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(54) **WRIST WATCH FOR MONITORING DIABETES**

(76) Inventor: **Bennie Mosley**, Rancho Cucamonga, CA (US)

Correspondence Address:
Law Office of J. Curtis Edmondson
15490 NW Oak Hills Drive
Beaverton, OR 97006

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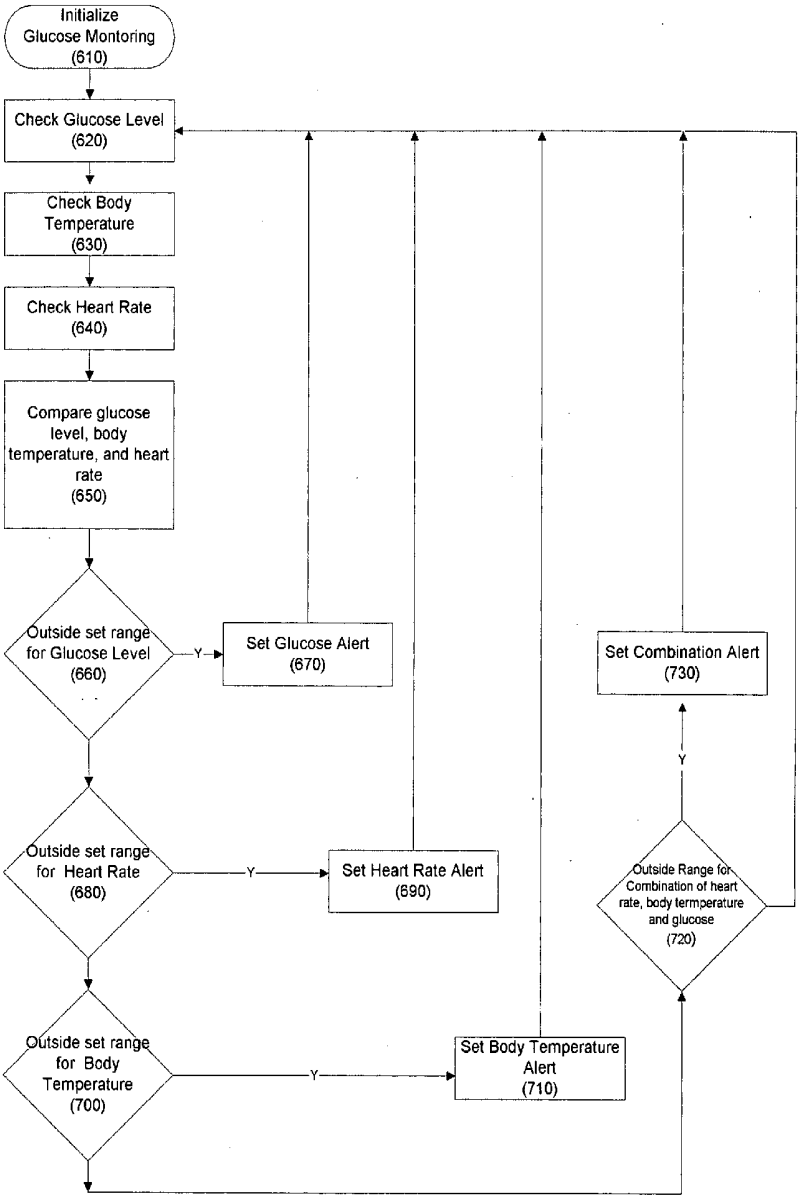
A61B 5/00	(2006.01)
G04B 47/00	(2006.01)
G04B 47/06	(2006.01)

(52) **U.S. Cl.** **368/281**; 368/11; 368/12; 600/301; 600/316

(57) **ABSTRACT**

A diabetes monitoring watch is shown with a computing system located in the watch, including a glucose monitoring system, a pulse rate monitor, a body temperature monitor, and an alert system. The system looks at the glucose level, the body temperature, and the heart rate and determines if the diabetic is in need of assistance. The diabetes monitoring watch also has an alert system for notification of the individual or other individuals if the person is in need.



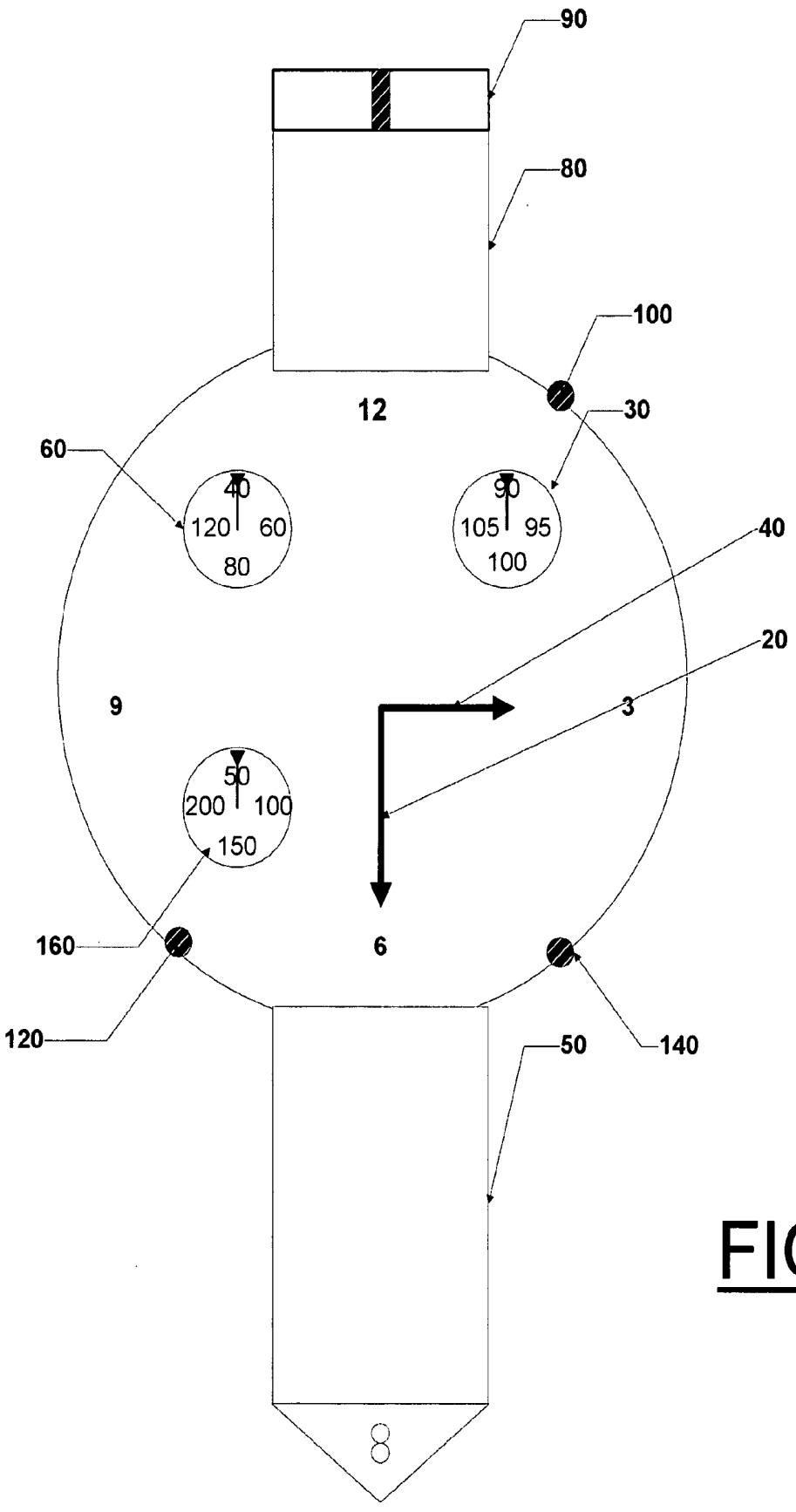

90
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FIG 1

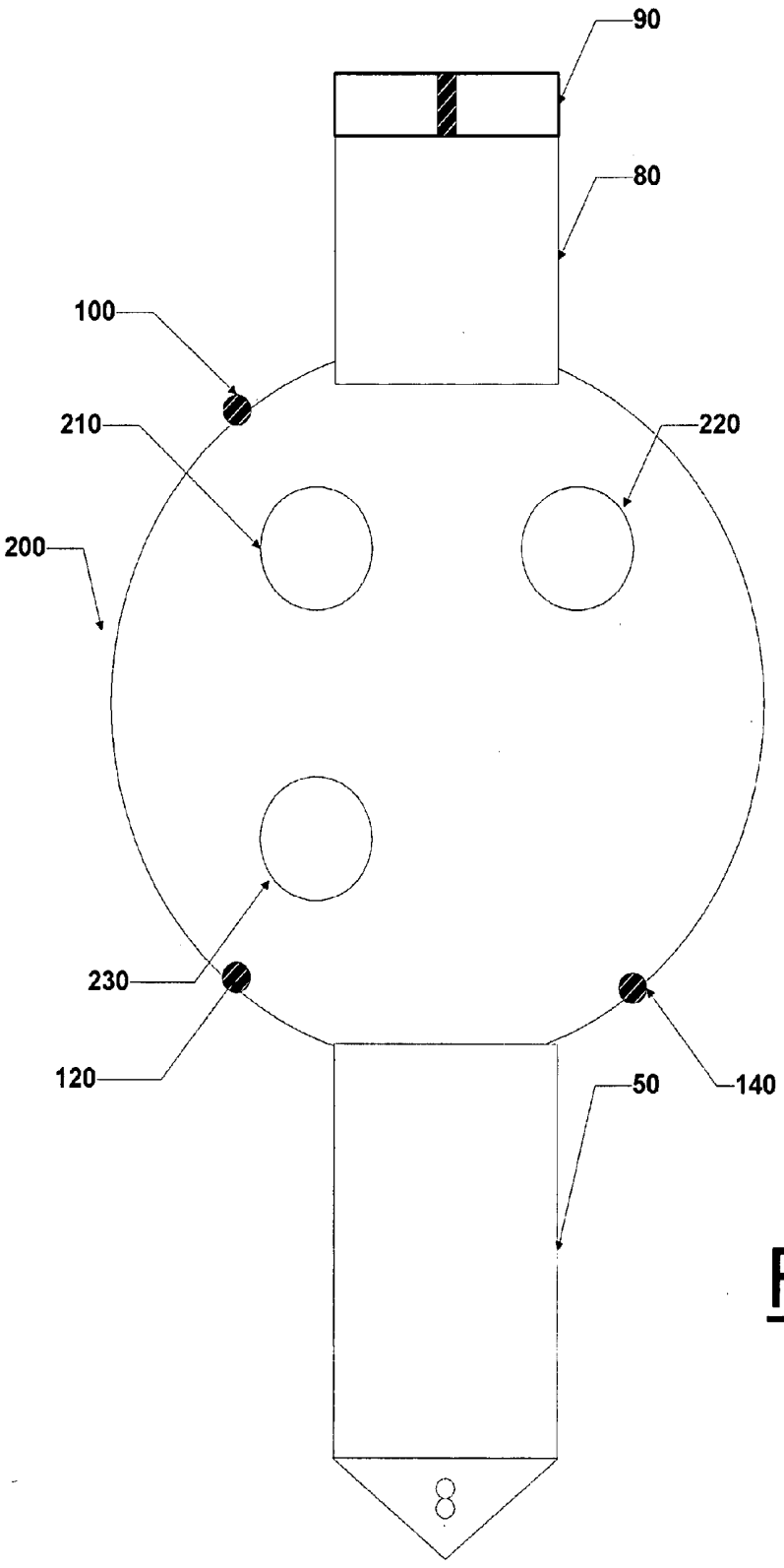

FIG 2

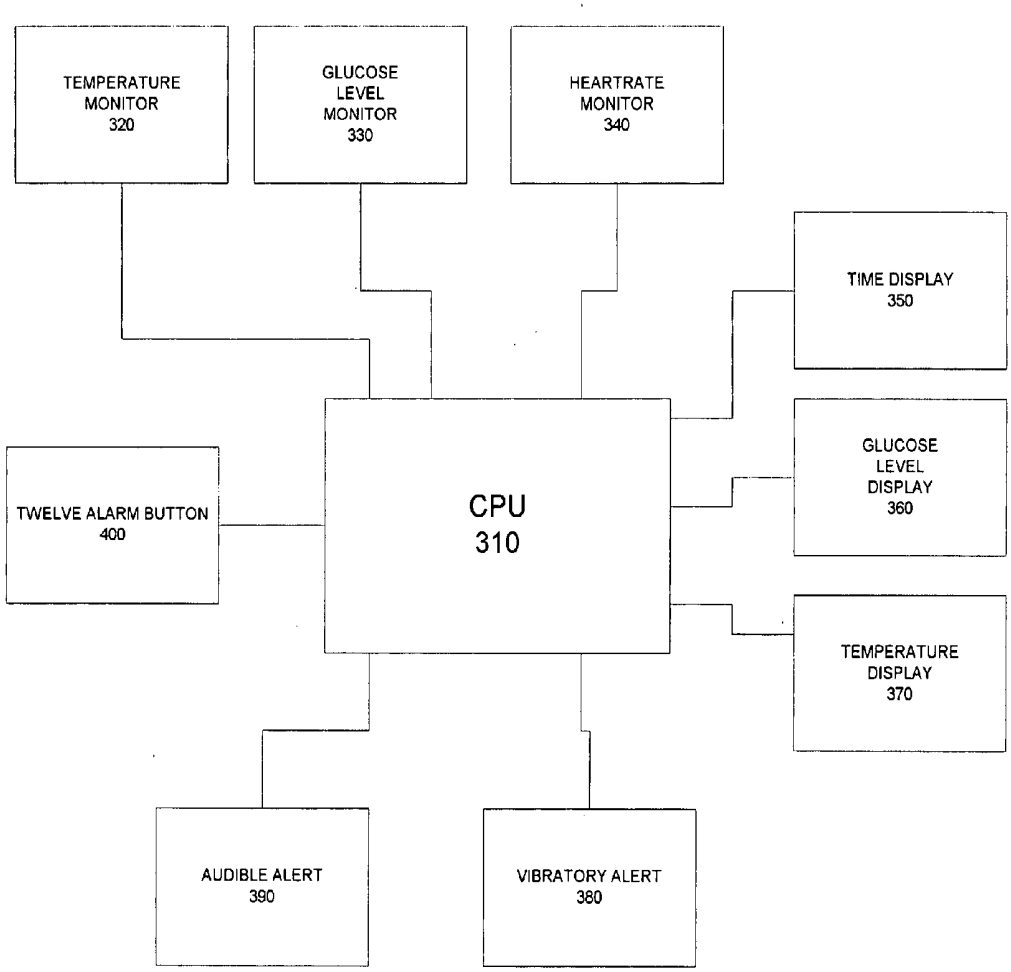
TEMPERATURE MONITOR 320
GLUCOSE LEVEL MONITOR 330
HEARTRATE MONITOR 340
TIME DISPLAY 350
GLUCOSE LEVEL DISPLAY 360
TEMPERATURE DISPLAY 370
TWELVE ALARM BUTTON 400
CPU 310
AUDIBLE ALERT 390
VIBRATORY ALERT 380

FIG 3

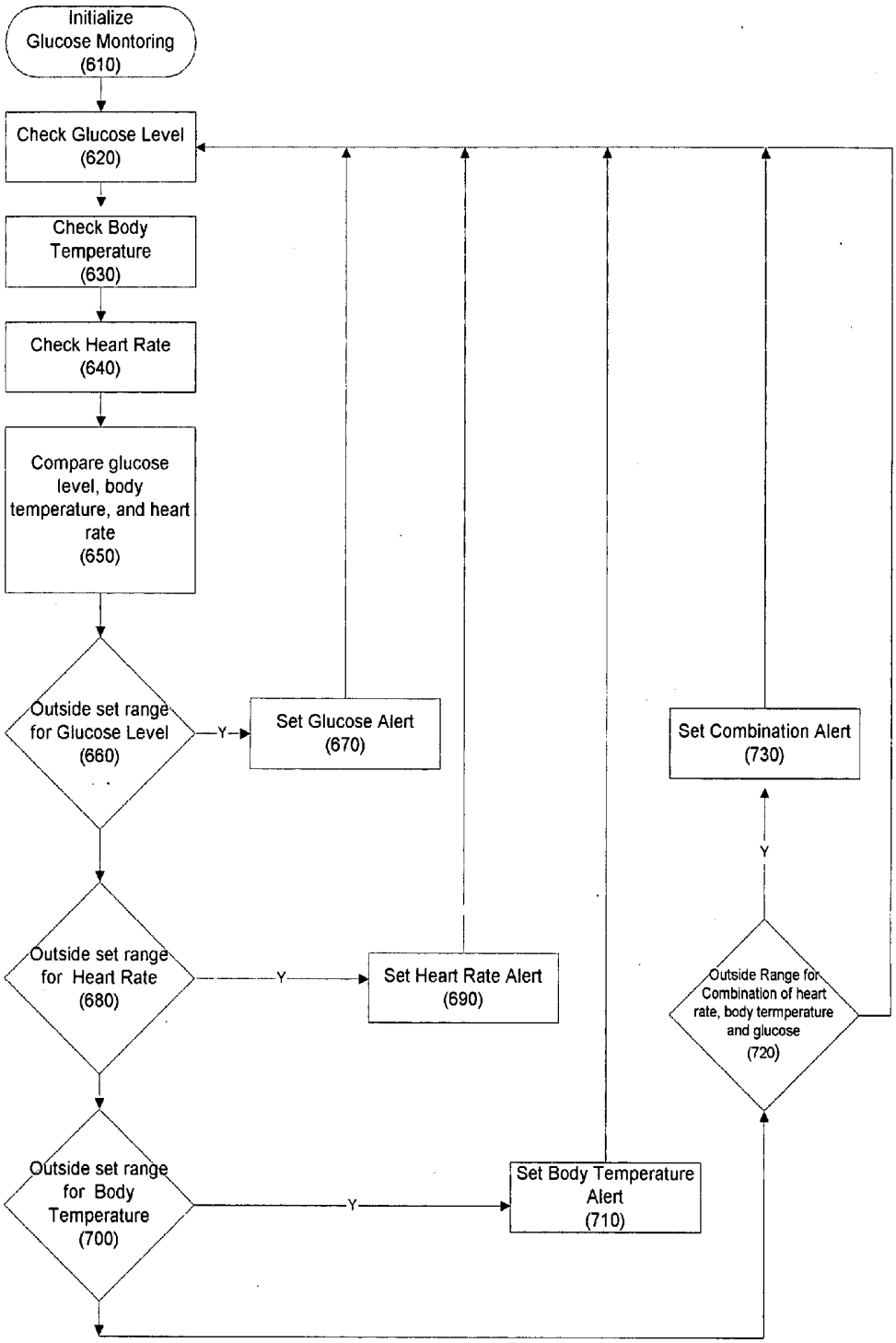
Initialize Glucose Montoring (610)
Check Glucose Level (620)
Check Body Temperature (630)
Check Heart Rate (640)
Compare glucose level, body temperature, and heart rate (650)
Outside set range for Glucose Level (660)
Y
Set Glucose Alert (670)
Outside set range for Heart Rate (680)
Y
Set Heart Rate Alert (690)
Outside set range for Body Temperature (700)
Y
Set Body Temperature Alert (710)
Outside Range for Combination of heart rate, body termperature and glucose (720)
Y
Set Combination Alert (730)

FIG 4

WRIST WATCH FOR MONITORING DIABETES

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Patent Application No. 60/844282 filed Sep. 14, 2006.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a wrist watch for monitoring the overall health of a diabetic patient.

[0004] 2. Discussion of the Related Art

[0005] Diabetes affects millions of Americans and tens of millions world-wide. Diabetes is the inability of the body to properly metabolized glucose resulting in hyperglycemia. The long term physical manifestations of hyperglycemia are pronounced: including, but not limited to heart disease, atherosclosis, blindness, stroke, hypertension and kidney failure.

[0006] Hyperglycemia is present when the blood glucose levels consistently exceed 126 mg/dL or 7 mmol/L. (see http://en.wikipedia.org/wiki/Hyperglycemia#Measurement and definition). When hyperglycemia becomes severe, patients may develop one of two potentially life-threatening complications: diabetic ketoacidosis (DKA) or hyperglycemic hyperosmolar nonketotic syndrome (HHNS). (See http://findarticles.com/p/articles/mi_ga3689/is_200108/ai_n8967972).

[0007] The increase in the risk of heart disease for chronic suffers of hyperglycemia can lead to an increase in the risk of heart attacks. A symptom of the onset of a myocardial infarction (e.g. heart attack) being an increased or irregular heart rate. Also during exercise by a diabetic the monitoring of heart rate can be used to roughly calculate the amount of carbohydrates to ingest to maintain proper blood sugar levels. (see http://www.idea2000.org/moreinfo/docs/diabetes_polar_tips.html).

[0008] One method of maintaining blood glucose levels involves determining the caloric count of foods and then determining the amount of food to eat to maintain the proper blood sugar level (see http://www.endocrineweb.com/diabetes/treatment.html).

[0009] The prior art describes systems for predicting blood glucose levels. U.S. Pat. No. 6,188,648 (Feb. 13, 2001) to Olsen describes a wristwatch device where the person can manually calculate carbohydrate counts. U.S. Pat. No. 7,215,601 B2 (May 7, 2007) to Plancon, et. al depicts a wristwatch display system that conveys analog information on the face of a wristwatch.

[0010] The prior art also describes systems for non-invasive monitoring glucose levels that may be incorporated into a wristwatch. U.S. Pat. No. 7,174,199 B2 (Feb. 6, 2007) to Berner, et. al describes a method of monitoring glucose levels specifically in the blood. U.S. Pat. No. 7,084,976 (Aug. 1, 2006) to Morokawa, et. al depicts an earring like device that monitors glucose concentration levels. U.S. Pat. No. 7,147,153 B2 (Dec. 12, 2006) to Rowe depicts a multispectral glucose monitoring system.

[0011] The prior art describes monitoring the caloric expenditure rate of the individual. U.S. Pat. No. 6,571,200 (May 27, 2003) to Mault describes a computer based apparatus that determines caloric expenditure based on activity monitors and a GPS input. U.S. Pat. No. 7,220,220 (May 22, 2007) to Stubbs, et. al depicts an exercise monitoring system which monitors physiological signals and incorporates a GPS unit.

[0012] The prior art also describes predictive algorithms for determining the onset of hypoglycemia. See U.S. Pat. No. 6,923,783 B1 (Aug. 2, 2005) to Kovatchev, et. al describing a non-linear model and implementation for hypoglycemia.

[0013] None of the aforementioned devices provide a wearable diabetes monitoring system which can predict when person may need to take food at a particular time and can notify the person when their blood sugar exceeds a particular range.

SUMMARY OF THE INVENTION

[0014] The present inventive subject matter overcomes problems in the prior art by providing a diabetic monitoring wristwatch with the following qualities, alone or in combination.

[0015] The present inventive concept monitors three physiological factors associated with being a diabetic and integrates this monitoring function into a single wristwatch.

[0016] The diabetes monitoring watch is attached to the wrist of an individual, and continuously monitors the individual's blood glucose levels. If a combination of the blood glucose levels of the individual exceed a preset band of acceptable values, in combination with other physiological parameters, such as the: rate of heartbeat, temperature, the watch will alert the individual or other parties of this condition. This notification can be done either by sound, vibration, or by activation of other devices through an electronic interface.

[0017] The wristwatch will also be water resistant, to allow use while involved in sporting activities or while showering.

[0018] The wristwatch will also be aesthetically pleasing, so as to not alert other people that the individual may suffer from any number of glucose related maladies.

[0019] These and other embodiments are described in more detail in the following detailed descriptions and the figures.

[0020] The foregoing is not intended to be an exhaustive list of embodiments and features of the present inventive subject matter. Persons skilled in the art are capable of appreciating other embodiments and features from the following detailed description in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] FIG. **1** is a front view of the diabetic monitoring watch.

[0022] FIG. **2** is a rear view of the diabetic monitoring watch.

[0023] FIG. **3** is a systems diagram of the diabetic monitoring watch.

[0024] FIG. **4** is a software flow chart of the diabetic monitoring watch.

DETAILED DESCRIPTION

[0025] While describing the invention and its embodiments various terms will be used for the sake of clarity. These terms are intended to not only include the recited

embodiments, but also all equivalents that perform substantially the same function, in substantially the same manner to achieve the same result.

[0026] FIG. **1** illustrates the face of the watch **10**. FIG. **2** illustrates the back of the watch **200**. The face of the watch **10** consists of the following metabolic monitoring features: temperature display **30**, pulse rate monitoring **60**, and glucose monitor **160**.

[0027] The body temperature display **30** on the watch **10** consists of a dial that ranges from a low body temperature to a high body temperature. In this embodiment the body temperature display **30** ranges from 90 to 105 degrees F. A more narrow range of body temperatures may be displayed in other embodiments, for example from 98 to 103 degrees F. In other embodiments a digital display for the body temperature may be used in lieu of a dial display. The body temperature is measured by the temperature sensor **210** mounted on the back of the watch **200**.

[0028] The pulse rate monitor display **60** on the watch **10** consists of a dial that ranges from a low pulse rate to a high pulse rate. In this embodiment the pulse rate monitor ranges from 40 beats per minute to 120 beats per minute. A more narrow or wider range of pulse rates may be displayed in other embodiments. In other embodiments a digital display for the pulse rates may be used in lieu of a dial display. The pulse rate is measured by the pulse rate sensor **220** mounted on the back of the watch **200**.

[0029] The glucose level indicator **160** on the watch **10** consists of a dial that ranges from a low amount to a high amount. In this embodiment, the glucose level ranges from 50 to 250 mg/dl. A more narrow or wider range of glucose level displays may be displayed in other embodiments. In other embodiments a digital display for the glucose levels may be used in lieu of a dial display. The glucose level is measured by the transdermal glucose sensor **230** mounted on the back of the watch **200**.

[0030] The internal functions of the watch are configured through a twelve alarm button **100**, and the medical data bank button **140**.

[0031] The watch also consists of the ability to display time with a second hand **20**, and an hour hand **40**. Other embodiments include a digital display in lieu of a second and hour hand configuration.

[0032] The watch is affixed to the person with straps **50**, **80**. The strap **50** is inserted into strap **80** in a looping fashion and held by a buckle or a hook and pile assembly (such as Velcro).

[0033] Now referring to FIG. **3** which shows a block diagram of the glucose monitoring wristwatch.

[0034] The CPU **310** is the central processing unit located within the wristwatch. A number of CPU's **310** that are well known in the arts may be used, including, but not limited to, 16 bit and 32 bit microprocessors. The CPU **310** also incorporates Read Only Memory (not shown) for stored program instructions and Random Access Memory (not shown) for operational memory. The CPU **310** may be connected to peripheral devices via a direct connection or using bus configuration.

[0035] The CPU **310** is connected to a temperature interface **320**, a glucose level interface **330**, and a heart rate monitor **340**. The CPU is connected to a time display **350**, a glucose level display **360**, and a temperature display **370**. Also connected is a vibratory alert **380** and a auditory alert **390**. Controlling the system is the twelve alarm button **400**.

[0036] The temperature interface **320** monitors body temperature using a direct contact with the skin. The temperature interface **320** is a dermal contact device located on the rear of the watch shown as temperature sensor **210** in FIG. **2**. The temperature interface is of a type similar to the MiniMitter Vitalsense Skin Temperature Patch (see http://www.minimitter.com/ProductsNitalSense/temperature.html#patch). The temperature interface **320** converts the body temperature represented by an analog electrical signal into a digital value that can be processed by the CPU **310**.

[0037] The glucose level interface **330** monitors glucose levels by a transdermal glucose sensor **230** mounted to the back of the watch **200** as shown in FIG. **2**. The glucose level interface **330** transdermal glucose sensor **230** is of a type similar to the Glucowatch®.

[0038] Now referring to FIG. **4** which shows a flowchart of the operation of the glucose-monitoring wristwatch. In the first step, the system is initialized **610**. The system checks the glucose level **620**. The system checks the body temperature **630**. The system checks the heart rate **640**. The system then compares the glucose level, body temperature, and heart rate **650** via an internal algorithm. If the glucose level is outside the set range **660** then the watch will send a glucose alert signal **670** and repeat the process. If the heart rate is outside the set range **680** then the watch will send a heart rate alert signal **690**. If the body temperature is outside the set range **700**, then the watch will send a body temperature alert signal. If a combination of the heart rate, body temperature, and glucose levels are outside the combined set ranges **710**, then an alert is set.

[0039] The system is configured by using the twelve alarm button. The configuration using a single button is well known in the arts and consists of a series of button presses to set time, date, glucose ranges, heart rate ranges, and body temperature ranges. The twelve alarm button also permits the setting of interval alerts to notify the person to take medications, in particular medications that aide in the process of glucose monitoring.

I claim:

1. A diabetes monitoring watch comprising:

a) a time piece, wherein the time piece is configured to fit on ones wrist; and wherein said time piece has a face and a back;

b) a central processing unit, the central processing unit comprising a stored programmable memory, a random access memory, a programmable central processing unit; and

c) a glucose monitor, wherein the glucose monitor is coupled to the central processing unit;

d) a heartbeat monitor; wherein the heartbeat monitor is coupled to the central processing unit;

e) a body temperature monitor, wherein the body temperature monitor is coupled to the central processing unit;

f) a pulse rate monitor, wherein the pulse rate monitor is coupled to the central processing unit;

g) an alert system, where the alert system is coupled to the central processing unit;

and wherein the central processing unit is configured to read the blood glucose level from the glucose monitor and store a multiplicity of blood glucose levels in random access memory; and wherein the blood glucose level is displayed on the face of the time piece;

and wherein the central processing unit is configured to read the pulse rates from the pulse rate monitor and store a multiplicity of pulse rates in the random access memory; and wherein the pulse rate is displayed on the face of the time piece;

and wherein the central processing unit is configured to read the body temperature from the body temperature monitor and store a multiplicity of body temperatures; and wherein the body temperature is displayed on the face of the time piece;

and wherein the central processing system sets an alert level in the alert system as calculated from the blood glucose levels, pulse rates, and body temperatures as stored in the central processing unit.

2. A diabetes monitoring watch as in claim **1**, wherein the glucose monitor reads the glucose levels using a transdermal sensor.

3. A diabetes monitoring watch as in claim **1**, wherein the glucose monitor reads the glucose levels using an infrared sensor.

4. A diabetes monitoring watch as in claim **1**, wherein the body temperature that is displayed on the timepiece is analog.

5. A diabetes monitoring watch as in claim **1**, wherein the alert system sends a notice using vibration.

6. A diabetes monitoring watch as in claim **1**, wherein the alert system sends a notice using electronic mail.

7. A diabetes monitoring watch as in claim **1**, wherein the alert system sends a notice using an audible tone.

8. A diabetes monitoring watch as in claim **1**, wherein the pulse rate display on the face of the time piece is analog.

9. A diabetes monitoring watch as in claim **1**, wherein the body temperature display on the face of the time piece is analog.

* * * * *

专利名称(译)	用于监测糖尿病的手表		
公开(公告)号	US20080068932A1	公开(公告)日	2008-03-20
申请号	US11/897850	申请日	2007-09-01
[标]申请(专利权)人(译)	莫斯利BENNIE		
申请(专利权)人(译)	莫斯利BENNIE		
当前申请(专利权)人(译)	莫斯利BENNIE		
[标]发明人	MOSLEY BENNIE		
发明人	MOSLEY, BENNIE		
IPC分类号	A44C5/00 A61B5/00 G04B47/00 G04B47/06		
CPC分类号	A61B5/02055 A61B5/14532 G04G21/025 A61B5/681 A61B5/1486		
优先权	60/844282 2006-09-14 US		
外部链接	Espacenet USPTO		

摘要(译)

示出了糖尿病监测手表，其具有位于手表中的计算系统，包括葡萄糖监测系统，脉搏率监测器，体温监测器和警报系统。该系统查看葡萄糖水平，体温和心率，并确定糖尿病患者是否需要帮助。糖尿病监测手表还具有警报系统，用于在需要时通知个人或其他个体。