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(54) **COMBINED PERIPHERAL AND HEALTH MONITORING DEVICES**

(75) Inventor: **Paul Wessel**, Delano, MN (US)

Correspondence Address:
CROMPTON, SEAGER & TUFTE, LLC
1221 NICOLLET AVENUE
SUITE 800
MINNEAPOLIS, MN 55403-2420 (US)

(73) Assignee: **GUIDANCE INTERACTIVE HEALTHCARE, INC.**, Loretto, MN (US)

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Publication Classification

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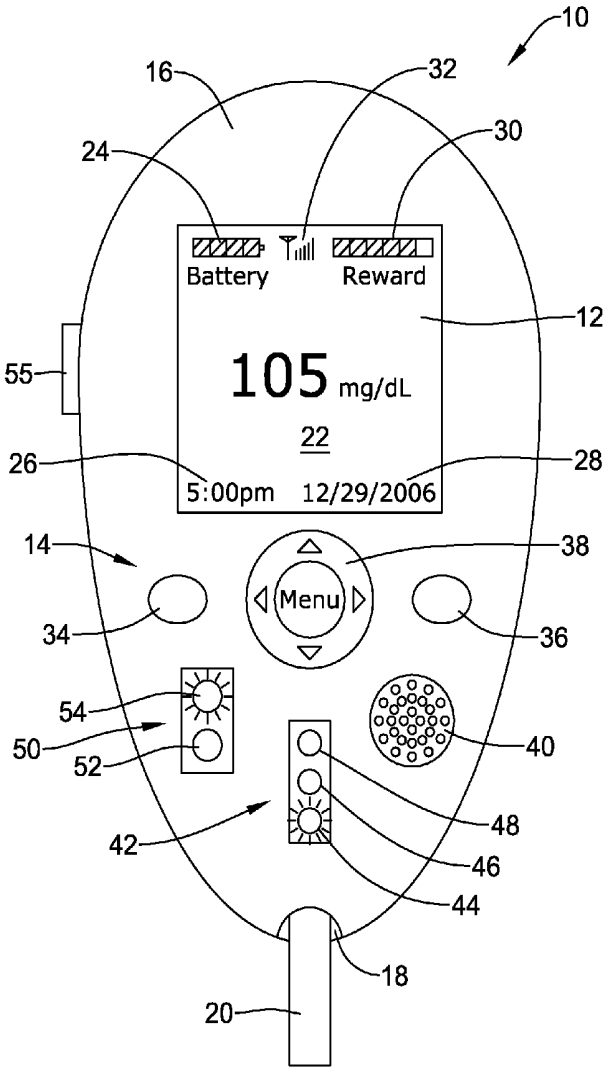
A61B 5/00 (2006.01)

(52) **U.S. Cl.** **600/301**

(57) **ABSTRACT**

A combined peripheral and health monitoring device for use with a computer is disclosed. The device can include a sensor adapted to sense one or more medical parameters such as blood glucose levels, medical circuitry in communication with the sensor for processing the one or more sensed medical parameters, and a communications interface for transmitting and receiving data back and forth between the device and the computer.



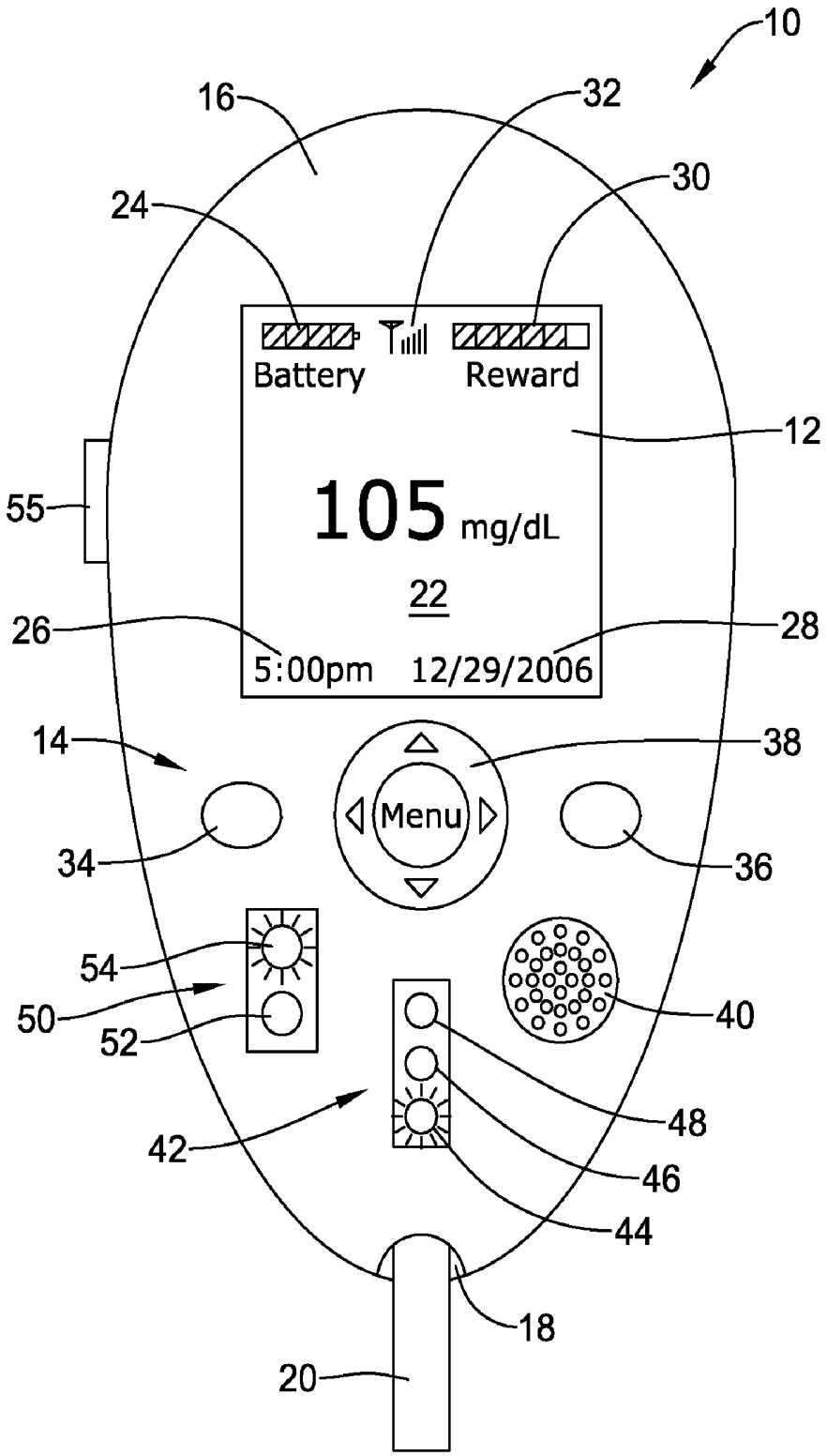

10
16
32
30
24
Battery
Reward
12
55
105 mg/dL
22
26
28
5:00pm 12/29/2006
14
38
Menu
34
36
54
50
52
40
42
48
46
44
18
20

Figure 1

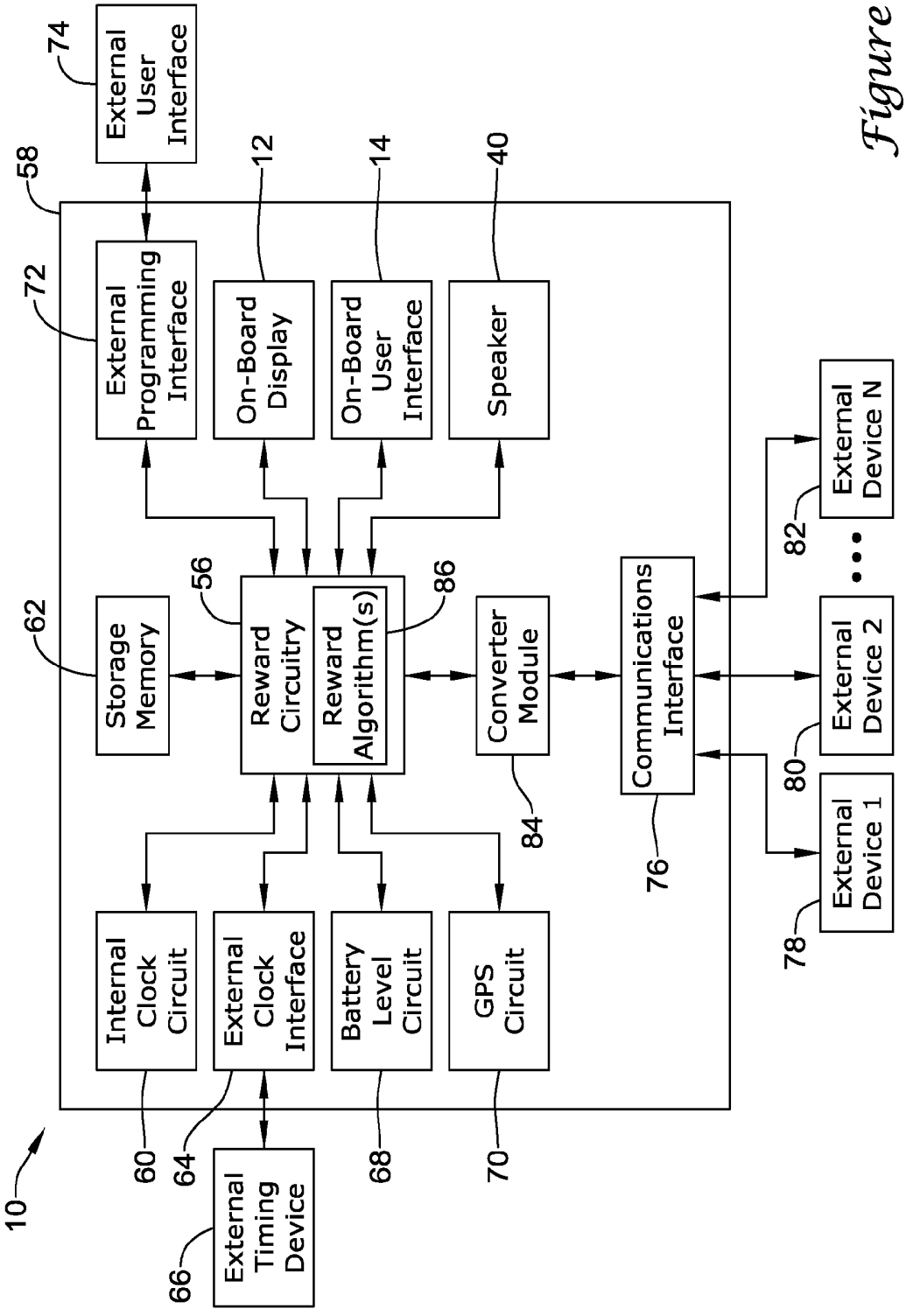

10
58
External User Interface
74
External Programming Interface
72
On-Board Display
12
On-Board User Interface
14
Speaker
40
Storage Memory
62
Reward Circuitry
56
Reward Algorithm(s)
86
Converter Module
84
Communications Interface
76
External Device N
82
External Device 2
80
External Device 1
78
Internal Clock Circuit
60
External Clock Interface
64
Battery Level Circuit
68
GPS Circuit
70
External Timing Device
66

Figure 2

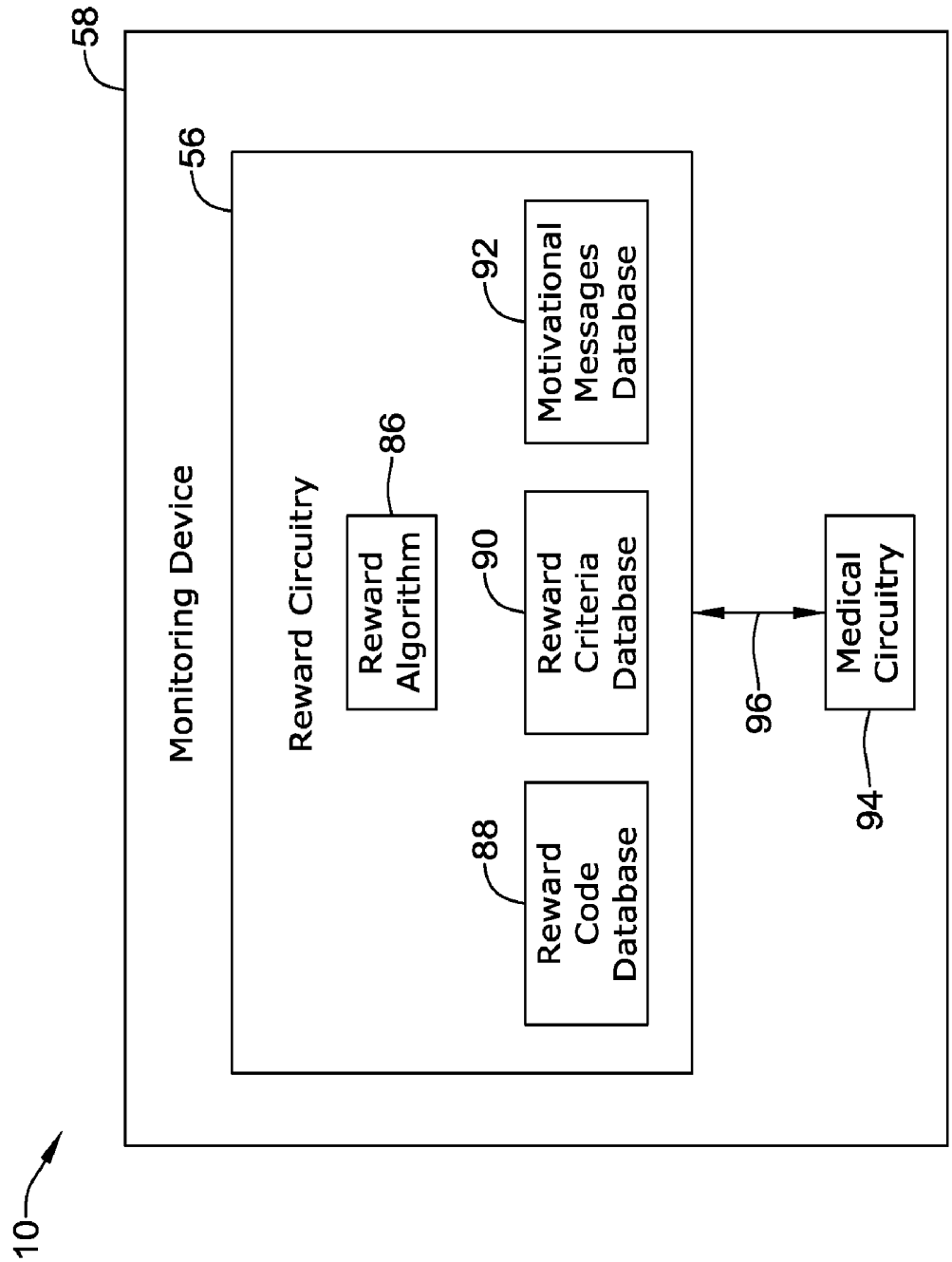

10
58
Monitoring Device
56
Reward Circuitry
Reward Algorithm
86
Reward Criteria Database
90
Reward Code Database
88
Motivational Messages Database
92
96
Medical Circuitry
94

Figure 3

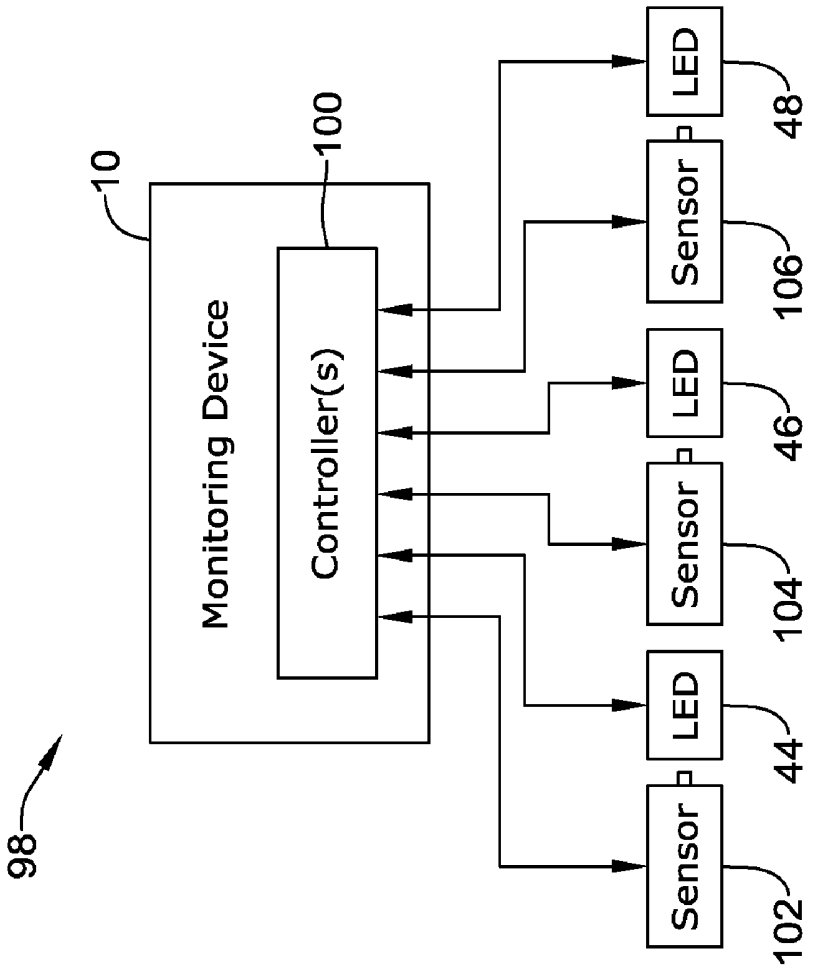

98
10
Monitoring Device
100
Controller(s)
LED
48
Sensor
106
LED
46
Sensor
104
LED
44
Sensor
102

Figure 4

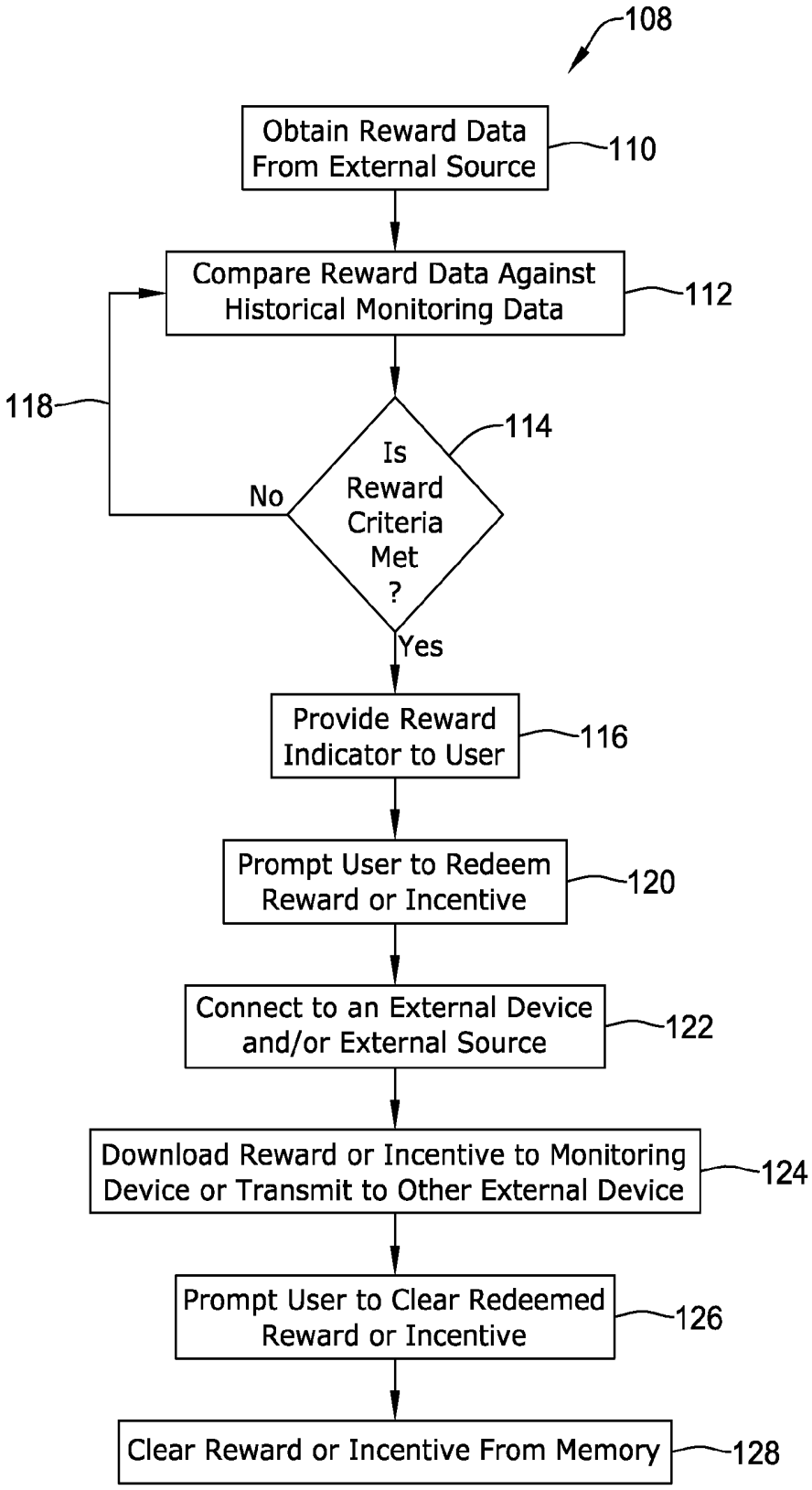

108
Obtain Reward Data From External Source
110
Compare Reward Data Against Historical Monitoring Data
112
118
Is Reward Criteria Met ?
114
No
Yes
Provide Reward Indicator to User
116
Prompt User to Redeem Reward or Incentive
120
Connect to an External Device and/or External Source
122
Download Reward or Incentive to Monitoring Device or Transmit to Other External Device
124
Prompt User to Clear Redeemed Reward or Incentive
126
Clear Reward or Incentive From Memory
128

Figure 5

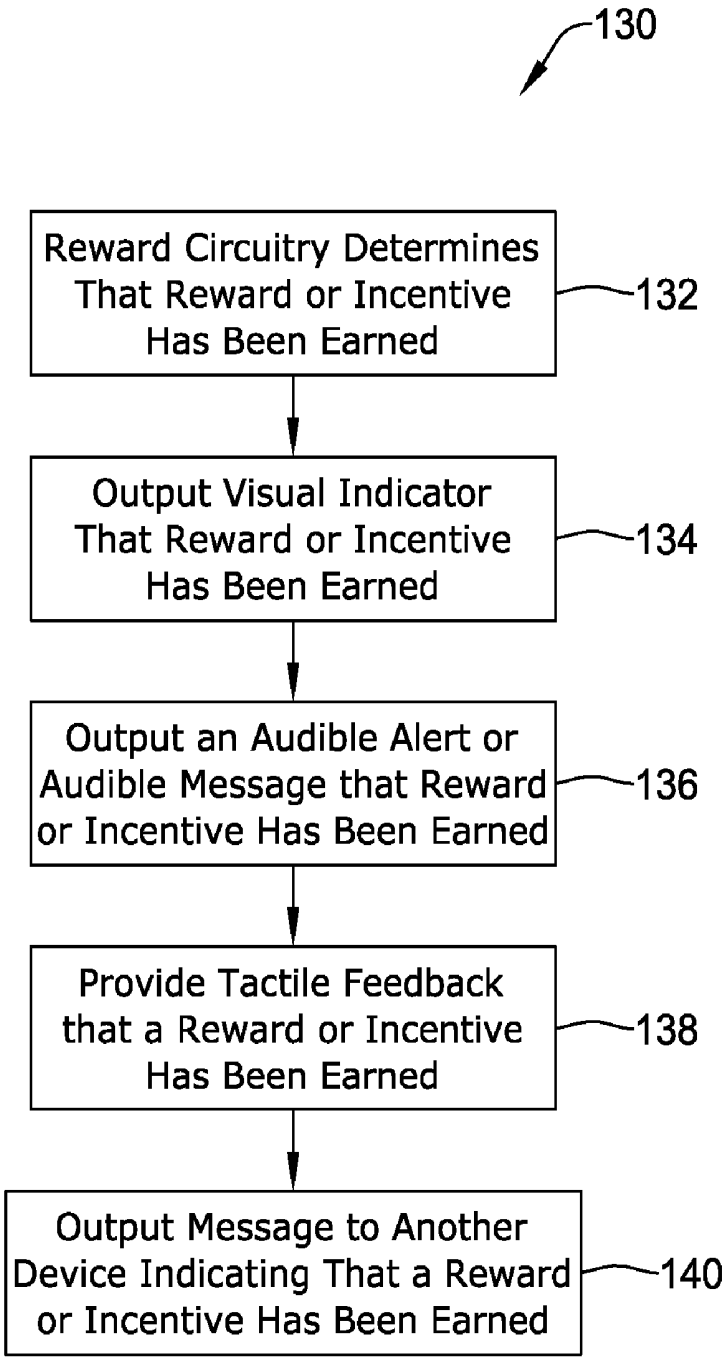

130
Reward Circuitry Determines That Reward or Incentive Has Been Earned
132
Output Visual Indicator That Reward or Incentive Has Been Earned
134
Output an Audible Alert or Audible Message that Reward or Incentive Has Been Earned
136
Provide Tactile Feedback that a Reward or Incentive Has Been Earned
138
Output Message to Another Device Indicating That a Reward or Incentive Has Been Earned
140

Figure 6

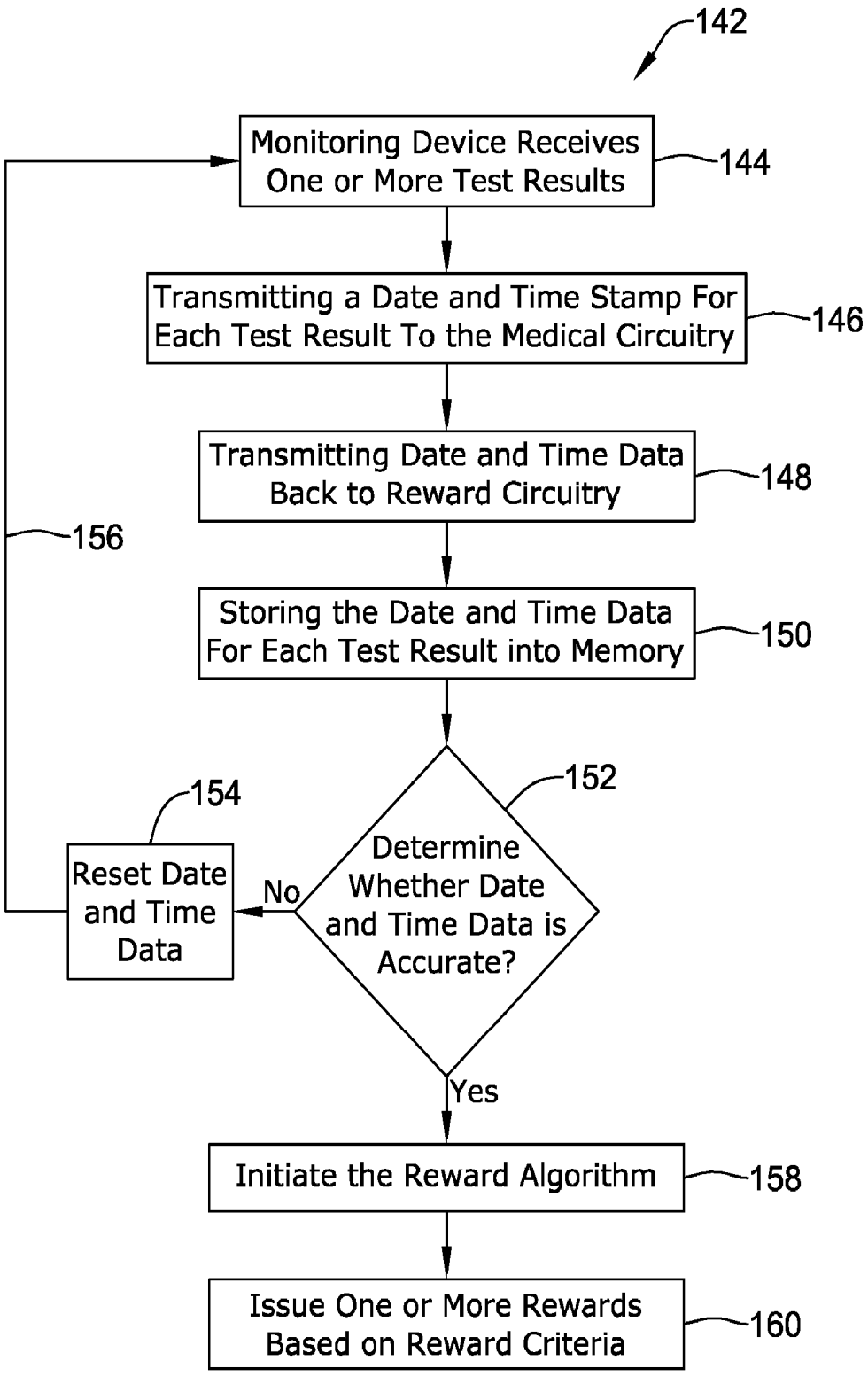

142
Monitoring Device Receives One or More Test Results
144
Transmitting a Date and Time Stamp For Each Test Result To the Medical Circuitry
146
Transmitting Date and Time Data Back to Reward Circuitry
148
156
Storing the Date and Time Data For Each Test Result into Memory
150
152
154
Reset Date and Time Data
No
Determine Whether Date and Time Data is Accurate?
Yes
Initiate the Reward Algorithm
158
Issue One or More Rewards Based on Reward Criteria
160

Figure 7

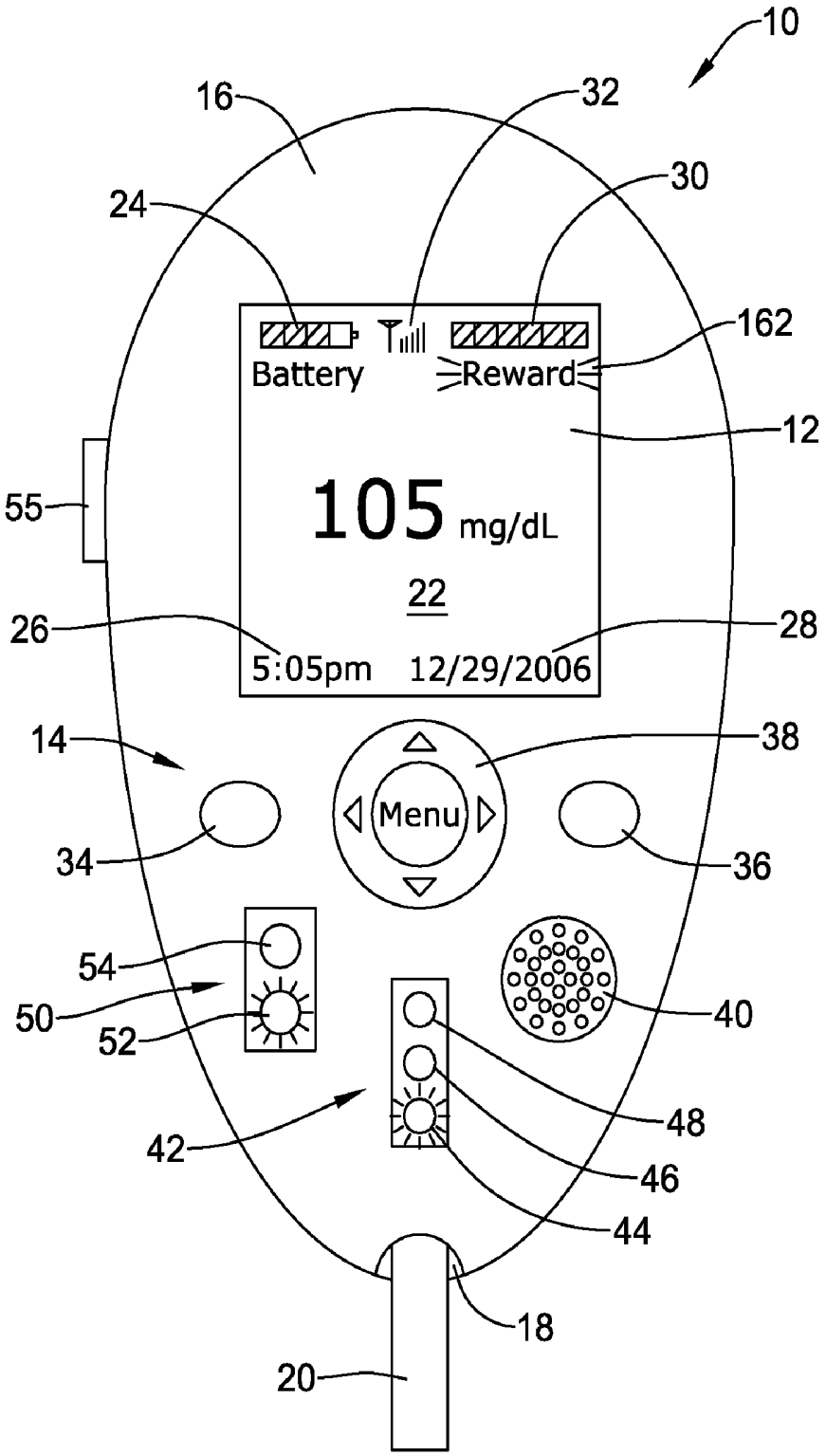

10
16
32
30
24
162
Battery
Reward
12
55
105 mg/dL
22
26
28
5:05pm 12/29/2006
14
38
Menu
34
36
54
50
52
40
48
42
46
44
18
20

Figure 8

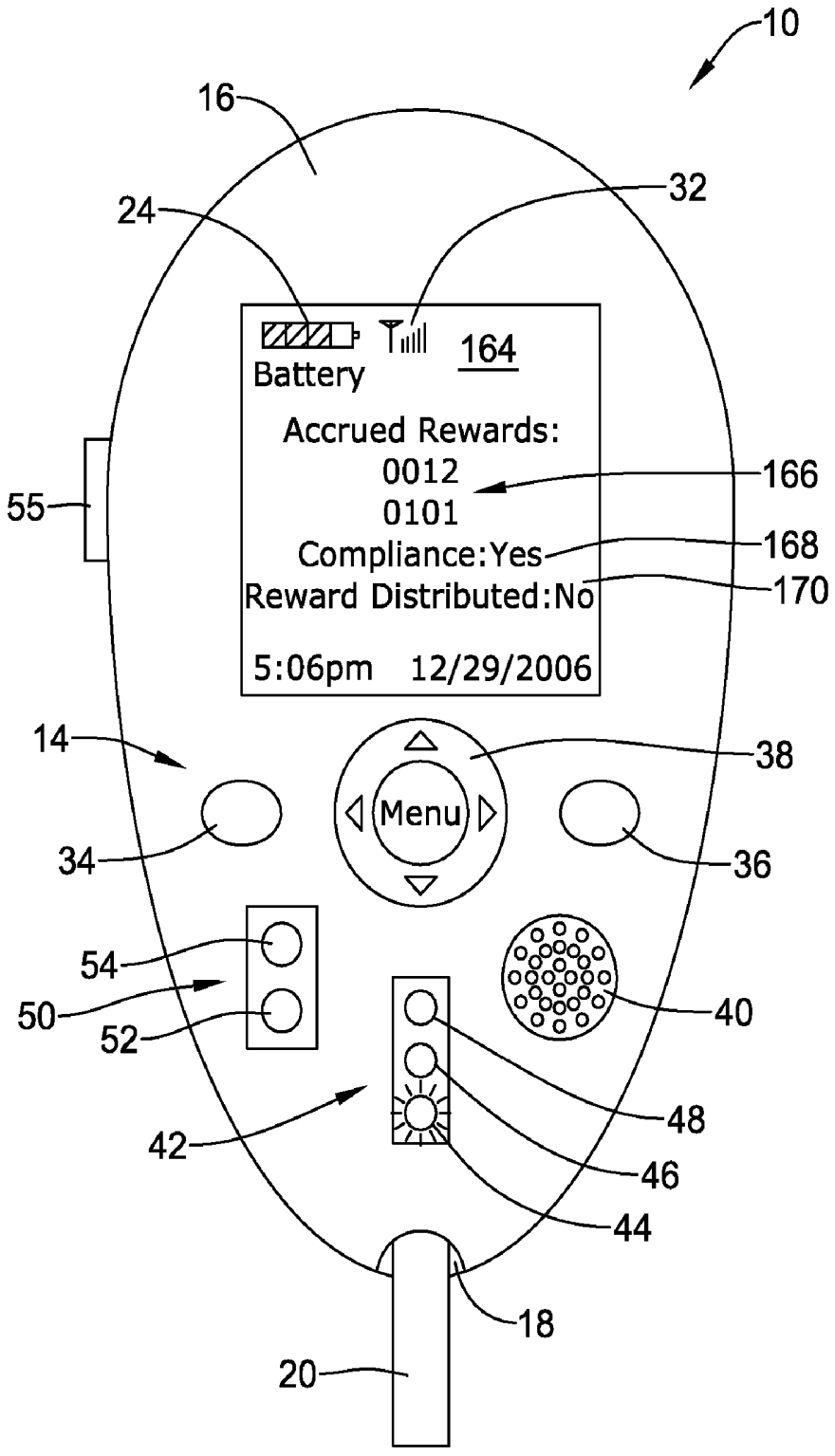

10
16
24
32
Battery
164
Accrued Rewards:
0012
0101
166
55
Compliance:Yes
168
Reward Distributed:No
170
5:06pm 12/29/2006
14
38
Menu
34
36
54
50
52
40
48
42
46
44
18
20

Figure 9

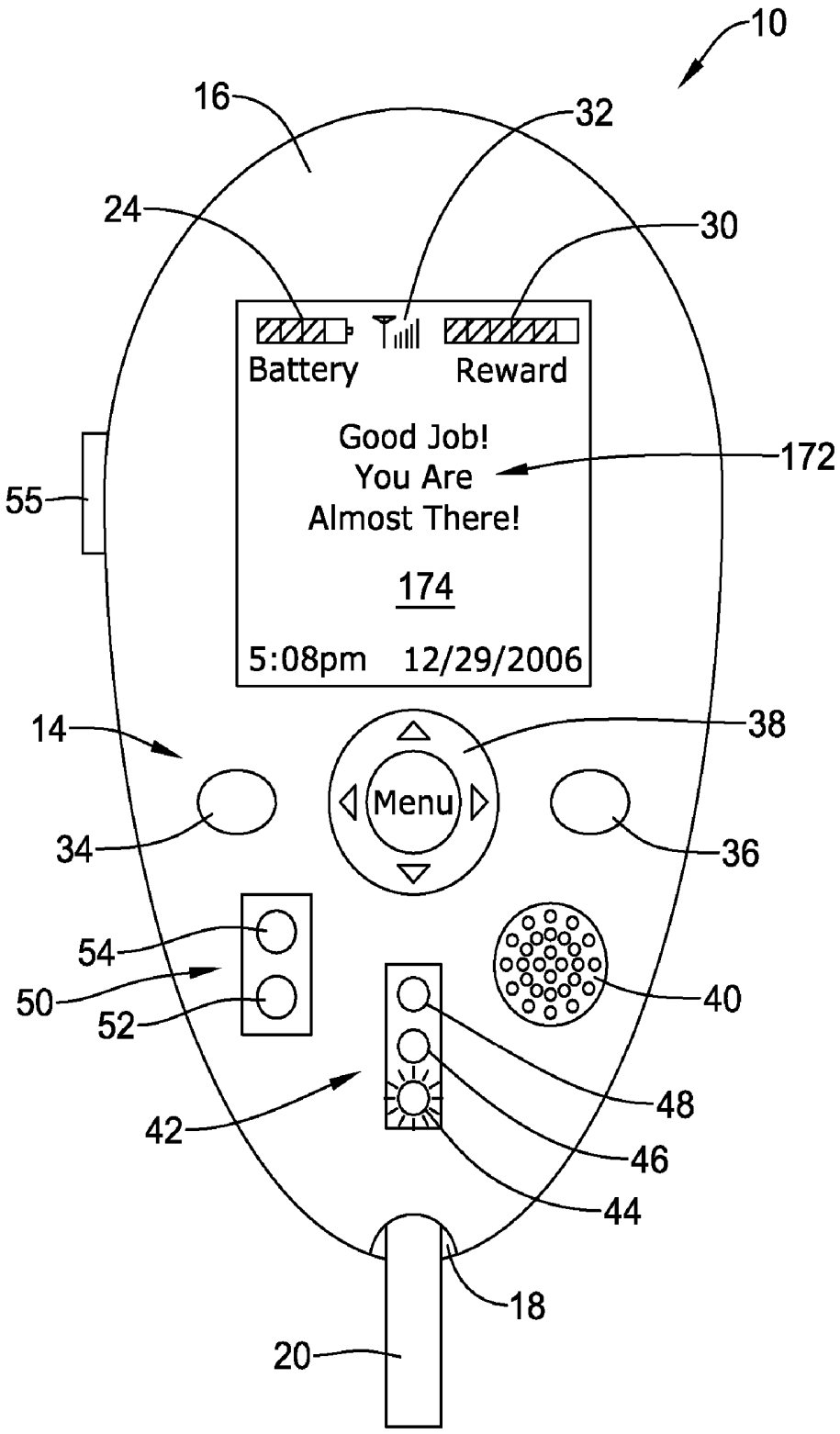

10
16
32
24
30
Battery
Reward
Good Job!
You Are
Almost There!
172
55
174
5:08pm 12/29/2006
14
38
Menu
34
36
54
50
52
40
48
42
46
44
18
20

Figure 10

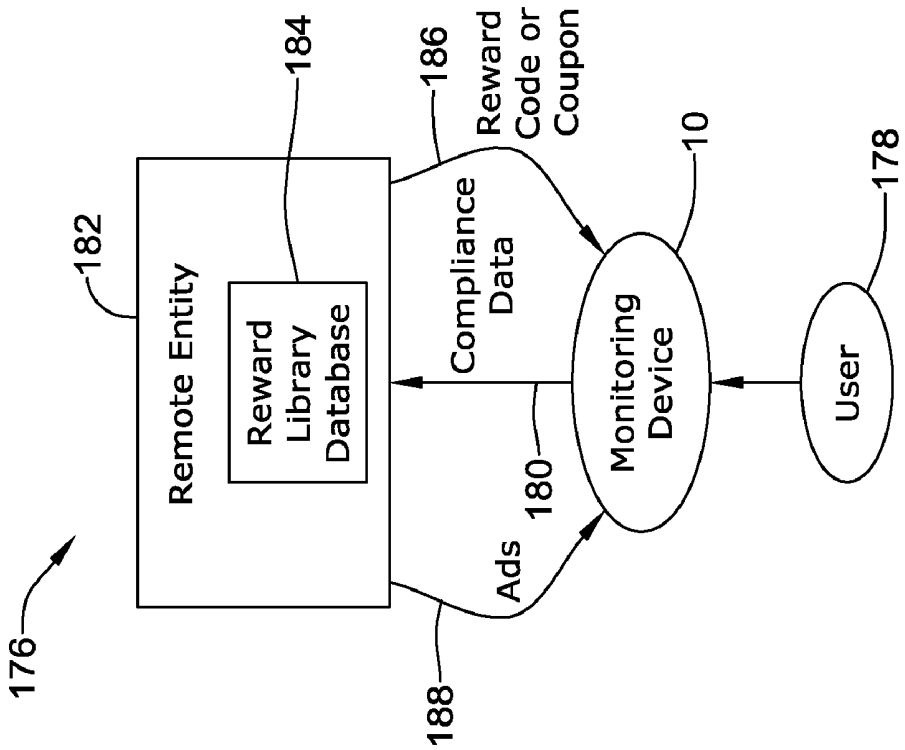

176
182
Remote Entity
184
Reward Library Database
186
Reward Code or Coupon
Compliance Data
180
Ads
188
10
Monitoring Device
178
User

Figure 11

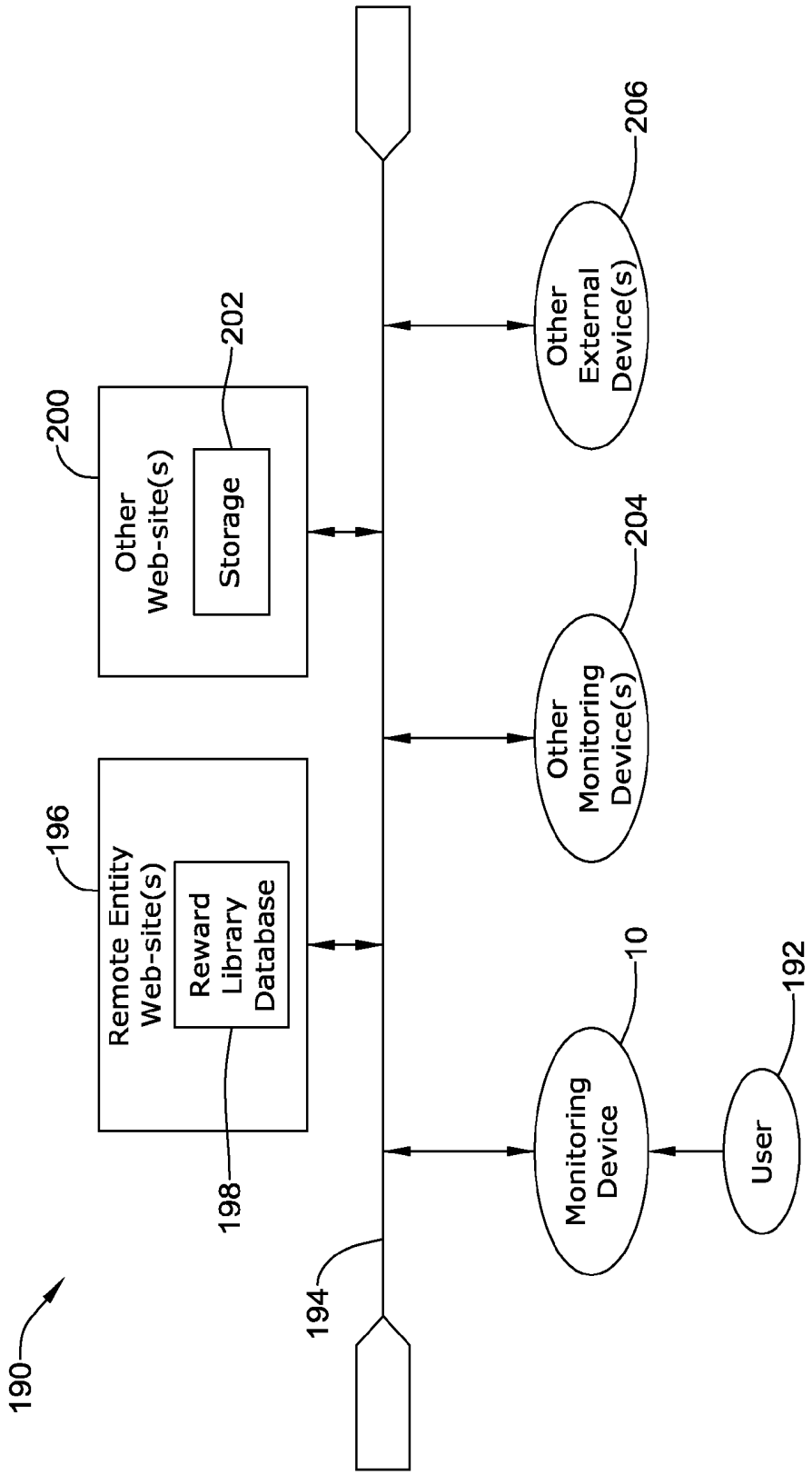

190
194
198
196
Remote Entity Web-site(s)
Reward Library Database
200
202
Other Web-site(s)
Storage
10
Monitoring Device
192
User
204
Other Monitoring Device(s)
206
Other External Device(s)

Figure 12

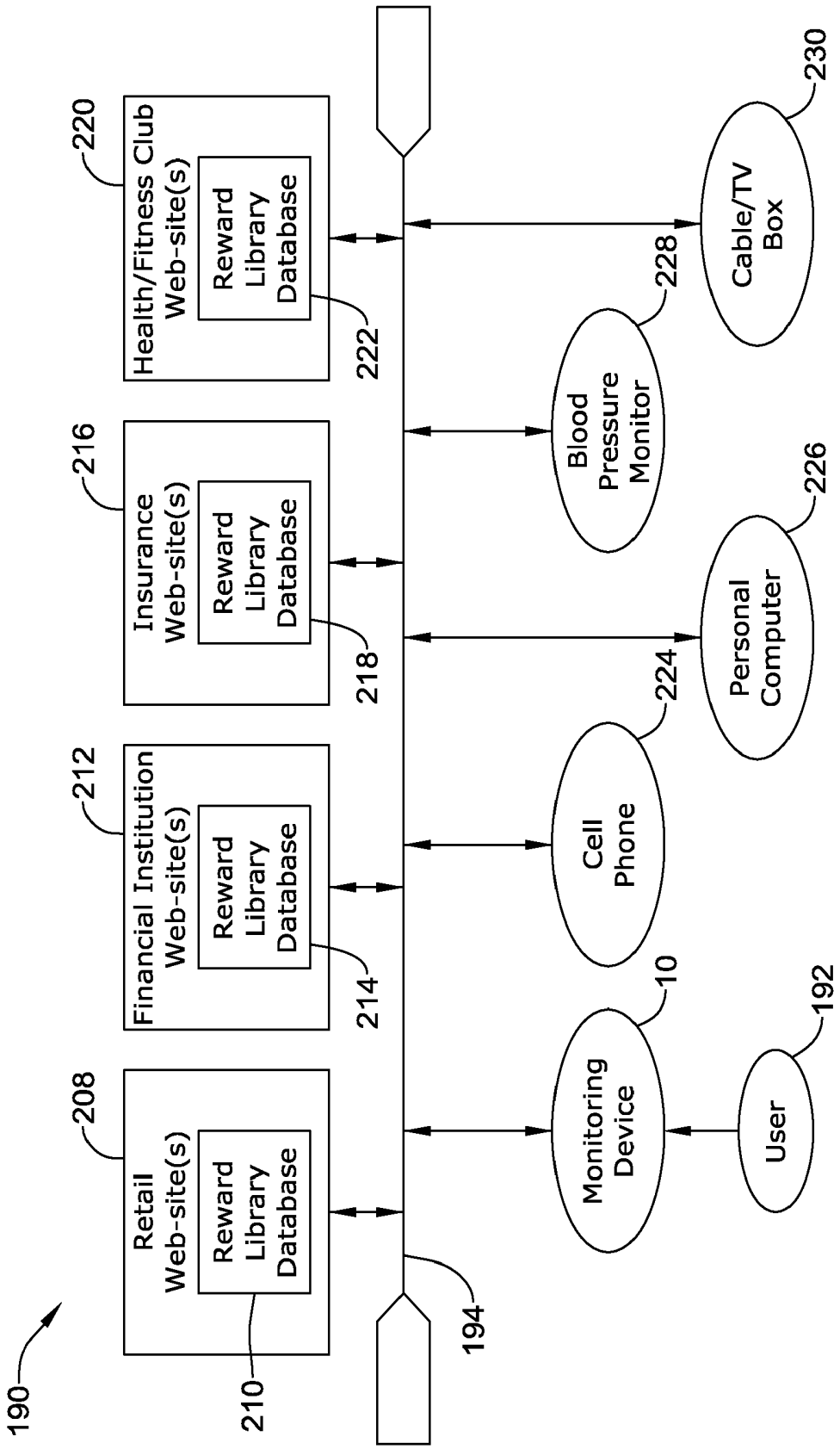

190
Retail Web-site(s)
Reward Library Database
208
210
Financial Institution Web-site(s)
Reward Library Database
212
214
Insurance Web-site(s)
Reward Library Database
216
218
Health/Fitness Club Web-site(s)
Reward Library Database
220
222
194
Monitoring Device
10
User
192
Cell Phone
224
Personal Computer
226
Blood Pressure Monitor
228
Cable/TV Box
230

Figure 13

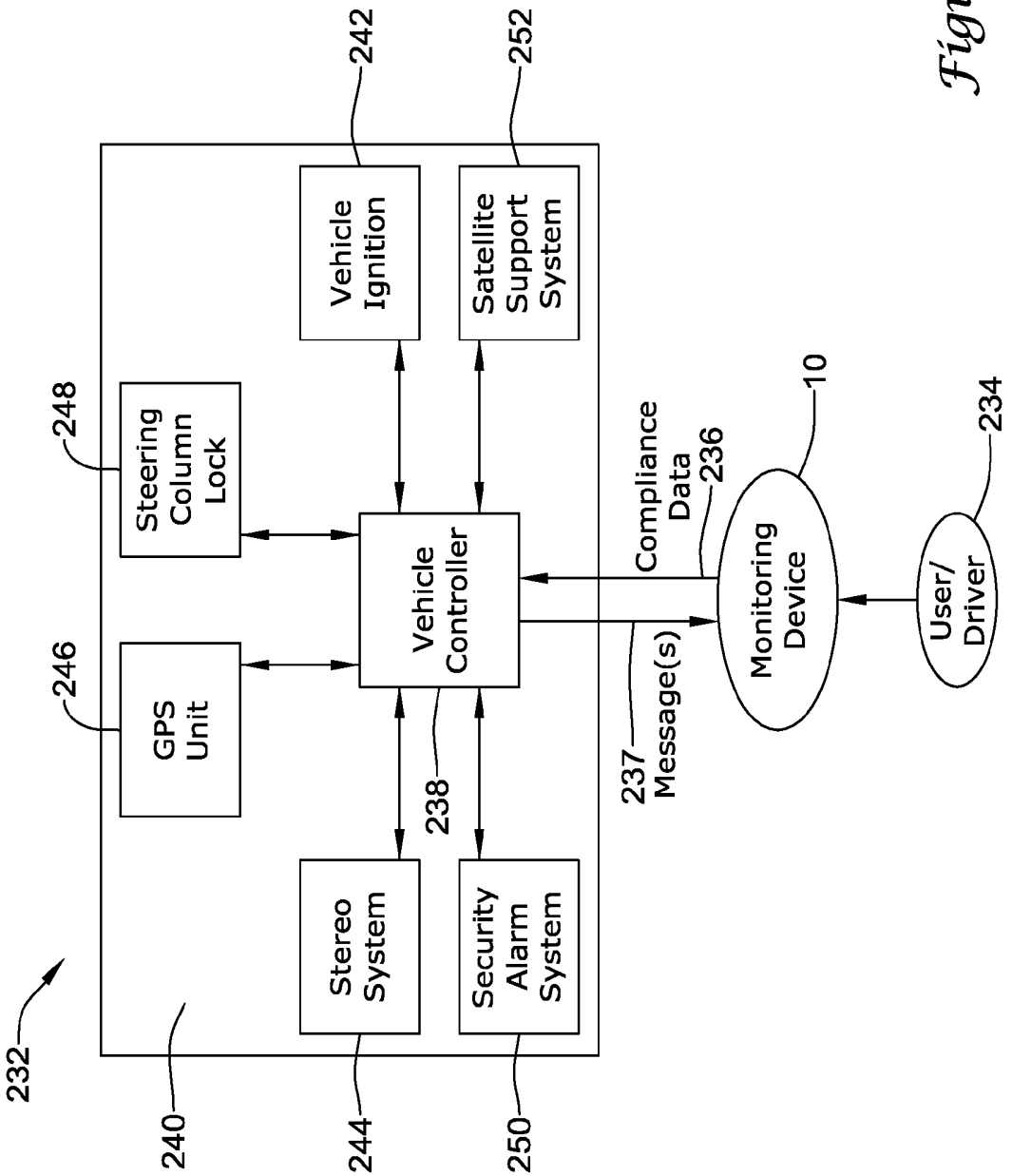

232
240
242
Vehicle Ignition
252
Satellite Support System
248
Steering Column Lock
246
GPS Unit
Vehicle Controller
238
244
Stereo System
250
Security Alarm System
Compliance Data
236
237
Message(s)
10
Monitoring Device
234
User/ Driver

Figure 14

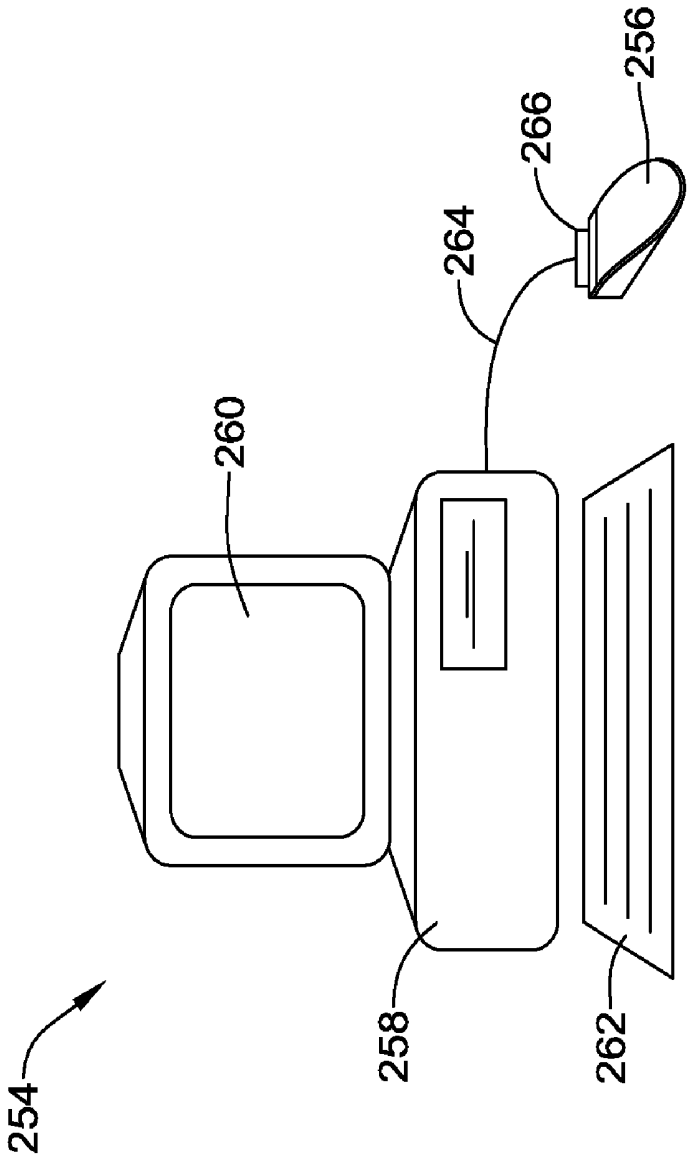


Figure 15

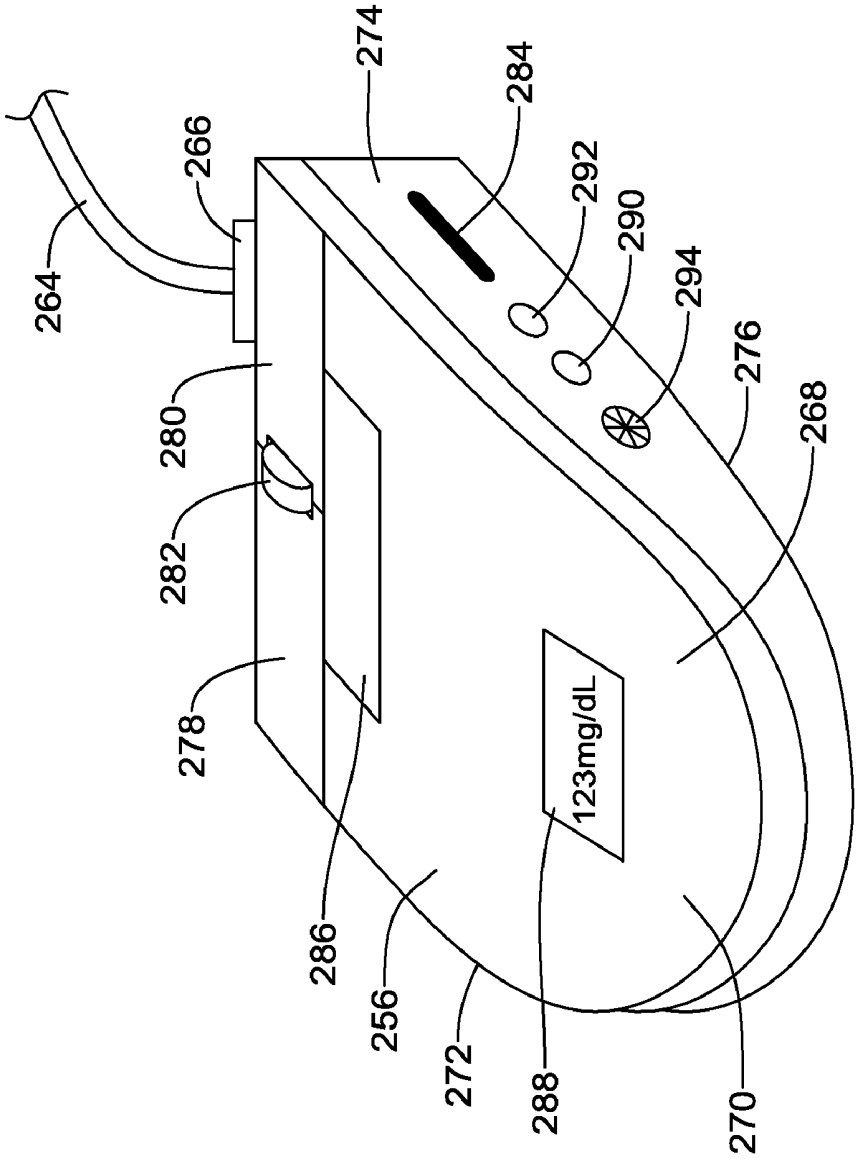

274
284
266
292
290
264
294
276
280
268
282
278
123mg/dL
286
256
272
288
270

Figure 16

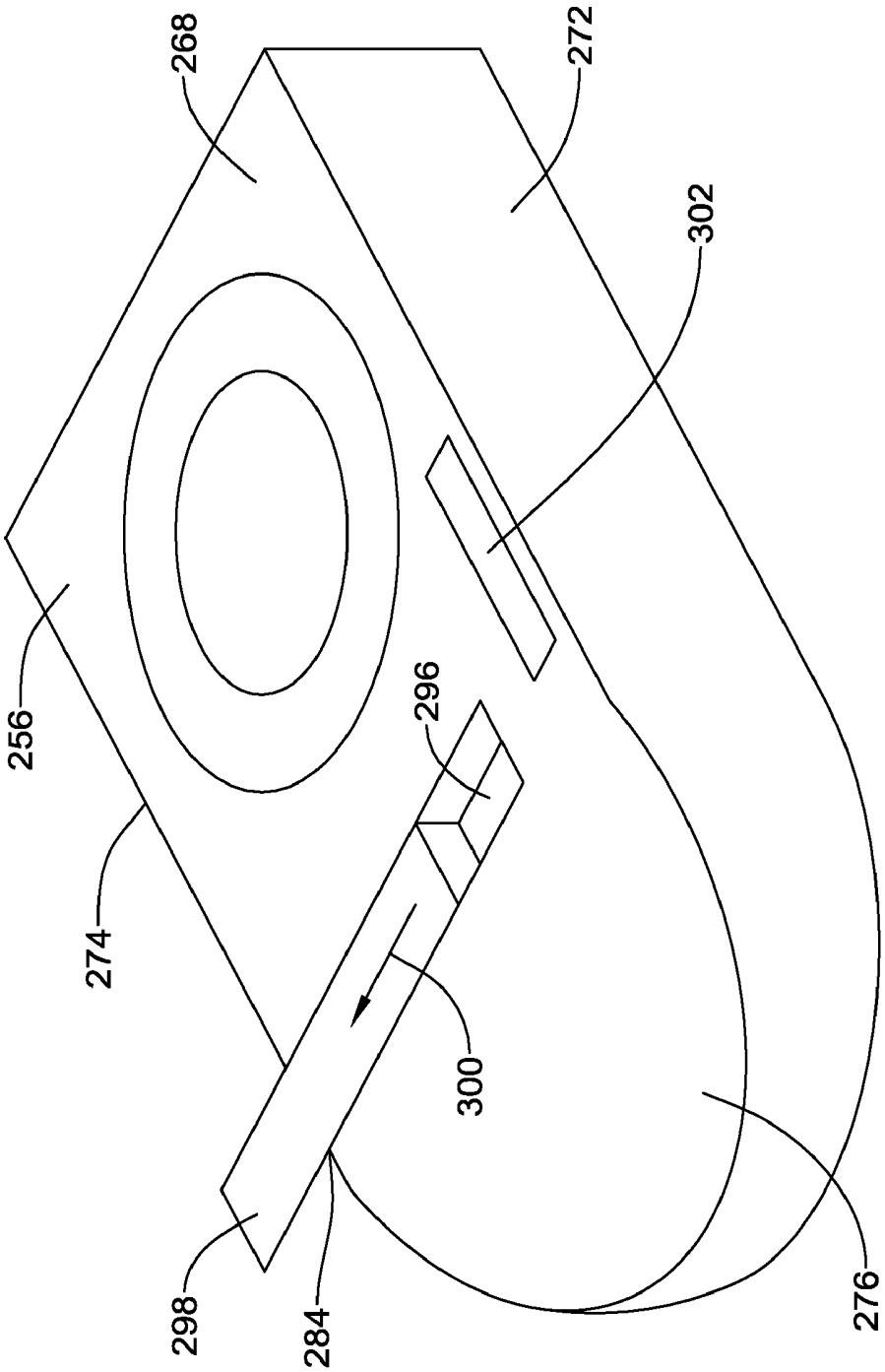


Figure 17

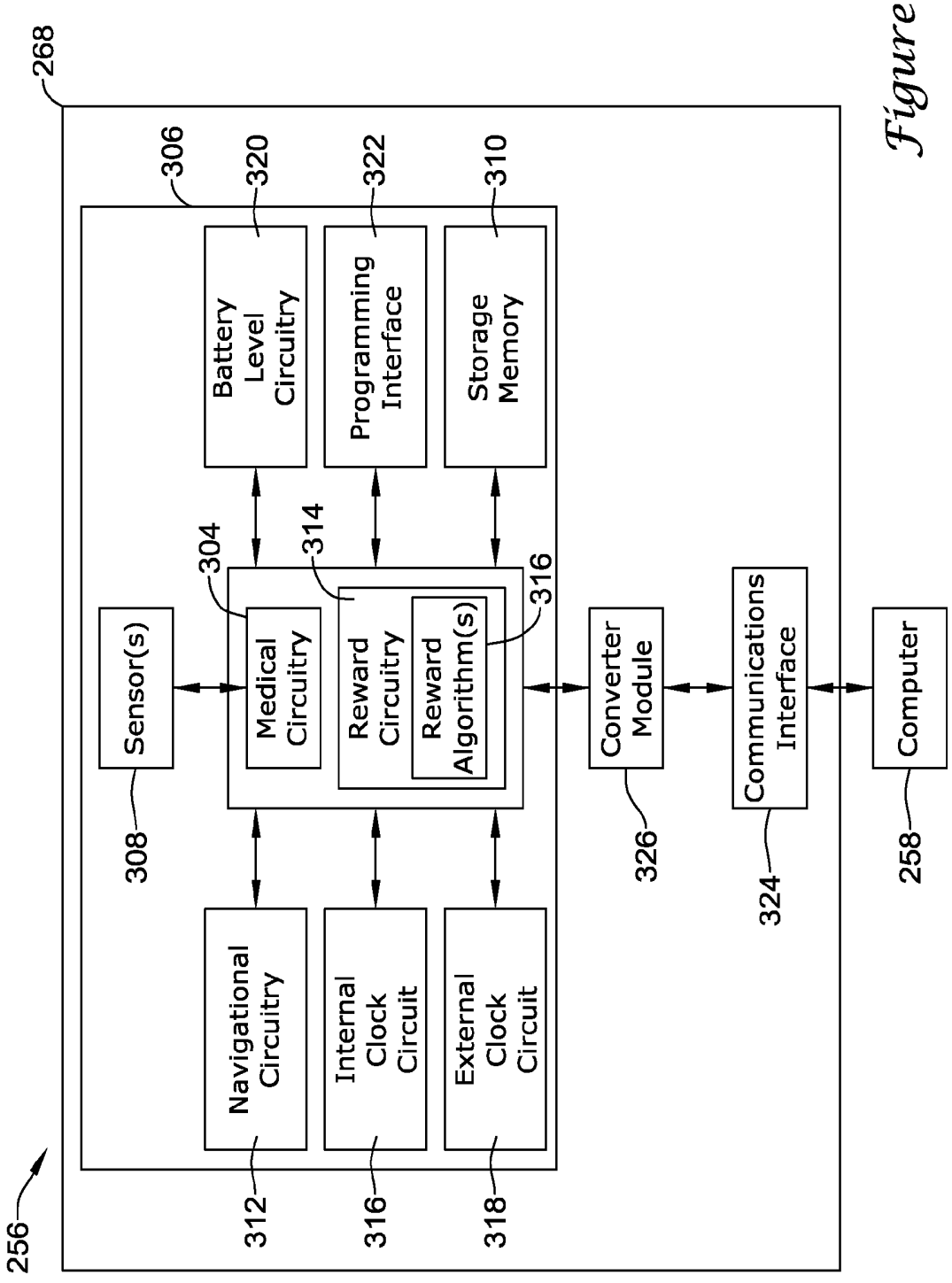

268
306
320
322
310
Battery Level Circuitry
Programming Interface
Storage Memory
304
314
316
Sensor(s)
Medical Circuitry
Reward Circuitry
Reward Algorithm(s)
Converter Module
Communications Interface
Computer
308
326
324
258
Navigational Circuitry
Internal Clock Circuit
External Clock Circuit
312
316
318
256

Figure 18

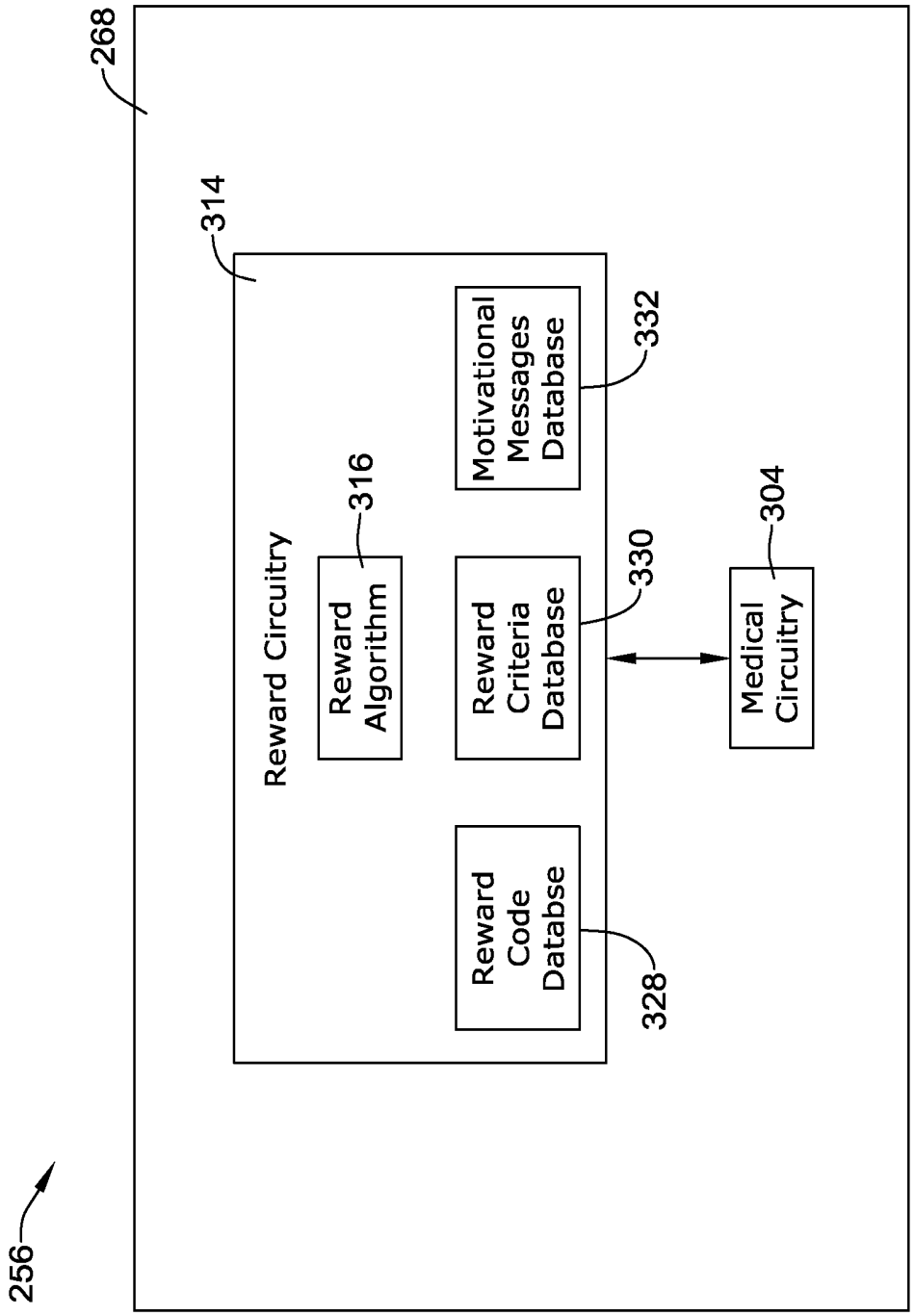

256
268
314
Reward Circuitry
Reward Algorithm
316
Reward Criteria Database
330
Reward Code Database
328
Motivational Messages Database
332
Medical Circuitry
304

Figure 19

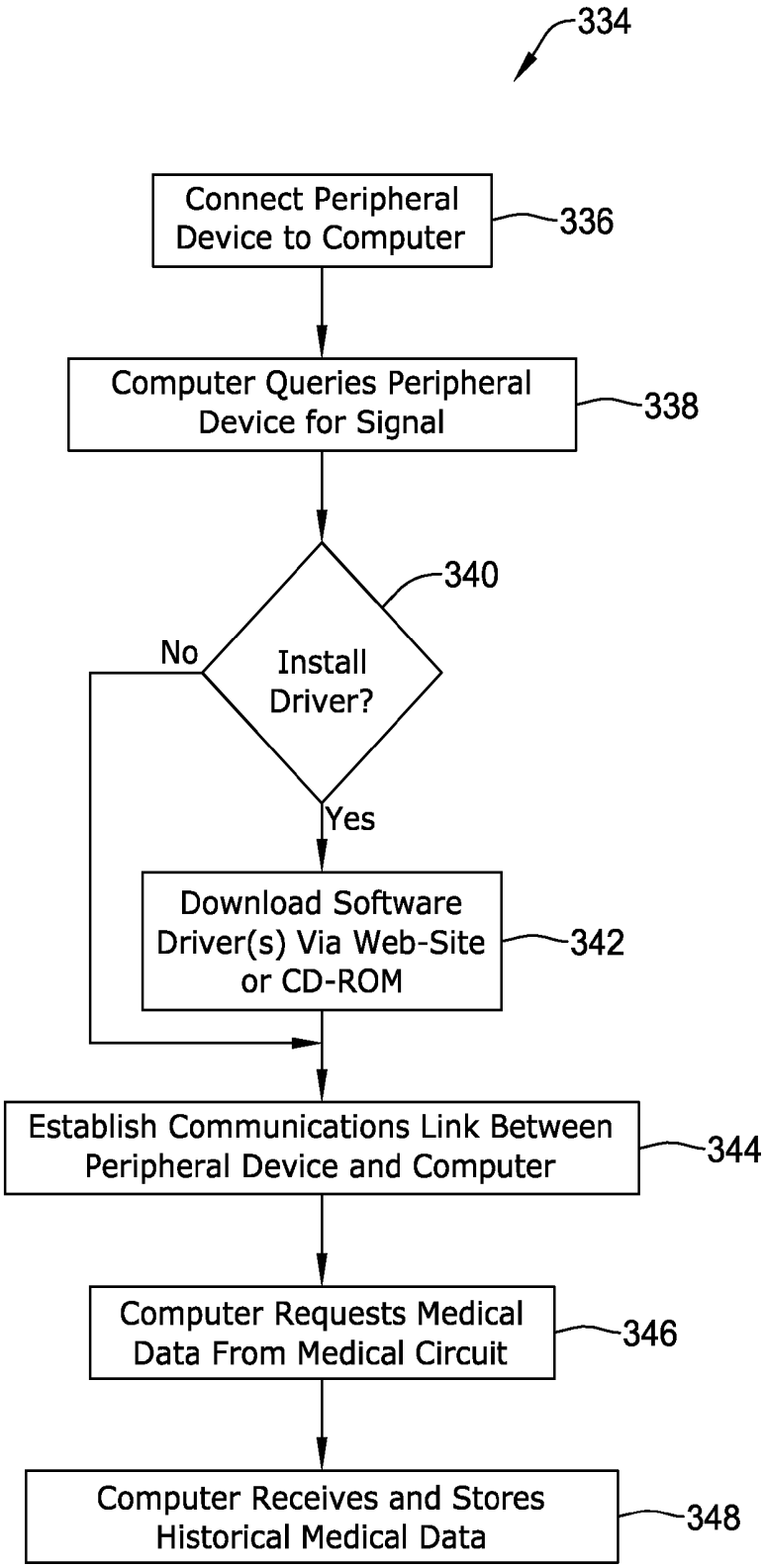

334
Connect Peripheral Device to Computer
336
Computer Queries Peripheral Device for Signal
338
340
Install Driver?
No
Yes
Download Software Driver(s) Via Web-Site or CD-ROM
342
Establish Communications Link Between Peripheral Device and Computer
344
Computer Requests Medical Data From Medical Circuit
346
Computer Receives and Stores Historical Medical Data
348

Figure 20

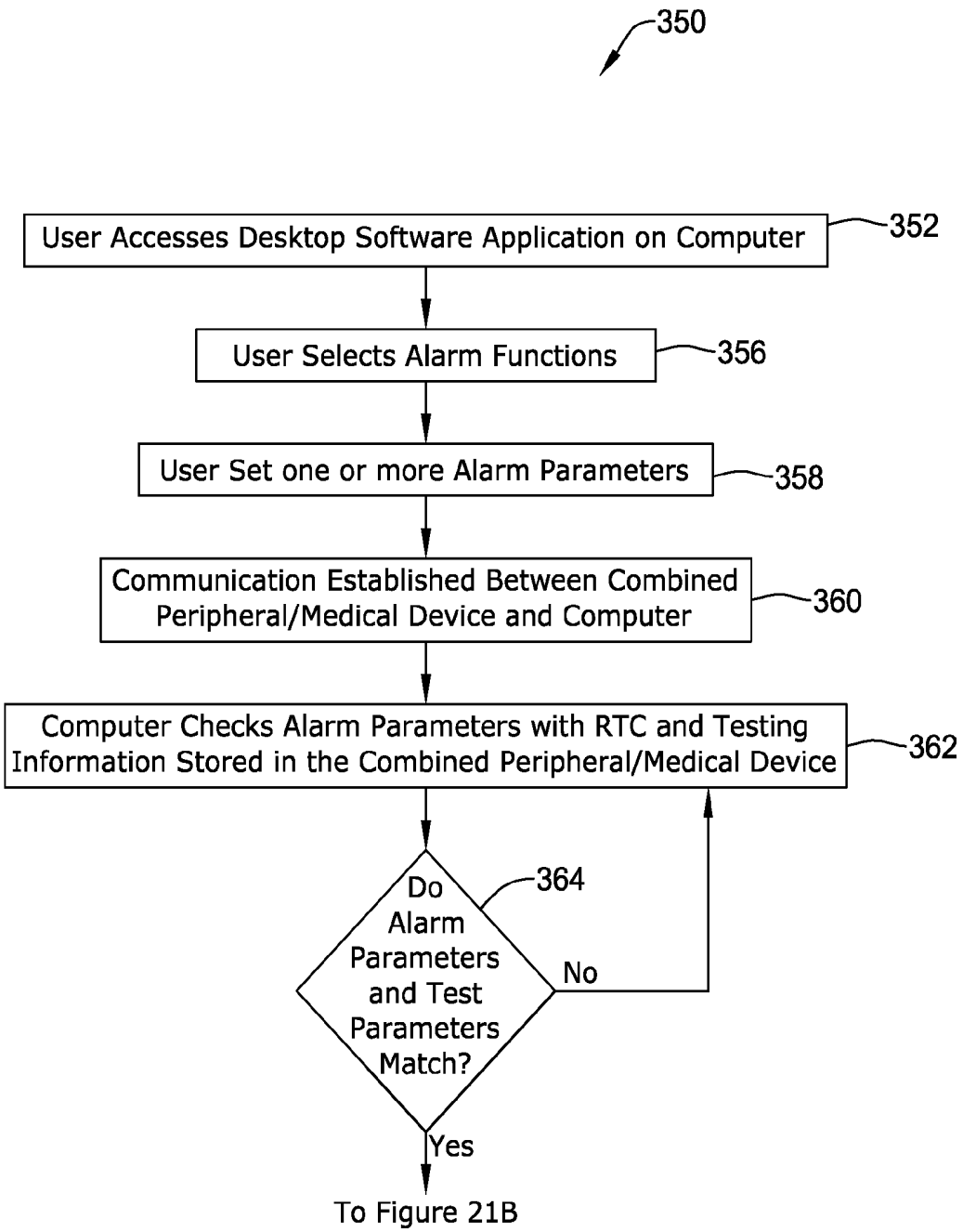

350
User Accesses Desktop Software Application on Computer
352
User Selects Alarm Functions
356
User Set one or more Alarm Parameters
358
Communication Established Between Combined Peripheral/Medical Device and Computer
360
Computer Checks Alarm Parameters with RTC and Testing Information Stored in the Combined Peripheral/Medical Device
362
Do Alarm Parameters and Test Parameters Match?
364
No
Yes
To Figure 21B

Figure 21A

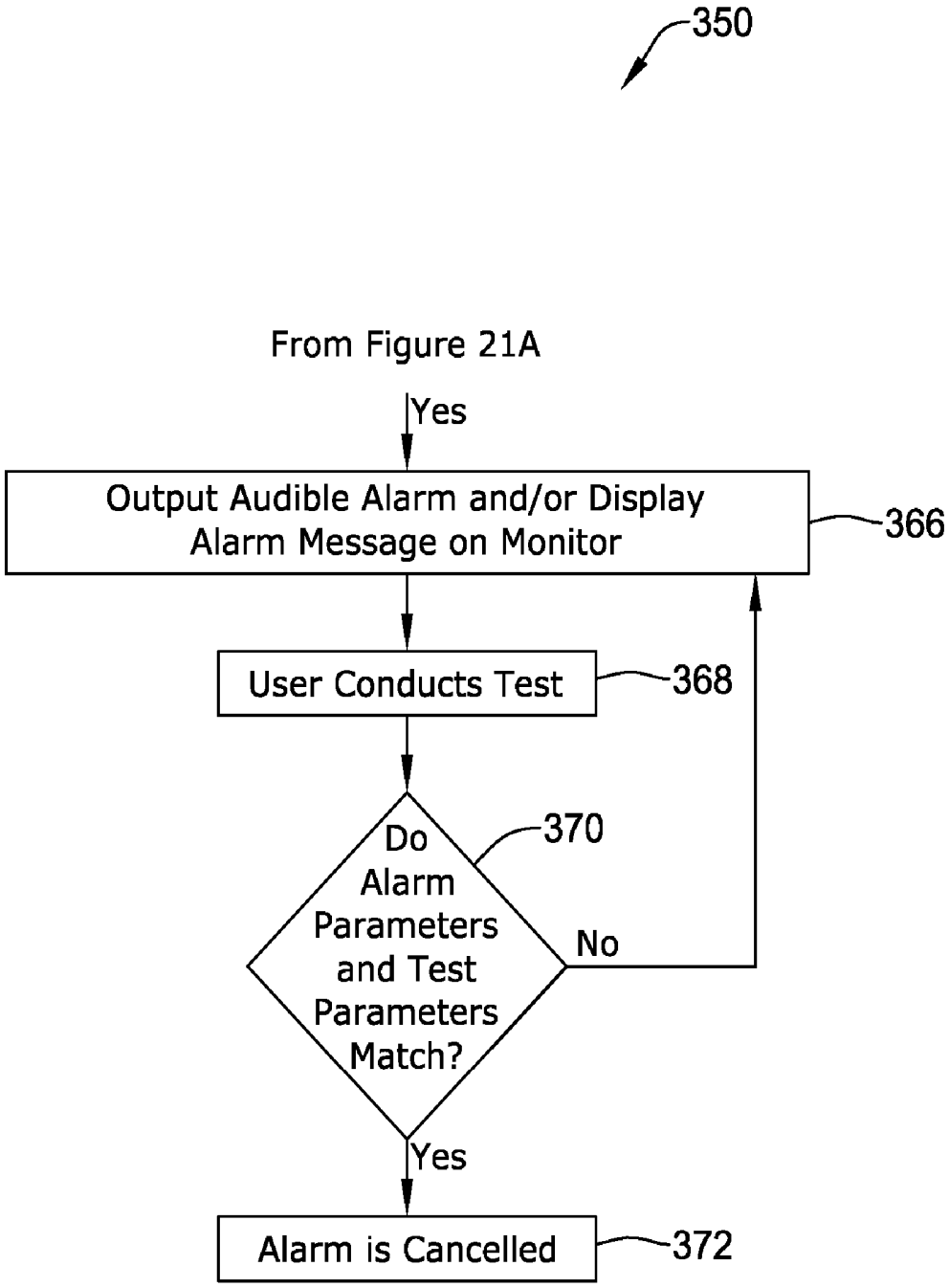

350
From Figure 21A
Yes
Output Audible Alarm and/or Display Alarm Message on Monitor
366
User Conducts Test
368
Do Alarm Parameters and Test Parameters Match?
370
No
Yes
Alarm is Cancelled
372

Figure 21B

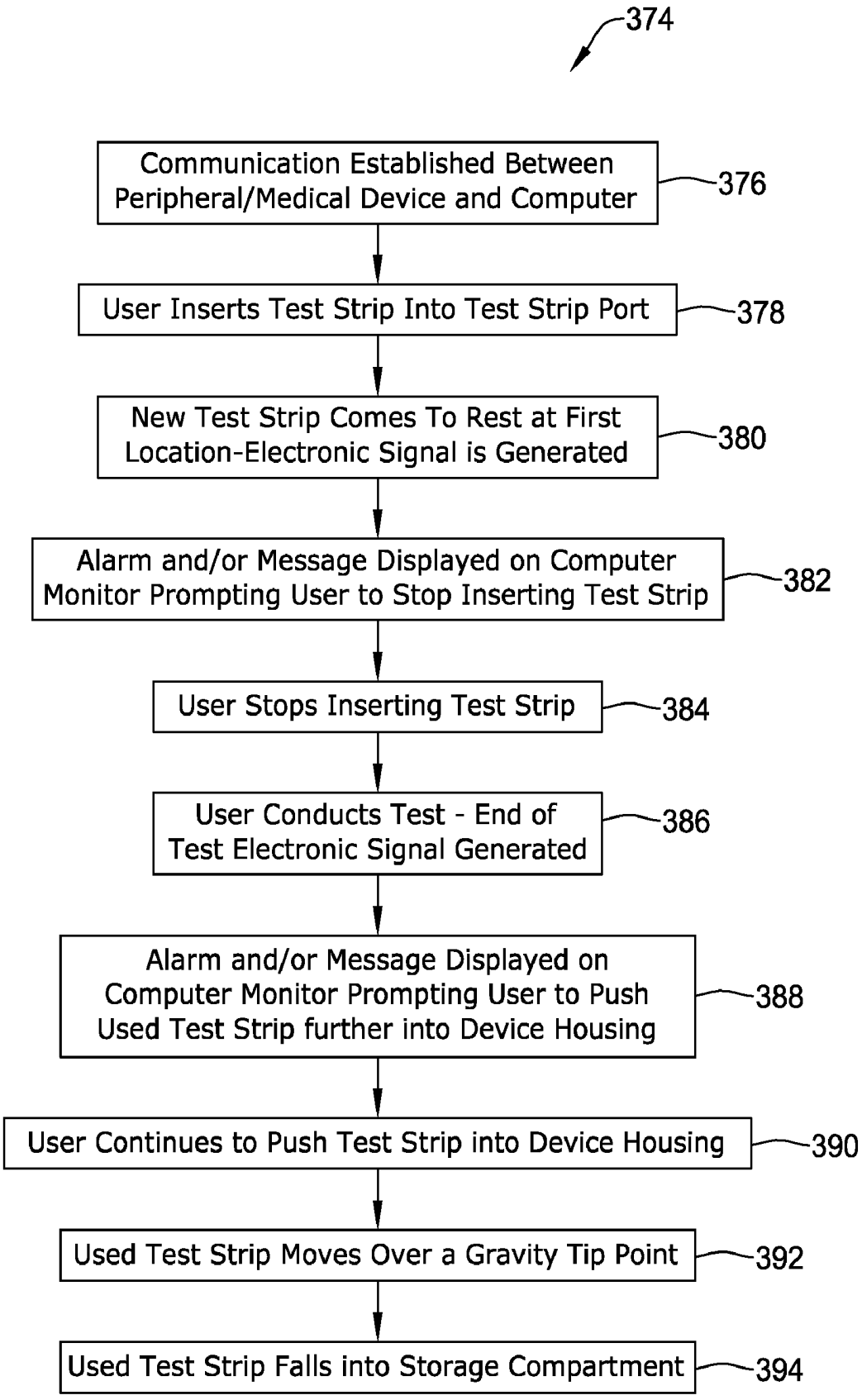

374
Communication Established Between Peripheral/Medical Device and Computer
376
User Inserts Test Strip Into Test Strip Port
378
New Test Strip Comes To Rest at First Location-Electronic Signal is Generated
380
Alarm and/or Message Displayed on Computer Monitor Prompting User to Stop Inserting Test Strip
382
User Stops Inserting Test Strip
384
User Conducts Test - End of Test Electronic Signal Generated
386
Alarm and/or Message Displayed on Computer Monitor Prompting User to Push Used Test Strip further into Device Housing
388
User Continues to Push Test Strip into Device Housing
390
Used Test Strip Moves Over a Gravity Tip Point
392
Used Test Strip Falls into Storage Compartment
394

Figure 22

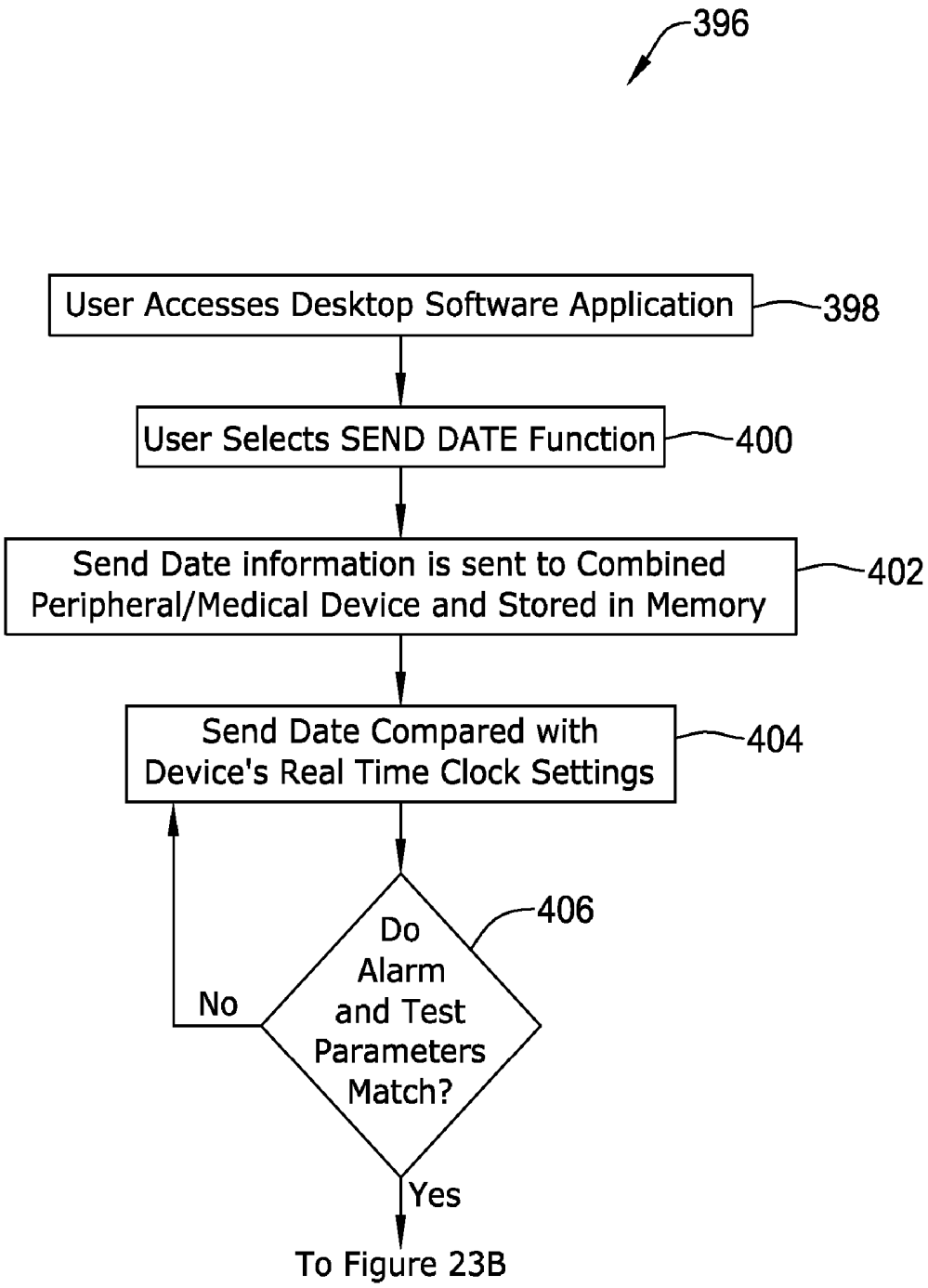

396
User Accesses Desktop Software Application
398
User Selects SEND DATE Function
400
Send Date information is sent to Combined Peripheral/Medical Device and Stored in Memory
402
Send Date Compared with Device's Real Time Clock Settings
404
Do Alarm and Test Parameters Match?
406
No
Yes
To Figure 23B

Figure 23A

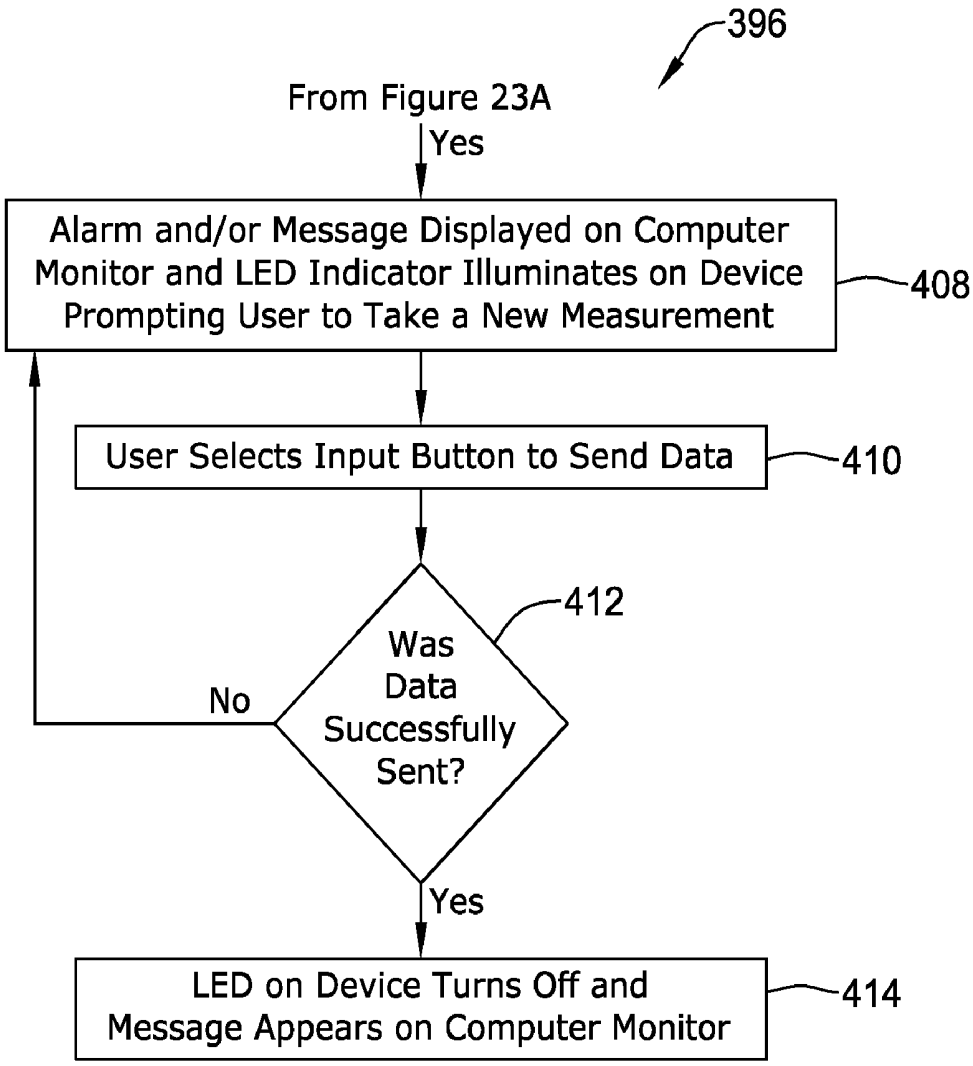

396
From Figure 23A
Yes
Alarm and/or Message Displayed on Computer Monitor and LED Indicator Illuminates on Device Prompting User to Take a New Measurement
408
User Selects Input Button to Send Data
410
412
Was Data Successfully Sent?
No
Yes
LED on Device Turns Off and Message Appears on Computer Monitor
414

Figure 23B

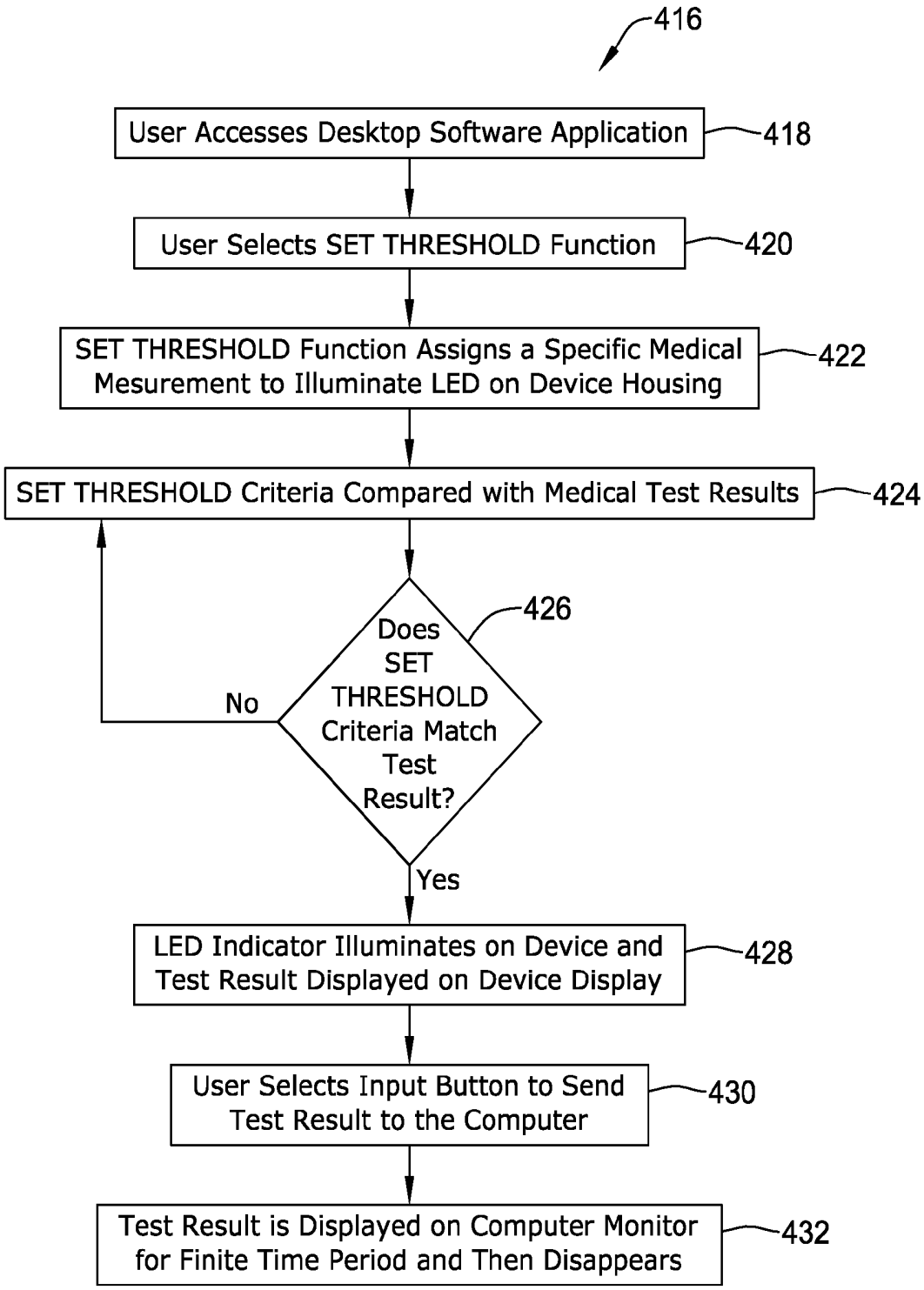

416
User Accesses Desktop Software Application
418
User Selects SET THRESHOLD Function
420
SET THRESHOLD Function Assigns a Specific Medical Mesurement to Illuminate LED on Device Housing
422
SET THRESHOLD Criteria Compared with Medical Test Results
424
Does SET THRESHOLD Criteria Match Test Result?
426
No
Yes
LED Indicator Illuminates on Device and Test Result Displayed on Device Display
428
User Selects Input Button to Send Test Result to the Computer
430
Test Result is Displayed on Computer Monitor for Finite Time Period and Then Disappears
432

Figure 24

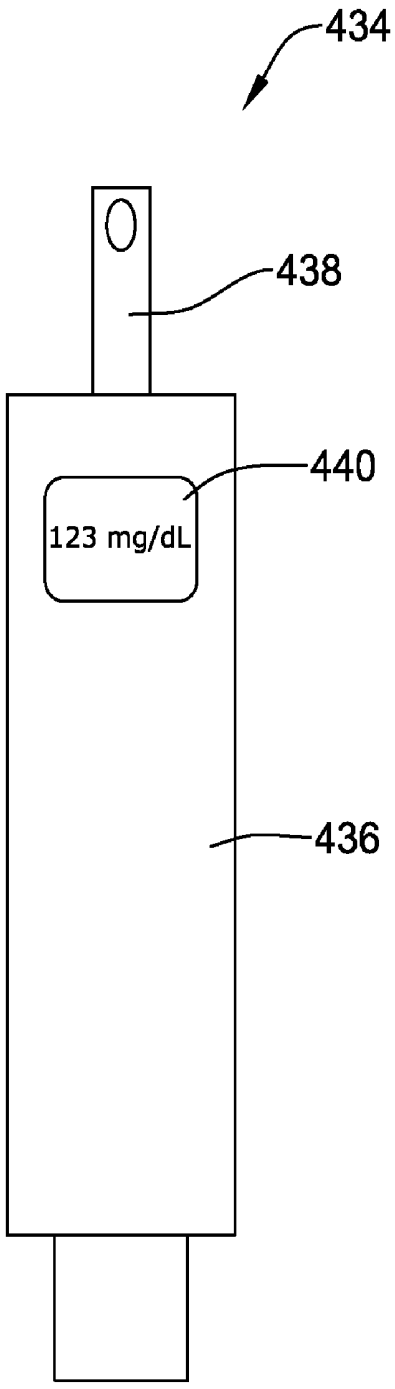


Figure 25

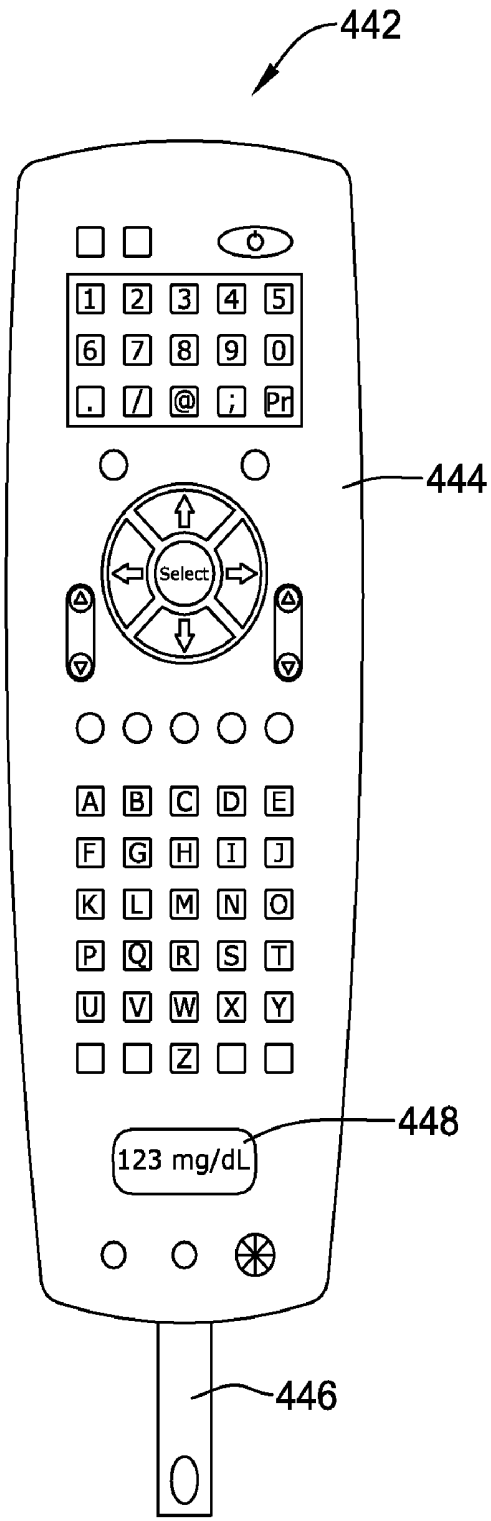

442
444
Select
1 2 3 4 5
6 7 8 9 0
. / @ ; Pr
A B C D E
F G H I J
K L M N O
P Q R S T
U V W X Y
Z
448
123 mg/dL
446

Figure 26

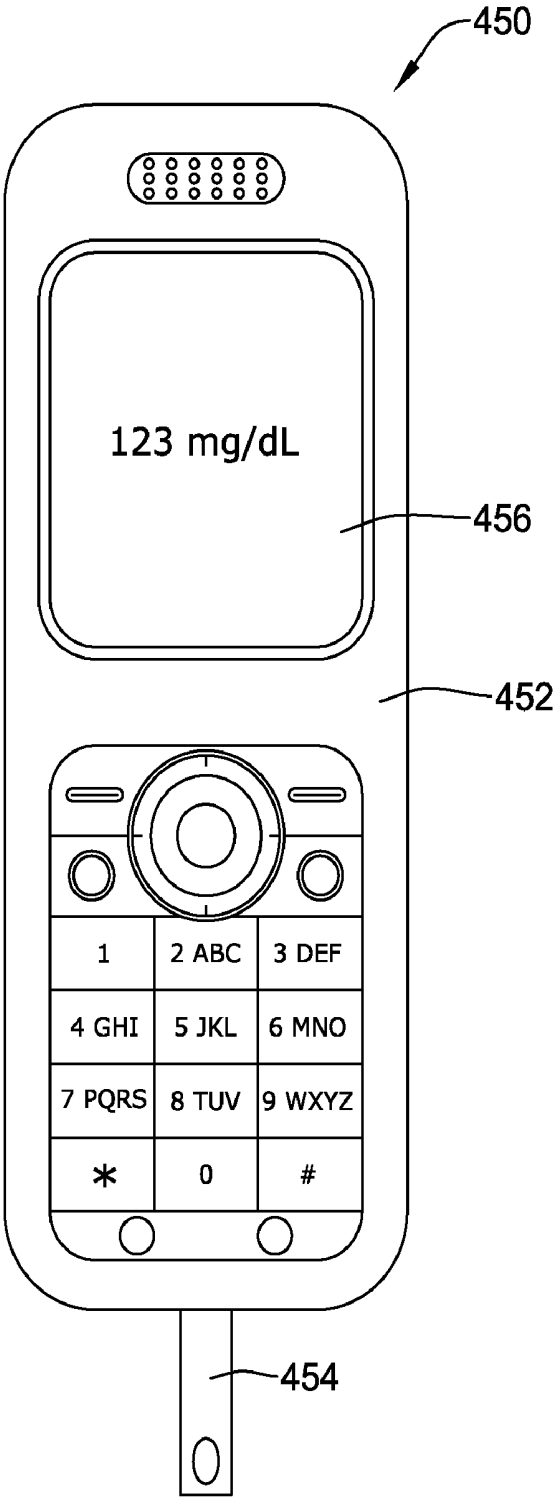

450
123 mg/dL
456
452
1
2 ABC
3 DEF
4 GHI
5 JKL
6 MNO
7 PQRS
8 TUV
9 WXYZ
*
0
#
454

Figure 27

COMBINED PERIPHERAL AND HEALTH MONITORING DEVICES

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application is a Continuation-In-Part of U.S. application Ser. No. 11/617,591, filed on Dec. 28, 2006, entitled "Programmable Devices, Systems And Methods For Encouraging The Monitoring Of Medical Parameters", which claims the benefit of U.S. Provisional Application No. 60/754,399, filed on Dec. 29, 2005, and entitled "Programmable Incentive Methods Based on Medical Parameters".

FIELD

[0002] The present invention relates generally to the field of health monitoring. More specifically, the present invention pertains to programmable health monitoring devices, systems, and methods for encouraging the monitoring of medical parameters.

BACKGROUND

[0003] The impact of diabetes-related complications on the population represents a significant portion of healthcare costs worldwide. In the United States alone, more than 18 million individuals suffer from this condition, representing approximately 6 percent of children and adults. Those that suffer from the condition are at a greater risk of cardiovascular related diseases, and typically experience a greater occurrence of amputation and loss of mobility compared to those without the condition. Other physical and psychological factors have also been attributed to diabetes. For example, individuals suffering from diabetes are often more at risk for depression and other behavioral problems. Despite advances in the field, diabetes still remains a significant problem which is expected to rise as the population ages and as more children are diagnosed with an early-onset version of the disease.

[0004] Individuals suffering from medical conditions such as diabetes are constantly required to monitor their blood sugar levels to ensure compliance with one or more goals, often under a prescribed medical plan determined by a physician or other healthcare provider. Diabetic patients, for example, are typically required to test their blood glucose levels four or more times per day to ensure that their blood sugar levels are within an acceptable range. In addition to constant monitoring, such individuals are often required to adapt a strict diet and exercise routine as well as undergo insulin therapy in order to maintain their blood sugar levels at acceptable levels.

[0005] Blood glucose monitors are frequently employed by individuals suffering from diabetes, hypoglycemia and other blood disorders to determine the amount of glucose contained in the blood stream. These meters typically function by pricking the user's skin with a lancet, and then placing a small capillary blood sample onto a test strip which can then be used by the monitor to sense the amount of glucose within the sample. Once a sample is taken, the monitor then generates a glucose value which can be displayed on a display screen in a desired format (e.g. "mmol/L" or "mg/dL") based on the user's preference. The readings outputted by the device can then be used by the individual to better manage their condition and, if necessary, take corrective action.

[0006] The monitoring of medical parameters such as blood sugar is often a time-consuming and tedious task, requiring the individual to constantly check their condition to ensure that they are in compliance with the goals of their prescribed medical plan. The desire to perform such monitoring is often counterbalanced or outweighed by the pain and inconvenience associated with such tests. For example, for diabetics who are required to test their blood sugar levels multiple times throughout the day, the desire to perform such self-testing may be reduced by the pain associated with pricking their finger with a lancet. In some cases, psychological factors such as the individual's self-esteem or the psychosocial stigma associated with performing self-tests in public may also affect the individual's desire to perform such monitoring. These physical and mental hurdles are particularly acute in children, who frequently experience diabetes burnout at an early age if not sufficiently motivated to continue with their testing regimen.

BRIEF SUMMARY

[0007] The present invention relates generally to programmable health monitoring devices, systems, and methods for encouraging the monitoring of medical parameters. An illustrative health monitoring device can include medical circuitry adapted to sense one or more medical parameters such as blood glucose or blood pressure, and reward circuitry adapted to run a reward algorithm or routine for encouraging the monitoring of one or more medical parameters by the user. The reward circuitry can include a reward criteria database containing one or more programmed goals associated with the user's medical condition. During use, the reward algorithm or routine can be configured to formulate a reward or incentive based on the user's compliance with the one or more goals as determined by the reward criteria. A communications interface can be utilized to transmit and receive reward data and/or medical data back and forth between the health monitoring device and one or more remote devices.

[0008] The health monitoring device can be equipped with a display panel including one or more display screens that can be used to display medical test data as well as various reward and motivation messages. In some embodiments, the health monitoring device can further include one or more light sources for providing the user with a visual indication of their compliance with the one or more goals determined by the reward criteria as well as any rewards or incentives that have or will be earned based on their compliance with those goals. Other status indicators such as an audible alarm outputted by a speaker or tactile feedback provided by a vibration element within the health monitoring device may also be provided to the user, if desired.

[0009] The health monitoring device can be used as part of a system for encouraging the monitoring of one or more medical parameters. In certain embodiments, for example, the health monitoring device can be connected to at least one remote device via a wired or wireless communications link, allowing various medical and/or reward data to be transmitted back and forth between the health monitoring device and each remote device. In an on-line based system, the health monitoring device can be connected to one or more websites and/or other remote devices via an Internet or intranet connection. Examples of remote devices that can be connected to the health monitoring device can include the

computer system of a remote entity such as a pharmacy, medical supply store, health clinic, health club facility, or fitness center. The remote device can also include other monitoring devices such as blood pressure monitors, blood oxygen monitors, and/or heart monitors as well as other external devices such as personal computers, laptop computers, hand-held computers, cellular telephones, pagers, television set or cable boxes, video game consoles, digital media players, and/or GPS units.

[0010] An illustrative method of providing individuals with a reward or incentive for monitoring one or more medical parameters with the health monitoring device can include the steps of receiving reward criteria data into the health monitoring device, comparing the reward criteria data against one or more stored medical parameters sensed by the health monitoring device, determining whether one or more goals of the reward criteria data have been satisfied, prompting the user to redeem one or more rewards or incentives based at least in part on their compliance with the one or more goals, and then downloading the reward or incentive into the health monitoring device and/or transmitting the reward or incentive to one or more other devices.

[0011] The health monitoring device can be integrated into another device to permit the user to perform health monitoring in addition to performing other functions. In some embodiments, for example, a combined peripheral and health monitoring device such as a computer mouse can include at least one sensor and medical circuitry that permits the monitoring of one or more medical parameters via the device. In some embodiments, the combined peripheral and health monitoring device may further include a storage memory that can store one or more sensed medical parameters along with a date and time stamp corresponding to each sensed medical parameter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. **1** is a perspective view of a health monitoring device in accordance with an illustrative embodiment;

[0013] FIG. **2** is a schematic view showing several illustrative components of the health monitoring device of FIG. **1**;

[0014] FIG. **3** is a schematic view showing the reward circuitry and medical circuitry for the health monitoring device of FIG. **1**;

[0015] FIG. **4** is a diagrammatic view of an illustrative optical system for monitoring the illumination status of the LED's used by the health monitoring device of FIG. **1**;

[0016] FIG. **5** is a flow diagram of an illustrative method of providing users with a reward or incentive for monitoring one or more medical parameters using a health monitoring device;

[0017] FIG. **6** is a flow diagram of an illustrative method of providing a reward status indicator to a user using a health monitoring device;

[0018] FIG. **7** is a flow diagram of an illustrative method of triggering a reward or incentive using the internal clock circuitry of the health monitoring device;

[0019] FIGS. **8-10** are several perspective views of the health monitoring device of FIG. **1**, showing the steps of providing a visual indicator to the user indicating that a reward or incentive has or will be earned;

[0020] FIG. **11** is a diagrammatic view showing an illustrative reward system for rewarding a user for monitoring one or more medical parameters using a health monitoring device;

[0021] FIG. **12** is a diagrammatic view showing an illustrative on-line reward system for rewarding a user for monitoring one or more medical parameters using a health monitoring device;

[0022] FIG. **13** is a diagrammatic view showing an illustrative implementation of the on-line reward system of FIG. **12**;

[0023] FIG. **14** is a diagrammatic view showing an illustrative vehicle reward system for rewarding a driver for monitoring one or more medical parameters using a health monitoring device;

[0024] FIG. **15** is a diagrammatic view showing an illustrative system for monitoring one or more medical parameters using a combined peripheral and health monitoring device;

[0025] FIG. **16** is a top perspective view of the combined peripheral and health monitoring device of FIG. **15**;

[0026] FIG. **17** is a bottom perspective view of the combined peripheral and health monitoring device of FIG. **15**;

[0027] FIG. **18** is a schematic view showing several illustrative components of the combined peripheral and health monitoring device of FIG. **15**;

[0028] FIG. **19** is a schematic view showing the reward circuitry and medical circuitry for the combined peripheral and health monitoring device of FIG. **15**;

[0029] FIG. **20** is a flow chart showing an illustrative method of initiating the combined peripheral and health monitoring device of FIG. **15** for use with a computer;

[0030] FIGS. **21**A-**21**B is a flow chart showing an illustrative method of creating an alarm for reminding a user to take a test using the combined peripheral and health monitoring device of FIG. **15**;

[0031] FIG. **22** is a flow chart showing an illustrative method of taking blood glucose measurements using the combined peripheral and health monitoring device of FIG. **15**;

[0032] FIGS. **23**A-**23**B is a flow chart showing an illustrative method of transmitting time and date information back and forth between the combined peripheral and health monitoring device and computer of FIG. **15**;

[0033] FIG. **24** is a flow chart showing an illustrative method of setting thresholds and assigning various functions to the LED's for the combined peripheral and health monitoring device of FIG. **15**;

[0034] FIG. **25** is a perspective view showing a combined peripheral and health monitoring device in accordance with another illustrative embodiment;

[0035] FIG. **26** is a perspective view showing a combined peripheral and health monitoring device in accordance with another illustrative embodiment; and

[0036] FIG. **27** is a perspective view showing a combined peripheral and health monitoring device in accordance with another illustrative embodiment.

DETAILED DESCRIPTION

[0037] The following description should be read with reference to the drawings, in which like elements in different drawings are numbered in like fashion. The drawings depict several illustrative embodiments, and are not intended to limit the scope of the invention. While the devices, systems, and methods are frequently described herein with respect to continuous blood glucose monitors, it should be understood that other medical and non-medical devices can incorporate one or more of the features described herein. Examples of other devices can include, but are not limited to, blood pressure monitors, blood oxygen monitors, heart monitors, spirometers, insulin pumps, pedometers, scales, shoes, exercise or fitness equipment, personal computers, laptop computers, hand-held computers, cellular telephones, pagers, television set or cable boxes, video game consoles, and digital media players.

[0038] Referring now to FIG. **1**, a health monitoring device **10** in accordance with an illustrative embodiment will now be described. Device **10**, illustratively a blood glucose monitor for use by a diabetic or hypoglycemic user, can include a display panel **12** for displaying various operational status and monitoring information, and a user interface **14** which can be used to enter, and in some cases program, various commands into the device **10**. The display panel **12** and user interface **14** may be inset within a housing **16** of the device **10** having a port **18** adapted to receive a test strip **20** containing a sample of blood obtained from the user. Once inserted into the port **18**, the test strip **20** can be used by the device **10** to determine the user's current glucose levels, which can then be outputted as a result (e.g. "105 mg/dL") on a display screen **22**, as shown.

[0039] The display panel **12** can include a liquid crystal display (LCD), light emitting diode (LED) panel, touchscreen, or other suitable means for displaying information to the user. In some embodiments, the display panel **12** can be configured by the user interface **14** and/or remotely by an external computing device to display both text and graphics simultaneously on the display screen **22**. Alternatively, and in other embodiments, the display panel **12** can be configured, either locally and/or remotely, to display only text characters on the display screen **22**. While only a single display panel **12** is depicted in FIG. **1**, it should be understood that multiple display panels may be utilized to display information. For example, the monitoring device **10** can include a first display panel for displaying one or more current and/or past glucose test readings obtained from the user, and a second display panel for displaying any accrued rewards or incentives the user has or will earn as a result of complying with the goals of their prescribed medical plan, as discussed further herein.

[0040] The display panel **12** can be configured to provide other information to the user, including a progression indicator **24** indicating the current charge-status of the batteries, a time indicator **26** indicating the current time, and a date indicator **28** indicating the current date. A second progression indicator **30** can also be provided on the display screen **22** indicating when a reward or incentive has or will be earned. In those embodiments in which the monitoring device **10** is a wireless device, a signal strength meter **32** may display the signal strength of the wireless connection between the monitoring device **10** and another remote device.

[0041] The user interface **14** can include a number of keys, buttons, dials and/or other means for inputting, and in some cases programming, various commands into the monitoring device **10**. A first set of buttons **34**,**36**, for example, can be utilized to set the current display mode to cause the display panel **12** to switch back and forth between a number of different display screens. Selection of button **34**, for example, can cause the monitoring device **10** to switch between a display screen which shows the user's most recent glucose reading(s), a display screen which shows one or more previously stored glucose readings or an averaged glucose reading, and a display screen that can be used to show any accrued rewards or incentives earned and/or other useful information pertinent to the user's medical condition. Selection of button **36**, in turn, can cause the monitoring device **10** to toggle the format in which the device **10** displays glucose level readings. For example, selection of button **36** can cause the monitoring device **10** to toggle between the display of glucose level readings between a "mmol/L" format and a "mg/dL" format.

[0042] A circle-wheel button **38** can be further provided to permit the user to access other display screens and/or functionality within the monitoring device **10** or an external computing device, including a setup screen that can be used to set the current date and time, to clear any previously stored glucose level readings sensed by the device **10** and/or to set various interface parameters used by the device **10** to communicate with other devices. The circle-wheel button **38** can also be utilized to access other functionality including a communications screen that can be used to view and/or send messages and other data back and forth between the monitoring device **10** and another remote device.

[0043] The monitoring device **10** can be further equipped with a speaker **40** that can be used to prompt the user to perform certain tasks as well as to aurally provide the user with information regarding their current health status. The speaker **40**, for example, can be configured to produce an audible alarm tone reminding the user to take a new glucose level reading, informing the user that a new reward or incentive has been earned, and/or prompting the user to perform some other task such as transmitting data to another device. Other audible alarm tones may also be provided warning the user that the battery level is low or alerting the user that a message has been received and is ready for viewing. In some embodiments, the speaker **40** can be used to output voice messages received by the device **10**. For example, the speaker **40** can be used to output MP3, WAV, or other such audio files received by the user's caregiver or physician educating the user about their current health status, and to provide motivational messages to encourage the user's compliance with their prescribed medical plan.

[0044] The pitch and/or volume of the alarm tones can be varied to notify the user of the importance to take action, or to differentiate between types of alerts. For example, the device **10** can be configured to output an audible alarm tone at a first pitch prompting the user to take a glucose level reading, and another alarm tone at a second, discernable

pitch informing the user that a message and/or new reward code is available for viewing. The loudness of the alarm tones may vary depending on the urgency in which action must be taken. For example, the loudness of the alarm tone outputted by the speaker **40** can be increased as the time from the user's last glucose level reading increases, thus providing the user with feedback of the urgency to take a new measurement. The time between the alarm tones can also be increased, informing the user of the urgency to take action. In some embodiments, the monitoring device **10** can be further equipped with an internal vibration element that can be used to provide the user with tactile feedback of the urgency to take measurements.

[**0045**] A number of light sources (e.g. LED's) inset within the housing **16** can be used to provide the user with status information on their compliance with the programmed goals of their prescribed medical plan as well as information on whether any rewards or incentives have or will be earned. A first array **42** of LED's within the housing **16**, for example, can provide the user with visual feedback on the user's compliance with their blood glucose monitoring. The array **42** of LED's can be arranged in a format that can be quickly and easily understood by the user. In the illustrative embodiment depicted in FIG. **1**, for example, the array **42** of LED's can include three separate LED's **44**,**46**,**48** arranged in a stop-light configuration, with the illumination of a green LED **44** used to indicate full compliance, a yellow LED **46** used to indicate that action may be needed, and a red LED **48** used to indicate that prompt action is necessary. The illumination of the green LED **44** may indicate, for example, a blood glucose level of between 80-90 mg/dL whereas the illumination of the yellow and red LED's **46**,**48** may indicate blood glucose levels of between 90-100 and 101+, respectively. Other light configurations can also be utilized to provide the user with a visual indicator of their compliance. In certain embodiments, the monitoring device **10** can be programmed to assign specific ranges to one or more of the LED's **44**,**46**,**48**. If, for example, the user desires to assign a glucose range different than the default range pre-programmed within the monitoring device **10**, the user may select the appropriate button or buttons on the user interface **14** to adjust the range.

[**0046**] A second array **50** of LED's can be provided to alert the user of any unused rewards or incentives that have or will be earned as a result of compliance with the goals of the user's prescribed medical plan. The second array **50** of LED's can include, for example, a first LED **52** for informing the patient whether they have any rewards which have not been claimed, and a second LED **54** that can be used to inform the user whether a reward or incentive is forthcoming. The first LED **52**, for example, can be illuminated when the user has received a new reward code as a result of successfully monitoring their blood glucose levels for a pre-determined period of time. The second LED **54**, in turn, can be illuminated when a new reward or incentive is impending based on the user's compliance with various reward criteria programmed within the monitoring device **10**.

[**0047**] The appearance and/or blink rate of the LED's **52**,**54** can be altered to further indicate the status of any rewards or incentives earned. For example, the first LED **52** can be configured to output a first color (e.g. green) indicating that a reward code or incentive has been earned whereas the LED **52** can be configured to output a different color (e.g. red) indicating that a reward or incentive has not been earned. Alternatively, and in other embodiments, the blink rate of the LED **52** may be adjusted depending on the number of unused reward codes or incentives that have been earned. For example, the LED **52** may blink once indicating that one unused reward code or incentive has been earned, twice indicating that two unused reward codes or incentives have been earned, and so forth. The appearance and/or blink rate of the second LED **54** can be similarly adjusted to provide the user with an indication of when an upcoming reward or incentive will be earned. For example, the blink rate of the second LED **54** can be made proportional to the time remaining for the next reward or incentive to be earned.

[**0048**] An external communications port **55** can be utilized to connect the monitoring device **10** to an external computing device such as a personal computer, laptop computer, hand-held computer, cellular telephone video game console, or digital media player. In certain embodiments, for example, the external communications port **55** may be utilized to connect the monitoring device **10** to another monitoring device such as a blood pressure monitor, allowing the user to transmit and/or receive data back and forth between the two monitoring devices. In some cases, the external communications port **55** may permit other devices such as a printer to be connected to the monitoring device **10**, if desired.

[**0049**] FIG. **2** is a schematic view showing several components of the health monitoring device **10** of FIG. **1**. As can be seen in FIG. **2**, the monitoring device **10** can include reward circuitry **56** electrically connected to a number of other components located on a circuit board **58** within the device housing **16**. An internal clock circuit **60** can used to maintain the current time and date as well as for timing the duration between glucose level readings. The clock circuit **60** can be configured to provide a date and time stamp for each glucose level reading, which can be stored along with the reading within a storage memory **62** such as a RAM, EEPROM, or flash memory. In use, the clock circuit **60** can be used determine the type and/or frequency of rewards or incentives provided to the user. For example, the clock circuit **60** can be used to produce a particular reward on the user's birthday or if the user promptly performed a reading every four hours as required by their prescribed medical plan.

[**0050**] An external clock interface **64** can be used to synch the time and/or date of the monitoring device **10** with another external timing device **66**, if desired. For example, in some embodiments the external clock interface **64** can be used to synch the monitoring device **10** with the timer of another monitoring device such as a heart monitor, blood pressure monitor, blood oxygen monitor, spirometer, or insulin pump. In some cases, the external clock interface **64** can be used to obtain the time and date automatically from a remote source such as from a radio signal.

[**0051**] The external clock data received via the external clock interface **64** can be compared against the time and date maintained by the internal clock circuit **60** to determine the user's behavioral compliance patterns for their prescribed medical plan. In some embodiments, for example, the external clock data can be used to determine trends associated with the user's monitoring of their medical parameters. If,

for example, the user is habitually late in performing their testing regimen at a particular time of the day such as in the evening, the external clock data can be compared against the date and time stamps associated with their past readings to determine an alternative time to perform such tests.

[0052] A battery level circuit **68** can be used to monitor the level of the batteries used to power the monitoring device **10**. The battery level circuit **68**, for example, can measure the charge of the batteries and output a message or status indicator (e.g. via the progression indicator **24** on the display screen **22**) notifying the user that the batteries are low and require replacement or recharging. In some embodiments, the battery level circuit **68** may further output a message or status indicator informing the user that the batteries are being recharged when rechargeable batteries are used.

[0053] A GPS circuit **70** can be configured to receive a global positioning signal (GPS) that can be used to track the location of the monitoring device **10**. In some embodiments, for example, the GPS circuit **70** can be used to monitor whether the user is out of range from receiving healthcare from their healthcare provider, or is located near a store where medical supplies can be purchased. For example, the signals received by the GPS circuit **70** can be utilized in conjunction with mapping software and/or hardware to provide the user with directions to the closest medical supply store for purchasing needed supplies. In some cases, the GPS circuit **70** can be used to notify the user where to redeem a reward or incentive that has been earned as a result of their compliance with the goals of their prescribed medical plan.

[0054] An external programming interface **72** can be used to connect the monitoring device **10** to an external user interface **74** to permit the user to interact with, and in some cases program, the device **10** from a remote location and/or via another device. For example, in some embodiments the external programming interface **72** can be used to program the monitoring device **10** from a keyboard, keypad, or other suitable means for inputting data to the device **10**. In some cases, the external programming interface **72** may permit reward codes to be programmed into the device **10** by the manufacturer of the device **10**, or by the user's healthcare provider, insurance provider, or caregiver. The external programming interface **72** may permit either wired or wireless transmission of programming data via either a bidirectional or asynchronous port.

[0055] The monitoring device **10** can further include a communications interface **76** that can be used to transmit and receive various commands and data back and forth between one or more external devices **78,80,82** in communication with the device **10**. Examples of external devices that can be connected to the monitoring device **10** via the communications interface **76** can include, but are not limited to, personal computers, laptop computers, hand-held computers (e.g. PDA, BLUETOOTH, PALM-PILOT), cellular telephones, pagers, television set or cable boxes, video game consoles, digital media players (e.g. IPOD, MP3 or MPEG players), point of sale devices, bar code readers, and vehicle controllers. Other healthcare devices such as blood pressure monitors, blood oxygen monitors, heart monitors, spirometers, insulin pumps, and pedometers can also be connected to the monitoring device **10** via the communications interface **76**, if desired. In some cases, the communications interface **76** may permit other devices such as a printer to be connected to the monitoring device **10**, allowing test data and reward information to be printed.

[0056] Connection between the communications interface **76** and the external devices **78,80,82** can be accomplished via a wired communications link such a USB cable, IEEE394 cable, Ethernet cable, serial (e.g. RS232) cable, parallel cable, or optical cable. Connection to the external devices **78,80,82** can also be accomplished with a wireless communications link such as via an RF signal (e.g. 802.11a, 802.11b, 802.11g, Bluetooth, Zigbee, etc.) or infrared signal (e.g. IRDA). In some embodiments, connection to one or more of the external devices **78,80,82** can be accomplished via the Internet through a dial-up connection, DSL connection, cable broadband connection, or the like. A converter module **84** can be used to convert and, in some cases encrypt, data sent back and forth over the connection lines. For example, the converter module **84** can be used to convert glucose level readings into a different and more secure format that can then be transmitted and deciphered by another device in communication with the monitoring device **10**.

[0057] The reward circuitry **56** can be configured to run one or more reward algorithm or routines **86** that can be used to monitor the user's progress in monitoring their glucose levels and formulate rewards or incentives based on the user's compliance with reward criteria programmed within the monitoring device **10**. As can be further seen in FIG. **3**, the reward circuitry **56** can include a reward code database **88** such as a look-up table containing one or more reward codes that can be provided when the user satisfies one or more reward criteria from a reward criteria database **90**. For example, for diabetic users, the reward circuitry **56** can be internally or externally configured to provide the user with one or more reward codes when the user successfully completes a series of glucose level readings on-time, when the user's glucose levels are maintained within a certain range for a period of time, or other such goal. The reward codes contained within the reward code database **88** can be provided as bar codes, alpha numeric characters, hexadecimal characters, or other type of encrypted code. In use, the reward algorithm or routine **86** can be configured to perform various computational functions to determine whether the user's monitoring of one or more medical parameters satisfies the reward criteria programmed within the database **90**.

[0058] The reward circuitry **56** can further include a motivational messages database **92** containing a number of motivational messages that can be used to encourage patient compliance with the goals of their prescribed medical plan. In certain embodiments, for example, the reward circuitry **56** can be configured to generate motivational messages triggered based on the user's compliance with the reward criteria, which can then be displayed on the display screen as a text message and/or graphic or outputted from the speaker as an audible message. The reward circuitry **56** can be configured to output motivational messages at certain times of the day and/or in response to the user's behavioral patterns. For example, if the reward circuitry **56** determines that the user is one hour past due in taking a glucose level reading, the reward circuitry **56** may display one or more motivational messages on the display screen encouraging the user to take a measurement.

[0059] Other types of messages may also be stored within the database **92**, which can then be provided based on the user's compliance with the reward criteria, the user's personal information, as well as other factors. For example, and in some embodiments, the database **92** may also contain promotional advertising messages or special offers that can be provided to the user based on criteria programmed within the monitoring device **10** and/or criteria provided by another external computing device in communication with the monitoring device **10**. In one illustrative embodiment, advertising messages may be pre-programmed within the monitoring device relating to a particular retailer's products. In exchange for such advertising, the retailer can be assessed a sponsorship fee.

[0060] The reward circuitry **56** can be optically isolated from the medical circuitry **94** or can be formed integrally therewith. During operation, the medical circuitry **94** can be configured to transmit medical data to the reward circuitry **56** via a communications link **96**, which can then be received and stored within the memory along with a date and time stamp corresponding to the date and time the measurements were taken. The reward circuitry **56** containing the reward codes, reward criteria, and motivational messages can be implemented as either hardware and/or software, and can be programmed via the on-board user interface, the external user interface, an external device such as a computer, and/or via the Internet. In some embodiments, the reward codes, reward criteria, promotional and motivational messages can be pre-programmed at the factory, at a servicing kiosk, or other such location. Programming of the reward codes, reward criteria, and motivational messages can be accomplished via a wireless or wired connection, remotely or locally, by setting a dip switch, or by other means.

[0061] In some embodiments, the reward circuitry **56** can be configured to convert reward codes to another format. For example, the reward circuitry **56** can be configured to take reward codes provided as an alphanumeric message and convert that message into another electronic format such as an audible message, a printer file, etc. Conversion of the reward codes can be accomplished, for example, using the converter module **84** described above with respect to FIG. **2**, although other means for converting the codes are possible. In some cases, the reward circuitry **56** may permit multiple reward codes to be combined together for redemption, if desired.

[0062] FIG. **4** is a diagrammatic view of an illustrative optical system **98** for self-checking the illumination status of the LED's used by the health monitoring device **10**. As shown in FIG. **4**, the monitoring device **10** may further include a separate controller **100**, or multiple controllers, in communication with each of the LED's **44,46,48**. The controller **100**, may comprise, for example, a part of the reward circuitry **56** or medical circuitry **94** adapted to send signals to each of the LED's **44,46,48**, causing them to illuminate in a desired manner based on computations made by the reward algorithm or routine **86**.

[0063] To provide a level or redundancy to the system **98** in the event one or more of the LED's **44,46,48** burns out or otherwise becomes inoperable, an optical detector **102,104, 106** located adjacent to each LED **44,46,48** can be configured to send a signal back to the controller **100** informing the controller **100** of the illumination status of each of the LED's **44,46,48**. For example, the optical detectors **102,104,106** may send signals back to the controller **100** indicating whether the LED's **44,46,48** are currently illuminated when activated. In some embodiments, the optical detectors **102, 104,106** can be configured to sense other information such as the wavelength of light outputted by the LED's **44,46,48** to determine whether the LED's **44,46,48** are functioning properly. The optical detectors **102,104,106** can be separate components from the LED's **44,46,48**, or can be formed integrally with the LED's **44,46,48**. Although optical detectors **102,104,106** can be utilized to sense whether the LED's **44,46,48** are functioning properly, it should be understood that other suitable means for checking the operational status of the LED's **44,46,48** may also be employed, if desired.

[0064] The comparison of the illumination status of the LED's **44,46,48** can be accomplished using a single controller or multiple controllers. When multiple controllers are employed, the monitoring information obtained by each controller can be compared against each other to determine whether the LED's are not functioning properly. If the status of the LED's is the same, an acceptable monitoring condition exists. When a single controller is employed, four inputs can be provided to the controller for each LED and corresponding sensor. For example, a first input pin of the controller can receive a first set of inputs from the LED and sensor whereas a second input pin of the controller can receive a second set of inputs from the LED and sensor. The controller can then compare the first set of inputs against the second set of inputs to determine whether an acceptable monitoring condition exists.

[0065] Referring now to FIG. **5**, an illustrative method **108** of providing users with a reward or incentive for monitoring one or more medical parameters using a health monitoring device will now be described. The method may begin generally at block **110**, with the step of obtaining reward data from an external source. Step **110** may include, for example, the process of downloading reward criteria data and/or one or more reward codes from a web-site or from another external device in communication with the monitoring device. In those embodiments in which the monitoring device is a blood glucose monitor, for example, the reward criteria may include one or more goals associated with the user's prescribed medical plan such as the lowering of blood pressure, increasing exercise levels, lowering blood sugar levels, etc. The reward data can further include one or more reward codes that can be used to reward the user for taking a number of glucose level readings within a certain period of time and/or for maintaining their glucose levels within a certain range. The reward criteria and reward codes will typically vary depending on the patient's particular medical condition, the type of monitoring device, the patient's gender and age, as well as other factors.

[0066] Once the monitoring device has obtained the reward criteria data at step **110**, the monitoring device may next compare the reward criteria data against historical monitoring data previously obtained by the device, as indicated generally by block **112**. In certain embodiments, for example, the comparison step **112** can include the step of comparing a glucose monitoring schedule containing the times and dates in which glucose levels are to be checked against one or more previously obtained glucose level readings stored within memory. Such step may be performed, for example, by the reward circuitry and/or from an

external device in communication with the monitoring device. A date and time stamp may be provided in conjunction with the user's previously stored test data in order to compare the reward criteria with the actual measurements. The date and time stamp can be provided, for example, by the monitoring devices' internal clock or via an external source. In use, the internal or external clock can be used by the reward circuitry to determine the proper time to release the reward codes.

[0067] If at decision block **114** the reward circuitry determines that at least one goal of the reward criteria has been met, the monitoring device can be configured to provide the user with a reward indicator informing the user that a reward or incentive has been earned, as indicated generally by block **116**. For example, if the user successfully maintains their glucose levels within a certain range for a predetermined period of time such as a week, the monitoring device can be configured to output a reward indicator **116** informing the user that they have achieved one of their goals. The reward indicator provided at step **116** may be in the form of a visual alert provided on the display screen of the monitoring device and/or an audible alert outputted by the speaker informing the user that they have earned a reward or incentive. In some embodiments, the visual alert may also be presented on the display screen of an external computing device. Tactile feedback (e.g. produced by an internal vibration element within the monitoring device) may also be provided notifying the user that a reward or incentive has been earned. An illustrative method of providing a visual alert to a user upon receiving a reward or incentive is described herein with respect to FIGS. **8-10**.

[0068] If at decision block **114** the reward circuitry determines that the user has not successfully satisfied the reward criteria, the monitoring device may continue the step **112** of comparing the reward data against the user's historical data until the user satisfies one of the goals from the reward criteria, as indicated generally by arrow **118**.

[0069] Once the user is notified of an earned reward, the monitoring device may further prompt the user to redeem the reward or incentive, as further indicated generally by block **120**. For example, the monitoring device may output a message on the display screen informing the user that a reward has been earned along with instructions on how to redeem that reward. Once prompted, the user may then follow the instructions on the display screen, causing the monitoring device to connect to an external device, if necessary, in order to download a reward code, as indicated generally by block **122**. For example, if at step **120** the monitoring device provides a URL address in which to redeem an earned reward, the user may then visit the web-site using either the monitoring device or some other external device in order to redeem the reward or incentive. As indicated generally by block **124**, the user may then download the reward or incentive into the monitoring device and/or transmit the reward or incentive to another device. For example, the reward or incentive may be outputted to the display screen of a personal computer or hand-held computer as a pop-up advertisement. In some cases, the monitoring device may also track the time in which the reward was downloaded and/or redeemed.

[0070] Once the user has redeemed the reward or incentive, the monitoring device may then prompt the user to clear that reward or incentive from memory, as indicated generally by block **126**. For example, and in some embodiments, the reward or incentive can be cleared manually by selecting one or more buttons on the user interface or by removing the batteries. In other embodiments, the internal clock within the monitoring device may be used to automatically determine when a reward or incentive is to be cleared. For example, the monitoring device may automatically delete the reward code after a certain period of time (e.g. one week) has elapsed, or when the reward code has been redeemed. The reward data can then erased from memory, as indicated generally by block **128**.

[0071] FIG. **6** is a flow diagram of an illustrative method **130** of providing a reward status indicator to a user using a health monitoring device. Method **130** may represent, for example, several illustrative steps to be performed in conjunction with block **116** described above with respect to FIG. **5**. As shown in FIG. **6**, the method **130** may begin generally at block **132** when the reward circuitry for the monitoring device determines that a reward or incentive has been earned by the user. Determination that a reward has been earned can be accomplished, for example, in a manner similar to that described above with respect to blocks **112** and **114** in FIG. **5**, wherein the monitoring device compares the reward criteria data obtained from an external source and stored or from predetermined reward criteria stored within the monitoring device and then compares that data against historical monitoring data obtained by the device.

[0072] Once the monitoring device determines that one or more goals from the reward criteria have been met, the device can be configured to output a visual indicator notifying the user that a reward or incentive has been earned, as indicated generally by block **134**. For example, at block **134** the monitoring device may provide a text message on the display screen of the monitoring device indicating that a reward or incentive has been earned. In some embodiments, for example, the monitoring device may alternate between displaying the user's most recent glucose level on the screen with a text message stating that a reward or incentive has or will be earned. In addition, one or more light sources may be illuminated on the monitoring device informing the user that the reward or incentive has or will be earned. For example, with respect to the illustrative monitoring device **10** described above with respect to FIG. **1**, the LED's **52**,**54** may illuminate or change color in a particular manner notifying the user that a reward or incentive has been earned or is about to be earned.

[0073] As further indicated generally by block **136**, the monitoring device may further output an audible alert or audible message informing the user that a reward or incentive has been earned. In certain embodiments, for example, the monitoring device may output an audible beep or tone from the speaker that can be distinguished from other alarm tones outputted by the device. A computer-simulated voice may further notify the user that a reward has been earned along with instructions on how to redeem that reward.

[0074] Other means for notifying the user that a reward or incentive has been earned may also be provided by the monitoring device. For example, and as indicated generally by block **138**, the monitoring device can be configured to vibrate for a period of time, providing the user with tactile feedback that a reward or incentive has been earned. The

monitoring device can also be configured to send an email message or instant message to another external device such as a computer or cellular telephone, as indicated generally by block **140**. For example, the communications interface for the monitoring device can be used to send an email to user-specified email address and/or an SMS message to the user's cell phone, allowing the user to view, and in some cases redeem, the earned reward or incentive via the Internet or through the user's cell phone service provider.

[**0075**] FIG. **7** is a flow diagram of an illustrative method **142** of triggering a reward or incentive using the internal clock circuitry of the health monitoring device. The method **142** may begin generally at block **144**, in which the monitoring device receives on or more test results from the user. Block **144** may represent, for example, the step of obtaining one or more glucose level readings by inserting test strips into the monitoring device, or the step of taking one or more blood pressure readings using a blood pressure cuff. The test results received at block **144** will typically vary, however, depending on the type of monitoring device employed.

[**0076**] As each test reading is received and processed by the monitoring device, a date and time stamp corresponding to each test result can be transmitted to the medical circuitry and stored along with the medical data corresponding to each test reading, as indicated generally by block **146**. The medical circuit may then send the date and time information for one or more of the test results back to the reward circuitry, as indicated generally by block **148**. The reward circuitry may then store the date and time data for each test result into memory, as indicated generally by block **150**.

[**0077**] At decision block **152**, the reward circuitry may then determine whether the date and time data is accurate. Determination of the accuracy of the date and time data can be accomplished, for example, by comparing the date and time data of the actual test results with an external clock source used to synch the internal clock. If at block **152**, the reward circuitry determines that the date and time stamps are not accurate, the reward circuitry may then reset the date and time data, as indicated generally by block **160**. The process of receiving user input at block **144** can then be repeated, as indicated generally by arrow **156**. If at decision block **152**, however, the reward circuitry determines that the date and time data is accurate, the monitoring device can be configured to initiate the reward algorithm, as indicated generally by block **158**. The monitoring device may then issue one or more rewards based on the reward criteria programmed within the reward criteria database, as indicated generally by block **160**. The method **142** can then be repeated one or more times as each new test result is obtained.

[**0078**] FIGS. **8-10** are several perspective views of the monitoring device **10** of FIG. **1**, showing several illustrative steps of providing a visual indicator to a user indicating that a reward or incentive has been earned. As can be seen in a first view in FIG. **8**, the monitoring device **10** can be configured to blink a reward status indicator **162** on the display screen **22** when a reward or incentive has been earned, informing the user that a reward or incentive is available. Other means for proving the user with reward status information may also be provided as discussed herein, including the illumination of the LED's **52**,**54**, the providing of an audible alert via the speaker **40** and/or the simultaneous display on a display screen of an external computing device.

[**0079**] From the main screen depicted generally in FIG. **8**, the user may then access a separate reward screen **164** providing the user with more information about the reward or incentive. For example, and as shown in a second view depicted in FIG. **9**, the monitoring device may provide a list **166** of reward codes (e.g. "0012", "0101", etc.) for each reward earned, a message **168** indicating whether the user is currently in compliance with their prescribed medical plan, and a message **170** indicating whether the reward code or codes have been redeemed. Other information such as the current time and date may be further provided on the reward screen **164**, if desired. Access to the reward screen **164** can be accomplished by selecting one or more buttons on the user interface **14** and/or remotely via an external computing device. Alternatively, and in other embodiments, the monitoring device **10** can be configured to automatically alternate between displaying the main display screen **22** and the reward screen **164**, if desired.

[**0080**] FIG. **10** is a perspective view showing a motivational message **172** displayed on a separate motivational display screen **174** of the monitoring device **10**. As shown in FIG. **10**, the monitoring device **10** can be configured to display one or more motivational messages **172** on the display screen **174** to encourage the user to comply with the goals of their medical plan. The motivational messages **172** can be downloaded into the monitoring device **10** from another external device, via a web-site on the Internet, or can be pre-programmed into the device **10**.

[**0081**] FIG. **11** is a diagrammatic view showing an illustrative reward system **176** for rewarding a user **178** of the health monitoring device **10** for monitoring one or more medical parameters. As shown in FIG. **11**, the monitoring device **10** can be configured to transmit compliance data **180** such as the user's prior test readings to the computer system of one or more remote entities **182**. An illustrative entity **182** may comprise, for example, a pharmacy, health-clinic, or other such business entity through which the user **178** normally purchases medical supplies such as insulin pumps, syringes, and test strips. Examples of other entities **182** can include, but are not limited to, insurance companies, self-insured employers, retailers, health-clubs, and fitness centers. The type of entity **182** will typically vary depending on the specific medical condition of the user **178** as well as the type of monitoring device **10** employed. For example, for individuals suffering from high blood pressure, the participating entity **182** may be a health club facility and the monitoring device **10** may be a blood pressure monitor.

[**0082**] The transmission of compliance data **180** to the participating entity **182** can occur via either a wireless or wired connection, and may vary depending on the type of remote entity **182** involved. For example, for a business such as a pharmacy or health-clinic, the transmission of compliance data **180** may occur automatically when the user enters the store or clinic, at regular intervals (e.g. once a day, once a week, once a month, etc.), when a reward or incentive has been earned, or some other desired criteria. The compliance data **180** can also be sent manually by the selection of a button or buttons on the monitoring device **10**, or by some other deliberate action taken by the user. In some cases, the user may charge the entity **182** for the use of the compliance data **180**.

[**0083**] In some embodiments, the compliance data **180** sent to the remote entity **182** may be converted to another

format, if desired. For example, the compliance data **180** may be converted to a multimedia format such as MP3, MPEG, WAV, etc., and can be encrypted to prevent its interception from a third party.

[**0084**] The compliance data **180** transmitted to the remote entity **182** can be stored within a reward library database **184**, which can then be used to generate one or more rewards or incentives based on the user' compliance with the entities' reward criteria, based on customer loyalty and/or patronage, as well as other factors. If, for example, the remote entity **182** is a medical supply store such as a pharmacy, the compliance data **180** transmitted can be used to generate rewards or incentives in the form of discount coupons for the purchase of medical supplies such as insulin pumps, syringes, test strips, etc. Other rewards or incentives such as cash-back rebates or credits may also be provided based on the user's compliance with the reward criteria established by the entity **182**. For example, the reward or incentive may be in the form of discount coupons for diabetic test strips based on the user's glucose level readings. In some embodiments, rewards or incentives unrelated to the user's health may also be offered to the user **178**. For example, the reward or incentive may be in the form of an access code that permits the user/customer to gain access to games, activities, or other such incentives on the remote entity's web-site.

[**0085**] The rewards or incentives generated by the remote entity **182** can be transmitted back to the user's monitoring device **10** and redeemed in a manner similar to that discussed above with respect to FIG. **5**. As indicated generally by arrow **186**, for example, the participating entity **182** may transmit a reward code or coupon to the user's monitoring device **10**, which can then be redeemed at a later time at the remote entity **182**, at another store, on a web-site, and/or at some other location. Rewards or incentives generated by the participating entity **182** may also be transmitted to another location for redemption. For example, the reward or incentive may be transmitted to a cash register within the entity's store that can be redeemed automatically at the point of sale, or to a web-site that can be later accessed by the user to obtain an on-line discount or other such incentive. In use, reward codes provided to the monitoring device **10** can be used as part of the remote entity's business plan to achieve customer retention and increase customer loyalty.

[**0086**] The remote entity **182** may further transmit one or more advertisements to the user's monitoring device **10**, as indicated generally by arrow **188**, informing the user **178** of any specials, price reductions, bulk discounts, and/or new products that may be available for purchase. The advertisements **188** can be targeted based on the user's specific medical condition, or can be provided to a larger subset of the population. For example, targeted advertisements can be provided to diabetics informing them of certain diabetic products that are on sale and/or any new products that may be of interest. For individuals suffering from asthma, the advertisements may correspond to other related products such as allergy relief medicines and/or air filtration products. In some cases, the advertisements **188** provided to the user may be based on the user's compliance data **180**.

[**0087**] FIG. **12** is a diagrammatic view showing an illustrative on-line reward system **190** for rewarding a user **192** of the health monitoring device **10** for monitoring one or more medical parameters. As shown in FIG. **12**, the monitoring device **10** can be connected to one or more on-line components via an Internet or intranet connection **194**, including one or more remote entity websites **196** each having a reward library database **198** that can be accessed by the user **192** to obtain various product and store information, advertisements, discount coupons, as well as other information. An example remote website **196** may comprise, for example, an on-line pharmacy or medical supply store having a specialized rewards web-page that can be accessed by the user to view and/or redeem one or more earned rewards or incentives. The monitoring device **10** may be further linked to one or more other web-sites **200** each including storage **202** for storing information about the user's compliance with their prescribed medical plan, any past rewards or incentives that have been received, the anticipated time when another reward or incentive will be received, customer identifying information, as well as other information. In certain embodiments, for example, one of the other web-sites **200** may comprise the user's own personal web-site or the web-site of their healthcare provider or health insurance provider.

[**0088**] As can be further seen in FIG. **12**, one or more other monitoring devices **204** and/or other external devices **206** can also be linked to the monitoring device **10** as well as the remote entity websites **196** and other web-sites **200** via the Internet or an intranet connection **194**. Other monitoring devices **204** that can be connected can include, but are not limited to, blood pressure meters, blood oxygen monitors, insulin pumps, continuous glucose monitors, prosthetic devices, shoes, scales, pedometers, exercise equipment, heart monitors, and spirometers. Other external devices **206** that can be connected can include, but are not limited to, personal computers, laptop computers, hand-held computers, cellular telephones, pagers, television set or cable boxes, video game consoles, and digital media players. In one illustrative embodiment, for example, a television or cable set box can be connected to the monitoring device **10** via the Internet **194**, allowing the user **192** to transmit and receive data and messages back and forth between the monitoring device **10** and one or more of the other components **196**, **200**,**204**,**206**.

[**0089**] FIG. **13** is a diagrammatic view showing an illustrative implementation of the on-line reward system **190** of FIG. **12**. As shown in FIG. **13**, the monitoring device **10** can be connected to one or more retail web-sites **208** each including a reward library database **210** that can be accessed by the user **192** to obtain various product and store information, advertisements, discount coupons, as well as other information. The monitoring device **10** can also be connected to one or more financial institution web-sites **212** each including a reward library database **214**. An example financial institution web-site may include a credit card company or bank in which the user **192** conducts business with. Based on the user' compliance with the reward criteria within the reward library database **214**, the credit card company or bank may provide the user with a reward or incentive such as a credit or rebate to their account.

[**0090**] The monitoring device **10** can also be connected to one or more insurance web-sites **216** each including a reward library database **218**. In certain embodiments, for example, insurance web-sites **216** may include the web-site of the use's heath insurance provider. Based on the user's

compliance with the reward criteria within the reward library database **218**, the insurance provider may then provide the user with a reward or incentive such as a reduction in health insurance premiums or co-pays. In similar fashion, the monitoring device **10** can be connected to one or more health/fitness club web-sites each including a reward library database **222**. Based on the user's compliance with the reward criteria within the reward library database **222**, the health/fitness club may provide the user with a reward or incentive such as the reduction in membership fees. As further shown in FIG. **13**, the monitoring device **10** can be connected to one or more other devices including, but not limited to, a cellular telephone **224**, personal computer **226**, blood pressure monitor **228** and/or a cable/television set box **230**.

[**0091**] FIG. **14** is a diagrammatic view showing an illustrative vehicle reward system **232** for rewarding a driver **234** that uses the monitoring device **10** for monitoring one or more medical parameters. As shown in FIG. **14**, the monitoring device **10** can be configured to transmit compliance data **236** to a vehicle controller **238** of a vehicle **240**, which can be used by the controller **238** to decide whether to permit the driver **234** to start the vehicle **240** based on the driver's current medical condition and/or the time or times of their most recent readings. For diabetic patients, for example, the monitoring device **10** can be configured to transmit the last few glucose level readings to the vehicle controller **238**, which can then be used by the controller **238** to determine whether to activate the vehicle's ignition system **242** and/or steering column lock **248** based on the compliance data **236** received from the monitoring device **10**. If, for example, the drivers' glucose level is determined to be too high (e.g. above **101**), the vehicle controller **238** can be configured to deactivate the vehicle ignition system **242** and/or steering column lock **248**, preventing the driver **234** from operating the vehicle **240** until their levels are brought within a certain range. In such event, the vehicle controller **238** may transmit a message **237** back to the monitoring device **10** and/or some other display screen such as one found on a navigational system notifying the driver **234** that their current glucose levels are too high to permit the safe operation of the vehicle **240**. The monitoring device **10** can then prompt the driver **234** to take another measurement prior to operating the vehicle **240**.

[**0092**] The compliance data **236** received by the vehicle controller **238** can also be outputted to other components of the vehicle **240**. For example, and as further shown in FIG. **14**, the vehicle controller **238** can be connected to the vehicle's audio system **244**, a GPS navigational unit **246**, the vehicle's steering column lock **248**, the vehicle's security alarm system **250** and/or a satellite support system **252**. The vehicle's audio system **244**, for example, can be utilized to generate an audible alarm notifying the driver **234** to take a measurement, providing the user with a warning if their levels are out of range, etc. The vehicle's security alarm system **250**, in turn, can be used to provide other individuals with an indication that the driver **234** may require assistance. For example, the vehicle security alarm system **250** may cause the emergency lights on the vehicle to automatically flash if the driver's glucose levels fall within a certain range. In those vehicles equipped with a satellite support system **252**, such information could also be relayed to an operator in order to provide the operator with more detailed information on what emergency services to dispatch.

[**0093**] In those vehicles equipped with a GPS unit **246**, the monitoring device **10** may be further used in conjunction with the vehicle's GPS mapping software to provide the driver **234** with directions to the closest medical supply store for purchasing needed supplies, the location of the closest emergency facility, etc. In some embodiments, the GPS mapping software may also be used to notify the driver **234** where to redeem a reward or incentive that has or will be earned.

[**0094**] The monitoring device **10** may use its internal clock to determine the last time a measurement was taken, which can then be transmitted to the vehicle **240** as a part of the compliance data **236** and compared against the vehicle's own internal clock. Comparison of the monitoring device internal clock with the vehicle clock can be accomplished in a manner similar to that described above with respect to FIG. **7**, by comparing the user input against reward criteria within the reward circuitry to determine the accuracy of the time measurements. The monitoring device **10** can be programmed to permit the driver **234** to operate the vehicle only if a reading has been obtained within a certain period of time. For example, the monitoring device can be programmed to only permit the driver **234** to operate the vehicle **240** if a glucose level reading has been obtained within the past four hours, within the past 2 hours, or other such time interval.

[**0095**] FIG. **15** is a diagrammatic view showing an illustrative system **254** for monitoring one or more medical parameters using a combined peripheral and health monitoring device **256**. In the illustrative embodiment of FIG. **15**, the combined peripheral and health monitoring device **256** is a computer mouse equipped with one or more sensors that can be used to monitor various medical parameters while the device **256** is in use. For example, in certain embodiments the device **256** can be equipped with a sensor that can be used to sense the user's blood glucose levels while the user grips the device **256** with their hand. Examples of other medical parameters that can be sensed using the device **256** may include, but are not limited to, hemoglobin levels, blood pressure levels, temperature, exercise data, oxygen saturation levels, stress levels, carpal tunnel indication data, and hypoglycemia levels.

[**0096**] The device **256** can be connected to a computer **258** and operated as both a pointing device for operating the computer **258** as well as a health monitoring device for monitoring one or more medical parameters. The computer **258** may be a personal computer equipped with a display panel **260** and keyboard **262**, as depicted in FIG. **15**, or can comprise another type of computing device. For example, the computer **258** may be a laptop computer, hand-held computer (e.g. PDA, BLUETOOTH, PALM-PILOT), cellular telephone, pager, television set or cable box, video game console, digital media player (e.g. IPOD, MP3 or MPEG players), GPS unit, point of sale device, bar code reader, vehicle controller, or other such device. The type of device **256** connected to the computer **258** will typically vary depending on the type of computer **258**, the type of interface used by the computer **258**, as well as other factors. In those embodiments in which the computer **258** is a video game console, for example, the device **256** may include a joystick, track-ball, or the like. While the device **256** in FIG. **15** is shown connected to a single computer **258**, it should

be understood that the device can be connected to multiple computing devices, if desired.

[0097] The device **256** can be connected to the computer **258** via either a wired or wireless communications link. In the illustrative embodiment of FIG. **15**, the device **256** is shown connected to the computer **258** via a wired connection **264** such as a USB cable, IEEE394 cable, serial (e.g. RS232) cable, or optical cable. The device **256** can be equipped with a quick connect hub **266** to facilitate connection of the wire **264** to the device **256**, or alternatively, can be hard-wired to the device **256**. In some embodiments, the device **256** can be connected to the computer **258** via a wireless communications link such as via an RF signal (e.g. 802.11a, 802.11b, 802.11g, Bluetooth, Zigbee, etc.) or infrared signal (e.g. IRDA). Depending on the type of device **256**, connection to the computer **258** can be accomplished via the Internet through a dial-up connection, DSL connection, cable broadband connection, or the like.

[0098] FIG. **16** is a top perspective view of the combined peripheral and health monitoring device **256** of FIG. **15**. As can be further seen in FIG. **16**, the device **256** can include a housing **268** having a top portion **270**, a left side **272**, a right side **274**, and a bottom portion **276**. A number of selection buttons **278**,**280** and slide wheel **282** inset within the top portion **270** of the housing **268** can be used to transmit various commands to the computer **258**, allowing the user to navigate and make selections on a graphical user interface provided on the computer monitor **260**.

[0099] The device **256** may further include a port **284** adapted to receive a test strip containing a sample of blood obtained from the user. In certain embodiments, for example, the port **284** can be configured to receive a test strip that can be used by one or more internal sensors and medical circuitry within the device **256** to determine the user's current blood glucose levels. It should be understood, however, that the port **284** can be configured to receive other types of test strips for measuring other parameters from the user. For example, in some embodiments, the port **284** can be configured to receive a test strip that can be used by the device **256** to determine other medical parameters such as the user's hemoglobin levels. In certain embodiments, the housing **268** can be further equipped with a skin lance to facilitate the collection of a blood sample, if necessary. While the port **284** depicted in FIG. **16** may be configured to receive test strips, it should be understood that the device **256** can be configured to receive other types of test sample specimens based on the medical parameter or parameters to be measured.

[0100] The device **256** may further include one or more other sensors that can be used to monitor other medical parameters while the device **256** is being used. For example, and in some embodiments, the device **256** may include a sensor **286** that can be used to sense parameters such as the user's temperature, blood pressure, blood oxygen levels, etc. while the device **256** is in use. The sensor **286** can be inset within the top portion **270** of the housing **268**, and can be configured to sense the parameters from the user's fingers and/or palm while the device **256** is being gripped by the user's hand. During operation, the sensor **286** can be used to measure the user's parameters over a longer period of time than would normally be done with other conventional devices. For example, when the sensor **286** is configured to sense the user's blood pressure, measurements can be taken over a longer period of time than would customarily be done with a blood pressure cuff which is normally used to measure blood pressure at discrete time periods.

[0101] A display panel **288** on the device **256** can be provided to display the user's current and/or past test readings as well as provide the user with various reward information and motivational messages. The display panel **288** can include a liquid crystal display, (LCD), light emitting diode (LED) panel, touchscreen, or other suitable means for displaying information to the user. In use, the display panel **288** can be used to display one or more current and/or past test readings obtained from the user as well as any accrued rewards or incentives the user has or will earn as a result of complying with the goals of their health plan.

[0102] A number of light sources **290**,**292** (e.g. LED's) inset within the housing **268** can also be used to provide the user with status information on their testing compliance as well as information on whether any rewards or incentives have or will be earned. A first LED **290**, for example, can provide the user with visual feedback on their testing compliance. A second LED **292**, in turn, can provide the user with visual feedback on any rewards or incentives that have or will be earned as a result of their testing compliance. Other light configurations can also be utilized to provide the user with a visual indicator of their compliance. In certain embodiments, for example, arrays of light sources can be used to provide the user with visual feedback on their compliance. In some embodiments, the device **256** can be programmed to assign specific ranges to one or both of the LED's **290**,**292**. If, for example, the user desires to assign a glucose range different than the default range pre-programmed within the device **256**, the user may select the appropriate button or buttons **278**,**280** on the device **256** to adjust the range.

[0103] The appearance and/or blink rate of the LED's **290**,**292** can be altered to notify the user of their current health status, and to indicate the status of any rewards or incentives earned. For example, the first LED **290** can be configured to output a first color (e.g. green) indicating that the user's current health as sensed by the device **256** is within a certain range whereas the LED **290** can be configured to output a different color (e.g. red) indicating that the user's health is out of range. Alternatively, or in addition, the blink rate of the LED **290** may be adjusted depending on the user's current health condition. The appearance and/or blink rate of the second LED **292** can be similarly adjusted to provide the user with an indication of when an upcoming reward or incentive will be earned. For example, the blink rate of the second LED **292** can be made proportional to the time remaining for the next reward or incentive to be earned.

[0104] The device **256** can be further equipped with a speaker **294** that can be used to prompt the user to perform certain tasks as well as to aurally provide the user with information regarding their current health status. The speaker **294**, for example, can be configured to produce an audible alarm tone reminding the user to take a new glucose level reading, informing the user that a new reward or incentive has been earned, and/or prompting the user to perform some other task such as transmitting data to the computer **258** or to another device. Other audible alarm tones may also be provided warning the user that the battery

level is low or alerting the user that other action may be necessary. In some embodiments, the speaker **294** can be used to output voice messages received from the computer **258**.

[**0105**] The pitch and/or volume of the alarm tones can be varied to notify the user of the importance to take action, or to differentiate between types of alerts. For example, the device **256** can be configured to output an audible alarm tone at a first pitch prompting the user to take a glucose level reading, and another alarm tone at a second, discernable pitch informing the user that a message and/or new reward code is available for viewing. The loudness of the alarm tones may vary depending on the urgency in which action must be taken. For example, the loudness of the alarm tone outputted by the speaker **294** can be increased as the time from the user's last glucose level reading increases, thus providing the user with feedback of the urgency to take a new measurement. The time between the alarm tones can also be increased, informing the user of the urgency to take action. In some embodiments, the device **256** can be further equipped with an internal vibration element that can be used to provide the user with tactile feedback of the urgency to take measurements.

[**0106**] FIG. **17** is a bottom perspective view of the combined peripheral and health monitoring device **256** of FIG. **15**. As shown in FIG. **17**, the device **256** may further include an internal storage compartment **296** that can be used to store test strips inserted into the test strip port **284**. The test strips inserted into the storage compartment **294** via the port **284** can be accessed via a sliding door **298**, which can be opened in the direction indicated generally by arrow **300** to gain later access to the strips. Alternatively, the door **298** can be hingedly connected to the housing **268**, allowing the door **298** to be opened by rotating the door **298** outwardly away from the bottom portion **276** of the housing **268**. In some embodiments, the device **256** may further include a second internal storage compartment **302** that can be used to store new test strips for performing future tests with the device **256**.

[**0107**] FIG. **18** is a schematic view showing several illustrative components of the combined peripheral and health monitoring device **256** of FIG. **15**. As can be seen in FIG. **18**, the device **256** can include medical circuitry **304** located on a circuit board **306** within the device housing **268**. The medical circuitry **304** is in communication with one or more sensors **308** that can be used to sense various parameters, including but not limited to, blood glucose, blood pressure, blood oxygen, and/or temperature. The sensed medical data processed by the medical circuitry **304** can be stored within a storage memory unit **310** along with a date and time stamp corresponding to the date and time the measurements were taken.

[**0108**] In those embodiments in which the device **256** is a mouse pointer, the device **256** may further include navigational circuitry **312** used by the device **256** to sense any movement of the device **256** as well as to process input signals received via the buttons **278**,**280** and the wheel **282**. The device **256** may further include reward circuitry **314** configured to run one or more reward algorithms or routines **316** that can be used to monitor the user's progress in monitoring their health levels and formulate rewards or incentives based on the user's compliance with reward criteria programmed within the device **256** and/or computer **258**.

[**0109**] An internal clock circuit **316** can be used to maintain the current date and time as well as provide a date and time stamp for each sensor reading, which can then be stored along with the reading within the storage memory **310**. The internal clock circuit **316** can be used to provide date and time stamps for each sensor reading taken when the device **256** is disconnected from the computer **258** and/or when the computer **258** is not in operation. When the device **256** is connected to the computer **258**, the internal clock circuit **316** can be synched with the time and date provided by the computer **258**. In some embodiments, an external clock circuit **318** can also be used to synch the date and/or time of the device **256** with an external timing device. For example, the external clock circuit **318** can be used to obtain the date and time automatically from a remote source such as an RF signal transmission.

[**0110**] A battery level circuit **320** can be used to monitor the level of any batteries used to power the device **256**. The battery level circuit **320**, for example, can measure the charge of the batteries and output a message or status indicator (e.g. via the display panel **288**) notifying the user that the batteries are low and require replacement or recharging.

[**0111**] In some embodiments, the battery level circuit **320** may further output a message or status indicator informing the user that the batteries are being recharged when rechargeable batteries are used.

[**0112**] A programming interface **322** can be used to program the device **256** from a remote location and/or via another device. In some embodiments, for example, the programming interface **322** can be used to program the device **256** via the computer **258**.

[**0113**] Alternatively, or in addition, the programming interface **322** can be used to program the device **256** using the buttons **278**,**280** and wheel **282** on the device **256**.

[**0114**] A communications interface **324** can be used to transmit and/or receive various commands and data back and forth between the device **256** and one or more external devices in communication with the device **256**, including the computer **258**. A converter module **326** can be used to convert, and in some cases encrypt, data sent back and forth between the device **256** and computer **258**. In some embodiments, for example, the converter module **326** can be used to convert medical test readings into a different format that can be transmitted and deciphered by the computer **258**.

[**0115**] The reward circuitry **314** can be configured to run one or more algorithms or routines **316** that can be used to monitor the user's health levels based on information received from the medical circuitry **304** and formulate rewards or incentives based on the user's compliance with reward criteria programmed within the device **256** and/or within the computer **258**. As can be further seen in FIG. **19**, the reward circuitry **314** can include a reward code database **328** such as a look-up table containing one or more reward codes that can be provided when the user satisfies one or more reward criteria from a reward criteria database **330**. In some embodiments, the reward codes contained within the reward code database **328** can be provided as bar codes,

alpha numeric characters, hexadecimal characters, or other type of encrypted code. In use, the reward algorithm or routine **316** can be configured to perform various computational functions to determine whether the user's monitoring of one or more medical parameters satisfies the reward criteria programmed within the reward criteria database **330**.

[**0116**] The reward circuitry **314** can further include a motivational messages database **332** containing a number of motivational messages that can be used to encourage patient compliance with the goals of their prescribed medical plan. In certain embodiments, for example, the reward circuitry **314** can be configured to generate motivational messages based on the user's compliance with the reward criteria, which can then be displayed on a display screen as a text message and/or graphic or outputted from a speaker as an audible alert. The reward circuitry **314** can be configured to output motivational messages at certain times of the day and/or in response to the user's behavioral patterns. In some embodiments, other types of messages such as advertisement and/or educational messages may also be stored within the database **332**, which can then be provided based on the user's compliance with the reward criteria, the user's personal information, as well as other factors.

[**0117**] Referring now to FIG. **20**, a flow chart showing an illustrative method **334** of initiating the combined peripheral and health monitoring device **256** of FIG. **15** for use with the computer **258** will now be described. The method **334** may begin generally at block **336**, with the step of connecting the device **256** to the computer **258**. Connection of the device **256** to the computer **258** can be accomplished, for example via a wired connection such as a USB cable, serial cable, or optical cable. Connection to the computer **258** can also be accomplished via a wireless connection such as an RF signal or infrared signal.

[**0118**] Once the device **256** is connected to the computer **256**, the computer **258** may next query the device **256** for a signal to determine if the device **256** is turned on and is functional, as indicated generally at box **338**. If a signal is detected, the computer **258** may then determine whether the necessary software driver or drivers necessary to communicate with the device **256** have been previously installed on the computer **258**, as indicated generally at decision block **340**. If no software driver has been installed at block **340**, the computer **258** may then establish an Internet connection and download the software drivers via a web-site, or may prompt the user to install a CD-ROM containing the drivers. Alternatively, if the software drivers are already present on the computer **258** and have been installed, the computer **258** may skip the downloading process at block **342**.

[**0119**] Once configured for use with the device **256**, the computer **258** may next establish a communications link with the device **256**, as indicated generally at block **344**. Once established, the computer **258** may then query the device **256** for any historical medical data obtained by the medical circuitry **304**, as indicated generally by block **346**. At block **348**, the computer **258** may then receive and store any historical medical data obtained by the device **256**. If, for example, the device **256** contains ten prior glucose level readings stored within memory **310**, the computer **258** may query the device **256** to transmit those historical readings to the computer **258**.

[**0120**] FIGS. **21**A-**21**B is a flow chart showing an illustrative method **350** of creating an alarm to remind a user to take tests using the combined peripheral and health monitoring device **256** of FIG. **15**. The method **350** may begin generally at block **352** when the user accesses a desktop software application on the computer **258** adapted to control the device **256**. In those embodiments in which the device **256** is a combined computer mouse and blood glucose meter, for example, block **352** may include the step of initiating a computer software program on the computer **258** containing the necessary drivers needed to control the mouse.

[**0121**] Once the software application is initiated at block **352**, the user may then access one or more alarm functions on the application that can be used to program an alarm based on the user's compliance with their testing regimen, as indicated generally at block **356**. At block **358**, the user may then program one or more alarm parameters into the computer **258**, which can be used to later produce an audible and/or visible alarm reminding the user to perform a self-test, take their medication, and/or perform some other task. In some embodiments, for example, the user may program an alarm parameter pertaining to an acceptable range of blood glucose levels. If the user's blood glucose level sensed by the device **256** falls outside of the programmed range, the device **256** and/or computer **258** can be configured to produce an alarm informing the user that further action may need to be taken.

[**0122**] Once the user has programmed at least one alarm parameter via the software application, the computer **258** may next establish a communications link with the device **256** (block **360**), and then check the RTC and testing data contained within the device **256** against the alarm parameters (block **362**). At decision block **364**, the computer **258** then determines whether the test parameters match the alarm parameters. If at block **364** at least one test parameter matches an alarm parameter, the computer **258** can be configured to output an audible alarm and/or display an alarm message on the computer monitor **260**, as indicated generally at block **366**. In some cases, the device **256** can be further configured to produce an audible and/or visual alarm. Once prompted via the alarm, the user may then conduct a test or perform some other task, as indicated generally at block **368**. Once the test is taken, the computer **258** may then determine whether the new test parameter obtained matches the alarm parameters, as indicated generally at block **370**. If the new test parameter obtained at block **368** matches the programmed alarm parameter, the computer **258** can be configured to cancel the alarm, as indicated generally at block **372**. If, on the other hand, the new test parameter does not match the programmed alarm parameter, the computer **258** can be configured to continue the alarm until, at such point, a new testing parameter is obtained that satisfies the programmed alarm parameter.

[**0123**] FIG. **22** is a flow chart showing an illustrative method **374** of taking blood glucose measurements using the combined peripheral and health monitoring device **256** of FIG. **15**. The method **374** may begin generally at block **376**, with the step of establishing a communications link between the device **256** and the computer **258**. Once a communications link has been established, the user may then insert a new test strip into the test strip port **284**, as indicated generally at block **378**. As the new test strip is inserted into the port **284**, the device **256** can be configured to sense the test strip as the test strip comes to rest at a first location within the device housing **268** and generate an electrical

signal that can be fed to the computer **258**, as indicated generally at block **380**. At block **382**, the computer **258** can then be configured to output an alarm and/or produce a message on the computer monitor **260** prompting the user to stop inserting the test strip into the port **284**, as indicated generally at block **384**.

[**0124**] Once the test strip has been inserted into the test port **284**, the user may then place a blood sample onto the test strip, causing the device **256** to generate another electrical signal at block **386** indicating that a blood glucose test is to be performed. At block **388**, the computer **258** may then output another alarm and/or produce a message on the computer monitor **260** prompting the user to push the used test strip containing the blood sample further into the device housing **268**. At block **390**, the user may then continue to push the used test strip into the device **256** until the test strip moves over a gravity tip point within the housing **268** (block **392**), causing the used test strip to fall within the internal storage compartment **296** (block **394**) where it can be temporarily stored. The method **374** can then be repeated one or more times to obtain other blood glucose readings, as desired.

[**0125**] FIGS. **23**A-**23**B is a flow chart showing an illustrative method **396** of transmitting time and date information back and forth between the combined peripheral and health monitoring device **256** and the computer **258** of FIG. **15**. The method may begin generally at block **398** when the user accesses the desktop software application on the computer **258** adapted to control the device **256**. Using the software application, the user may then select a "SEND DATE" function on the software at block **400**, which causes the computer **258** at block **402** to send the current date and time to the device **256** for storage within the device's internal storage memory **310**. The device **256** may then compare the date and time information received from the computer **258** against the date and time maintained by the internal clock circuit **316** of the device **256**, as indicated generally at block **404**. If at decision block **406** the alarm and test parameters within the device **256** are satisfied, the computer **258** can be configured to output an audible alarm and/or display an alarm message on the computer monitor **260** prompting the user to take a new measurement, as indicated generally at block **408**. In some embodiments, an LED on the device **256** (e.g. LED **290**) can also be illuminated, further prompting the user to take a new measurement. If at decision block **406** the alarm and test parameters are not satisfied, the device **256** can then be configured to perform the step at block **404** until one or more parameters are satisfied.

[**0126**] At block **410**, once prompted by the device **256** and/or computer **258** to take a new measurement, the user may then select an input button on the device **256** to transmit a new test measurement to the computer **258**. The transmission of the new test measurement may occur, for example, after the user has inserted a new test strip into the test port **284** and performed a blood glucose check as described, for example, with respect to FIG. **22**. Once a request to transmit data has been made at block **410**, the computer **258** may then determine at decision block **412** whether that data has been successfully sent. If the information is transmitted successfully, the LED **290** on the device **256** may turn off and a message displayed on the computer monitor **260** indicating that the data transfer was successful, as indicated generally at block **414**. Otherwise, if at block **412** the transmission of the data was unsuccessful, the alarm and/or message provided on computer **258** and the LED **290** on the device **256** may remain on prompting the user to resend the data to the computer **258**.

[**0127**] FIG. **24** is a flow chart showing an illustrative method **416** of setting the thresholds and assigning various functions to the LED's for the combined peripheral and health monitoring device **256** of FIG. **15**. The method **416** may begin generally at block **418** when the user accesses the desktop software application on the computer **258** adapted to control the device **256**. Using the software application, the user may then select a "SET THRESHOLD" function on the software at block **420**, which causes the computer **258** to initiate a routine for adjusting the threshold values required for a test parameter to satisfy an alarm parameter. Once initiated, the SET THRESHOLD function on the software can then be used to assign a specific medical measurement to a particular LED on the device housing **268**, as indicated generally at block **422**. For example, the user may use the SET THRESHOLD function on the software to assign LED **290** to illuminate when the user's current blood glucose levels or other specific medical parameter reaches a certain level.

[**0128**] Once the user has assigned a specific medical measurement to one or more of the LED's on the device housing **268**, the computer **258** can then compare the threshold criteria set at block **422** with the medical test results obtained from the device **256**, as indicated generally at block **424**. If at decision block **426** the threshold criteria matches a test result, the LED indicator on the device **256** can illuminate and a test result displayed on the device display **288**, as indicated generally at block **428**. Otherwise, if the threshold criterion is not satisfied, the step **424** of comparing the threshold criteria against the medical parameters can be repeated one or more times until the threshold criterion is satisfied. At block **430**, once the threshold criteria has been met, the user may then select an input button on the device **256** causing the device **256** to send the test result to the computer **258**. The test result can also be displayed on the computer monitor **260** for a period of time and then disappear, as indicated generally at block **432**, informing the user that the test result has been received and stored within the computer **258**.

[**0129**] Although the combined peripheral and medical device may comprise a computer mouse equipped with one or more sensors and medical circuitry for monitoring various medical parameters, it should be understood that other devices may incorporate one or more features discussed herein. In one alternative embodiment depicted in FIG. **25**, for example, the combined peripheral and medical device may be a portable USB storage device **434** having a housing **436** equipped with a port adapted to receive a test strip **438** that can be used by the device **434** to determine the user's blood glucose levels. A display panel **440** on the device **434** can be provided to display the user's current and/or past glucose level readings as well as to provide other status information. In some embodiments, other medical parameters in addition to, or in lieu of, blood glucose levels may also be monitored with the device **434**.

[**0130**] FIG. **26** is a perspective view showing an illustrative television remote control device **442** having a housing **444** equipped with a port adapted to receive a test strip **446**

that can be used by the device **442** for monitoring the user's blood glucose levels. A display panel **448** on the remote control device **442** can be provided to display the user's current and/or past blood glucose level readings. In similar fashion, FIG. **27** illustrates a cellular telephone **450** having a housing **452** equipped with a port adapted to receive a test strip **454**, and a display panel **456** for displaying one or more sensed glucose level readings. Other devices including, but not limited to, blood pressure monitors, blood oxygen monitors, heart monitors, spirometers, insulin pumps, pedometers, scales, shoes, exercise or fitness equipment, personal computers, laptop computers, hand-held computers, pagers, television set or cable boxes, video game consoles, digital media players, and GPS units may also incorporate one or more of the features discussed herein for monitoring medical parameters.

[**0131**] Having thus described several embodiments of the present invention, those of skill in the art will readily appreciate that other embodiments may be made and used which fall within the scope of the claims attached hereto. It will be understood that this disclosure is, in many respects, only illustrative. Changes can be made with respect to various elements described herein without exceeding the scope of the invention.

What is claimed is:

1. A peripheral device, comprising:

at least one sensor adapted to sense one or more medical parameters from a user;

medical circuitry in communication with said at least one sensor, the medical circuitry adapted to process the one or more sensed medical parameters; and

a communications interface for transmitting and/or receiving data back and forth between the peripheral device and one or more remote devices in communication with the peripheral device.

2. The peripheral device of claim 1, further including a storage memory adapted to store one or more sensed medical parameters along with a date and time stamp corresponding to each sensed medical parameter.

3. The peripheral device of claim 1, further including reward circuitry including a reward algorithm or routine for encouraging the monitoring of said one or more medical parameters.

4. The peripheral device of claim 3, wherein the reward circuitry includes a reward code database containing one or more programmed reward codes.

5. The peripheral device of claim 3, wherein the reward circuitry includes a reward criteria database containing one or more programmed goals.

6. The peripheral device of claim 5, wherein the reward algorithm or routine is adapted to formulate a reward or incentive based at least in part on the user's compliance with said one or more programmed goals.

7. The peripheral device of claim 3, wherein the reward circuitry is separate from the medical circuitry.

8. The peripheral device of claim 1, wherein the one or more medical parameters includes a blood glucose level parameter.

9. The peripheral device of claim 1, wherein the one or more medical parameters includes a blood pressure parameter.

10. The peripheral device of claim 1, wherein the one or more medical parameters includes a blood oxygen level parameter.

11. The peripheral device of claim 1, wherein the one or more medical parameters includes a temperature parameter.

12. The peripheral device of claim 1, wherein the one or more medical parameters includes a hemoglobin level parameter.

13. The peripheral device of claim 1, wherein the one or more medical parameters are selected from the group of medical parameters including a hemoglobin parameter, blood pressure parameter, blood glucose parameter, temperature parameter, exercise data parameter, oxygen saturation parameter, stress data parameter, carpal tunnel indication data parameter, and hypoglycemia parameter.

14. The peripheral device of claim 1, wherein the peripheral device further includes a skin lance.

15. The peripheral device of claim 1, wherein the peripheral device further includes a display panel for displaying medical information.

16. The peripheral device of claim 1, wherein the peripheral device further includes at least one light source adapted to provide feedback on the one or more sensed medical parameters.

17. The peripheral device of claim 5, wherein the peripheral device further includes at least one light source adapted to provide feedback on any rewards or incentives that have or will be earned based on the user's compliance with said one or more programmed goals.

18. The peripheral device of claim 1, wherein the peripheral device includes a port adapted to receive one or more test strips containing a blood sample.

19. The peripheral device of claim 18, wherein the peripheral device includes a storage area for storing the one or more test strips.

20. The peripheral device of claim 1, wherein the peripheral device includes a storage area for storing one or more new test strips.

21. The peripheral device of claim 1, wherein the peripheral device is a computer mouse.

22. The peripheral device of claim 1, wherein the peripheral device is a portable storage memory unit.

23. The peripheral device of claim 1, wherein the peripheral device is a television remote control.

24. The peripheral device of claim 1, wherein the peripheral device is a cellular telephone.

25. A computer mouse device, comprising:

a housing including at least one port adapted to receive a test specimen;

at least one sensor adapted to sense one or more medical parameters from the test specimen;

medical circuitry in communication with said at least one sensor, the medical circuitry adapted to process the one or more sensed medical parameters; and

a communications interface for transmitting and/or receiving data back and forth between the mouse device and one or more remote devices in communication with the device.

26. A system for monitoring one or more medical parameters of a user, the system comprising:

a computer; and

a combined peripheral and health monitoring device in communication with the computer, the combined peripheral and health monitoring device including:

at least one sensor adapted to sense one or more medical parameters from a user;

medical circuitry in communication with said at least one sensor, the medical circuitry adapted to process the one or more sensed medical parameters; and

a communications interface for transmitting and/or receiving data back and forth between the device and one or more remote devices in communication with the device.

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专利名称(译)	结合外围和健康监测设备		
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[标]申请(专利权)人(译)	指导INTERACTIVE HEALTHCARE		
申请(专利权)人(译)	指导INTERACTIVE HEALTHCARE，INC.		
当前申请(专利权)人(译)	指导INTERACTIVE HEALTHCARE，INC.		
[标]发明人	WESSEL PAUL		
发明人	WESSEL, PAUL		
IPC分类号	A61B5/00		
CPC分类号	A61B5/14532 A61B5/411 A61B5/0002 G06F19/3456 A61B2562/0295 G06F19/3406 G16H40/63 G16H40/67		
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摘要(译)

公开了一种与计算机一起使用的组合外围和健康监测设备。该设备可以包括适于感测一个或多个医疗参数（例如血糖水平）的传感器，与传感器通信的医疗电路，用于处理一个或多个感测的医疗参数，以及用于在两者之间来回发送和接收数据的通信接口。设备和计算机。