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(54) **BIOLOGICAL SAMPLE MEASURING DEVICE**

MESSGERÄT FÜR BIOLOGISCHE PROBEN

DISPOSITIF DE MESURE D'ÉCHANTILLON BIOLOGIQUE

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Description

TECHNICAL FIELD

[0001] The present invention relates to a biological sample measurement apparatus, and more particularly a biological sample measurement apparatus having a wireless communication function.

BACKGROUND ART

[0002] Various techniques for extending continuous operating time in battery-powered electronic devices have been disclosed in the past.

[0003] For example, as shown in the electronic device block diagram of FIG. 11, Patent Citation 1 discloses that when an automatic battery charge detector 101 has detected that the charge of a battery has dropped to or below a specific value, a central processing controller 102 instructs a wireless communication device 103 to move the communication mode from class 2 (high output level) to class 3 (low output level). At this point, the central processing controller 102 instructs a signal processor 104 to halt some functions. This extends the continuous operating time by cutting back on power consumption.

[0004] Patent Citation 1: Japanese Laid-Open Patent Application 2004-266452

[0005] The international patent application WO 02/078512 discloses a blood glucose tracking apparatus. According to this disclosure, a measurement module for glucose testing includes a glucose testing measurement module housing, a test strip receptacle formed in the housing, and a connector portion formed in the housing and shaped to permit mechanical removable attachment of the housing to a hand-held computer. Electronics determine the amount of glucose present in a sample of body fluid, when the test strip is positioned in the receptacle and the body fluid is placed on a test strip, and communicate the glucose amount to the hand-held computer via the connector portion.

DISCLOSURE OF INVENTION

TECHNICAL PROBLEM

[0006] When prior art is used for something like a musical device, music can be reproduced until the battery goes dead, even if there is a drop-off in quality. On the other hand, with a biological sample measurement apparatus, such as a blood glucose meter having a wireless communication function for sending a measurement result to another device, at least the blood glucose level has to be measured accurately, and the power required for this must be ensured.

[0007] However, when prior art was used, a problem was that proper measurement could not be performed if the required power could not be ensured and the battery charge dropped low.

[0008] In view of this, it is an object of the present invention to be able to perform proper measurement even if the battery charge drops low.

5 TECHNICAL SOLUTION

[0009] The biological sample measurement apparatus according to the first aspect of the present invention is a battery-powered biological sample measurement apparatus that communicates wirelessly with an external device, and includes a biological data measurement component, a transmitter, a receiver, a voltage monitor, and a transmission controller. The biological data measurement component measures biological data. The transmitter transmits to the external device the biological data measured by the biological data measurement component. The receiver receives response signals sent from the external device in response to the transmission of the biological data from the transmitter to the external device. The voltage monitor monitors the output voltage of the battery. The transmission controller changes the transmission method used by the transmitter on the basis of the output voltage of the battery detected by the voltage monitor.

[0010] Further, the transmission controller controls the transmitter so that the transmission of biological data is not executed if the output voltage of the battery as detected by the voltage monitor is lower than a first reference voltage in order to secure the minimum power required for the biological sample measurement apparatus (2) to measure biological data, and maintain the blood glucose level measurement function.

[0011] Here, the transmission controller changes the transmission method used by the transmitter on the basis of the output voltage of the battery detected by the voltage monitor.

[0012] Consequently, when the battery charge drops low, for example, the transmission controller controls the transmitter so not to execute the transmission of biological data to an external device, retransmission in the event of unsuccessful transmission of biological data, or the like, and this avoids the consumption of battery power.

[0013] As a result, the minimum power required for the biological sample measurement apparatus to measure biological data can be ensured, so measurement can be carried out properly even if the battery charge drops low.

[0014] Further, how the transmitter is controlled by the transmission controller is also specified.

[0015] Consequently, if the battery charge drops low, the battery power will not be consumed by the transmission of biological data. As a result, it is possible to extend battery life for measuring biological data.

[0016] The biological sample measurement apparatus according to the second aspect is the biological sample measurement apparatus according to the first aspect, wherein the transmission controller controls the transmitter so that the retransmission of biological data is exe-

cuted if the output voltage of the battery as detected by the voltage monitor is equal to or greater than a second reference voltage, when the response signal received by the receiver is not an acknowledge signal indicating that the external device has properly received the biological data, or when the receiver does not receive the response signal within a specific length of time.

[0017] Here, how the transmitter is controlled by the transmission controller is specified.

[0018] Consequently, it is possible to determine the retransmission of biological data by objectively determining when communication with an external device was not successful. Also, since the retransmission of biological data can be determined on the basis of the output voltage of the battery, it is possible to perform retransmission so that the biological data can be properly transmitted when the battery is sufficiently charged.

[0019] The biological sample measurement apparatus according to the third aspect is the biological sample measurement apparatus according to any of the first and second aspects, wherein the transmission controller controls the transmitter so that biological data is not retransmitted if the output voltage of the battery as detected by the voltage monitor is lower than a second reference voltage and is equal to or greater than the first reference voltage, when the response signal received by the receiver is not an acknowledge signal, or when the receiver does not receive the response signal within the specific length of time.

[0020] Here, how the transmitter is controlled by the transmission controller is specified.

[0021] Consequently, it is possible to determine the retransmission of biological data by objectively determining when communication with an external device was not successful. Also, since the retransmission of biological data can be determined on the basis of the output voltage of the battery, it is possible to extend battery life for measuring biological data.

[0022] The biological sample measurement apparatus according to the fourth aspect is the biological sample measurement apparatus according to any of the first to third aspects, and further includes a reception controller that controls the receiver so that a response signal is not received from an external device if the output voltage of the battery as detected by the voltage monitor is lower than a second reference voltage.

[0023] Here, how the receiver is controlled by the reception controller is specified.

[0024] Consequently, if the battery charge drops low, the consumption of battery power by the reception of a response signal can be avoided, so it is possible to extend battery life for measuring biological data.

[0025] The biological sample measurement apparatus according to the fifth aspect is the biological sample measurement apparatus according to any of the first to fourth aspects, and further includes an interface that has a display component to display the biological data measured by the biological data measurement component, an

operation setting component that the user uses to make various operation settings, and an alarm sound output component to output an alarm sound.

[0026] The biological sample measurement apparatus according to the sixth aspect is the biological sample measurement apparatus according to the fifth aspect, wherein the interface further has a first display controller to control the display component so that the biological data is not displayed until the transmitter has completed the transmission of the biological data.

[0027] Consequently, until the transmission of biological data is complete, at least the area around the display component is kept uncovered by the user's hand so that the user can check his or her own biological data. As a result, the effect of radio wave absorption by the user's hand can be reduced, then the transmission power can be kept low and the service life of the battery can be further extended, since.

[0028] The biological sample measurement apparatus according to the seventh aspect is the biological sample measurement apparatus according to the fifth or sixth aspect, wherein the interface further has an alarm sound output controller to control the alarm sound output component so that the alarm sound is outputted when the value of the biological data is equal to or greater than a first reference value, or is less than or equal to a second reference value that is lower than the first reference value.

[0029] Consequently, when the measured biological data has a value indicating an emergency situation, for example, people around the user are warned by an alarm sound that the user is in an emergency situation.

[0030] The biological sample measurement apparatus according to the eighth aspect is the biological sample measurement apparatus according to any of the fifth to seventh aspects, wherein the interface further has a second display controller to control the display component so that an emergency status is displayed when the value of the biological data is equal to or greater than a first reference value, or is less than or equal to a second reference value that is lower than the first reference value.

[0031] Consequently, when the measured biological data has a value indicating an emergency situation, for example, people around the user are warned by a display that there is an emergency situation.

[0032] The biological sample measurement apparatus according to the ninth aspect is the biological sample measurement apparatus according to the eighth aspect, wherein the emergency status is a telephone number.

[0033] Consequently, the user or people around the user can see the displayed telephone number and immediately contact the family or personal physician of the patient.

[0034] The biological sample measurement apparatus according to the tenth aspect is the biological sample measurement apparatus according to the eighth or ninth aspect, wherein the emergency status is a method of treating hyperglycemia or hypoglycemia.

[0035] Consequently, the user or people around the user can provide suitable treatment while looking at the displayed treatment method, etc.	1	biosensor
	2	wireless blood glucose meter (biological sample measurement apparatus)
[0036] The biological sample measurement apparatus according to the eleventh aspect is the biological sample measurement apparatus according to any of the first to tenth aspects, which is a wireless blood glucose meter constituted so that the biological data measurement component measures a blood glucose level blood glucose level.	3	portable terminal (external device)
	5 11	working electrode
	12	counter electrode
	13	reactant
	21	blood glucose level detector (biological data measurement component)
	10 22	transmitter
[0037] Here, a wireless blood glucose meter that communicates wirelessly with a portable terminal is applied as a biological sample measurement apparatus.	23	receiver
	24	voltage monitor
	25	interface
[0038] Consequently, it is possible to provide a wireless blood glucose meter that can properly measure a blood glucose level even if the battery charge drops low.	26	battery
	15 101	automatic battery charge detector
	102	central processing controller
	103	wireless communication device
ADVANTAGEOUS EFFECTS	104	signal processor
	211	connector
[0039] With the biological sample measurement apparatus according to the present invention, measurement can be carried out properly even if the battery charge drops low.	20 212	computation amplifier
	213	feedback resistor
	214	reference potential
	215	A/D conversion circuit
	216	computation circuit
BRIEF DESCRIPTION OF DRAWINGS	25 217	memory
	221	transmission control circuit (transmission controller)
[0040]	222	power setting register
FIG. 1 is a block diagram of a wireless blood glucose meter and peripheral device in an embodiment of the present invention;	223	maximum power holding register
FIG. 2 is a block diagram of a blood glucose level detector in an embodiment of the present invention;	30 224	selector
FIG. 3 is a block diagram of a transmitter in an embodiment of the present invention;	225	transmission circuit
FIG. 4 is a control flowchart of a transmitter in an embodiment of the present invention;	231	reception control circuit (reception controller)
FIG. 5 is a block diagram of a receiver in an embodiment of the present invention;	232	reception circuit
FIG. 6 is a control flowchart of a receiver in an embodiment of the present invention;	35 233	preamble detection circuit
FIG. 7 is a block diagram of a voltage monitor in an embodiment of the present invention;	234	sync pattern detection circuit
FIG. 8 is a block diagram of an interface in an embodiment of the present invention;	235	demodulation circuit
FIGS. 9A and 9B are diagrams illustrating examples of the change in the display state of a wireless blood glucose meter in another embodiment of the present invention;	236	reception register
FIG. 10 is a diagram of when the wireless blood glucose meter in FIG. 9 is held in the left hand; and	237	error detection circuit
FIG. 11 is a block diagram of a conventional electronic device.	40 241	constant voltage circuit
	242 4_5 V	voltage divider circuit
	243 4_2 V	voltage divider circuit
	244 4_5	comparator
	245 4_2	comparator
	45 251	operating setting component
	252	display component
	252a	blood glucose level display (biological data display)
	253	alarm sound output component
	50 254	time manager
	255	first display controller
	256	second display controller
	257	alarm sound output controller
EXPLANATION OF REFERENCE	55	BEST MODE FOR CARRYING OUT THE INVENTION
[0041]		[0042] A wireless blood glucose meter (biological sample measurement apparatus) 2 according to an embod-

iment of the present invention will now be described through reference to FIGS. 1 to 8.

Constitution of Wireless Blood Glucose Meter 2

[0043] A blood glucose level (biological data) is measured several times a day with the wireless blood glucose meter 2. The user of the wireless blood glucose meter 2 connects an electrochemical, disposable biosensor 1 to the wireless blood glucose meter 2, and puts a spot of blood on the biosensor 1.

[0044] The wireless blood glucose meter 2 detects the blood glucose level from the connected biosensor 1, and sends the detected blood glucose level data to a portable terminal (external device) 3. The portable terminal 3 sends a response signal to the wireless blood glucose meter 2 upon receiving this data. This response signal is usually an acknowledge signal indicating that the blood glucose level data has been received from the wireless blood glucose meter 2, but if some kind of data has been received from the wireless blood glucose meter 2, but blood glucose level data cannot be read due to external disturbance, this is a non-acknowledge signal.

[0045] The portable terminal 3 is carried around by a hospital physician or nurse and used to store blood glucose levels measured by the patient. The portable terminal 3 has a function of display these blood glucose levels in a graph so that its transition can be checked, and sending stored blood glucose levels to a server installed in the hospital, etc. through a network

Internal Operation of Wireless Blood Glucose Meter 2

[0046] The internal operation of the wireless blood glucose meter 2 will now be described through reference to FIG. 1, which is a block diagram of a wireless blood glucose meter and peripheral device in an embodiment of the present invention.

[0047] As shown in FIG. 1, the wireless blood glucose meter 2 has a blood glucose level detector (biological data measurement component) 21, a transmitter 22, a receiver 23, a voltage monitor 24, an interface 25, and a battery 26.

[0048] The blood glucose level detector 21 measures a blood glucose level from a spot of blood placed on the biosensor 1. The blood glucose level thus measured is then transferred to the transmitter 22 and the interface 25.

[0049] The transmitter 22 sends the portable terminal 3 the blood glucose level data detected by the blood glucose level detector 21.

[0050] Here, the portable terminal 3 sends an acknowledge signal upon receiving blood glucose level data sent from the transmitter 22.

[0051] Upon receiving an acknowledge signal from the portable terminal 3, the receiver 23 outputs to the transmitter 22 information indicating that an acknowledge signal has been received. Here, if the receiver 23 cannot receive an acknowledge signal within 600 ms even

though the transmitter 22 has sent a blood glucose level to the portable terminal 3, the transmitter 22 sets the transmission power to the highest value possible and re-sends the blood glucose level data to the portable terminal 3. This retransmission of the blood glucose level data is performed five times at most, until the receiver 23 receives an acknowledge signal. The maximum transmission power at which the transmitter 22 transmits shall be within a range that complies with any applicable legal restrictions.

[0052] The voltage monitor 24 monitors the output voltage of the battery 26 installed in the wireless blood glucose meter 2. This allows a transmission control circuit (transmission controller) 221 (discussed below) to perform control according to the output voltage of the battery 26, that is, to the remaining charge of the battery 26. This will be discussed in detail later.

[0053] The interface 25 serves as an interface component when the user operates the wireless blood glucose meter 2, and has an operating setting component 251 and a display component 252, for example. The interface 25 will be discussed in detail later.

[0054] The battery 26 supplies voltage for driving the various components of the wireless blood glucose meter 2.

Internal Blocks of Wireless Blood Glucose Meter 2

[0055] The internal blocks of the wireless blood glucose meter 2 will now be described in detail.

Blood glucose level Detector 21

[0056] Next, the blood glucose level detector 21 will be described in detail through reference to FIG. 2, which is a block diagram of the blood glucose level detector 21.

[0057] As shown in FIG. 2, the blood glucose level detector 21 has a connector 211, a computation amplifier 212, a feedback resistor 213, an A/D conversion circuit 215, a computation circuit 216, and a memory 217.

[0058] The biosensor 1 here is a disposable, electrochemical type, and has a working electrode 11, a counter electrode 12, and a reactant 13. The working electrode 11 comes into contact with an electrode 2111 when the biosensor 1 is inserted into the connector 211. The counter electrode 12 comes into contact with an electrode 2112 when the biosensor 1 is inserted into the connector 211. The reactant 13 is formed from an enzyme, a mediator, or the like. When a spot of blood is placed on the reactant 13, the reactant 13 dissolves in the blood and undergoes an enzyme reaction.

[0059] The connector 211 is an insertion opening for inserting the biosensor 1, and has the electrode 2111 and the electrode 2112. When the biosensor 1 is inserted into the connector 211, the electrode 2111 comes into contact with the working electrode 11 included in the biosensor 1, and the electrode 2112 comes into contact with the counter electrode 12 included in the biosensor 1.

[0060] The computation amplifier 212 applies voltage to the working electrode 11 and the counter electrode 12 through the electrode 2111 in contact with the working electrode 11 of the biosensor 1 and the electrode 2112 in contact with the counter electrode 12 of the biosensor 1. Current that is correlated to the sugar concentration in the blood flows through the feedback resistor 213 to the biosensor 1 at this point A non-inverting input terminal 2122 of the computation amplifier 212 is connected to a reference potential 214 here. The computation amplifier 212 controls so as to keep the non-inverting input terminal 2122 and an inverting input terminal 2121 at the same potential, so a voltage in which the reference potential 214 is added to the potential drop produced by the current of the feedback resistor 213 is generated at an output terminal 2123. Consequently, a voltage that is proportional to the current flowing to the biosensor 1 is generated, and current-voltage conversion can be performed.

[0061] The A/D conversion circuit 215 converts the voltage generated at the output terminal 2123 into a digital value. The A/D conversion circuit 215 sends the converted digital value to the computation circuit 216.

[0062] The computation circuit 216 computes the digital value sent from the A/D conversion circuit 215. Consequently, the glucose concentration in the blood can be calculated from the value for the current flowing to the biosensor 1. The computation circuit 216 transfers the calculated glucose concentration to the transmitter 22 and the interface 25.

[0063] For example, the following processing is carried out in obtaining the glucose concentration in the blood.

[0064] Ahead of time, at the factory, two constant current supplies that generate current equivalent to a low glucose concentration and a high glucose concentration are connected between the electrode 2111 and the electrode 2112 of the connector 211, and a linear conversion expression for the current value and the digital value is found with the computation circuit 216 from the A/D conversion values of each. The slope a and the intercept b of this linear expression are information that correlates the glucose concentration and the digital value outputted from the A/D conversion circuit 215, and this information is stored in the memory 217. Then, when the user measures a blood glucose level, the computation circuit 216 calculates the glucose concentration in the blood by plugging the digital value obtained from the A/D conversion circuit 215 into the linear expression stored in the memory 217. The calculated blood glucose level is transferred to the transmitter 22 and the interface 25.

Transmitter 22

[0065] The transmitter 22 will now be described in detail through reference to FIG. 3, which is a block diagram of the transmitter 22, and FIG. 4, which is a control flowchart for the transmitter 22.

[0066] As shown in FIG. 3, the transmitter 22 has a transmission control circuit 221, a power setting register

222, a maximum power holding register 223, a selector 224, and a transmission circuit 225.

[0067] The transmission control circuit 221 controls the selector 224 and the transmission circuit 225.

5 **[0068]** The power setting register 222 holds the transmission power during transmission by a transmission power determination component.

[0069] The maximum power holding register 223 holds the maximum transmission power that can be sent by the wireless blood glucose meter 2.

10 **[0070]** The selector 224 switches the power outputted to the transmission circuit 225 between the power setting register 222 and the maximum power holding register 223.

15 **[0071]** The transmission circuit 225 takes the blood glucose level data sent from the blood glucose level detector 21 and sends it to the portable terminal 3 at the power sent from the selector 224.

20 **[0072]** The transmission control circuit 221 changes the transmission method for the transmitter 22 on the basis of the output voltage of the battery 26 monitored by the voltage monitor 24, and instructs the transmission circuit 225 to send the blood glucose level outputted from the blood glucose level detector 21 to the portable terminal 3. More specifically, the transmission control circuit 221 confirms the output voltage of the battery 26 monitored by the voltage monitor 24.

25 **[0073]** Here, when it has been determined by the voltage monitor 24 that the output voltage of the battery 26 is lower than 4.2 V (the first reference voltage) (BP [1:0] of voltage monitor 24 = 00), the transmission control circuit 221 does not allow the blood glucose level outputted from the blood glucose level detector 21 to be sent to the portable terminal 3, and ends processing.

30 **[0074]** When it has been determined by the voltage monitor 24 that the output voltage of the battery 26 is at least 4.2 V (BP [1:0] of voltage monitor 24 = 01, or BP [1:0] of voltage monitor 24 = 11), the transmission circuit 225 modulates into transmission data the product of adding an error detection signal to the measurement data, adds a preamble pattern and a sync pattern to the head of this, and sends this to the portable terminal 3. The transmission control circuit 221 issues a command to transmit to the transmission circuit 225, and begins counting with an internal timer. The portable terminal 3 sends out an acknowledge signal 500 ms after the receipt of the blood glucose level data. The transmission control circuit 221 instructs the receiver 23 to begin receiving 100 ms after transmission, and ends the receipt by the receiver 23 600 ms after the start of transmission.

35 **[0075]** Next, the transmission control circuit 221 check the information whether or not an acknowledge signal has been received with the receiver 23. If the receiver 23 has received an acknowledge signal from the portable terminal 3, the transmission control circuit 221 controls the transmission circuit 225 so that the transmission of the blood glucose level to the portable terminal 3 is ended.

[0076] Meanwhile, if the receiver 23 has not received an acknowledge signal from the portable terminal 3, or if it has received a non-acknowledge signal from the portable terminal 3 (that is, if information that an acknowledge signal is not received is outputted from the receiver 23), it is checked the transmission count and whether the output voltage of the battery 26 meets specific conditions (discussed in detail later), and the transmission control circuit 221 switches the selector 224 so that the value stored in the maximum power holding register 223 is inputted to the transmission circuit 225. The transmission control circuit 221 then instructs the transmission circuit 225 to resend the blood glucose level.

[0077] The above-mentioned specific conditions will now be explained.

[0078] First, the transmission control circuit 221 confirms whether or not the transmission count N of the blood glucose level data is 5 or greater. If the transmission count of the blood glucose level data is 5 or greater, that is, if the blood glucose level has been retransmitted by the transmission circuit 225 five times without being able to receive an acknowledge signal from the portable terminal 3 even once, then the transmission control circuit 221 instructs the transmission circuit 225 to end the transmission of the blood glucose level. That is, the retransmission of the blood glucose level by the transmission circuit 225 is only carried out five times.

[0079] On the other hand, if the transmission count of the blood glucose level data is less than 5, the transmission control circuit 221 confirms the output voltage of the battery 26 monitored by the voltage monitor 24.

[0080] Here, when it has been determined by the voltage monitor 24 that the output voltage of the battery 26 is at least 4.2 V (the first reference voltage) and lower than 4.5 V (the second reference voltage) (BP [1:0] of voltage monitor 24 = 01), the transmission control circuit 221 ends the series of processing without instructing that the blood glucose level outputted from the blood glucose level detector 21 be sent to the portable terminal 3. Consequently, power consumption of the battery 26 can be reduced, which makes it possible to further extend the service life of the battery 26.

[0081] When it has been determined by the voltage monitor 24 that the output voltage of the battery 26 is at least 4.5 V (BP [1:0] of voltage monitor 24 = 11), the transmission control circuit 221 switches the selector 224 and sends (resends) the blood glucose level. This allows retransmission to be performed only when the battery 26 still has plenty of charge left.

[0082] As indicated above, because the transmission control circuit 221 controls whether or not a blood glucose level is transmitted based on the value of the output voltage monitored by the voltage monitor 24, the battery lasts longer and the blood glucose level measurement function of the wireless blood glucose meter 2 can be maintained.

Receiver 23

[0083] Next, the receiver 23 will be described in detail through reference to FIG. 5, which is a block diagram of the receiver 23, and FIG. 6, which is a control flowchart for the receiver 23.

[0084] As shown in FIG. 5, the receiver 23 has a reception control circuit (reception controller) 231, a reception circuit 232, a preamble detection circuit 233, a sync pattern detection circuit 234, a demodulation circuit 235, a reception register 236, and an error detection circuit 237.

[0085] The reception control circuit 231 receives a reception commencement command from the transmitter 22, and controls the reception circuit 232.

[0086] The reception circuit 232 performs detection of carrier waves from received signals, gain control, conversion to intermediate frequencies, and other such processing, and transfers the processed data to the preamble detection circuit 233, the sync pattern detection circuit 234, and the demodulation circuit 235.

[0087] The preamble detection circuit 233 performs detection of a four-byte continuous preamble pattern. When a preamble pattern is detected, the preamble detection circuit 233 outputs an actuation pulse to the sync pattern detection circuit 234.

[0088] The sync pattern detection circuit 234 performs detection of a sync pattern from reception data outputted from the reception circuit 232, by means of the actuation pulse from the preamble detection circuit 233.

[0089] The demodulation circuit 235 performs demodulation of reception data using as a reference the sync pattern detected by the sync pattern detection circuit 234.

[0090] The reception register 236 stores the reception data demodulated by the demodulation circuit 235. The error detection circuit 237 performs error detection on reception data, and outputs the result to the reception control circuit 231.

[0091] Upon receipt of a result notification from the error detection circuit 237, the reception control circuit 231 outputs to the transmitter 22 information to the effect that an acknowledge signal has been received if no error was detected in the reception data and a code indicating an acknowledge signal was present in a specific region of the reception data, or information to the effect that there was no acknowledge signal if a code indicating a non-acknowledge signal was present, and ends the reception operation. The reception control circuit 231 also ends the reception operation when a reception end signal has been received from the transmitter 22.

[0092] At this point, information to the effect that there is no acknowledge signal is output to the transmitter 22 if an error was detected in the reception data, or if no preamble pattern, sync pattern, or the like could be detected and the reception data could not be demodulated.

Voltage Monitor 24

[0093] Next, the voltage monitor 24 will be described in detail through reference to FIG. 7, which is a block diagram of the voltage monitor 24.

[0094] As shown in FIG. 7, the voltage monitor 24 has a constant voltage circuit 241, a 4.5 V voltage divider circuit 242, a 4.2 V voltage divider circuit 243, a 4.5 comparator 244, and a 4.2 comparator 245.

[0095] The output of the battery 26 is inputted to the constant voltage circuit 241, which normally outputs 5 V with respect to an input voltage of 2 to 10 V. A 5 V signal is produced by the constant voltage circuit 241. The 5 V signal produced by the constant voltage circuit 241 is inputted to the 4.5 V voltage divider circuit 242 and the 4.2 V voltage divider circuit 243, and reference voltage signals of 4.5 V and 4.2 V are produced. The 4.5 V reference voltage signal produced by the 4.5 V voltage divider circuit 242 is supplied to the negative terminal of the 4.5 comparator 244 and compared with the output voltage of the battery 26. The 4.2 V reference voltage signal produced by the 4.2 V voltage divider circuit 243 is supplied to the negative terminal of the 4.2 comparator 245 and compared with the output voltage of the battery 26. As a result, the output BP [1:0] of the 4.5 comparator 244 and the 4.2 comparator 245 is "11" when the output voltage of the battery 26 is greater than 4.5 V, is "01" when the output voltage of the battery 26 is from 4.2 to 4.5 V, and is "00" when this voltage is less than 4.2 V.

[0096] Monitoring of the voltage can also be accomplished by digitizing the output of the battery 26 with an A/D converter and reading the digital value with a CPU or the like.

Interface 25

[0097] Next, the interface 25 will be described in detail through reference to FIG. 8, which is a block diagram of the interface 25.

[0098] As shown in FIG. 8, the interface 25 has the operating setting component 251, the display component 252, an alarm sound output component 253, a time manager 254, a first display controller 255, a second display controller 256, and an alarm sound output controller 257.

[0099] The user adjusts the settings by using the operating setting component 251 while checking the setting categories displayed on the display component 252. The setting categories here include the day of the week, the time, the transmission power, and other such information.

[0100] The day of the week and time are outputted to the time manager 254.

[0101] The time manager 254 manages the current day of the week and time along with the setting information. The information about day of the week and time managed in the time manager 254 is outputted to the display component 252.

[0102] When a blood glucose level is calculated by the blood glucose level detector 21 during the measurement

of a blood glucose level, the display component 252 displays the day of the week and time information along with the calculated blood glucose level. If there is a hyperglycemic state in which the calculated blood glucose level is over 400 mg/dL (first reference value), or a hypoglycemic state in which the blood glucose level is under 50 mg/dL (second reference value), the alarm sound output controller 257 objectively determines that the user (diabetes patient) is in an extremely dangerous situation, and controls the alarm sound output component 253 so that an alarm sound is outputted in order to alert the user or any people around the user to this danger. The second display controller 256 takes into account the possibility that the user has lost consciousness, and controls the display component 252 so that an emergency contact telephone number or information related to emergency measures, such as boosting the glucose content in the case of hypoglycemia, is displayed.

[0103] Consequently, people around the user of the wireless blood glucose meter 2 can be alerted to the danger to the user. Also, even if the user of the wireless blood glucose meter 2 should lose consciousness, a nearby person can see the telephone number displayed on the display component 252 and immediately call the emergency contact number, or can provide suitable assistance while looking at the treatment method, etc., displayed on the display component 252.

Other Embodiments

[0104] An embodiment of the present invention was described above, but the present invention is not limited to or by the above embodiment.

35 (A)

[0105] In the above embodiment, a case of application to the wireless blood glucose meter 2 was described as an example of a biological sample measurement apparatus, but the present invention is not limited to this.

[0106] For instance, the measurement apparatus may be one that measures lactic acid, uric acid, or the like, and as long as it is an apparatus that wirelessly transmits this data to another terminal or the like, the effect will be the same as that with the wireless blood glucose meter 2 according to the above embodiment.

(B)

[0107] With the wireless blood glucose meter 2 in the above embodiment, an example was given in which when the output voltage of the battery 26 was determined by the voltage monitor 24 to be at least 4.2 V but lower than 4.5 V (second reference voltage) (BP [1:0] of voltage monitor 24 = 01), the transmission control circuit 221 ended the series of processing without instructing that the blood glucose level outputted from the blood glucose level detector 21 be sent to the portable terminal 3, but the

present invention is not limited to this.

[0108] For instance, the constitution may be such that the receiver 23 does not receive a response signal from the portable terminal 3 when it has been determined by the voltage monitor 24 that the output voltage of the battery 26 is lower than 4.5 V (second reference voltage) (BP [1:0] of voltage monitor 24 = 01). At this point, the transmitter 22 does not retransmit the blood glucose level. Consequently, the receiver 23 consumes less power and the service life of the battery 26 can be further extended.

(C)

[0109] With the wireless blood glucose meter 2 in the above embodiment, an example was given in which when a blood glucose level was calculated by the blood glucose level detector 21 during measurement of a blood glucose level, the display component 252 displayed the day of the week and time information along with the calculated blood glucose level.

[0110] In addition to this, for example, the first display controller 255 (see FIG. 8) may control such that until the transmitter 22 has completed transmission of the blood glucose level, as shown in FIG. 9A, the blood glucose level (biological data) is not displayed (not executed) on the display component 252, and once the transmitter 22 does complete transmission of the blood glucose level, as shown in FIG. 9B, the blood glucose level (biological data) 252a is displayed on the display component 252. Consequently, as shown in FIG. 10, until the transmission of blood glucose level is complete, at least the area around the display component 252 is kept uncovered by the user's hand so that the user can check his or her own blood glucose level. Thus, even with a compact apparatus with which the wireless blood glucose meter 2 is held in the hand during use, since the effect of radio wave absorption by the user's hand can be reduced, the transmission power can be kept low and the service life of the battery 26 can be further extended.

(D)

[0111] With the wireless blood glucose meter 2 in the above embodiment, an example was given in which the alarm sound output component 253 and the display component 252 emitted an alarm if the blood glucose level data measured by the blood glucose level detector 21 was at least 400 mg/dL (first reference value) or was under 50 mg/dL (second reference value), but the present invention is not limited to this.

[0112] This is merely employing a common indicator for diabetes patients, but the setting may be personalized for the user, such as setting to 350 mg/dL.

[0113] Also, regarding the relationship with the first reference value, it is possible to set the conditions according to the indicator of a first reference value serving as a determination reference, such as being the same value

or being smaller.

[0114] This is merely employing a common indicator for diabetes patients, but the setting may be personalized for the user, such as setting to 60 mg/dL.

[0115] Also, regarding the relationship with the second reference value, it is possible to set the conditions according to the indicator of a second reference value serving as a determination reference, such as being the same value or being smaller.

(E)

[0116] With the wireless blood glucose meter 2 of the above-mentioned embodiment, an example was given in which the processing was ended without the transmission control circuit 221 instructing that the blood glucose level outputted from the blood glucose level detector 21 be sent to the portable terminal 3, when it was determined by the voltage monitor 24 that the output voltage of the battery 26 was lower than 4.2 V (BP [1:0] of voltage monitor 24 = 00), but the present invention is not limited to this.

[0117] The criterion of 4.2 V for ending processing (the first reference voltage) may instead be 4.0 V or 3.5 V, for example, and the setting value is not important. The first reference voltage can be suitably set as dictated by the performance of the battery or the power consumption of the wireless blood glucose meter.

(F)

[0118] With the wireless blood glucose meter 2 of the above-mentioned embodiment, an example was given in which the selector 224 was switched by the transmission control circuit 221 and retransmission was performed when it was determined by the voltage monitor 24 that the output voltage of the battery 26 was at least 4.5 V (BP [1:0] of voltage monitor 24 = 11), but the present invention is not limited to this.

[0119] The criterion of 4.5 V for ending retransmission processing (the second reference voltage) may instead be 5.0 V or 5.5 V, for example, and the setting value is not important. The second reference voltage can be suitably set as dictated by the performance of the battery or the power consumption of the wireless blood glucose meter.

(G)

[0120] With the wireless blood glucose meter 2 of the above-mentioned embodiment, an example was given in which the control blocks shown in FIG. 1 were each constructed from a hardware function, but the present invention is not limited to this.

[0121] The construction of the control blocks in FIG. 1 may, for example, consist of a single piece of hardware or computer software, or functions of hardware and computer software may be combined. This can be suitably decided according to the processing capability and so

forth.

INDUSTRIAL APPLICABILITY

[0122] The wireless blood glucose meter according to the present invention is useful as a wireless blood glucose meter with which measurement can be carried out properly even when the battery charge drops low.

Claims

1. A battery-powered biological sample measurement apparatus (2) that communicates wirelessly with an external device (3), comprising:

a biological data measurement component (21) configured to measure biological data;
a transmitter (22) configured to transmit the biological data measured by the biological data measurement component (21) to the external device (3);

a receiver (23) configured to receive response signals sent from the external device (3) in response to the transmission of the biological data from the transmitter (22) to the external device (3);

a voltage monitor (24) configured to monitor the output voltage of the battery; and

a transmission controller (221) configured to change the transmission method used by the transmitter (22) on the basis of the output voltage of the battery detected by the voltage monitor;

wherein the transmission controller (221) controls the transmitter (22) so that the transmission of biological data is not executed if the output voltage of the battery as detected by the voltage monitor (24) is lower than a first reference voltage in order to secure the minimum power required for the biological sample measurement apparatus (2) to measure biological data, and maintain the blood glucose level measurement function.

2. The biological sample measurement apparatus (2) according to claim 1,

wherein the transmission controller (221) controls the transmitter (22) so that the retransmission of biological data is executed if the output voltage of the battery as detected by the voltage monitor (24) is equal to or greater than a second reference voltage, when the response signal received by the receiver (23) is not an acknowledge signal indicating that the external device (3) has properly received the biological data, or when the receiver (23) does not receive the response signal within a specific length of time.

3. The biological sample measurement apparatus (2) according to claim 1 or 2, wherein the transmission controller (221) controls the transmitter (22) so that biological data is not retransmitted if the output voltage of the battery as detected by the voltage monitor (24) is lower than a second reference voltage and is equal to or greater than the first reference voltage, when the response signal received by the receiver (23) is not the acknowledge signal, or when the receiver (23) does not receive the response signal within the specific length of time.

4. The biological sample measurement apparatus (2) according to any of claims 1 to 3, further comprising a reception controller that controls the receiver (23) so that the response signal is not received if the output voltage of the battery as detected by the voltage monitor (24) is lower than the second reference voltage.

5. The biological sample measurement apparatus (2) according to any of claims 1 to 4, further comprising an interface that has a display component (252) configured to display the biological data measured by the biological data measurement component (21), an operation setting component (251) that the user uses to make various operation settings, and an alarm sound output component (253) configured to output an alarm sound.

6. The biological sample measurement apparatus (2) according to claim 5, wherein the interface further has a first display controller configured to control the display component (252) so that the biological data is not displayed until the transmitter (22) has completed the transmission of the biological data.

7. The biological sample measurement apparatus (2) according to claim 5 or 6, wherein the interface further has an alarm sound output controller (257) configured to control the alarm sound output component (253) so that the alarm sound is outputted when the value of the biological data is equal to or greater than a first reference value, or is less than or equal to a second reference value that is lower than the first reference value.

8. The biological sample measurement apparatus (2) according to any of claims 5 to 7, wherein the interface further has a second display controller (256) configured to control the display component (252) so that an emergency status is displayed when the value of the biological data is equal to or greater than a first reference value, or is less than or equal to a second reference value that is lower than the first reference value.

9. The biological sample measurement apparatus (2) according to claim 8, wherein the second display controller (256) is configured to control the display component (252) to display a telephone number in the emergency.
10. The biological sample measurement apparatus (2) according to claim 8 or 9, wherein the second display controller (256) is configured to control the display component (252) to display a method of treating hyperglycemia or hypoglycemia in the emergency status.
11. The biological sample measurement apparatus (2) according to any of claims 1 to 10, which is a wireless blood glucose meter (2) constituted so that the biological data measurement component (21) measures a blood glucose level.

Patentansprüche

1. Batteriebetriebene biologische Proben-Messvorrichtung (2), die drahtlos mit einem externen Gerät (3) kommuniziert, umfassend:

eine biologische Daten-Messkomponente (21), die ausgestaltet ist, biologische Daten zu messen;

einen Sender (22), der so ausgestaltet ist, dass er die von der biologischen Daten-Messkomponente (21) gemessenen biologischen Daten an das externe Gerät (3) sendet;

einen Empfänger (23), der so ausgestaltet ist, dass er von dem externen Gerät (3) in Antwort auf das Senden der biologischen Daten von dem Sender (22) an das externe Gerät (3) gesendete Antwortsignale empfängt;

eine Spannungsüberwachung (24), die ausgestaltet ist, die Ausgangsspannung der Batterie zu überwachen; und

eine Sendesteuerung (221), die ausgestaltet ist, die Sendart, die von dem Sender (22) genutzt wird, auf Basis der von der Spannungsüberwachung erfassten Ausgangsspannung der Batterie zu ändern;

wobei die Sendesteuerung (221) den Sender (22) derart steuert, dass das Senden biologischer Daten nicht ausgeführt wird, falls die von der Spannungsüberwachung (24) erfasste Ausgangsspannung der Batterie niedriger ist als eine erste Referenzspannung, um die Mindestleistung zu sichern, die für die biologische Proben-Messvorrichtung (2) nötig ist, um biologische Daten zu messen und die Blutzuckerspiegelmessfunktion aufrechtzuerhalten.

2. Biologische Proben-Messvorrichtung (2) gemäß An-

spruch 1, wobei die Sendesteuerung (221) den Sender (22) derart steuert, dass das Rücksenden von biologischen Daten ausgeführt wird, falls die von der Spannungsüberwachung (24) erfasste Ausgangsspannung der Batterie größer oder gleich einer zweiten Referenzspannung ist, wenn das von dem Empfänger (23) empfangene Antwortsignal kein Bestätigungssignal ist, das anzeigt, dass das externe Gerät (3) die biologischen Daten ordnungsgemäß empfangen hat oder wenn der Empfänger (23) das Antwortsignal nicht in einer spezifischen Zeitdauer empfängt.

3. Biologische Proben-Messvorrichtung (2) gemäß Anspruch 1 oder 2, wobei die Sendesteuerung (221) den Sender (22) derart steuert, dass biologische Daten nicht zurückgesendet werden, falls die von der Spannungsüberwachung (24) erfasste Ausgangsspannung der Batterie niedriger ist als eine zweite Referenzspannung und größer oder gleich der ersten Referenzspannung ist, wenn das von dem Empfänger (23) empfangene Antwortsignal nicht das Bestätigungssignal ist, oder wenn der Empfänger (23) das Antwortsignal nicht innerhalb der spezifischen Zeitdauer empfängt.

4. Biologische Proben-Messvorrichtung (2) gemäß einem der Ansprüche 1-3, die weiter eine Empfangssteuerung umfasst, die den Empfänger (23) derart steuert, dass das Antwortsignal nicht empfangen wird, falls die von der Spannungsüberwachung (24) erfasste Ausgangsspannung der Batterie niedriger ist als die zweite Referenzspannung.

5. Biologische Proben-Messvorrichtung (2) gemäß einem der Ansprüche 1-4, die weiter eine Schnittstelle aufweist, die eine Anzeigekomponente (252) hat, die konfiguriert ist, die von der biologischen Datenmesskomponente (21) gemessenen biologischen Daten anzuzeigen, eine Betriebseinstellungskomponente (251), die der Benutzer benutzt, um verschiedene Betriebseinstellungen zu machen, und eine Alarmtonausgabekomponente (253), die konfiguriert ist, einen Alarmton auszugeben.

6. Biologische Proben-Messvorrichtung (2) gemäß Anspruch 5, wobei die Schnittstelle weiter eine erste Anzeigensteuerung hat, die konfiguriert ist, die Anzeigekomponente (252) derart zu steuern, dass die biologischen Daten nicht angezeigt werden, bis der Sender (22) das Senden der biologischen Daten abgeschlossen hat.

7. Biologische Proben-Messvorrichtung (2) gemäß An-

spruch 5 oder 6,
wobei die Schnittstelle weiter eine Alarmtonausgabe-
steuerung (257) hat, die konfiguriert ist, die Alarm-
tonausgabekomponente (253) derart zu steuern,
dass der Alarmton ausgegeben wird, wenn der Wert
der biologischen Daten größer oder gleich eines ers-
ten Referenzwertes ist oder kleiner oder gleich eines
zweiten Referenzwertes ist, der kleiner ist als der
erste Referenzwert.

8. Biologische Proben-Messvorrichtung (2) gemäß ei-
nem der Ansprüche 5-7,
wobei die Schnittstelle weiter eine zweite Anzeigen-
steuerung (256) hat, die konfiguriert ist, die Anzei-
genkomponente (252) derart zu steuern, dass ein
Notfallstatus angezeigt wird, wenn der Wert der bi-
ologischen Daten größer oder gleich eines ersten
Referenzwertes ist oder kleiner oder gleich eines
zweiten Referenzwertes ist, der kleiner ist als der
erste Referenzwert.

9. Biologische Proben-Messvorrichtung (2) gemäß An-
spruch 8,
wobei die zweite Anzeigensteuerung (256) konfigu-
riert ist, die Anzeigenkomponente (252) derart zu
steuern, im Notfall eine Telefonnummer anzuzeigen.

10. Biologische Proben-Messvorrichtung (2) gemäß An-
spruch 8 oder 9,
wobei die zweite Anzeigensteuerung (256) konfigu-
riert ist, die Anzeigenkomponente (252) derart zu
steuern, im Notfallstatus ein Verfahren zur Behand-
lung der Hyperglykämie oder Hypoglykämie anzu-
zeigen.

11. Biologische Proben-Messvorrichtung (2) gemäß ei-
nem der Ansprüche 1-10,
die ein drahtloses Blutzuckermessgerät (2) ist, das
so ausgebildet ist, dass die biologische Datenmess-
komponente (21) einen Blutzuckerspiegel misst.

Revendications

1. Dispositif de mesure d'échantillon biologique (2) ali-
menté par pile qui communique sans fil avec un ap-
pareil externe (3), comprenant:

un composant de mesure de données biologi-
ques (21) qui est configuré pour mesurer des
données biologiques;

un émetteur (22) qui est configuré pour émettre
audit appareil externe (3) les données biologi-
ques mesurées par ledit composant de mesure
de données biologiques (21);

un récepteur (23) qui est configuré pour recevoir
des signaux de réponse envoyés par ledit ap-
pareil externe (3) en réponse à l'émission des

données biologiques depuis l'émetteur (22) vers
l'appareil externe (3);

un dispositif de surveillance de tension (24) con-
figuré pour surveiller la tension de sortie de la
pile; et

un dispositif de commande d'émission (21) qui
est configuré pour changer le mode d'émission
utilisé par l'émetteur (22), sur la base de la ten-
sion de sortie de la pile détectée par le dispositif
de surveillance de tension;

dans lequel ledit dispositif de commande
d'émission (221) commande l'émetteur (22) de
telle sorte que l'émission de données biologi-
ques n'est pas mise en oeuvre si la tension de
sortie de la pile telle que détectée par le dispositif
de surveillance de tension (24) est inférieure à
une première tension de référence, pour assurer
la puissance minimale nécessaire au dispositif
de mesure d'échantillon biologique (2) pour me-
surer des données biologiques et maintenir la
fonction de mesure du taux de glycémie.

2. Dispositif de mesure d'échantillon biologique (2) se-
lon la revendication 1,

dans lequel le dispositif de commande d'émission
(221) commande l'émetteur (22) de telle sorte que
la retransmission de données biologiques est mise
en oeuvre si la tension de sortie de la pile telle que
détectée par le dispositif de surveillance de tension
(24) est supérieure ou égale à une deuxième tension
de référence, lorsque le signal de réponse reçu par
le récepteur (23) n'est pas un signal d'acquiescement
indiquant que ledit appareil externe (3) a bien reçu
les données biologiques, ou lorsque le récepteur
(23) ne reçoit pas le signal de réponse dans un laps
de temps spécifique.

3. Dispositif de mesure d'échantillon biologique (2) se-
lon la revendication 1 ou 2,

dans lequel le dispositif de commande d'émission
(221) commande l'émetteur (22) de telle sorte que
des données biologiques ne sont pas retransmises
si la tension de sortie de la pile telle que détectée
par le dispositif de surveillance de tension (24) est
inférieure à une deuxième tension de référence et
est supérieure ou égale à la première tension de
référence, lorsque le signal de réponse reçu par le
récepteur (23) n'est pas le signal d'acquiescement ou
lorsque le récepteur (23) ne reçoit pas le signal de
réponse dans le laps de temps spécifique.

4. Dispositif de mesure d'échantillon biologique (2) se-
lon l'une quelconque des revendications 1 à 3,

comportant en outre un dispositif de commande de
réception qui commande le récepteur (23) de telle
manière que le signal de réponse n'est pas reçu si
la tension de sortie de la pile telle que détectée par
le dispositif de surveillance de tension (24) est infé-

- rieure à la deuxième tension de référence.
5. Dispositif de mesure d'échantillon biologique (2) selon l'une quelconque des revendications 1 à 4, comprenant en outre une interface qui présente un composant d'affichage (252) configuré pour afficher les données biologiques mesurées par le composant de mesure de données biologiques (21), un composant de réglage de fonctionnement (251) que l'utilisateur utilise pour effectuer divers réglages de fonctionnement, et un composant de sortie d'alarme sonore (253) configuré pour émettre une alarme sonore.
6. Dispositif de mesure d'échantillon biologique (2) selon la revendication 5, dans lequel ladite interface comprend en outre un premier dispositif de commande d'affichage configuré pour commander le composant d'affichage (252) de telle sorte que les données biologiques ne sont pas affichées jusqu'à ce que l'émetteur (22) a terminé l'émission des données biologiques.
7. Dispositif de mesure d'échantillon biologique (2) selon la revendication 5 ou 6, dans lequel ladite interface comprend en outre un dispositif de commande de sortie d'alarme sonore (257) configuré pour commander le composant de sortie d'alarme sonore (253) de telle sorte que l'alarme sonore est émise lorsque la valeur des données biologiques est supérieure ou égale à une première valeur de référence ou est inférieure ou égale à une deuxième valeur de référence qui est inférieure à la première valeur de référence.
8. Dispositif de mesure d'échantillon biologique (2) selon l'une quelconque des revendications 5 à 7, dans lequel ladite interface comprend en outre un deuxième dispositif de commande d'affichage (256) configuré pour commander le composant d'affichage (252) de telle sorte qu'un état d'urgence est affiché lorsque la valeur des données biologiques est supérieure ou égale à une première valeur de référence ou est inférieure ou égale à une deuxième valeur de référence qui est inférieure à la première valeur de référence.
9. Dispositif de mesure d'échantillon biologique (2) selon la revendication 8, dans lequel ledit deuxième dispositif de commande d'affichage (256) est configuré pour commander le composant d'affichage (252) de manière à afficher, en cas d'urgence, un numéro de téléphone.
10. Dispositif de mesure d'échantillon biologique (2) selon la revendication 8 ou 9, dans lequel ledit deuxième dispositif de commande d'affichage (256) est configuré pour commander le
- composant d'affichage (252) de manière à afficher, en état d'urgence, une méthode de traitement de l'hyperglycémie ou de l'hypoglycémie.
11. Dispositif de mesure d'échantillon biologique (2) selon l'une quelconque des revendications 1 à 10, qui est un appareil de mesure de glycémie (2) sans fil réalisé de telle sorte que le composant de mesure de données biologiques (21) mesure un taux de glucose dans le sang.

FIG. 1

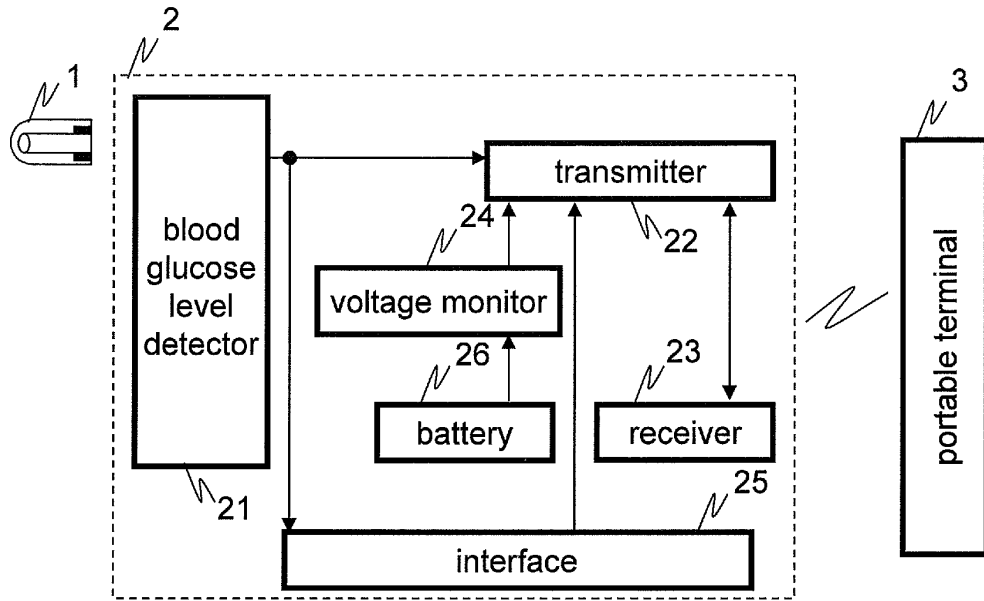
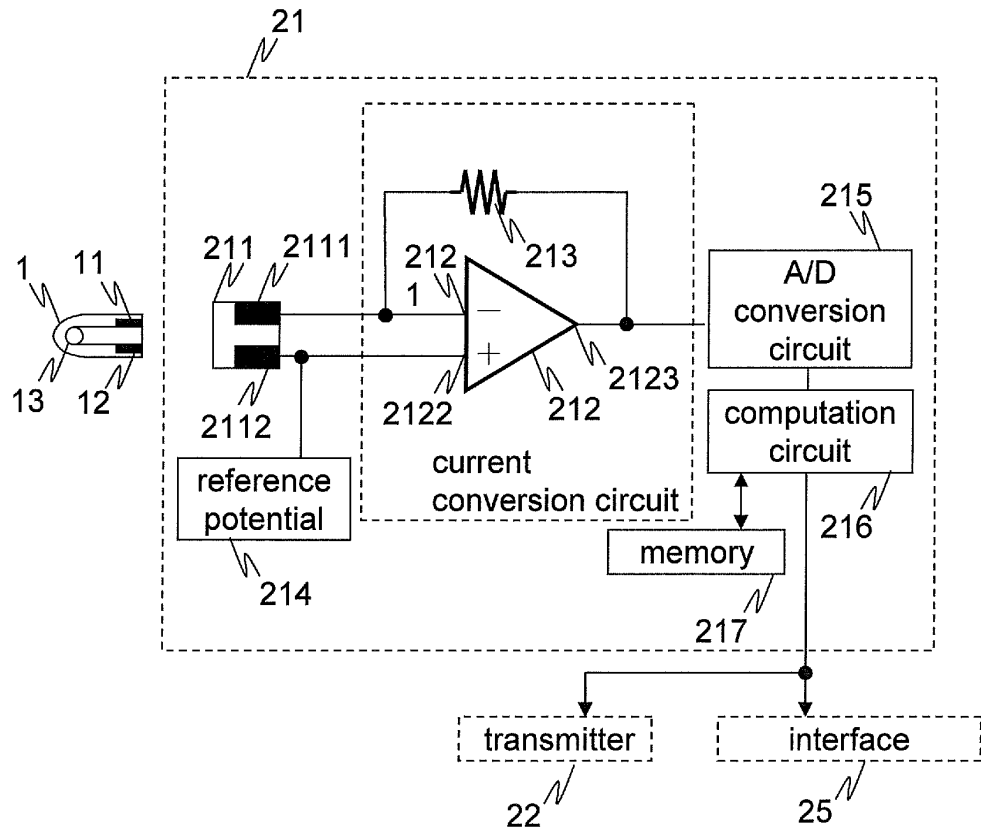


FIG. 2



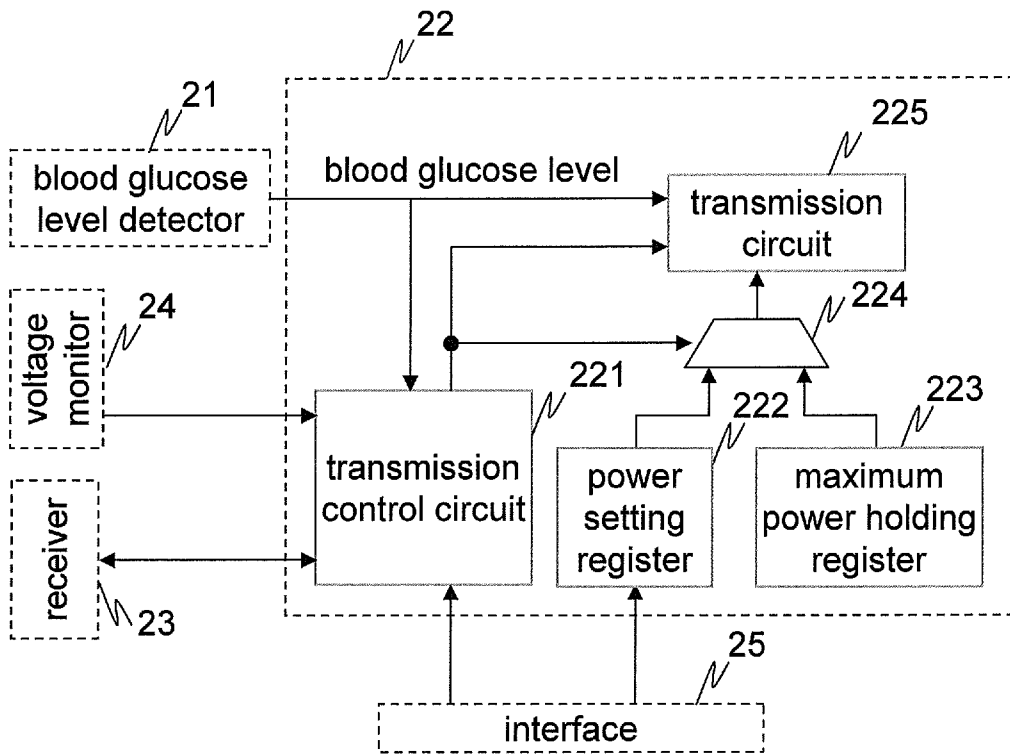


FIG. 3

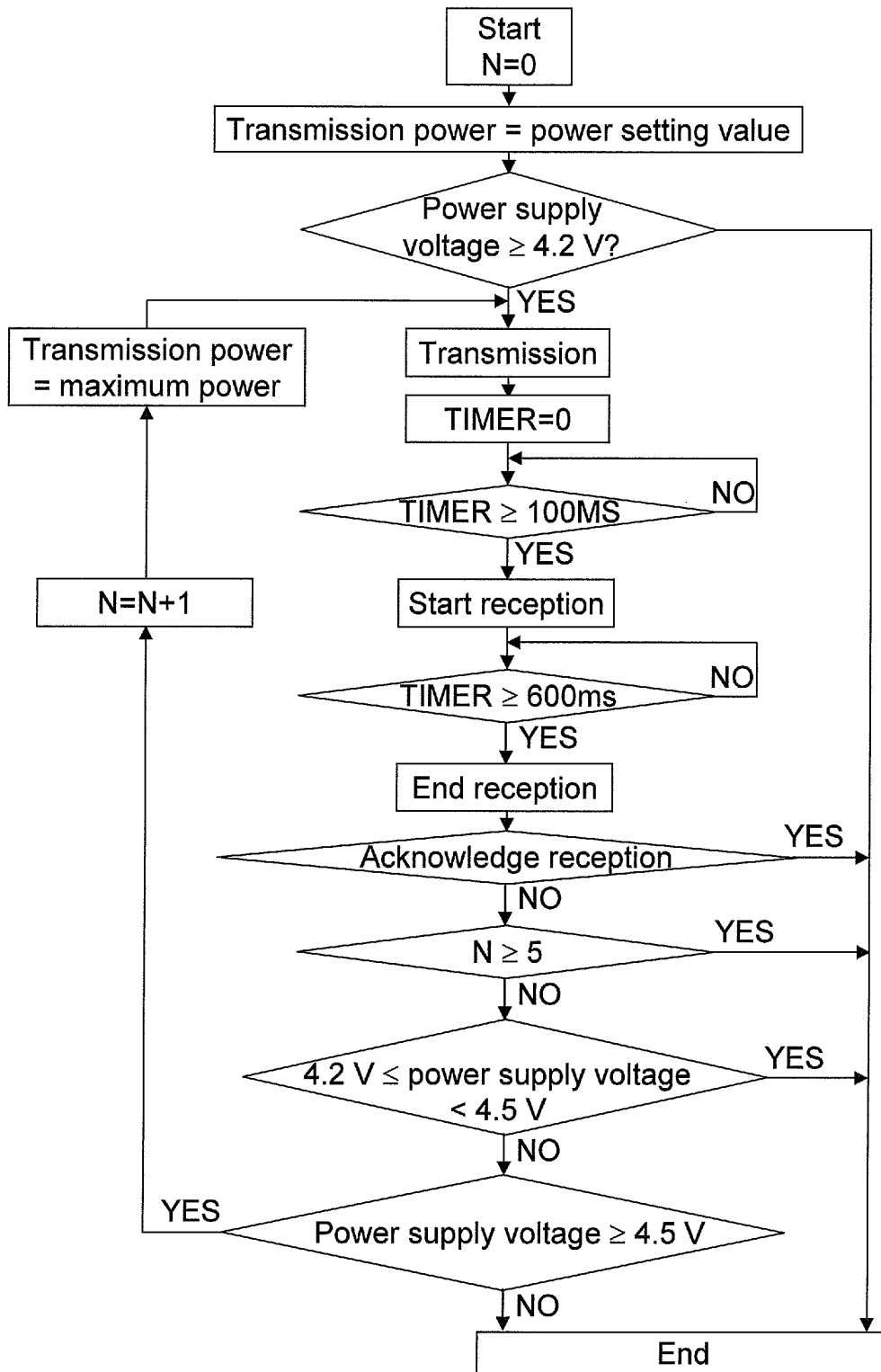


FIG. 4

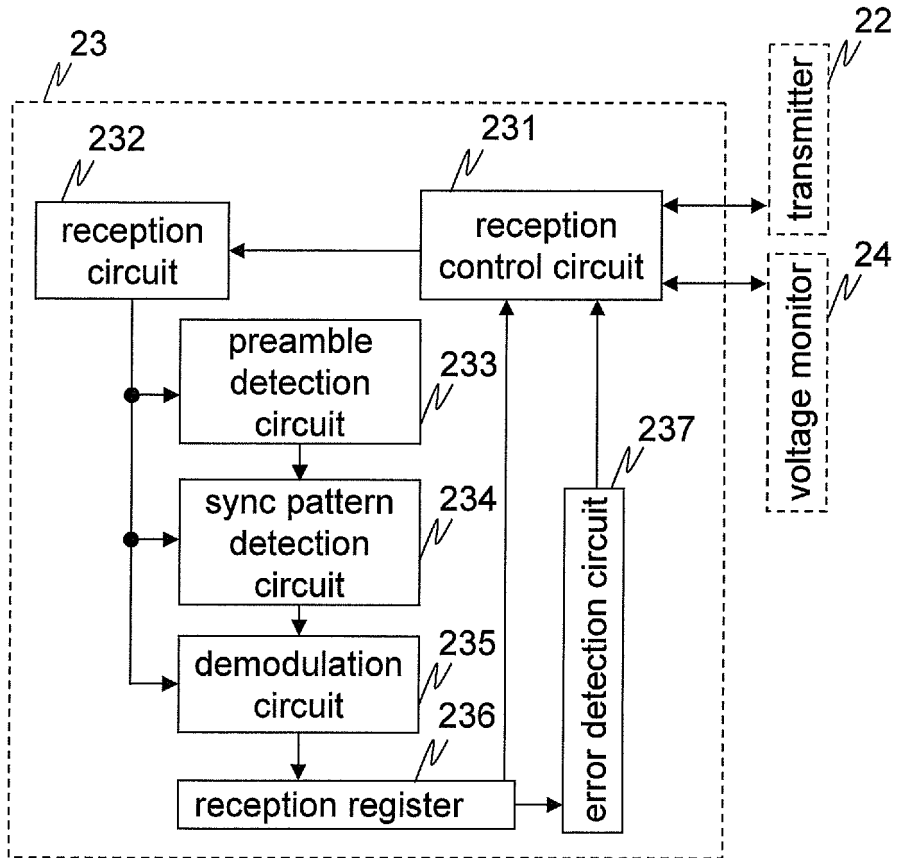


FIG. 5

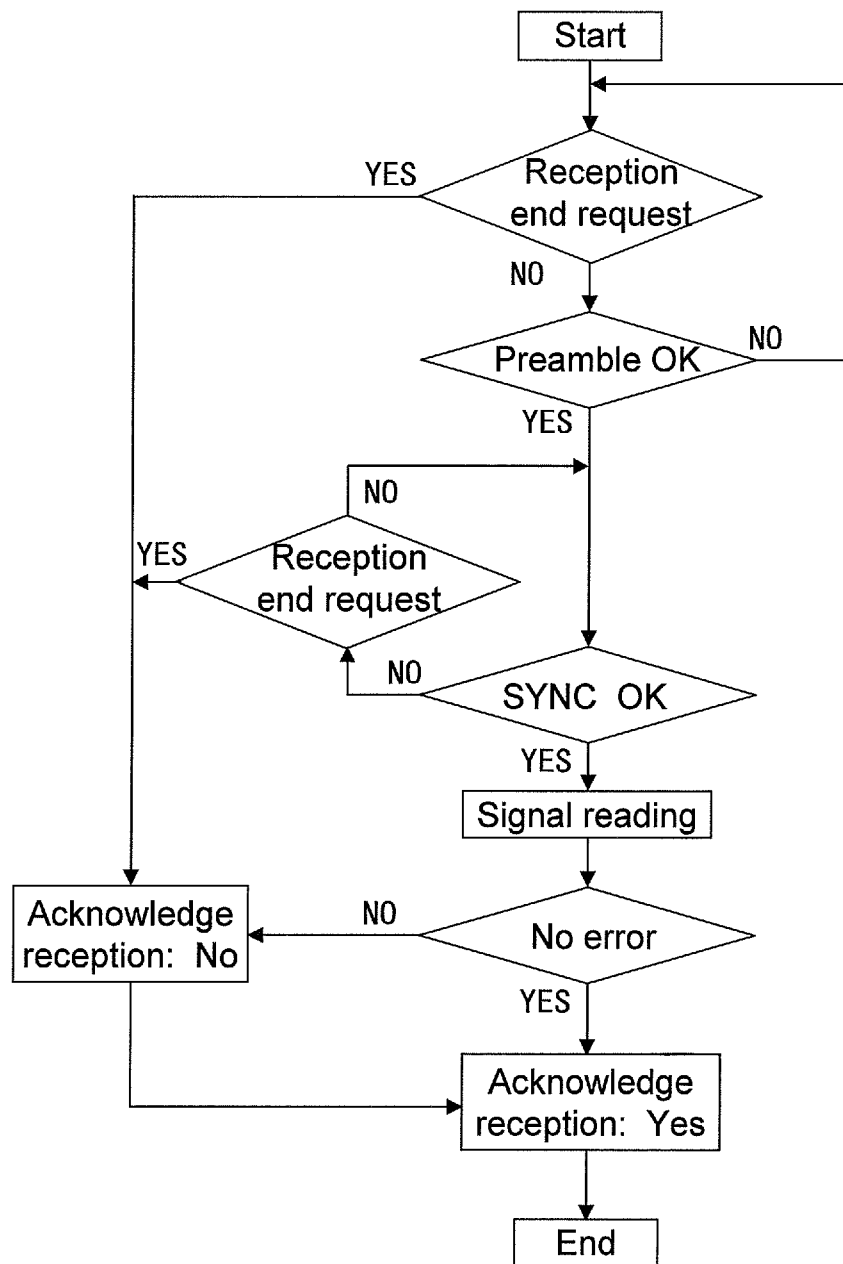


FIG. 6

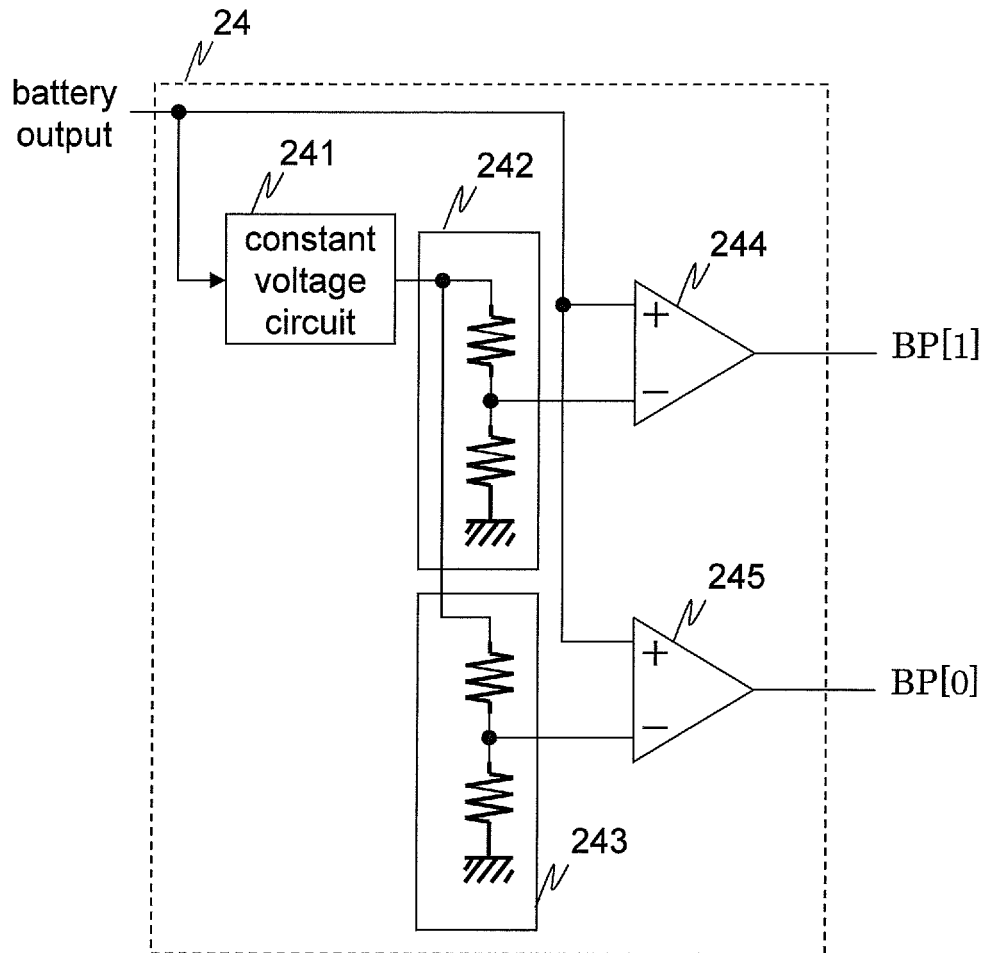


FIG. 7

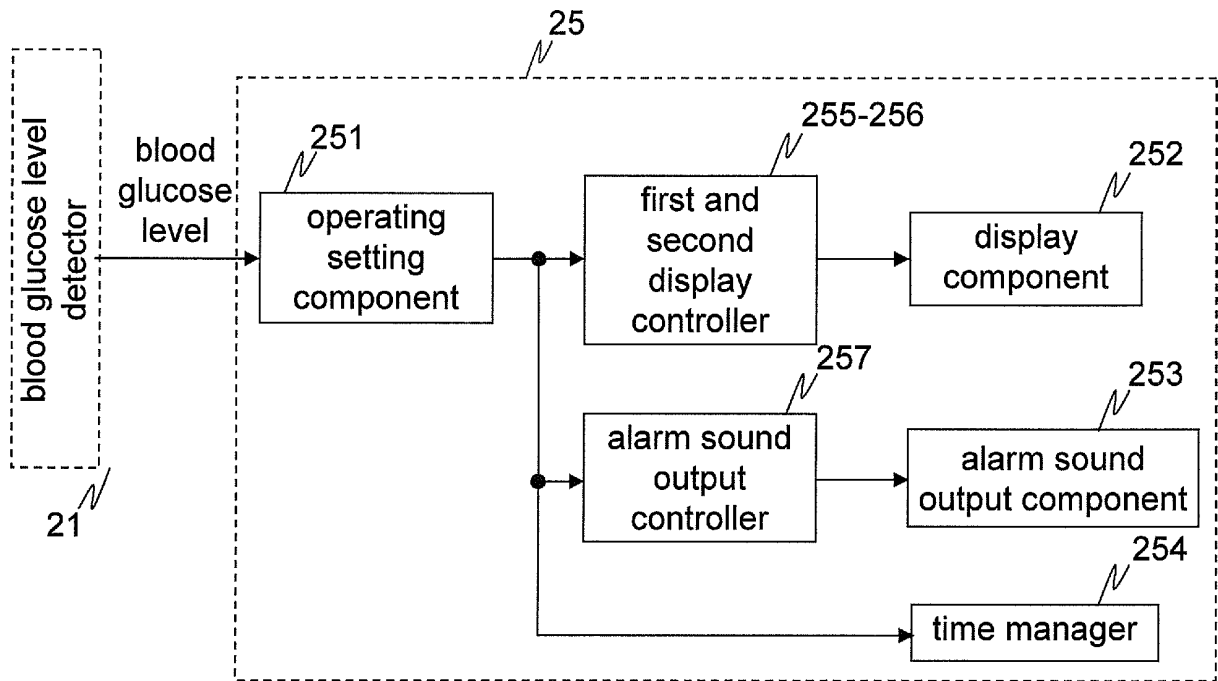


FIG. 8

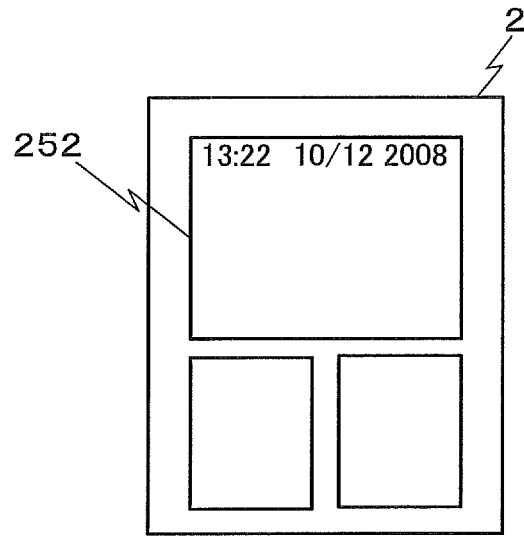


FIG. 9A

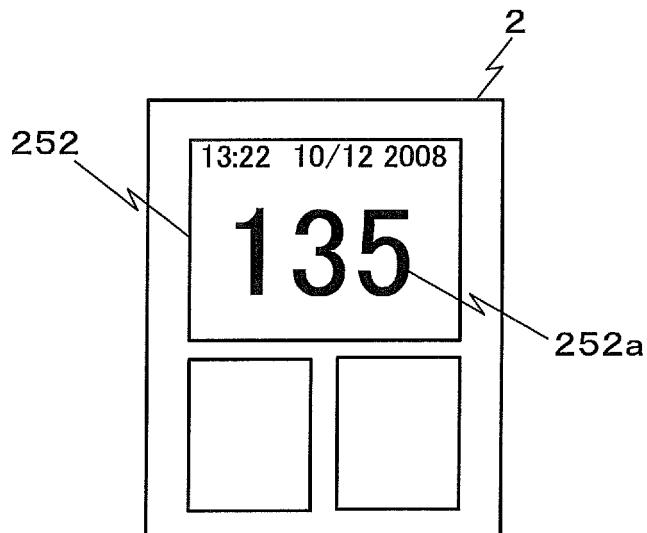


FIG. 9B

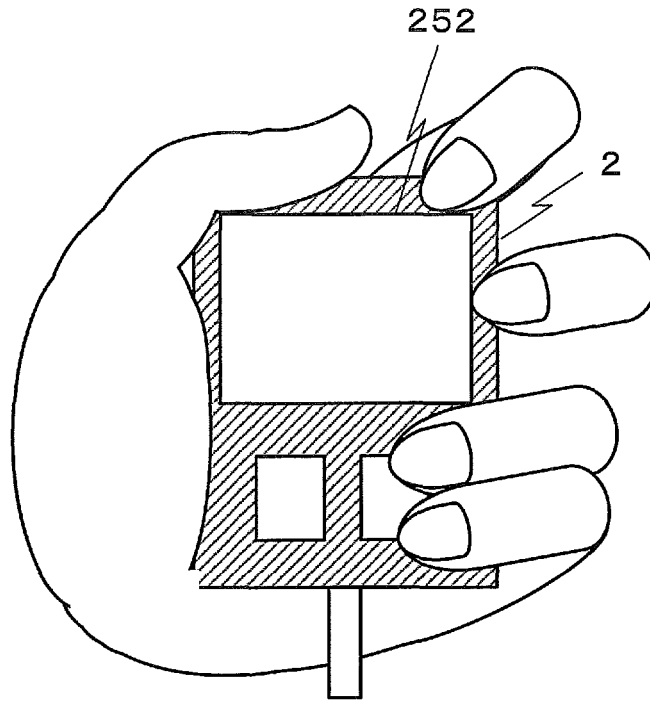


FIG. 10

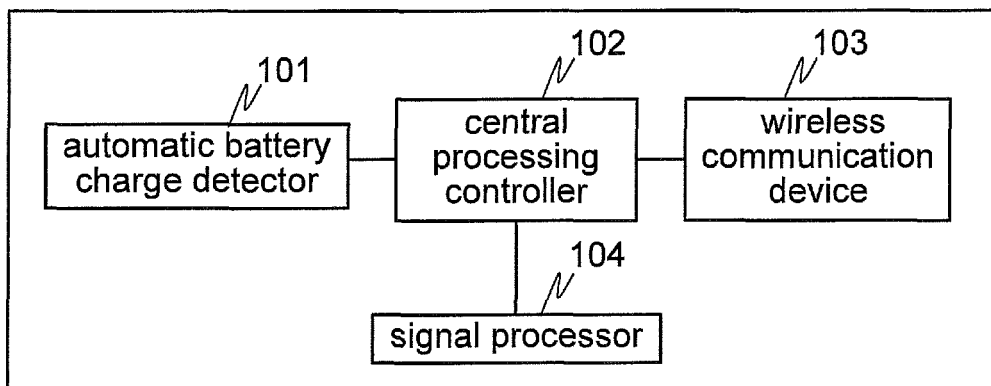


FIG. 11

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- WO 02078512 A [0005]

专利名称(译)	生物样品测量装置		
公开(公告)号	EP2108948B1	公开(公告)日	2016-06-29
申请号	EP2008859378	申请日	2008-12-08
申请(专利权)人(译)	松下电器产业株式会社		
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摘要(译)

无线血糖仪 (2) 是用于与便携式终端 (3) 无线通信的电池 (26) 供电设备, 并且包括测量血糖水平的血糖水平检测器 (21), 发送器 (22) 将由血糖值检测器 (21) 测量的血糖值传送到便携式终端 (3) 的接收器 (23) 接收从便携式终端 (3) 发送的响应于血液传输的响应信号发送器 (22) 到便携式终端 (3) 的葡萄糖水平, 以及监视电池 (26) 的输出电压的电压监视器 (24)。传输控制电路 (231) 根据电压监视器 (24) 检测到的电池 (26) 的输出电压, 改变发送器 (22) 使用的传输方法。

FIG. 1

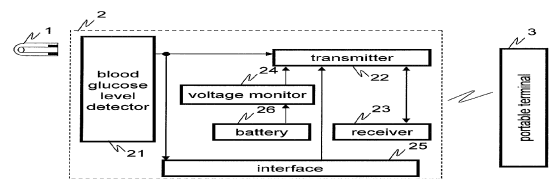


FIG. 2

