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(71) Applicant *(for all designated States except DE, US):* **KONINKLIJKE PHILIPS ELECTRONICS N.V.** [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).

(71) Applicant *(for DE only):* **PHILIPS INTELLECTUAL PROPERTY & STANDARDS GMBH** [DE/DE]; Steindamm 94, 20099 Hamburg (DE).

(72) Inventors; and

(75) Inventors/Applicants *(for US only):* **YU, Donghai** [CN/CN]; Lane 888, Tian Lin Road, High tech compus, shanghai 200233 (CN). **PINTER, Robert** [AT/DE]; Weisshausstrasse 2, 52066 Aachen (DE). MULSTEFF, **Jens** [DE/DE]; Weisshausstrasse 2, 52066 Aachen (DE). **REITER, Harald** [DE/DE]; Weisshausstrasse 2, 52066 Aachen (DE). SPEKOWIUS, **Gerhard** [DE/CN]; Lane 888, Tian Lin Road, High tech compus, shanghai 200233 (CN). HABETHA, **Joerg** [DE/DE]; Weisshausstrasse 2, 52066 Aachen (DE).

(74) Agents: KROEZE, **John** et al; High Tech Campus 44, NL-5656 AE Eindhoven (NL).

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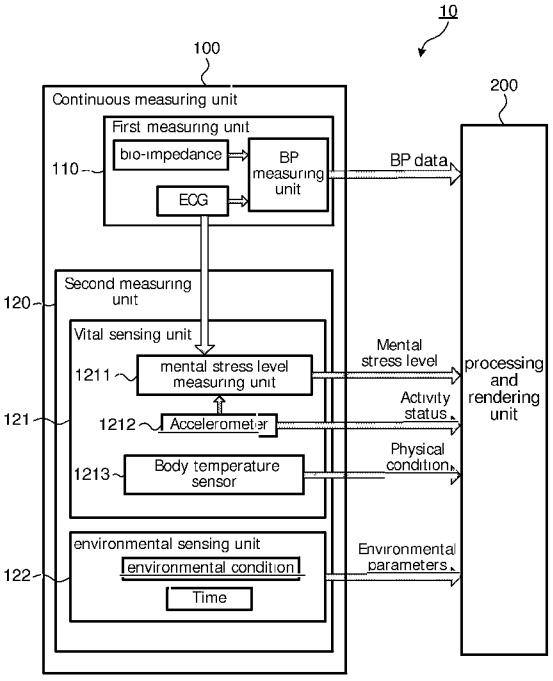

FIG. 3

(57) Abstract: The invention provides a device for and a method of BP monitoring, which is applicable for hypertension intervention treatment. The device provided in the present invention comprises: a first measuring unit (110) for measuring blood pressure (BP) data of a user,- a second measuring unit (120) for measuring at least one influencing parameter that possibly affects the BP data of the user; a processing unit (600) for generating feedback information, based on the measured BP data and the at least one measured influencing parameter, for managing the user's blood pressure. With the device and method provided by the invention, the user can not only be aware of his/her BP condition, but also instantly knows the factors that cause BP variations. Therefore, the device and method provided by the invention may help the user maintain a healthy lifestyle, thereby controlling or preventing hypertension.

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A METHOD AND APPARATUS FOR MONITORING BLOOD PRESSURE

Field of the Invention

The present invention relates to a device for and a method of monitoring blood pressure (BP), and more particularly to a portable device and a method enabling long-term continuous monitoring of a user's BP.

Background of the Invention

In recent times there has been a rapid increase in the number of people suffering from hypertension in each country. Currently, about 15%—37% of the adult population worldwide is afflicted by hypertension. Further, as regards people aged over 60 , as many as one-half of them are hypertensive in some areas of the world.

For hypertension patients, the increase of the blood pressure is very dangerous. If the BP is constantly over 140/90mmHg, the patient's organs, such as brain vessels, heart and eyes will be damaged to different degrees, and the increase of the BP also changes the patient's metabolism. The effects of hypertension are devastating. If left untreated, hypertension causes stroke, cardiac failure and other cardiovascular diseases that may cause mortality. However, many hypertension patients are normally not aware of the increase in their BP, which makes hypertension a very dangerous "silent killer" that is a threat to people's lives and health. Therefore, it is very important to monitor and control the patient's BP, that is, to conduct hypertension intervention treatment.

Hypertension intervention treatment mainly involves the following three aspects: A. making patients constantly aware and concerned about their BP conditions; B. making those patients who need pharmaceutical therapy follow the doctor's advice and stick to the prescription; C. encouraging patients to adopt a healthy lifestyle so as to prevent hypertension. Among these aspects, adopting a healthy lifestyle, e.g. giving up smoking, reducing salt intake, exercising appropriately etc., is generally considered a basic hypertension prevention measure necessary to all hypertension patients.

In hypertension intervention treatment, a BP monitoring device is one of the most common and important tools. A commonly used BP monitoring device is a cuff BP meter as

shown in Fig. 1. However, the cuff BP meter is of large volume and not easy to carry, which is not suitable for real-time monitoring of the patient's BP variation in daily life. In order to monitor the patient's BP in real time, cuffless/continuous BP meters have been developed. This kind of BP meter can obtain the user' s BP in real time through measuring Pulse Wave Velocity (PWV) or Pulse Arrival Time (PAT). Furthermore, Koninklijke Philips Electronics N.V. has successfully developed a continuous BP meter integrated in underwear by using functional textile and dry electrode technology. The continuous BP meter may be wearable for a long period of time and is suitable for monitoring and registering the user's BP data in real time.

However, the currently available cuff/cuffless BP meters only provide simple BP data or a high BP alarm to a user, which cannot help the user understand which factors cause BP variation. As a result, the user may ignore the displayed BP data, and thus the aim of the intervention treatment may not be met. Furthermore, human BP may change due to various factors. Thus, from the simple BP reading, the user can hardly see the effect of medicine and activity, especially the effectt of changing his lifestyle, which makes it difficult for the user to stick to the doctor's suggestion. Accordingly, the currently available BP meters cannot meet the requirement of hypertension intervention treatment.

Summary **of the Invention**

An object of the present invention is to provide a BP monitoring device and method suitable for hypertension intervention treatment.

Another object of the present invention is to provide a device and method that may guide a user to perform respiration exercises so as to reduce the BP.

According to an aspect of the invention, the invention provides a device for monitoring a user's blood pressure. The device comprises a first measuring unit for measuring blood pressure (BP) data of a user; a second measuring unit for measuring at least one influencing parameter that possibly affects the BP data of the user; a processing unit for generating feedback information, based on the measured BP data and the at least one measured influencing parameter, for managing the user's blood pressure.

According to another aspect of the invention, the invention provides a method for monitoring a user's blood pressure. The method comprises: measuring blood pressure (BP) data of a user; measuring at least one influencing parameter that possibly affects the user's BP;

generating feedback information based on the measured BP data and the at least one measured influencing parameter, for managing the user's BP.

These and other objects and advantages of the present invention will become apparent and easy to understand through the following description with reference to the drawings and the claims, resulting in a better understanding of the present invention.

Brief Description of the Drawings

The invention will be explained in detail by describing examples with reference to the accompanying drawings, where:

Fig. 1 is a schematic view of a cuff BP meter as known in the art;

Fig. 2 is a schematic view of a wearable continuous BP meter as known in the art;

Fig. 3 is a block diagram of a BP monitoring device according to an embodiment of the invention;

Fig. 4A is a schematic view of one embodiment of a first measuring unit shown in Fig. 3;

Fig. 4B is a schematic view of one embodiment of the sensors' setting in each measuring unit shown in Fig. 3;

Fig. 5 is a structural view of a processing and rendering unit in a BP monitoring device according to an embodiment of the present invention;

Fig. 6 illustrates a predefined table related to the activity status according to an embodiment of the present invention;

Fig. 7 illustrates a flow chart of an analysis procedure of influencing factors according to an embodiment of the present invention.

Throughout the drawings, same reference numerals indicate similar or corresponding features or functions.

Detailed Description of the Invention

Fig. 3 illustrates a block diagram of a BP monitoring device according to an embodiment of the present invention.

As shown in Fig. 3, the BP monitoring device 10 includes a continuous measuring unit 100 and a processing and rendering unit 200. The continuous measuring unit 100

continuously monitors a user's blood pressure (BP) through a first measuring unit 110. Meanwhile, the continuous measuring unit 100 continuously monitors, through a second measuring unit 120, influencing parameters that may affect the user's BP. For example, the influencing parameters may include the user's physical or mental condition (such as body temperature, activity status etc.) and the environmental condition around the user. The measured BP data and influencing parameters are then sent from the continuous measuring unit 100 to the processing and rendering unit 200 for further analysis, for example, analyzing which parameter causes the user's BP variation. Next, the processing and rendering unit 200 feeds back the analysis result and the BP data to the user for BP management and control. In this embodiment, feedback information for BP management may include BP data rendered in real time, potential factors that may cause BP variation and that are obtained by analyzing, and some guiding suggestions.

In the following, the detailed structure and operation of the above BP monitoring device proposed by the present invention will be described with reference to Figs. 3-7.

I. Continuous Measurement

As shown in Fig. 3, the continuous measuring unit 100 includes a first and second measuring unit. The first measuring unit 110 is adapted to measure the user's BP data. According to an embodiment of the present invention, the first measuring unit 110 may be a continuous BP meter, as shown in Fig. 2, the detailed structure of which is shown in Fig. 4A. In Fig. 4A, dry electrodes, which are integrated at certain positions in a boxer short, are used to sense bio-impedance signals at the main artery and the left and right femoralis. Meanwhile, an electrode at the belt is used to measure the user's ECG signals. Based on the R-R peak of the measured ECG signals and the time delay between the sensed bio-impedance signals, the PWV or PAT of pulse waves can be obtained, and thereby the user's BP data may be measured. A detailed description of the continuous BP meter of Fig. 2 is shown in patent application WO2007/052512.

However, those skilled in the art should appreciate that the first measuring unit 110 is not limited to the embodiment as shown in Fig. 4A. Instead, the first measuring unit 110 may be realized in various other ways. For example, the BP data may be obtained by combining ECG signals measured by an ECG sensor and PPG signals measured by a PPG sensor which is positioned at the end of one of a user's limbs, such as fingers and wrist. Alternatively, the user's BP data may be obtained by measuring the PWV or PAT with two PPG sensors or two

bio-impedance sensors at different parts of the user's body. In other words, various ways known to those skilled in the art may be used in the first measuring unit 110 of the present invention to measure the user's BP data.

The user's BP measured by the first measuring unit 110 may change due to various factors. For example, the user's BP may increase due to fever, stress, a quick run, humid weather etc. Furthermore, the user's BP may change periodically during a day even under normal conditions. Specifically, the BP appears to be "high during daytime and low at night", and especially, in the early morning after users wake up, the blood pressure may increase by 2 to 5 kPa within a few minutes. Therefore, besides real-time BP data, it is also necessary to measure and analyze various potential factors that may cause the user's BP variation, so that the user may take corresponding actions properly.

To this end, a second measuring unit 120 is also arranged in the continuous measuring unit 100 of the present invention. The second measuring unit 120 may include one or more sensing units for sensing parameters that may affect the user's BP. In the embodiment of Fig. 3, the second measuring unit 120 includes two sensing units, one of which is a vital measuring unit 121 for measuring the user's vital signals, the other is an environmental sensing unit 122 for measuring the environmental conditions around the user.

The vital measuring unit 121 may be used to measure at least a signal reflecting the user's vital status, for example, signals reflecting at least one of the user's activity status, physical condition and/or mental stress level. In the embodiment of the present invention, to fully analyze influencing factors on the user's BP, the vital sensing unit 121 of Fig. 3 includes an accelerometer 1212 for measuring the user's activity status, a measuring unit 1211 for measuring the user's mental stress level and a body temperature sensor 1213 for measuring the user's body temperature.

Specifically, as shown in Fig. 3, the vital sensing unit 121 may include one or more accelerometers 1212 for measuring the user's activity status. The accelerometer 1212 may be attached to a certain part of the limbs so as to sense the movement amplitude and determine for example whether the user is walking or jogging. Preferably, another accelerometer 1212 may be attached to the chest at the same time, so as to sense the movement of the user's chest and measure the respiration frequency. The respiration frequency and movement amplitude may be combined to further determine the user's activity status with high accuracy. In

addition, the respiration frequency may also be measured by sensing the bio-impedance, the change in ECG axis etc.

Furthermore, a unit 121 1 for estimating the user's mental stress level is also arranged in the vital sensing unit 121 as shown in Fig. 3. The unit 1211 may estimate the user's mental stress level according to the heart rate variability (HRV) of the user. For example, the smaller the HRV, the greater the mental stress is. The HRV of this embodiment may be simply obtained from the ECG signals sensed by the first measuring unit, although the HRV may also be sensed by using a separate ECG sensor. In order to have a more accurate estimation, the unit 1211 may further determine the user's mental stress level according to the synchronization level between the HRV and the respiration frequency determined by an accelerometer or other sensors (such as a bio-impedance sensor) (The details are shown in the patent application with Attorney docket No. CNPHI59444 , which is filed on the same day as the present application).

Further, the vital sensing unit 121 of Fig. 3 may also be provided with a sensor for measuring basic physical parameters of a user, for example, a sensor 1213 for measuring the body temperature. Of course, dependent upon the practical requirements, other physiological parameters may also be sensed.

In the embodiment of Fig. 3, the environmental factors that affect the user's BP are also considered in addition to the vital parameters that are directly related to the user's body. For this consideration, an environmental sensing unit 122 is arranged in the second measuring unit 120. The environmental sensing unit 122 is adapted to measure the environmental conditions around the user, and may include, for example, an ambient temperature sensor, a humidity sensor etc. Moreover, the environmental sensing unit 122 may further include a timer. The timer may determine the time of day, so as to let the user be aware of the BP variation during a day. Optionally, the timer may also be used to count how long the user remains in a certain state, for example, the user's jogging time.

In the above, some influencing parameters, which may be measured by the second measuring unit, are listed by way of example with reference to Fig. 3. In practical applications, the number and the type of the influencing parameters are not limited to the above. The measured influencing parameters may be any of the above parameters, and may also include other parameters. Moreover, the sensors of the second measuring unit and those of the first

measuring unit may be integrated together in a functional textile that the user may wear for a long time, such as underwear, a shirt, a belt and the like, as shown in Fig. 4B.

II. Processing and rendering

As shown in Fig. 3, the BP related data and values of various influencing parameters may be measured by the first and second measuring unit, and the measured data are then sent to the processing and rendering unit 200 for further analysis. Fig. 5 illustrates an exemplary structure diagram of the processing and rendering unit 200.

As shown in Fig. 5, the unit 200 comprises a processing unit 210, a memory 220, a rendering unit 230, and a user input interface 240 for receiving manual update information from the user. The processing unit 210 includes a calculation unit 211 and a determination unit 212, for processing and analyzing the measured data received from the continuous measuring unit 100. The rendering unit 230 includes a display unit 231 and an audio unit 232, for rendering the BP data, analysis results and/or any alerting information to the user in a visible and/or audible way. Here, the processing unit 210 and memory 220 may be integrated with the continuous measuring unit 100 into an integrated circuit within a functional textile (as shown in Fig. *X).* The rendering unit 230 and user input interface 240 may be separate components that are connected to the processing unit 210 in a wired or wireless way. Moreover, the processing and rendering unit 200 as a whole may be a separate device connected to the processing unit 210 in a wired or wireless way, such as a smart phone or PDA.

In the following, the operation procedure of the processing and rendering unit 200 will be described in detail with reference to Fig. 5.

First, the processing unit 210 of Fig. 5 may process the BP data received from the first measuring unit 110 in a way similar to that of conventional electronic BP meters. For example, the calculation unit 211 of the processing unit 210 may calculate BP variation and/or the rate of BP variation, according to the BP data received from the first measuring unit 100 and a predetermined BP baseline (ideal BP) pre-stored in the memory 220, so as to have them rendered to the user via the rendering unit 230. Optionally, the determination unit 212 of the processing unit 210 may further compare the calculated rate of BP variation with a predetermined threshold. If the calculated rate of BP variation is greater than the threshold, the rendering unit 230 gives an alert. The predetermined BP baseline, which is pre-stored in

the memory 220, may be updated manually by the user. For example, the user may manually input the BP baseline via the user input interface 230 according to the physical examination result.

In the embodiment of the present invention, in addition to providing BP data and an alert in a conventional way, the processing and rendering unit 220 may further analyze various factors that may cause BP variation, and feed back the analysis result to the user. The factors that may cause BP variation not only include known influencing parameters that have been measured by the second measuring unit 120, such as activity status, mental stress level and environmental factors, but also include unknown factors that may cause BP variation, such as medicine intake, diet change etc.

In the following, the analysis procedure of the influencing factors will be described according to an embodiment of the present invention with reference to Figs. 6 and 7.

In order to analyze the influencing factors, a table as shown in Fig. 6 is first pre-stored in the memory 220. The table contains a clinically determined correspondence relationship between each influencing parameter and an expected BP variation caused by the influencing parameter.

Referring to Fig. 6, there is exemplarily illustrated a table of BP variations under different activity statuses. As shown in the table of Fig. 6, the user's activity status (activity intensity) may be ranked into different levels. For example, walking is indicated as level 1, while jogging is indicated as level 2. For each level, there is an expected BP variation in the table. Preferably, the table of Fig. 6 may also include the duration (lasting time) of the user's activity. For example, walking for 5 minutes may increase the BP by 3 to 4 kPa, while walking for 15 minutes may increase the BP by 5 to 8 kPa.

In an actual analysis procedure, the processing unit 210 analyzes the factors that affect the BP, by using the BP variation calculated from the table of Fig. 6. Fig. 7 illustrates an exemplary analysis procedure.

As shown in Fig. 7, the calculation unit 211 of the processing unit 210 first obtains the influencing parameters measured by the second measuring unit 120 (Step S710). For example, the obtained influencing parameters include an activity of level 2 and a duration (lasting time) of 10 minutes. Next, the calculation unit 211 first searches the obtained activity level in the table of Fig. 6, and thereby obtains the corresponding expected BP variation, such as 5 to 7 kPa (Step S720). The calculation unit 211 then adds the obtained expected BP variation to the

initial value of S, i.e., the BP baseline of the user, thus acquiring an expected BP value S (Step S730). At this point, if it is determined that (Step S740) no other influencing parameters have changed, the calculation unit 211 may output the expected BP value S to the determination unit 212. The determination unit 212 compares the actual user's BP measured by the first measuring unit 210 with the expected BP value S acquired by the calculation unit 211. If the two values are the same or close to each other, then this shows that the increase in the user's BP is caused by the activity (e.g., jogging), and the analysis result is then rendered to the user via the rendering unit 230 (Step S750).

Alternatively, the calculation unit 211 may also acquire an expected rate of the BP variation, according to the expected BP variation and its duration (lasting time), as shown in the table of Fig. 6. The expected rate of BP variation may be output to the determination unit 212. At this point, if the determination unit 212 determines that the expected rate of BP variation exceeds a predefined threshold, the rendering unit 230 may remind the user that he should no longer continue the current activity (e.g., jogging), so as to prevent the BP from getting too high (Step S750).

In another embodiment of the present invention, in addition to the activity status, the BP variation caused by other influencing parameters, such as mental stress level, ambient temperature, time of day and the like, may also be recorded in tables similar to that of Fig. 6. For example, in the example of Fig. 7, if it is further measured in the second measuring unit that the humidity increases from 30% to 80%, then the calculation unit 211 determines (Step S740) that a further influencing parameter changes, and thereby the above steps S710 to S730 will be repeated. What is different is that: a table related to humidity is searched at step S720 with reference to the measured humidity, so as to obtain the expected BP variation related to the humidity of 80%. Next, at step S730, the expected BP variation caused by the humidity is added to the previously acquired expected BP value S, thereby obtaining the expected BP value considering both factors of activity status and humidity. Finally, the determination unit 212 compares the expected BP value and the actual user's BP value. If the two values are the same or close to each other, it is then determined that the user's BP variation is caused by the above two factors together (step S750).

Furthermore, preferably, if the determination unit 212 determines that the user's actual BP value is obviously higher or lower than the expected BP value, then this shows that there are other unknown factors that affect the user's BP, in addition to the measured influencing

parameters. For example, in another embodiment, if the calculation unit 211 computes an expected BP value of 130mmHg, while the first measuring unit measures that the user's actual BP value is lOOmmHg, then the determination unit 212 determines that there are other unknown factors which make the user's BP too low. In this case, the determination unit 212 reminds the user via the rendering unit 230 to check whether anti-hypertension medicine is inappropriately taken or the diet has changed etc. (step S750).

In the embodiment of Fig. 7, the table of Fig. 6 is used to analyze the influence that the measured influencing parameters exert on the user's BP variation. However, in a specific application, the table of Fig. 6 may be omitted to simplify the analysis procedure. For example, a threshold value may be predefined for an influencing parameter. When the processing unit finds that the measured influencing parameter, e.g., the mental stress level, has exceeded the threshold value, it may determine that the BP increase is caused by excessively high stress values, and the result is fed back to the user via the rendering unit.

Based on the above, the user may be instantly aware of the effect of such factors as activities, medicine, mental stress and/or diet change through the information fed back by the rendering unit 230. Having knowledge of these influencing factors, the user may be adequately motivated or reminded to adopt or stick to a healthy lifestyle, so as to treat or prevent hypertension.

Furthermore, according to an embodiment of the invention, the BP data measured by the continuous measuring unit 100 and the influencing factors analyzed by the processing unit may be saved together as a set of history data in the memory 220. The set of history data may be used for long-term tendency analysis. The tendency analysis result, which is obtained according to the set of history data, may be provided to a clinic doctor by the user, and will help the doctor to know the patient's BP variation characteristics. For example, the continuous feedback information provided by the BP monitoring device according to the invention may be used to perform 24-hour BP monitoring and/or 24-hour monitoring in personal medication conditions. Thus, the BP monitoring device proposed by the invention is not only beneficial for a user's self BP monitoring, but also helps the doctor make the right diagnosis.

III. Automatic update

In an embodiment of the present invention, the set of history data maintained in the BP monitoring device may also be used to automatically update the BP baseline and the predefined table of Fig. 6, both of which are stored in the memory. In one example, when all of the influencing factors remain the same or unchanged, the average of the BP values measured in the last four months may be used to update the user's BP baseline. In another example, with the same influencing parameters, if the measured BP variation for an activity of level 2 and a duration (lasting time) of 5 minutes is always 6 to 8kPa during the most recent period (e.g., three months), then the 5 to 7kPa in the table of Fig. 6 may be updated to 6 to 8kPa. In this way, the table of Fig. 6 may be automatically updated according to the user's personal characteristics. Tables for other influencing factors may be updated in the same way as above.

Furthermore, considering the fact that the BP variation is also related to the user's physical condition, such as weight and age, one or more correction values, which correspond to BP variations related to different weights and ages, may be pre-stored in the memory when the device is manufactured. When the user manually inputs his/her weight or age via the input interface 240, the processing unit may update the table of Fig. 6, based on the corresponding correction value.

Furthermore, the user may semi-automatically establish or update the table of Fig. 6 by manually inputting certain parameters and using the measured BP variation. For example, the user may manually input a humidity value via the input interface, as a result of which he obtains a BP variation measured by the BP monitoring device. The input humidity and the measured BP variation related thereto are then stored into the memory. In this way, a part of a humidity-related table is formed.

Since the BP monitoring device according to the invention has the above automatic update function, the device may provide personalized BP analysis according to an individual's physical property and set personalized alerting thresholds.

VI. BP reduction exercise guide

When the user's BP is too high, the BP monitoring device according to the invention may also provide a guide for BP reduction exercise to the user, in order to reduce the user's BP within a short period of time, or help the user to develop good habits and a better BP control .

For example, as shown in studies, regular breathing may be helpful in BP reduction. To this end, the processing unit 210 may customize a respiration exercise for the user, with a customized respiration frequency and exercise time, according to the currently measured status of the user, such as activity status, respiration frequency, HRV and BP data. Then, the rendering unit 230 may render to the user respiration guide information which is determined based on the customized respiration frequency. The guide information is shown, for example, through music, rhythm, audio commands or video indication (e.g. waveform). When the user follows the respiration guide instruction to do the respiration exercise, the rendering unit provides real-time BP variation to the user, such that the user may instantly see the effect of the respiration exercise, thereby helping the user to relax and feel relieved.

A detailed description of the embodiments of the present invention is given in the above with reference to the drawings. It should be noted that the above embodiments illustrate rather than limit the invention, and that those skilled in the art will be able to design many alternative embodiments without departing from the scope of the appended claims. Therefore, the scope of protection of the present invention is defined by the appended claims. Moreover, in the claims, any reference signs placed between parentheses shall not be construed as limiting the claim.

What is claimed is:

1. A device for monitoring user's blood pressure, comprising:

a first measuring unit for measuring blood pressure (BP) data of a user;

a second measuring unit for measuring at least one influencing parameter that possibly affects the BP data of the user;

a processing unit for generating feedback information, based on the measured BP data and the at least one measured influencing parameter, for managing the user's blood pressure.

2. The device of claim 1, wherein

the device further comprises: a memory for storing a correspondence relationship between the at least one influencing parameter and an expected BP variation that is caused by the at least one influencing parameter; and

the feedback information includes factors that affect the user's BP, wherein the factors are determined according to the measured BP data, the at least one measured influencing parameter and the correspondence relationship.

3. The device of claim 2, wherein the processing unit comprises:

a calculation unit for calculating the expected BP data of the user, based on the at least one measured influencing parameter and the correspondence relationship; and

a determination unit for determining the factors that affect the user's BP, by comparing the BP data measured by the first measuring unit and the expected BP data calculated by the calculation unit.

4. The device of claim 2, wherein the correspondence relationship is automatically updated, according to history data including the BP data measured by the first measuring unit and the at least one influencing parameter measured by the second measuring unit.

5. The device of claim 2, further comprising an input interface for receiving a user's input.

6. The device of claim 5, wherein the correspondence relationship is updated according to the user's input received via the input interface.

7. The device of claim 2, wherein the second measuring unit comprises:

a vital sensing unit for sensing physical and psychological parameters of the user; and/or

an environmental sensing unit for sensing environmental parameters.

8. The device of claim 7, wherein the vital sensing unit comprises at least one of an activity sensor, a body temperature sensor, a bio-impedance sensor, an ECG sensor, a PPG sensor and a measuring unit for measuring the user's mental stress level.

9. The device of claim 8, wherein the activity sensor includes at least one accelerometer.

10. The device of claim 8, wherein the mental stress level is determined at least according to signals sensed by the ECG sensor.

11. The device of claim 7, wherein the environmental sensing unit includes at least one of an ambient temperature sensor, a humidity sensor and a timer.

12. The device of claim 1, wherein the first measuring unit includes at least one of an ECG sensor, a PPG sensor and a bio-impedance sensor.

13. The device of claim 5, wherein the user's input includes any one of a user's body parameter, an environmental parameter and an age parameter.

14. The device of claim 2, further comprising a rendering unit for rendering the feedback information to the user.

15. The device of claim 14, wherein the rendering unit is further used to render to the user at least one of the following: BP data, mental stress level, activity condition, ambient temperature, humidity, time of the day.

16. The device of claim 14, wherein the rendering unit includes a display unit and/or an audio unit for rendering the feedback information to the user in a visible and/or audible way.

17. The device of claim 1, wherein the feedback information includes a respiration exercise guide for helping the user reduce the BP.

18. A method of monitoring a user's blood pressure, comprising:

measuring blood pressure (BP) data of a user;

measuring at least one influencing parameter that possibly affects the user's BP;

generating feedback information, based on the measured BP data and the at least one measured influencing parameter, for managing the user's BP.

19. The method of claim 18, wherein the generating step comprises:

pre-storing a correspondence relationship between the at least one influencing parameter and an expected BP variation caused by the at least one influencing parameter;

determining, by referring to the correspondence relationship, factors that affect the user's BP, according to the measured BP data and the at least one measured influencing parameter, and

wherein the feedback information comprises the determined factors that affect the user's BP.

20. The method of claim 19, wherein the determining step comprises:

obtaining an expected BP variation caused by the at least one measured influencing parameter, from the correspondence relationship according to the at least one measured influencing parameter;

determining the factors that affect the user's BP according to the expected BP variation and the measured BP data.

21. The method of claim 20, further comprising:

updating the correspondence relationship according to history data including the at least one measured influencing parameter and the measured BP data.

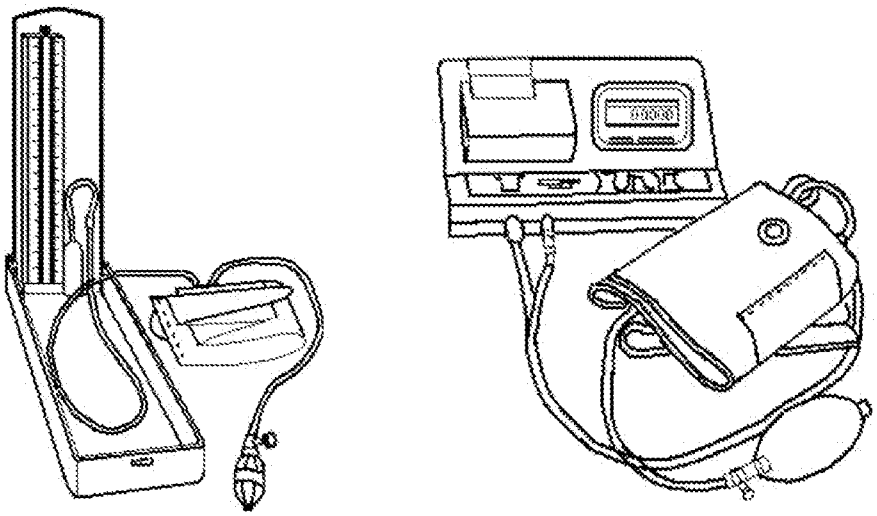

FIG. 1

FIG. 2

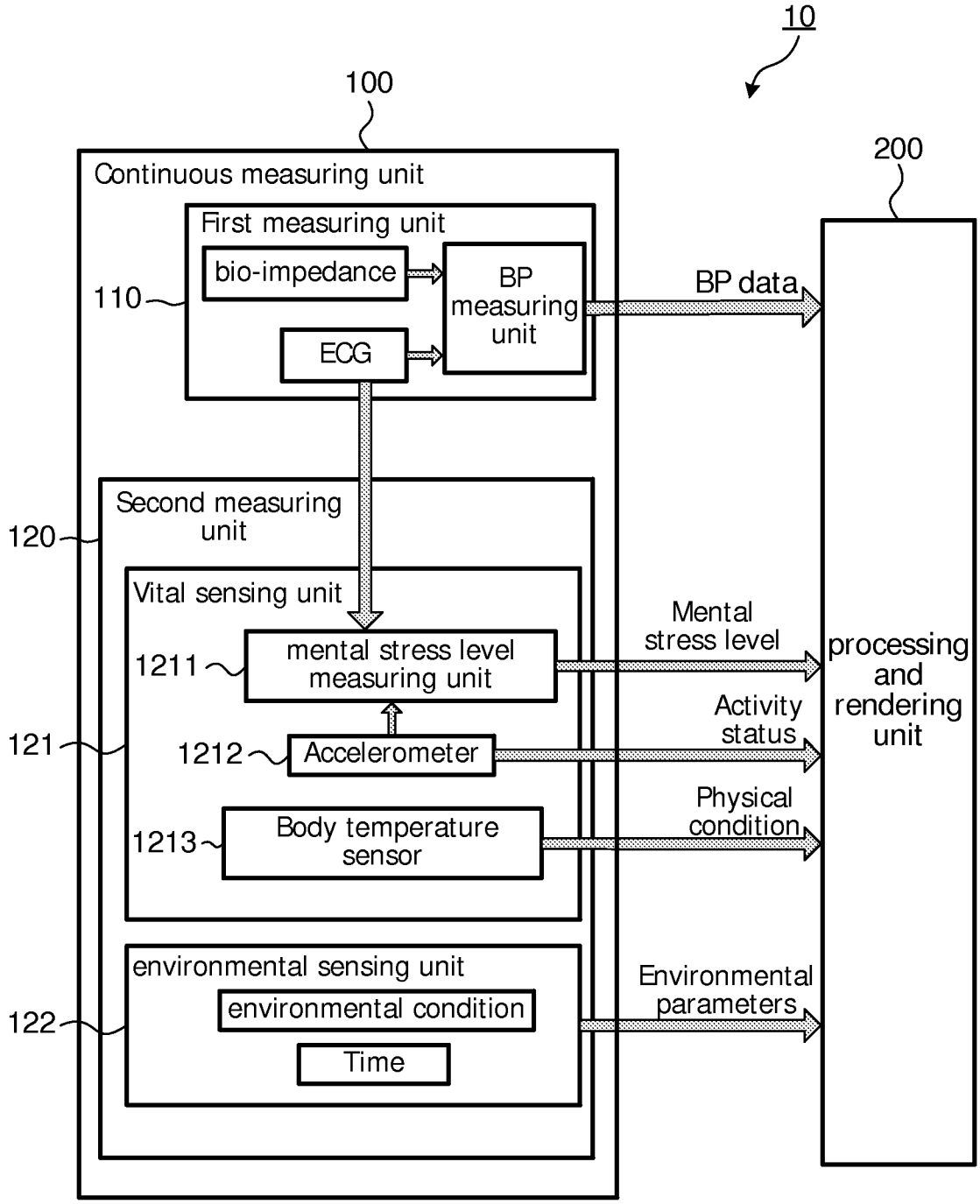
10
100
200
Continuous measuring unit
First measuring unit
bio-impedance
ECG
BP measuring unit
110
BP data
Second measuring unit
120
Vital sensing unit
1211
mental stress level measuring unit
Mental stress level
121
1212
Accelerometer
Activity status
1213
Body temperature sensor
Physical condition
processing and rendering unit
environmental sensing unit
environmental condition
Time
122
Environmental parameters

FIG. 3

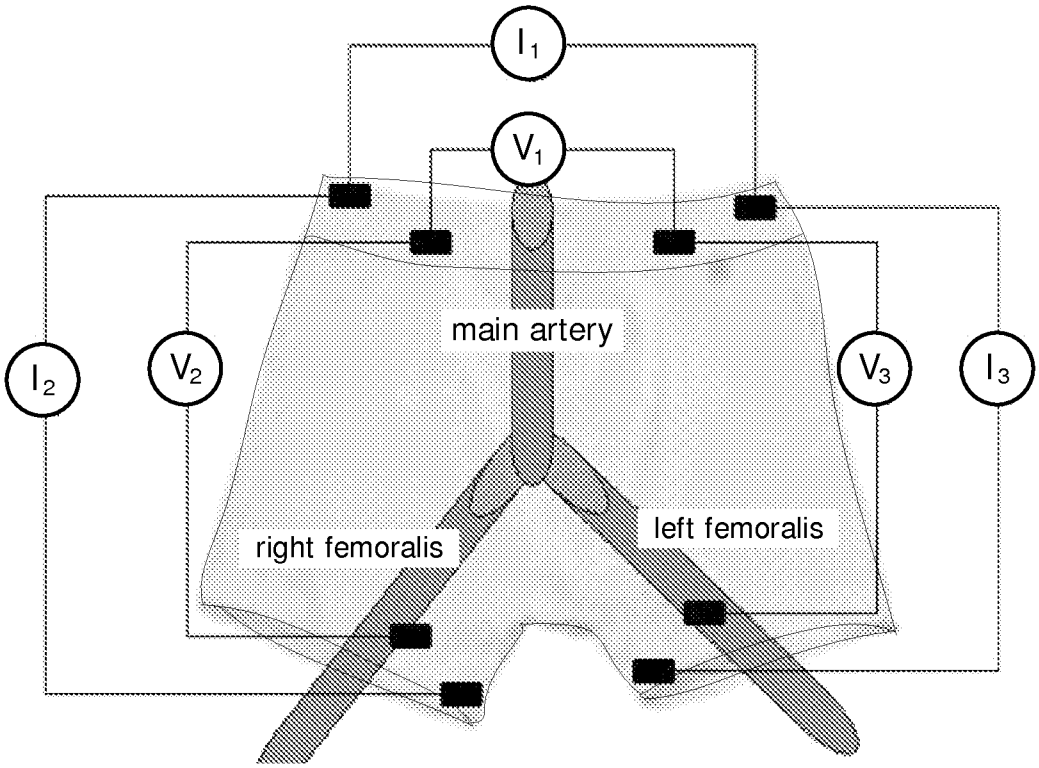

FIG. 4A

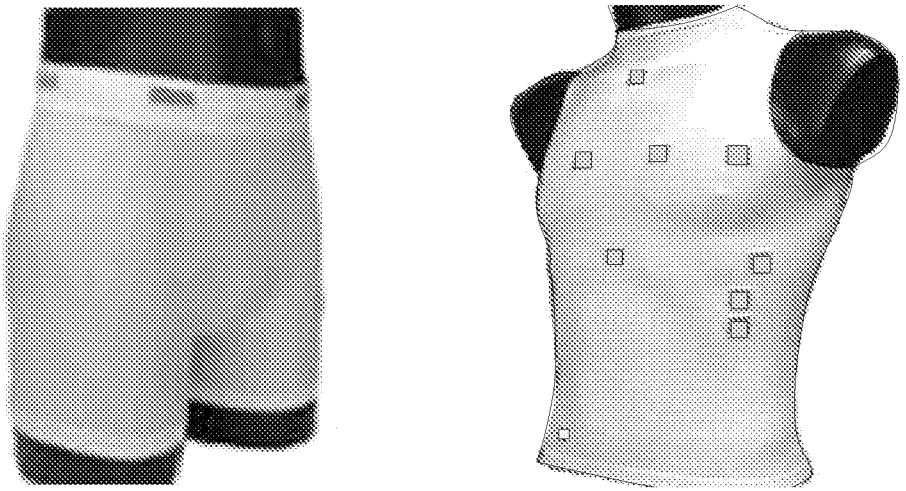

FIG. 4B

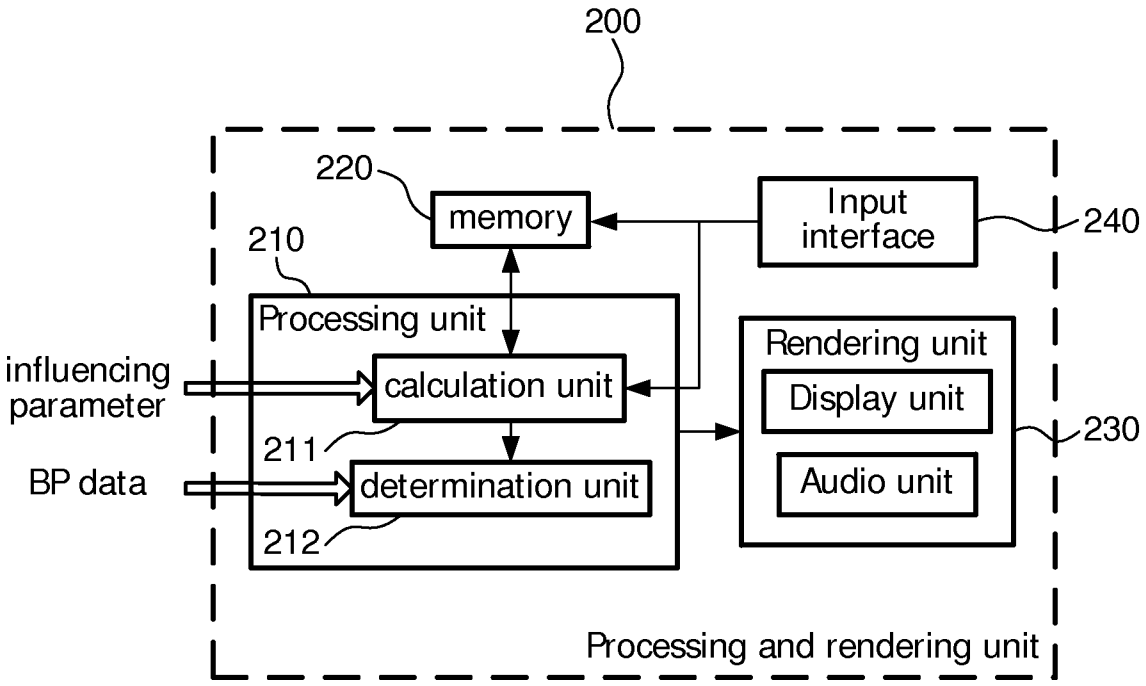

FIG. 5

Activity Status	Lasting time (min.)	Expected BP varation (kPa)
1	5	3-4
1	10	5-6
1	15	5-8
.....	.....	.....
2	5	4-5
2	10	5-7
2	15	6-9
.....	.....	.....

FIG. 6

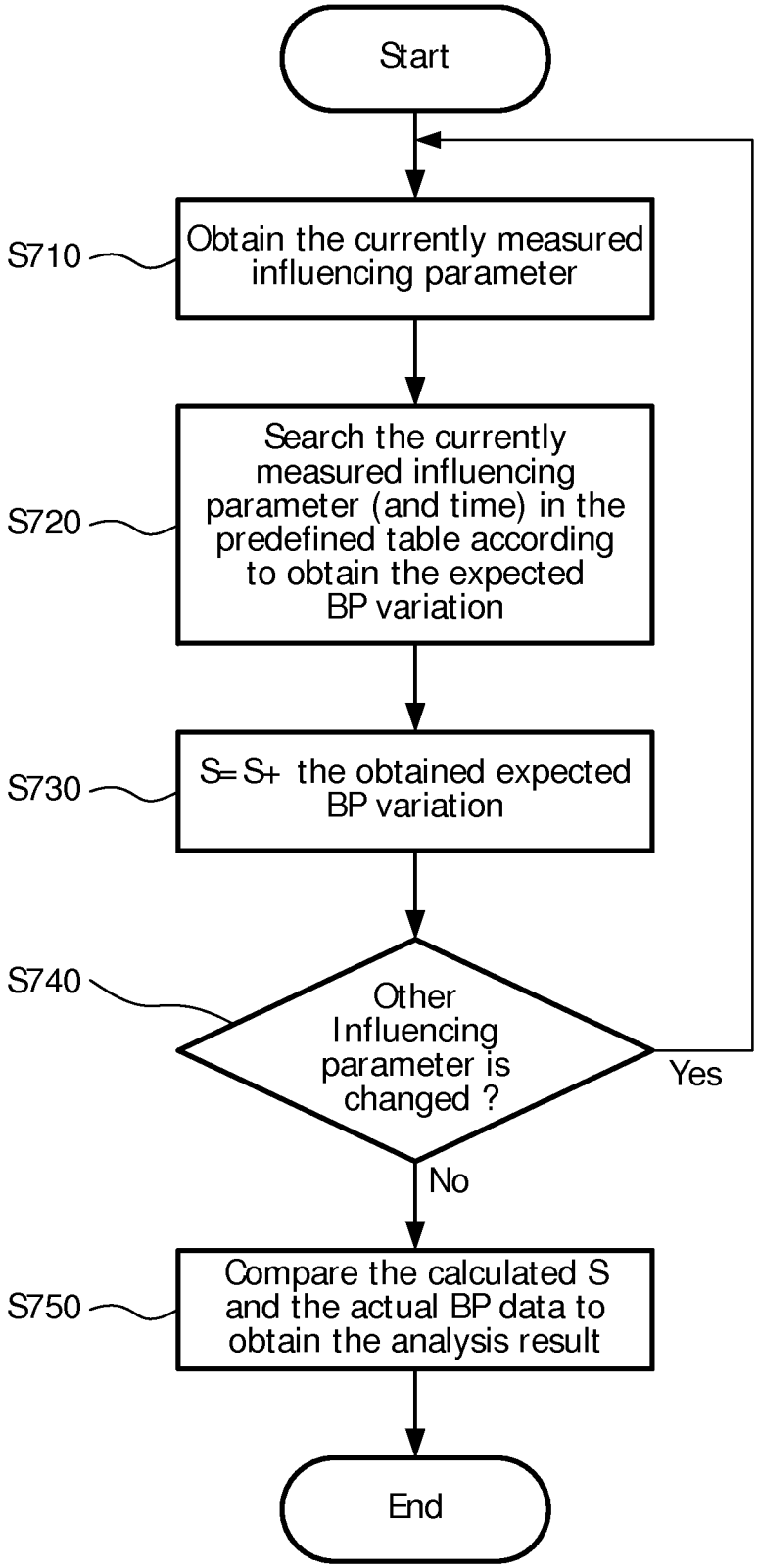
Start
S710
Obtain the currently measured influencing parameter
S720
Search the currently measured influencing parameter (and time) in the predefined table according to obtain the expected BP variation
S730
S= S+ the obtained expected BP variation
S740
Other Influencing parameter is changed ?
Yes
No
S750
Compare the calculated S and the actual BP data to obtain the analysis result
End

FIG. 7

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2009/051897

A. CLASSIRCATION OF SUBJECT MATTER
INV. A61B5/021 A61B5/11

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

B. RELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
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 practical, search terms used)

EPO-Internal , WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 2008/082001 Al (HATLESTAD JOHN D [US] ET AL) 3 April 2008 (2008-04-03) paragraphs [0012], [0015], [0022] figure 1	1-5,7-9, 18-21 10
X A	US 6 592 528 B2 (AMANO KAZUHIKO [JP]) 15 July 2003 (2003-07-15) column 20, line 18 - line 20 figures 1,20 column 13, line 8 - line 26 column 20, line 18 - line 20 column 22, lines 24-42 column 24, line 4 - line 23 column 23, line 1 - line 5 column 23, line 30 - line 35 column 10, line 59 - line 62	1,2,5-9, 11-17 3,4,10

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"O' document referring to an oral disclosure, use, exhibition or other means

[1]P* document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

'X' document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

'Y' document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such docu¬ments, such combination being obvious to a person skilled in the art

'&' document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 July 2009	13/08/2009

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswiik Tel (+31-70) 340-2040, Fax: (+31-70) 340-3016	De la Hera, German

Form PCT/ISA/210 (second sheet) (April 2005)

C(ConUnuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
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A	US 2008/081961 Al (WESTBROOK PHILIP R [US] ET AL) 3 April 2008 (2008-04-03) paragraph [0025]	12
A	WO 2006/050725 A (MEDICUS ENGINEERING APS [DK]; FLEISCHER JESPER [DK]; JENSEN MARTIN SNE) 18 May 2006 (2006-05-18) page 5, line 24 - line 25 figure 6	17

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2009/051897

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		WO 0170106 A1	27-09-2001
		JP 3951708 B2	01-08-2007
		US 2002072860 A1	13-06-2002
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