(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 242 115 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
12.09.2018 Bulletin 2018/37

(21) Application number: **16800865.4**

(22) Date of filing: **22.03.2016**

(51) Int Cl.:
G01K 7/00 *(2006.01)* ***A61B 5/11*** *(2006.01)*
G01K 13/00 *(2006.01)* ***A61B 5/01*** *(2006.01)*
A61B 5/00 *(2006.01)* ***A61B 10/00*** *(2006.01)*

(86) International application number:
PCT/JP2016/058925

(87) International publication number:
WO 2017/163300 (28.09.2017 Gazette 2017/39)

(54) BASAL BODY TEMPERATURE MEASUREMENT SYSTEM AND BASAL BODY TEMPERATURE MEASUREMENT DEVICE

SYSTEM ZUR BASALEN TEMPERATURMESSUNG UND VORRICHTUNG ZUR BASALEN TEMPERATURMESSUNG

SYSTÈME DE MESURE DE TEMPÉRATURE CORPORELLE BASALE ET DISPOSITIF DE MESURE DE TEMPÉRATURE CORPORELLE BASALE

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(43) Date of publication of application:
08.11.2017 Bulletin 2017/45

(73) Proprietor: **E3 Co., Ltd.**
Shinjuku-Ku
Tokyo
1630532 (JP)

(72) Inventor: **YAO, Bingwei**
Tokyo 163-0532 (JP)

(74) Representative: **Vossius & Partner**
Patentanwälte Rechtsanwälte mbB
Siebertstrasse 3
81675 München (DE)

(56) References cited:
WO-A1-2010/098022
CN-A- 103 815 878
CN-A- 105 105 719
CN-U- 204 636 322
JP-A- H1 147 136
JP-A- H05 228 116
JP-A- S63 260 542
JP-A- 2005 164 405
JP-A- 2012 220 287
JP-A- 2014 233 585
JP-A- 2014 233 585

EP 3 242 115 B1

Description

TECHNICAL FIELD

[0001] The present invention relates to a basal body temperature measuring system and a basal body temperature measuring device, and more particularly to a device and system for measuring a basal body temperature in attachment to a body of a user for a sleeping period.

BACKGROUND ART

[0002] A human basal body temperature represents a body temperature measured in a resting state in which a factor of a change in a body temperature caused by activity is eliminated and only a minimum energy required for life support is consumed. In the case of women, the basal body temperature is closely related to an ovulation cycle. For this reason, the basal body temperature is utilized for various purposes, for example, reference of a woman who desires pregnancy or nonpregnancy, analysis of the cause of irregular menstruation or observation of progress thereof, and the like. Recently, the basal body temperature is utilized for a beauty, regulation of a health condition or the like in some cases.

[0003] Usually, the basal body temperature of a woman is changed periodically between approximately 0.3 to 0.5 degree except for the case of a sickness or heavy stress. By measuring the basal body temperature every day to know a rhythm (a change in a body temperature), it is possible to grasp a condition of a body such as presence of ovulation, a period of menstruation or a period likely to get pregnant.

[0004] It is necessary to accurately capture a fine change in a value. For this reason, the basal body temperature is usually measured in a body resting state. As a specific measuring method, it is recommended to perform measurement in a state in which a user is lying down in bed when a body has not been moved and an inner part of the body is taking a rest immediately after waking with enough sleeping.

[0005] Conventionally, there is proposed the technique for starting various sensors in a timing five minutes before a set time of an alarm clock (a standard time required for measuring a body temperature by a temperature sensor), deciding by these sensors whether the user is trying to measure a basal body temperature, and giving warning if there is a possibility that the measurement might be forgotten (for example, see JP 2012-220287 A (Patent Document 1)).

[0006] According to the technique described in the Patent Document 1, the user can be prompted to measure the basal body temperature without forgetting it immediately after waking. Referring to the technique described in the Patent Document 1, however, the user measures the basal body temperature after the user is forcibly waken through an alarm clock or receives the warning from a device. For this reason, the measurement cannot be performed in a resting state.

[0007] On the other hand, there is also proposed the technique for going to bed with a body temperature measuring device attached to a housing pocket in underwear and measuring a basal body temperature and recording the basal body temperature in a memory during sleeping (for example, see JP 2005-164405 A (Patent Document 2)). The Patent Document 2 also describes that the sleep onset of a user is confirmed by the acceleration sensor and the measurement of a body temperature is then started by the temperature measuring element. According to the technique described in the Patent Document 2, it is possible to measure a basal body temperature in a resting state during sleeping.

[0008] Other basal body temperature (BBT) measuring techniques are known in the prior art, e.g. from CN 204 636 322 U, JP 2014-233585 A, JP 2012-220287 A, JP 2005-164405 A, CN 105 105 719 A, CN 103 815 878 A and JP H11-47136 A.

DISCLOSURE OF THE INVENTION

[0009] Referring to the technique described in the Patent Document 2, however, the body temperature is continuously measured from sleep onset to wake-up. Therefore, it is impossible to specify which time zone for a body temperature is grasped to be suitable for a basal body temperature during that time. The body temperature is changed by a delicate movement such as turn-over. For this reason, the body temperature to be measured from the sleep onset to the wake fluctuates. In the case of the Patent Document 2, there is a problem in that it is impossible to specify which of the fluctuating body temperatures is grasped to be the basal body temperature.

[0010] The present invention has been made to solve the problems and has an object to enable accurate measurement of a basal body temperature in a resting state. This object has been achieved with the features of the claims.

[0011] In the device as described, body temperature information to be measured by a temperature sensor for a sleeping period is recorded in a storage medium in association with movement information to be detected by a movement detecting sensor for the same sleeping period, and the movement information recorded in the storage medium is then analyzed to detect a wake timing of a user and body temperature information measured immediately before the wake timing is specified as a basal body temperature.

[0012] According to the present invention, the body temperature of the user can be measured in a resting state during sleeping and be recorded in the storage medium. In addition, the body temperature recorded immediately before waking can be specified as a basal body temperature. Therefore, it is possible to obtain an accurate basal body temperature measured in the resting state immediately before the waking.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013]

FIG. 1 is a block diagram showing an example of a functional structure of a basal body temperature measuring device according to a first embodiment.
FIG. 2 is a view showing an example of an appearance structure of a basal body temperature measuring device according to first to third embodiments.
FIG. 3 is a chart showing an example of processing of a basal body temperature specifying unit.
FIG. 4 is a block diagram showing an example of a structure of a basal body temperature measuring system according to the first embodiment.
FIG. 5 is a block diagram showing an example of a functional structure of the basal body temperature measuring device according to the second embodiment.
FIG. 6 is a block diagram showing an example of a functional structure of the basal body temperature measuring device according to the third embodiment.

BEST MODE FOR CARRYING OUT THE INVENTION

(First Embodiment)

[0014] A first embodiment of the present invention will be described below with reference to the drawings. FIG. 1 is a block diagram showing an example of a functional structure of a basal body temperature measuring device according to the first embodiment. FIG. 2 is a view showing an example of an appearance structure of the basal body temperature measuring device according to the first embodiment.

[0015] A basal body temperature measuring device 10 according to the first embodiment is attached to a body of a user for a sleeping period to measure a basal body temperature. As shown in FIG. 2, a temperature sensor 11 is provided on a surface of a housing and the basal body temperature measuring device 10 is attached in such a manner that the temperature sensor 11 touches a body of a user. For example, the basal body temperature measuring device 10 is attached to measure a body temperature in such a manner that the temperature sensor 11 touches a breast or abdomen part of the user.

[0016] A belt 21 for fixing the basal body temperature measuring device 10 to a body is provided in such a manner that the basal body temperature measuring device 10 does not slip down from the body during sleeping. Although the belt 21 is used herein, a fixing method is not restricted thereto. For example, a tape or the like may be used to fix the basal body temperature measuring device 10 to the body.

[0017] As shown in FIG. 1, the basal body temperature measuring device 10 according to the first embodiment includes, as a functional structure thereof, the temperature sensor 11, a movement detecting sensor 12, an information recording unit 13, a storage medium 14, a basal body temperature specifying unit 15 and a second information recording unit 16. Function blocks of the information recording unit 13, the basal body temperature specifying unit 15 and the second information recording unit 16 can be configured from any of hardware, a DSP (Digital Signal Processor) and software.

[0018] For example, with a structure obtained by the software, each of the function blocks 13, 15 and 16 actually includes a CPU, an RAM, an ROM and the like in a computer and is implemented by an operation of a program stored in a storage medium such as an RAM, an ROM, a hard disk or a semiconductor memory. The storage medium for storing the program may be the same as the storage medium 14 or different therefrom.

[0019] The temperature sensor 11 measures a temperature of a body of a user during sleeping. The movement detecting sensor 12 detects a movement of the body of the user during sleeping. The movement detecting sensor 12 can be configured from an acceleration sensor as an example. When the body of the user is moved, the acceleration sensor detects an acceleration generated in the movement and outputs acceleration information.

[0020] The information recording unit 13 records, in the storage medium 14, body temperature information to be measured by the temperature sensor 11 in association with the movement information (acceleration information) to be detected by the movement detecting sensor 12. The storage medium 14 is a nonvolatile storage medium such as a hard disk or a semiconductor memory.

[0021] The association of body temperature information and movement information can be performed through a measuring time, for example. Specifically, the information recording unit 13 records, in the storage medium 14, the body temperature information and the movement information input from the temperature sensor 11 and the movement detecting sensor 12 respectively together with a time stamp at a predetermined time interval (for example, an interval of 30 seconds).

[0022] Information to be used for the association of the body temperature information and the movement information is not restricted to the time stamp. For example, it is also possible to use a simple identifier such as a serial number issued sequentially every predetermined time interval from start of the measurement in place of the time stamp.

[0023] The basal body temperature specifying unit 15 analyzes the movement information recorded in the storage medium 14 to detect a wake timing of the user and specifies body temperature information measured immediately before the wake timing as a basal body temperature.

[0024] FIG. 3 is a chart showing an example of processing of the basal body temperature specifying unit 15. FIG. 3 shows acceleration information obtained in use of the acceleration sensor as the movement detect-

ing sensor 12. For easy understanding as an image, acceleration information in time series obtained by the movement detecting sensor 12 is shown as a continuous waveform. However, the acceleration information is actually recorded, in the storage medium 14, as discrete data every 30 seconds.

[0025] For example, in the case in which the basal body temperature measuring device 10 is attached to the breast part of the user, acceleration information about a comparatively small amplitude is detected by the movement detecting sensor 12 in conformity with a breathing cycle through the movement of the breast part attendant on the breathing of the user and is recorded in the storage medium 14 through the information recording unit 13 (periods T1 and T3). The periods T1 and T3 are periods for which the user is sleeping at rest without moving user's body.

[0026] When the user turns over during sleeping, moreover, acceleration information about a comparatively great amplitude is detected by the movement detecting sensor 12 at that moment and is recorded in the storage medium 14 through the information recording unit 13 (the period T2). When the user wakes, furthermore, the acceleration information about a comparatively great amplitude is detected by the movement detecting sensor 12 for a long time and is recorded in the storage medium 14 through the information recording unit 13 (a period T4) .

[0027] The basal body temperature specifying unit 15 detects, as the wake timing of the user, a start timing of the period T4 for which the acceleration information about a comparatively great amplitude continues for a long time based on the acceleration information shown in FIG. 3 which is recorded in the storage medium 14. Then, the basal body temperature specifying unit 15 specifies, as a basal body temperature, body temperature information measured at a timing t immediately before the wake timing. In other words, the body temperature information recorded in the storage medium 14 in association with a time stamp at the timing t is specified as the basal body temperature of the user.

[0028] The timing t is a timing included in the period T3 for which the user is in a resting state. By specifying, as the basal body temperature, a body temperature recorded at the timing t, accordingly, it is possible to obtain an accurate basal body temperature measured in a resting state in which the user is sleeping.

[0029] The basal body temperature specifying unit 15 notifies the second information recording unit 16 of the specified basal body temperature of the user. The second information recording unit 16 records the basal body temperature given from the basal body temperature specifying unit 15 in the storage medium 14 in association with calendar information representing a measurement date. By measuring and recording the basal body temperature every day, it is possible to grasp a rhythm of a change in the basal body temperature.

[0030] The information recorded in the storage medium 14 (the body temperature information and the movement information, and the specified basal body temperature information) can be output to an external computer which is not shown and be thus utilized. Alternatively, it is also possible to provide a display in the basal body temperature measuring device 10 itself, thereby visualizing and displaying the information recorded in the storage medium 14 graphically.

[0031] As described above in detail, in the first embodiment, the body temperature information to be measured by the temperature sensor 11 for the sleeping period is recorded in the storage medium 14 in association with the movement information to be detected by the movement detecting sensor 12 for the same sleeping period and the movement information recorded in the storage medium 14 is then analyzed to detect the wake timing of the user, and the body temperature information measured immediately before the wake timing is specified as the basal body temperature.

[0032] According to the first embodiment having such a structure, the body temperature of the user can be measured in a resting state during sleeping and be recorded in the storage medium 14, and furthermore, the body temperature recorded immediately before the waking can be specified as the basal body temperature. Therefore, it is possible to obtain an accurate basal body temperature measured in the resting state brought immediately before the waking.

[0033] As described above, there is a possibility that the basal body temperature might be changed even if a little body movement is performed. For this reason, it is desirable to acquire, as the basal body temperature, a body temperature when the user is sleeping and his (her) body is not being moved. However, the basal body temperature is conventionally measured after waking. Therefore, the basal body temperature cannot be measured in a real sense. On the other hand, according to the first embodiment, it is possible to measure a true basal body temperature.

[0034] Although the basal body temperature measuring device 10 includes all of the temperature sensor 11, the movement detecting sensor 12, the information recording unit 13, the storage medium 14, the basal body temperature specifying unit 15 and the second information recording unit 16 in the embodiment, the present invention is not restricted thereto. For example, as shown in FIG. 4, it is also possible to employ a system structure in which a portable basal body temperature measuring device 10' includes the temperature sensor 11, the movement detecting sensor 12, the information recording unit 13 and the storage medium 14 and an external computer 20 to be connected to the basal body temperature measuring device 10' by wireless or wire includes the basal body temperature specifying unit 15, the second information recording unit 16 and a storage medium 41.

[0035] In this case, the basal body temperature measuring device 10' and the external computer 20 can be connected through a cable such as a USB (Universal Serial Bus) . Alternatively, both the basal body temper-

ature measuring device 10' and the external computer 20 may include wireless communicating means such as Bluetooth (registered trademark) or a wireless LAN to enable wireless transmission of the information recorded in the storage medium 14 from the basal body temperature measuring device 10' to the external computer 20. Alternatively, both the basal body temperature measuring device 10' and the external computer 20 may include internet connecting means to enable upload of the information recorded in the storage medium 14 from the basal body temperature measuring device 10' to a server device (not shown) on internet and download of the information from the server device by the external computer 20.

(Second Embodiment)

[0036] Next, a second embodiment of the present invention will be described with reference to the drawings. FIG. 5 is a block diagram showing an example of a functional structure of a basal body temperature measuring device 10A according to the second embodiment. In FIG. 5, since components having the same reference numerals as those shown in FIG. 1 have the same functions, repetitive description will be omitted. An appearance structure of the basal body temperature measuring device 10A is the same as that in FIG. 2.

[0037] As shown in FIG. 5, the basal body temperature measuring device 10A according to the second embodiment further includes a sleeping state deciding unit 51 as the functional structure. Moreover, an information recording unit 13A is provided in place of the information recording unit 13.

[0038] The sleeping state deciding unit 51 decides whether the user is in a REM sleeping state or non-REM sleeping state based on body temperature information to be measured by a temperature sensor 11. The REM sleeping represents a state in which a body is sleeping and a brain is waking, that is, a state in which sleeping is light. The non-REM sleep represents a state in which the brain is sleeping, that is, a state in which sleeping is deep.

[0039] It is known that the REM sleep and non-REM sleep and the body temperature have a correlation. In other words, when a human first falls asleep, the body temperature rapidly falls by approximately one degree and moves into the non-REM sleep to be a deep sleep. When approximately 90 minutes pass, thereafter, a transition to the REM sleep which is a light sleep is made. A rhythm of the non-REM sleep and the REM sleep is set to be a single sleeping cycle which is repeated four to five times in one night. A period for the REM sleep is short, that is, approximately 2 to 3 minutes in an initial sleep cycle and is increased every time the sleep cycle is repeated.

[0040] Also after the body temperature rapidly falls by approximately one degree immediately after falling asleep, the body temperature slightly rises or falls. In the movement into the non-REM sleep, a sweating function becomes active so that the body temperature falls . On the other hand, when the non-REM sleep is changed to the REM sleep, the body temperature rises. Accordingly, the sleeping state deciding unit 51 can decide whether a user is in the REM sleeping state or the non-REM sleeping state by monitoring whether the body temperature measured by the temperature sensor 11 is in a falling state or a rising state.

[0041] The information recording unit 13A starts to record the body temperature information and the movement information in the storage medium 14 when it is decided by the sleeping state deciding unit 51 that a transition from the non-REM sleeping state to the REM sleeping state has been made. In the case in which the user naturally wakes without using an alarm clock or the like, there is a high possibility that user might wake for a period of the REM sleep which is a light sleep. When the record into the storage medium 14 is started when the transition from the non-REM sleeping state to the REM sleeping state is detected, therefore, it is possible to measure and record a basal body temperature in a resting state immediately before waking without performing unnecessary record as much as possible.

[0042] Since the REM sleep occurs four to five times during sleeping in one night, the record into the storage medium 14 may be started when the transition to a fourth REM sleep is detected, for example. In consideration of how many sleeping cycles are included during a sleeping time scheduled by the user, alternatively, the user may designate the start of the record since an n-th (n is a desirable value of 1 to 5) REM sleep for the basal body temperature measuring device 10A. As another example, moreover, it is also possible to perform a recording operation into the storage medium 14 for each REM sleeping period and to prevent the recording operation from being performed for each non-REM sleeping period.

[0043] Although the description has been given to the example in which the REM sleeping state / non-REM sleeping state is decided based on the body temperature information to be measured by the temperature sensor 11 in the second embodiment, it is also possible to decide the REM sleeping state / non-REM sleeping state based on the movement information to be detected by the movement detecting sensor 12 in place of or in addition to the body temperature information.

[0044] As described above, the REM sleep represents a state in which the body is sleeping and the brain is waking. For this reason, the body is rarely moved during the REM sleep. On the other hand, the non-REM sleep represents a state in which the brain is sleeping, and a muscle supporting the body is being used so that turnover can be performed. Accordingly, the sleeping state deciding unit 51 can decide whether the user is in the REM sleeping state or the non-REM sleeping state by monitoring whether the movement of the body is detected by the movement detecting sensor 12.

[0045] Also in the second embodiment, in the same

manner as in FIG. 4, it is also possible to employ a system structure including a basal body temperature measuring device 10A' having a temperature sensor 11, a movement detecting sensor 12, an information recording unit 13A, a storage medium 14 and a sleeping state deciding unit 51, and an external computer 20 having a basal body temperature specifying unit 15, a second information recording unit 16 and a storage medium 41.

(Third Embodiment)

[0046] Next, a third embodiment of the present invention will be described with reference to the drawings. FIG. 6 is a block diagram showing an example of a functional structure of a basal body temperature measuring device 10B according to the third embodiment. In FIG. 6, since components having the same reference numerals as those shown in FIG. 1 have the same functions, repetitive description will be omitted. An appearance structure of the basal body temperature measuring device 10B is the same as that in FIG. 2.

[0047] As shown in FIG. 6, the basal body temperature measuring device 10B according to the third embodiment further includes a second sleeping state deciding unit 61 as a functional structure thereof. Moreover, a second information recording unit 16B is provided in place of the second information recording unit 16.

[0048] The second sleeping state deciding unit 61 decides whether a user has been in a REM sleeping state or a non-REM sleeping state in a measurement timing (a timing t in FIG. 3) of a basal body temperature specified by a basal body temperature specifying unit 15 based on at least one of body temperature information and movement information which are recorded in a storage medium 14. The deciding method is the same as described in the second embodiment. The second sleeping state deciding unit 61 notifies the second information recording unit 16B of the decided sleeping state.

[0049] The second information recording unit 16B records, in the storage medium 14, the basal body temperature specified by the basal body temperature specifying unit 15 together with information representing the sleeping state (either the REM sleeping state or the non-REM sleeping state) decided by the second sleeping state deciding unit 61.

[0050] As described above, in the case in which the user naturally wakes without using an alarm clock, there is a high possibility that the user might wake for a REM sleeping period in which sleeping is light. However, this does not always occur. By leaving, as record, whether the basal body temperature measured in the timing t is obtained during the REM sleep or the non-REM sleep, therefore, it is possible to grasp whether the recorded basal body temperature is a lower body temperature during the non-REM sleep or a higher body temperature during the REM sleep.

[0051] Also in the third embodiment, in the same manner as in FIG. 4, it is also possible to employ a system structure including a basal body temperature measuring device 10B' having a temperature sensor 11, a movement detecting sensor 12, an information recording unit 13 and a storage medium 14, and an external computer 20 having a basal body temperature specifying unit 15, a second information recording unit 16B, a storage medium 41 and a second sleeping state deciding unit 61.

[0052] Although the description has been given to the example in which the acceleration sensor is used as an example of the movement detecting sensor 12 and the wake timing of the user is detected based on the acceleration information shown in FIG. 3 in the first to third embodiments, the present invention is not restricted thereto. For example, it is also possible to use an angular velocity sensor (a gyro sensor) in place of or in addition to the acceleration sensor.

[0053] For example, in the case in which a posture of the user is detected by the gyro sensor, the posture is greatly changed when the user is lying down and sleeping and when he (she) is waking and standing up. For this reason, the basal body temperature specifying unit 15 can detect, as a wake timing, a time that the posture is greatly changed and can specify, as a basal body temperature, body temperature information measured immediately before the wake timing.

EXPLANATION OF DESIGNATION

[0054]

10, 10', 10A, 10B basal body temperature measuring device
11 temperature sensor
12 movement detecting sensor
13, 13A information recording unit
14 storage medium
15 basal body temperature specifying unit
16, 16B second information recording unit
20 external computer
51 sleeping state deciding unit
61 second sleeping state deciding unit

Claims

1. A basal body temperature measuring device (10, 10', 10A, 10B) for measuring a basal body temperature in attachment to a body of a user for a sleeping period, the device comprising:

   a temperature sensor (11) for measuring a temperature of the body;
   a movement detecting sensor (12) for detecting a movement of the body;
   an information recording unit (13, 13A) for recording, in a storage medium (14), body temperature information to be measured by the temperature sensor (11) in association with move-

ment information to be detected by the movement detecting sensor (12); and
a basal body temperature specifying unit (15) for analyzing the movement information recorded in the storage medium (14) configured to detect a waking time of the user, **characterized in that**
the basal body temperature specifying unit (15) is configured to specify, as the basal body temperature, body temperature information measured immediately before the waking time.

2. The basal body temperature measuring device according to claim 1,
further comprising a second information recording unit (16)for recording, in a storage medium (14), the basal body temperature specified by the basal body temperature specifying unit (15).

3. The basal body temperature measuring device according to claim 1,
further comprising a sleeping state deciding unit (51) configured to decide whether the user is in a REM sleeping state or a non-REM sleeping state based on at least one of the body temperature information to be measured by the temperature sensor (11) and the movement information to be detected by the movement detecting sensor (12),
the information recording unit (13A) being configured to start to record the body temperature information and the movement information into the storage medium (14) when it is decided by the sleeping state deciding unit (51) that a transition from the non-REM sleeping state to the REM sleeping state has been made.

4. The basal body temperature measuring device (10', 10B) according to claim 1,
further comprising a second sleeping state deciding unit (61) configured to decide whether the user has been in a REM sleeping state or a non-REM sleeping state in a measurement timing of the basal body temperature specified by the basal body temperature specifying unit (15) based on at least one of the body temperature information and the movement information which are recorded in the storage medium (14).

5. The basal body temperature measuring device according to claim 4,
further comprising a second information recording unit (16B) for recording, in a storage medium (14), the basal body temperature specified by the basal body temperature specifying unit (15) together with information representing a sleeping state decided by the second sleeping state deciding unit (61).

6. A basal body temperature measuring system including a portable basal body temperature measuring device (10') according to any one of the preceding claims, wherein the basal body temperature specifying unit (15) is provided in an external computer (20) to be connected to the basal body temperature measuring device (10') by wireless or wire.

7. A basal body temperature measuring system including a portable basal body temperature measuring device (10, 10A, 10B) according to any one of claims 1 to 5, wherein the temperature sensor (11), the movement detecting sensor (12), the storage medium (14), the information recording uit (13, 13A) and the basal body specifying unit (15) are provided in a portable basal body temperature measuring device (10, 10A, 10B).

Patentansprüche

1. Vorrichtung (10, 10', 10A, 10B) zur Messung der Basalkörpertemperatur zum Messen einer Basalkörpertemperatur durch Anheften an einen Körper eines Benutzers während einer Schlafperiode, wobei die Vorrichtung aufweist:

einen Temperatursensor (11) zum Messen einer Temperatur des Körpers;
einen Bewegungsermittlungssensor (12) zum Ermitteln einer Bewegung des Körpers;
eine Informationsaufzeichnungseinheit (13, 13A) zum Aufzeichnen auf einem Speichermedium (14) von Körpertemperaturinformationen, die durch den Temperatursensor (11) gemessen werden sollen, in Verbindung mit Bewegungsinformationen, die durch den Bewegungsermittlungssensor (12) ermittelt werden sollen; und
eine Einheit (15) zum Spezifizieren der Basalkörpertemperatur zum Analysieren von auf dem Speichermedium (14) aufgezeichneten Bewegungsinformationen, die konfiguriert ist, eine Aufwachzeit des Benutzers zu ermitteln, **dadurch gekennzeichnet, dass** die Einheit (15) zum Spezifizieren der Basalkörpertemperatur konfiguriert ist, als die Basalkörpertemperatur Körpertemperaturinformationen zu spezifizieren, die unmittelbar vor der Aufwachzeit gemessen werden.

2. Vorrichtung zur Messung der Basalkörpertemperatur nach Anspruch 1,
die ferner eine zweite Informationsaufzeichnungseinheit (16) zum Aufzeichnen auf einem Speichermedium (14) der durch die Einheit (15) zum Spezifizieren der Basalkörpertemperatur spezifizierten Basalkörpertemperatur aufweist.

3. Vorrichtung zur Messung der Basalkörpertempera-

tur nach Anspruch 1,
die ferner eine Schlafzustand-Entscheidungseinheit (51) aufweist, die konfiguriert ist, zu entscheiden, ob sich der Benutzer in einem REM-Schlafzustand oder einem Nicht-REM-Schlafzustand befindet, beruhend auf den Körpertemperaturinformationen, die durch den Temperatursensor (11) gemessen werden sollen, und/oder den Bewegungsinformationen, die durch den Bewegungsermittlungssensor (12) ermittelt werden sollen, wobei die Informationsaufzeichnungseinheit (13A) konfiguriert ist, die Aufzeichnung der Körpertemperaturinformationen und der Bewegungsinformationen auf dem Speichermedium (14) zu beginnen, wenn durch die Schlafzustand-Entscheidungseinheit (51) entschieden wird, dass ein Übergang vom Nicht-REM-Schlafzustand zum REM-Schlafzustand vorgenommen worden ist.

4. Vorrichtung zur Messung der Basalkörpertemperatur (10', 10B) nach Anspruch 1,
die ferner eine zweite Schlafzustand-Entscheidungseinheit (61) aufweist, die konfiguriert zu entscheiden, ob sich der Benutzer in einem REM-Schlafzustand oder einem Nicht-REM-Schlafzustand befunden hat, in einer Messzeit der durch die Einheit (15) zum Spezifizieren der Basalkörpertemperatur spezifizierten Basalkörpertemperatur, beruhend auf den Körpertemperaturinformationen und/oder den Bewegungsinformationen, die im Speichermedium (14) aufgezeichnet sind.

5. Vorrichtung zur Messung der Basalkörpertemperatur nach Anspruch 4,
die ferner eine zweite Informationsaufzeichnungseinheit (16B) zum Aufzeichnen auf einem Speichermedium (14) der durch die Einheit (15) zum Spezifizieren der Basalkörpertemperatur spezifizierten Basalkörpertemperatur zusammen mit Informationen aufweist, die einen Schlafzustand repräsentieren, der durch die zweite Schlafzustand-Entscheidungseinheit (61) entschieden wird.

6. System zur Messung der Basalkörpertemperatur, das eine tragbare Vorrichtung (10') zur Messung der Basalkörpertemperatur nach einem der vorhergehenden Ansprüche aufweist, wobei die Einheit (15) zum Spezifizieren der Basalkörpertemperatur in einem externen Computer (20) vorgesehen ist, der mit der Vorrichtung (10') zur Messung der Basalkörpertemperatur drahtlos oder drahtgebunden verbunden werden soll.

7. System zur Messung der Basalkörpertemperatur, das eine tragbare Vorrichtung (10, 10A, 10B) zur Messung der Basalkörpertemperatur nach einem der Ansprüche 1 bis 5 aufweist, wobei der Temperatursensor (11), der Bewegungsermittlungssensor (12), das Speichermedium (14), die Informationsaufzeichnungseinheit (13, 13A) und die Einheit (15) zum Spezifizieren der Basalkörpertemperatur in einer tragbaren Vorrichtung zur Messung der Basalkörpertemperatur (10, 10A, 10B) vorgesehen sind.

Revendications

1. Dispositif de mesure de température corporelle basale (10, 10', 10A, 10B) permettant de mesurer une température corporelle basale en liaison avec un corps d'un utilisateur pendant une période de sommeil, le dispositif comprenant :

un capteur de température (11) permettant de mesurer une température du corps ;
un capteur de détection de mouvement (12) permettant de détecter un mouvement du corps ;
une unité d'enregistrement d'informations (13, 13A) permettant d'enregistrer, dans un support de stockage (14), des informations de température corporelle destinée à être mesurée par le capteur de température (11) en association avec des informations de mouvement destiné à être détecté par le capteur de détection de mouvement (12) ; et
une unité d'identification de température corporelle basale (15) permettant d'analyser les informations de mouvement enregistrées dans le support de stockage (14) configurée pour détecter un temps de réveil de l'utilisateur,
caractérisé en ce que
l'unité d'identification de température corporelle basale (15) est configurée pour identifier, en tant que température corporelle basale, les informations de température corporelle mesurées immédiatement avant l'heure du réveil.

2. Dispositif de mesure de température corporelle basale selon la revendication 1,
comprenant en outre une deuxième unité d'enregistrement d'informations (16) permettant d'enregistrer, dans un support de stockage (14), la température corporelle basale identifiée par l'unité d'identification de température corporelle basale (15) .

3. Dispositif de mesure de température corporelle basale selon la revendication 1,
comprenant en outre une unité de décision d'état de sommeil (51) configurée pour décider si l'utilisateur se trouve dans un état de sommeil paradoxal ou dans un état de sommeil non paradoxal sur la base des informations de température corporelle destinée à être mesurée par le capteur de température (11) et/ou des informations de mouvement destiné à être détecté par le capteur de détection de mouvement (12),
l'unité d'enregistrement d'informations (13A) étant

configurée pour commencer à enregistrer les informations de température corporelle et les informations de mouvement dans le support de stockage (14) lorsqu'il est décidé par l'unité de décision d'état de sommeil (51) qu'une transition de l'état de sommeil non paradoxal à l'état de sommeil paradoxal a été faite.

4. Dispositif de mesure de température corporelle basale (10', 10B) selon la revendication 1, comprenant en outre une deuxième unité de décision d'état de sommeil (61) configurée pour décider si l'utilisateur a été dans un état de sommeil paradoxal ou un état de sommeil non paradoxal au cours d'un temps de mesure de la température corporelle basale identifiée par l'unité d'identification de température corporelle basale (15) sur la base des informations de température corporelle et/ou des informations de mouvement qui sont enregistrées dans le support de stockage (14).

5. Dispositif de mesure de température corporelle basale selon la revendication 4, comprenant en outre une deuxième unité d'enregistrement d'informations (16B) permettant d'enregistrer, dans un support de stockage (14), la température corporelle basale identifiée par l'unité d'identification de température corporelle basale (15) conjointement avec les informations représentant un état de sommeil décidé par la deuxième unité de décision d'état de sommeil (61).

6. Système de mesure de température corporelle basale comportant un dispositif de mesure de température corporelle basale (10') portatif selon l'une quelconque des revendications précédentes, dans lequel l'unité d'identification de température corporelle basale (15) est prévue dans un ordinateur externe (20) à connecter sans fil ou de manière filaire au dispositif de mesure de température corporelle basale (10').

7. Système de mesure de température corporelle basale comportant un dispositif de mesure de température corporelle basale (10, 10A, 10B) portatif selon l'une quelconque des revendications 1 à 5, dans lequel le capteur de température (11), le capteur de détection de mouvement (12), le support de stockage (14), l'unité d'enregistrement d'informations (13, 13A) et l'unité d'identification de température corporelle basale (15) sont prévus dans un dispositif de mesure de température corporelle basale (10, 10A, 10B) portatif.

Fig. 1

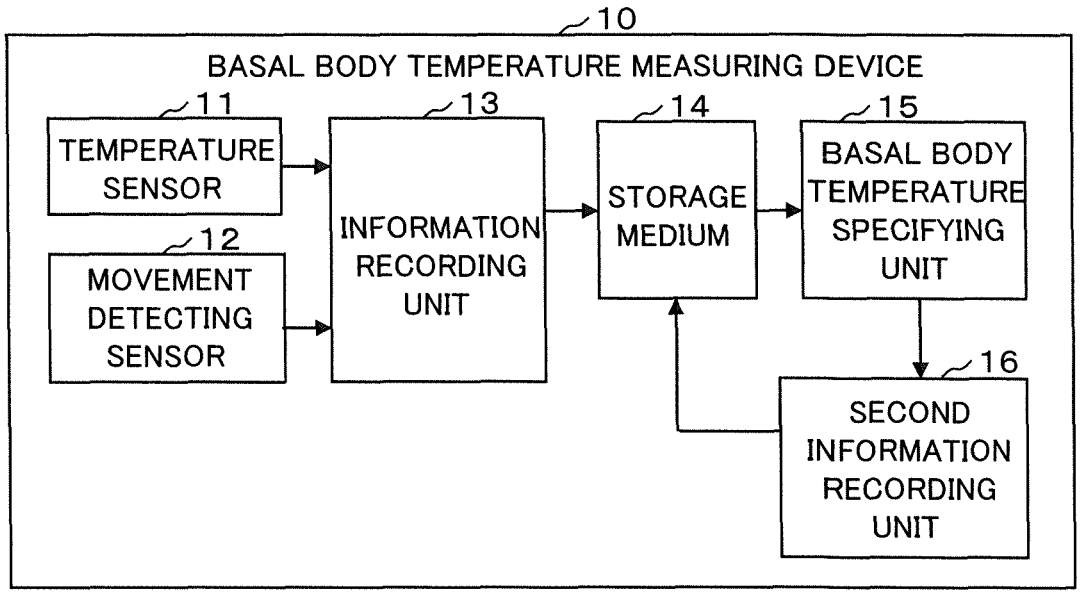

10
BASAL BODY TEMPERATURE MEASURING DEVICE
11
TEMPERATURE SENSOR
12
MOVEMENT DETECTING SENSOR
13
INFORMATION RECORDING UNIT
14
STORAGE MEDIUM
15
BASAL BODY TEMPERATURE SPECIFYING UNIT
16
SECOND INFORMATION RECORDING UNIT

Fig. 2

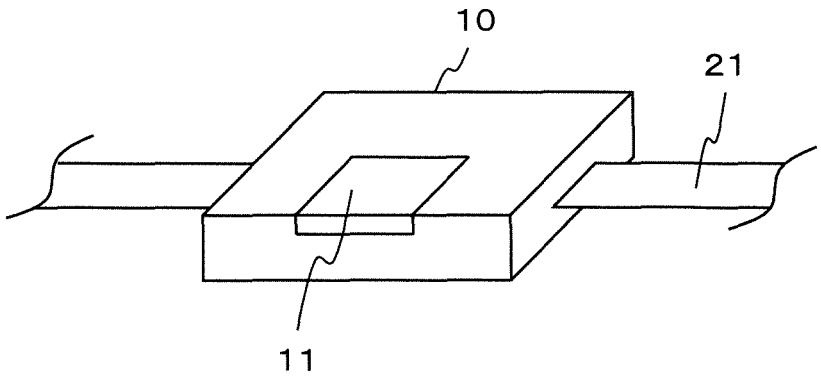

10
21
11

Fig. 3

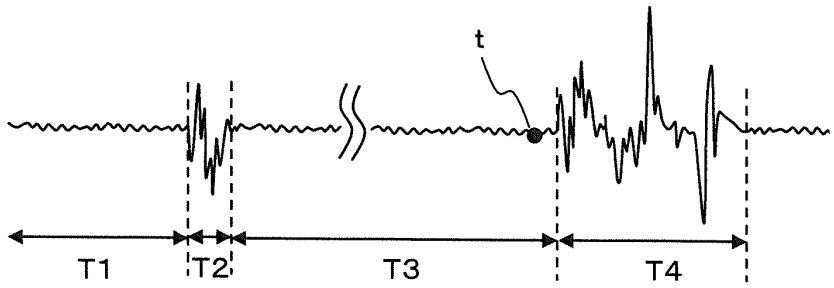

t
T1
T2
T3
T4

Fig. 4

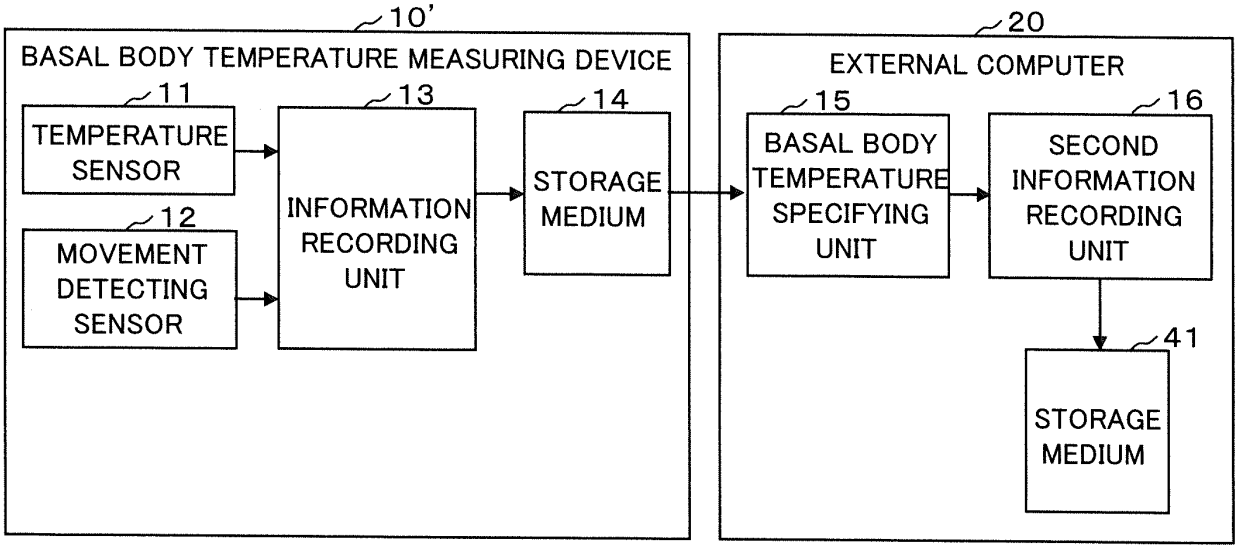

10'
BASAL BODY TEMPERATURE MEASURING DEVICE
11
TEMPERATURE SENSOR
12
MOVEMENT DETECTING SENSOR
13
INFORMATION RECORDING UNIT
14
STORAGE MEDIUM
20
EXTERNAL COMPUTER
15
BASAL BODY TEMPERATURE SPECIFYING UNIT
16
SECOND INFORMATION RECORDING UNIT
41
STORAGE MEDIUM

Fig. 5

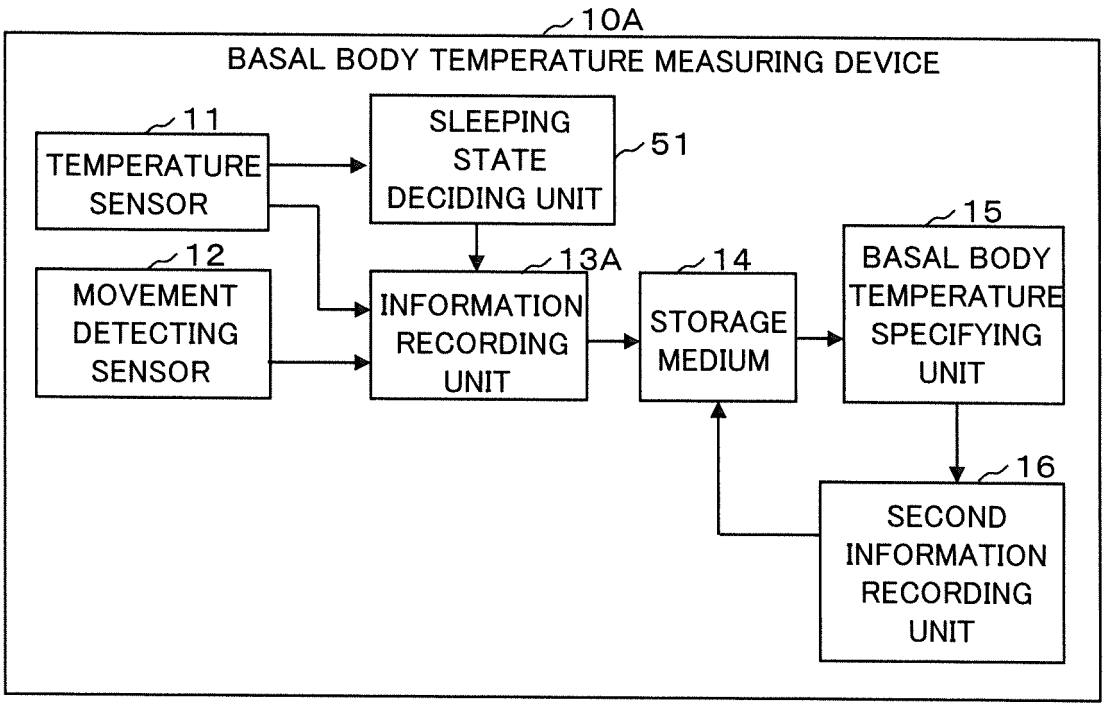
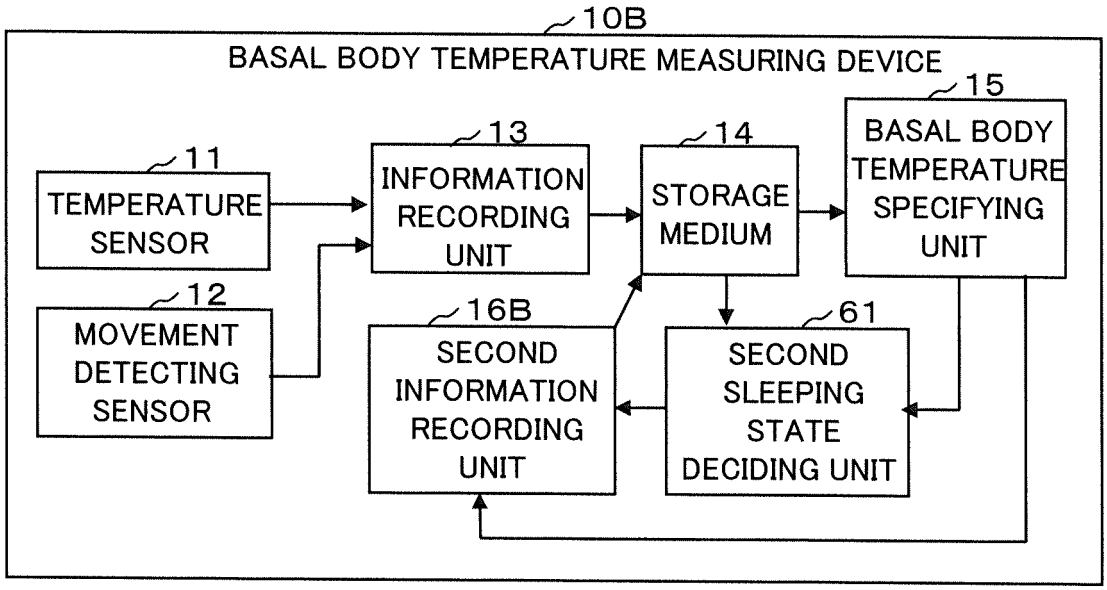

10A
BASAL BODY TEMPERATURE MEASURING DEVICE
11
TEMPERATURE SENSOR
12
MOVEMENT DETECTING SENSOR
SLEEPING STATE DECIDING UNIT
51
13A
INFORMATION RECORDING UNIT
14
STORAGE MEDIUM
15
BASAL BODY TEMPERATURE SPECIFYING UNIT
16
SECOND INFORMATION RECORDING UNIT

Fig. 6


10B
BASAL BODY TEMPERATURE MEASURING DEVICE
11
TEMPERATURE SENSOR
12
MOVEMENT DETECTING SENSOR
13
INFORMATION RECORDING UNIT
14
STORAGE MEDIUM
15
BASAL BODY TEMPERATURE SPECIFYING UNIT
16B
SECOND INFORMATION RECORDING UNIT
61
SECOND SLEEPING STATE DECIDING UNIT

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2012220287 A **[0005] [0008]**
- JP 2005164405 A **[0007] [0008]**
- CN 204636322 U **[0008]**
- JP 2014233585 A **[0008]**
- CN 105105719 A **[0008]**
- CN 103815878 A **[0008]**
- JP H1147136 A **[0008]**

专利名称(译)	基础体温测量系统和基础体温测量装置		
公开(公告)号	EP3242115B1	公开(公告)日	2018-09-12
申请号	EP2016800865	申请日	2016-03-22
申请(专利权)人(译)	E3 CO.，LTD.		
当前申请(专利权)人(译)	E3 CO.，LTD.		
[标]发明人	YAO BINGWEI		
发明人	YAO, BINGWEI		
IPC分类号	G01K7/00 A61B5/11 G01K13/00 A61B5/01 A61B5/00 A61B10/00		
其他公开文献	EP3242115A4 EP3242115A1		
外部链接	Espacenet		

摘要(译)

提供了一种信息记录单元13，用于在存储介质14中记录由温度传感器11测量的用于睡眠时段的体温信息，该温度信息与由移动检测传感器12检测的用于相同睡眠的移动信息相关联。基准体温度指定单元15，用于分析记录在存储介质14中的运动信息，以检测用户的唤醒定时，并指定紧接在唤醒定时之前测量的体温信息作为基础体温，以及用户的体温可以在睡眠期间以静止状态测量并因此记录在存储介质14中，此外，可以将在醒来之前记录的体温指定为基础体温。

Fig. 1

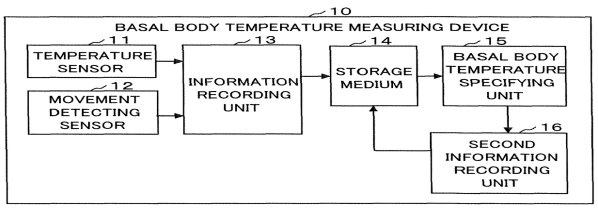


Fig. 2