US007238156B1

(12) **United States Patent**
Adamczyk

(10) **Patent No.: US 7,238,156 B1**
(45) **Date of Patent: Jul. 3, 2007**

(54) **SYSTEMS, METHODS, AND DEVICES FOR HEALTH MONITORING**

(75) Inventor: **Maria Adamczyk**, Alpharetta, GA (US)

(73) Assignee: **AT&T Intellectual Property, Inc.**, Wilmington, DE (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/631,549**

(22) Filed: **Jul. 31, 2003**

(51) **Int. Cl.**
A61B 5/00 (2006.01)

(52) **U.S. Cl.** **600/300**; 128/904; 128/920; 705/2

(58) **Field of Classification Search** 600/300–301; 128/903–905, 920; 340/539, 573.1; 705/2–4
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,760,593	A		7/1988	Shapiro et al.
4,918,717	A		4/1990	Bissonnette et al.
5,333,171	A		7/1994	Wang et al.
5,438,568	A		8/1995	Weisser, Jr.
5,589,818	A		12/1996	Queen
5,717,379	A		2/1998	Peters
5,724,025	A	*	3/1998	Tavori 600/300
5,812,054	A		9/1998	Cohen
5,884,032	A		3/1999	Bateman et al.
6,094,134	A		7/2000	Cohen
6,271,752	B1		8/2001	Vaios
6,292,542	B1		9/2001	Bilder
6,295,346	B1		9/2001	Markowitz
6,302,844	B1	*	10/2001	Walker et al. 600/300
6,330,499	B1		12/2001	Chou et al.
6,356,841	B1		3/2002	Hamrick et al.
6,442,241	B1		8/2002	Tsumpes
6,443,890	B1	*	9/2002	Schulze et al. 600/300
6,478,736	B1	*	11/2002	Mault 600/300
6,504,909	B1		1/2003	Cook et al.
6,519,241	B1		2/2003	Theimer
6,553,106	B1		4/2003	Gould et al.
6,563,910	B2		5/2003	Menard et al.
6,567,502	B2		5/2003	Zellner et al.

OTHER PUBLICATIONS

An online article titled, "Samsung integrate digital camera and phone," published on Jul. 1, 2000, and retrieved from http://www.dpreview.com/news/0007/00070101samsungdigiphone.asp on Aug. 10, 2000 (two pages).

Daniel L. Lough et al., "A Short Tutorial on Wireless LANs and IEEE 802.11," retrieved from http://computer.org/students/looking/summer97/free802.htm on Sep. 7, 2000 (five pages).

Description of ITI Wireless Intrusion Sensors, pp. 1-3, available on Feb. 22, 2000 at http://www.flex.com/~digital/itwis.html.

U.S. Appl. No. 09/586,065, filed Jun. 2, 2000.

U.S. Appl. No. 10/402,517, filed Mar. 28, 2003.

U.S. Appl. No. 09/586,067, filed Jun. 2, 2000.

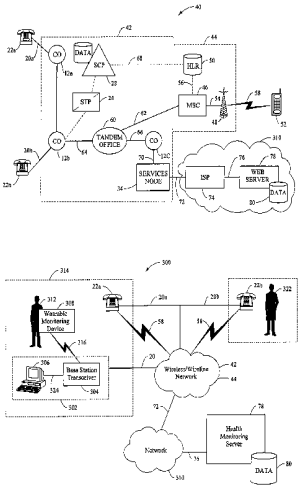
* cited by examiner

Primary Examiner—Max F. Hindenburg
Assistant Examiner—Michael C Astorino
(74) *Attorney, Agent, or Firm*—Potomac Patent Group PLLC

(57) **ABSTRACT**

A health monitoring system is disclosed. According to one embodiment, the health monitoring system includes a first server configured to receive a first set of information from a monitoring device, wherein the first set of information includes a health condition reading of a subscriber, and wherein the first server is configured to process the first set of information and transmit a second set of information to the monitoring device and/or a telecommunications device, wherein the second set of information includes medical treatment information and/or medical advice concerning the subscriber. The health monitoring system also includes a database in communication with the first server and configured to store a third set of information therein, wherein the third set of information includes emergency contact information, one or more health conditions of the subscriber, monitoring time intervals, and/or numerical ranges defining acceptable health conditions and medical alert conditions.

10 Claims, 5 Drawing Sheets



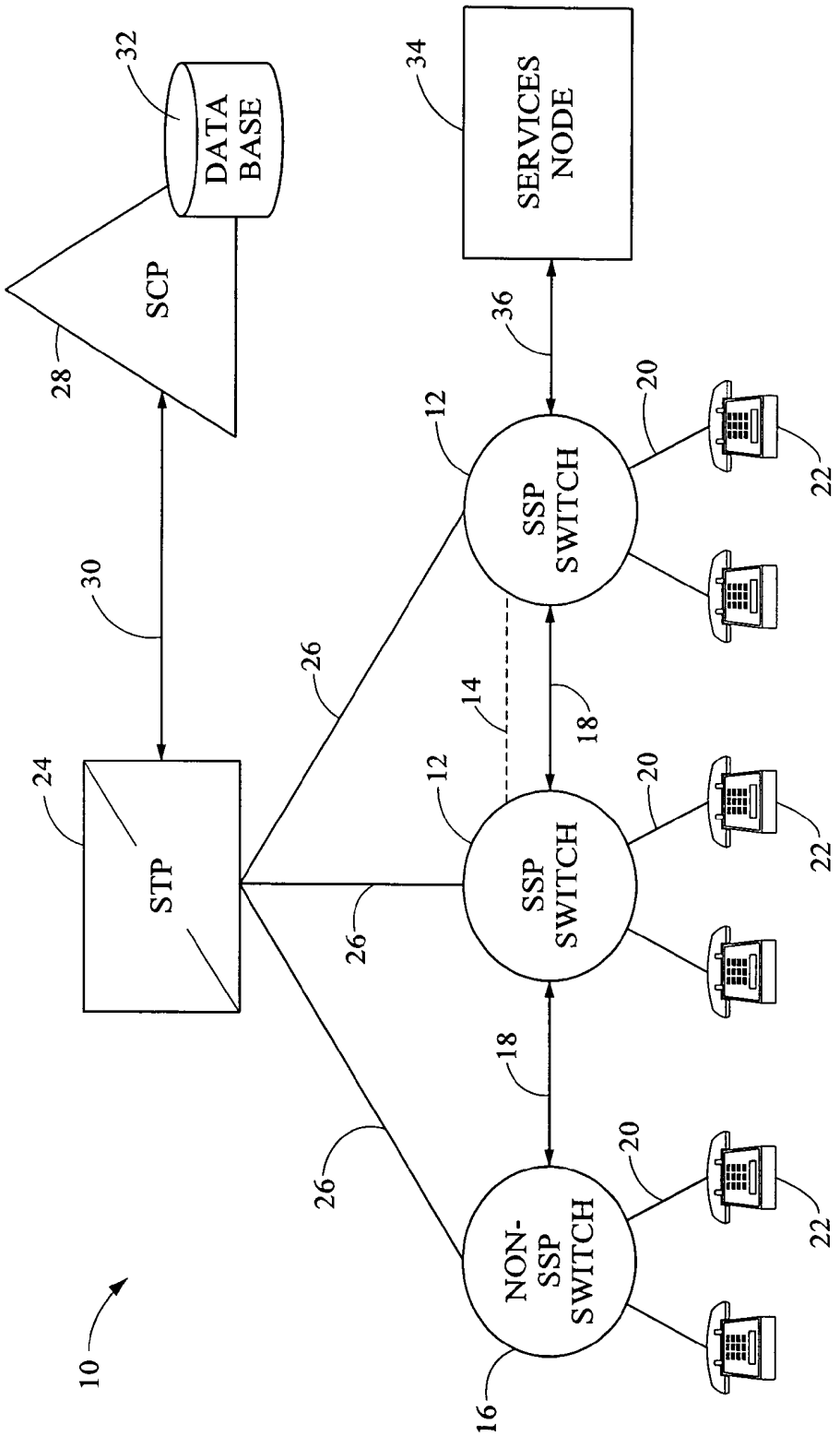

10
STP
24
SCP
28
DATA BASE
32
30
SERVICES NODE
34
36
SSP SWITCH
12
SSP SWITCH
12
NON-SSP SWITCH
16
14
18
18
26
26
26
20
20
20
22
22
22

FIG. 1

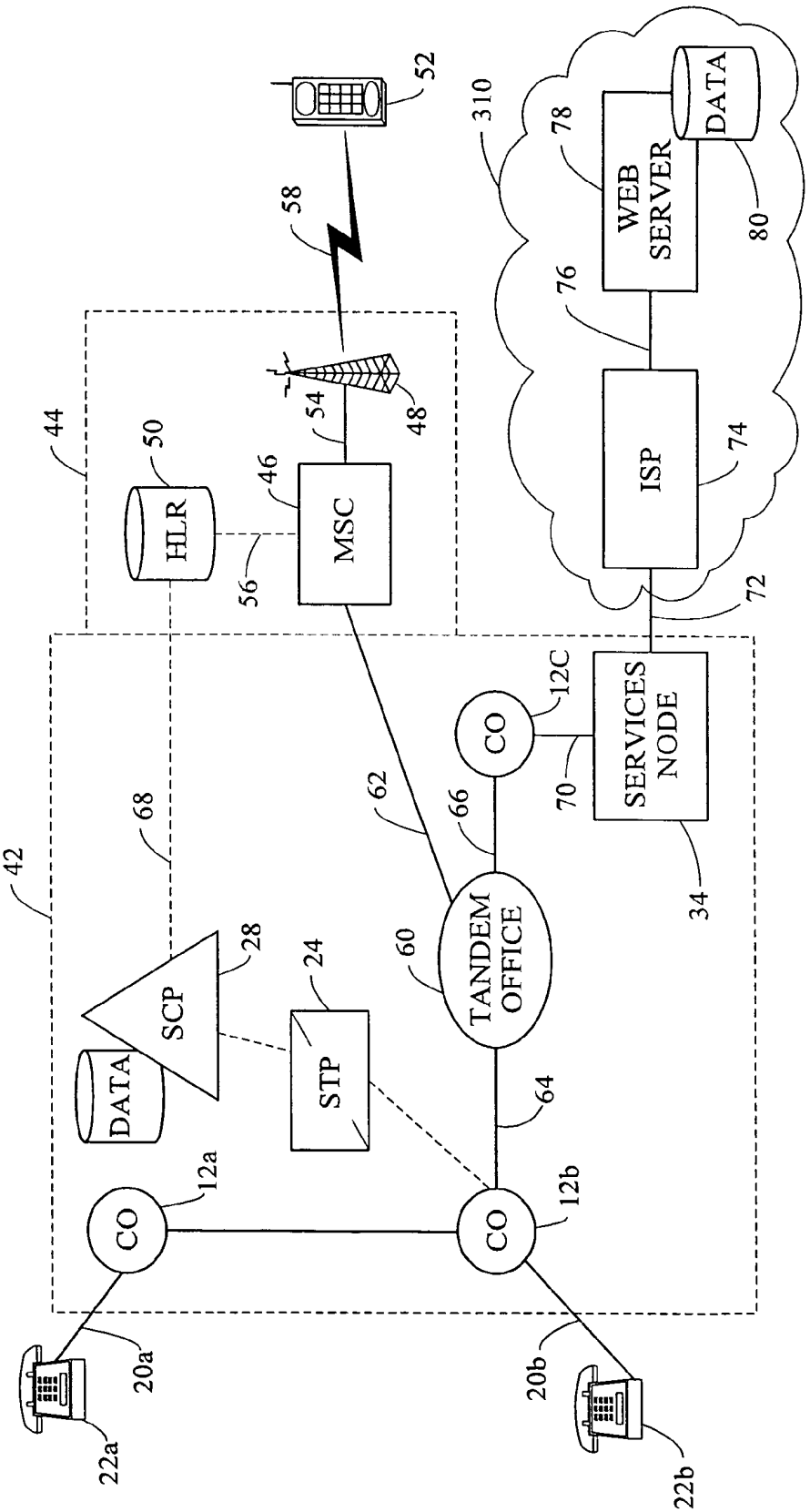

40
42
44
46
48
50
52
54
56
58
60
62
64
66
68
70
72
74
76
78
80
310
34
HLR
MSC
SCP
DATA
STP
TANDEM OFFICE
CO
CO
CO
SERVICES NODE
ISP
WEB SERVER
DATA
12a
12b
12C
20a
20b
22a
22b
24
28

FIG. 2

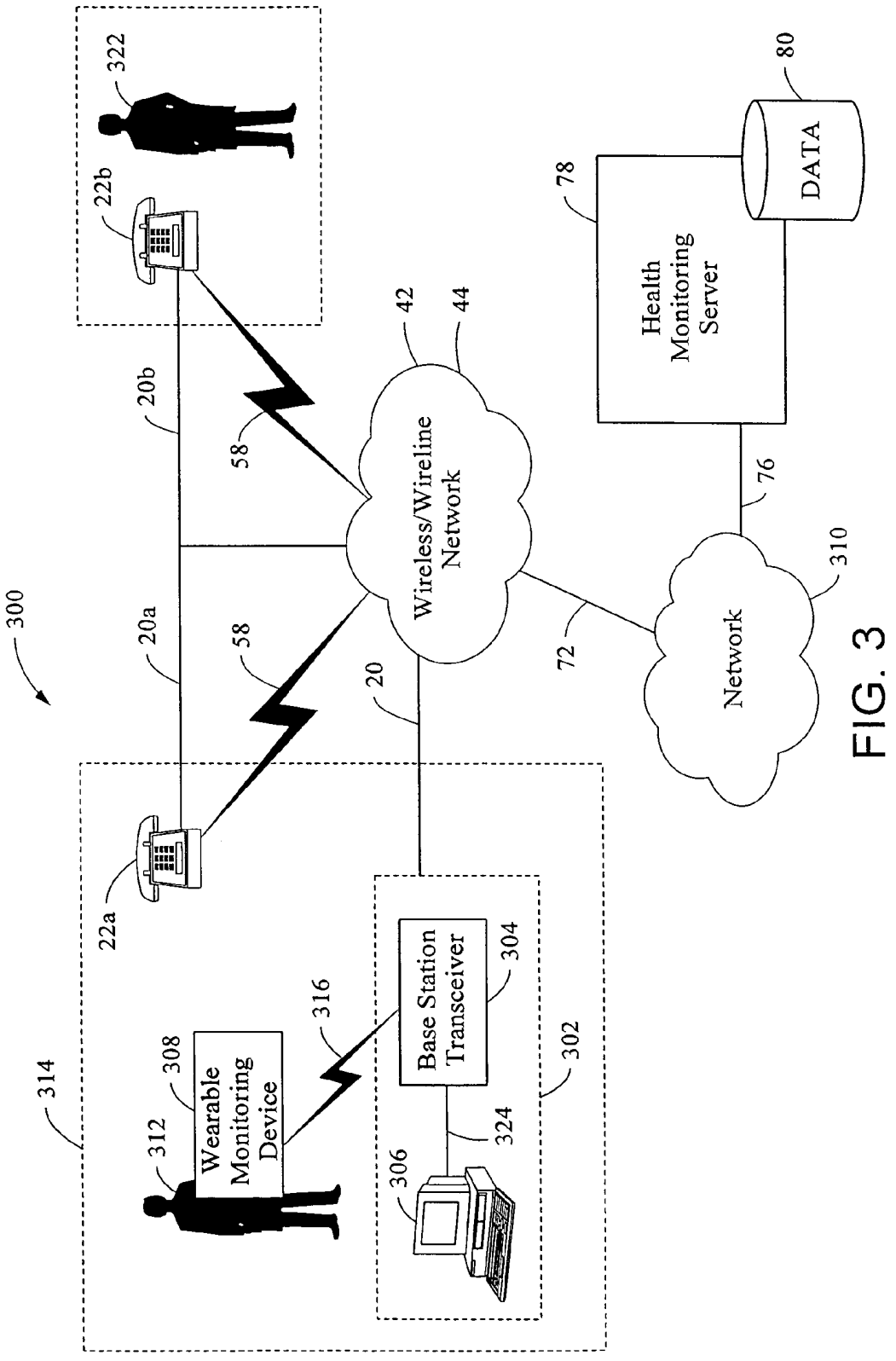

300
314
312
308
Wearable Monitoring Device
316
306
Base Station Transceiver
304
324
302
22a
20a
58
20
22b
20b
58
322
42
44
Wireless/Wireline Network
72
Network
310
76
78
Health Monitoring Server
80
DATA

FIG. 3

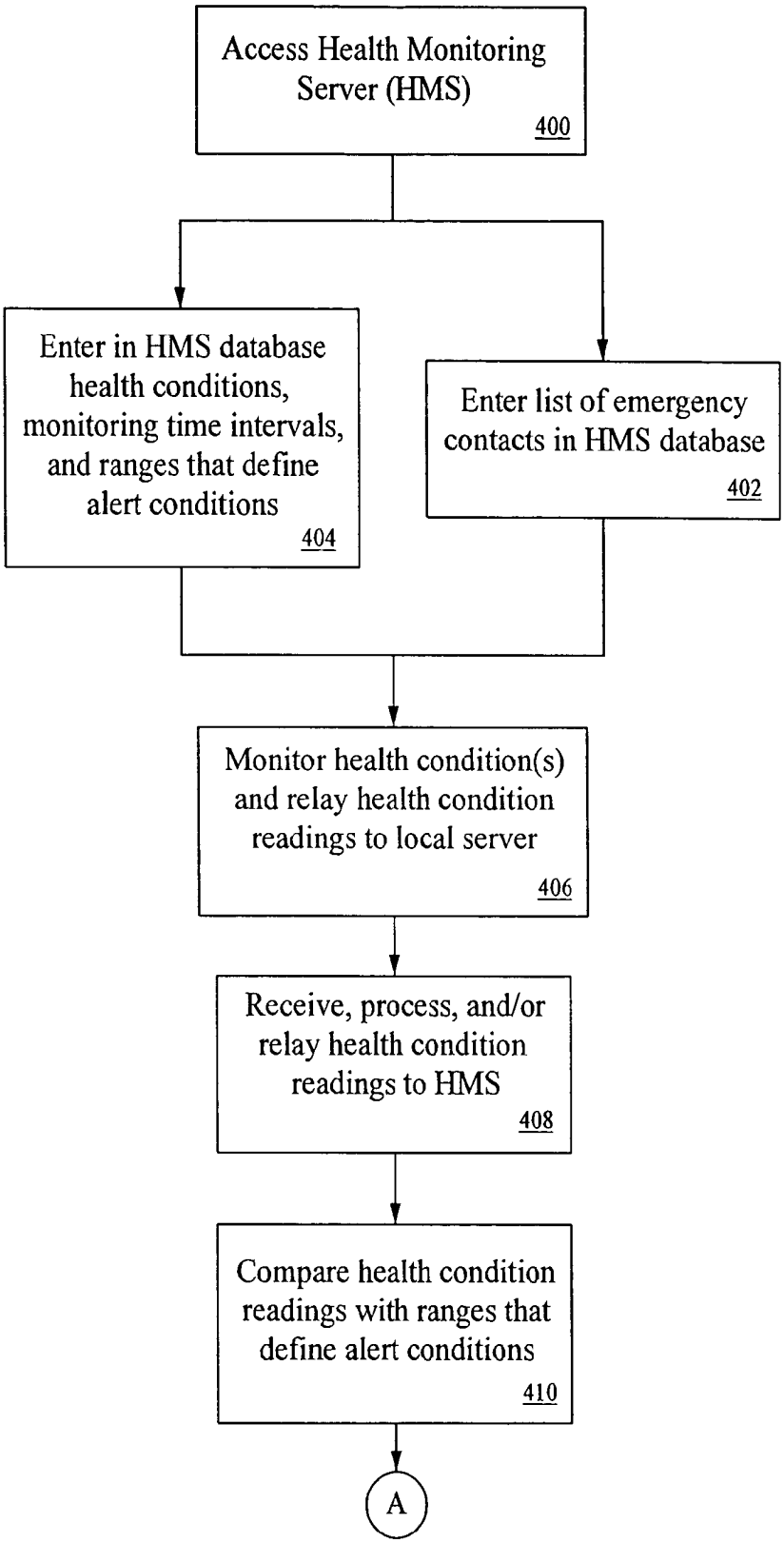

Access Health Monitoring Server (HMS)
400
Enter in HMS database health conditions, monitoring time intervals, and ranges that define alert conditions
404
Enter list of emergency contacts in HMS database
402
Monitor health condition(s) and relay health condition readings to local server
406
Receive, process, and/or relay health condition readings to HMS
408
Compare health condition readings with ranges that define alert conditions
410
A

FIG. 4A

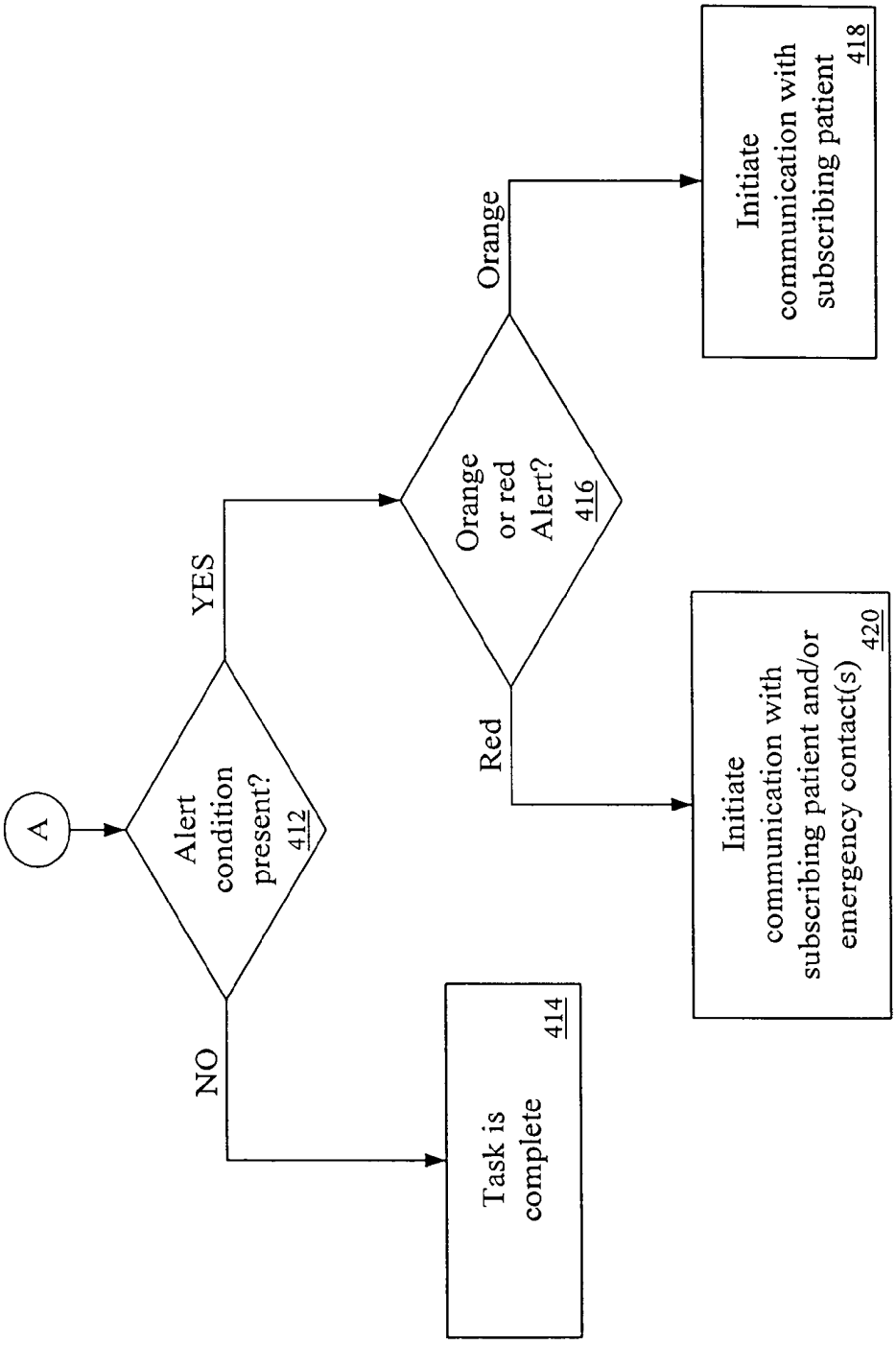

A
Alert condition present? 412
NO
Task is complete 414
YES
Orange or red Alert? 416
Orange
Initiate communication with subscribing patient 418
Red
Initiate communication with subscribing patient and/or emergency contact(s) 420

FIG. 4B

SYSTEMS, METHODS, AND DEVICES FOR HEALTH MONITORING

BACKGROUND

In the medical industry, it is common practice to utilize instruments and devices to monitor the health condition of patients. The health condition of a patient may be defined by measuring and recording a quantifiable parameter such as, for example, pulse, blood pressure, blood sugar, and cholesterol and then comparing the recorded measurement against a predefined range that a physician may establish for each patient. If the recorded measurement is within the predefined range, the patient's health may be considered satisfactory. In contrast, a recorded measurement that falls outside the predefined range may cause a physician to further explore the nonconforming reading and ultimately prescribe medical treatment.

Generally, the instruments and devices that are capable of monitoring a patient's health are located at doctors' offices, hospitals, or other medical facilities, and thus require patients to travel from their residence or workplace to monitor their particular health condition(s). However, many people such as, for example, elderly individuals, have health conditions that necessitate constant monitoring. In addition, the inconvenience and expense of doctor/hospital visits may also prevent individuals from monitoring their particular condition and thus prevent such individuals from maintaining good health.

SUMMARY

In one general respect, one embodiment of the present invention is directed to a health monitoring system. According to this embodiment, the health monitoring system includes a first server configured to receive a first set of information from a monitoring device, wherein the first set of information includes a health condition reading of a subscriber, and wherein the first server is configured to process the first set of information and transmit a second set of information to the monitoring device and/or a telecommunications device, wherein the second set of information includes medical treatment information and/or medical advice concerning the subscriber. The health monitoring system also includes a database in communication with the first server and configured to store a third set of information therein, wherein the third set of information includes emergency contact information, one or more health conditions of the subscriber, monitoring time intervals, and/or numerical ranges defining acceptable health conditions and medical alert conditions.

BRIEF DESCRIPTION OF THE DRAWINGS

Further advantages of the present invention may be better understood by referring to the following description taken in conjunction with the accompanying drawings, in which:

FIG. **1** is a block diagram of an Advanced Intelligent Network (AIN) for integration with a public switched telephone network according to one embodiment of the present invention;

FIG. **2** is a block diagram of a system according to one embodiment of the present invention;

FIG. **3** is a block diagram of a system according to another embodiment of the present invention; and

FIGS. **4***a* and **4***b* are flowcharts illustrating a process performed by the system shown in FIG. **3** according to one embodiment of the present invention.

DESCRIPTION

It is to be understood that the figures and descriptions of the present invention have been simplified to illustrate elements that are relevant for a clear understanding of the present invention, while eliminating, for purposes of clarity, other elements of a conventional telecommunications network. For example, certain operating system details and modules of certain of the intelligent platforms of the network are not described herein. Those of ordinary skill in the art will recognize, however, that these and other elements may be desirable in a typical telecommunications network. However, because such elements are well known in the art and because they do not facilitate a better understanding of the present invention, a discussion of such elements is not provided herein.

The term "calling party" is used herein generally to refer to the person or device that initiates a telecommunication. In some cases, the calling party may not be a person, but may be a device such as a facsimile machine, an answering service, a modem, etc. The term "communication" is used herein to include all messages or calls that may be exchanged between a calling party and a called party, including, but not limited to, voice, data and video messages. The term "communication" is used synonymously herein with the term "call" unless a distinction is noted. The term "subscriber" is used herein to generally refer to a subscriber of the described telecommunications service. The subscriber may also be referred to herein as "patient" or as "subscribing patient."

According to one embodiment, the system of the present invention utilizes the intelligent functionality of an Advanced Intelligent Network (AIN). The AIN is a network that may be used in conjunction with a conventional telephone network, such as the public switched telephone network (PSTN), to provide enhanced voice and data services and dynamic routing capabilities using two different networks. The actual voice call is transmitted over a circuit-switched network, but the signaling is done on a separate packet-switched network. In another embodiment, the AIN may be a service independent architecture designed to be programmable and controlled by software distributed in elements throughout the network. In addition, the AIN may reside in a Common Channel Signaling (CCS) network, using Signaling System 7 (SS7) protocol to request routing instruction. Before describing details of the system of the present invention, a description of the AIN is provided.

FIG. **1** is a block diagram of an Advanced Intelligent Network (AIN) **10** for integration with the public switched telephone network (PSTN) according to one embodiment of the present invention. The AIN **10** may be employed by a Local Exchange Carrier (LEC) and may be utilized by the LEC to allow the LEC to provide call processing features and services that are not embedded within conventional switching circuits of the PSTN.

A typical LEC includes a number of central office (CO) switches for interconnecting customer premises terminating equipment with the PSTN. For an LEC including the AIN **10** as illustrated in FIG. **1**, the central office switches may be provided as Service Switching Points (SSP) switches **12**. The dashed line **14** between the SSP switches **12** indicates that the number of SSP switches **12** in the AIN **10** may vary depending on the particular requirements of the AIN **10**. The AIN **10** may also include a non-SSP switch **16**. The difference between the SSP switches **12** and the non-SSP switch **16** is that the SSP switches **12** provide intelligent network functionality. Interconnecting the SSP switches **12** and the

non-SSP switch **16** are communication links **18** which may be, for example, trunk circuits.

Each SSP switch **12** and non-SSP switch **16** has a number of subscriber lines **20** connected thereto. The subscriber lines **20** may be, for example, conventional twisted pair loop circuits (i.e. Plain Old Telephone Service (POTS)) connected between the switches **12**, **16** and the telephone drops for the customer premises, or the subscriber lines **20** may be trunk circuits, such as T-1 trunk circuits, a Digital Subscriber Line (DSL), or an Integrated Services Digital Network (ISDN). The number of subscriber lines **20** connected to each switch **12** and switch **16** may be on the order of, for example, ten thousand to one hundred thousand lines. Each of the subscriber lines **20** is connected to a terminating piece of customer premises equipment, represented in FIG. **1** by the landline telephones **22**. Alternatively, the terminating equipment may be other types of telecommunications devices such as, for example, a telecopier, a personal computer, a modem, or a private branch exchange (PBX) switching system.

For the AIN **10** illustrated in FIG. **1**, each SSP switch **12** and the non-SSP switch **16** are connected to a signal transfer point (STP) **24** via a communication link **26**. The communication link **26** may employ, for example, the SS7 switching protocol. The STP **24** may be a multi-port high speed packet switch that is programmed to respond to the routing information in the appropriate layer of the switching protocol and route the data packets to their intended destination.

One of the intended destinations of the data packets from the STP **24** is a service control point (SCP) **28**. The STP **24** is in communication with the SCP **28** via a communication link **30**, which may also employ the SS7 switching protocol. The SCP **28** may be an intelligent database server such as, for example, an Intelligent Network Service Control Point available from Lucent Technologies Inc., Murray Hill, N.J., and may have associated with it a network database **32** for storing network data. The intelligent functionality of the SCP **28** may be realized by application programs, such as programmable Service Program Applications (SPA), which are run by the SCP **28**. The SCP **28** may be employed to implement high volume routing services, such as call forwarding and number portability translation and routing. In addition, another of the functions of the SCP **28** is hosting of the network database **32**, which may store subscriber information, such as subscriber call management profiles, used in providing enhanced calling services.

The AIN **10** illustrated in FIG. **1** also includes a services node (SN) **34**. The SN **34** may be, for example, a Compact Services Node (CSN) available from Lucent Technologies Inc., Murray Hill, N.J., although the SN **34** may be any other type of available intelligent peripheral. The SN **34** may be connected to one or more of the SSP switches **12** via a communications link **36** which may be, for example, an Integrated Service Digital Network (ISDN), including BRI (Basic Rate Interface) or PRI (Primary Rate Interface) lines. According to other embodiments, the communications link **36** may be, for example, a T-1 trunk circuit.

In order to keep the processing of data and calls as simple as possible at the switches, such as at the SSP switches **12**, a set of triggers may be defined at the SSP switches **12** for each call. A trigger in an AIN is an event associated with a particular subscriber line **20** that generates a data packet to be sent from the SSP switch **12** servicing the particular subscriber line **20** to the SCP **28** via the STP **24**. The triggers may be originating triggers for calls originating from the subscriber premises or terminating triggers for calls terminating at the subscriber premises. A trigger causes a message in the form of a query to be sent from the SSP switch **12** to the SCP **28**.

The SCP **28** in turn interrogates the database **32** to determine whether some customized call feature or enhanced service should be implemented for the particular call or whether conventional dial-up telephone service should be provided. The results of the database inquiry are sent back from the SCP **28** to the SSP switch **12** via the STP **24**. The return packet includes instructions to the SSP switch **12** as to how to process the call. The instructions may be to take some special action as a result of a customized calling service or enhanced feature. For example, for an enhanced calling feature requiring the capabilities of the SN **34**, the return message from the SCP **28** may include instructions for the SSP switch **12** to route the call to the SN **34**. In addition, the return message from the SCP **28** may simply be an indication that there is no entry in the database **32** that indicates anything other than conventional telephone service should be provided for the call. The query and return messages may be formatted, for example, according to conventional SS7 TCAP (Transaction Capabilities Application Part) formats. U.S. Pat. No. 5,438,568, which is incorporated herein by reference, discloses additional details regarding the functioning of an AIN.

The AIN **10** illustrated in FIG. **1** includes only one STP **24**, one SCP **28**, one network database **32**, and one SN **34**, although the AIN **10** may further include an additional number of these components as well as other network components which are not included in FIG. **1** for purposes of clarity. For example, the AIN **10** may additionally include redundant SCPs and STPs to take over if the STP **24** or the SCP **28** should fail. In addition, the AIN **10** may include an Automatic Electronic Switching System (AESS) Network Access Point (NAP) in communication with the STP **24**, which may be programmed to detect the trigger conditions. Further, the AIN **10** may include regional STPs and regional SCPs in communication with, for example, the local STP **24**, for routing and servicing calls between different LECs.

The present invention is directed, according to one embodiment, to a system for monitoring the health condition (s) of a patient such as, for example, pulse, blood pressure, blood sugar, and cholesterol. FIG. **2** is a diagram of a system **40** according to one such embodiment. For clarity, the communications links shown in FIG. **2** that are used exclusively for signaling (e.g., no call data) are illustrated with dashed lines, and communications links that transfer signaling or call data are illustrated with solid lines. The system **40** includes a landline network **42** and a wireless network **44**. The landline network **42** includes portions of an AIN as described in conjunction with FIG. **1**, including the CO SSP switches **12***a–c* (designated as "CO" in FIG. **2** and referred to as "CO switch(es)" hereinafter), the STP **24**, the SCP **28**, and the SN **34**. The landline telephones **22***a*, **22***b* are in communication with the switches **12***a*, **12***b* via subscriber lines **20***a*, **20***b*, respectively. For purposes of clarity, other elements of an AIN are not shown in FIG. **2**.

The wireless network **44** includes a mobile switching center (MSC) **46**, a base transceiver station (BTS) **48**, and a home location register (HLR) **50**. The MSC **46** is in communication with a wireless telecommunications device **52**, such as a wireless telephone, as illustrated in FIG. **2**, via the BTS **48**. The BTS **48** may communicate with wireless telecommunications device **52** according to an air-interface communication scheme **58** such as, for example, AMPS (ANSI-553), TDMA (IS-136), CDMA (IS-95), or GSM. The BTS **48** may be in communication with the MSC **46** via the

communications link **54**. The MSC **46** is an automatic switching system in a wireless telecommunications network that acts as the interface for subscriber traffic between the wireless network **44** and the landline network **42** or other MSCs in the same or other wireless networks. The MSC **46** performs the same general function as a central office switch in a landline based system. In addition, the MSC **46** supports incoming calls through a radio telecommunications front-end, as well as handoff and roaming functions. Accordingly, the MSC **46** may include wireless IN functionality for detecting originating and terminating triggers (e.g. WIN and CAMEL).

The MSC **46** may be in communication with the HLR **50** via a communications link **56** which may, for example, be an SS7 signaling protocol link. The HLR **50** is a location register to which the user identity of a wireless telecommunications device, such as the wireless telephone **52**, is assigned for record purposes. The HLR **50** may register subscriber information relating to wireless telecommunications devices such as, for example, profile information, current location, and authorization period. When the MSC **46** detects a wireless telecommunications device entering the MSC's service area, the MSC **46** performs a registration process that includes requesting subscriber profile information from either the HLR **50** or a visitor location register (VLR) (not shown), depending upon whether the wireless telephone **52** is within its home location or within a visitor location. For integrated wireless networks, the VLR assigned to the service area of a visiting wireless subscriber may be updated with information from the HLR associated with the wireless subscriber's wireless service provider (WSP). Accordingly, the MSC **46** servicing a particular area has access to information regarding each of the wireless users presently in its service area. In addition, the HLR **50** of the wireless network **44** may be in communication with the SCP **28** of the landline network **42**, via a communications link **68** employing, for example, the IS-41 signaling protocol.

The landline network **42** additionally includes a tandem office **60**, which provides a switching interface between the landline network **42** and the wireless network **44**. The tandem office **60** may be in communication with the MSC **46** via a communications link **62**, which may be, for example, a trunk circuit or an ISDN. In addition, the tandem office **60** may be in communication with the CO switches (such as CO switches **12***b*, **12***c* as illustrated in FIG. **2**) via communications links **64**, **66** respectively, which may be, for example, trunk circuits.

Also, the CO switches (such as the CO switch **12***c*, as illustrated in FIG. **2**) may be in communication with a services node (SN) **34** via a communications link **70**, which may be, for example, an Integrated Service Digital Network (ISDN), including BRI (Basic Rate Interface) or PRI (Primary Rate Interface) lines. According to other embodiments, the communications link **70** may be, for example, a T-1 trunk circuit.

In one embodiment of the present invention, the SN **34** executes programmable applications to access a server **78**, such as, for example, a web server, to provide either the wireless device **52** or the landline device **22***a*, **22***b* with call specific information. The SN **34** then transmits such information to the wireless network **44** or the landline network **42**, via the tandem office **60**. In one embodiment of the present invention, the SN **34** may function as a voice/web gateway to allow the landline network **42** to access a network **310**, such as, for example, the Internet and an Internet service provider **74** via a communications link **72**, which may be, for example, a TCP/IP (Transmission Control Protocol/Internet Protocol) connection. Also, the Internet service provider **74** may be in communication with the server **78** and its corresponding database **80**, via a communications link **76**, which may be, for example, another TCP/IP connection. In another embodiment, the SN **34** may be located in the wireless network **44**.

In one embodiment, where the personal health monitoring service is provided as a subscriber service by a telecommunications provider, the SN **34** may execute programmable applications to access the server database **80** to provide, for example, audio, video, graphics, and/or text files that include medical treatment information and/or medical advice concerning the subscriber's health condition.

FIG. **3** is a block diagram of a system **300** according to one embodiment of the present invention. According to this embodiment, a local server **302** may be located, for example, at a subscriber's **312** residence or workplace **314**. The local server **302** may include, for example, a personal computer **306** that provides network addressing and routing and functions as a gateway between the home/workplace **314** and a network **310** such as, for example, the Internet. In addition, the local server **302** may, for example, also include one or more base station transceivers **304** that are configured to transmit and receive signals to and from a monitoring device **308** that may be worn by the subscriber **312**. In one embodiment, the subscriber **312** may, for example, wear the monitoring device **308** around his/her wrist or neck similar to a wristwatch or necklace. In another embodiment, the subscriber **312** may attach the monitoring device **308** to his/her clothing such as, for example, attaching the monitoring device **308** to his/her belt, sock, pants or shirt.

According to one embodiment of the present invention, a signal **316** received by the base station transceiver **304** from the monitoring device **308** may, for example, include data regarding pulse, blood pressure, blood sugar level or any other parameter that a physician may establish for the subscriber **312** such as, for example, an electrocardiogram. According to this embodiment, the base station transceiver **304** may, for example, be coupled to the personal computer **306** via a wire or wireless communications link **324**. The personal computer **306** may, therefore, receive the data from the base station transceiver **304** and process, store, and/or relay the data to a server **78**, which may be configured as a health monitoring server, via a dialup or permanent connection to the network **310**.

In one embodiment, the communications link **324** may be a wired connection such as, for example, conventional twisted pair copper wire or a coaxial cable connection. Alternatively, communications link **324** may be implemented as a wireless connection such as, for example, IEEE 802.11 wireless LAN or Bluetooth technologies.

In another embodiment, the system **300** may include a communications link **20** that may be conventional twisted pair loop circuits (i.e. Plain Old Telephone Service (POTS)), trunk circuits, such as T-1 trunk circuits, a Digital Subscriber Line (DSL), or an Integrated Services Digital Network (ISDN). In addition, a service node **34** (not shown) included in the wireless/wireline network **42**, **44** may function as a voice/web gateway to allow the wireless/wireline network **42**, **44** to access an Internet service provider (not shown) via a communications link **72**, which may be, for example, a TCP/IP (Transmission Control Protocol/Internet Protocol) connection.

In one embodiment, the Internet service provider may, for example, be in communication with the server **78** via a communications link **76**, which may be, for example,

another TCP/IP connection. According to this embodiment, the server **78** may include a database **80** that is configured to store numerical ranges that identify acceptable and unacceptable health condition(s) for the subscriber **312**. In another embodiment, the server **78** may also be configured to compare the predefined ranges with the current health condition readings obtained from the monitoring device **308**.

In yet another embodiment, the personal computer **306** may receive information from the server **78**, via communications link **20**. According to this embodiment, the personal computer **306** may relay such information to the base station transceiver **304** which may in turn transmit the signal **316** to the monitoring device **308**. In one embodiment, the signal **316** may include data such as, for example, text messages involving medical instructions that can be displayed on the monitoring device **308**. In addition, the data may, for example, be in a short message service (SMS) format or a multimedia message service (MMS). According to this embodiment, the signal may include, for example, text, voice, data and/or video messages involving medical instructions and/or notifications that alert or advise the subscriber **312** of a possible medical emergency. In another embodiment, the signal **316** may, for example, also cause a red or orange light on the monitoring device **308** to illuminate.

According to one embodiment of the present invention, the wireless network connectivity (depicted as signal **316**) between the monitoring device **308** and the base station transceiver **304** and the wireless network connectivity (depicted as communications link **324**) between the base station transceiver **304** and the personal computer **306** may be accomplished using radio frequencies (RF) such as, for example, IEEE 802.11 wireless LAN or Bluetooth technologies. The IEEE 802.11 standard defines the protocol for two types of networks: ad hoc and client/server networks. An ad hoc network may be a network in which communications are established between multiple stations in a given coverage area without the use of an access point or server. The standard specifies the etiquette that each station must observe so that all stations have fair access to the wireless media. It provides methods for arbitrating requests to use the media to ensure that throughput is maximized for all subscribers in the base service set. The client/server network uses an access point that controls the allocation of transmit time for all stations and allows mobile stations to roam from cell to cell. The access point is used to handle traffic from the mobile radio to the wired or wireless backbone of the client/server network. This arrangement allows for point coordination of all of the stations in the basic service area and ensures proper handling of the data traffic. The access point routes data between wireless stations or to and from the network server.

Bluetooth radio technology provides a universal bridge to existing data networks, a peripheral interface, and a mechanism to form small private ad hoc groupings of connected devices away from fixed network infrastructures. Designed to operate in an RF environment, the Bluetooth radio uses a fast-acknowledgment and frequency-hopping scheme to make a robust link between a data network and a peripheral interface. In addition, Bluetooth radio modules may avoid interference from other signals by hopping to a new frequency after transmitting or receiving a data packet.

In another embodiment of the present invention, the server **78** may transmit a signal, via the network **310** and the wireless/wireline network **42**, **44**, to one or more communications devices **22***a* associated with the subscriber's home/workplace **314** and/or one or more communications devices **22***b* associated with an emergency contact(s) **322**. In one embodiment, communications devices **22***a* and **22***b* may, for example, include a POTS telephone, as shown in FIG. **3**, or, in other embodiments, communications devices **22***a* and **22***b* may include, for example, a personal computer, telecopier, wireless telephone, a personal digital assistant (PDA), and/or a pager.

In one embodiment, the wireless network **44** may communicate with the communications devices **22***a* and **22***b* according to an air-interface communication scheme **58** such as, for example, AMPS (ANSI-553), TDMA (IS-136), CDMA (IS-95), or GSM. In another embodiment, the wireline network **42** may communicate with communications devices **22***a* and **22***b* via communications links **20***a* and **20***b*, which may be conventional twisted pair loop circuits (i.e. Plain Old Telephone Service (POTS)), trunk circuits, such as T-1 trunk circuits, a Digital Subscriber Line (DSL), or an Integrated Services Digital Network (ISDN).

According to one embodiment of the present invention, the signal transmitted from the server **78** to the communications devices **20***a* and **20***b* may, for example, be in a short message service (SMS) format or a multimedia message service (MMS) format. According to this embodiment, the signal may include, for example, text, voice, data and/or video messages involving medical instructions and/or notifications that alert or advise the subscriber **312** and/or the emergency contact **322** of a possible medical emergency.

FIGS. **4***a* and **4***b* are flowcharts illustrating an embodiment of a process performed by the system **300** shown in FIG. **3**. At step **400**, the subscribing patient **312** and medical personnel, such as, for example, a physician or nurse, access the server **78**. At step **402**, the subscribing patient **312** enters into the database **80** of the server **78** a list of emergency contacts **322** and their associated contact information such as, for example, the email address or the telephone, facsimile, and/or pager number(s) of a doctor, ambulance service, neighbor, relative, the subscribing patient's **312** home/work place, etc.

In addition, medical personnel may, at step **404**, enter into the database **80** the health condition(s) to be monitored and the time intervals in which to monitor them. Medical personnel may also enter ranges that define acceptable and unacceptable health levels as well as varying alert conditions that result from readings that do not fall within a predefined range. For example, the health condition of the subscribing patient **312** may be defined by measuring and recording a quantifiable parameter such as, for example, pulse, blood pressure, blood sugar, and cholesterol and then comparing the recorded measurement against the predefined range that a physician may establish for the subscribing patient **312**. If the recorded measurement (i.e. the health condition reading) is within the predefined range, the patient's health may be considered satisfactory. In contrast, a health condition reading that falls outside the predefined range may trigger, for example, an orange or red alert (discussed below) that may cause a physician to further explore the nonconforming reading and ultimately prescribe medical treatment.

Once the subscribing patient **312** and medical personnel input the necessary information into the database **80**, the monitoring device **308** may continually monitor the subscribing patient's **312** health condition identified by medical personnel in step **404** and relay, at defined time intervals, the health condition readings to the local server **302**, as shown by step **406**.

At step **408**, the local server **302**, may then receive, process and/or relay the health condition readings to the server **78**. After receiving the health condition readings, the

server **78**, at step **410**, may then compare the readings with the ranges that medical personnel defined in step **404**. As shown at step **412**, the server **78** then identifies if an alert condition exists. If the health condition reading is within the predefined range, no alert condition exists, and the task is complete at step **414**. However, if the health condition reading is not within the predefined range, an alert condition exists and the process proceeds to step **416**.

At step **416**, the server **78** may further define the alert condition identified in step **412** to be, for example, an orange or red alert condition. In one embodiment of the present invention, an orange alert may occur if the health condition reading is slightly above or below the predefined range such that the reading falls within other ranges that medical personnel have defined to be an orange alert condition. In such case, the server **78** may, as shown by step **418**, initiate a communication with the subscribing patient **312**, via the health monitoring device **308** and/or the communications device **22***a*. According to one embodiment, the communication may, for example, involve illuminating an orange light on the monitoring device **308** and/or delivering one or more voice, data, text, or graphic messages to the monitoring device **308** and/or the communications device **22***a* that provide the subscribing patient **312** with medical instructions such as, for example, "you have been stressed, relax and take your prescribed medication."

In another embodiment of the present invention, a red alert may occur if the health condition reading is drastically above or below the predefined range such that the reading falls within other ranges that medical personnel have defined to be a red alert condition. In such case, the server **78** may, as shown by step **420**, initiate a communication with or between the subscribing patient **312** and one or more emergency contacts **322**, via the health monitoring device **308** and/or communications devices **22***a* and **22***b*. According to one embodiment, the communication may, for example, involve illuminating a red light on the monitoring device **308** and/or delivering one or more voice, data, text, or graphic messages to the monitoring device **308** and/or the communications devices **22***a* and **22***b* that may provide medical information and advice to the subscribing patient **312** and/or the emergency contact **322**.

The various methods described hereinabove may be implemented on any type of suitable computer hardware, computer software, or combinations thereof. For example, the methods may be implemented in computer software using any suitable computer software language type such as, for example, C or C++ using, for example, conventional or object-oriented techniques. Such software may be stored on any type of suitable computer-readable medium or media such as, for example, a magnetic or optical storage medium.

While several embodiments of the invention have been described, it should be apparent, however, that various modifications, alterations and adaptations to those embodiments may occur to persons skilled in the art with the attainment of some or all of the advantages of the present invention. It is therefore intended to cover all such modifications, alterations and adaptations without departing from the scope and spirit of the present invention as defined by the appended claims.

What is claimed is:

1. A health monitoring system, comprising:

a monitoring device which monitors at least one health condition associated with a subscriber and which transmits a first set of information associated with said at least one health condition;

a first server, local to said monitoring device and which provides network addressing, routing and functions as a gateway between said first server and a network and containing at least one transceiver, wherein said transceiver transmits to said monitoring device and receives said first set of information from said monitoring device, wherein said first server stores, processes and retransmits said first set of information;

a second server, remote from said monitoring device and which receives said first set of information from said first server;

a database, in communication with the second server and which stores a second set of information therein, wherein the second set of information includes:

(a) emergency contact information associated with said subscriber,

(b) one or more health conditions associated with said subscriber,

(c) monitoring time intervals associated with said subscriber, and

(d) a plurality of numerical ranges, for each of said at least one health conditions, defining (1) an acceptable health condition range, (2) a first alert range indicating a mild medical alert condition for one of said at least one health condition and (3) a second alert range indicating a more serious medical alert condition for said one of said at least one health condition,

wherein said second server processes the first set of information using the second set of information from said database to determine if an alert condition is present,

and further wherein if said alert condition is present, said second server transmits a third set of information to the first server if said alert condition is within said first alert range within which said subscriber is to be informed of said alert condition via said monitoring device; and

transmits said third set of information to a second telecommunication device if said alert condition is within said second alert range, said second alert range being different from said first alert range, within which an emergency contact is to be informed of said alert condition via said telecommunication device.

2. The system of claim **1**, wherein when said subscriber is to be informed of said alert condition via said monitoring device, said monitoring device illuminates a red or orange light.

3. The system of claim **1**, wherein said monitoring device is adapted to be directly attached to said subscriber.

4. The system of claim **1**, wherein said health condition is at least one of pulse, blood pressure, blood sugar or cholesterol.

5. The system of claim **1**, wherein when said subscriber is to be informed of said alert condition via said monitoring device, said alert consists of at least one of text, voice, data or video.

6. A method for monitoring health, comprising:

monitoring, by a monitoring device, at least one health condition associated with a subscriber;

transmitting, by said monitoring device, a first set of information associated with said at least one health condition;

providing network addressing, routing and functioning as a gateway between said first server and a network and containing at least one transceiver, configuring said transceiver to transmit to said monitoring device and receiving said first set of information from said moni-

toring device at a first server, local to said monitoring device, wherein said first server stores, process and retransmits said first set of information;

receiving said first set of information from said first server at a second server, remote from said monitoring device;

storing a second set of information in a database, in communication with the second server, wherein the second set of information includes:

(a) emergency contact information associated with said subscriber,

(b) one or more health conditions associated with said subscriber,

(c) monitoring time intervals associated with said subscriber, and

(d) a plurality of numerical ranges, for each of said at least one health conditions, defining (1) an acceptable health condition range, (2) a first alert range indicating a mild medical alert condition for one of said at least one health condition and (3) a second alert range indicating a more serious medical alert condition for said one of said at least one health condition,

processing, by said second server, the first set of information using the second set of information from said database to determine if an alert condition is present,

transmitting, by said second server if said alert condition is present, a third set of information to the first server:

if said alert condition is within said first alert range within which said subscriber is to be informed of said alert condition via said monitoring device; and

transmitting said third set of information to a telecommunication device if said alert condition is within said second alert range, said second alert range being different from said first alert range, within which an emergency contact is to be informed of said alert condition via said telecommunication device.

7. The method of claim **6**, wherein when said subscriber is to be informed of said alert condition via said monitoring device, said monitoring device illuminates a red or orange light.

8. The method of claim **6**, wherein said monitoring device is adapted to be directly attached to said subscriber.

9. The method of claim **6**, wherein said health condition is at least one of pulse, blood pressure, blood sugar or cholesterol.

10. The method of claim **6**, wherein when said subscriber is to be informed of said alert condition via said monitoring device, said alert consists of at least one of text, voice, data or video.

* * * * *

专利名称(译)	用于健康监测的系统，方法和设备		
公开(公告)号	US7238156	公开(公告)日	2007-07-03
申请号	US10/631549	申请日	2003-07-31
申请(专利权)人(译)	AT＆T的知识产权，INC.		
当前申请(专利权)人(译)	AT＆T的知识产权，INC.		
[标]发明人	ADAMCZYK MARIA		
发明人	ADAMCZYK, MARIA		
IPC分类号	A61B5/00		
CPC分类号	G06F19/3418 G06Q50/22 H04W8/20 A61B5/7282 H04L67/42 Y10S128/92 G06F2212/174 Y10S128/904		
外部链接	Espacenet USPTO		

摘要(译)

公开了一种健康监测系统。根据一个实施例，健康监测系统包括第一服务器，其被配置为从监测设备接收第一组信息，其中第一组信息包括订户的健康状况读数，并且其中第一服务器被配置为处理第一组信息并将第二组信息发送到监视设备和/或电信设备，其中第二组信息包括关于用户的医疗信息和/或医疗建议。健康监测系统还包括与第一服务器通信并配置成在其中存储第三组信息的数据库，其中第三组信息包括紧急联系信息，订户的一个或多个健康状况，监视时间间隔，以及/或定义可接受的健康状况和医疗警报条件的数值范围。