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- (71) Applicant (for all designated States except US): **MASSIVE HEALTH, INC.** [US/US]; 330 Townsend, Suite 207, San Francisco, CA 94107 (US).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **RASKIN, Aza** [US/US]; 49 Shipley, #8, San Francisco, CA 94107 (US). **KAMALANATHAN, Suthagar** [CA/US]; 451 Kansas St, Unit 390, San Francisco, CA 94107 (US).
- (74) Agent: **SCHOX, Jeffrey**; 500 3rd Street, Ste. 515, San Francisco, CA 94107 (US).
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(54) Title: HEALTH METER

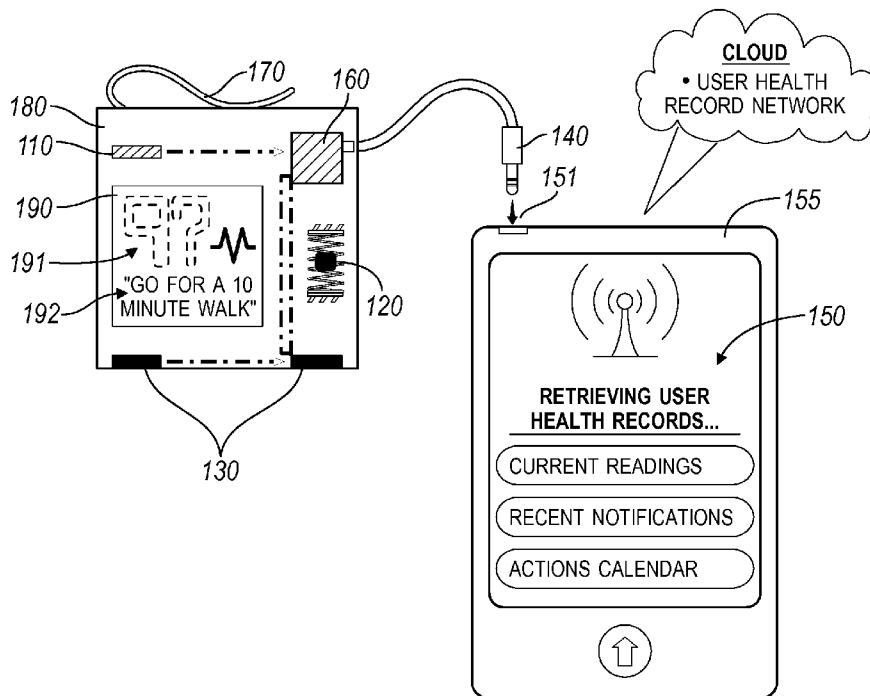


FIG. 1

(57) Abstract: One variation of a preferred health meter includes: a housing configured to be worn by a user; a glucose meter coupled to the housing; a pedometer coupled to the housing; a processor arranged within the housing and configured to generate a directive for a user action in response to a measured glucose level and an output of the pedometer; and a display arranged within the housing and configured to display the directive for the user.

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HEALTH METER

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application No. 61/509,075, filed 18 JUL 2011, U.S. Provisional Application No. 61/527,730, filed 26 AUG 2011, and U.S. Provisional Application No. 61/531,858, filed 07 SEP 2011, all of which are incorporated in their entirety by this reference.

TECHNICAL FIELD

[0002] This invention relates generally to the health care field, and more specifically to a new and useful health meter in the health care field.

BACKGROUND

[0003] Blood glucose meters are commonly used, particularly by individuals diagnosed with diabetes, to monitor glucose levels in the blood stream. Conventional blood glucose meters typically measure blood glucose levels in users and provide analyses of blood samples to users, but conventionally blood glucose meters fail to convey such information in valuable ways that are tailored to the needs of each user and that promote health improvements rather than just health maintenance. Thus, there is a need in the health care field for a new and useful health meter for testing the blood glucose level of a user.

BRIEF DESCRIPTION OF THE FIGURES

[0004] FIGURE 1 is a schematic representation of a health meter of a preferred embodiment;

[0005] FIGURE 2 is a schematic representation of a variation of the preferred health meter;

[0006] FIGURE 3 is a flowchart representation of one variation in accordance with the preferred health meter;

[0007] FIGURE 4 is a flowchart representation of one variation in accordance with the preferred health meter; and

[0008] FIGURE 5 is a schematic representation of a variation of the preferred health meter.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0009] The following description of the preferred embodiments of the invention is not intended to limit the invention to these preferred embodiments, but rather to enable any person skilled in the art to make and use this invention.

1. Health Meter

[0010] As shown in FIGURES 1 and 2, the health meter 100 of the preferred embodiment for providing a health-related notification to a user includes: a blood glucose meter 110 that generates an output based upon the level of glucose in the blood of the user; a pedometer 120 that detects a footstep taken by the user and generates an output based upon the detected footstep; a heart rate monitor 130 that detects the heart rate of the user and generates an output based upon the heart rate of the user; a data link 140 that conveys the output of at least one of the blood glucose meter 110, pedometer 120, and heart rate monitor 130 to a digital multimedia device 155; a software module 150 that evaluates the output of at least one of the blood glucose meter 110, pedometer 120, and heart rate monitor 130 and generates a health report of the user based upon the evaluation; and a processor 160 that accesses the health report and controls the conveyance of the health-related notification 192, based upon the health report, to the user. The preferred health meter 100 may further include a clip 170 and a housing 180. The preferred health meter 100 may also include a display 190 that renders a form of the health-related notification 192. Finally, the preferred health meter 100 may further include a data storage device that stores the health report such that the processor 160 may access the health report and convey the health-related notification 192 to the user when the data link 140 is not in communication with the digital multimedia device 155.

[0011] The preferred health meter 100 preferably captures current biological and/or physiological metrics of the user to enable generation of directives for the user to improve the current and/or long-term health of the user. The preferred health meter 100 preferably interfaces with a digital multimedia device 155, via the data link 140, to analyze user physiological data, to display the directive, and/or to track and maintain user physiological data over time. The digital multimedia device 155 is preferably a cellular phone, a smartphone, a tablet, a desktop computer, or a laptop computer, though the digital multimedia device 155 may be any other suitable external electronic device. The preferred health meter 100 may additionally or alternatively communicate with a remote server, such as through the digital multimedia device 155 connected via the data link 140, to enable these or any additional functions.

[0012] The blood glucose meter 110 of the preferred health meter 100 functions to analyze the blood of the user and to generate an output based upon the analysis of the blood. In a first example implementation, the blood glucose meter 110 includes a glucose test strip slot configured to receive a test strip, as shown in FIGURE 1. In this example implementation, the user may dispense a blood sample onto the glucose test strip, such as by pricking a finger to induce the finger to bleed, then swiping blood from the finger onto the glucose test strip. The user may then insert the glucose test strip into the glucose test strip slot of the blood glucose meter 110, at which point the blood glucose meter 110 analyzes the blood sample, determines the glucose level in the blood sample, and then generates the output. In another example implementation, as shown in FIGURE 2, the blood glucose meter includes a recess configured to receive a finger of the user and a spike configured to prick the finger. In this example implementation, the user may insert a finger into the recess, wherein the spike pierces the skin of the finger to obtain a blood sample. The blood glucose meter 110 may then analyze the blood sample. In this example implementation, the user may activate the spike, such as by engaging a button, switch, or lever. Alternatively, the processor 160 may activate the spike, such as by triggering a linear actuator or solenoid.

[0013] In another example implementation shown in FIGURE 2, the blood glucose meter 110 is a bloodless glucose meter. For example, the blood glucose meter

110 may be an infrared glucose meter including an optical emitter and an optical receiver and implementing near-infrared spectroscopy to estimate the level of glucose in the blood of the user, such as disclosed in U.S. Patent No. 7,310,542, issued 18 DEC 2007 and which is incorporated herein in its entirety by this reference. Alternatively, the blood glucose meter 110 may use acoustic waves to analyze the glucose level in the blood under the skin. In this example implementation, the blood glucose meter 110 preferably analyzes intracorporeal blood under the skin of the finger, though the blood glucose meter 100 may additionally or alternatively analyze intracorporeal or intravascular blood under the skin of the palm, forearm, neck, or any other part of the body of the user. In this example implementation, the blood glucose meter 100 preferably measures the glucose level of the user whenever the user contacts the blood glucose meter for any suitable period of time, such as when the user attaches the housing to an article of clothing. In a further example implementation, the blood glucose meter 110 includes a first element that is a glucose sensor placed substantially beneath the skin of the user and in communication with a second element that analyzes the blood sensed by the first element. The communication link between the first and second elements of this fourth example may be a wired connection or a wireless connection, such as a Bluetooth connection. In this fourth example implementation, the blood glucose meter 110 may be a continuous blood glucose meter that measures the glucose level in the blood of the user at specified intervals (i.e. every five minutes). However, the blood glucose meter 110 may access a blood sample by any other method and estimate the glucose level in the blood of the user in any other way.

[0014] The blood glucose meter 110 may be activated directly by any number of inputs or actions. For example, insertion of a glucose test strip into a test strip slot of the blood glucose meter 110 may initiate the process of analyzing the blood sample and generating the output based upon the glucose in the blood sample. In this example, the insertion of the blood glucose test strip (or any other step of acquiring a blood sample, such as the first and second examples above) may activate the blood glucose meter 110 and may further activate one or more other elements of the health meter, such as the data link 140 to transmit and/or receive data, the software module 150 to analyze the

output of the blood glucose meter 110, or the processor 160 to convey a message to the user. Alternatively, the blood glucose meter 110 may be a passive element or indirectly activated such that the function of the blood glucose meter 110 is initiated by another element of the preferred health meter 100, such as by the processor 160 when the processor 160 receives a notification from an digital multimedia device 155 (e.g., a computer executing a native health maintenance application) indicating that the user should take test blood glucose. In this example, the processor 160 may control the blood glucose meter 110 such that the processor 160 sends commands to the blood glucose meter 110 and receives data from the blood glucose meter 110 based upon those commands. The processor 160 may further analyze the data to generate the directive that is based upon the blood glucose level. The processor 160 may further transmit the directive to a digital multimedia device 155 when connected via the data link 140. The directive is preferably related to the glucose level in the blood of the user but may also be related to additional information such as white blood cell count or cholesterol level of the user, any of which may be input by the user, received from the digital multimedia device 155, or measured by an additional biological or physiological sensor. The blood glucose meter 110, however, may function in any other way and may be activated by any other device or element to measure glucose level in the blood of the user.

[0015] The pedometer 120 of the preferred health meter 100 preferably detects a footstep taken by the user and generates an output based upon the detected footsteps. In a first example implementation, the pedometer 120 includes an accelerometer, such as a mass-spring accelerometer, a piezoelectric accelerometer, a null-balance accelerometer, a shear mode accelerometer, or any other type of accelerometer, wherein the pedometer associates an output of the accelerometer with a footstep taken by the user. In a second example implementation, the pedometer includes a Global Positioning System (GPS) sensor, a near-field communication (NFC) tag, or any other type of sensor and/or communication device that communicates with an external electronic device or transmitter to detect user motion or change of user location. For example, the pedometer 120 may sense NFC tags arranged along a walkway and estimate, based upon the distance between a NFC tags, the number of step taken by the user as the user

traverses the walkway. Furthermore, the time taken by the user to pass from a first to a second NFC tag may be used to determine if the user is walking, jogging, or running. A demographic of the user (i.e. age, height, race, gender, etc., a combination thereof) may suggest an average step length of the user in this example implementation. In another example implementation, the pedometer 120 may interface with the digital multimedia device 155 to retrieve a signal from the digital multimedia device 155 and to determine a footstep taken by the user based upon the signal. The signal could include a location measurement, an accelerometer measurement, a distance calculation, or any other suitable measurement or calculation. The pedometer 120 preferably actively monitors for footsteps and may add the detected footstep to a log of footsteps taken by the user. Alternatively, the processor 160 and/or software module 150 may log or track user footsteps. Furthermore, the processor 160 and/or software module 150 may activate the pedometer 120 by indicating when the pedometer 120 should and should not monitor for footsteps. However, the pedometer 120 may function in any other way and include any other type of sensor.

[0016] The heart rate monitor 130 of the preferred health meter 100 functions to detect the heart rate of the user. The heart rate monitor 130 preferably includes two conductive pads (or electrodes) that contact the skin of the patient and sense electrical signals within the body that control heart function, as shown in FIGURES 1, 2, and 5. The electrodes of the heart rate monitor 130 are preferably integrated into opposing legs of the clip 170, but may alternatively be located on the housing 180. In one example implementation, a first conductive pad is arranged on a surface of the clip 170 and a second conductive pad is arranged on the housing 180 such that the heart rate monitor 130 measures the heart rate of a user when the user contacts the first and second conductive pads to arrange the clip 140 on an article of clothing or to remove the clip 140 from the article of clothing. In another example implementation, a first conductive pad is arranged on a first section of the clip 140 and a second conductive pad is arranged on a second section of the clip 140, wherein the data link 140 that extends from an end of the first section and the second section encases the data link 140 when the first and second sections are assembled. In this example implementation, the heart rate monitor

preferably measures the heart rate of a user when the user engages the clip to separate the first and second sections to access the data link 140. The heart rate monitor 130 may alternatively include an infrared or RF transmitter and receiver that implement infrared or acoustic energy to detect blood flow through blood vessels in a particular region of the body of the user. In another example implementation, the heart rate monitor 130 includes a microphone that detects the sound of a mechanical disturbance in the body of the user consistent with a heartbeat. The heart rate monitor 130 may be active and consistently monitoring for heart beats of the user, such as whenever the user touches the heart rate monitor 130. The heart rate monitor may alternatively be passive and attempt to measure user heart rate only when instructed by the processor 160 or initiated by the user.

[0017] The heart rate monitor preferably incorporates a timer such that the heart rate monitor 130 may determine the heart rate of the user based upon the elapsed time between two or more heartbeats or based upon the number of heartbeats in a given period of time. However, the heart rate monitor 130 may rather interface with another element of the health monitor that does include a timer, such as the processor 160, in order to calculate the user heart rate. The heart rate monitor 130, however, may function in any other way and may be activated by any other device or element.

[0018] The data link 140 of the preferred health meter 100 functions to transmit the output of at least one of the blood glucose meter 110, the pedometer 120, and the heart rate monitor 130 to the digital multimedia device 155, as shown in FIGURES 3 and 4. The data link 140 is preferably a wired connection, as shown in FIGURES 1 and 2, wherein the data link includes a wired jack connector (e.g., a 1/8" headphone jack) such that the preferred health meter 100 may communicate with the digital multimedia device 155 through an audio jack of the digital multimedia device 155. In one example implementation of the data link 140 that is a wired jack, the data link 140 is configured only to transmit data (or outputs) from the blood glucose meter 110, the pedometer 120, the heart rate monitor 130, the processor 160, etc. In another example implementation, the data link 140 is configured to transmit data to and from at least one element of the preferred health meter 100 and the digital multimedia device 155. In this example

implementation, the data link 140 may transmit data into the digital multimedia device 155 through the microphone input of the audio jack of the digital multimedia device 151 and may retrieve data from the audio output of the audio jack of the digital multimedia device 151. In this example implementation, the data link 140 may communicate with the digital multimedia device 155 via inter-integrated circuit communication (I2C), one-wire, master-slave, or any other suitable communication protocol. However, the data link 140 may transmit data in any other way and may include any other type of wired connection (such as a USB wired connection) that supports data transfer between the preferred health meter 100 and the digital multimedia device 155.

[0019] Alternatively, the data link 140 may be a wireless connection. For example, the data link 140 may include a Bluetooth module that interfaces with a second Bluetooth module included in the digital multimedia device, wherein data (e.g., sensor outputs) are transmitted from the preferred health meter 100 to the digital multimedia device over Bluetooth communications. The data link 140 may implement other types of wireless communications, such as 3G, 4G, radio, or Wi-Fi communication. In this example implementation, data is preferably encrypted before being transmitted by the data link 140. For example, cryptographic protocols such as Diffie–Hellman key exchange, Wireless Transport Layer Security (WTLS), or any other suitable type of protocol may be used. The data encryption may also comply with standards such as the Data Encryption Standard (DES), Triple Data Encryption Standard (3-DES), or Advanced Encryption Standard (AES).

[0020] The data link 140 that is a wired connection may further serve as a power and/or charging connector for the preferred health meter 100. The data link 140 may transmit the outputs of the blood glucose meter 110, the pedometer 120, and the heart rate monitor 130 directly from these components to the digital multimedia device, as shown in FIGURE 4. Alternatively and as shown in FIGURE 3, the outputs of the blood glucose meter 110, the pedometer 120, and the heart rate monitor 130 may first pass to the processor 160 (and be subsequently modified) and/or pass to the data storage module 200 before transmission by the data link 140. However, the data link 140 may

include any other type of connector or connection, function via any other method, and/or complete any other function.

[0021] The software module 150 of the preferred health meter 100 functions to evaluate the output of at least one of the blood glucose meter 110, the pedometer 120, and the heart rate monitor 130 and to generate a health report of the user based upon the evaluation. Preferably, the software module 150 evaluates at least one of the blood glucose level, motion or activity, and heart rate of the user in order to determine the current health risk of the user. For example, the software module 150 may determine that the blood sugar of the user is too low or less than ideal (hypoglycemia), which increases short-term risk of diabetic crash. The software module 150 may additionally or alternatively determine that the blood sugar level of the user is within a proper range but recent activity (e.g., running) and a high heart rate indicate that the blood sugar level of the user will drop within a predicted period of time, which also increases risk of diabetic crash. The software module 150 may additionally or alternatively determine that the blood sugar level of the user is too high (hyperglycemia) and is not associated with an appropriate level of user activity, which increases long-term risk of worsening diabetic condition. The software module 150 preferably incorporates at least one of user goals, user health condition, user demographic, previous user activity, and previous user compliance in evaluating health risk and generating the health report for the user. For example, if the user, such as in consultation with a doctor, sets a specific acceptable blood glucose level range which is entered into the software module 150, the software module 150 may not only include short-term risks like diabetic crash or long-term risks like worsening diabetic condition in the health report, but may also include risk of moving outside of the acceptable glucose level range defined by the user as a user goal. In another example, the software module 150 may determine the user to be in poor health, such as suffering from a second disease, and therefore increase the evaluated health risk of certain measured biosignals. For example, the software module 150 may note that the user has cancer or bronchitis and therefore associate a greater health risk for the user with a heart rate outside a narrower range of acceptable heart rates. Furthermore, the software module may notify a physician, hospital, paramedic, etc. if

the health risk of the user is substantially high or above a preset threshold. For example, the software module 150 may contact a 9-1-1 service, send an email to a physician, or alert a family member of the user via a SMS message. The software module 150 may additionally or alternatively generate a health report that includes any other health- and/or user-related information that may be useful in treating, maintaining, improving, or generating a diagnosis of the user.

[0022] As shown in FIGURE 1, the software module 150 is preferably an application (or 'app') that executes on the digital multimedia device 155. As described above, the digital multimedia device is preferably a smartphone but may also be a tablet, laptop computer, desktop computer, PDA, e-book reader, or any other digital multimedia device. The software module 150 preferably includes an interface that accepts inputs from the user, such as user goals, user health condition, user demographic, etc., and uses these inputs to evaluate the health risk of the user. The software module 150 also or alternatively accesses a remote network (or database) that contains health information (health records) of the user. The remote network may be a server associated with a hospital or a network of hospitals (such as where a primary care physician of the user is employed), a server associated with a health insurance agency or network of health insurance agencies (such as a health insurance company that insures the user), a server associated with a third party that manages health records, or any other user- or health-related server or entity. Physicians and/or staff associated with the health care of the user may add to, update, or otherwise modify the user health record on the remote network such that the software module 150 may access current user health information and evaluate appropriate risk levels based upon the user health information, biosignals, and/or physiological data. The software module 150 may further add the health report generated by the software module 150 to the user health records on the remote network. In the variation of the preferred health meter 100 in which the software module 150 retrieves and/or transmits user health data from and/or to the remote network, the data is preferably encrypted with cryptographic protocols such as those described above. Alternatively, the user, physician, and/or staff may add, update, or otherwise modify user health information from directly within the software

module 150, such as by entering information into a user interface displayed on a screen of the digital multimedia device 155 that couples to the preferred health meter 100 via the data link 140.

[0023] The software module 150 may also execute fully or in part on a remote server. For example, the software module 150 may be a cloud-computing-based application that performs data analysis, calculations, and other actions remotely from the digital multimedia device 155. In this example, the digital multimedia device 155 may receive an output of the preferred health meter 100 via the data link 140 and then transfer the output to the remote server upon which the software module 150 executes. The data are preferably transferred via a wireless connection, such as a 3G or 4G cellular connection or via a Wi-Fi internet connection. In this variation, the digital multimedia device 155 performs the primary function of transmitting data to and/or receiving data from the software module 150. The software module 155 may include a first software component that executes on the digital multimedia device 155, such as an app that manages the collection, transmission, retrieval, and/or display of data. The software module 150 may thus further include a second software component that executes on the remote server to retrieve the data, analyze the data, generate the health report, and/or manage the transmission of the health report back to the digital multimedia device 155, wherein the first software component manages retrieval of data sent from the second software component, transmits a form of the health report back to the preferred health meter 100 through the data link 140, and/or renders of a form of the health report on the display of the digital multimedia device 155 and or display 190 of the health meter 100. However, the software module 150 may include any number of software components that execute on any digital multimedia device 155, health meter, or server and that perform any other function or combination of functions.

[0024] The processor 160 of the preferred health meter 100 functions to access the health report and to control conveyance of the health-related notification 192 (e.g., directive) to the user. The health-related notification 192 is preferably based upon the health report generated by the software module 150. In one example implementation, the processor 160 receives the health report and generates the health-related

notification 192 based upon the health report. In this example implementation, a form of the health report is preferably transmitted from the digital multimedia device 155 to the processor 160 via the data link 140, wherein the digital multimedia device 155 accesses the health report either from the software module 150 executing on the digital multimedia device 155 or from the software module 150 executing on a remote server and in communication with the digital multimedia device 155. In another example implementation, the software module 150 generates both the health report and the health-related notification 192 based upon the health report. In this example implementation, the health-related notification 192 is preferably transmitted to the processor 160 via the data link 140. The processor 160 preferably controls conveyance of the health-related notification 192 to the user, such as by triggering the display 190 to depict the directive or notification, by triggering a display of the digital multimedia device 155 to display the directive or notification, or by generating and/or transmitting an email, SMS, voicemail, Facebook or Twitter message, or any other message accessible by the user and which contains the health-related notification 192. The processor 160 may also convey the health-related notification 192 by altering the state (i.e. ON or OFF) of one or more lamps (e.g. LEDs) that comprise the display 190. For example, each of a series of lamps may be labeled one of 'Eat', 'Walk', 'Run', 'Rest', 'Test', 'Medicate', etc., wherein the processor 160 toggles the state of each lamp to indicate which action the user should take to minimize health risk associated with at least one of the blood glucose level, heart rate, and activity of the user. However, the processor 160 may manage the conveyance of any other information and function in any other way.

[0025] The health-related notification 192 preferably contains information relevant to the health of the user and specifically to minimizing the health risk of the user based upon at least a portion of the health report, such as the blood glucose level, the heart rate, and/or the activity level of the user. The health-related notification 192 preferably includes an explicit directive for the user to perform a certain action, such as to eat, rest, or exercise. Therefore, the health-related notification 192 preferably systematically and repeatably analyzes a health condition of the user and provides medical consultation to manage and/or improve user health (or substantially minimize

user health risk) substantially in real time. For example, the health-related notification 192 may indicate that the user should eat, walk, run, rest, test, or medicate. The notification may further include information related to what or how much to eat, how much protein or carbohydrate to consume, where and how long to run, level of exertion, how to rest and for how long, when to test blood glucose level or heart rate, when to schedule a future test, what and how much medication to consume or inject, and/or any other relevant information. The health-related notification 192 is preferably displayed to the user through the preferred health meter 100, such as with a series of labeled idiot lights or on the display 190. Alternatively, the health-related notification may be provided to the user through an email, voicemail, SMS, calendar, Facebook, or Twitter message, or any other message. Furthermore, the health-related notification provided through the digital multimedia device 155 or any other external electronic device, such as a phone, smartphone, tablet, PDA, e-book, MP3 player, laptop computer, or desktop computer. In one example, the processor 160 generates the health-related notification 192 and the display 190 renders the health-related notification 192. The data link 140 then manages an SMS message (or other type of message) that is sent to a cellular phone number associated with the user. The data link 140 may additionally or alternatively add to or modify a calendar of the user to include the directive of the health-related notification 192, such as by adding an exercise event to an opening in the user's schedule.

[0026] The preferred health meter 100 may further include an alarm or buzzer that alerts the user when a new health-related notification 192 is available. Alternatively, the preferred health meter 100 may communicate with the digital multimedia device that includes an alarm or buzzer to notify the user that a new health-related notification 192 is available. However, the health-related notification 192 may include any other information and/or directive and may be conveyed to the user in any other way or combination of ways.

[0027] As shown in FIGURES 1 and 2, the preferred health meter 100 may further include a display 190 that functions to depict the health-related notification 192. The display is preferably an e-ink display that requires power substantially only when

changing rendered content. However, the display 190 may include any other type of digital display, such as an LCD display with a LED, PDP, OLED, or SED backlight, a segment display, or any other type of display. The display may render content, such as the health-related notification 192, the number of steps taken by the user, or the heart rate of the user in black and white, in color, or in any other form, and the display may update at specific time intervals (such as every minute or every hour) or in conjunction with certain events. Such events may include a user request for updated information, a new blood glucose test, a certain heart rate of the user, a sufficient period of user inactivity, completion of the health-related notification 192 and/or health report, or immediacy of a health-related event scheduled in the user's calendar of the user. The processor 160 preferably controls the display 190, though the display 190 may be controlled by any other component of the preferred health meter 100 and in any other way.

[0028] One variation of the preferred health meter 100 further includes a data storage module 200 that retains health-related data such as the health report, the health-related notification, results of one or more blood glucose tests, one or more heart rates of the user, footsteps taken by the user, and/or any other output of any other physiological and/or biological sensor incorporated into the preferred health meter 100. The data storage module 200 is preferably arranged within the housing 180 and is preferably coupled to processor such that data stored on the data storage module 200 remains accessible to the processor 160. Alternatively, the data storage module 200 may be integral with the digital multimedia device 155 or otherwise substantially remote from the processor 160, such as connected to the remote server or a remote network. Data generated by the blood glucose meter 110, the pedometer 120, the heart rate monitor 130, or any other element connected to the data storage module 200, are preferably stored on the data storage module 200 when the data link 140 is not in communication with the digital multimedia device 155. Furthermore, data are preferably transmitted to the digital multimedia device 155 when a communication link is established via the data link 140. However the data storage module 200 may store these or any other data.

[0029] Another variation of the preferred health meter 100 further includes a housing 180 that substantially encases at least one of the blood glucose meter 110, the pedometer 120, the heart rate monitor 130, the data link 140, the processor 150, the display 190, and the data storage module 200. Generally, the housing 180 is preferably of a clamshell configuration, including a front element and a back element that fasten together to form a vessel that contains one or more components of the preferred health meter 100. The housing 180 preferably manufactured from medical-grade materials such as antimicrobial plastics, 316L stainless steel, or medical-grade silicone rubbers. Alternatively, the housing 180 may be manufactured of non-medical-grade materials but include a medical-grade coating, such as overmolded medical-grade silicone rubber. The housing 180 is also preferably waterproof and dustproof, such as with an Ingress Protection rating of 25 or greater. Implementation of medical-grade materials, a dustproof housing, and/or a waterproof housing may promote longevity of the preferred health meter 100 by reducing susceptibility to damage by cleaning agents, bodily fluids, misuse, etc. However, the housing 180 may be of any other form and may encase any other element.

[0030] Yet another variation of the preferred health meter 100 further includes a clip 170 that couples the housing to an article of clothing worn by the user, such as a belt, belt loop, purse, pocket, armband, or any other article of clothing, accessory, or wearable article worn by the user. Furthermore, the clip 170 may couple the preferred health meter 100 to other features or items proximal the user, such as to a seat belt of a car driven by the user or to the digital multimedia device 155 that is a cellular phone carried by the user. However, the clip 170 may couple the preferred health meter 100 to any other suitable object. In the variation of the preferred health meter 100 in which the data link 140 includes a wired connection, the clip 170 is preferably physically coextensive with the data link 140, as shown in FIGURES 2 and 5. In one example implementation, the data link 140 includes a wired jack that is separable from (i.e. transiently or removably coupled to) the clip 170 such that the wired jack may be inserted into the digital multimedia device 155 to enable communication therebetween. In another example implementation shown in FIGURE 2 and 5, clip includes a first

section 170a and a second section 170b, wherein the data link 140 extends from the second section 170b and the first section 170a transiently couples to the second section 170b to encase the wired jack and is separable from the second section 170b to enable access to the data link 140. In the foregoing example implementation, the first section 170a of the clip 170 is preferably sprung (i.e. coupled to a spring) and the second section of the clip 170 that includes the data link 140 is preferably not sprung to permit substantially free manipulation of the data link 140, such as when the user plugs the data link 140 into a port of the digital multimedia device 155. Generally, the data link 140 preferably slides out of the first section 170a of the clip 170, thus freeing the second section to pivot and to enable access to the wired jack of the data link 140.

[0031] As shown in FIGURES 2 and 5, the clip 170 preferably defines a circular cross-section swept along a U-shaped profile. Alternatively, the clip 170 may be an alligator-, carabineer-, snap-, French barrette-, plunger-type, or any other type of clip. The clip 170 is preferably arranged on the housing 180, such as glued, bonded, or fastened with one or more screws. However, a portion of the clip 170 may also be physically coextensive with the housing 180. For example, the housing 180 may include features that include one side or section of the clip 170. The clip 170 is preferably sprung against the housing 180 such that the clip 170 retains the housing 180 on an article of clothing by pinching (e.g., biasing against) a portion of the article of clothing between the housing 180 and a portion of the clip 170. At least one side or section of the clip 170 may therefore be coupled to a return spring that provides a clamping force between (at least one section of) the clip 170 and the housing 180. However, the clip 170 and data link 140 may be of any other physically coextensive or distinct configuration, and the clip 170 may be arranged within or on the preferred health meter 100 in any other way.

[0032] One variation of the preferred health meter 100 shown in FIGURE 1 includes: a housing 180 configured to be worn by a user; a glucose meter 110 coupled to the housing 180; a pedometer 120 coupled to the housing 180; a processor 160 arranged within the housing 180 and configured to generate a directive for a user action in response to a measured glucose level and an output of the pedometer 120; and a display 190 arranged within the housing 180 and configured to display the directive for the user.

[0033] As shown in FIGURE 5, another variation of the preferred health meter 100 configured to be worn by a user includes: a physiological sensor 109; a clip 170 coupled to the physiological sensor and including a sprung loop configured bias against (or pinch) an article of clothing worn by the user to couple the physiological sensor to the article of clothing; and a data link 140 comprising a wired jack physically coextensive with the clip 170 and configured to transmit a form of an output of the physiological sensor. In this variation, the wired jack of the data link 140 preferably includes a stereo jack that communicates data to and from an external electronic device via inter-integrated circuit communication protocol. The physiological sensor 109 is preferably a blood glucose meter 110 that analyzes intracorporeal blood of the user (i.e. a bloodless blood glucose meter). However, the physiological sensor 109 may be a pedometer 120, a heart rate monitor 130, or any other type of biological sensor. The physiological sensor 109 preferably measures a biological status of the user at a specified interval and the data link 140 preferably transmits a form of a plurality of outputs of the physiological sensor 109 when coupled to an external electronic device. As shown in FIGURE 5, the clip 170 may further include a first section 170a and a second section 170b, wherein the first section 170a transiently couples to the second section 170b to encase the wired jack that extends from the second section 170b. For example, the second section 170b of the clip 170 may translate linearly relative the first section 170a such that the wired jack may be exposed. Furthermore, the first section 170a may be sprung against the housing 180 while the second section 170b is not sprung but rather pivotable relative the first section 170a when the datalink 140 is exposed.

[0034] As shown in FIGURE 5, a further variation of the preferred health meter 100 includes: a housing 180; a clip 170 arranged on the housing 180 and including a sprung loop configured to bias against a portion of a wearable article to couple the housing 180 to the wearable article; and a heart rate monitor 130 comprising a first conductive pad 121 and a second conductive pad 122 configured to engage an extremity of a user, wherein the first conductive pad 121 is arranged on a surface of the clip 170. In this variation, the wearable article is preferably a shirt, a pair of pants, a belt, a jacket, a vest, a coat, a glove, a shoe, a hat, an armband, or any other suitable article of clothing

or accessory. However, the wearable article may be any other suitable item, article, or object, such as a seatbelt or medical diagnostic equipment or instrumentation. The second conductive pad 122 may be arranged on the housing 180 such that the heart rate monitor 120 measures the heart rate of a user when the user contacts the first and second conductive pads 121, 122 while arranging the clip 170 on an article of clothing. As shown in FIGURE 5, the clip 170 may define a circular cross-section swept along a U-shaped profile, though the clip 170 may be of any other cross section or profile. Furthermore, the clip 170 may include a first section 170a and a second section 170b separable from the first section 170a, wherein the first section is preferably sprung against the housing, as shown in FIGURE 5. The first conductive pad 121 is preferably arranged on the first section 170a and the second conductive pad 122 is preferably arranged on the second section 170b of the clip 170. The preferred health meter 100 may further include a data link 140 including a wired jack extending from the second section 170b, wherein the data link 140 transmits a form of an output of the heart rate monitor 120. The first section 170a of the clip 170 may also be removably coupled to the second section 170b to encase the data link 140, as described above. This variation of the preferred health meter 100 may further include a switch that triggers the heart rate monitor to measure the heart rate of a user when the user moves the second section 170b of the clip 170 relative to the first section 170a, such as to clip the preferred health meter 100 to the wearable article or to remove the preferred health meter 100 from the wearable article. In this and the foregoing variations in which the physiological sensor 109 and/or heart rate monitor 120 includes one or more conductive pads arranged on the clip 170, the clip is preferably electrically non-conductive such that the first and second conductive pads 121, 122 are electrically isolated via the clip 170. For example, the clip 170 may be nylon, polyethylene, ABS, or any other suitable type or polymer or plastic. However, the preferred health meter 100 can be of any other form or configuration and can function in any other way.

2. Example Implementations

[0035] In a first example implementation of the preferred health meter 100, the preferred health meter 100 includes a housing 180 that substantially encapsulates the blood glucose meter 110, the pedometer 120, and the processor 160; the clip 170, the heart rate monitor 130, and the display 190 are arranged on the housing 180. The blood glucose meter 110 includes a test strip slot into which the user inserts a blood sample on a glucose test strip. The pedometer 120 is a two-axis accelerometer and the heart rate monitor 130 includes two conductive pads, each arranged on separate sections of the clip 170. The data link 140 is a wired connection comprising 1/8" headphone jack connector and is physically coextensive with the clip 170 such that the data link 140 may separate from a portion of the clip 170 to enable insertion into a portion of the digital multimedia device 155. The digital multimedia device 155 is a smartphone with a 1/8" headphone jack 151 and the software module 150 is an application configured to execute on the smartphone. The software module 150: receives data from the blood glucose meter 110, the pedometer 120 and heart rate monitor 130 through the data link 140; assesses the data in conjunction with user goals, user health condition, user demographic, previous user activity, and previous user compliance to generate the health report; dispatches the health report to a remote network configured to store the health record of the patient and wherein the health record of the patient is available to a primary-care physician of the user; transmits the health report to the processor 160 via the data link 140; and/or modifies a calendar of the user on the smartphone to reflect explicit directives relevant to the health of the user (such as scheduling a walk). The processor 160 accesses the health report; generates the health-related notification 152 or directive, and renders the health-related notification 152 on the display 190.

[0036] In a second example implementation of the preferred health meter 100, the housing 180 encapsulates the blood glucose meter 110 and the data link 140 and is implanted into the body of the user such that the data link transmits the glucose level of the blood, as measured by the implanted blood glucose meter 110, to the digital multimedia device. The data link 140 includes a low-power, short-range wireless communication module that transmits and receives data to and from the digital multimedia device 155 that is a smartphone. The heart rate monitor 130 is a microphone

arranged on the smartphone and senses the heart rate of the user when the user places a finger over the microphone. The pedometer 120 is an accelerometer arranged within the smartphone and detects motion of the smartphone carried by the user. The software module 150 is a cloud-based application operating on a remote server that: receives data from the blood glucose meter 110, the pedometer 120 and heart rate monitor 130 through a wireless connection established with server by the smartphone; assesses the data in conjunction with user goals, user health condition, user demographic, previous user activity, and previous user compliance to generate the health report; stores the health report on a remote network configured to store the health record of the patient and wherein the health record of the patient is available to a primary-care physician of the user; and dispatches the health report to the smartphone via the wireless connection with the smartphone. The processor 160 is arranged within the smartphone and receives the health report from the software module 150 and renders a form of the health report (such as compliance with set user goals) on the display 190 integral with the smartphone. The processor 160 further suggests specific directives to the user, such as to go for a run with a second user substantially proximal the user and who has substantially similar health-related goals and has a substantially similar recent health report as the user.

[0037] In a third example implementation, the preferred health meter 100 functions much as the first example implementation above, but in place of (or in addition to) a blood glucose meter 110, the preferred health meter 100 includes elements of a polysomnography test kit, such as an lung airflow sensor, an eye movement sensor, and a chest wall movement meter, wherein the polysomnography sensors detect sleep patterns of the user. Data collected by the polysomnography sensors are preferably transmitted to the digital multimedia device 155 via the data link 140 and then accessed by the software module 150. The software module 150 uses the data to detect sleep apnea in the patient and to generate a health report incorporating a diagnosis thereof. The health report is then used to provide directives to the user for improving sleep, and the processor 160 manages generation and distribution of the directives to alter and improve the user sleep, such as to change the position of an

adjustable bed in which the user sleeps, to increase the level of white noise proximal to the user at night, or to increase oxygen flow through a face mask worn by the user.

[0038] In a fourth example implementation, the preferred health meter 100 functions much as the second example implementation above, aside from the housing 180 that encapsulates the blood glucose meter 110 and data link 140, wherein the data link 140 is a proprietary connector configured to plug into a data port of a digital multimedia device 155 that is a smartphone, and wherein the blood glucose meter 110 is a bloodless glucose meter.

[0039] As a person skilled in the art will recognize from the previous detailed description and from the figures and claims, modifications and changes can be made to the preferred embodiments of the invention without departing from the scope of this invention as defined in the following claims.

CLAIMS

We Claim:

1. A health meter comprising:
 - a housing configured to be worn by a user;
 - a glucose meter coupled to the housing;
 - a pedometer coupled to the housing;
 - a processor arranged within the housing and configured to generate a directive for a user action in response to a measured glucose level and an output of the pedometer;and
 - a display arranged within the housing and configured to display the directive for the user.
2. The health meter of Claim 1, wherein the processor is further configured to estimate an activity of the user based upon footsteps taken by the user and detected by the pedometer.
3. The health meter of Claim 1, further comprising a heart rate monitor, wherein the processor generates the directive in further response to a measured heart rate of the user.
4. The health meter of Claim 1, wherein the glucose meter comprises an optical emitter and an optical detector configured to detect a glucose level in intracorporeal blood of the user.
5. The health meter of Claim 1, wherein the display comprises a set of indicator lamps, wherein each lamp is assigned a distinct directive for a user action, and wherein the processor sets a state of each indicator lamp according to the generated directive for the user action.

6. The health meter of Claim 1, wherein the processor generates the directive for a user action that is one of to eat, to rest, and to exercise.
7. A health meter configured to be worn by a user, the health meter comprising:
 - a physiological sensor;
 - a clip coupled to the physiological sensor and comprising a sprung loop configured to bias against an article of clothing worn by the user to couple the physiological sensor to the article of clothing; and
 - a data link comprising a wired jack physically coextensive with the clip and configured to transmit a form of an output of the physiological sensor.
8. The health meter of Claim 7, wherein the wired jack of the data link comprises a stereo jack configured to communicate data between an external electronic device via inter-integrated circuit communication protocol.
9. The health meter of Claim 7, wherein the clip further comprises a first section and a second section, wherein the first section transiently couples to the second section to encase the wired jack that extends from the second section.
10. The health meter of Claim 9, wherein the first section of the clip is sprung against the housing, and wherein the second section is pivotable relative the first section.
11. The health meter of Claim 9, wherein the second section of the clip is configured to translate linearly relative the first section to expose the wired jack.
12. The health meter of Claim 7, wherein the physiological sensor measures a biological status of the user at a specified interval, and wherein the data link transmits a form of a plurality of outputs of the physiological sensor when coupled to an external electronic device.

13. The health meter of Claim 12, wherein the physiological sensor comprises a blood glucose meter configured analyze intracorporeal blood of the user.
14. A health meter comprising:
 - a housing;
 - a clip arranged on the housing and comprising a sprung loop configured to bias against a portion of a wearable object to couple the housing to the wearable object; and
 - a heart rate monitor comprising a first conductive pad and a second conductive pad configured to engage an extremity of a user, wherein the first conductive pad is arranged on a surface of the clip.
15. The health meter of Claim 14, wherein the second conductive pad is arranged on the housing, and wherein the heart rate monitor measures the heart rate of a user when the user contacts the first and second conductive pads.
16. The health meter of Claim 14, wherein the clip defines a circular cross-section swept along a U-shaped profile.
17. The health meter of Claim 14, wherein the clip further comprises a first section and a second section separable from the first section, wherein the first section is sprung against the housing and wherein the first conductive pad is arranged on the first section.
18. The health meter of Claim 17, further comprising a data link comprising a wired jack extending from the second section and configured to transmit a form of an output of the heart rate monitor, wherein the first section is removably coupled to the second section to encase the data link.

19. The health meter of Claim 17, further comprising a switch, wherein the second conductive pad is arranged on the second section, and wherein the switch is configured to trigger the heart rate monitor to measures the heart rate of a user when the user moves the second section relative to the first section.

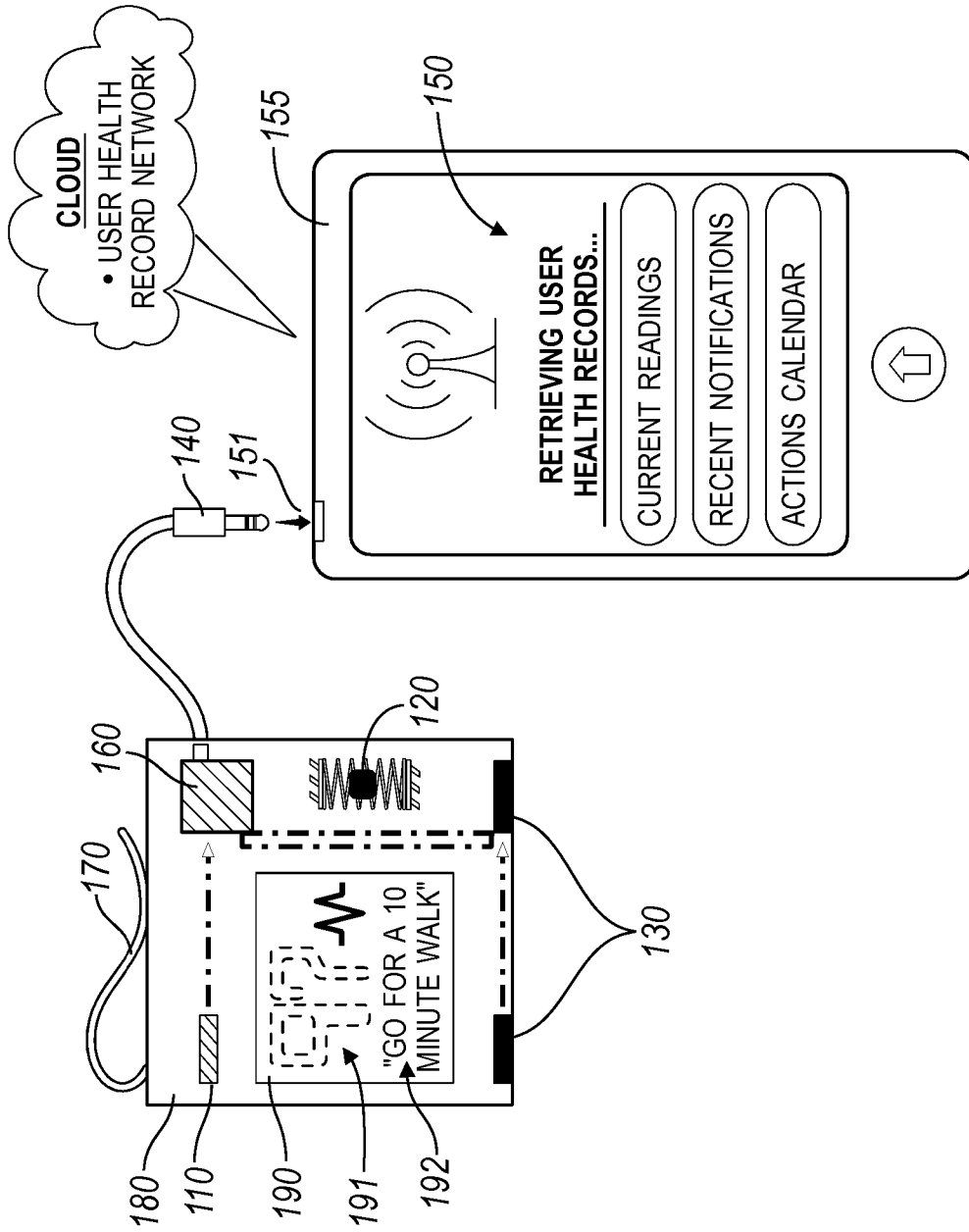


FIG. 1

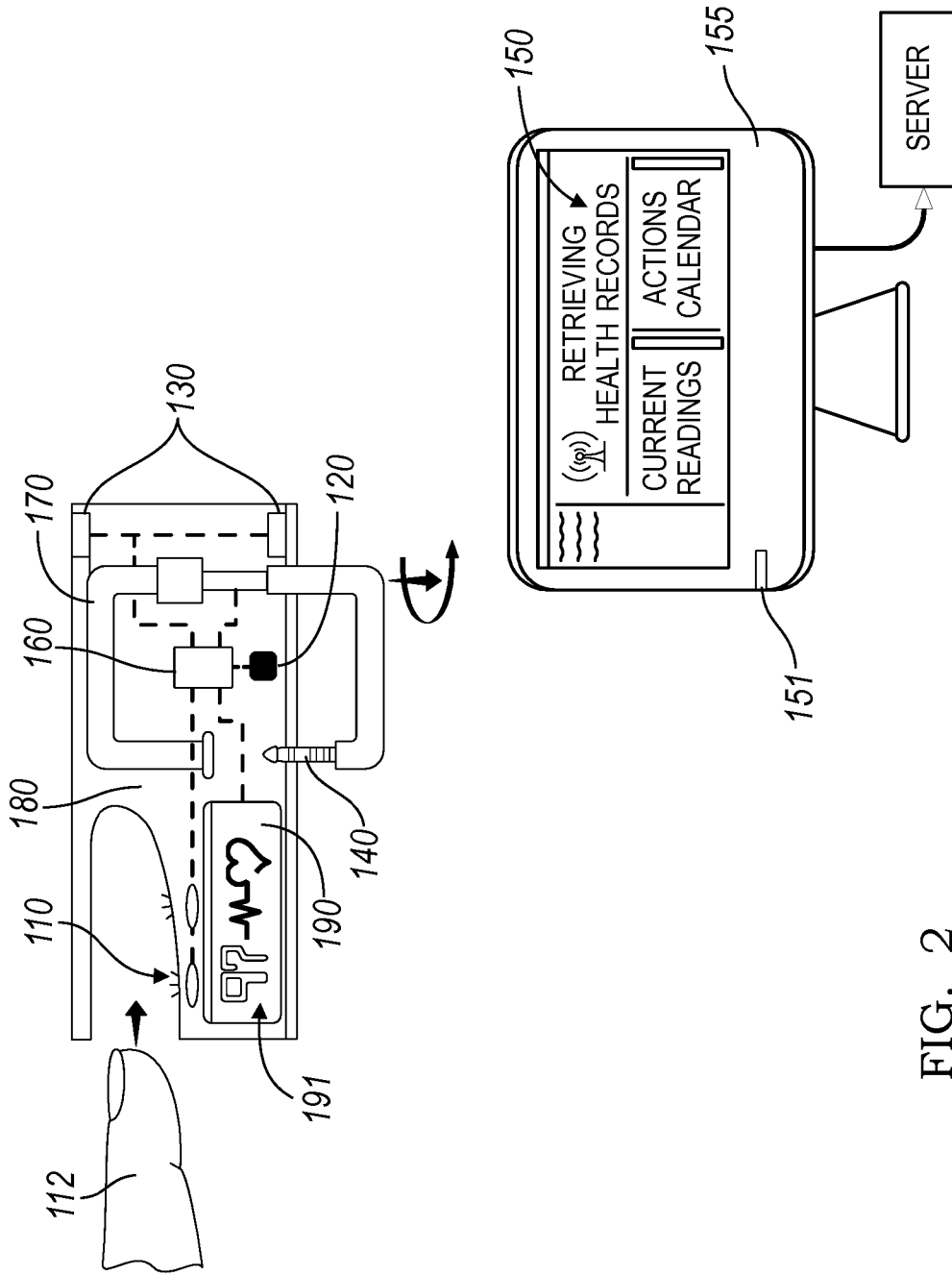


FIG. 2

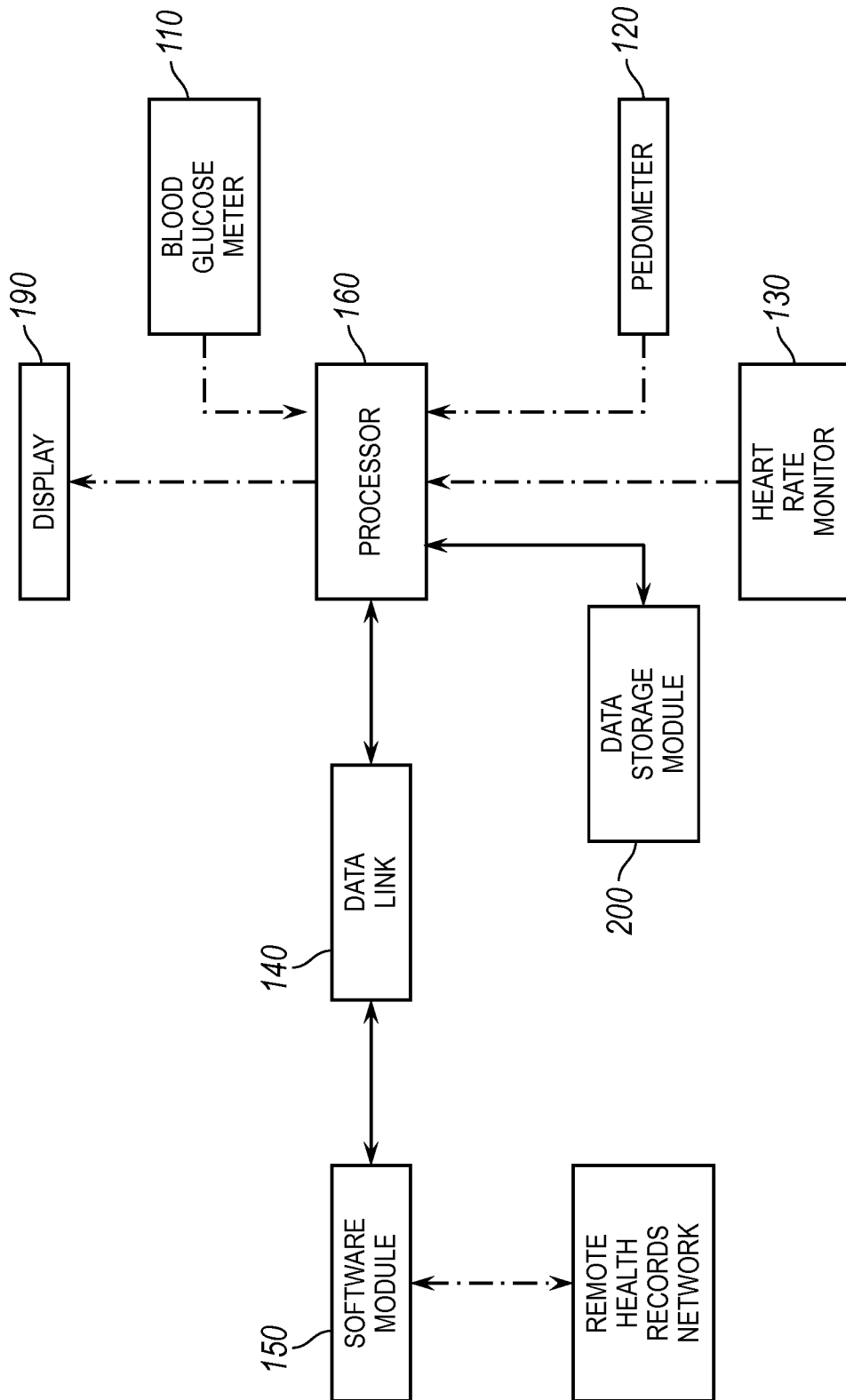


FIG. 3

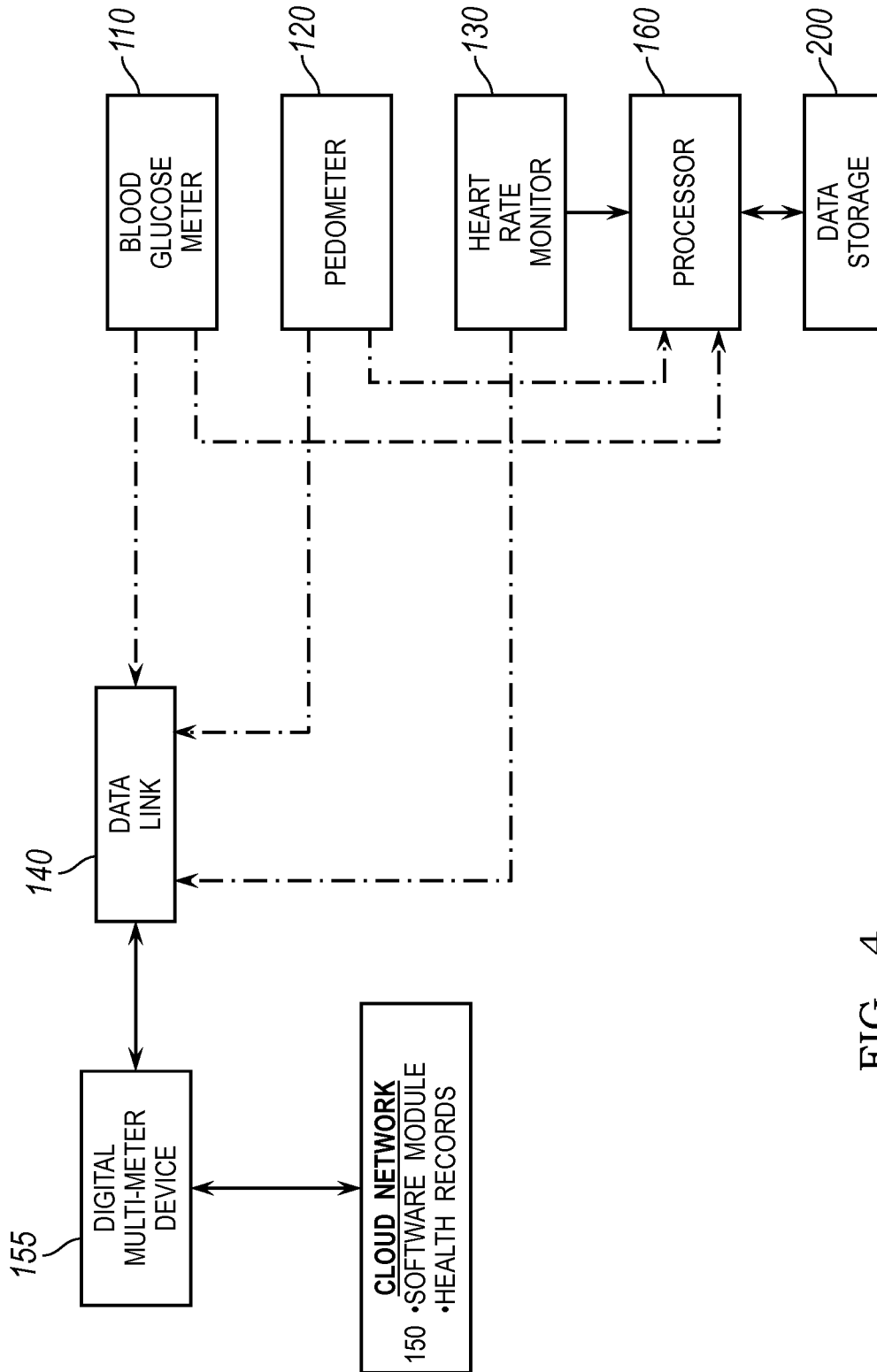


FIG. 4

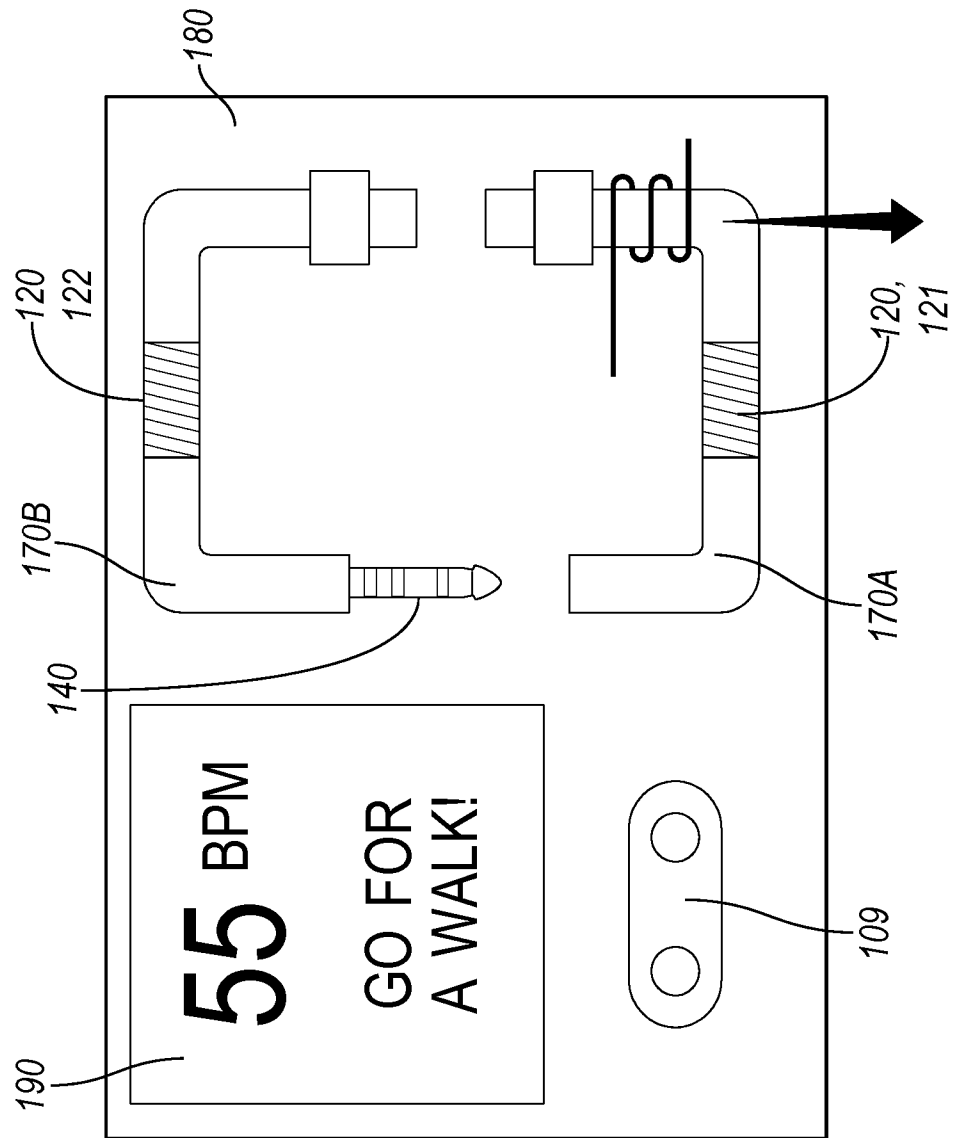


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 12/47229

A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - A61B 5/04 (2012.01) USPC - 600/365, 587; 702/160 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC(8) - A61B 5/04 (2012.01) USPC - 600/365, 587; 702/160		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched 600/301, 347, 520 (Search term limited; see below)		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) PubWest (PGPB, USPT, EPAB, JPAB); Google Search Terms: Glucose meter, sensor, measure, insulin pump, diabetes, health monitor, health meter, pedometer, exercise meter, exercise monitor, activity monitor, activity meter		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2010/0191075 A1 (ANGELIDES) 29 July 2010 (29.07.2010) Entire document, especially Abstract, para[0019]- para[0021], para[0024]- para[0031], para[0035], Claims 2-4 and FIG. 1.	1-3
X	US 2003/0208113 A1 (MAULT et al.) 06 November 2003 (06.11.2003) Entire document, especially Abstract, para[0062], para[0069]- para[0075], para[0105], para[0132], para[0137], para[0148]- para[0149] and FIGS. 1, 16.	1-2, 4-6
X	US 2009/0264337 A1 (ANGELIDES) 22 October 2009 (22.10.2009) Entire document, especially Abstract, para[0007]-[0009].	1-2
X	US 2009/0240128 A1 (MENSINGER et al.) 24 September 2009 (24.09.2009) Entire document, especially Abstract, para[0097], Claims 11, 18, 19.	1-2
X	US 2008/0139910 A1 (MASTRÓTOTARO et al.) 12 June 2008 (12.06.2008) Entire document, especially Abstract, para[0033].	1-2
A	US 2011/0124996 A1 (REINKE et al.) 26 May 2011 (26.05.2011) Entire document.	1-6
A	US 2009/0240193 A1 (MENSINGER et al.) 24 September 2009 (24.09.2009) Entire document.	1-6
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/>		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "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 documents, 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 28 November 2012 (28.11.2012)		Date of mailing of the international search report 04 DEC 2012
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201		Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 12/47229

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
-- see extra sheet --

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-6

- Remark on Protest**
- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
 - The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
 - No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 12/47229

Continuation of Box III: Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: claims 1-6 describing a combination pedometer and glucose meter health monitor to generate a directive for a user action in response to a measured glucose level and an output of the pedometer

Group II: claims 7-19 describing a health monitor comprising a clip to bias a physiological sensor against clotting, a data link and a heart rate monitor or glucose sensor

The inventions listed as Groups I - IV do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The commonality between the groups comprises a health monitor which comprises a generic glucose sensor, however, glucose sensors in general are well known in the art to monitor health (see US 2007/0276294 A1 to Gupta et al., who describes health monitors that monitor both glucose and heart rate (Abstract, para[0007]), therefore such monitors in general do not constitute an advancement over existing art.

Thus the remaining features are, group I: directive generation device for monitoring health in response to glucose and a pedometer, and group II: a clipping arrangement for physiological sensors (in general) and a data link for use therewith. None of the groups share a technical feature with another group. Thus, unity is lacking.