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(54) **PORTABLE MEDICAL MEASUREMENT DEVICE AND METHOD**

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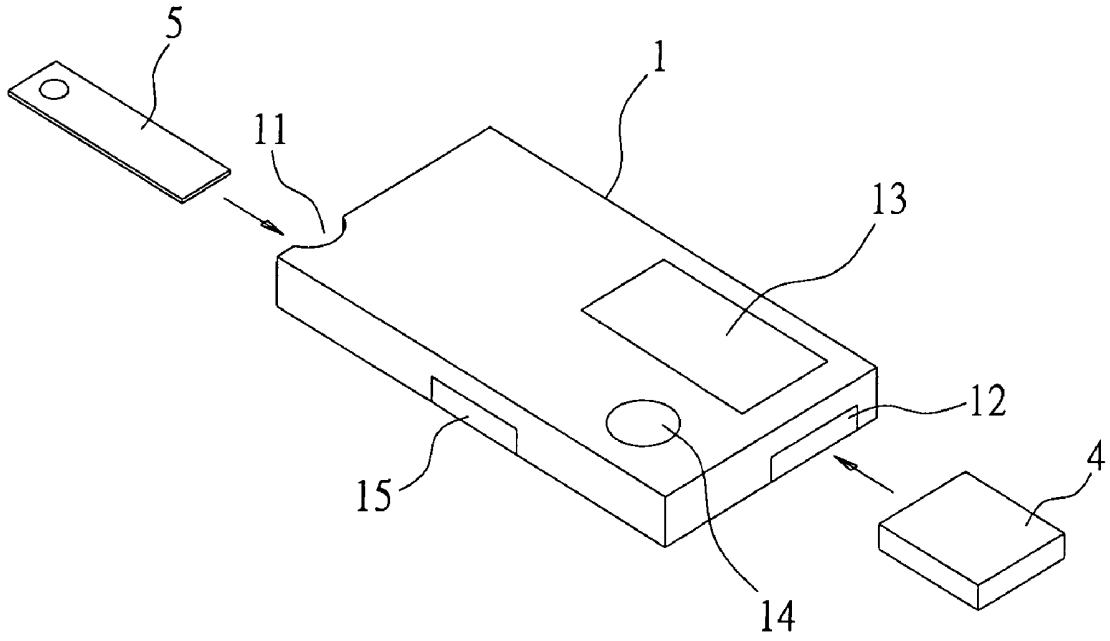
(57) **ABSTRACT**

A portable medical measurement device and method are used for biomedical measurements. The medical measurement device comprises a medical measurement unit for analyzing the reaction of a measured target, a signal receiving unit for receiving a measurement signal, a lookup table for storing reference signals and corresponding parameters, and a microprocessor. When making medical measurement, a measured value of the target is analyzed. Next, a measurement signal is received. The lookup table is then used to find out the corresponding parameter of the measurement signal. Finally, the reaction result of the measured value is calculated out by using the corresponding parameter.



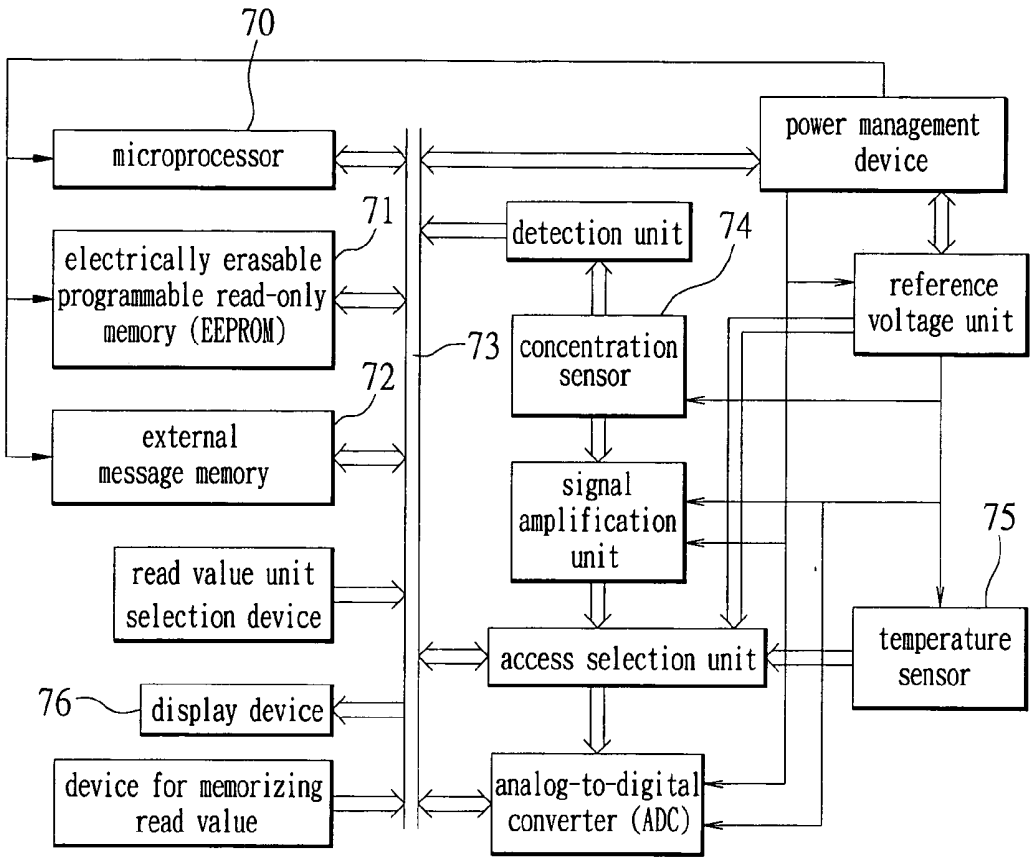


FIG. 1
PRIOR ART

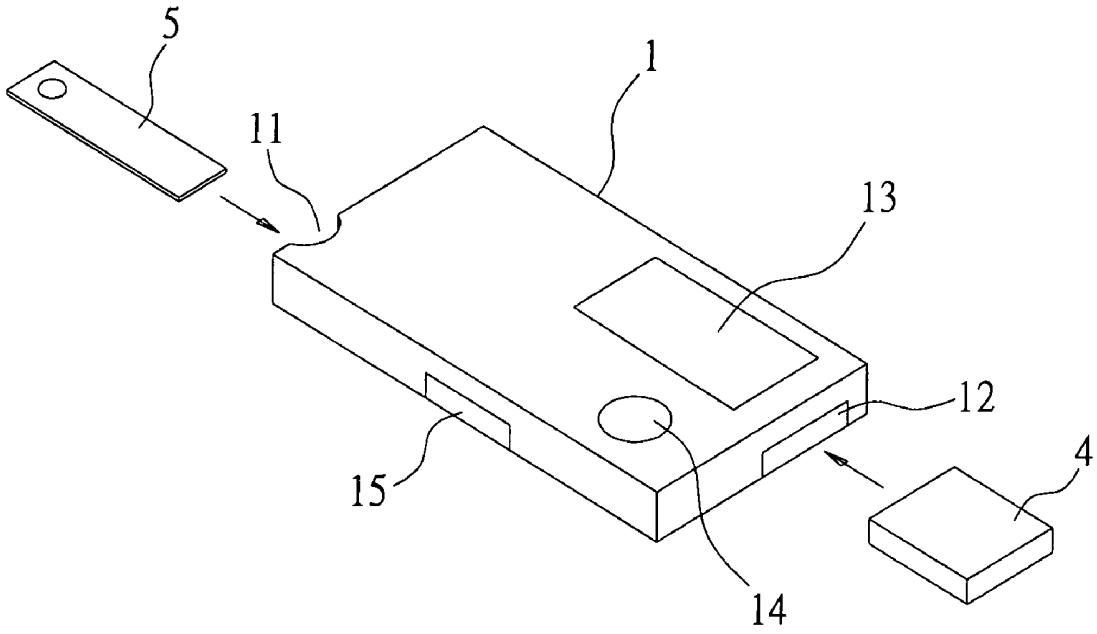


FIG 2

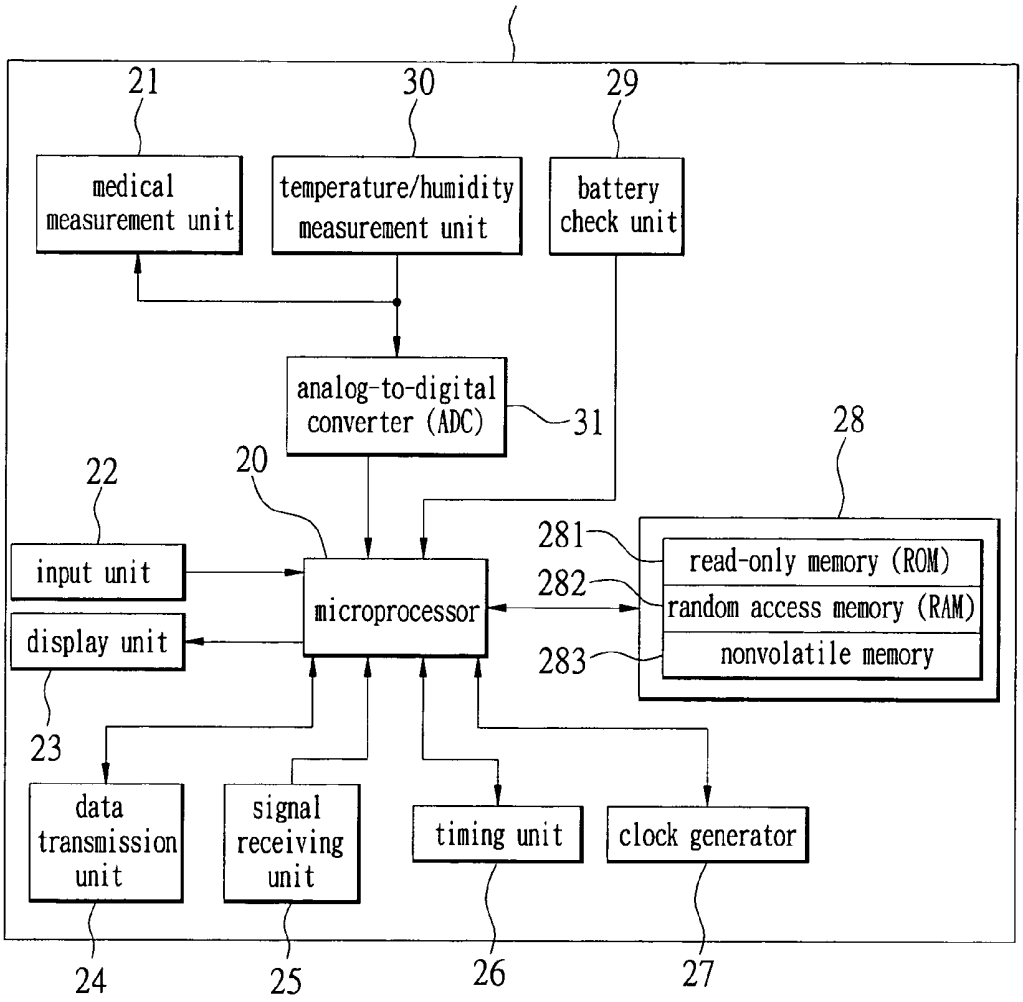

21
30
29
medical measurement unit
temperature/humidity measurement unit
battery check unit
analog-to-digital converter (ADC)
31
28
22
20
281
read-only memory (ROM)
input unit
282
microprocessor
random access memory (RAM)
display unit
283
nonvolatile memory
23
data transmission unit
signal receiving unit
timing unit
clock generator
24
25
26
27

FIG 3

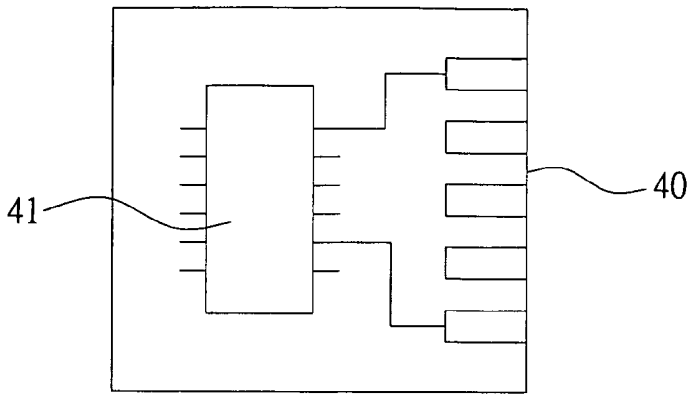


FIG 4A

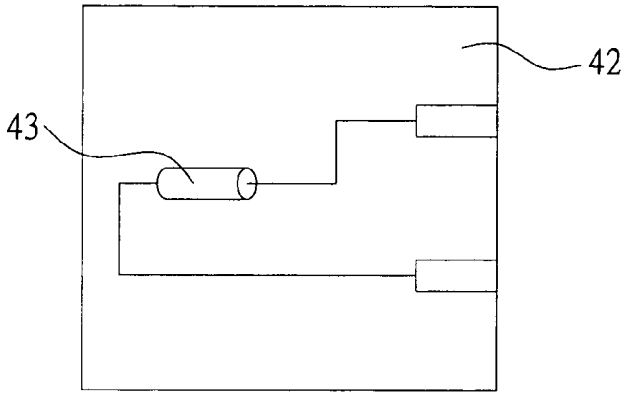


FIG 4B

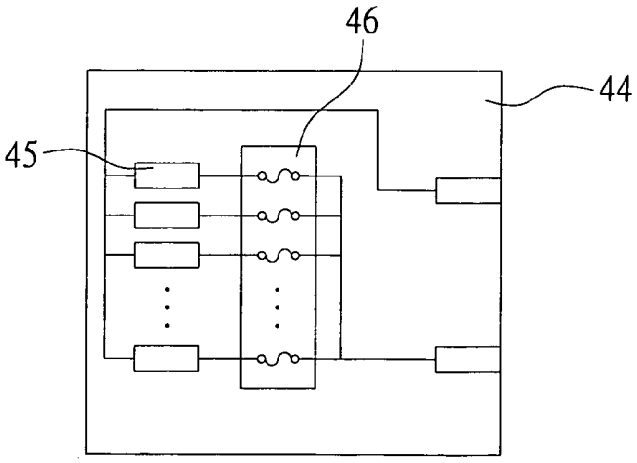


FIG 4C

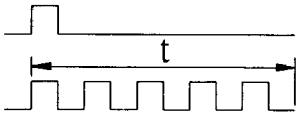
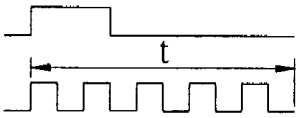
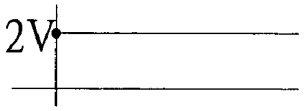
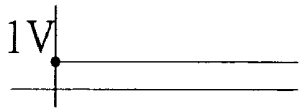
	reference signal	corresponding parameter	
		procedure	operation
1			measured valuex 0.5
2			measured valuex 1
3			measured valuex 1
4			measured valuex 2
5		measurement time10sec	
6		measurement time5sec	

FIG 5

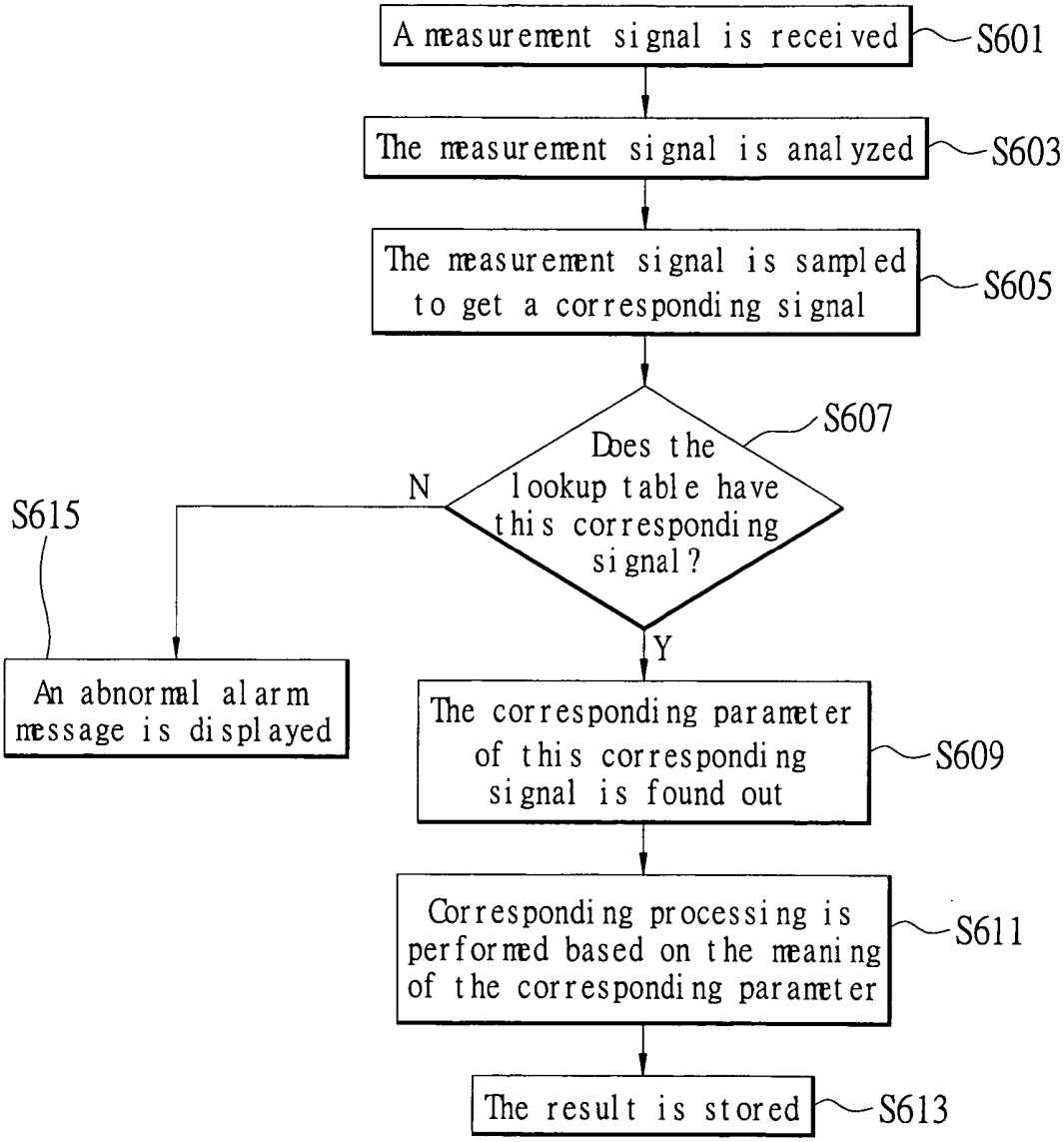

A measurement signal is received
S601
The measurement signal is analyzed
S603
The measurement signal is sampled to get a corresponding signal
S605
Does the lookup table have this corresponding signal?
S607
N
Y
S615
An abnormal alarm message is displayed
The corresponding parameter of this corresponding signal is found out
S609
Corresponding processing is performed based on the meaning of the corresponding parameter
S611
The result is stored
S613

FIG 6

PORTABLE MEDICAL MEASUREMENT DEVICE AND METHOD

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a portable medical measurement device and method and, more particularly, to a medical measurement device and method, which make use of an inputted signal matched with a lookup table to find out corresponding parameters.

[0003] 2. Description of Related Art

[0004] Along with progress of the bio-chemical industry and development of the electronic industry, the functions of portable medical measurement devices become more and more diversified. Through convenient operation of portable medical measurement devices, medical measurement data can be more easily and quickly obtained in families and hospitals.

[0005] The bio-chemical industry and bio-chemical materials are still at their infancy. Most of portable medical products make use of electrochemical reactions for measurement. Electrochemical signals measured by electrochemical electrode strips may differ for the same concentration because there are differences in material properties of the electrochemical electrode strips. The differences may result from the manufacturing process or different standards to cause errors in the preparation of drugs or the enzymes used.

[0006] In order to make up for the influence to each batch of electrochemical electrode strips caused by the above errors, an operation mechanism for correcting parameters should be added so that electrochemical electrode strips of the same kind can be used in the same portable medical products for getting the same operation results. This operation mechanism for correcting parameters is illustrated in the disclosure of R.O.C. Pat. No. 559,660 "a portable multi-function electrochemical bio-detection device". As shown in **FIG. 1**, an external message memory **72** memories parameter messages required for a concentration sensor **74** to measure the concentrations of different targets to be measured. The external message memory **72** can thus be used to measure the concentrations of targets of different kinds. The external message memory **72** is included in an external message card (not shown), which is inserted in a slot of a portable multi-function electrochemical bio-detection device. Data in the external message memory **72** can be read by a microprocessor **70** via a bus **73**.

[0007] In practical operation, the microprocessor **70** will first transfer all parameter messages in the external message memory **72** to an electrically erasable programmable read-only memory (EEPROM) **71**. When electrochemical reaction happens, an electrochemical reaction signal outputted by the concentration sensor **74** and a parameter message provided by the EEPROM **71** will be combined together with a temperature offset built by a temperature sensor **75**, thereby calculating out the concentration of the target. Finally, the calculation result is outputted to a display device **76**.

[0008] For the above conventional portable multi-function electrochemical bio-detection device, related parameter messages are obtained by means of an external card. The parameter messages are used as correction parameters for adjusting the concentration sensor **74**. Because the required parameter messages are stored in the external message card, it is necessary to provide an external memory for storage of the parameter messages. Because an EEPROM is used as the external memory and its contacts may be subject to interference of outside noises, data may be rewritten to cause abnormal test results and even result in consequences difficult to make up for.

SUMMARY OF THE INVENTION

[0009] The primary object of the present invention is to provide a portable medical measurement device and method, which find out correction parameters required for each batch of electrochemical electrode strips by looking up a table to enhance the reliability of the provided parameters.

[0010] To achieve the above object, the present invention provides a portable medical measurement device, which at least comprises a medical measurement unit for analyzing the reaction of a measured target to output a measured value, a signal receiving unit for receiving a measurement signal, a lookup table for storing at least a set of data including a reference signal and a corresponding parameter, and a microprocessor for comparing the measurement signal with the reference signals in the lookup table to find out a corresponding parameter of the measurement signal and perform calculation to the corresponding parameter of the measurement signal and the measured value for obtaining a real reaction result of the target.

[0011] In order to achieve the above object, the present invention also provides a portable medical measurement method used in a portable medical measurement device. The portable medical measurement device comprises a medical measurement unit and a signal receiving unit. The measurement method comprises the steps of: using the medical measurement unit to analyze the reaction of a measured target for outputting a measured value; using the signal receiving unit to receive a measurement signal; comparing the measurement signal with a reference signal in a lookup table to find out a corresponding parameter of the measurement signal; and calculating the reaction result of the target by using the corresponding parameter of the measurement signal and the measured value. The lookup table is used to store at least a set of data including the reference signal and the corresponding parameter.

[0012] The various objects and advantages of the present invention will be more readily understood from the following detailed description when read in conjunction with the appended drawing, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] **FIG. 1** is a circuit block diagram of a portable multi-function electrochemical bio-detection device in the prior art;

[0014] **FIG. 2** is a perspective view of a portable medical measurement device of the present invention;

[0015] **FIG. 3** is a block diagram according to a preferred embodiment of the present invention;

[0016] **FIGS. 4A** to **4C** are diagrams of signal cards used in the present invention;

[0017] **FIG. 5** is a diagram of a lookup table used in the present invention; and

[0018] **FIG. 6** is a flowchart showing how a portable medical measurement device of the present invention makes use of the lookup table.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0019] As shown in **FIG. 2**, an electrochemical electrode strip **5** can be inserted into a strip slot **11** of a medical measurement device **1** to measure the electrochemical reaction of a measured object on the electrochemical electrode strip **5**. A signal card **4** can also be inserted into a card reader **12** for input of external signals. Matched with the operation of a key **14**, the measured result can be known from a display panel **13**. The measured result can also be sent out to a computer, a personal digital assistant (PDA), or a printer via a transmission port **15**.

[0020] For the medical measurement device **1** of the present invention, the signal card **4** can generate specific measurement signals like square wave, sine wave, triangular wave, periodic signal, non-periodic signal or DC level signal. A lookup table is built in the medical measurement device **1**. This lookup table stores at least a set of data including a reference signal and a corresponding parameter in advance. The medical measurement device **1** finds out a corresponding parameter from the lookup table according to the received measurement signal, and then further makes use of the corresponding parameter matched with a measured value of the electrochemical electrode strip **5** to find out the electrochemical reaction of the measured target.

[0021] As shown in **FIG. 3**, the medical measurement device **1** comprises a microprocessor **20**, a medical measurement unit **21**, an input unit **22**, a display unit **23**, a data transmission unit **24**, a signal receiving unit **25**, a timing unit **26**, a clock generator **27**, a memory unit **28**, a battery check unit **29**, a temperature/humidity measurement unit **30**, and an analog-to-digital converter **31**.

[0022] The microprocessor **31** is the operation core of the medical measurement device **1**, and can provide corresponding operation and processing mechanisms in response to various input commands. The memory unit **28** comprises a read-only memory (ROM) **281**, a random access memory (RAM), and a nonvolatile memory **283**. The lookup table used in the present invention is stored in the nonvolatile memory **283** or the microprocessor **20**. The ROM **281** stores operation codes of the microprocessor **20**. The RAM **282** stores temporary data during operation of the microprocessor **20**. The nonvolatile memory **283** is preferred to an electrically erasable programmable read-only memory (EEPROM).

[0023] In this embodiment, the medical measurement unit **21** is a sensor for measuring blood pressure, blood sugar, cholesterol, HBA_1C, hormone, polymerase chain reaction, medical antibody, or protein. The medical measurement unit **21** performs analysis and measurement to a target to be measured on the electrochemical electrode strip **5** inserted into the strip slot **11**, and outputs a measured value. This measured value is an analog value, which should be converted into a digital value by the ADC **31** to be then inputted to the microprocessor **20** for subsequent determination and processing.

[0024] The signal receiving unit **25** receives signal data inputted by the signal card **4**. In this embodiment, the signal receiving unit **25** is the card reader **12** shown in **FIG. 2**. The signal receiving unit **25** receives signals in a wired or wireless way. For instance, the signal receiving unit **25** can be a wireless signal receiver or a wired transmission connector. The signal card **4** can be a wireless device of RF, EM wave barcode, or RFID, or can be an electronic device making use of wired transmission like a computer or a PDA.

[0025] The data transmission unit **24**, like the transmission port **15** shown in **FIG. 2**, provides a data channel for external transmission. For instance, the processed result of the microprocessor **20** can be sent to a computer, a PDA, or a printer via the data transmission unit **24**. The input unit **22**, like the key **14** shown in **FIG. 2**, provides an operation interface for user. The display unit **23**, like the display panel **13** shown in **FIG. 2**, displays messages related to the operation process. The clock generator **27** provides a working clock signal for the microprocessor **20**. The timing unit **26** is used for keeping time. The temperature/humidity measurement unit **30** measures the temperature/humidity around the medical measurement device **20**. The battery check unit **29** is used to check the electricity of the medical measurement device **20**.

[0026] The types of the signal card **4** used in the present invention are shown in **FIGS. 4A** to **4C**. The signal card **4** is primarily realized by providing a component for generating a measurement signal on a printed circuit board (PCB). As shown in **FIG. 4A**, an IC **41** is disposed on a signal card **40**. This IC **41** can produce a square wave, a sine wave, a phase wave, a triangular wave, a periodic signal, or a non-periodic wave. As shown in **FIG. 4B**, a resistor **43** is disposed on a signal card **42**. This resistor **43** is used to produce a constant DC level signal. As shown in **FIG. 4C**, several resistors **45** of different resistance values are disposed on a signal card **4**. Each of the resistors **45** connects to a fuse **46** so that more DC level signals can be provided for selection. Only the fuse corresponding to the wanted DC level signal is reserved while all other fuses are burned out for generate a measurement signal.

[0027] As shown in **FIG. 5**, the lookup table includes reference signals and corresponding parameter data. Each reference signal has a corresponding parameter. The corresponding parameters can be specific procedures or operations. As for a specific procedure, an original measurement time Of 10 sec can be changed to 9 sec based on different signals. As for an operation, an original multiplication by 1 can be changed to a multiplication by 2 based on different signals. The corresponding parameters can also have other uses. For instance, an original measurement of blood sugar can be changed to a measurement of uric acid according to the corresponding content of the lookup table for different control modes, or a standard product can be changed to an OEM product according to the corresponding content of the lookup table for different judgment conditions.

[0028] **FIG. 6** is a flowchart showing how a portable medical measurement device of the present invention makes use of the lookup table. When the medical measurement device **1** has an electrochemical electrode strip **5** inserted therein and analyzes the reaction of a measured target to output a measured value, an operation mechanism for correcting parameters should be added. The present invention

specially provides a table lookup method to find out the corresponding parameter needed to be corrected. This method comprises the following steps.

[0029] First, the signal receiving **25** receives a measurement signal (Step S**601**). This measurement signal is outputted by the signal card **4**. Next, the measurement signal is analyzed (Step S**603**) to discriminate its type (square wave, sine wave, phase wave, triangular wave, periodic signal, non-periodic signal, or DC level signal). The measurement signal is then sampled to get a corresponding signal (Step S**605**). The sampling way can differ according to the type of the measurement signal. For instance, the sampling can be accomplished by means of digital detection, time sampling detection, periodic time detection, non-periodic time detection, duty-cycle detection, or phase detection. Subsequently, whether the lookup table has this corresponding signal is determined (Step S**607**). The corresponding signal is compared with reference signals in the lookup table one by one. If the answer is yes, the corresponding parameter of the corresponding signal in the lookup table is found out (Step S**609**). Corresponding calculation and processing is performed based on the meaning of the corresponding parameter matched with the measured value of the electrochemical electrode strip **5** (Step S**611**). Finally, the result is stored (Step S**613**). If the answer in Step S**607** is no, an abnormal alarm message is displayed (Step S**615**).

[0030] In Step S**609**, in addition to being displayed on the display unit **23**, the found corresponding parameter can also be manually adjusted through the input unit **23** or the key **14**. The adjustable range is predefined in the lookup table, especially when the signal card **4** is as shown in **FIG. 4C**. This signal card **4** is characterized in that a resistor is selected from several resistors with different resistance values for outputting a specific DC level signal as the measurement signal. Because the user can manually adjust the corresponding parameter found by the table lookup method, the corresponding parameter will have better flexible variation space to conform to diversified inputs of measurement signal.

[0031] The medical measurement device **1** of the present invention is used to measure the electrochemical reaction of an electrochemical electrode strip **5**. After the medical measurement device **1** detects a periodic, non-periodic, or constant-level measurement signal inputted from the outside, a corresponding parameter of this signal is found out by means of the table lookup method based on the specific meaning of the measurement signal. Therefore, different processing can be performed according to the corresponding parameter matched with the result of the electrochemical reaction.

[0032] To sum up, the portable medical measurement device and method of the present invention have the following advantages.

[0033] 1. The reliability of external signal card can be enhanced.

[0034] 2. The corresponding parameter is found out by a table lookup method so that corresponding processing can be performed more flexibly based on different characteristics of electrochemical electrode strip.

[0035] Furthermore, in addition to being able to measure the electrochemical electrode strips, the medical measurement device can also measure optical electrode strips. Moreover, the insertion position of the signal card **4** is not limited to the card reader **12**. The signal card **4** can also be inserted into the strip slot **11**. Because the strip slot **11** has the capability of reading electrochemical values, the electric signal outputted by the signal card **4** can be read by the medical measurement unit **21** in the strip slot **11** and then be determined and processed by the microprocessor **20**.

[0036] Although the present invention has been described with reference to the preferred embodiment thereof, it will be understood that the invention is not limited to the details thereof. Various substitutions and modifications have been suggested in the foregoing description, and other will occur to those of ordinary skill in the art. Therefore, all such substitutions and modifications are intended to be embraced within the scope of the invention as defined in the appended claims.

I claim:

1. A portable medical measurement device at least comprising:

a medical measurement unit for analyzing the reaction of a measured target to output a measured value;

a signal receiving unit for receiving a measurement signal;

a lookup table for storing at least a set of data including a reference signal and a corresponding parameter; and

a microprocessor for comparing said measurement signal with said reference signals in said lookup table to find out a corresponding parameter of said measurement signal and perform calculation to said corresponding parameter of said measurement signal and said measured value for obtaining a real reaction result of said target.

2. The portable medical measurement device as claimed in claim 1, wherein said medical measurement unit is a sensor for measuring blood pressure, blood sugar, cholesterol, HBA_1C, hormone, polymerase chain reaction, medical antibody, or protein.

3. The portable medical measurement device as claimed in claim 1, wherein said measurement signal is a square wave, a sine wave, a phase wave, a triangular wave, a periodic signal, a non-periodic signal, or a DC level signal.

4. The portable medical measurement device as claimed in claim 1, wherein said measurement signal is outputted by a signal card.

5. The portable medical measurement device as claimed in claim 4, wherein said signal card can input a signal to said medical measurement unit or said signal receiving unit so that they can read said signal.

6. The portable medical measurement device as claimed in claim 4, wherein said signal card is realized by providing an IC on a PCB to generate said measurement signal.

7. The portable medical measurement device as claimed in claim 4, wherein said signal card is realized by providing a resistor on a PCB to generate said measurement signal.

8. The portable medical measurement device as claimed in claim 4, wherein said signal card is realized by providing a plurality of resistors on a PCB to generate said measurement signal, each resistor connects to a fuse, and said fuses separately connected with said resistors are burned out except one.

9. The portable medical measurement device as claimed in claim 1, wherein said signal receiving unit is a card reader, a wireless signal receiver, or a connector.

10. The portable medical measurement device as claimed in claim 1 further comprising a temperature/humidity detection unit for measuring the temperature/humidity around said portable medical measurement device.

11. The portable medical measurement device as claimed in claim 1 further comprising a data transmission unit for transmission with the outside.

12. A medical measurement method applied to a portable medical measurement device, said portable medical measurement device comprising a medical measurement unit and a signal receiving unit, said medical measurement method comprising the steps of:

using said medical measurement unit to analyze the reaction of a measured target for outputting a measured value;

using said signal receiving unit to receive a measurement signal; comparing said measurement signal with a reference signal in a lookup table to find out a corresponding parameter of said measurement signal, said lookup table being used to store at least a set of data including said reference signal and said corresponding parameter; and

calculating the reaction result of said target by using said corresponding parameter of said measurement signal and said measured value.

13. The medical measurement method as claimed in claim 12, wherein said measurement signal is a square wave, a sine wave, a phase wave, a triangular wave, a periodic signal, a non-periodic signal, or a DC level signal.

14. The medical measurement method as claimed in claim 12, wherein said measurement signal is outputted by a signal card.

15. The medical measurement method as claimed in claim 14, wherein said signal card makes use of an IC to generate said measurement signal.

16. The medical measurement method as claimed in claim 14, wherein said signal card makes use of a resistor to generate said measurement signal.

17. The medical measurement method as claimed in claim 14, wherein said signal card makes use of a plurality of resistors to generate said measurement signal, each said resistor connects to a fuse, and said fuses separately connected with said resistors are burned out except one.

18. The medical measurement method as claimed in claim 12 further comprising a step of sampling said measurement signal to get a corresponding signal.

19. The medical measurement method as claimed in claim 18, wherein the sampling in said step of sampling said measurement signal to get a corresponding signal is accomplished by means of digital detection, time sampling detection, periodic time detection, non-periodic time detection, duty-cycle detection, or phase detection.

20. The medical measurement method as claimed in claim 12 further comprising a step of storing the result of said step of calculating the reaction result of said target by using said corresponding parameter of said measurement signal and said measured value.

* * * * *

专利名称(译)	便携式医疗测量装置和方法		
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[标]申请(专利权)人(译)	陈望SHIOW陈 陈财益 TSAY哲陈聪 YEH JIH兴		
申请(专利权)人(译)	陈望SHIOW-CHEN 陈TSAI-YI TSAY宗喀巴-哲 YEH JIH兴		
当前申请(专利权)人(译)	TYSON生物学研究，INC.		
[标]发明人	CHEN WANG SHIOW CHEN CHEN TSAI YI TSAY TSONG TSEH YEH JIH HSING		
发明人	CHEN WANG, SHIOW-CHEN CHEN, TSAI-YI TSAY, TSONG-TSEH YEH, JIH-HSING		
IPC分类号	C12Q1/00 A61B5/00 A61B5/02		
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外部链接	Espacenet USPTO		

摘要(译)

便携式医学测量装置和方法用于生物医学测量。该医学测量装置包括用于分析测量目标的反应的医学测量单元，用于接收测量信号的信号接收单元，用于存储参考信号和相应参数的查找表，以及微处理器。在进行医学测量时，分析目标的测量值。接下来，接收测量信号。然后使用查找表来找出测量信号的相应参数。最后，通过使用相应的参数计算出测量值的反应结果。