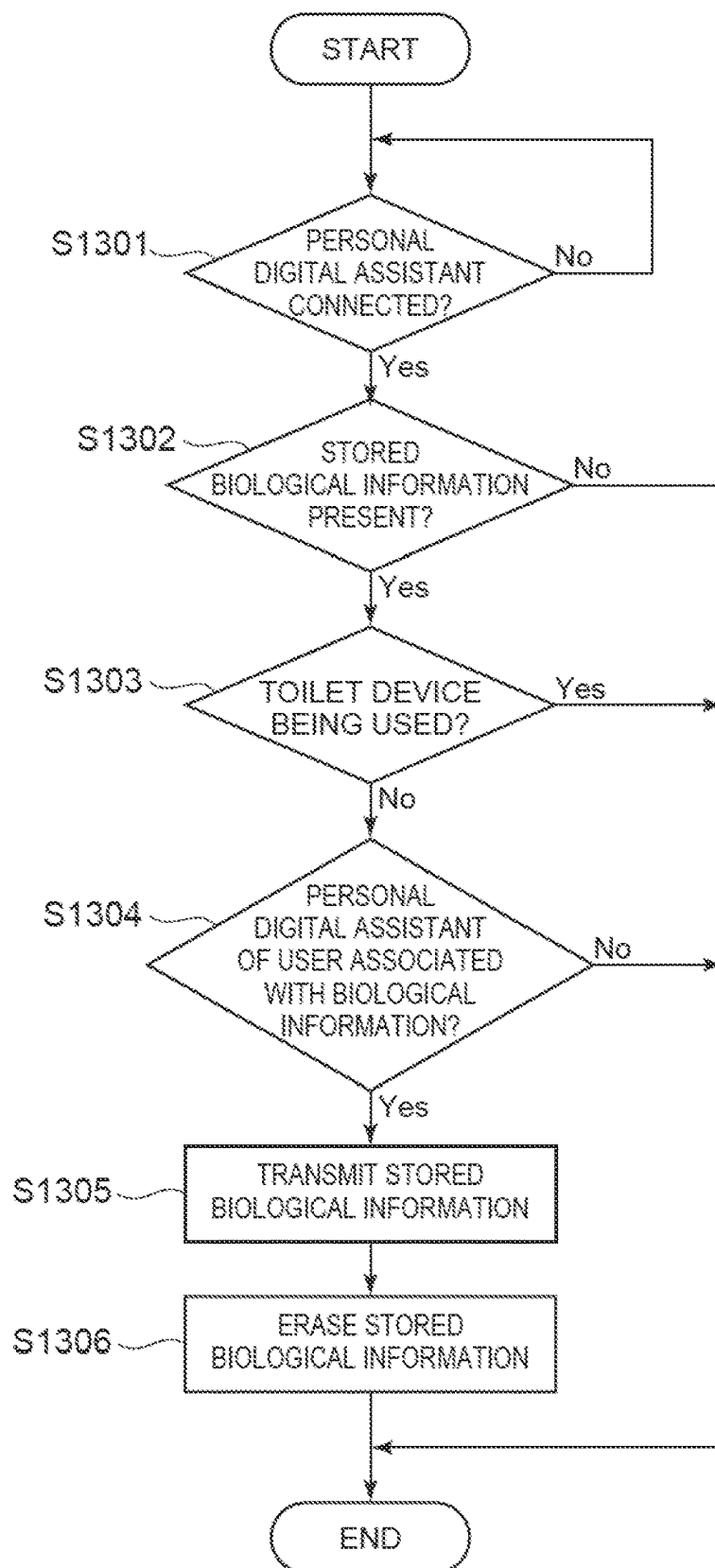


FIG. 11

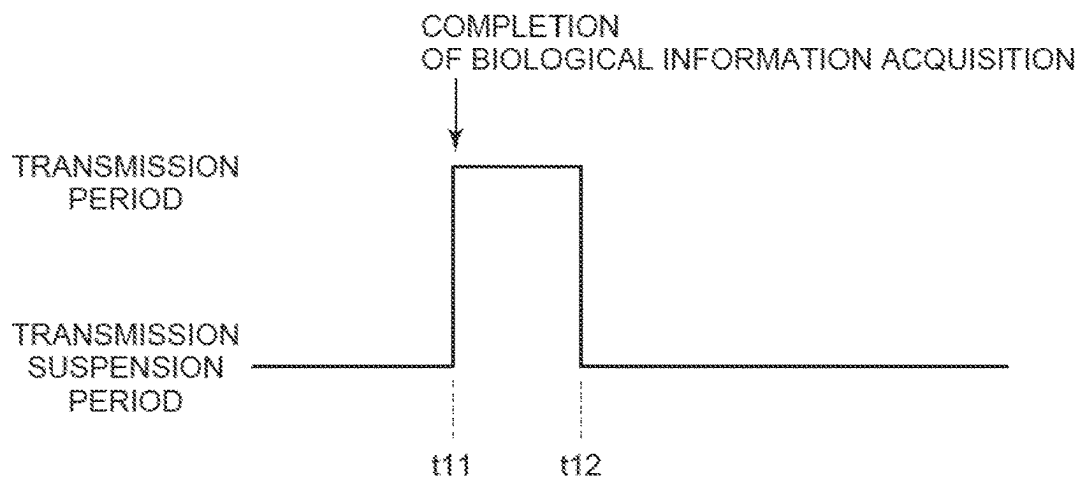


FIG. 12

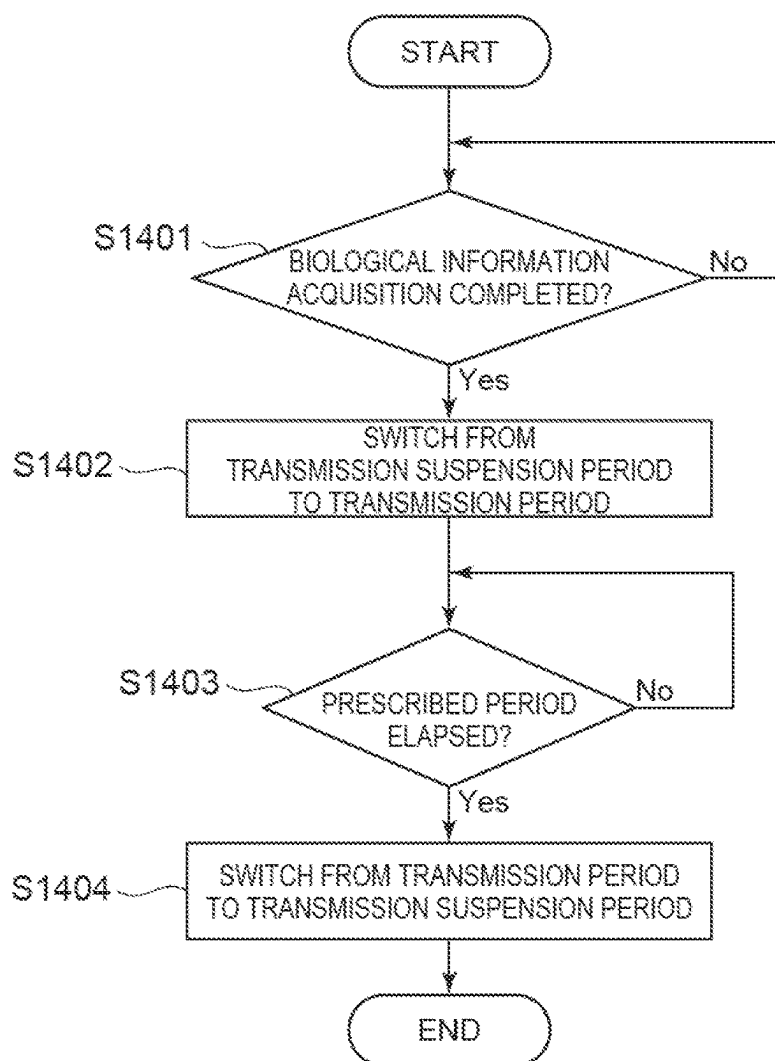


FIG. 13

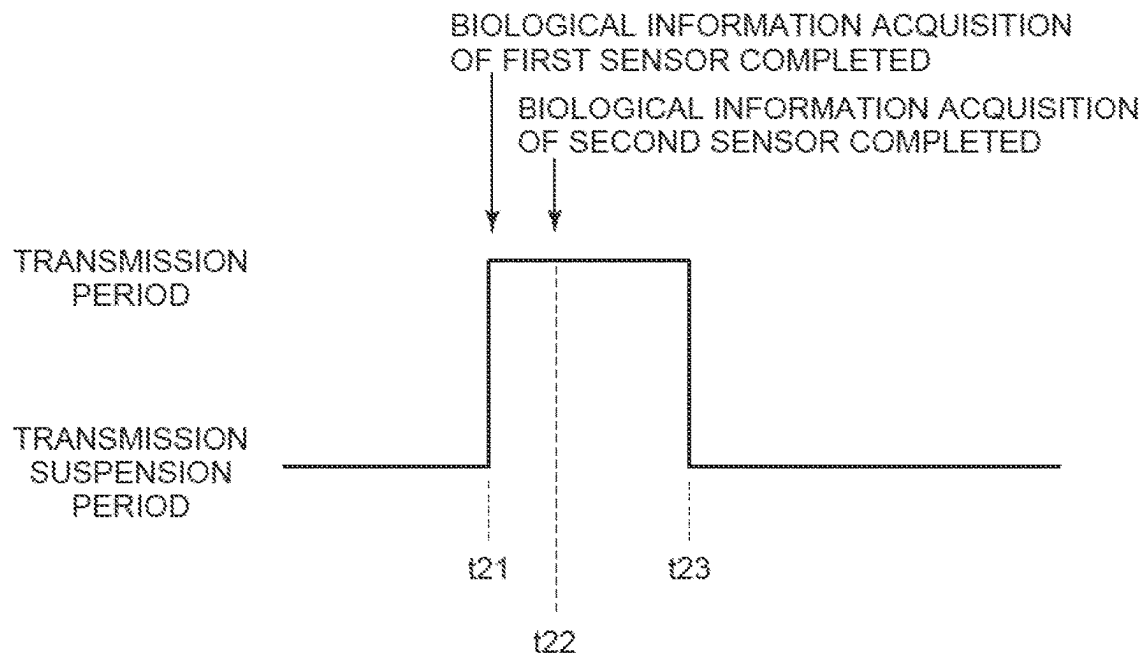


FIG. 14

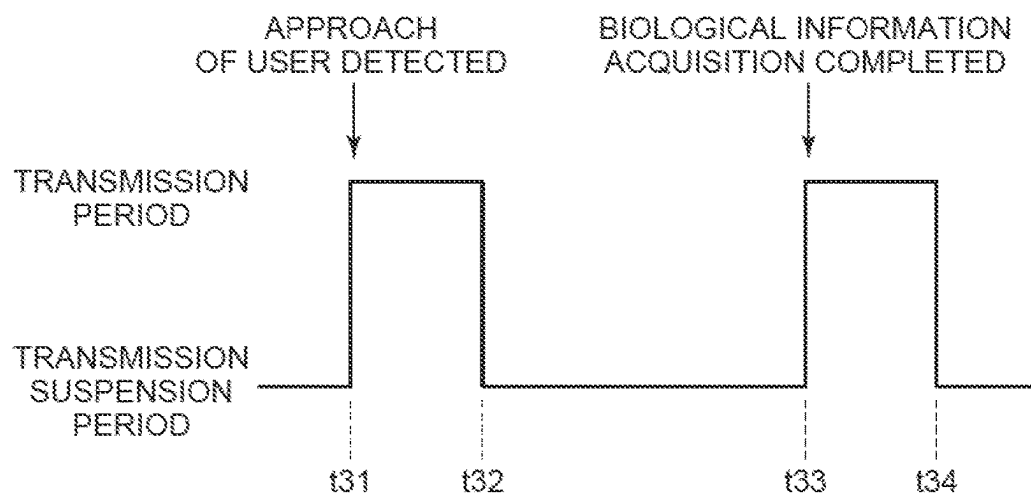


FIG. 15

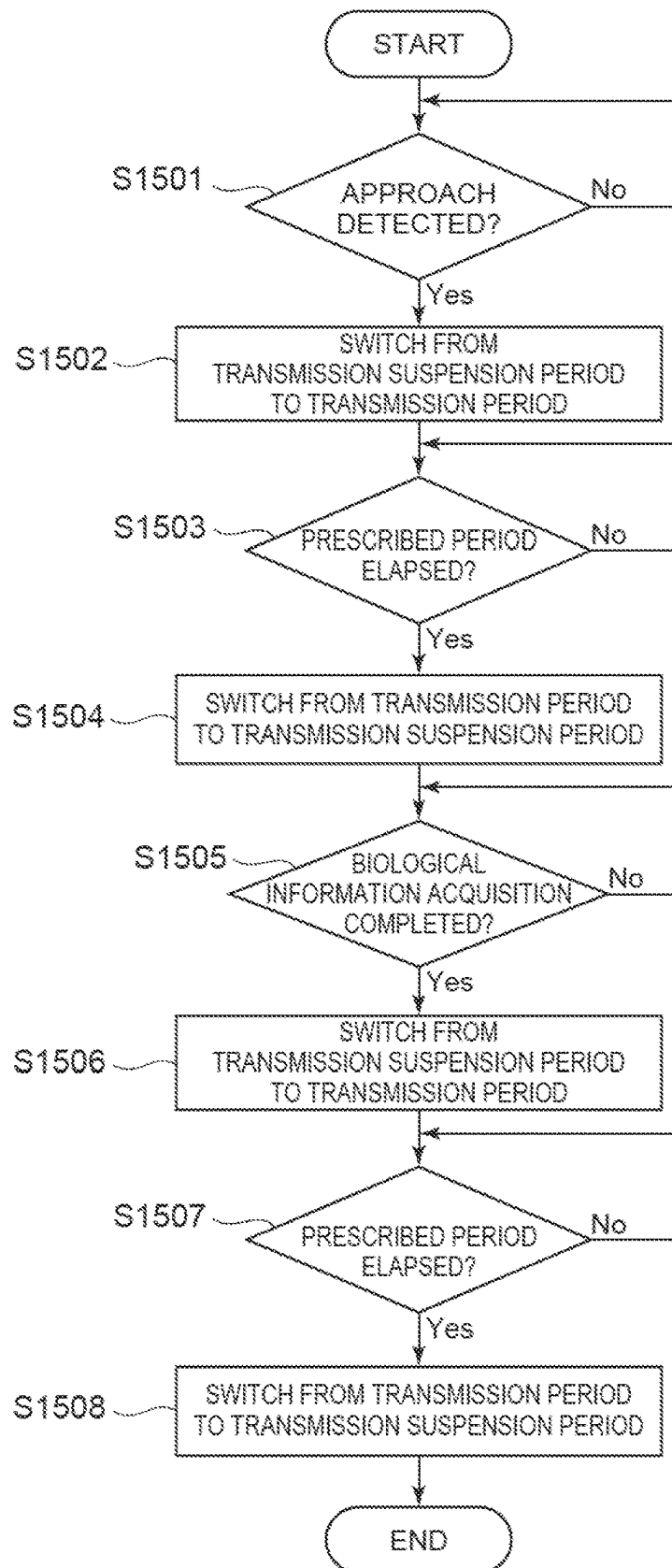


FIG. 16

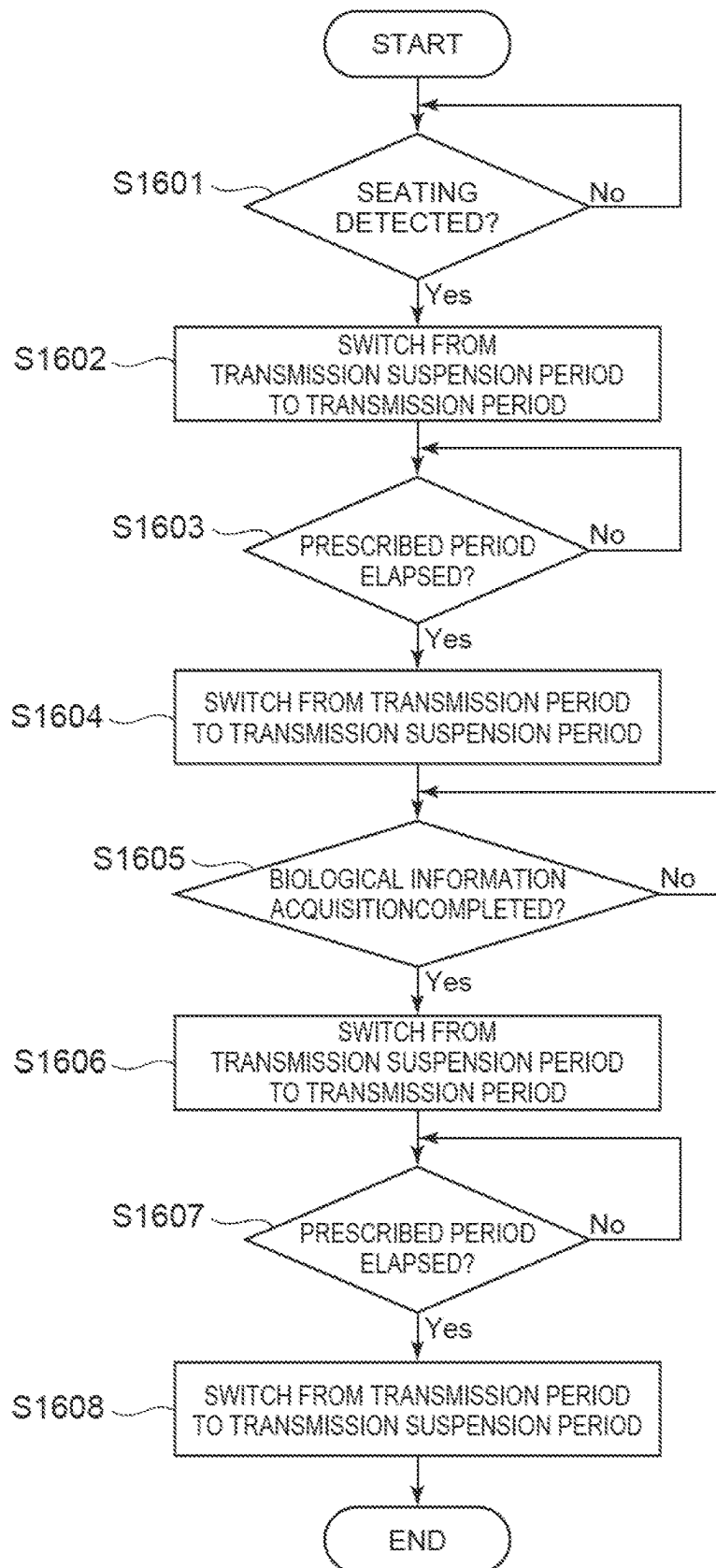


FIG. 17



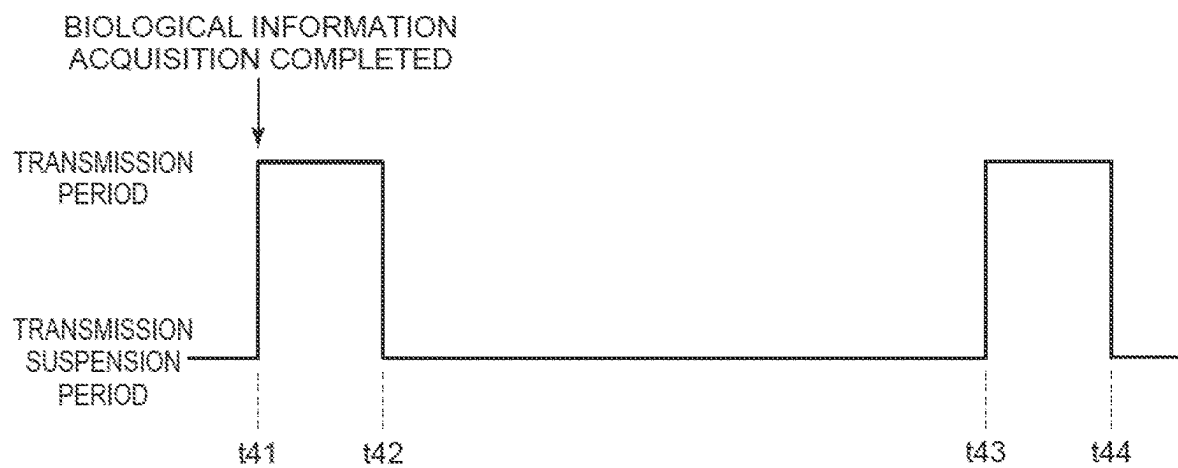


FIG. 18

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# TOILET DEVICE, METHOD FOR CONTROLLING A TOILET DEVICE, AND CONTROL PROGRAM OF A TOILET DEVICE

## CROSS-REFERENCE TO RELATED APPLICATIONS

This application is based upon and claims the benefit of priority from Japanese Patent Application No. 2023-058676, filed on Mar. 31, 2023; the entire contents of which are incorporated herein by reference.

## FIELD

Embodiments described herein relate generally to a toilet device, a method for controlling a toilet device, and a control program of a toilet device.

## BACKGROUND

There is a toilet device that measures biological information such as the pulsatory motion, excrement condition, etc., of a user and transmits the measurement result to a personal digital assistant of the user via wireless communication (e.g., 2020-187089 JP A). To improve the convenience of the user of such a toilet device, it is desirable for the measurement result to be automatically transmitted to the personal digital assistant without the user performing a special operation.

For example, automatic transmission of the measurement result to the personal digital assistant is being investigated in which an activation signal is transmitted from a toilet device to a personal digital assistant to activate prescribed application software, which is preinstalled in the personal digital assistant, in the background without requiring a user operation.

However, according to such a method, if the user performs a so-called task-kill that manually ends the application software activated in the background, there is a possibility that the personal digital assistant may no longer respond to subsequent activation signals; and the application software may no longer be re-activated.

To recover from the state in which the personal digital assistant does not respond to the activation signal without operating the personal digital assistant, a state in which the activation signal is not received must be continued for not less than a prescribed period. Therefore, if the toilet device is regularly transmitting the activation signal, it would be necessary to move once out of the range of communication of the toilet device (e.g., outside the toilet room).

It also may be considered that the user could operate the personal digital assistant, etc., to activate the application software to manually establish wireless communication with the toilet device, but this would undesirably require time and effort of the user.

Thus, when the personal digital assistant no longer responds to the activation signal, the user must take action such as moving once out of the range of communication or manually establishing wireless communication, which undesirably requires time and effort of the user. If the user does not take such action, the transmission of the measurement result is undesirably carried over to a subsequent use.

Because defecation is a natural part of daily life (the user cannot intentionally defecate), the measurement result should be acquirable automatically without requiring the intention of the user. Rather than receiving the measurement

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result at a fixed time, it is desirable for the measurement result to be acquirable as close as possible to the timing of the defecation because defecation is not performed at fixed times and frequency throughout the day.

It is therefore desirable for a toilet device that transmits biological information to a personal digital assistant of a user via wireless communication to be able to more appropriately transmit the biological information to the personal digital assistant of the user.

## SUMMARY

According to the embodiment, a toilet device includes a toilet unit including a toilet seat, a biological information measuring part configured to measure biological information of a user, a wireless communication part configured to wirelessly communicate with a personal digital assistant of the user, and a controller configured to transmit the biological information to the personal digital assistant of the user; the personal digital assistant includes an active state in which an application software is activated, and an inactive state in which the application software is suspended; the personal digital assistant is configured to receive the biological information by wirelessly communicating with the wireless communication part in the active state; the controller is configured to allow the biological information to be automatically transmitted to the personal digital assistant by switching the personal digital assistant from the inactive state to the active state by transmitting an activation signal from the wireless communication part to the personal digital assistant; the activation signal is for switching the personal digital assistant from the inactive state to the active state; the controller is configured to switch from a transmission suspension period to a transmission period between a start of the user using the toilet unit and a transmission of the biological information by controlling switching between the transmission period and the transmission suspension period; the activation signal is transmitted in the transmission period; and the transmission of the activation signal is suspended in the transmission suspension period.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view schematically illustrating a toilet system including a toilet device according to an embodiment;

FIG. 2 is a block diagram schematically illustrating the toilet system including the toilet device according to the embodiment;

FIG. 3 is a front view schematically illustrating a remote control of the toilet device according to the embodiment;

FIG. 4 is a flowchart schematically illustrating an example of an operation of a registration mode of the toilet device and the personal digital assistant according to the embodiment;

FIG. 5 is a flowchart schematically illustrating an example of an operation of a use mode of the toilet device and the personal digital assistant according to the embodiment;

FIG. 6 is a flowchart schematically illustrating an example of an operation when connecting the toilet device and the personal digital assistant according to the embodiment;

FIG. 7 is a flowchart schematically illustrating an example of an operation in the user authentication of the toilet device and the personal digital assistant according to the embodiment;

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FIG. 8 is a flowchart schematically illustrating an example of an operation in the user authentication of the remote control of the toilet device according to the embodiment;

FIG. 9 is a flowchart schematically illustrating an example of an operation of the use mode of the toilet device according to the embodiment;

FIG. 10 is a flowchart illustrating an example of an operation of the use mode of the toilet device according to the embodiment;

FIG. 11 is a flowchart illustrating an example of an operation of the use mode of the toilet device according to the embodiment;

FIG. 12 is a timing chart illustrating an example of the operation of the transmission of the activation signal of the toilet device according to the embodiment;

FIG. 13 is a flowchart illustrating an example of the operation of the transmission of the activation signal of the toilet device according to the embodiment;

FIG. 14 is a timing chart illustrating a modification of the operation of the transmission of the activation signal of the toilet device according to the embodiment;

FIG. 15 is a timing chart illustrating a modification of the operation of the transmission of the activation signal of the toilet device according to the embodiment;

FIG. 16 is a flowchart illustrating the modification of the operation of the transmission of the activation signal of the toilet device according to the embodiment;

FIG. 17 is a flowchart illustrating a modification of the operation of the transmission of the activation signal of the toilet device according to the embodiment; and

FIG. 18 is a timing flowchart illustrating a modification of the operation of the transmission of the activation signal of the toilet device according to the embodiment.

#### DETAILED DESCRIPTION

A first aspect is a toilet device that includes a toilet unit including a toilet seat, a biological information measuring part configured to measure biological information of a user, a wireless communication part configured to wirelessly communicate with a personal digital assistant of the user, and a controller configured to transmit the biological information to the personal digital assistant of the user; the personal digital assistant includes an active state in which an application software is activated, and an inactive state in which the application software is suspended; the personal digital assistant is configured to receive the biological information by wirelessly communicating with the wireless communication part in the active state; the controller is configured to allow the biological information to be automatically transmitted to the personal digital assistant by switching the personal digital assistant from the inactive state to the active state by transmitting an activation signal from the wireless communication part to the personal digital assistant; the activation signal is for switching the personal digital assistant from the inactive state to the active state; the controller is configured to switch from a transmission suspension period to a transmission period between a start of the user using the toilet unit and a transmission of the biological information by controlling switching between the transmission period and the transmission suspension period; the activation signal is transmitted in the transmission period; and the transmission of the activation signal is suspended in the transmission suspension period.

According to the toilet device, by switching from the transmission suspension period to the transmission period

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between the start of the user using the toilet unit and the transmission of the biological information, the undesirable state in which the personal digital assistant does not respond to the activation signal when transmitting the biological information due to a task-kill performed before the biological information is transmitted can be suppressed. Accordingly, when transmitting the biological information, the personal digital assistant can be switched more appropriately to the active state; and the biological information can be transmitted more appropriately and automatically to the personal digital assistant via wireless communication. As a result, the need for the user to take action such as moving once out of the range of communication or manually establishing wireless communication can be suppressed, and the usability can be further improved.

A second aspect is the toilet device of the first aspect, wherein the controller switches from the transmission suspension period to the transmission period for a prescribed period in response to the biological information measuring part completing an acquisition of the biological information.

According to the toilet device, the undesirable state in which the personal digital assistant does not respond to the activation signal when transmitting the biological information due to a task-kill performed before the biological information is transmitted can be more appropriately suppressed.

A third aspect is the toilet device of the second aspect, further including a proximity sensor configured to detect the user approaching the toilet unit and the user leaving the toilet unit; and the controller switches from the transmission suspension period to the transmission period for a prescribed period in response to the proximity sensor detecting the user approaching.

According to the toilet device, by switching from the transmission suspension period to the transmission period for a prescribed period in response to the proximity sensor detecting the user approaching, the personal digital assistant can be switched more promptly to the active state; and by switching from the transmission suspension period to the transmission period for the prescribed period in response to the completion of the acquisition of the biological information, the undesirable state in which the personal digital assistant does not respond to the activation signal when transmitting the biological information can be suppressed, even when a task-kill is performed between detecting the approach and completing the acquisition of the biological information.

A fourth aspect is the toilet device of the second aspect, further including a seating sensor configured to detect the user being seated on the toilet seat and the user leaving the toilet seat; and the controller switches from the transmission suspension period to the transmission period for a prescribed period in response to the seating sensor detecting the user being seated.

According to the toilet device, by switching from the transmission suspension period to the transmission period for the prescribed period in response to the seating sensor detecting the user being seated, the personal digital assistant can be switched more promptly to the active state; and by switching from the transmission suspension period to the transmission period for the prescribed period in response to the completion of the acquisition of the biological information, the undesirable state in which the personal digital assistant does not respond to the activation signal when transmitting the biological information can be suppressed,

even when a task-kill is performed between detecting the seating and completing the acquisition of the biological information.

A fifth aspect is the toilet device of the first aspect, wherein the controller switches from the transmission suspension period to the transmission period and continues the transmission period for a first duration, switches from the transmission period to the transmission suspension period and continues the transmission suspension period for a second duration, and then again switches from the transmission suspension period to the transmission period.

According to the toilet device, by again switching from the transmission suspension period to the transmission period after continuing the transmission suspension period for the second duration, the state in which the personal digital assistant does not respond to the activation signal and the biological information cannot be transmitted can be more appropriately suppressed, even when a task-kill is performed after the start of the user using the toilet unit.

A sixth aspect is a method for controlling a toilet device; the toilet device includes a toilet unit including a toilet seat, a biological information measuring part configured to measure biological information of a user, a wireless communication part configured to wirelessly communicate with a personal digital assistant of the user, and a controller configured to transmit the biological information to the personal digital assistant of the user; the personal digital assistant includes an active state in which an application software is activated, and an inactive state in which the application software is suspended; the personal digital assistant is configured to receive the biological information by wirelessly communicating with the wireless communication part in the active state; the controller is configured to allow the biological information to be automatically transmitted to the personal digital assistant by switching the personal digital assistant from the inactive state to the active state by transmitting an activation signal from the wireless communication part to the personal digital assistant; the activation signal is for switching the personal digital assistant from the inactive state to the active state; the controller is configured to control switching between a transmission period in which the activation signal is transmitted and a transmission suspension period in which the transmission of the activation signal is suspended; and the method includes switching from the transmission suspension period to the transmission period between a start of the user using the toilet unit and a transmission of the biological information.

According to the method for controlling the toilet device, by switching from the transmission suspension period to the transmission period between the start of the user using the toilet unit and the transmission of the biological information, the undesirable state in which the personal digital assistant does not respond to the activation signal when transmitting the biological information due to a task-kill performed before the biological information is transmitted can be suppressed. Accordingly, when transmitting the biological information, the personal digital assistant can be switched more appropriately to the active state; and the biological information can be transmitted more appropriately and automatically to the personal digital assistant via wireless communication. As a result, the need for the user to take action such as moving once out of the range of communication or manually establishing wireless communication can be suppressed, and the usability can be further improved.

A seventh aspect is a control program of a toilet device; the control program is installed in the toilet device; the toilet device includes a toilet unit including a toilet seat, a bio-

logical information measuring part configured to measure biological information of a user, a wireless communication part configured to wirelessly communicate with a personal digital assistant of the user, and a controller configured to transmit the biological information to the personal digital assistant of the user; the personal digital assistant includes an active state in which an application software is activated, and an inactive state in which the application software is suspended; the personal digital assistant is configured to receive the biological information by wirelessly communicating with the wireless communication part in the active state; the controller is configured to allow the biological information to be automatically transmitted to the personal digital assistant by switching the personal digital assistant from the inactive state to the active state by transmitting an activation signal from the wireless communication part to the personal digital assistant; the activation signal is for switching the personal digital assistant from the inactive state to the active state; the controller is configured to control switching between a transmission period in which the activation signal is transmitted and a transmission suspension period in which the transmission of the activation signal is suspended; and the control program is configured to cause the toilet device to switch from the transmission suspension period to the transmission period between a start of the user using the toilet unit and a transmission of the biological information.

According to the control program of the toilet device, by switching from the transmission suspension period to the transmission period between the start of the user using the toilet unit and the transmission of the biological information, the undesirable state in which the personal digital assistant does not respond to the activation signal when transmitting the biological information due to a task-kill performed before the biological information is transmitted can be suppressed. Accordingly, when transmitting the biological information, the personal digital assistant can be switched more appropriately to the active state; and the biological information can be transmitted more appropriately and automatically to the personal digital assistant via wireless communication. As a result, the need for the user to take action such as moving once out of the range of communication or manually establishing wireless communication can be suppressed, and the usability can be further improved.

Embodiments of the invention will now be described with reference to the drawings. Similar components in the drawings are marked with the same reference numerals; and a detailed description is omitted as appropriate.

#### Toilet Device

FIG. 1 is a perspective view schematically illustrating a toilet system including a toilet device according to an embodiment.

FIG. 2 is a block diagram schematically illustrating the toilet system including the toilet device according to the embodiment.

FIG. 3 is a front view schematically illustrating a remote control of the toilet device according to the embodiment.

As illustrated in FIGS. 1 to 3, the toilet system 500 according to the embodiment includes the toilet device 100 and a personal digital assistant 200.

The toilet device 100 includes a toilet unit 10, a biological information measuring part 20, a controller 30, a wireless communication part 40, a storage part 50, a human body detection sensor 60, and a remote control 70. The toilet device 100 is disposed inside a toilet room TR. The toilet room TR may be a toilet room in a general household, or

may be a private room (a so-called toilet booth disposed in the restroom of a public facility).

The toilet unit **10** includes a toilet **11**, a toilet seat **12**, a toilet lid **13**, and a casing **14**. The toilet **11** is a western-style sit-down toilet. The toilet **11** includes a concave bowl **11a** that is recessed downward. The bowl **11a** receives human waste, urine, etc., excreted from the user. The toilet unit **10** may not always include the toilet **11**. The toilet device **100** may be a toilet device that includes the toilet **11** by being integrated with a toilet, or may be a seat-type toilet device detachably mounted on a toilet.

The toilet seat **12** and the toilet lid **13** each are pivotally supported to be openable and closable with respect to the casing **14**. FIG. **1** illustrates a state in which the toilet seat **12** is closed and the toilet lid **13** is open. The toilet lid **13** covers the toilet seat **12** in the closed state from above. The toilet lid **13** is provided as necessary and is omissible. It is sufficient for the toilet unit **10** to include at least the casing **14** and the toilet seat **12** pivotally supported to be openable and closable with respect to the casing **14**.

The casing **14** stores various functional units. For example, an automatic opening/closing unit automatically opening and closing the toilet seat **12** and/or the toilet lid **13**, a private part washing unit including a nozzle for washing a private part of the user, a private part drying unit for drying a private part of the user, a deodorizing unit that deodorizes, etc., are stored inside the casing **14**. These various functional units are provided as necessary and are omissible. The controller **30**, the wireless communication part **40**, the storage part **50**, etc., are stored inside the casing **14**.

The biological information measuring part **20** measures biological information of the user. The biological information includes, for example, information related to the user's pulsatory motion, excrement condition, etc. The biological information measuring part **20** is electrically connected with the controller **30**. The biological information measuring part **20** communicates with the controller **30** regarding the measured biological information.

The biological information measuring part **20** includes multiple sensors including a first sensor **21** and a second sensor **22**. The biological information measuring part **20** uses the multiple sensors **21** and **22** to measure multiple biological information of the user. The first sensor **21** is, for example, a pulsatory motion sensor. More specifically, the first sensor **21** is, for example, a laser sensor. For example, the first sensor **21** is disposed at the toilet seat **12**. For example, the first sensor **21** measures the pulsatory motion of the user seated on the toilet seat **12** by using hemoglobin infrared reflection.

The second sensor **22** is, for example, an image sensor. More specifically, the second sensor **22** is, for example, a line sensor in which multiple pixels are arranged in a line shape. The second sensor **22** may be, for example, an area sensor in which multiple pixels are arranged in a matrix configuration. For example, the second sensor **22** is disposed inside the casing **14**. For example, the second sensor **22** determines the excrement condition (the shape, color, amount, etc.) by using image data of the imaged excrement such as feces and the like excreted into the bowl **11a**.

The measurement of the biological information by the first and second sensors **21** and **22** may include acquiring information by a measurement and analyzing the information acquired by the measurement. As biological information, for example, the first sensor **21** acquires (estimates) information such as the vascular age, lower limb blood circulation status, fitness level, basal metabolism, body water level, body clock, normal heart rate, etc., by analyzing

information of the measured pulsatory motion of the user. As biological information, for example, the second sensor **22** acquires (estimates) information of the state of the intestinal environment by analyzing information of the measured excrement condition.

The analysis of the information measured by the first and second sensors **21** and **22** is not limited to the first and second sensors **21** and **22** and may be performed by, for example, the controller **30**, the personal digital assistant **200**, etc. For example, the analysis of the biological information may be performed by an external server or the like (an external device) by transmitting the biological information from the personal digital assistant **200** of the user to an external server (e.g., a cloud server), etc.

Thus, the biological information that is measured by the first and second sensors **21** and **22** may be measurement information for which only measurement is performed, or may be analysis information acquired by analyzing the measurement information acquired by the measurement.

Each of the first and second sensors **21** and **22** may acquire multiple measurement information by measurement. Each of the first and second sensors **21** and **22** may acquire multiple biological information by analysis. For example, each of the first and second sensors **21** and **22** may acquire multiple biological information from one set of measurement information by analysis. In other words, one sensor disposed in the biological information measuring part **20** may measure multiple biological information.

The multiple biological information that is measured by the multiple sensors of the biological information measuring part **20** is not limited to the biological information described above and may be any information that is associated with the health condition of the user and is acquirable by the toilet device **100**. In the example, the biological information measuring part **20** includes two sensors, i.e., the first sensor **21** and the second sensor **22**. The number of sensors disposed in the biological information measuring part **20** is not limited to two and may be three or more. It is sufficient for the number of sensors disposed in the biological information measuring part **20** to be appropriately set according to the biological information to be measured.

The controller **30** is electrically connected with the biological information measuring part **20**, the wireless communication part **40**, the storage part **50**, and the human body detection sensor **60**. The controller **30** acquires the measurement result (the biological information) of the biological information measuring part **20** and the detection result of the human body detection sensor **60**. The controller **30** controls the biological information measuring part **20**, the wireless communication part **40**, and the storage part **50**. For example, the controller **30** controls the start and stop of the measurement of the biological information by the biological information measuring part **20**. The controller **30** includes, for example, a main body controller that comprehensively controls the components of the toilet device **100**, and a sensor controller that is disposed in the biological information measuring part **20** and controls the operation of the biological information measuring part **20**. In other words, a part of the controller **30** may be disposed in the biological information measuring part **20**. For example, the start and stop of the measurement of the biological information by the biological information measuring part **20** is controlled by at least one of the main body controller or the sensor controller. The controller **30** is, for example, a control circuit including an IC element. The controller **30** is not limited to one IC element (processor) and may include a combination of multiple IC elements.

The controller **30** is configured to transmit the biological information to the personal digital assistant **200** of the user via the wireless communication part **40**. The controller **30** also stores the biological information in the storage part **50**. The storage part **50** may include a storage part connected to the main body controller and a storage part connected to the sensor controller. In other words, a part of the storage part **50** may be disposed in the biological information measuring part **20**. The biological information may be stored in the storage part of the main body controller and may be stored in the storage part of the sensor controller. The controller **30** erases the biological information stored in the storage part **50** from the storage part **50**. The storage and erasure of the biological information in the storage part **50** is described below.

The wireless communication part **40** is configured to connect the controller **30** and the personal digital assistant **200** by wireless communication. The wireless communication part **40** is electrically connected with the controller **30**. The wireless communication part **40** is, for example, a communication module configured to communicate using a Bluetooth (registered trademark) standard such as BLE (Bluetooth Low Energy), etc. For example, the wireless communication part **40** is configured to connect the controller **30** and the personal digital assistant **200** positioned inside the toilet room TR by wireless communication. For example, the connection between the controller **30** and the personal digital assistant **200** is disconnected when the personal digital assistant **200** is outside the toilet room TR. Also, the connection between the controller **30** and the personal digital assistant **200** is disconnected when, for example, a disconnect request signal is transmitted from the personal digital assistant **200**. The connection between the toilet device **100** (the controller **30**) and the personal digital assistant **200** is described below.

The form of communication between the toilet device **100** and the personal digital assistant **200** is not limited to the toilet device **100** and the personal digital assistant **200** being directly connected by wireless communication and may be, for example, communication via an external server (e.g., a cloud server), etc. The wireless communication part **40** may wirelessly communicate with the external server. For example, the toilet device **100** may transmit the acquired biological information (analysis information) to the external server. In such a case, analysis of the biological information may be performed by the server receiving the biological information from the toilet device **100**. The personal digital assistant **200** may receive its own biological information (analysis information) from the server by wirelessly communicating with the server. The timing of the wireless communication of the toilet device **100** with the server may be, for example, when transmitting the biological information (the analysis information), in the user authentication, or both. The timing of the wireless communication of the personal digital assistant **200** with the server may be any timing. Devices used in the communication between the toilet device **100** and the personal digital assistant **200** are not limited to servers and may include other devices. The form of communication between the toilet device **100** and the personal digital assistant **200** may be via any external device.

The storage part **50** is configured to store the information output from the controller **30**. The storage part **50** is electrically connected with the controller **30**. For example, the storage part **50** stores the biological information. For example, the storage part **50** associates and stores the biological information and user information identifying the

user in a state in which user authentication is performed. User authentication is described below.

The storage part **50** associates and stores identification information identifying the personal digital assistant **200** and the user information identifying the user. For example, the information that associates the identification information and the user information may be stored in a storage part disposed in the wireless communication part **40**. In other words, a part of the storage part **50** may be disposed in the wireless communication part **40**. The identification information is, for example, unique information assigned to the personal digital assistant **200** such as a MAC address, etc. The identification information may be, for example, an ID number, a BD address (a Bluetooth address), pairing information (cryptographic information shared by the toilet device **100** and an application of the personal digital assistant **200** when pairing), etc. The user information is, for example, unique information assigned to each user such as a user number, etc. The user information may be any information that can identify the multiple users. The identification information may be any information that can identify the personal digital assistant **200** of each user. A registration mode in which the identification information and the user information are associated and stored is described below.

The human body detection sensor **60** detects the state of the user. The human body detection sensor **60** includes, for example, at least one of a seating sensor **61** or a proximity sensor **62**. For example, the seating sensor **61** is disposed in the toilet seat **12**. The seating sensor **61** includes, for example, a capacitive sensor. For example, the seating sensor **61** detects the user being seated on the toilet seat **12** and the user leaving the toilet seat **12**. The seating sensor **61** may be, for example, a mechanical switch disposed in the casing **14**, etc. The seating sensor **61** may be any sensor that can appropriately detect the user being seated and leaving the seat.

For example, the proximity sensor **62** is disposed inside the casing **14**. For example, the proximity sensor **62** detects the user approaching the toilet unit **10** and the user leaving the toilet unit **10**. For example, the proximity sensor **62** detects the user entering the toilet room TR and the user exiting the toilet room TR. In other words, the proximity sensor **62** is a room entrance detection sensor.

The proximity sensor **62** includes a nondetection state in which the user is not detected, and a detection state in which the user is detected. In other words, the nondetection state is the state in which the user exiting the toilet room TR is detected. In other words, the detection state is the state in which the user entering the toilet room TR is detected.

The proximity sensor **62** includes, for example, at least one of a radio wave sensor or an infrared sensor. However, the proximity sensor **62** is not limited to such sensors and may be any sensor that can appropriately detect the user approaching. The proximity sensor **62** is not limited to a sensor detecting the user entering the toilet room TR and may be a sensor detecting the user approaching the toilet seat **12**, the casing **14**, or the like of the toilet unit **10**. The proximity sensor **62** may be disposed outside the casing **14**.

For example, the remote control **70** is disposed at a wall surface WL of the toilet room TR. The remote control **70** is an operation unit for remotely operating various functional units stored inside the casing **14**. The operation unit is not limited to the remote control **70** being disposed separately from the casing **14** and may be, for example, integrally provided with the casing **14**.

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For example, the remote control **70** transmits, to the controller **30**, signals for operating the various functional units based on operation input of the remote control **70** by the user. When receiving the signals from the remote control **70**, the controller **30** controls the various functional units based on the signals. For example, the remote control **70** is connected with the controller **30** by wireless communication. For example, the wireless communication part that connects the remote control **70** and the controller **30** is disposed separately from the wireless communication part **40**.

The remote control **70** (the operation unit) includes, for example, an authentication switch **71** for transmitting an authentication signal. When an operation input of the authentication switch **71** is performed, the remote control **70** transmits the authentication signal to the controller **30**. For example, the controller **30** can perform user authentication based on the authentication signal from the remote control **70**. The user authentication is described below.

The personal digital assistant **200** is, for example, a smartphone, tablet terminal, or the like possessed by the user. However, the personal digital assistant **200** is not limited to such terminals; any terminal that can be carried by the user may be used.

A control program (application software) for connecting with the toilet device **100** and displaying information (e.g., analysis information) transmitted from the toilet device **100** is preinstalled in the personal digital assistant **200**.

The personal digital assistant **200** includes an active state in which the application software is activated, and an inactive state in which the application software is suspended. The personal digital assistant **200** is configured to receive the biological information by wirelessly communicating with the wireless communication part **40** in the active state.

FIG. **4** is a flowchart schematically illustrating an example of an operation of a registration mode of the toilet device and the personal digital assistant according to the embodiment.

FIG. **5** is a flowchart schematically illustrating an example of an operation of a use mode of the toilet device and the personal digital assistant according to the embodiment.

As illustrated in FIGS. **4** and **5**, the toilet device **100** (the controller **30**) includes the registration mode and the use mode.

The registration mode is a mode in which user registration can be performed. User registration is the operation of associating the identification information identifying the personal digital assistant **200** and the user information (e.g., the user number) identifying the user, and storing the identification information and the user information in the storage part **50**. The user registration may be performed by storing the identification information and the user information in a storage part disposed in the wireless communication part **40** (a part of the storage part **50** disposed in the wireless communication part **40**). The registration mode is performed in a state in which the toilet device **100** (the controller **30**) and the personal digital assistant **200** are connected by wireless communication.

The use mode is a mode in which the measurement of the biological information, the analysis of the biological information, and the transmission of the analysis information can be performed. For example, the controller **30** normally operates in the use mode. For example, the controller **30** performs the operation of the registration mode in response to receiving an instruction from the remote control **70** or the

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personal digital assistant **200** to perform the registration mode during the operation of the use mode. After performing the operation of the registration mode, the controller **30** returns to the operation of the use mode.

When user registration has already been performed, the user authentication can be performed in the use mode. User authentication is the operation of designating the user. In other words, user authentication is the operation of designating the user information (the user number) of the user using the toilet device **100** and the identification information of the personal digital assistant **200** of the user. For example, by performing user authentication, the biological information can be associated with the user information (the user number) and/or the identification information of the personal digital assistant **200** of the user and stored in the storage part **50**. By performing user authentication, for example, selective wireless communication can be established between the toilet device **100** and the personal digital assistant **200** designated by the user authentication.

For example, the user authentication is performed by the toilet device **100** (the controller **30**) and the personal digital assistant **200** being connected by wireless communication. In such a case, the personal digital assistant **200** that is connected with the toilet device **100** (the controller **30**) transmits, to the toilet device **100**, an authentication signal including the user information (the user number) registered in the personal digital assistant **200**. When receiving the authentication signal, the toilet device **100** determines that the user of the user information (the user number) included in the authentication signal is using the toilet device **100**. As a result, the user information (the user number) of the user using the toilet device **100** and the identification information of the personal digital assistant **200** of the user can be designated. The user authentication using the personal digital assistant **200** is described below.

For example, the user authentication may be performed by an operation input of the authentication switch **71** of the remote control **70**. In such a case, when the operation input of the authentication switch **71** (e.g., the selection of the user number) is performed, the remote control **70** transmits an authentication signal including the user information (the user number) to the toilet device **100**. When receiving the authentication signal, the toilet device **100** determines that the user of the user information (the user number) included in the authentication signal is using the toilet device **100**. As a result, the user information (the user number) of the user using the toilet device **100** and the identification information of the personal digital assistant **200** of the user can be designated. The user authentication using the remote control **70** is described below.

Thus, the controller **30** performs the user authentication to designate the user based on the user information stored in the storage part **50**. For example, the controller **30** receives the authentication signal including the user information from at least one of the personal digital assistant **200** or the remote control **70** (the operation unit) and performs user authentication to designate the user based on the user information included in the received authentication signal and the user information stored in the storage part **50**. For example, when the same user information as the user information included in the received authentication signal is stored in the storage part **50**, the controller **30** designates the user indicated by the user information as the current user.

After performing the user authentication, by associating the biological information and user information of the user designated by the user authentication, the controller **30** can transmit the biological information to the personal digital

assistant **200** of the user designated based on the identification information associated with the user information and stored in the storage part **50**. As a result, the undesirable transmission of the biological information to the personal digital assistant **200** of a different user can be suppressed.

The registration mode will now be described in more detail.

In the registration mode as illustrated in FIG. 4, the toilet device **100** (the controller **30**) determines whether or not a user number selection signal is received (step **S101**). The toilet device **100** (the controller **30**) repeats step **S101** until the user number selection signal is received (step **S101**: No). The user number selection signal indicates a user number selected by the personal digital assistant **200**.

When the user number selection signal is received (step **S101**: Yes), the toilet device **100** (the controller **30**) associates the selected user number and the identification number of the personal digital assistant **200** transmitting the user number selection signal and stores (registers) the selected user number and the identification number in the storage part **50** (step **S102**).

The user number and the identification number are associated and registered (step **S102**); and the toilet device **100** (the controller **30**) transmits a registration completion signal to the personal digital assistant **200** (step **S103**). The registration completion signal indicates that the registration is completed.

When the user number is selected by the personal digital assistant **200**, the personal digital assistant **200** transmits the user number selection signal to the toilet device **100** (step **S201**).

When the user number selection signal is transmitted to the toilet device **100** (step **S201**), the personal digital assistant **200** determines whether or not the registration completion signal is received from the toilet device **100** (step **S202**). The personal digital assistant **200** repeats step **S202** until the registration completion signal is received (step **S202**: No).

When the registration completion signal is received (step **S202**: Yes), the personal digital assistant **200** stores (registers) the registered user number (step **S203**).

The use mode will now be described in more detail.

In the use mode as illustrated in FIG. 5, the toilet device **100** (the controller **30**) determines whether or not the seating sensor **61** has detected the user being seated on the toilet seat **12** (step **S301**). The toilet device **100** (the controller **30**) repeats step **S301** until the seating sensor **61** detects the user being seated on the toilet seat **12** (step **S301**: No).

When the seating sensor **61** detects the user being seated on the toilet seat **12** (step **S301**: Yes), the toilet device **100** (the controller **30**) causes the sensors **21** and **22** of the biological information measuring part **20** to start the measurement of biological information (step **S302**).

When the measurement of the biological information is completed (step **S303**), the sensors **21** and **22** start analyzing the biological information (step **S304**). If the user leaving the toilet seat **12** is detected before the measurement is completed, for example, the sensors **21** and **22** end the measurement of the biological information partway through and start analyzing the biological information.

When the analysis of the biological information is completed (step **S305**), the toilet device **100** (the controller **30**) transmits the biological information (the analysis information) obtained by the analysis to the personal digital assistant **200** (step **S306**). As described above, the transmission of the biological information is performed by the controller **30** via the wireless communication part **40**. As described above, the analysis of the biological information may be performed by

the controller **30** and/or the personal digital assistant **200**. Steps **S304** and **S305** may be omitted.

For example, the personal digital assistant **200** displays progress information of the measurement of the biological information (step **S401**). The display of the progress information is described below.

The personal digital assistant **200** determines whether or not the biological information is received (step **S402**). The personal digital assistant **200** repeats step **S402** until the biological information is received (step **S402**: No).

When the biological information is received (step **S402**: Yes), the personal digital assistant **200** displays the biological information (step **S403**). The personal digital assistant **200** may store the biological information to be able to display the biological information even after the connection between the toilet device **100** (the controller **30**) and the personal digital assistant **200** is disconnected.

In step **S301**, the toilet device **100** (the controller **30**) may determine whether or not the proximity sensor **62** has detected the user approaching the toilet unit **10**, or may determine whether or not the proximity sensor **62** has detected the user entering the toilet room TR. That is, the trigger of the measurement start of the biological information of the toilet device **100** (the controller **30**) may be the user being seated on the toilet seat **12**, the user approaching the toilet unit **10**, or the user entering the toilet room TR. The trigger of the measurement start of the biological information may be, for example, the completion of the user authentication. The trigger of the measurement start of the biological information may be, for example, a change of the state of the biological information measuring part **20**. More specifically, a change of the state of the biological information measuring part **20** is, for example, the change of the output of the line sensor (e.g., a falling object detected), a change of the output of the laser sensor, etc.

The connection between the toilet device **100** and the personal digital assistant **200** will now be described in more detail.

FIG. 6 is a flowchart schematically illustrating an example of an operation when connecting the toilet device and the personal digital assistant according to the embodiment.

As illustrated in FIG. 6, the toilet device **100** (the controller **30**) transmits an activation signal to the personal digital assistant **200** (step **S501**). The activation signal is a signal for switching the personal digital assistant **200** from the inactive state to the active state. More specifically, the activation signal is a signal for switching the application software to the active state in the background. In the active state, the personal digital assistant **200** is able to receive an advertisement signal (a wireless signal). In the inactive state, the personal digital assistant **200** cannot receive the advertisement signal (the wireless signal). In other words, the active state is a state in which the advertisement signal can be received. In other words, the inactive state is a state in which the advertisement signal cannot be received.

When transmitting the activation signal (step **S501**), the toilet device **100** (the controller **30**) transmits an advertisement signal to the personal digital assistant **200** (step **S502**). The advertisement signal is a signal for causing the personal digital assistant **200** to start a connection with the toilet device **100** (the controller **30**).

When transmitting the advertisement signal (step **S502**), the toilet device **100** (the controller **30**) determines whether or not a connection request signal is received (step **S503**). The connection request signal is a signal for causing the



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toilet device **100** (the controller **30**) to start a connection with the personal digital assistant **200**.

When receiving the connection request signal (step **S503**: Yes), the toilet device **100** (the controller **30**) starts a connection with the personal digital assistant **200** (step **S504**). When the connection request signal is not received (step **S503**: No), the toilet device **100** (the controller **30**) does not perform step **S504**. That is, when the connection request signal is not received (step **S503**: No), the toilet device **100** (the controller **30**) does not start a connection with the personal digital assistant **200**.

The personal digital assistant **200** determines whether or not the activation signal is received (step **S601**). The personal digital assistant **200** repeats step **S601** until the activation signal is received (step **S601**: No).

When the activation signal is received (step **S601**: Yes), the personal digital assistant **200** switches from the inactive state to the active state (step **S602**). For example, the personal digital assistant **200** is set to a background active state in which the application software is activated in the background. For example, when the activation signal is received when the user is referring to the screen, etc., the personal digital assistant **200** may activate the application software in the foreground.

In the active state (step **S602**), the personal digital assistant **200** determines whether or not the advertisement signal is received (step **S603**). The personal digital assistant **200** repeats step **S603** until the advertisement signal is received (step **S603**: No).

When the advertisement signal is received (step **S603**: Yes), the personal digital assistant **200** transmits a connection request signal to the toilet device **100** (the controller **30**) (step **S604**) and starts a connection with the toilet device **100** (the controller **30**) (step **S605**).

Thus, the controller **30** switches the personal digital assistant **200** from the inactive state to the active state by transmitting, from the wireless communication part **40** to the personal digital assistant **200**, the activation signal for switching the personal digital assistant **200** from the inactive state to the active state. As a result, the controller **30** automatically starts the connection with the personal digital assistant **200** by wireless communication without requiring an operation of the user, etc. As a result, the controller **30** allows the biological information to be automatically transmitted to the personal digital assistant **200**. By transmitting the activation signal to automatically start the connection with the personal digital assistant **200** by wireless communication, user authentication that uses the personal digital assistant **200** can be easily performed.

The user authentication using the personal digital assistant **200** will now be described in more detail.

FIG. **7** is a flowchart schematically illustrating an example of an operation in the user authentication of the toilet device and the personal digital assistant according to the embodiment.

As illustrated in FIG. **7**, when starting the connection with the personal digital assistant **200** (step **S701**), the toilet device **100** (the controller **30**) determines whether or not the authentication signal is received (step **S702**). The toilet device **100** (the controller **30**) repeats step **S702** until the authentication signal is received (step **S702**: No). The authentication signal is, for example, a signal that includes the user information (the user number).

When the authentication signal is received (step **S702**: Yes), the toilet device **100** (the controller **30**) designates the user information and the identification information based on the authentication signal (step **S703**). More specifically, the

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toilet device **100** (the controller **30**) designates the user information included in the authentication signal and designates the personal digital assistant **200** having the identification information associated with the user information included in the authentication signal.

When the user information and the identification information are designated (step **S703**), the toilet device **100** (the controller **30**) transmits an authentication completion signal to the personal digital assistant **200** (step **S704**). The authentication completion signal indicates that the user authentication is completed.

When transmitting the authentication completion signal (step **S704**), the toilet device **100** (the controller **30**) determines whether or not a disconnect request signal is received (step **S705**). The toilet device **100** (the controller **30**) repeats step **S705** until the disconnect request signal is received (step **S705**: No). The disconnect request signal is a signal for causing the toilet device **100** (the controller **30**) to disconnect the connection with the personal digital assistant **200**.

When the disconnect request signal is received (step **S705**: Yes), the toilet device **100** (the controller **30**) disconnects the connection with the personal digital assistant **200** (step **S706**).

When starting the connection with the toilet device **100** (the controller **30**) (step **S801**), the personal digital assistant **200** transmits the authentication signal (step **S802**).

When transmitting the authentication signal (step **S802**), the personal digital assistant **200** determines whether or not the authentication completion signal is received (step **S803**). The personal digital assistant **200** repeats step **S803** until the authentication completion signal is received (step **S803**: No).

When the authentication completion signal is received (step **S803**: Yes), the personal digital assistant **200** transmits the disconnect request signal (step **S804**) and disconnects the connection with the toilet device **100** (the controller **30**) (step **S805**).

Thus, after performing the registration mode (i.e., in the state in which the identification information and the user information are associated and stored in the storage part **50**), the toilet device **100** (the controller **30**) can perform user authentication in the use mode to designate the user information and the identification information when receiving the authentication signal.

The user authentication using the remote control **70** will now be described in more detail.

FIG. **8** is a flowchart schematically illustrating an example of an operation in the user authentication of the remote control of the toilet device according to the embodiment.

As illustrated in FIG. **8**, when an operation input of the authentication switch **71** is performed (step **S901**), the remote control **70** selects user information (step **S902**). More specifically, the remote control **70** selects, for example, the user number 1 for the first operation input.

When selecting the user information (step **S902**), the remote control **70** determines whether or not a further operation input of the authentication switch **71** is performed (step **S903**). When a further operation input of the authentication switch **71** has been performed (step **S903**: Yes), the remote control **70** updates the user information (step **S904**). More specifically, for example, the remote control **70** selects the user number 2 when a second operation input is performed. For example, the remote control **70** selects the user number 3 when a third operation input is performed. For example, the remote control **70** selects the user number **N** when the **N**th operation input (**N** being a natural number) is

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performed. In other words, for example, the remote control 70 adds 1 to the numerical value of the user number when the operation input is performed. For example, the remote control 70 selects the user number 1 when a further operation input is performed in a state in which the numerical value of the user number has reached an upper limit.

When updating the user information (step S904), the remote control 70 determines whether or not a prescribed period has elapsed from the first operation input (step S905). When the prescribed period has not elapsed from the first operation input (step S905: No), the remote control 70 returns to step S903.

When a further operation input is not performed (step S903: No), the remote control 70 performs step S905 without performing step S904. The remote control 70 repeats step S903, step S904, and step S905 until the prescribed period has elapsed from the first operation input.

When the prescribed period has elapsed from the first operation input (step S905: Yes), the remote control 70 finalizes the user information included in the authentication signal and transmits the authentication signal to the controller 30 (step S906). More specifically, the remote control 70 transmits the authentication signal including the finally-selected user number. As a result, the user authentication can be performed by the remote control 70. In such a case, the user authentication can be performed even when the user is not carrying the personal digital assistant 200, which can improve the convenience of the toilet device 100. For example, the remote control 70 may determine whether or not the prescribed period has elapsed from the previous operation input and may transmit the authentication signal to the controller 30 in response to the elapse of the prescribed period from the previous operation input.

Thus, by including the remote control 70 that transmits the authentication signal, compared to when, for example, the authentication signal is transmitted by operating an operation unit or the like disposed in a location (e.g., the toilet unit 10, etc.) other than the remote control 70, the transmission of the authentication signal (the user authentication) can be performed in a form close to normal use, which is easy-to-use.

The user information for the user authentication can be switched by the number of times one authentication switch 71 is operated by selecting the user information to be designated by the authentication signal based on the number of times that the operation input of the authentication switch 71 is performed until the prescribed period has elapsed, and then transmitting the authentication signal when the prescribed period has elapsed. Misauthentications can be suppressed thereby.

The progress check of the measurement of the biological information will now be described in more detail.

FIG. 9 is a flowchart schematically illustrating an example of an operation of the use mode of the toilet device according to the embodiment.

As illustrated in FIG. 9, when starting the measurement of the biological information (step S1001), the toilet device 100 (the controller 30) transmits a measurement start signal to the personal digital assistant 200 (step S1002). The measurement start signal indicates that the measurement of the biological information has started.

When transmitting the measurement start signal (step S1002), the toilet device 100 (the controller 30) determines whether or not a progress request signal is received (step S1003). The progress request signal is a signal for causing the toilet device 100 (the controller 30) to transmit progress information. The progress information indicates the progress

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of the measurement of the biological information. When receiving the progress request signal (step S1003: Yes), the toilet device 100 (the controller 30) transmits the progress information (step S1004).

When transmitting the progress information (step S1004), the toilet device 100 (the controller 30) determines whether or not the measurement of the biological information is completed (step S1005). When the progress request signal is not received (step S1003: No), the toilet device 100 (the controller 30) performs step S1005 without performing step S1004.

When the measurement of the biological information is not completed (step S1005: No), the toilet device 100 (the controller 30) returns to step S1003. The toilet device 100 (the controller 30) repeats step S1003, step S1004, and step S1005 until the measurement of the biological information is completed.

When the measurement of the biological information is completed (step S1005: Yes), the toilet device 100 (the controller 30) transmits a measurement completion signal to the personal digital assistant 200 (step S1006). The measurement completion signal indicates that the measurement of the biological information is completed.

When receiving the measurement start signal, the personal digital assistant 200 is enabled to transmit the progress request signal until the measurement completion signal is received. For example, the personal digital assistant 200 transmits the progress request signal to the toilet device 100 (the controller 30) (step S1101) when an operation input to display the progress information is input to the personal digital assistant 200 while the personal digital assistant 200 is enabled to transmit the progress request signal.

When transmitting the progress request signal (step S1101), the personal digital assistant 200 determines whether or not the progress information is received (step S1102). The personal digital assistant 200 repeats step S1102 until the progress information is received (step S1102: No).

When the progress information is received (step S1102: Yes), the personal digital assistant 200 displays the progress information (step S1103).

The personal digital assistant 200 maintains the state of being enabled to transmit the progress request signal until the measurement completion signal is received. When the measurement completion signal is received, the personal digital assistant 200 is set to the state of not being enabled to transmit the progress request signal.

In the example, when the personal digital assistant 200 receives the measurement start signal, the progress information is displayed by the personal digital assistant 200 only while the measurement is being performed by setting the personal digital assistant 200 to a state of being enabled to transmit the progress request signal until the measurement completion signal is received; however, the progress information may be displayed by the personal digital assistant 200 only while the measurement is being performed by enabling the toilet device 100 (the controller 30) to transmit the progress information only while the measurement is being performed. That is, when the measurement is not being performed, the toilet device 100 (the controller 30) may not transmit the progress information even when the progress request signal is received. In such a case, steps S1102 and S1006 are omissible.

The operation of the use mode will now be described in more detail.

FIG. 10 is a flowchart illustrating an example of an operation of the use mode of the toilet device according to the embodiment.

In the operation of the use mode as illustrated in FIG. 10, the controller 30 determines whether or not a user authentication has been performed (step S1201). As described above, the controller 30 performs the user authentication by receiving the authentication signal including the user information from at least one of the personal digital assistant 200 or the remote control 70 (the operation unit). When the controller 30 has performed the user authentication and designated the current user, for example, the controller 30 temporarily stores the user information of the designated user as the authentication information in the storage part 50. More specifically, for example, the authentication information is temporarily stored in a storage part connected to the main body controller.

When the controller 30 has performed the user authentication (step S1201: Yes), the controller 30 continues by determining whether or not the authentication signal is received (step S1202). For example, the controller 30 determines whether or not the authentication signal is received from the remote control 70.

When the controller 30 determines that the authentication signal is received from the remote control 70 (step S1202: Yes), the controller 30 modifies the user designated by the user authentication based on the received authentication signal (step S1203).

For example, when the same user information as the user information included in the authentication signal received from the remote control 70 is stored in the storage part 50, the controller 30 modifies the user to the user indicated by the user information included in the received authentication signal. For example, the controller 30 modifies the user designated by the user authentication by modifying the user information of the authentication information temporarily stored in the storage part 50 to the new user information included in the received authentication signal.

When the user authentication has not been performed (step S1201: No), when the authentication signal has not been received (step S1202: No), or when the user has been modified, the controller 30 continues by determining whether or not the seating sensor 61 has detected the user leaving the toilet seat 12 (step S1204).

When the user leaving the toilet seat 12 is not detected, the controller 30 returns to the processing of step S1201. As a result, the controller 30 can perform the user authentication at any timing within a prescribed period in which the user is using the toilet unit 10, and can modify the user designated by the user authentication at any timing within a prescribed period after the user authentication is performed.

The prescribed period is, for example, the period from the timing of the detection of the start of the user using the toilet unit 10 to the timing of the detection of the user leaving the toilet seat 12. In the operation of the use mode as described with reference to FIG. 5, the controller 30 measures the biological information in response to the detection of the user being seated on the toilet seat 12. In other words, the controller 30 performs the user authentication and the modification of the user after the user authentication at any timing in the period from the start of the user using the toilet unit 10 until the biological information is acquired.

The timing of the detection of the start of the user using the toilet unit 10 is, for example, the timing of the proximity sensor 62 detecting the user approaching the toilet unit 10 (entering the toilet room TR). The timing of the detection of the start of the user using the toilet unit 10 may be, for example, the timing of the seating sensor 61 detecting the user being seated on the toilet seat 12. The timing of the detection of the start of the user using the toilet unit 10 may

be, for example, the timing of the reception of a signal (e.g., the authentication signal) from the remote control 70. The timing of the detection of the start of the user using the toilet unit 10 may be, for example, the timing at which the wireless communication with the personal digital assistant 200 is established. The timing of the detection of the start of the user using the toilet unit 10 is not limited to the timing described above and may be any timing at which the controller 30 can appropriately detect the start of the user using the toilet unit 10.

The timing of the end of the prescribed period is not limited to the timing of the detection of leaving the seat and may be, for example, the timing when a prescribed period has elapsed from the seating sensor 61 detecting the user leaving the toilet seat 12. The timing of the end of the prescribed period may be, for example, the timing of the proximity sensor 62 detecting the user leaving the toilet unit 10 (exiting the toilet room TR). The timing of the end of the prescribed period may be, for example, the timing at which the connection with the personal digital assistant 200 by wireless communication is disconnected (the timing of the personal digital assistant 200 leaving the communication range). The timing of the end of the prescribed period may be, for example, the timing of the detection of the washing of the toilet 11. For example, the washing of the toilet 11 can be detected in response to the input of a signal from the remote control 70. The washing of the toilet 11 may be detected by, for example, using a sensor or the like to detect the flow of water inside the toilet 11. The timing of the end of the prescribed period is not limited to the timing described above and may be any timing at which the controller 30 can appropriately detect the end of the use of the toilet unit 10 by the user.

In response to the seating sensor 61 detecting the user leaving the toilet seat 12, the controller 30 ends the user authentication and the acceptance of a modification of the user designated by the user authentication (step S1205). In such a case, the end of the acceptance may be immediately upon the detection of leaving the seat, or may be after a prescribed period has elapsed from the detection of leaving the seat. Thus, ending the acceptance in response to the detection of leaving the seat includes ending the acceptance at the timing of the detection of leaving the seat and ending the acceptance at the timing at which a prescribed period has elapsed from the detection of leaving the seat.

After ending the user authentication and the acceptance of the modification of the user designated by the user authentication, the controller 30 determines whether or not the user authentication has been performed (step S1206). In other words, the controller 30 determines whether or not finalized user information is stored in the storage part 50 as authentication information.

When the user authentication has been performed (step S1206: Yes), the controller 30 finalizes the association between the user information and the biological information (step S1207). For example, after the detection of leaving the seat, the controller 30 ends the user authentication and the acceptance of the modification of the user and associates the biological information acquired in response to the detection of the user being seated and the user information stored as the authentication information in the storage part 50.

After finalizing the association between the user information and the biological information, the controller 30 determines whether or not the personal digital assistant 200 is connected by wireless communication (step S1208).

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When the personal digital assistant **200** is connected by wireless communication (step **S1208**: Yes), the controller **30** transmits the biological information to the personal digital assistant **200** (step **S1209**).

When the personal digital assistant **200** is not connected by wireless communication (step **S1208**: No), the controller **30** stores the biological information in the storage part **50** without transmitting the biological information to the personal digital assistant **200** (step **S1210**). At this time, the controller **30** associates the biological information and the user information and stores the biological information and the user information in the storage part **50**. Thus, after the prescribed period has ended, the controller **30** associates the biological information with the user information and stores the biological information and the user information in the storage part **50**. The operation after storing the biological information is described below.

When the user authentication has not been performed (step **S1206**: No), the controller **30** erases the biological information (step **S1211**). The controller **30** transmits the biological information to the personal digital assistant **200** or stores (saves) the biological information in the storage part **50** only when the user authentication has been performed. For example, the controller **30** may associate the biological information (the analysis information) and the user information and store the biological information (the analysis information) and the user information in the storage part **50** after the association of the user information and the biological information is finalized regardless of the connection status with the personal digital assistant **200** by wireless communication. In such a case, when connected with the personal digital assistant **200** by wireless communication, the controller **30** may erase the biological information (the analysis information) stored in the storage part **50** in response to the transmission of the biological information (the analysis information) to the personal digital assistant **200** being appropriately completed. For example, the controller **30** may continue to store the biological information in the storage part **50** when a discrepancy occurs when transmitting the biological information, etc.

For example, after transmitting the biological information to the personal digital assistant **200** or storing the biological information in the storage part **50**, the controller **30** erases the user information of the authentication information temporarily stored in the storage part **50**. In other words, after transmitting the biological information to the personal digital assistant **200** or storing the biological information in the storage part **50**, the controller **30** clears the authentication status of the user authentication for which the storage is completed.

An operation of the use mode after storing the biological information will now be described in more detail.

FIG. **11** is a flowchart illustrating an example of an operation of the use mode of the toilet device according to the embodiment.

As illustrated in FIG. **11**, each time the toilet device **100** (the controller **30**) is connected with the personal digital assistant **200** (step **S1301**: Yes), the toilet device **100** (the controller **30**) determines whether or not biological information (that is, untransmitted biological information) is stored in the storage part **50** (step **S1302**). The toilet device **100** (the controller **30**) repeats step **S1301** until connected with the personal digital assistant **200** (step **S1301**: No).

When biological information is stored in the storage part **50** (step **S1302**: Yes), the toilet device **100** (the controller **30**) determines whether or not the toilet device **100** is being used (step **S1303**).

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For example, the toilet device **100** (the controller **30**) determines that the toilet device **100** is being used when the human body detection sensor **60** detects the user. For example, the toilet device **100** (the controller **30**) determines that the toilet device **100** is being used when the seating sensor **61** detects the user seated on the toilet seat **12**. For example, the toilet device **100** (the controller **30**) determines that the toilet device **100** is being used when the proximity sensor **62** detects the user approaching the toilet unit **10**. For example, the toilet device **100** (the controller **30**) determines that the toilet device **100** is being used when the proximity sensor **62** detects the user entering the toilet room **TR**. For example, the toilet device **100** (the controller **30**) determines that the toilet device **100** is being used when the biological information measuring part **20** measures the biological information.

When the toilet device **100** is not being used (step **S1303**: No), the toilet device **100** (the controller **30**) determines whether or not the connected personal digital assistant **200** is the personal digital assistant **200** of the user associated with the stored biological information (step **S1304**). As described above, the biological information is stored after being associated with the user information; and the user information is stored (registered) after being associated with the identification information of the personal digital assistant **200** possessed by the user. Therefore, the biological information that is stored after being associated with the user information is indirectly associated with the identification information that is stored (registered) after being associated with the user information. In other words, the stored biological information is stored after being associated with the identification information of the personal digital assistant **200** to which the biological information is to be transmitted. Here, it is determined whether or not the connected personal digital assistant **200** is the personal digital assistant **200** to which the stored biological information is to be transmitted.

When the connected personal digital assistant **200** is the personal digital assistant **200** of the user associated with the stored biological information (step **S1304**: Yes), the toilet device **100** (the controller **30**) transmits the biological information stored in the storage part **50** to the personal digital assistant **200** (step **S1305**).

When the biological information stored in the storage part **50** is transmitted to the personal digital assistant **200** (step **S1305**), the toilet device **100** (the controller **30**) erases the stored biological information from the storage part **50** (step **S1306**).

When no biological information is stored in the storage part **50** (step **S1302**: No), the toilet device **100** (the controller **30**) does not perform step **S1303**, step **S1304**, step **S1305**, and step **S1306**. When the toilet device **100** is being used (step **S1303**: Yes), the toilet device **100** (the controller **30**) does not perform step **S1304**, step **S1305**, and step **S1306**. When the connected personal digital assistant **200** is not the personal digital assistant **200** of the user associated with the stored biological information (step **S1304**: No), steps **S1305** and **S1306** are not performed.

Thus, according to the embodiment, when the analysis of the biological information is completed in a state in which the toilet device **100** (the controller **30**) is connected with the personal digital assistant **200** by wireless communication, the toilet device **100** (the controller **30**) transmits the biological information to the personal digital assistant **200**. When the analysis of the biological information is completed in a state in which the controller **30** is not connected with the personal digital assistant **200** by wireless communication, the controller **30** stores the biological information

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in the storage part **50** without transmitting the biological information to the personal digital assistant **200**. When the controller **30** is connected with the personal digital assistant **200** in a state in which the biological information is stored the storage part **50**, the controller **30** transmits the stored biological information to the personal digital assistant **200**.

By transmitting the biological information in the personal digital assistant **200** when the analysis of the biological information is completed when the toilet device **100** is connected with the personal digital assistant **200**, by storing the biological information in the storage part **50** without transmitting the biological information to the personal digital assistant **200** when the analysis of the biological information is completed when the toilet device **100** is not connected with the personal digital assistant **200**, and by transmitting the stored biological information to the personal digital assistant **200** when the toilet device **100** is connected with the personal digital assistant **200** in a state in which the biological information is stored in the storage part **50**, even if the analysis of the biological information is not completed when the connection between the toilet device **100** and the personal digital assistant **200** becomes disconnected (e.g., when the user exits the toilet room TR), the biological information can be stored; and the stored biological information can be transmitted to the personal digital assistant **200** the next time the toilet device **100** and the personal digital assistant **200** are connected. As a result, the biological information can be more reliably transmitted to the personal digital assistant **200** of the user; and the ease of use can be improved.

According to the embodiment, for example, when the biological information is stored in the storage part **50** in the state in which the user authentication has been performed, the toilet device **100** (the controller **30**) associates the biological information and the user information identifying the user and stores the biological information and the user information in the storage part **50**. Then, for example, when connected with the personal digital assistant **200** having identification information that is not associated with the user information in a state in which biological information associated with the user information is stored in the storage part **50**, the toilet device **100** (the controller **30**) does not transmit the biological information associated with the user information to the personal digital assistant **200** having the identification information not associated with the user information. On the other hand, when connected with the personal digital assistant **200** having identification information associated with the user information in a state in which biological information associated with the user information is stored in the storage part **50**, the toilet device **100** (the controller **30**) transmits the biological information associated with the user information to the personal digital assistant having the identification information associated with the user information.

When connected with the personal digital assistant **200** having identification information associated with the user information in a state in which biological information associated with the user information is stored in the storage part **50**, by transmitting the biological information (that is, the stored biological information) associated with the user information to the personal digital assistant **200**, the transmission of the biological information to a personal digital assistant **200** other than the user's own personal digital assistant **200** can be suppressed, and the biological information can be more reliably transmitted to the personal digital assistant **200** of the user as a privacy precaution. Also, the number of

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communications can be reduced because the biological information is transmitted only to the user's own personal digital assistant **200**.

According to the embodiment, for example, when the wireless communication part **40** is connected with the personal digital assistant **200** in a state in which the biological information is stored in the storage part **50**, the toilet device **100** (the controller **30**) does not transmit the biological information to the personal digital assistant **200** if the toilet device **100** is being used. On the other hand, when the wireless communication part **40** is connected with the personal digital assistant **200** in a state in which the biological information is stored in the storage part **50**, the toilet device **100** (the controller **30**) transmits the biological information to the personal digital assistant **200** if the toilet device **100** is not being used.

By not transmitting the biological information to the personal digital assistant **200** if the toilet device **100** is being used when the wireless communication part **40** is connected with the personal digital assistant **200** in a state in which the biological information is stored in the storage part **50**, processing other than the transmission of the biological information can be given priority while the toilet device **100** is being used. As a result, for example, the analysis of the biological information of the user that is using the toilet device **100** at that time can be given priority, which can improve the ease of use. When, however, the wireless communication part **40** is connected with the personal digital assistant **200** in a state in which the analysis information is stored in the storage part **50**, the toilet device **100** (the controller **30**) may transmit the analysis information in the personal digital assistant **200** regardless of whether or not the toilet device **100** is being used.

For example, when the analysis information is stored in the storage part **50**, the toilet device **100** (the controller **30**) may regularly transmit the user information associated with the biological information. In such a case, when the personal digital assistant **200** receives the same user information as the user information possessed by the personal digital assistant **200** itself, the personal digital assistant **200** may connect with the toilet device **100** by wireless communication and receive the analysis information from the toilet device **100**.

An operation of the transmission of the activation signal will now be described in more detail.

FIG. **12** is a timing chart illustrating an example of the operation of the transmission of the activation signal of the toilet device according to the embodiment.

As illustrated in FIG. **12**, the controller **30** controls switching between a transmission period in which the activation signal is transmitted, and a transmission suspension period in which the transmission of the activation signal is suspended. In the transmission period, for example, the controller **30** transmits the activation signal regularly at a prescribed interval such as an interval of several seconds, etc. Normally, the controller **30** is set to the transmission suspension period in the operation of the use mode.

FIG. **13** is a flowchart illustrating an example of the operation of the transmission of the activation signal of the toilet device according to the embodiment.

As illustrated in FIGS. **12** and **13**, in the operation of the use mode, the controller **30** determines whether or not the acquisition of the biological information by the biological information measuring part **20** is completed (step S1401). The controller **30** repeats step S1401 until the acquisition of the biological information is completed. The completion of the acquisition of the biological information is the completion of the acquisition of the measurement information

(when the toilet device **100** does not perform the analysis) or the completion of the acquisition of the analysis information. In other words, the completion of the acquisition of the biological information is the completion of the analysis of the analysis information based on the measurement information.

The controller **30** switches from the transmission suspension period to the transmission period in response to the biological information measuring part **20** completing the acquisition of the biological information (step **S1402**, timing **t11**). In other words, the controller **30** starts the transmission of the activation signal in response to the completion of the acquisition of the biological information. Thus, the controller **30** switches from the transmission suspension period to the transmission period between the start of the user using the toilet unit **10** and the transmission of the biological information.

The switching to the transmission period may be performed immediately after the completion of the acquisition of the biological information, or may be performed when a prescribed period has elapsed from the completion of the acquisition of the biological information. Thus, "switching to the transmission period in response to the completion of the acquisition of the biological information" includes switching at the timing at which the acquisition of the biological information is completed, and switching at the timing at which a prescribed period has elapsed from the completion of the acquisition of the biological information.

After switching to the transmission period, the controller **30** determines whether or not the prescribed period has elapsed from the timing of the switching to the transmission period (step **S1403**). The prescribed period is, for example, about 2 minutes (not less than 1 minute and not more than 4 minutes).

When the prescribed period is determined to have elapsed, the controller **30** switches from the transmission period to the transmission suspension period (step **S1404**, timing **t12**). Namely, the controller **30** suspends the transmission of the activation signal when the prescribed period has elapsed from the start of the transmission of the activation signal. In other words, the controller **30** switches from the transmission suspension period to the transmission period for a prescribed period in response to the biological information measuring part **20** completing the acquisition of the biological information.

When the biological information measuring part **20** includes multiple sensors, and the multiple sensors need different amounts of time to complete the acquisition of the biological information (for measurement and analysis), the controller **30** may switch from the transmission suspension period to the transmission period for a prescribed period and transmit the biological information each time a sensor completes the acquisition of the biological information. Or, the controller **30** may collectively transmit all of the biological information to the personal digital assistant **200** by switching from the transmission suspension period to the transmission period for a prescribed period when all of the biological information has been acquired.

In the toilet device **100** according to the embodiment as described above, the controller **30** switches from the transmission suspension period to the transmission period between the start of the user using the toilet unit **10** and the transmission of the biological information. The undesirable state in which the personal digital assistant **200** does not respond to the activation signal when transmitting the biological information due to a task-kill performed before the biological information is transmitted can be suppressed

thereby. Accordingly, when transmitting the biological information, the personal digital assistant **200** can be switched more appropriately to the active state; and the biological information can be transmitted more appropriately and automatically to the personal digital assistant **200** via wireless communication. As a result, the need for the user to take action such as moving once out of the range of communication or manually establishing wireless communication can be suppressed, and the usability can be further improved.

In the toilet device **100** according to the embodiment, the controller **30** switches from the transmission suspension period to the transmission period for a prescribed period in response to the biological information measuring part **20** completing the acquisition of the biological information. The undesirable state in which the personal digital assistant **200** does not respond to the activation signal when transmitting the biological information due to a task-kill performed before the biological information is transmitted can be more appropriately suppressed thereby.

The timing of switching from the transmission suspension period to the transmission period is not limited to the timing of the completion of the acquisition of the biological information, and may be any timing related to the start of the user using the toilet unit **10**. The timing of the start of the user using the toilet unit **10** may be, for example, the timing at which the proximity sensor **62** detects the user approaching the toilet unit **10** (entering the toilet room **TR**), the timing at which the seating sensor **61** detects the user being seated on the toilet seat **12**, the timing at which a signal (e.g., the authentication signal) is received from the remote control **70**, or the timing at which the wireless communication with the personal digital assistant **200** is established.

FIG. **14** is a timing chart illustrating a modification of the operation of the transmission of the activation signal of the toilet device according to the embodiment.

When the biological information measuring part **20** includes multiple sensors, there is a possibility that amounts of time for the multiple sensors to complete the acquisition of the biological information may change. In such a case, when the transmission suspension period is switched to the transmission period for a prescribed period each time a sensor completes the acquisition of the biological information, and when the transmission suspension period has been switched to the transmission period in response to one sensor completing the acquisition of the biological information, it is possible that another sensor may complete the acquisition of the biological information during the transmission period.

In such a case, when the other sensor completes the acquisition of the biological information during the transmission period as illustrated in FIG. **14**, the controller **30** starts timing the prescribed period from the timing at which the other sensor completes the acquisition of the biological information.

In the example illustrated in FIG. **14**, the controller **30** switches from the transmission suspension period to the transmission period in response to the first sensor **21** completing the acquisition of the biological information (a timing **t21**), starts timing the prescribed period in response to the detection of the second sensor **22** completing the acquisition of the biological information during the transmission period (a timing **t22**), and switches from the transmission period to the transmission suspension period when the prescribed period has elapsed from the second sensor **22** completing the acquisition of the biological information (a timing **t23**).

Thus, when another sensor completes the acquisition of the biological information during the transmission period, the controller **30** starts timing the prescribed period from the timing at which the other sensor completed the acquisition of the biological information. As a result, for example, the personal digital assistant **200** can more appropriately receive the activation signal. When the other sensor completes the acquisition of the biological information during the transmission period, the controller **30** may switch from the transmission period to the transmission suspension period when the prescribed period has elapsed from a previous sensor completing the acquisition of the biological information.

FIG. **15** is a timing chart illustrating a modification of the operation of the transmission of the activation signal of the toilet device according to the embodiment.

FIG. **16** is a flowchart illustrating the modification of the operation of the transmission of the activation signal of the toilet device according to the embodiment.

In the example as illustrated in FIGS. **15** and **16**, the controller **30** determines whether or not the proximity sensor **62** has detected the user approaching the toilet unit **10** (entering the toilet room TR) (step S1501).

The controller **30** switches from the transmission suspension period to the transmission period in response to the proximity sensor **62** detecting the user approaching the toilet unit **10** (step S1502, timing t31). In other words, the controller **30** starts the transmission of the activation signal in response to the proximity sensor **62** detecting the user approaching the toilet unit **10**. The switching to the transmission period may be performed immediately after the approach is detected, or may be performed when a prescribed period has elapsed from the approach being detected.

After switching to the transmission period, the controller **30** determines whether or not a prescribed period has elapsed from the timing of the switching to the transmission period (step S1503).

When it is determined that the prescribed period has elapsed, the controller **30** switches from the transmission period to the transmission suspension period (step S1504, timing t32). In other words, in the example, the controller **30** switches from the transmission suspension period to the transmission period for a prescribed period in response to the proximity sensor **62** detecting the user approaching the toilet unit **10**.

Thereafter, similarly to the description related to FIGS. **12** and **13**, the controller **30** switches from the transmission suspension period to the transmission period for a prescribed period in response to the biological information measuring part **20** completing the acquisition of the biological information (steps S1505 to S1508, timing t33 and t34).

Thus, in the example, by switching from the transmission suspension period to the transmission period for a prescribed period in response to the proximity sensor **62** detecting the user approaching, the personal digital assistant **200** can be switched more promptly to the active state. For example, the personal digital assistant **200** can be switched to the active state to perform the user authentication; and the establishment of wireless communication can be started automatically. By switching from the transmission suspension period to the transmission period for a prescribed period in response to the completion of the acquisition of the biological information, the undesirable state in which the personal digital assistant **200** does not respond to the activation signal when transmitting the biological information can be suppressed, even when a task-kill is performed between detecting the approach and completing the acquisition of the biological information.

pressed, even when a task-kill is performed between detecting the approach and completing the acquisition of the biological information.

FIG. **17** is a flowchart illustrating a modification of the operation of the transmission of the activation signal of the toilet device according to the embodiment.

In the example as illustrated in FIG. **17**, the controller **30** determines whether or not the seating sensor **61** has detected the user being seated on the toilet seat **12** (step S1601).

The controller **30** switches from the transmission suspension period to the transmission period in response to the seating sensor **61** detecting the user being seated (step S1602). In other words, the controller **30** starts the transmission of the activation signal in response to the seating sensor **61** detecting the user being seated on the toilet seat **12**. The switching to the transmission period may be performed immediately after the seating is detected, or may be performed when a prescribed period has elapsed from the seating being detected.

After switching to the transmission period, the controller **30** determines whether or not the prescribed period has elapsed from the timing of the switching to the transmission period (step S1603).

When it is determined that the prescribed period has elapsed, the controller **30** switches from the transmission period to the transmission suspension period (step S1604). In other words, in the example, the controller **30** switches from the transmission suspension period to the transmission period for a prescribed period in response to the seating sensor **61** detecting the user being seated.

Thereafter, similarly to the description related to FIGS. **12** and **13**, the controller **30** switches from the transmission suspension period to the transmission period for a prescribed period in response to the biological information measuring part **20** completing the acquisition of the biological information (steps S1605 to S1608).

Thus, in the example, by switching from the transmission suspension period to the transmission period for a prescribed period in response to the seating sensor **61** detecting the user being seated, the personal digital assistant **200** can be switched more promptly to the active state. For example, the personal digital assistant **200** can be switched to the active state to perform the user authentication; and the establishment of the wireless communication can be started automatically. By switching from the transmission suspension period to the transmission period for a prescribed period in response to the completion of the acquisition of the biological information, the undesirable state in which the personal digital assistant **200** does not respond to the activation signal when transmitting the biological information can be suppressed, even when a task-kill is performed between detecting the seating and completing the acquisition of the biological information.

FIG. **18** is a timing flowchart illustrating a modification of the operation of the transmission of the activation signal of the toilet device according to the embodiment.

In the example as illustrated in FIG. **18**, the controller **30** switches from the transmission suspension period to the transmission period in response to the biological information measuring part **20** completing the acquisition of the biological information, and continues the transmission period for the first duration (the timing t41 to t42). The first duration is, for example, about 2 minutes (not less than 1 minute and not more than 4 minutes).

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After continuing the transmission period for the first duration, the controller 30 switches from the transmission period to the transmission suspension period (the timing t42).

After switching from the transmission period to the transmission suspension period, the controller 30 continues the transmission suspension period for the second duration (the timing t42 to t43). The second duration is, for example, about 10 minutes (not less than 1 minute and not more than 15 minutes). For example, the second duration is set to the time necessary for the personal digital assistant 200 to resolve the state of not responding to the activation signal.

After continuing the transmission suspension period for the second duration, the controller 30 again switches from the transmission suspension period to the transmission period (the timing t43). For example, after continuing the transmission period for a third duration, the controller 30 switches from the transmission period to the transmission suspension period (a timing t44). The third duration is, for example, about 2 minutes (not less than 1 minute and not more than 4 minutes). The third duration may be equal to or different from the first duration.

Thus, in the example, the controller 30 switches from the transmission suspension period to the transmission period, continues the transmission period for the first duration, switches from the transmission period to the transmission suspension period, continues the transmission suspension period for the second duration, and then again switches from the transmission suspension period to the transmission period. As a result, in the example, the undesirable state in which the personal digital assistant 200 does not respond to the activation signal and the biological information cannot be transmitted can be more appropriately suppressed, even when a task-kill is performed after the start of the user using the toilet unit 10, by continuing the transmission suspension period for the second duration and then again switching from the transmission suspension period to the transmission period.

In the example, the controller 30 switches to the transmission period twice. The switching is not limited thereto; the controller 30 may switch to the transmission period three or more times. In other words, for example, the controller 30 may switch regularly between the transmission suspension period and the transmission period. For example, the transmission period of the first duration and the transmission suspension period of the second duration may be alternately performed.

In the example, the switching to the transmission period is performed twice after the biological information measuring part 20 completes the acquisition of the biological information. The switching is not limited thereto; for example, the switching to the transmission period may be performed twice in response to a detection of the user approaching, being seated, etc. The operation of switching to the transmission period twice can be performed in response to the switching to the transmission period based on any timing after the start of the user using the toilet unit 10.

#### Method for Controlling Toilet Device

According to an embodiment, a method for controlling the toilet device 100 is provided. As illustrated in FIGS. 4 to 18, the method for controlling the toilet device 100 according to the embodiment includes a process of switching from the transmission suspension period to the transmission period between the start of the user using the toilet unit 10 and the transmission of the biological information. As a

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result, the biological information can be more appropriately transmitted to the personal digital assistant 200 of the user via wireless communication.

#### Control Program of Toilet Device

According to an embodiment, a control program that is installed in the toilet device 100 is provided. As illustrated in FIGS. 4 to 18, the control program of the toilet device 100 according to the embodiment causes the toilet device 100 to perform a process of switching from the transmission suspension period to the transmission period between the start of the user using the toilet unit 10 and the transmission of the biological information. As a result, the biological information can be more appropriately transmitted to the personal digital assistant 200 of the user via wireless communication. For example, the control program is stored in the storage part 50. The controller 30 performs the process described above by reading the control program stored in the storage part 50 and by sequentially processing the control program. For example, the control program may be stored in internal memory of the controller 30, etc.

#### Recording Medium

According to an embodiment, a recording medium is provided in which the control program of the toilet device described above is recorded. The recording medium is readable by at least a computer. The recording medium may be read-only, or may be both readable and writable.

Embodiments may include the following configurations. Configuration 1

A toilet device, comprising:

a toilet unit including a toilet seat;

a biological information measuring part configured to measure biological information of a user;

a wireless communication part configured to wirelessly communicate with a personal digital assistant of the user; and

a controller configured to transmit the biological information to the personal digital assistant of the user,

the personal digital assistant including

an active state in which an application software is activated, and

an inactive state in which the application software is suspended,

the personal digital assistant being configured to receive the biological information by wirelessly communicating with the wireless communication part in the active state,

the controller being configured to

allow the biological information to be automatically transmitted to the personal digital assistant by switching the personal digital assistant from the inactive state to the active state by transmitting an activation signal from the wireless communication part to the personal digital assistant, the activation signal being for switching the personal digital assistant from the inactive state to the active state, and

switch from a transmission suspension period to a transmission period between a start of the user using the toilet unit and a transmission of the biological information by controlling switching between the transmission period and the transmission suspension period, the activation signal being transmitted in the transmission period, the transmission of the activation signal being suspended in the transmission suspension period.



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## Configuration 2

The toilet device according to configuration 1, wherein the controller switches from the transmission suspension period to the transmission period for a prescribed period in response to the biological information measuring part completing an acquisition of the biological information.

## Configuration 3

The toilet device according to configuration 2, further comprising:

a proximity sensor configured to detect the user approaching the toilet unit and the user leaving the toilet unit, the controller switching from the transmission suspension period to the transmission period for a prescribed period in response to the proximity sensor detecting the user approaching.

## Configuration 4

The toilet device according to configuration 2, further comprising:

a seating sensor configured to detect the user being seated on the toilet seat and the user leaving the toilet seat, the controller switching from the transmission suspension period to the transmission period for a prescribed period in response to the seating sensor detecting the user being seated.

## Configuration 5

The toilet device according to any one of configurations 1 to 4, wherein

the controller switches from the transmission suspension period to the transmission period and continues the transmission period for a first duration, switches from the transmission period to the transmission suspension period and continues the transmission suspension period for a second duration, and then again switches from the transmission suspension period to the transmission period.

## Configuration 6

A method for controlling a toilet device,

the toilet device comprising:

a toilet unit including a toilet seat;

a biological information measuring part configured to measure biological information of a user;

a wireless communication part configured to wirelessly communicate with a personal digital assistant of the user; and

a controller configured to transmit the biological information to the personal digital assistant of the user, the personal digital assistant including:

an active state in which an application software is activated; and

an inactive state in which the application software is suspended,

the personal digital assistant being configured to receive the biological information by wirelessly communicating with the wireless communication part in the active state,

the controller being configured to:

allow the biological information to be automatically transmitted to the personal digital assistant by switching the personal digital assistant from the inactive state to the active state by transmitting an activation signal from the wireless communication part to the personal digital assistant, the activation signal being for switching the personal digital assistant from the inactive state to the active state; and control switching between a transmission period and a transmission suspension period, the activation signal

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being transmitted in the transmission period, the transmission of the activation signal being suspended in the transmission suspension period,

the method comprising:

switching from the transmission suspension period to the transmission period between a start of the user using the toilet unit and a transmission of the biological information.

## Configuration 7

A control program of a toilet device,

the control program being installed in the toilet device, the toilet device comprising:

a toilet unit including a toilet seat;

a biological information measuring part configured to measure biological information of a user;

a wireless communication part configured to wirelessly communicate with a personal digital assistant of the user; and

a controller configured to transmit the biological information to the personal digital assistant of the user, the personal digital assistant including:

an active state in which an application software is activated; and

an inactive state in which the application software is suspended,

the personal digital assistant being configured to receive the biological information by wirelessly communicating with the wireless communication part in the active state,

the controller being configured to:

allow the biological information to be automatically transmitted to the personal digital assistant by switching the personal digital assistant from the inactive state to the active state by transmitting an activation signal from the wireless communication part to the personal digital assistant, the activation signal being for switching the personal digital assistant from the inactive state to the active state; and control switching between a transmission period and a transmission suspension period, the activation signal

being transmitted in the transmission period, the transmission of the activation signal being suspended in the transmission suspension period,

the control program being configured to cause the toilet device to switch from the transmission suspension period to the transmission period between a start of the user using the toilet unit and a transmission of the biological information.

Thus, according to embodiments, a toilet device, a method for controlling a toilet device, and a control program of a toilet device are provided in which biological information can be more appropriately transmitted to the personal digital assistant 200 of a user via wireless communication.

The invention has been described with reference to the embodiments. However, the invention is not limited to these embodiments. Any design changes in the above embodiments suitably made by those skilled in the art are also encompassed within the scope of the invention as long as they fall within the spirit of the invention. For example, the shape, the size the material, the disposition and the arrangement or the like of the components included in the toilet device are not limited to illustrations and can be changed appropriately.

The components included in the embodiments described above can be combined to the extent possible, and these

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combinations are also encompassed within the scope of the invention as long as they include the features of the invention.

What is claimed is:

1. A toilet device, comprising:

a toilet unit including a toilet seat;

a biological information measuring part configured to measure biological information of a user;

a wireless communication part configured to wirelessly communicate with a personal digital assistant of the user;

a controller configured to transmit the biological information to the personal digital assistant of the user; and

a proximity sensor configured to detect the user approaching the toilet unit and the user leaving the toilet unit,

the personal digital assistant including

an active state in which an application software is activated, and

an inactive state in which the application software is suspended,

the personal digital assistant being configured to receive the biological information by wirelessly communicating with the wireless communication part in the active state,

the controller being configured to

allow the biological information to be automatically transmitted to the personal digital assistant by switching the personal digital assistant from the inactive state to the active state by transmitting an activation signal from the wireless communication

part to the personal digital assistant, the activation signal being for switching the personal digital assistant from the inactive state to the active state, and

switch from a transmission suspension period to a transmission period between a start of the user using the toilet unit and a transmission of the biological information by controlling switching between the transmission period and the transmission suspension

period, the activation signal being transmitted in the transmission period, the transmission of the activation signal being suspended in the transmission suspension period,

the controller being configured to

switch from the transmission suspension period to the transmission period for a prescribed period in response to the proximity sensor detecting the user approaching, and

switch from the transmission suspension period to the transmission period for a prescribed period in response to the biological information measuring part completing an acquisition of the biological information.

2. A toilet device, comprising:

a toilet unit including a toilet seat;

a biological information measuring part configured to measure biological information of a user;

a wireless communication part configured to wirelessly communicate with a personal digital assistant of the user;

a controller configured to transmit the biological information to the personal digital assistant of the user; and

a seating sensor configured to detect the user being seated on the toilet seat and the user leaving the toilet seat,

the personal digital assistant including

an active state in which an application software is activated, and

an inactive state in which the application software is suspended,

the personal digital assistant being configured to receive the biological information by wirelessly communicating with the wireless communication part in the active state,

the controller being configured to

allow the biological information to be automatically transmitted to the personal digital assistant by switching the personal digital assistant from the inactive state to the active state by transmitting an activation signal from the wireless communication

part to the personal digital assistant, the activation signal being for switching the personal digital assistant from the inactive state to the active state, and

switch from a transmission suspension period to a transmission period between a start of the user using the toilet unit and a transmission of the biological information by controlling switching between the transmission period and the transmission suspension period, the activation signal being transmitted in the

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an inactive state in which the application software is suspended,

the personal digital assistant being configured to receive the biological information by wirelessly communicating with the wireless communication part in the active state,

the controller being configured to

allow the biological information to be automatically transmitted to the personal digital assistant by switching the personal digital assistant from the inactive state to the active state by transmitting an activation signal from the wireless communication

part to the personal digital assistant, the activation signal being for switching the personal digital assistant from the inactive state to the active state, and

switch from a transmission suspension period to a transmission period between a start of the user using the toilet unit and a transmission of the biological information by controlling switching between the transmission period and the transmission suspension

period, the activation signal being transmitted in the transmission period, the transmission of the activation signal being suspended in the transmission suspension period,

the controller being configured to

switch from the transmission suspension period to the transmission period for a prescribed period in response to the seating sensor detecting the user being seated, and

switch from the transmission suspension period to the transmission period for a prescribed period in response to the biological information measuring part completing an acquisition of the biological information.

3. A toilet device, comprising:

a toilet unit including a toilet seat;

a biological information measuring part configured to measure biological information of a user;

a wireless communication part configured to wirelessly communicate with a personal digital assistant of the user; and

a controller configured to transmit the biological information to the personal digital assistant of the user;

the personal digital assistant including

an active state in which an application software is activated, and

an inactive state in which the application software is suspended,

the personal digital assistant being configured to receive the biological information by wirelessly communicating with the wireless communication part in the active state,

the controller being configured to

allow the biological information to be automatically transmitted to the personal digital assistant by switching the personal digital assistant from the inactive state to the active state by transmitting an activation signal from the wireless communication

part to the personal digital assistant, the activation signal being for switching the personal digital assistant from the inactive state to the active state, and

switch from a transmission suspension period to a transmission period between a start of the user using the toilet unit and a transmission of the biological information by controlling switching between the transmission period and the transmission suspension

period, the activation signal being transmitted in the

transmission period, the activation signal being transmitted in the

transmission period, the activation signal being transmitted in the

transmission period, the activation signal being transmitted in the

transmission period, the activation signal being transmitted in the

transmission period, the activation signal being transmitted in the

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transmission period, the transmission of the activation signal being suspended in the transmission suspension period,

the controller being configured to switch from the transmission suspension period to the transmission period and continue the transmission period for a first duration, switch from the transmission period to the transmission suspension period and continue the transmission suspension period for a second duration, and then again switch from the transmission suspension period to the transmission period.

4. A method for controlling a toilet device, the toilet device comprising:

- a toilet unit including a toilet seat;
- a biological information measuring part configured to measure biological information of a user;
- a wireless communication part configured to wirelessly communicate with a personal digital assistant of the user;
- a controller configured to transmit the biological information to the personal digital assistant of the user; and
- a proximity sensor configured to detect the user approaching the toilet unit and the user leaving the toilet unit,

the personal digital assistant including:

- an active state in which an application software is activated; and
- an inactive state in which the application software is suspended,

the personal digital assistant being configured to receive the biological information by wirelessly communicating with the wireless communication part in the active state,

the controller being configured to:

- allow the biological information to be automatically transmitted to the personal digital assistant by switching the personal digital assistant from the inactive state to the active state by transmitting an activation signal from the wireless communication part to the personal digital assistant, the activation signal being for switching the personal digital assistant from the inactive state to the active state; and
- control switching between a transmission period and a transmission suspension period, the activation signal being transmitted in the transmission period, the transmission of the activation signal being suspended in the transmission suspension period,

the method comprising:

- switching from the transmission suspension period to the transmission period between a start of the user using the toilet unit and a transmission of the biological information,

the method including

- switching from the transmission suspension period to the transmission period for a prescribed period in response to the proximity sensor detecting the user approaching, and
- switching from the transmission suspension period to the transmission period for a prescribed period in response to the biological information measuring part completing an acquisition of the biological information.

5. A method for controlling a toilet device, the toilet device comprising:

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- a toilet unit including a toilet seat;
- a biological information measuring part configured to measure biological information of a user;
- a wireless communication part configured to wirelessly communicate with a personal digital assistant of the user;
- a controller configured to transmit the biological information to the personal digital assistant of the user; and
- a seating sensor configured to detect the user being seated on the toilet seat and the user leaving the toilet seat,

the personal digital assistant including:

- an active state in which an application software is activated; and
- an inactive state in which the application software is suspended,

the personal digital assistant being configured to receive the biological information by wirelessly communicating with the wireless communication part in the active state,

the controller being configured to:

- allow the biological information to be automatically transmitted to the personal digital assistant by switching the personal digital assistant from the inactive state to the active state by transmitting an activation signal from the wireless communication part to the personal digital assistant, the activation signal being for switching the personal digital assistant from the inactive state to the active state; and
- control switching between a transmission period and a transmission suspension period, the activation signal being transmitted in the transmission period, the transmission of the activation signal being suspended in the transmission suspension period,

the method comprising:

- switching from the transmission suspension period to the transmission period between a start of the user using the toilet unit and a transmission of the biological information,

the method including

- switching from the transmission suspension period to the transmission period for a prescribed period in response to the seating sensor detecting the user being seated, and
- switching from the transmission suspension period to the transmission period for a prescribed period in response to the biological information measuring part completing an acquisition of the biological information.

6. A method for controlling a toilet device, the toilet device comprising:

- a toilet unit including a toilet seat;
- a biological information measuring part configured to measure biological information of a user;
- a wireless communication part configured to wirelessly communicate with a personal digital assistant of the user; and
- a controller configured to transmit the biological information to the personal digital assistant of the user,

the personal digital assistant including:

- an active state in which an application software is activated; and
- an inactive state in which the application software is suspended,

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the personal digital assistant being configured to receive the biological information by wirelessly communicating with the wireless communication part in the active state,

the controller being configured to:

allow the biological information to be automatically transmitted to the personal digital assistant by switching the personal digital assistant from the inactive state to the active state by transmitting an activation signal from the wireless communication part to the personal digital assistant, the activation signal being for switching the personal digital assistant from the inactive state to the active state; and control switching between a transmission period and a transmission suspension period, the activation signal being transmitted in the transmission period, the transmission of the activation signal being suspended in the transmission suspension period,

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the method comprising:

switching from the transmission suspension period to the transmission period between a start of the user using the toilet unit and a transmission of the biological information,

the method including

switching from the transmission suspension period to the transmission period,

continuing the transmission period for a first duration, switching from the transmission period to the transmission suspension period,

continuing the transmission suspension period for a second duration, and

switching from the transmission suspension period to the transmission period again.

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