[54] Title: DETACHABLE BLOOD GLUCOSE METER

[Fig. 3]

[57] Abstract: Disclosed herein is a detachable blood glucose meter, in which a measurement unit (11) having a strip insertion slot (13) and a temperature sensor is detachably connected to a main body (10) such that heat generated in the main body has little effect on the temperature sensor. For this purpose, the present invention provides a detachable blood glucose meter including: a main body (10) including a liquid crystal display panel (15) installed on a front surface and displaying a measured value or various picture information; a measurement unit (11) detachably connected to an upper end of the main body (10) and including a strip insertion slot (13) formed on an upper end of the measurement unit (11); and a temperature sensor provided in the inside of the measurement unit (11) and detecting an ambient temperature, wherein a temperature correction is made using information detected by the temperature sensor.
Published:

— with international search report (Art. 21(3))
Description

DETACHABLE BLOOD GLUCOSE METER

Technical Field

[1] The present invention relates to a detachable blood glucose meter and, more particularly, to a detachable blood glucose meter, in which a measurement unit having a strip insertion slot and a temperature sensor is detachably connected to a main body such that heat generated in the main body has little effect on the temperature sensor.

Background Art

[2] With the development of modern society, the function and performance of household appliances such as communication devices having a storage medium and an operating system have been rapidly developed and, in the case of consumer electronic products, great efforts are made to improve users convenience.

[3] Especially, such a tendency is observed in the field of medical devices and, like the household appliances, in the case of the medical devices that users directly manipulate, the convenience of the devices is no less important than the performance.

[4] One of such medical devices is a blood glucose meter. As well known in the art, the blood glucose meters are used by diabetics who require artificial regulation of blood glucose to easily measure the concentration of glucose in their blood.

[5] In an early stage, blood glucose is measured using an early blood glucose meter installed at a hospital after blood cells and plasma are separated from blood. Thereafter, with the development of techniques, blood glucose meters that do not need to wipe off blood or remove blood cells and allow easier measurements have attracted much attention as a next generation technology.

[6] Such blood glucose meters use either light intensity measurement or electrochemical measurement to measure blood glucose levels, in which a measurement unit, generally called a strip, is used. Here, the strip corresponds to only a measurement unit used in the light intensity measurement, and the strip used in the electrochemical measurement is referred to as a biosensor.

[7] The light intensity measurement uses the oxidation reaction of glucose by a glucose oxidase and a peroxidase as a basic principle and measures the concentration of glucose by analyzing the change in color of an indicator.

[8] For this purpose, a drop of blood is placed on the surface of reaction paper and, after a predetermined time has elapsed, a certain amount of light is irradiated from a light emitting means installed under the reaction paper to the surface of the reaction paper to utilize the amount of light reflected by an opaque reflection plate located under the reaction paper, thus measuring blood glucose level.
The electrochemical measurement is used to measure electrons generated by a reaction between the glucose oxidase and electrodes using an electron transfer medium instead of a chromogen. When a blood sample is coated on a reaction layer of a measurement strip used as a measurement sensor, glucose in blood is oxidized by the glucose oxidase, and the glucose oxidase is reduced.

At this time, an electron acceptor oxidizes the glucose oxidase and is reduced. Accordingly, the reduced electron acceptor loses electrons on the electron surface to which a certain voltage is applied and is electrochemically oxidized again. Since the amount of current generated at that time is proportional to the concentration of glucose in blood, the concentration of glucose in blood can be measured by measuring the amount of current.

As such, since the blood glucose meter electrochemically measures the concentration of glucose by measuring the amount of current, it is possible to accurately measure the concentration of glucose, reduce the measurement time, and improve the convenience of use.

As shown in FIG. 1, the electrochemical blood glucose meter comprises a main meter 103 and a measurement strip to be inserted into an upper surface of the main body 103.

Moreover, a strip insertion slot into which the measurement strip is inserted is formed on an upper end of the main body 103. A liquid crystal display (LCD) panel 107 is installed on a front surface of the main body 103 to display a measured value or various picture information in the form of numbers, icons, graphs, etc. A power switch 109 and a control switch 111 are placed adjacent to the LCD panel 107.

When a user intends to measure blood glucose using the above-described blood glucose meter 101, the user cleans his or her finger using sterile gauze, removes moisture, and then pricks the finger with a lancet to obtain a drop of blood.

Subsequently, the measurement strip is brought into contact with the drop of blood on the finger such that the measured value of blood glucose is displayed on the display panel 107.

Meanwhile, in the process of measuring blood glucose, some errors are caused by a change in environment such as ambient temperature and humidity in addition to an error caused by the strip itself.

Accordingly, a temperature sensor, which detects the above-described various errors, particularly the error due to a change in ambient temperature, and correct the temperature, are mounted in the upper end of the main body.

However, as the LCD panel is changed from black-and-white to color and various functions such as a touch screen are added to the LCD panel, heat is generated in the main body and has an effect on the temperature sensor, and thus the internal heat as well as the ambient environment causes an error.
Disclosure of Invention

Technical Problem

Accordingly, the present invention has been made to solve the above-described problems, and an object of the present invention is to provide a detachable blood glucose meter, in which a measurement unit equipped with a temperature sensor is detachably connected to a main body such that the measurement unit is connected to the main body in a normal state and, if a strip insertion slot is changed according to the shape of a strip, the measurement unit is replaced while using the main body as it is. As a result, a measurement sensor mounted in the measurement unit is not affected by the internal heat, thus measuring a more accurate blood glucose level. Moreover, it is possible to replace the measurement unit according to the shape of the strip, not changing the blood glucose meter, thus improving the compatibility.

Technical Solution

To accomplish the above objects of the present invention, there is provided a detachable blood glucose meter including: a main body including a liquid crystal display panel installed on a front surface and displaying a measured value or various picture information; a measurement unit detachably connected to an upper end of the main body and including a strip insertion slot formed on an upper end of the measurement unit; and a temperature sensor provided in the inside of the measurement unit and detecting an ambient temperature, wherein a temperature correction is made using information detected by the temperature sensor.

The detachable blood glucose meter may further include: a mounting portion formed on an upper end of the main body; locking grooves formed on both sides of the inside of the mounting portion; and locking projections formed on a lower end of the measurement unit to be detachably connected to the locking grooves.

The detachable blood glucose meter may further include: stopper grooves formed on an upper surface of the mounting portion; and stopper projections formed on a lower surface of the measurement unit to be inserted and connected to the stopper grooves.

If the strip insertion slot of the measurement unit is changed according to the shape of a strip, the main body may be used as it is and only the measurement unit may be replaced.

The measurement unit may include correction information for converting a signal measured according to the kind of the strip into a blood glucose level.

Advantageous Effects

According to the detachable blood glucose meter of the present invention, since the measurement unit is detachably connected to the main body, it is possible to block heat generated from the main body such that the temperature sensor mounted in the mea-
measurement unit is not affected by the temperature, thus measuring a more accurate blood glucose level. Moreover, it is possible to replace the measurement unit according to the shape of the strip, not changing the blood glucose meter, thus improving the compatibility.

Brief Description of Drawings

[26] FIG. 1 is a front view showing a conventional blood glucose meter;

[27] FIG. 2 is a perspective view showing a detachable blood glucose meter in accordance with a preferred embodiment of the present invention;

[28] FIG. 3 is an exploded perspective view showing a state in which a main body and a measurement unit of FIG. 2 are separated;

[29] FIG. 4 is a bottom view showing the measurement unit of FIG. 2; and

[30] FIG. 5 is a graph showing changes in temperature in a conventional blood glucose meter integrated with a temperature sensor and a detachable blood glucose meter of the present invention.

Best Mode for Carrying out the Invention

[31] Hereinafter, preferred embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[32] FIG. 2 is a perspective view showing a detachable blood glucose meter in accordance with a preferred embodiment of the present invention. FIG. 3 is an exploded perspective view showing a state in which a main body and a measurement unit of FIG. 2 are separated, FIG. 4 is a bottom view showing the measurement unit of FIG. 2.

[33] The present invention aims at providing a detachable blood glucose meter, in which a measurement unit 11 equipped with a temperature sensor is detachable connected to a main body 10 such that the measurement unit 11 is not affected by internal heat due to the additional functions of the main body 10.

[34] In general, since blood is taken from a finger to measure blood glucose, a strip is inserted into an upper or lower end of the main body 10.

[35] A strip insertion slot 13 into which the strip is inserted is formed on the main body 10, and a temperature sensor is installed in the vicinity of the strip insertion slot 13 to detect a change in ambient temperature.

[36] A liquid crystal display (LCD) panel 15 is installed on a front surface of the main body 10 to display a measured value, various picture information according to the measured value, a graph showing a change in the measured value, etc., and provide information for guiding the sequence of measurement. A power button 12 for turning on and off the blood glucose meter is installed adjacent to the bottom of the LCD panel 15.

[37] Here, the blood glucose meter according to the present invention has a structure in
which a portion in which the temperature sensor is installed is detached from the main body 10.

[38] The blood glucose meter comprises the main body 10 including the LCD panel 15 formed on the front surface and the measurement unit 11 detachably connected to the main body 10.

[39] The LCD panel 15 and the power button 12 are installed on the front surface of the main body 10, like the conventional one, and the measurement unit 11 is detachably connected to the upper or lower end of the main body 10 in a direction that the strip is inserted.

[40] A mounting portion 16 is formed on an upper or lower end of the main body 10 such that the measurement unit 11 is detachably connected to the main body 10. A male connector 17 for transmitting data measured by the measurement unit 11 to the main body 10 is installed on the mounting portion 16. Locking grooves 19 for the connection with the measurement unit 11 are formed on both sides of the inside of the mounting portion 16. Stopper grooves 21 are formed on an upper surface of the mounting portion 16 such that the measurement unit 11 is not taken out of the mounting portion 16.

[41] Meanwhile, the strip insertion slot 13 through which the strip is inserted is formed inwardly on the rear end of the measurement unit 11, and the temperature sensor for detecting the ambient temperature during glucose measurement is installed in the inside of the measurement unit 11.

[42] Moreover, a female connector 18 is installed on a lower surface of the measurement unit 11 to correspond to the male connector 17 of the mounting portion 16. Locking projections 20 for the connection with the mounting portion 16 are formed on both sides of the front end of the measurement unit 11 to correspond to the locking grooves 19. Stopper projections 22 are formed on the rear end of the lower surface of the measurement unit 11 to correspond to the stopper grooves 21 such that the measurement unit 11 is not taken out of the mounting portion 16.

[43] The method of replacing the measurement unit 11 in the main body 10 will be described below. When the measurement unit 11 is inserted on the mounting portion 16 such that the locking projections 20 are directed to the locking grooves 19, the locking projections 20 are inserted into the locking grooves 19, and the stopper projections 22 are inserted into the stopper grooves 21, thus fixing the measurement unit 11 onto the main body 10. On the contrary, when the upper surface of the measurement unit 11 is pushed upward while applying a constant force, the locking projections 20 are taken out of the locking grooves 19 and, when the measurement unit 11 is lifted up, the measurement unit 11 is detached from the main body 10.

[44] According to the detachable blood glucose meter having the above-described
structure, the measurement unit 11 is used while it is connected to main body 10, and
the measurement unit 11 can be simply detached from the main body 10, if necessary,
such that another measurement unit 11 in which the strip insertion slot 13 has different
size and shape is replaced and used.

Accordingly, since the main body 10 and the measurement unit 11 are detachably
connected to each other, it is possible to block heat generated from the main body 10
such that the temperature sensor mounted in the measurement unit 11 is not affected by
the temperature, thus measuring a more accurate blood glucose level. Moreover, it is
possible to replace the measurement unit 11 according to the shape of the strip, not
changing the blood glucose meter, thus improving the compatibility.

Test results measured at a hospital using the above-described detachable blood
glucose meter are shown in the following Table 1 and FIG. 5. FIG. 5 is a graph
showing changes in temperature in a conventional blood glucose meter integrated with
a temperature sensor and the detachable blood glucose meter of the present invention.

### Table 1

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The test was performed to simultaneously measure temperature using temperature
sensors in the conventional integrated blood glucose meter and the detachable blood
glucose meter of the present invention for one hour while the power of the blood
glucose meters are turned on.

As shown in FIG. 5 and Table 1, in the case of the conventional integrated blood
glucose meter, the temperature was increased from 26.35°C to 41.2°C; however, in the case of the detachable blood glucose meter of the present invention, the temperature was maintained in the range from 24.1°C to 27.3°C, from which it can be seen that the increase in temperature was very small. As a result, it was proved that the temperature has little effect on the temperature sensor since the detachable blood glucose meter of the present invention has a structure in which the main body 10 and the measurement unit 11 are detachably connected to each other.

The invention has been described in detail with reference to preferred embodiments thereof. However, it will be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles and spirit of the invention, the scope of which is defined in the appended claims and their equivalents.
Claims

[1] A detachable blood glucose meter comprising:
a main body including a liquid crystal display panel installed on a front surface
and displaying a measured value or various picture information;
a measurement unit detachably connected to an upper end of the main body and
including a strip insertion slot formed on an upper end of the measurement unit;
and
a temperature sensor provided in the inside of the measurement unit and
detecting an ambient temperature,
wherein a temperature correction is made using information detected by the temperature sensor.

[2] The detachable blood glucose meter of claim 1, further comprising:
a mounting portion formed on an upper end of the main body;
locking grooves formed on both sides of the inside of the mounting portion; and
locking projections formed on a lower end of the measurement unit to be detachably connected to the locking grooves.

[3] The detachable blood glucose meter of claim 1 or 2, further comprising:
stopper grooves formed on an upper surface of the mounting portion; and
stopper projections formed on a lower surface of the measurement unit to be inserted and connected to the stopper grooves.

[4] The detachable blood glucose meter of claim 1, wherein, if the strip insertion slot
of the measurement unit is changed according to the shape of a strip, the main
body is used as it is and only the measurement unit is replaced.

[5] The detachable blood glucose meter of claim 4, wherein the measurement unit
includes correction information for converting a signal measured according to
the kind of the strip into a blood glucose level.
INTEGRATED TEMPERATURE SENSOR
VS
DETACHED TEMPERATURE SENSOR

Temperature(°C)

Time(min)

- THERMOMETER
- DETACHMENT
- INTEGRATION
This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.

It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**
   a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
   
   The international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).
   b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see continuation of this first sheet.

2. **Certain claims were found unsearchable** (see continuation of this first sheet)

3. **Unity of invention is lacking** (see continuation of this first sheet)

4. With regard to the **title**,
   a. the text is approved as submitted by the applicant.
   b. the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,  
   a. the text is approved as submitted by the applicant.
   b. the text has been established, according to Rule 38.2(b), by this Authority as it appears in the continuation of this first sheet. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,  
   a. the figure of the drawings to be published with the abstract is Figure No. 3  
   b. none of the figures is to be published with the abstract.
Continuation of first sheet

1. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, the international search was carried out on the basis of:

Continuation No. IV:

Text of the abstract

(Continuation of item 5 of the first sheet)

Disclosed herein is a detachable blood glucose meter, in which a measurement unit (11) having a strip insertion slot (13) and a temperature sensor is detachably connected to a main body (10) such that heat generated in the main body has little effect on the temperature sensor. For this purpose, the present invention provides a detachable blood glucose meter including: a main body (10) including a liquid crystal display panel (15) installed on a front surface and displaying a measured value or various picture information; a measurement unit (11) detachably connected to an upper end of the main body (10) and including a strip insertion slot (13) formed on an upper end of the measurement unit (11); and a temperature sensor provided in the inside of the measurement unit (11) and detecting an ambient temperature, wherein a temperature correction is made using information detected by the temperature sensor.
### INTERNATIONAL SEARCH REPORT

**International application No**
PCT/KR 2009/002218

#### A CLASSIFICATION OF SUBJECT MATTER

| IPC8: | A61B 5/00 (2006.01) ; G01N 33/487 (2006.01) |

According to International Patent Classification (IPC) or to both national classification and IPC

#### B FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

| IPC8: | A61B |

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, WPI, X-FULL

#### C DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>WO 2000/005581 A1 (DIAMETRICS MEDICAL) 3 February 2000 (03.02.2000) Figs. 1a, 1b, Page 9 Line 36 - Page 11, Line 10</td>
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☐ Further documents are listed in the continuation of Box C

☒ See patent family annex

- **A** document defining the general state of the art which is not considered to be of particular relevance
- **E** earlier application or patent but published on or after the international filing date
- **L** document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- **O** document referring to an oral disclosure, use, exhibition or other means
- **P** document published prior to the international filing date but later than the priority date claimed

**Date of the actual completion of the international search**
6 August 2009 (06.08.2009)

**Date of mailing of the international search report**
1 September 2009 (01.09.2009)

**Name and mailing address of the ISA/AT**

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Form PCT/ISA/210 (second sheet) (January 2004)
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FormPCr/ISA/210 (patent family annex) Quly 1998; reprint January 2004)