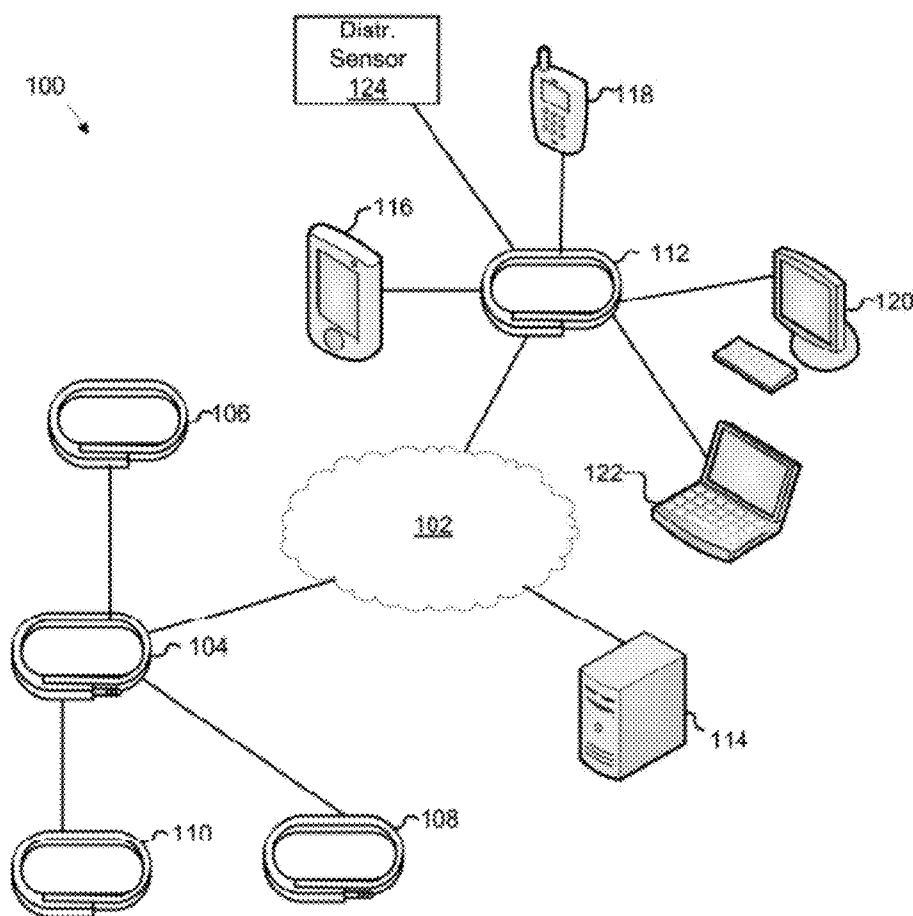




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DIAGNOSIS, MONITORING, AND
TREATMENT**filed on Jun. 11, 2011, provisional application No.
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11, 2011, provisional application No. 61/495,994,**Publication Classification**(51) **Int. Cl.**
A61B 5/01 (2006.01)
G08B 1/08 (2006.01)
(52) **U.S. Cl.** **600/549; 340/539.12**(57) **ABSTRACT**

A data-capable band for medical diagnosis, monitoring, and treatment is described, including one or more sensors configured to gather data associated with diagnosis, monitoring or treatment of a medical condition, an application configured to determine the medical condition using the data gathered by the sensors, a memory configured to store the data and the application, and a notification facility configured to provide an array of notifications in relation to the monitoring and treatment of the medical conditions. The notifications may be alarms, may be designed to prompt movement, or may be associated with a drug regimen.



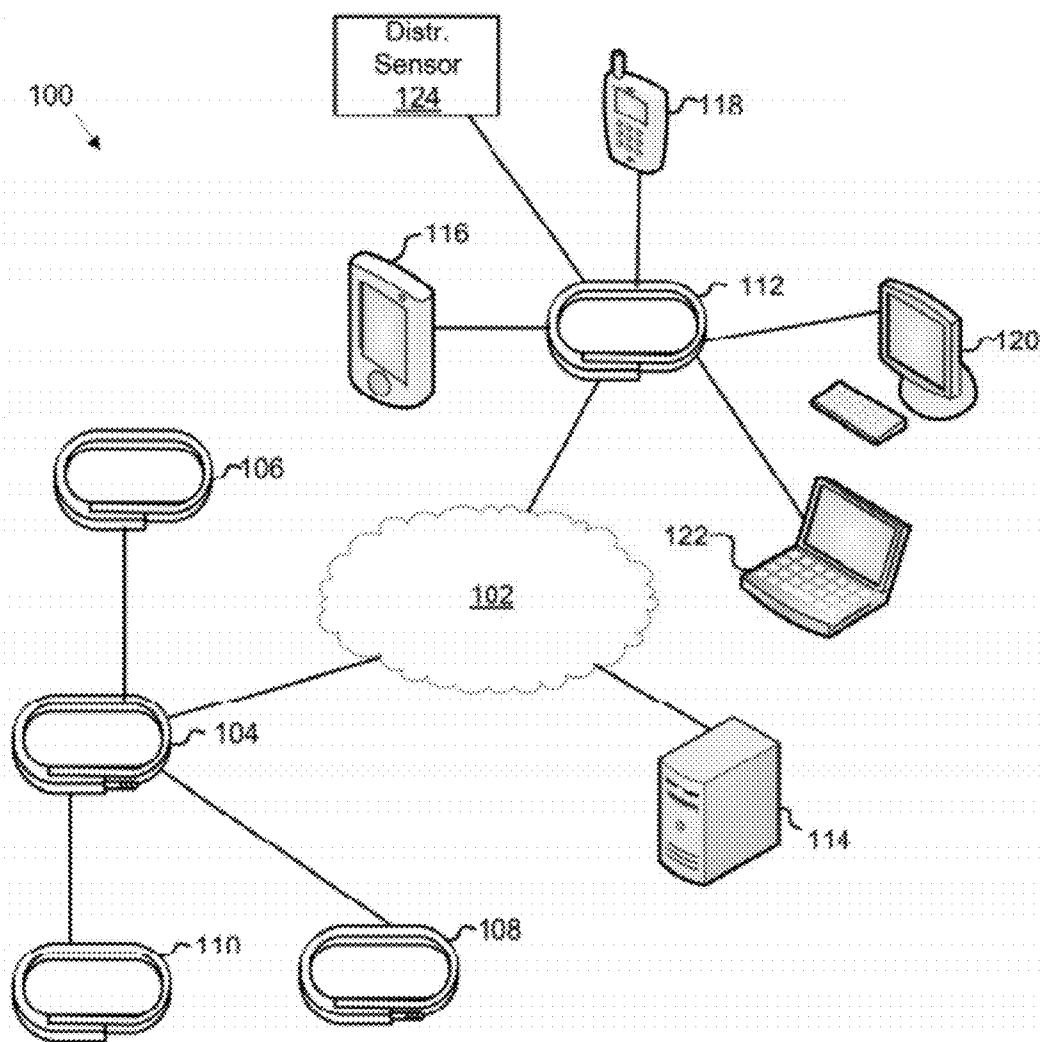


FIG. 1

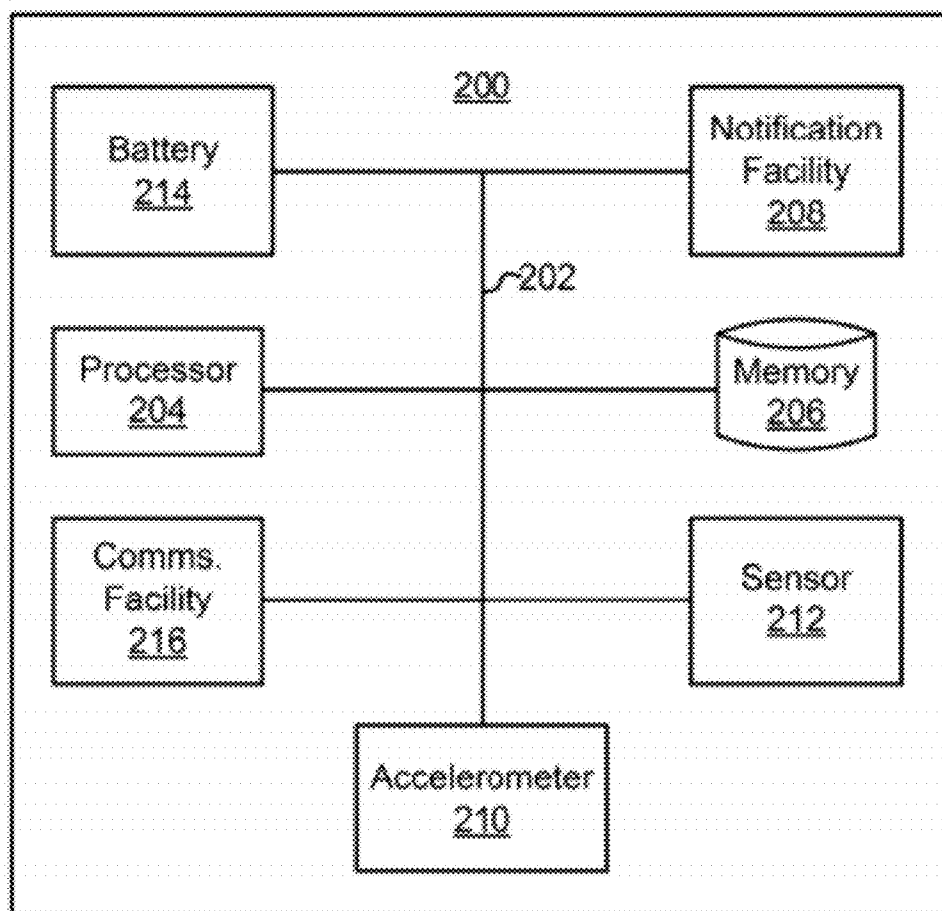
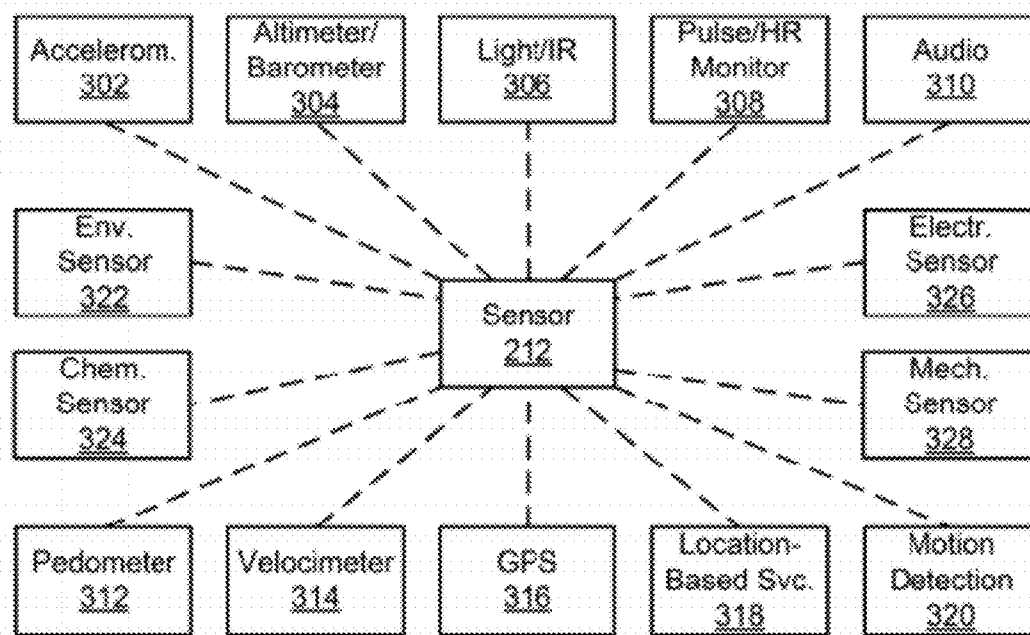


FIG. 2



300

FIG. 3

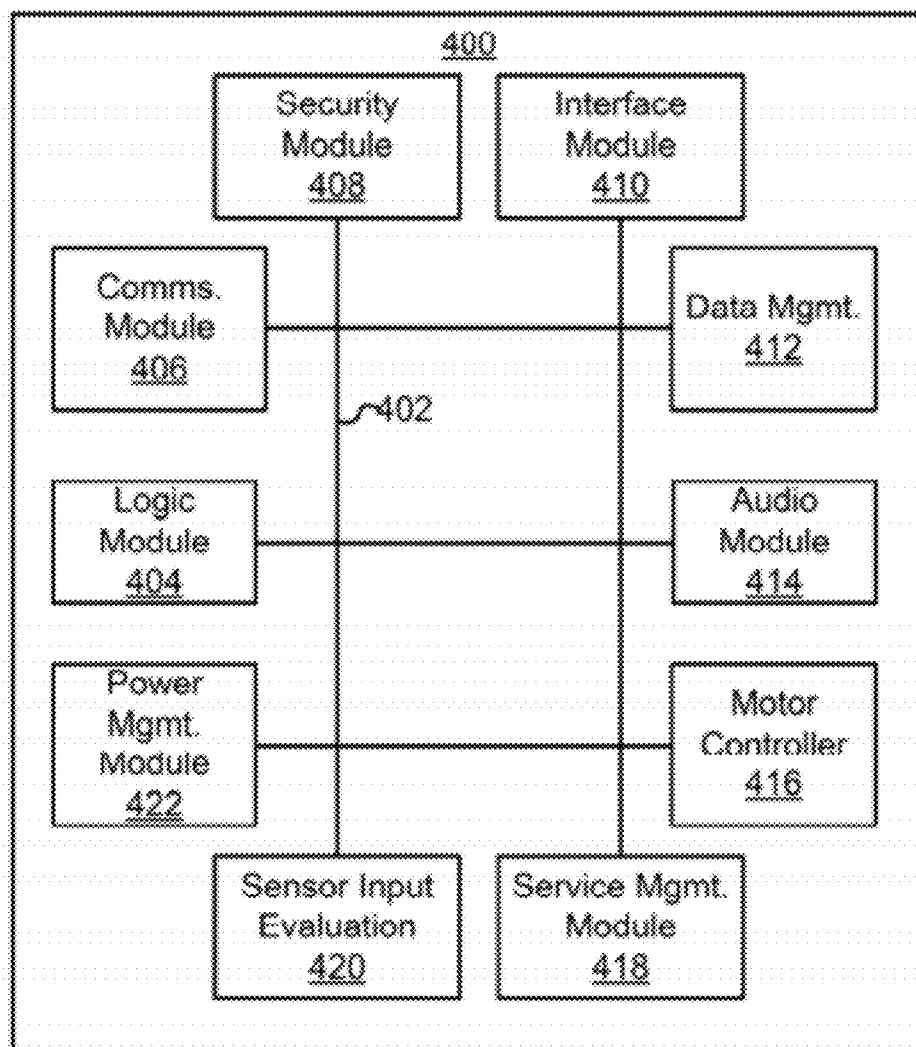


FIG. 4

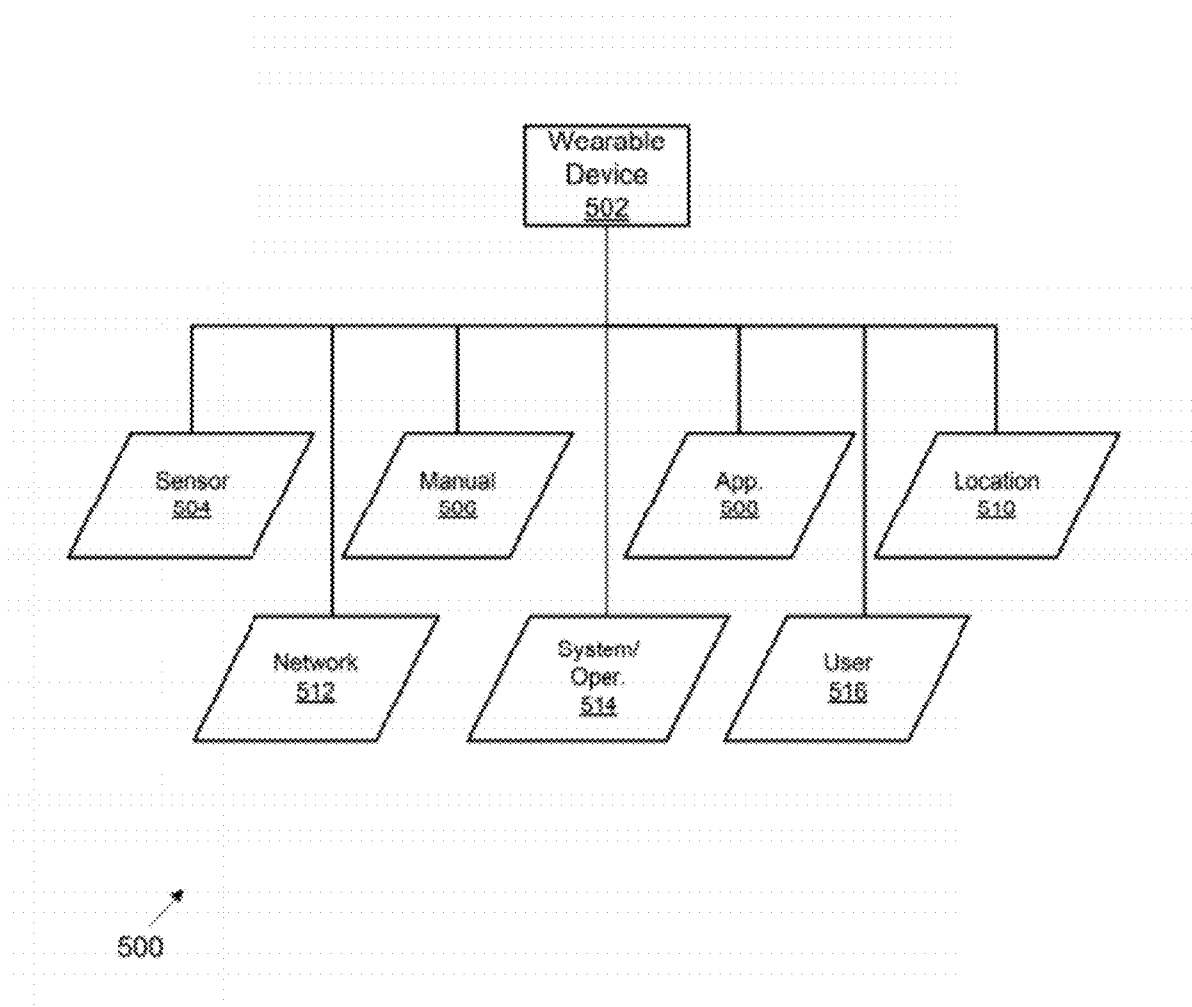
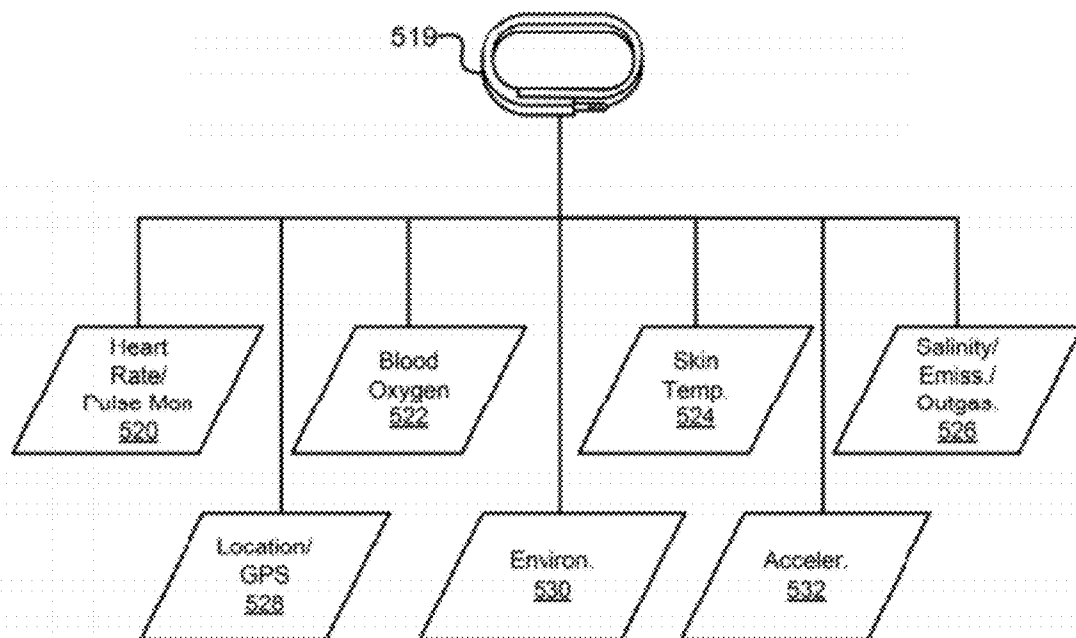


FIG. 5A



518

FIG. 5B

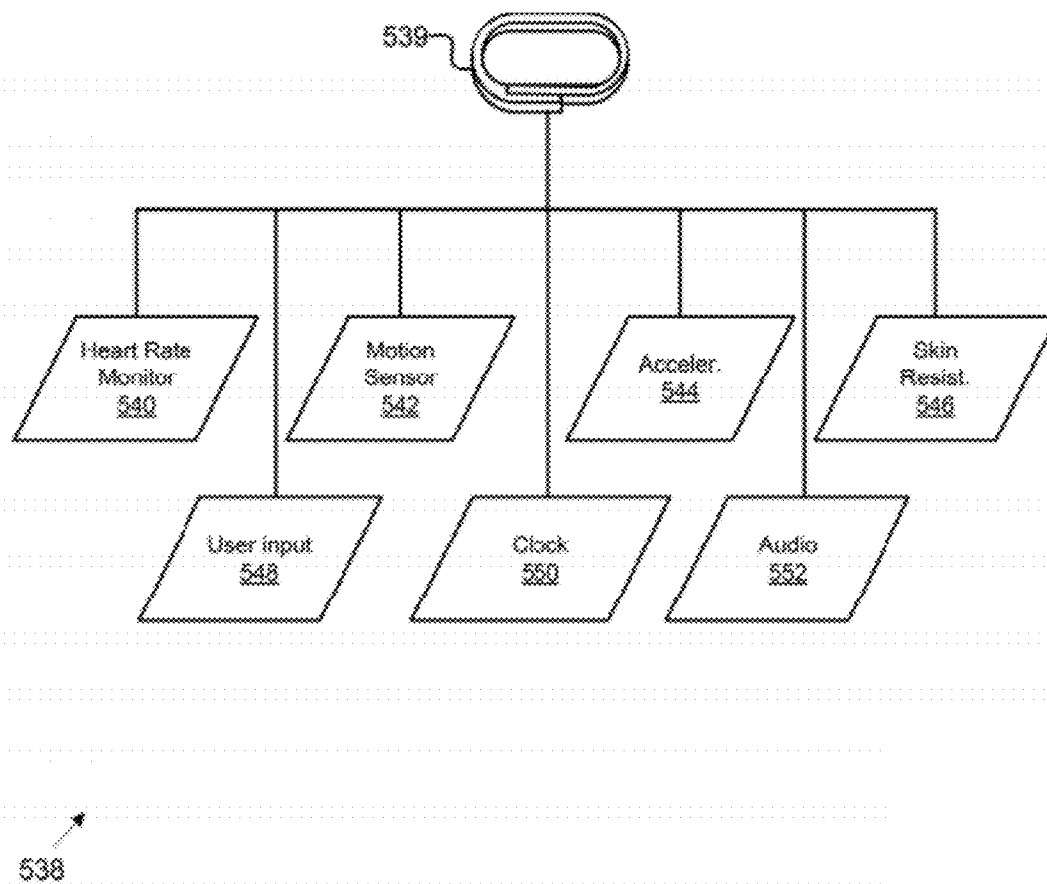


FIG. 5C

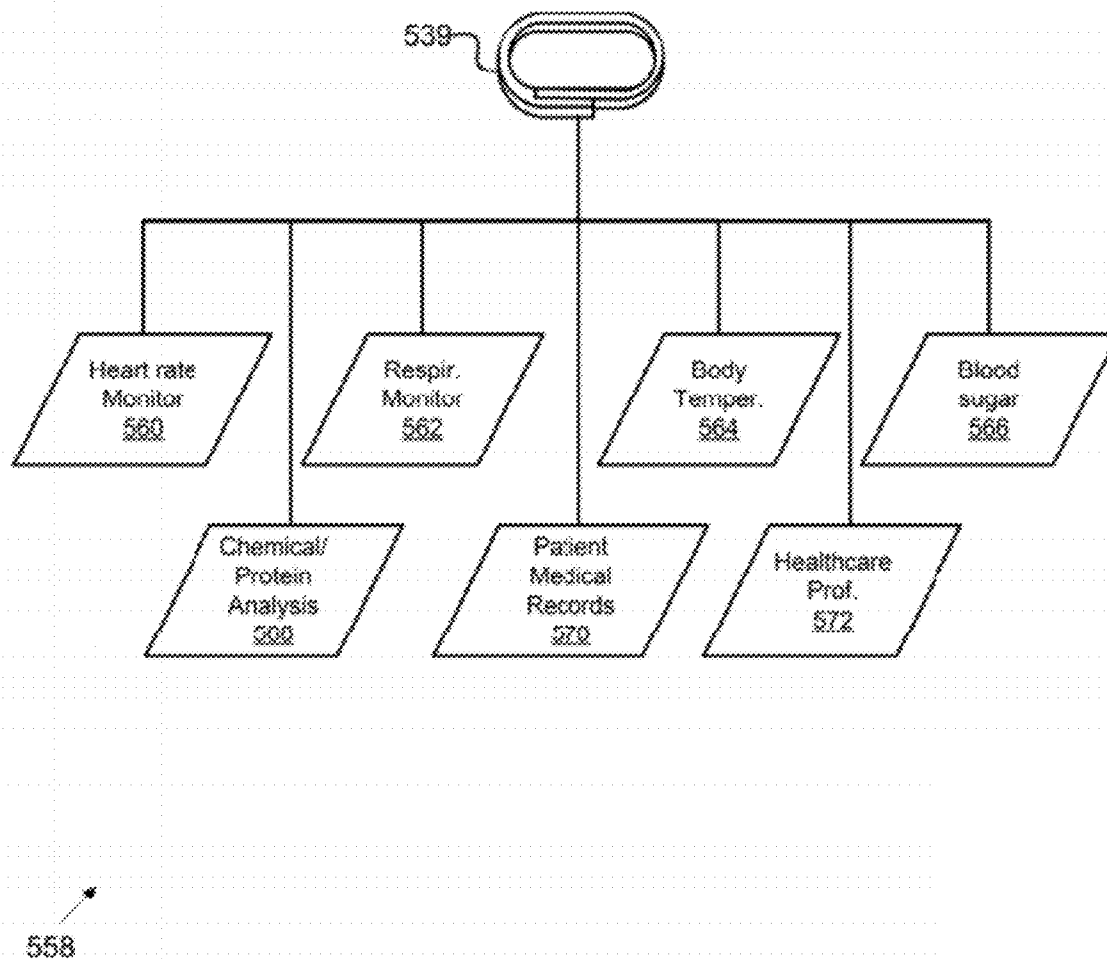


FIG. 5D

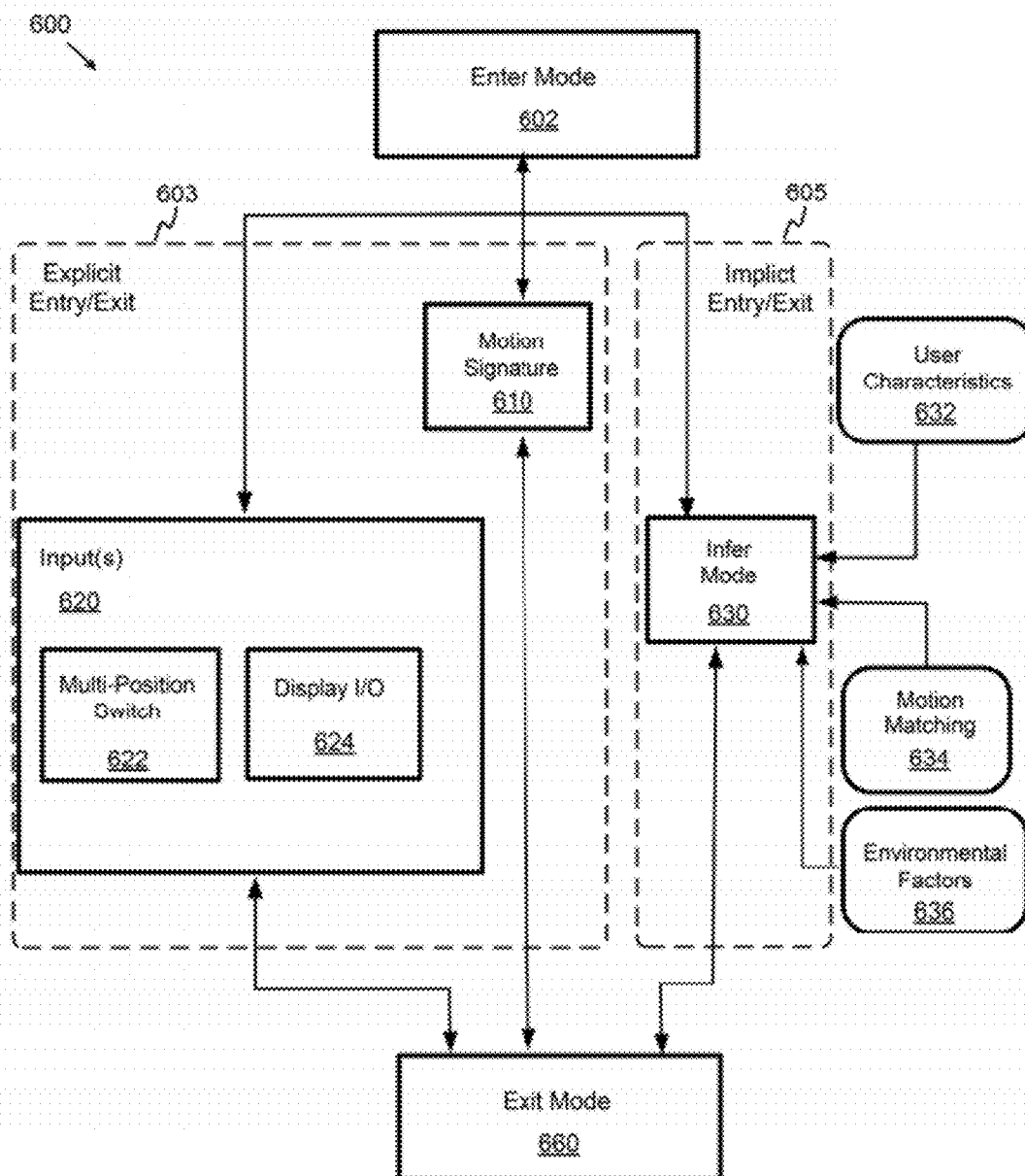
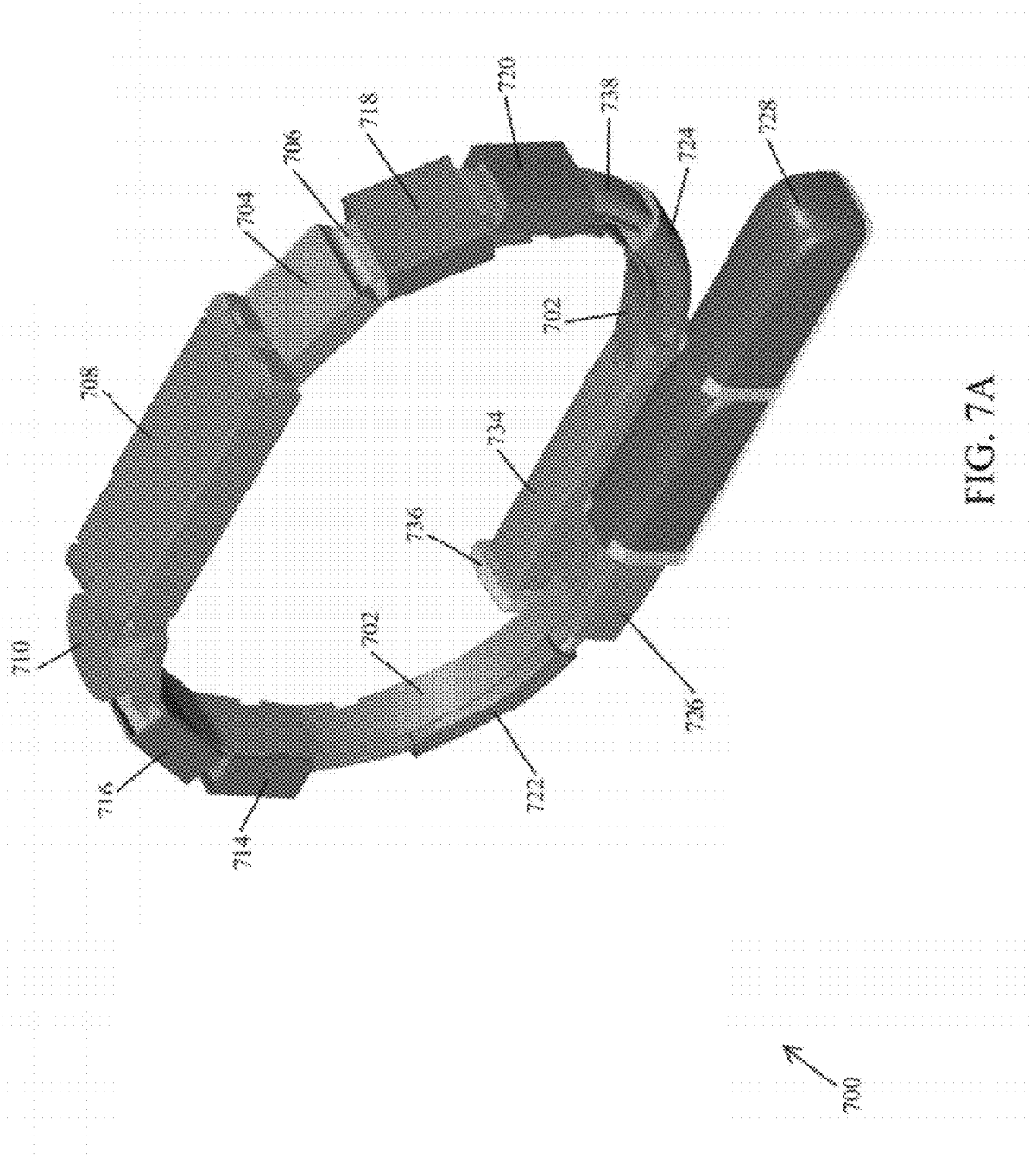


FIG. 6



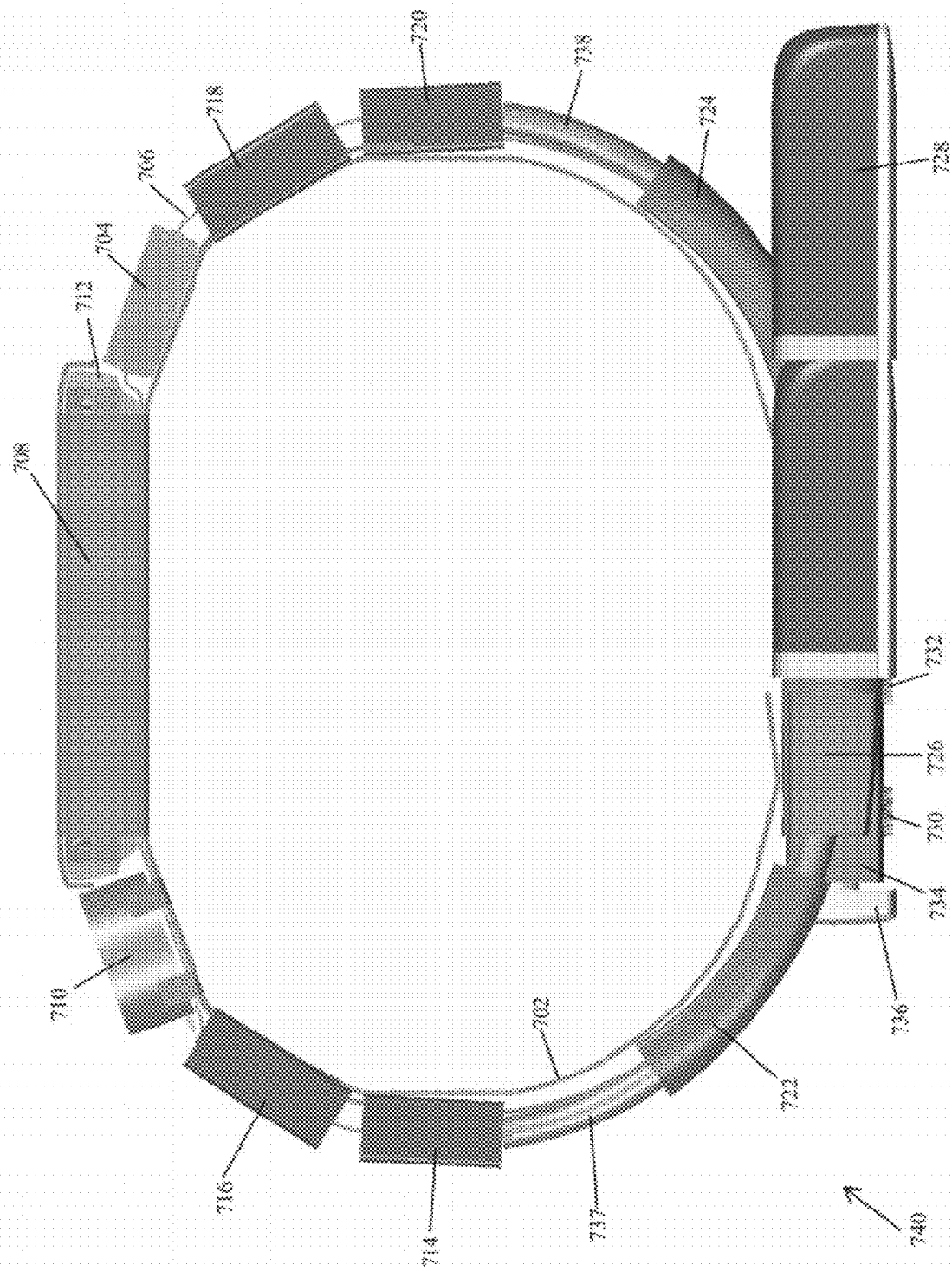


FIG. 7B

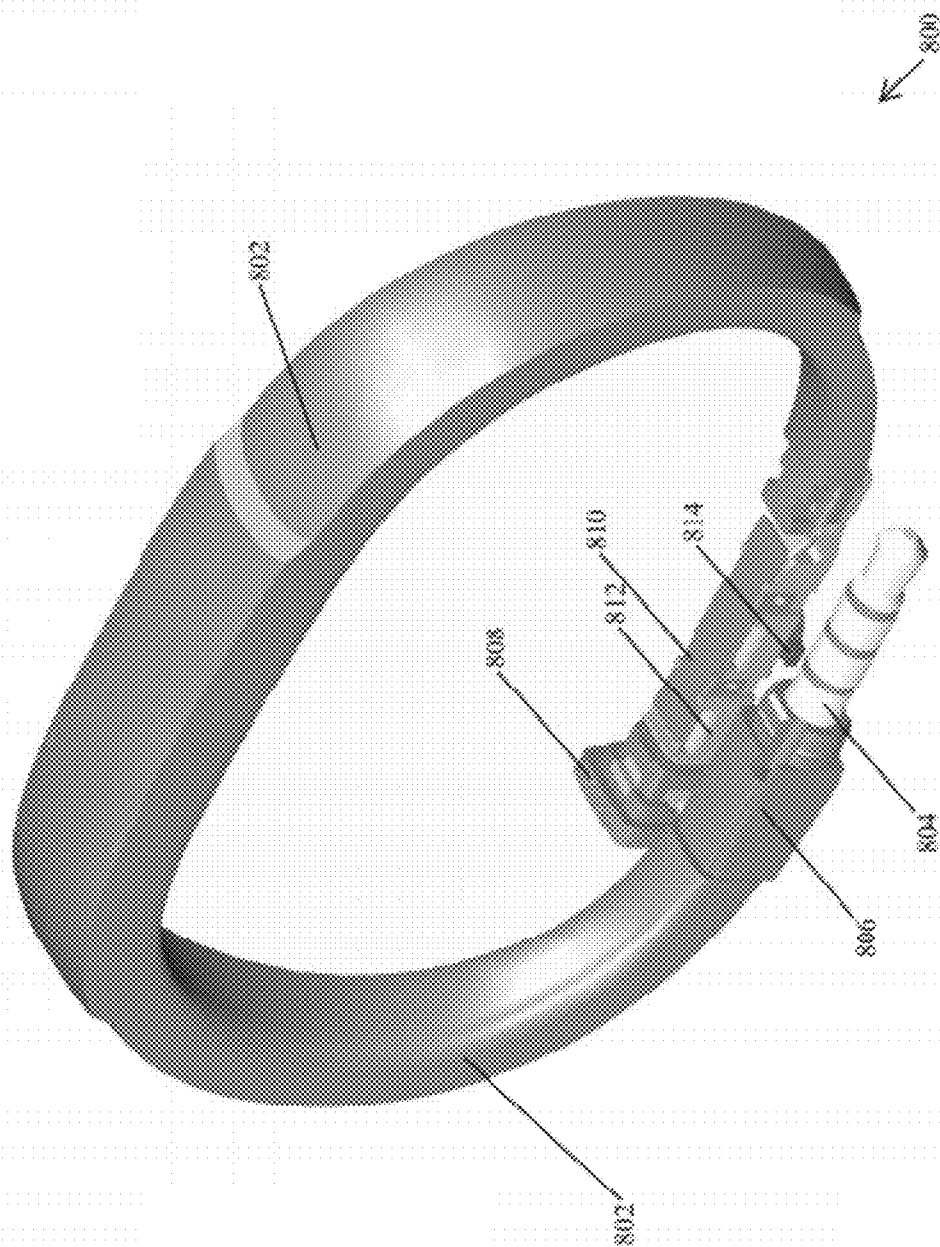


FIG. 8A

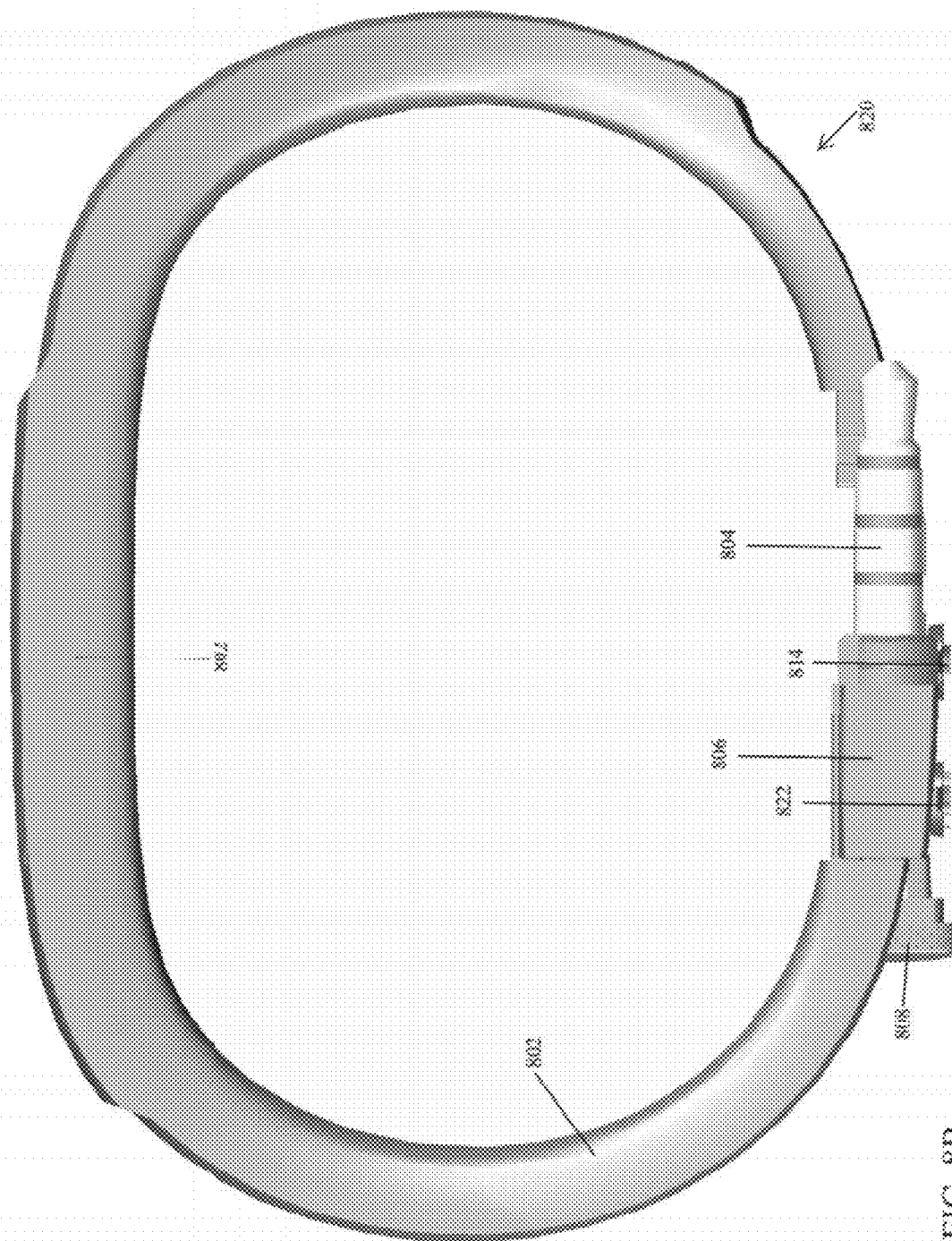


FIG. 8B

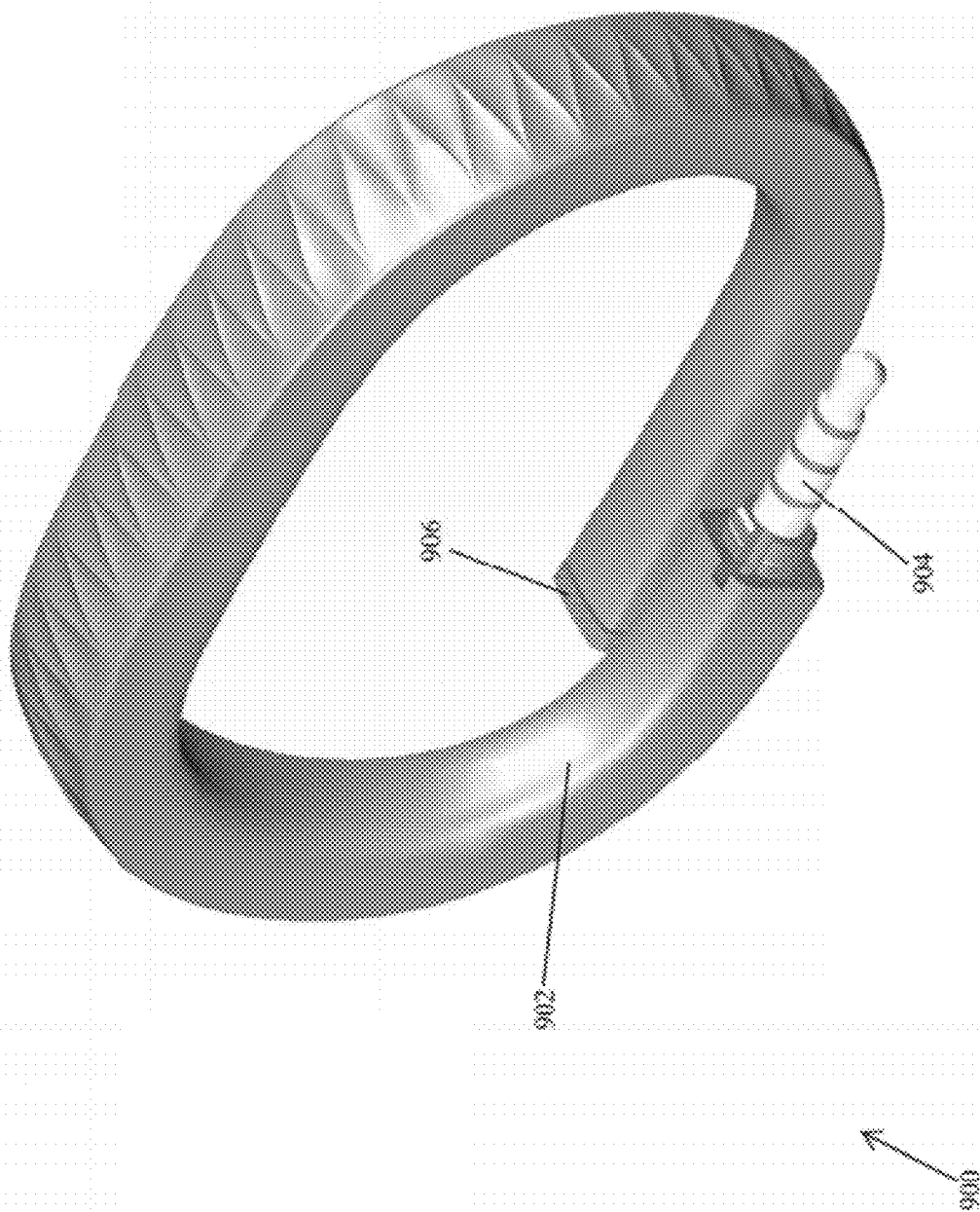


FIG. 9A

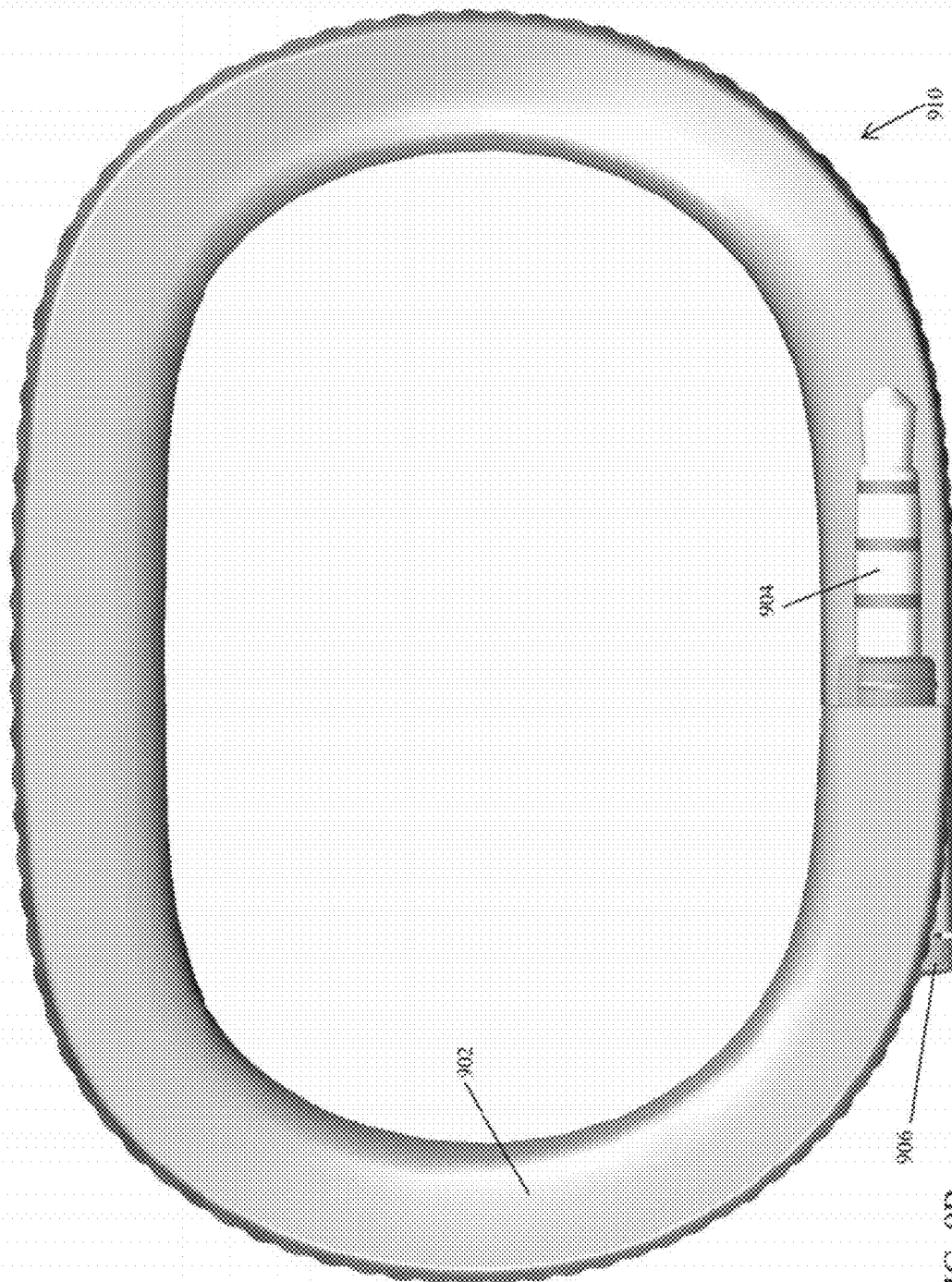


FIG. 9B

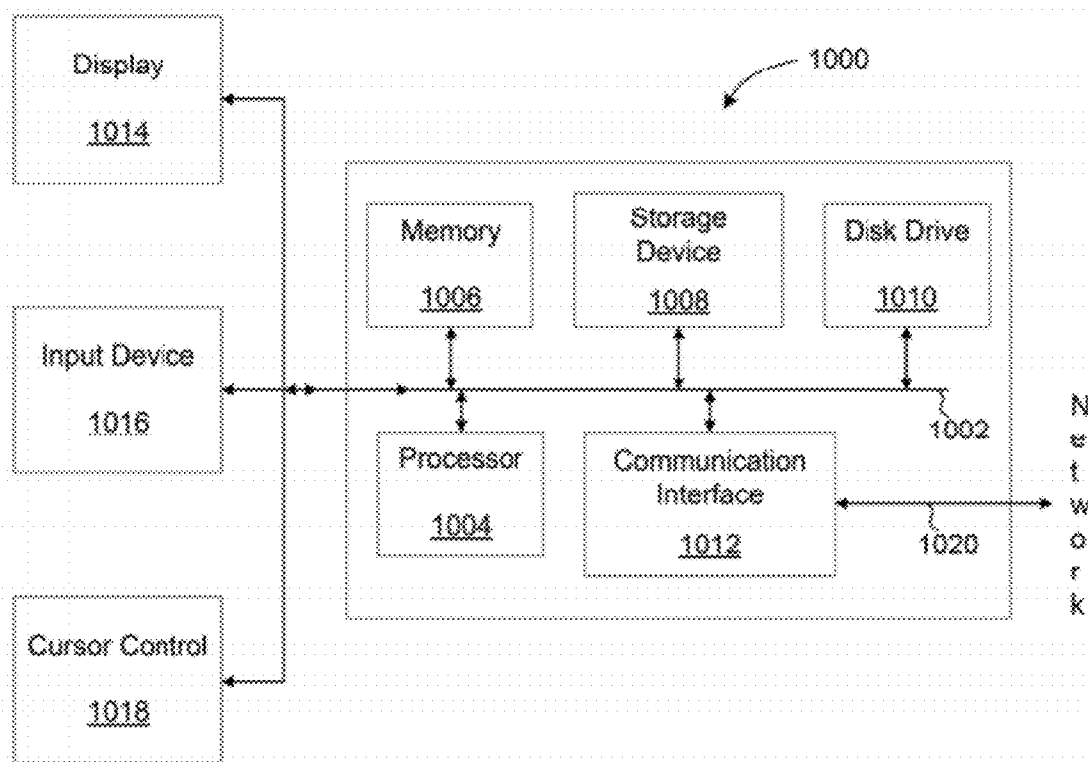


FIG. 10

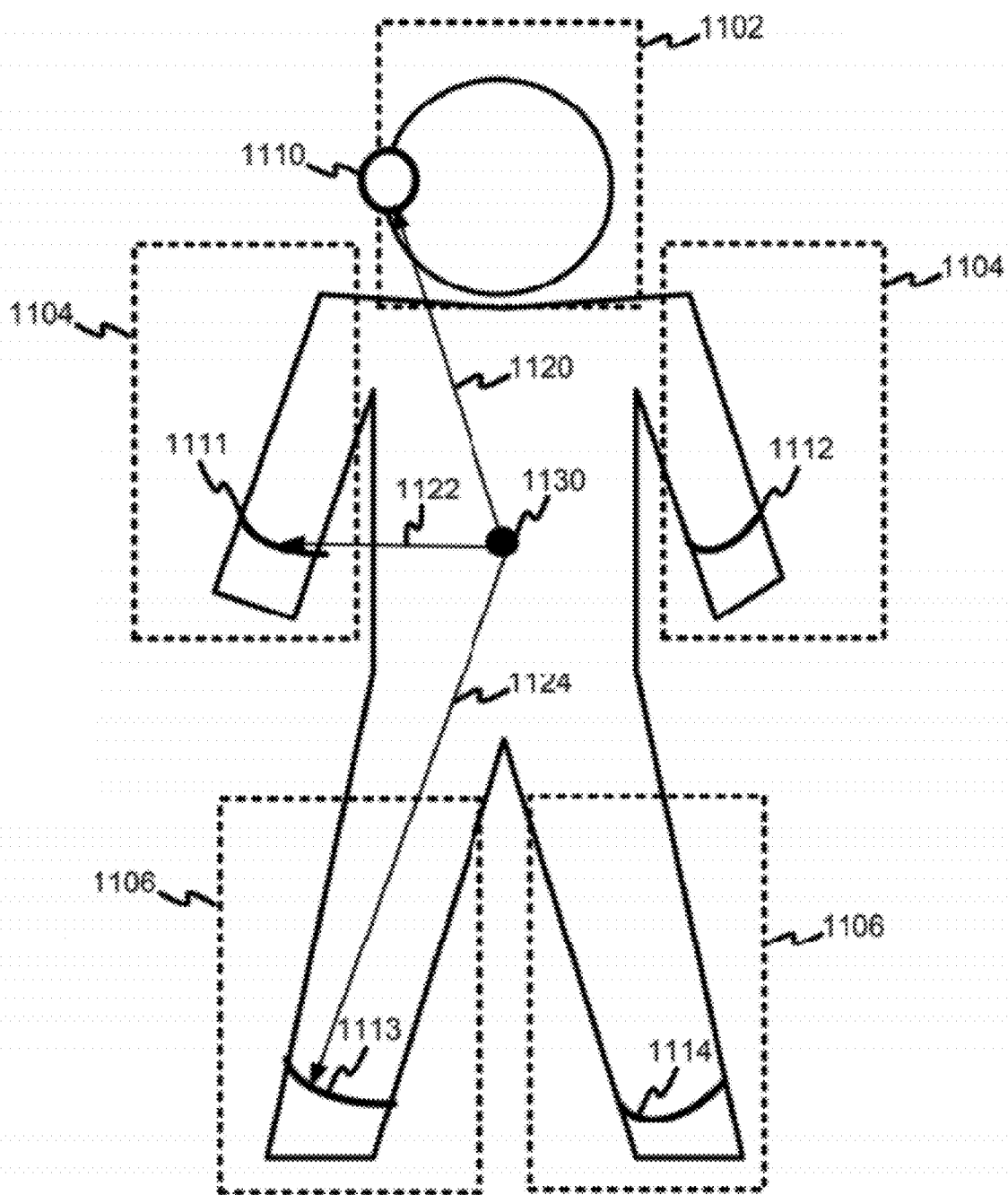
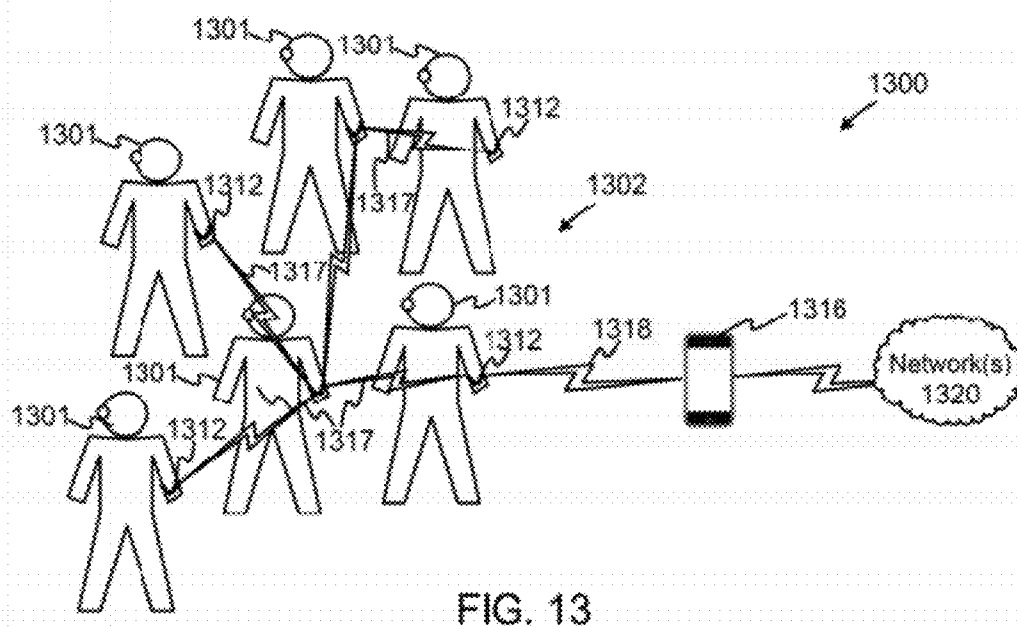
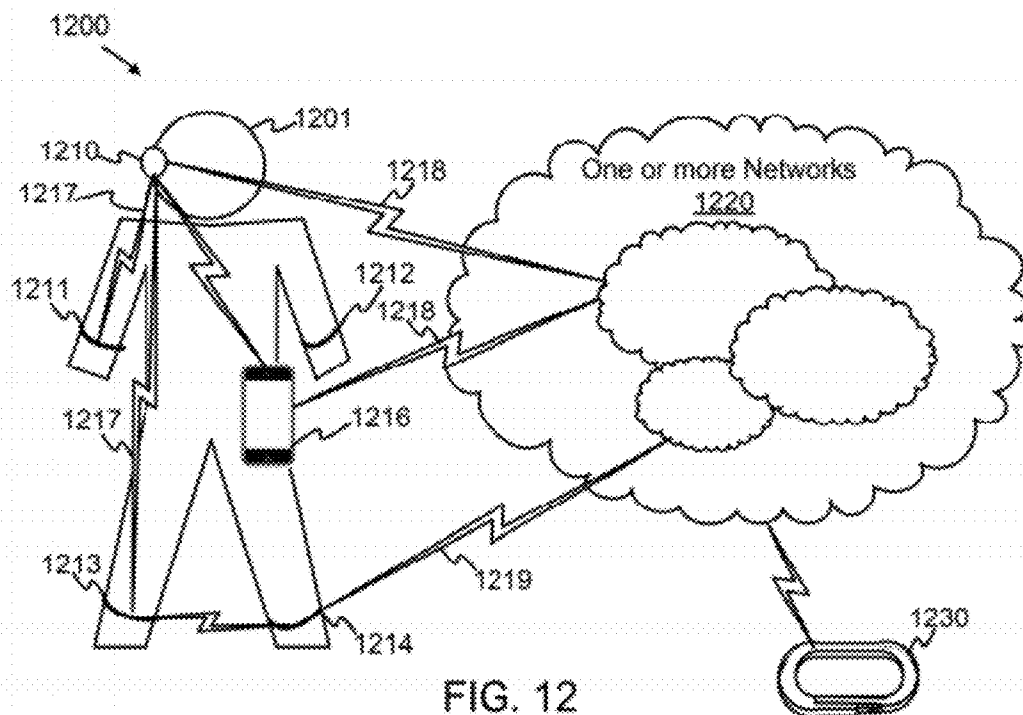


FIG. 11



DATA-CAPABLE BAND FOR MEDICAL DIAGNOSIS, MONITORING, AND TREATMENT

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a U.S. non-provisional patent application that claims the benefit of U.S. patent application Ser. No. 13/158,372, filed Jun. 10, 2011, and entitled “Component Protective Overmolding,” U.S. patent application Ser. No. 13/158,416, filed Jun. 11, 2011, and entitled “Component Protective Overmolding,” U.S. Provisional Patent Application No. 61/495,995, filed Jun. 11, 2011, and entitled “Data-Capable Strapband,” U.S. Provisional Patent Application No. 61/495,994, filed Jun. 11, 2011, and entitled “Data-Capable Strapband,” U.S. Provisional Patent Application No. 61/495,997, filed Jun. 11, 2011, and entitled “Data-Capable Strapband,” and U.S. Provisional Patent Application No. 61/495,996, filed Jun. 11, 2011, and entitled “Data-Capable Strapband,” all of which are herein incorporated by reference for all purposes.

FIELD

[0002] The present invention relates generally to electrical and electronic hardware, computer software, wired and wireless network communications, and computing devices. More specifically, techniques for a data-capable personal worn or carried device for medical diagnosis, monitoring, and treatment, are described.

BACKGROUND

[0003] With the advent of greater computing capabilities in smaller personal and/or portable form factors and an increasing number of applications (i.e., computer and Internet software or programs) for different uses, consumers (i.e., users) have access to large amounts of personal data. Information and data are often readily available, but poorly captured using conventional data capture devices. Conventional devices typically lack capabilities that can capture, analyze, communicate, or use data in a contextually-meaningful, comprehensive, and efficient manner. Further, conventional solutions are often limited to specific individual purposes or uses, demanding that users invest in multiple devices in order to perform different activities (e.g., a sports watch for tracking time and distance, a GPS receiver for monitoring a hike or run, a cyclometer for gathering cycling data, and others). Although a wide range of data and information is available, conventional devices and applications fail to provide effective solutions that comprehensively capture data for a given user across numerous disparate activities.

[0004] Some conventional solutions combine a small number of discrete functions. Functionality for data capture, processing, storage, or communication in conventional devices such as a watch or timer with a heart rate monitor or global positioning system (“GPS”) receiver are available conventionally, but are expensive to manufacture and purchase. Other conventional solutions for combining personal data capture facilities often present numerous design and manufacturing problems such as size restrictions, specialized materials requirements, lowered tolerances for defects such as pits or holes in coverings for water-resistant or waterproof devices, unreliability, higher failure rates, increased manufacturing time, and expense. Subsequently, conventional

devices such as fitness watches, heart rate monitors, GPS-enabled fitness monitors, health monitors (e.g., diabetic blood sugar testing units), digital voice recorders, pedometers, altimeters, and other conventional personal data capture devices are generally manufactured for conditions that occur in a single or small groupings of activities.

[0005] Generally, if the number of activities performed by conventional personal data capture devices increases, there is a corresponding rise in design and manufacturing requirements that results in significant consumer expense, which eventually becomes prohibitive to both investment and commercialization. Further, conventional manufacturing techniques are often limited and ineffective at meeting increased requirements to protect sensitive hardware, circuitry, and other components that are susceptible to damage, but which are required to perform various personal data capture activities. As a conventional example, sensitive electronic components such as printed circuit board assemblies (“PCBA”), sensors, and computer memory (hereafter “memory”) can be significantly damaged or destroyed during manufacturing processes where overmoldings or layering of protective material occurs using techniques such as injection molding, cold molding, and others. Damaged or destroyed items subsequently raises the cost of goods sold and can deter not only investment and commercialization, but also innovation in data capture and analysis technologies, which are highly compelling fields of opportunity.

[0006] Thus, what is needed is a solution for data capture devices without the limitations of conventional techniques.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] Various embodiments or examples (“examples”) are disclosed in the following detailed description and the accompanying drawings:

[0008] FIG. 1 illustrates an exemplary data-capable band system;

[0009] FIG. 2 illustrates a block diagram of an exemplary data-capable band;

[0010] FIG. 3 illustrates sensors for use with an exemplary data-capable band;

[0011] FIG. 4 illustrates an application architecture for an exemplary data-capable band;

[0012] FIG. 5A illustrates representative data types for use with an exemplary data-capable band;

[0013] FIG. 5B illustrates representative data types for use with an exemplary data-capable band in fitness-related activities;

[0014] FIG. 5C illustrates representative data types for use with an exemplary data-capable band in sleep management activities;

[0015] FIG. 5D illustrates representative data types for use with an exemplary data-capable band in medical-related activities;

[0016] FIG. 6 illustrates a transition between modes of operation of a band in accordance with various embodiments;

[0017] FIG. 7A illustrates a perspective view of an exemplary data-capable band;

[0018] FIG. 7B illustrates a side view of an exemplary data-capable band;

[0019] FIG. 8A illustrates a perspective view of an exemplary data-capable band;

[0020] FIG. 8B illustrates a side view of an exemplary data-capable band;

[0021] FIG. 9A illustrates a perspective view of an exemplary data-capable band;

[0022] FIG. 9B illustrates a side view of an exemplary data-capable band;

[0023] FIG. 10 illustrates an exemplary computer system suitable for use with a data-capable band;

[0024] FIG. 11 depicts a representative implementation of one or more bands and equivalent devices, as wearable devices, to form unique motion profiles, according to various embodiments; and

[0025] FIGS. 12 and 13 are diagrams representing examples of networks formed using one or more bands, according to some embodiments.

DETAILED DESCRIPTION

[0026] Various embodiments or examples may be implemented in numerous ways, including as a system, a process, an apparatus, a user interface, or a series of program instructions on a computer readable medium such as a computer readable storage medium or a computer network where the program instructions are sent over optical, electronic, or wireless communication links. In general, operations of disclosed processes may be performed in an arbitrary order, unless otherwise provided in the claims.

[0027] A detailed description of one or more examples is provided below along with accompanying figures. The detailed description is provided in connection with such examples, but is not limited to any particular example. The scope is limited only by the claims and numerous alternatives, modifications, and equivalents are encompassed. Numerous specific details are set forth in the following description in order to provide a thorough understanding. These details are provided for the purpose of example and the described techniques may be practiced according to the claims without some or all of these specific details. For clarity, technical material that is known in the technical fields related to the examples has not been described in detail to avoid unnecessarily obscuring the description.

[0028] FIG. 1 illustrates an exemplary data-capable band system. Here, system 100 includes network 102, bands 104-112, server 114, mobile computing device 116, mobile communications device 118, computer 120, laptop 122, and distributed sensor 124. Bands 104-112 may be implemented as data-capable devices that may be worn as a strap or band around an arm, leg, ankle, or other bodily appendage or feature. In other examples, bands 104-112 may be attached directly or indirectly to other items, organic or inorganic, animate, or static. In still other examples, bands 104-112 may be used differently.

[0029] As described above, bands 104-112 may be implemented as wearable personal data or data capture devices (e.g., data-capable devices) that are worn by a user around a wrist, ankle, arm, ear, or other appendage, or attached to the body or affixed to clothing. One or more facilities, sensing elements, or sensors, both active and passive, may be implemented as part of bands 104-112 in order to capture various types of data from different sources. Temperature, environmental, temporal, motion, electronic, electrical, chemical, or other types of sensors (including those described below in connection with FIG. 3) may be used in order to gather varying amounts of data, which may be configurable by a user, locally (e.g., using user interface facilities such as buttons, switches, motion-activated/detected command structures (e.g., accelerometer-gathered data from user-initiated

motion of bands 104-112), and others) or remotely (e.g., entering rules or parameters in a website or graphical user interface (“GUI”) that may be used to modify control systems or signals in firmware, circuitry, hardware, and software implemented (i.e., installed) on bands 104-112). Bands 104-112 may also be implemented as data-capable devices that are configured for data communication using various types of communications infrastructure and media, as described in greater detail below. Bands 104-112 may also be wearable, personal, non-intrusive, lightweight devices that are configured to gather large amounts of personally relevant data that can be used to improve user health, fitness levels, medical conditions, athletic performance, sleeping physiology, and physiological conditions, or used as a sensory-based user interface (“UI”) to signal social-related notifications specifying the state of the user through vibration, heat, lights or other sensory based notifications. For example, a social-related notification signal indicating a user is on-line can be transmitted to a recipient, who in turn receives the notification as, for instance, a vibration.

[0030] Using data gathered by bands 104-112, applications may be used to perform various analyses and evaluations that can generate information as to a person's physical (e.g., healthy, sick, weakened, activity level, or other states), emotional, or mental state (e.g., an elevated body temperature or heart rate may indicate stress, a lowered heart rate and skin temperature, or reduced movement (e.g., excessive sleeping), may indicate physiological depression caused by exertion or other factors, chemical data gathered from evaluating out-gassing from the skin's surface may be analyzed to determine whether a person's diet is balanced or if various nutrients are lacking, salinity detectors may be evaluated to determine if high, lower, or proper blood sugar levels are present for diabetes management, and others). Generally, bands 104-112 may be configured to gather from sensors locally and remotely.

[0031] As an example, band 104 may capture (i.e., record, store, communicate (i.e., send or receive), process, or the like) data from various sources (i.e., sensors that are organic (i.e., installed, integrated, or otherwise implemented with band 104) or distributed (e.g., microphones on mobile computing device 116, mobile communications device 118, computer 120, laptop 122, distributed sensor 124, global positioning system (“GPS”) satellites, or others, without limitation)) and exchange data with one or more of bands 106-112, server 114, mobile computing device 116, mobile communications device 118, computer 120, laptop 122, and distributed sensor 124. As shown here, a local sensor may be one that is incorporated, integrated, or otherwise implemented with bands 104-112. A remote or distributed sensor (e.g., mobile computing device 116, mobile communications device 118, computer 120, laptop 122, or, generally, distributed sensor 124) may be sensors that can be accessed, controlled, or otherwise used by bands 104-112. For example, band 112 may be configured to control devices that are also controlled by a given user (e.g., mobile computing device 116, mobile communications device 118, computer 120, laptop 122, and distributed sensor 124). For example, a microphone in mobile communications device 118 may be used to detect, for example, ambient audio data that is used to help identify a person's location, or an ear clip (e.g., a headset as described below) affixed to an ear may be used to record pulse or blood oxygen saturation levels. Additionally, a sensor implemented with a screen on mobile computing device 116 may be used to read

a user's temperature or obtain a biometric signature while a user is interacting with data. A further example may include using data that is observed on computer **120** or laptop **122** that provides information as to a user's online behavior and the type of content that she is viewing, which may be used by bands **104-112**. Regardless of the type or location of sensor used, data may be transferred to bands **104-112** by using, for example, an analog audio jack, digital adapter (e.g., USB, mini-USB), or other, without limitation, plug, or other type of connector that may be used to physically couple bands **104-112** to another device or system for transferring data and, in some examples, to provide power to recharge a battery (not shown). Alternatively, a wireless data communication interface or facility (e.g., a wireless radio that is configured to communicate data from bands **104-112** using one or more data communication protocols (e.g., IEEE 802.11a/b/g/n (WiFi), WiMax, ANTTM, ZigBee[®], Bluetooth[®], Near Field Communications ("NFC"), and others)) may be used to receive or transfer data. Further, bands **104-112** may be configured to analyze, evaluate, modify, or otherwise use data gathered, either directly or indirectly.

[0032] In some examples, bands **104-112** may be configured to share data with each other or with an intermediary facility, such as a database, website, web service, or the like, which may be implemented by server **114**. In some embodiments, server **114** can be operated by a third party providing, for example, social media-related services. Bands **104-112** and other related devices may exchange data with each other directly, or bands **104-112** may exchange data via a third party server, such as a third party like Facebook[®], to provide social-media related services. Examples of other third party servers include those implemented by social networking services, including, but not limited to, services such as Yahoo! IMTM, GTalkTM, MSN MessengerTM, Twitter[®] and other private or public social networks. The exchanged data may include personal physiological data and data derived from sensory-based user interfaces ("UI"). Server **114**, in some examples, may be implemented using one or more processor-based computing devices or networks, including computing clouds, storage area networks ("SAN"), or the like. As shown, bands **104-112** may be used as a personal data or area network (e.g., "PDN" or "PAN") in which data relevant to a given user or band (e.g., one or more of bands **104-112**) may be shared. As shown here, bands **104** and **112** may be configured to exchange data with each other over network **102** or indirectly using server **114**. Users of bands **104** and **112** may direct a web browser hosted on a computer (e.g., computer **120**, laptop **122**, or the like) in order to access, view, modify, or perform other operations with data captured by bands **104** and **112**. For example, two runners using bands **104** and **112** may be geographically remote (e.g., users are not geographically in close proximity locally such that bands being used by each user are in direct data communication), but wish to share data regarding their race times (pre, post, or in-race), personal records (i.e., "PR"), target split times, results, performance characteristics (e.g., target heart rate, target VO₂ max, and others), and other information. If both runners (i.e., bands **104** and **112**) are engaged in a race on the same day, data can be gathered for comparative analysis and other uses. Further, data can be shared in substantially real-time (taking into account any latencies incurred by data transfer rates, network topologies, or other data network factors) as well as uploaded after a given activity or event has been performed. In other words, data can be captured by the user as it is worn and

configured to transfer data using, for example, a wireless network connection (e.g., a wireless network interface card, wireless local area network ("LAN") card, cell phone, or the like). Data may also be shared in a temporally asynchronous manner in which a wired data connection (e.g., an analog audio plug (and associated software or firmware) configured to transfer digitally encoded data to encoded audio data that may be transferred between bands **104-112** and a plug configured to receive, encode/decode, and process data exchanged) may be used to transfer data from one or more bands **104-112** to various destinations (e.g., another of bands **104-112**, server **114**, mobile computing device **116**, mobile communications device **118**, computer **120**, laptop **122**, and distributed sensor **124**). Bands **104-112** may be implemented with various types of wired and/or wireless communication facilities and are not intended to be limited to any specific technology. For example, data may be transferred from bands **104-112** using an analog audio plug (e.g., TRRS, TRS, or others). In other examples, wireless communication facilities using various types of data communication protocols (e.g., WiFi, Bluetooth[®], ZigBee[®], ANTTM, and others) may be implemented as part of bands **104-112**, which may include circuitry, firmware, hardware, radios, antennas, processors, microprocessors, memories, or other electrical, electronic, mechanical, or physical elements configured to enable data communication capabilities of various types and characteristics.

[0033] As data-capable devices, bands **104-112** may be configured to collect data from a wide range of sources, including onboard (not shown) and distributed sensors (e.g., server **114**, mobile computing device **116**, mobile communications device **118**, computer **120**, laptop **122**, and distributed sensor **124**) or other bands. Some or all data captured may be personal, sensitive, or confidential and various techniques for providing secure storage and access may be implemented. For example, various types of security protocols and algorithms may be used to encode data stored or accessed by bands **104-112**. Examples of security protocols and algorithms include authentication, encryption, encoding, private and public key infrastructure, passwords, checksums, hash codes and hash functions (e.g., SHA, SHA-1, MD-5, and the like), or others may be used to prevent undesired access to data captured by bands **104-112**. In other examples, data security for bands **104-112** may be implemented differently.

[0034] Bands **104-112** may be used as personal wearable, data capture devices that, when worn, are configured to identify a specific, individual user. By evaluating captured data such as motion data from an accelerometer, biometric data such as heart rate, skin galvanic response, and other biometric data, and using long-term analysis techniques (e.g., software packages or modules of any type, without limitation), a user may have a unique pattern of behavior or motion and/or biometric responses that can be used as a signature for identification. For example, bands **104-112** may gather data regarding an individual person's gait or other unique biometric, physiological or behavioral characteristics. Using, for example, distributed sensor **124**, a biometric signature (e.g., fingerprint, retinal or iris vascular pattern, or others) may be gathered and transmitted to bands **104-112** that, when combined with other data, determines that a given user has been properly identified and, as such, authenticated. When bands **104-112** are worn, a user may be identified and authenticated to enable a variety of other functions such as accessing or modifying data, enabling wired or wireless data transmission

facilities (i.e., allowing the transfer of data from bands **104-112**), modifying functionality or functions of bands **104-112**, authenticating financial transactions using stored data and information (e.g., credit card, PIN, card security numbers, and the like), running applications that allow for various operations to be performed (e.g., controlling physical security and access by transmitting a security code to a reader that, when authenticated, unlocks a door by turning off current to an electromagnetic lock, and others), and others. Different functions and operations beyond those described may be performed using bands **104-112**, which can act as secure, personal, wearable, data-capable devices. The number, type, function, configuration, specifications, structure, or other features of system **100** and the above-described elements may be varied and are not limited to the examples provided.

[0035] FIG. 2 illustrates a block diagram of an exemplary data-capable band. Here, band **200** includes bus **202**, processor **204**, memory **206**, notification facility **208**, accelerometer **210**, sensor **212**, battery **214**, and communications facility **216**. In some examples, the quantity, type, function, structure, and configuration of band **200** and the elements (e.g., bus **202**, processor **204**, memory **206**, notification facility **208**, accelerometer **210**, sensor **212**, battery **214**, and communications facility **216**) shown may be varied and are not limited to the examples provided. As shown, processor **204** may be implemented as logic to provide control functions and signals to memory **206**, notification facility **208**, accelerometer **210**, sensor **212**, battery **214**, and communications facility **216**. Processor **204** may be implemented using any type of processor or microprocessor suitable for packaging within bands **104-112** (FIG. 1). Various types of microprocessors may be used to provide data processing capabilities for band **200** and are not limited to any specific type or capability. For example, a MSP430F5528-type microprocessor manufactured by Texas Instruments of Dallas, Tex. may be configured for data communication using audio tones and enabling the use of an audio plug-and-jack system (e.g., TRRS, TRS, or others) for transferring data captured by band **200**. Further, different processors may be desired if other functionality (e.g., the type and number of sensors (e.g., sensor **212**)) are varied. Data processed by processor **204** may be stored using, for example, memory **206**.

[0036] In some examples, memory **206** may be implemented using various types of data storage technologies and standards, including, without limitation, read-only memory ("ROM"), random access memory ("RAM"), dynamic random access memory ("DRAM"), static random access memory ("SRAM"), static/dynamic random access memory ("SDRAM"), magnetic random access memory ("MRAM"), solid state, two and three-dimensional memories, Flash®, and others. Memory **206** may also be implemented using one or more partitions that are configured for multiple types of data storage technologies to allow for non-modifiable (i.e., by a user) software to be installed (e.g., firmware installed on ROM) while also providing for storage of captured data and applications using, for example, RAM. Once captured and/or stored in memory **206**, data may be subjected to various operations performed by other elements of band **200**.

[0037] Notification facility **208**, in some examples, may be implemented to provide vibratory energy, audio or visual signals, communicated through band **200**. As used herein, "facility" refers to any, some, or all of the features and structures that are used to implement a given set of functions. In some examples, the vibratory energy may be implemented

using a motor or other mechanical structure. In some examples, the audio signal may be a tone or other audio cue, or it may be implemented using different sounds for different purposes. The audio signals may be emitted directly using notification facility **208**, or indirectly by transmission via communications facility **216** to other audio-capable devices (e.g., headphones (not shown), a headset (as described below with regard to FIGS. **11-13**), mobile computing device **115**, mobile communications device **118**, computer **120**, laptop **122**, distributed sensor **124**, etc.). In some examples, the visual signal may be implemented using any available display technology, such as lights, light-emitting diodes (LEDs), interferometric modulator display (IMOD), electrophoretic ink (E Ink), organic light-emitting diode (OLED), or other display technologies. As an example, an application stored on memory **206** may be configured to monitor a clock signal from processor **204** in order to provide timekeeping-functions to band **200**. For example, if an alarm is set for a desired time, notification facility **208** may be used to provide a vibration or an audio tone, or a series of vibrations or audio tones, when the desired time occurs. As another example, notification facility **208** may be coupled to a framework (not shown) or other structure that is used to translate or communicate vibratory energy throughout the physical structure of band **200**. In other examples, notification facility **208** may be implemented differently.

[0038] Power may be stored in battery **214**, which may be implemented as a battery, battery module, power management module, or the like. Power may also be gathered from local power sources such as solar panels, thermo-electric generators, and kinetic energy generators, among others that are alternatives power sources to external power for a battery. These additional sources can either power the system directly or can charge a battery, which, in turn, is used to power the system (e.g., of a band). In other words, battery **214** may include a rechargeable, expendable, replaceable, or other type of battery, but also circuitry, hardware, or software that may be used in connection with in lieu of processor **204** in order to provide power management, charge/recharging, sleep, or other functions. Further, battery **214** may be implemented using various types of battery technologies, including Lithium Ion ("LI"), Nickel Metal Hydride ("NiMH"), or others, without limitation. Power drawn as electrical current may be distributed from battery via bus **202**, the latter of which may be implemented as deposited or formed circuitry or using other forms of circuits or cabling, including flexible circuitry. Electrical current distributed from battery **204** and managed by processor **204** may be used by one or more of memory **206**, notification facility **208**, accelerometer **210**, sensor **212**, or communications facility **216**.

[0039] As shown, various sensors may be used as input sources for data captured by band **200**. For example, accelerometer **210** may be used to gather data measured across one, two, or three axes of motion. In addition to accelerometer **210**, other sensors (i.e., sensor **212**) may be implemented to provide temperature, environmental, physical, chemical, electrical, or other types of sensed inputs. As presented here, sensor **212** may include one or multiple sensors and is not intended to be limiting as to the quantity or type of sensor implemented. Data captured by band **200** using accelerometer **210** and sensor **212** or data requested from another source (i.e., outside of band **200**) may also be exchanged, transferred, or otherwise communicated using communications facility **216**. For example, communications facility **216** may include a

wireless radio, control circuit or logic, antenna, transceiver, receiver, transmitter, resistors, diodes, transistors, or other elements that are used to transmit and receive data from band 200. In some examples, communications facility 216 may be implemented to provide a “wired” data communication capability such as an analog or digital attachment, plug, jack, or the like to allow for data to be transferred. In other examples, communications facility 216 may be implemented to provide a wireless data communication capability to transmit digitally encoded data across one or more frequencies using various types of data communication protocols, without limitation. In still other examples, band 200 and the above-described elements may be varied in function, structure, configuration, or implementation and are not limited to those shown and described.

[0040] FIG. 3 illustrates sensors for use with an exemplary data-capable band. Sensor 212 may be implemented using various types of sensors, some of which are shown. Like-numbered and named elements may describe the same or substantially similar element as those shown in other descriptions. Here, sensor 212 (FIG. 2) may be implemented as accelerometer 302, altimeter/barometer 304, light/infrared (“IR”) sensor 306, pulse/heart rate (“HR”) monitor 308, audio sensor (e.g., microphone, transducer, or others) 310, pedometer 312, velocimeter 314, GPS receiver 316, location-based service sensor (e.g., sensor for determining location within a cellular or micro-cellular network, which may or may not use GPS or other satellite constellations for fixing a position) 318, motion detection sensor 320, environmental sensor 322, chemical sensor 324, electrical sensor 326, or mechanical sensor 328.

[0041] As shown, accelerometer 302 may be used to capture data associated with motion detection along 1, 2, or 3-axes of measurement, without limitation to any specific type of specification of sensor. Accelerometer 302 may also be implemented to measure various types of user motion and may be configured based on the type of sensor, firmware, software, hardware, or circuitry used. As another example, altimeter/barometer 304 may be used to measure environment pressure, atmospheric or otherwise, and is not limited to any specification or type of pressure-reading device. In some examples, altimeter/barometer 304 may be an altimeter, a barometer, or a combination thereof. For example, altimeter/barometer 304 may be implemented as an altimeter for measuring above ground level (“AGL”) pressure in band 200, which has been configured for use by naval or military aviators. As another example, altimeter/barometer 304 may be implemented as a barometer for reading atmospheric pressure for marine-based applications. In other examples, altimeter/barometer 304 may be implemented differently.

[0042] Other types of sensors that may be used to measure light or photonic conditions include light/IR sensor 306, motion detection sensor 320, and environmental sensor 322, the latter of which may include any type of sensor for capturing data associated with environmental conditions beyond light. Further, motion detection sensor 320 may be configured to detect motion using a variety of techniques and technologies, including, but not limited to comparative or differential light analysis (e.g., comparing foreground and background lighting), sound monitoring, or others. Audio sensor 310 may be implemented using any type of device configured to record or capture sound.

[0043] In some examples, pedometer 312 may be implemented using devices to measure various types of data asso-

ciated with pedestrian-oriented activities such as running or walking. Footstrikes, stride length, stride length or interval, time, and other data may be measured. Velocimeter 314 may be implemented, in some examples, to measure velocity (e.g., speed and directional vectors) without limitation to any particular activity. Further, additional sensors that may be used as sensor 212 include those configured to identify or obtain location-based data. For example, GPS receiver 316 may be used to obtain coordinates of the geographic location of band 200 using, for example, various types of signals transmitted by civilian and/or military satellite constellations in low, medium, or high earth orbit (e.g., “LEO,” “MEO,” or “GEO”). In other examples, differential GPS algorithms may also be implemented with GPS receiver 316, which may be used to generate more precise or accurate coordinates. Still further, location-based services sensor 318 may be implemented to obtain location-based data including, but not limited to location, nearby services or items of interest, and the like. As an example, location-based services sensor 318 may be configured to detect an electronic signal, encoded or otherwise, that provides information regarding a physical locale as band 200 passes. The electronic signal may include, in some examples, encoded data regarding the location and information associated therewith. Electrical sensor 326 and mechanical sensor 328 may be configured to include other types (e.g., haptic, kinetic, piezoelectric, piezomechanical, pressure, touch, thermal, and others) of sensors for data input to band 200, without limitation. Other types of sensors apart from those shown may also be used, including magnetic flux sensors such as solid-state compasses and the like, including gyroscopic sensors. While the present illustration provides numerous examples of types of sensors that may be used with band 200 (FIG. 2), others not shown or described may be implemented with or as a substitute for any sensor shown or described.

[0044] FIG. 4 illustrates an application architecture for an exemplary data-capable band. Here, application architecture 400 includes bus 402, logic module 404, communications module 406, security module 408, interface module 410, data management 412, audio module 414, motor controller 416, service management module 418, sensor input evaluation module 420, and power management module 422. In some examples, application architecture 400 and the above-listed elements (e.g., bus 402, logic module 404, communications module 406, security module 408, interface module 410, data management 412, audio module 414, motor controller 416, service management module 418, sensor input evaluation module 420, and power management module 422) may be implemented as software using various computer programming and formatting languages such as Java, C++, C, and others. As shown here, logic module 404 may be firmware or application software that is installed in memory 206 (FIG. 2) and executed by processor 204 (FIG. 2). Included with logic module 404 may be program instructions or code (e.g., source, object, binary executables, or others) that, when initiated, called, or instantiated, perform various functions.

[0045] For example, logic module 404 may be configured to send control signals to communications module 406 in order to transfer, transmit, or receive data stored in memory 206, the latter of which may be managed by a database management system (“DBMS”) or utility in data management module 412. As another example, security module 408 may be controlled by logic module 404 to provide encoding, decoding, encryption, authentication, or other functions to

band **200** (FIG. 2). Alternatively, security module **408** may also be implemented as an application that, using data captured from various sensors and stored in memory **206** (and accessed by data management module **412**) may be used to provide identification functions that enable band **200** to passively identify a user or wearer of band **200**. Still further, various types of security software and applications may be used and are not limited to those shown and described.

[0046] Interface module **410**, in some examples, may be used to manage user interface controls such as switches, buttons, or other types of controls that enable a user to manage various functions of band **200**. For example, a 4-position switch may be turned to a given position that is interpreted by interface module **410** to determine the proper signal or feedback to send to logic module **404** in order to generate a particular result. In other examples, a button (not shown) may be depressed that allows a user to trigger or initiate certain actions by sending another signal to logic module **404**. Still further, interface module **410** may be used to interpret data from, for example, accelerometer **210** (FIG. 2) to identify specific movement or motion that initiates or triggers a given response. In other examples, interface module **410** may be implemented differently in function, structure, or configuration and is not limited to those shown and described.

[0047] As shown, audio module **414** may be configured to manage encoded or unencoded data gathered from various types of audio sensors. In some examples, audio module **414** may include one or more codes that are used to encode or decode various types of audio waveforms. For example, analog audio input may be encoded by audio module **414** and, once encoded, sent as a signal or collection of data packets, messages, segments, frames, or the like to logic module **404** for transmission via communications module **406**. In other examples, audio module **414** may be implemented differently in function, structure, configuration, or implementation and is not limited to those shown and described. Other elements that may be used by band **200** include motor controller **416**, which may be firmware or an application to control a motor or other vibratory energy source (e.g., notification facility **208** (FIG. 2)). Power used for band **200** may be drawn from battery **214** (FIG. 2) and managed by power management module **422**, which may be firmware or an application used to manage, with or without user input, how power is consumer, conserved, or otherwise used by band **200** and the above-described elements, including one or more sensors (e.g., sensor **212** (FIG. 2), sensors **302-328** (FIG. 3)). With regard to data captured, sensor input evaluation module **420** may be a software engine or module that is used to evaluate and analyze data received from one or more inputs (e.g., sensors **302-328**) to band **200**. When received, data may be analyzed by sensor input evaluation module **420**, which may include custom or “off-the-shelf” analytics packages that are configured to provide application-specific analysis of data to determine trends, patterns, and other useful information. In other examples, sensor input module **420** may also include firmware or software that enables the generation of various types and formats of reports, for presenting data and any analysis performed thereupon.

[0048] Another element of application architecture **400** that may be included is service management module **418**. In some examples, service management module **418** may be firmware, software, or an application that is configured to manage various aspects and operations associated with executing software-related instructions for band **200**. For example,

libraries or classes that are used by software or applications on band **200** may be served from an online or networked source. Service management module **418** may be implemented to manage how and when these services are invoked in order to ensure that desired applications are executed properly within application architecture **400**. As discrete sets, collections, or groupings of functions, services used by band **200** for various purposes ranging from communications to operating systems to call or document libraries may be managed by service management module **418**. Alternatively, service management module **418** may be implemented differently and is not limited to the examples provided herein. Further, application architecture **400** is an example of a software/system/application-level architecture that may be used to implement various software-related aspects of band **200** and may be varied in the quantity, type, configuration, function, structure, or type of programming or formatting languages used, without limitation to any given example.

[0049] FIG. 5A illustrates representative data types for use with an exemplary data-capable band. Here, wearable device **502** may capture various types of data, including, but not limited to sensor data **504**, manually-entered data **506**, application data **508**, location data **510**, network data **512**, system/operating data **514**, and user data **516**. Various types of data may be captured from sensors, such as those described above in connection with FIG. 3. Manually-entered data, in some examples, may be data or inputs received directly and locally by band **200** (FIG. 2). In other examples, manually-entered data may also be provided through a third-party website that stores the data in a database and may be synchronized from server **114** (FIG. 1) with one or more of bands **104-112**. Other types of data that may be captured including application data **508** and system/operating data **514**, which may be associated with firmware, software, or hardware installed or implemented on band **200**. Further, location data **510** may be used by wearable device **502**, as described above. User data **516**, in some examples, may be data that include profile data, preferences, rules, or other information that has been previously entered by a given user of wearable device **502**. Further, network data **512** may be data is captured by wearable device with regard to routing tables, data paths, network or access availability (e.g., wireless network access availability), and the like. Other types of data may be captured by wearable device **502** and are not limited to the examples shown and described. Additional context-specific examples of types of data captured by bands **104-112** (FIG. 1) are provided below.

[0050] FIG. 5B illustrates representative data types for use with an exemplary data-capable band in fitness-related activities. Here, band **519** may be configured to capture types (i.e., categories) of data such as heart rate/pulse monitoring data **520**, blood oxygen saturation data **522**, skin temperature data **524**, salinity/emission/outgassing data **526**, location/GPS data **528**, environmental data **530**, and accelerometer data **532**. As an example, a runner may use or wear band **519** to obtain data associated with his physiological condition (i.e., heart rate/pulse monitoring data **520**, skin temperature, salinity/emission/outgassing data **526**, among others), athletic efficiency (i.e., blood oxygen saturation data **522**), and performance (i.e., location/GPS data **528** (e.g., distance or laps run), environmental data **530** (e.g., ambient temperature, humidity, pressure, and the like), accelerometer **532** (e.g., biomechanical information, including gait, stride, stride length, among others)). Other or different types of data may be captured by band **519**, but the above-described examples

are illustrative of some types of data that may be captured by band 519. Further, data captured may be uploaded to a website or online/networked destination for storage and other uses. For example, fitness-related data may be used by applications that are downloaded from a “fitness marketplace” where athletes may find, purchase, or download applications for various uses. Some applications may be activity-specific and thus may be used to modify or alter the data capture capabilities of band 519 accordingly. For example, a fitness marketplace may be a website accessible by various types of mobile and non-mobile clients to locate applications for different exercise or fitness categories such as running, swimming, tennis, golf, baseball, football, fencing, and many others. When downloaded, a fitness marketplace may also be used with user-specific accounts to manage the retrieved applications as well as usage with band 519, or to use the data to provide services such as online personal coaching or targeted advertisements. More, fewer, or different types of data may be captured for fitness-related activities.

[0051] FIG. 5C illustrates representative data types for use with an exemplary data-capable band in sleep management activities. Here, band 539 may be used for sleep management purposes to track various types of data, including heart rate monitoring data 540, motion sensor data 542, accelerometer data 544, skin resistivity data 546, user input data 548, clock data 550, and audio data 552. In some examples, heart rate monitor data 540 may be captured to evaluate rest, waking, or various states of sleep. Motion sensor data 542 and accelerometer data 544 may be used to determine whether a user of band 539 is experiencing a restful or fitful sleep. For example, some motion sensor data 542 may be captured by a light sensor that measures ambient or differential light patterns in order to determine whether a user is sleeping on her front, side, or back. Accelerometer data 544 may also be captured to determine whether a user is experiencing gentle or violent disruptions when sleeping, such as those often found in afflictions of sleep apnea or other sleep disorders. Further, skin resistivity data 546 may be captured to determine whether a user is ill (e.g., running a temperature, sweating, experiencing chills, clammy skin, and others). Still further, user input data may include data input by a user as to how and whether band 539 should trigger notification facility 208 (FIG. 2) to wake a user at a given time or whether to use a series of increasing or decreasing vibrations or audio tones to trigger a waking state. Clock data (550) may be used to measure the duration of sleep or a finite period of time in which a user is at rest. Audio data may also be captured to determine whether a user is snoring and, if so, the frequencies and amplitude therein may suggest physical conditions that a user may be interested in knowing (e.g., snoring, breathing interruptions, talking in one’s sleep, and the like). More, fewer, or different types of data may be captured for sleep management-related activities.

[0052] FIG. 5D illustrates representative data types for use with an exemplary data-capable band in medical-related activities. Here, band 539 may also be configured for medical purposes and related-types of data such as heart rate monitoring data 560, respiratory monitoring data 562, body temperature data 564, blood sugar data 566 (i.e., blood glucose levels), chemical protein/analysis data 568, patient medical records data 570, and healthcare professional (e.g., doctor, physician, registered nurse, physician’s assistant, dentist, orthopedist, surgeon, and others) data 572. Band 539 may also be configured for use with other data types (not shown), including blood pressure, oxygen saturation and skin conduc-

tance response (SCR, also known as skin conductance level, psychogalvanic reflex, electrodermal response or galvanic skin response). In some examples, data may be captured by band 539 directly from wear by a user. For example, band 539 may be able to sample and analyze sweat through a salinity or moisture detector to identify whether any particular chemicals, proteins, hormones, or other organic or inorganic compounds are present, which can be analyzed by band 539 or communicated to server 114 to perform further analysis. If sent to server 114, further analyses may be performed by a hospital or other medical facility using data captured by band 539. In other examples, more, fewer, or different types of data may be captured for medical-related activities.

[0053] Band 539 may be used to diagnose a wide range of medical conditions and diseases. For example, the types of sensor data described above may be useful for diagnosing or monitoring medical conditions and diseases such as sleep disorders, diabetes, heart attack, stroke, hyperthermia, hypothermia, shock, Parkinson’s Disease or other disorders (e.g., disorders involving movement-related symptoms). In some examples, band 539 may be implemented with multiple temperature sensors (e.g., one to gather body temperature data 564 and another to gather ambient temperature (i.e., environmental data 530)) in order to isolate changes to a user’s body temperature, which may be useful for numerous medical reasons. For example, dramatic changes in body temperature may indicate various types of illnesses (e.g., cold, flu, etc.) or life-threatening events (e.g., heart attack, stroke, hyperthermia, hypothermia, shock, etc.). In another example, changes in a person’s body temperature may be used to monitor a menstrual cycle and determine ovulation times (or failure to ovulate). In some examples, band 539 may be implemented to gather SCR data using two or more sensors. SCR data is known to measure arousal due to emotional intensity or cognitive effort. As such, SCR data may also be gathered to determine if a user is experiencing sympathetic stress, poor sleep quality or psychopathic tendencies. In another example, heart rate monitoring data 560, respiratory monitoring data 562, alone or along with other data types (e.g., motion sensor data 542, accelerometer data 544, etc.) may be gathered by band 539 to aid in determining when a baby stops breathing, if a baby has irregular breathing patterns when sleeping, or whether the baby is otherwise in danger of suffering from sudden infant death syndrome (SIDS). In other examples, band 539 may gather similar, or additional, data types to diagnose and monitor sleep disorders in adults. In other examples, various types of data gathered by band 539 may be useful in determining negative reactions to food, drink, or environmental influences (e.g., allergies, indigestion, intoxication, etc.). In yet other examples, band 539 may be implemented with different data types to diagnose or monitor other medical conditions and diseases. In some examples, the analysis of the above-described data types to diagnose and monitor medical conditions and diseases may be carried out using an application (i.e., software application), which may be stored in a memory (i.e., memory 206) and executed by a processor (i.e., processor 204). The application may be implemented using application architecture 400, as described in more detail above (see FIG. 4).

[0054] In response to the diagnosis and monitoring of medical conditions and diseases described above, band 539 may be implemented to provide notifications to a user (i.e., using notification facility 208) for treatment or prevention purposes. In some examples, patient medical records data 570

and healthcare professional (e.g., doctor, physician, registered nurse, physician's assistant, dentist, orthopedist, surgeon, and others) data **572** may be used in conjunction with the sensor-gathered data types described above to determine types of notifications for treatment and prevention of medical conditions and diseases. This determination may be made by an application (i.e., software application), which may be stored in a memory (i.e., memory **206**) and executed by a processor (i.e., processor **204**). The application may be implemented using application architecture **400**, as described in more detail above (see FIG. **4**). Various types of signals may be used to indicate various treatments and preventative measures. For example, a diabetic user may be prompted using one signal to eat if their blood glucose level falls below a certain threshold. A diabetic user may also be prompted using another signal to take insulin or other medication. In another example, band **539** may gather data associated with symptoms of anaphylactic shock, or other types of allergic reactions (e.g., hay fever, hives, etc.), and in response, provide a signal (e.g., vibratory, audio or visual signal via notification facility **208**) to prompt the user to use an epinephrine autoinjector (e.g., EpiPen™), to take a prescribed dose of medication (e.g., an antihistamine (e.g., Benadryl™), a corticosteroid (e.g. Prednisone™), or other drug), or to take other prescribed treatment actions. In another example, band **539** may gather data indicating irregular breathing patterns (e.g., no breaths, distressed breathing patterns, etc.) or other signs of distress or illness (e.g., SIDS warning signs) in a baby, and in response, provide a signal (e.g., vibratory, audio or visual signal via notification facility **208**) to prompt the baby to move or wake. In some examples, a band **539** worn by a baby may communicate with another band (not shown) worn by a parent, guardian or other caretaker (collectively referred to herein as "parent") that provides the parent with monitoring information or alerts (e.g., that the baby has stopped breathing, that the baby is awake, that the baby is experiencing distressed breathing, etc.). The monitoring information or alerts may be presented using any type of user interface, as described herein or may otherwise be implemented on the parent's band. The monitoring information or alerts may be communicated using a wired or wireless connection. In other examples, the monitoring information or alerts may be provided to the parent by any of the data and communications capable devices described herein. Similarly, band **539** may gather data indicating snoring, irregular breathing patterns, or other sleep disorder symptoms in an adult, and in response, provide a signal (e.g., vibratory, audio or visual signal via notification facility **208**) to prompt the adult to move or wake. In yet other examples, band **539** may be implemented with different types of notification schemes to treat or prevent other medical conditions and diseases.

[0055] As described in more detail below, band **539** may be implemented in communication with other bands and other devices. The data types described above may be gathered by multiple bands and devices to obtain a more comprehensive set of data for analysis by an application. In some examples, one band (e.g., band **539**) may be worn by a non-human subject, such as an animal (e.g., a pet, a zoo animal, a trained animal, etc.) to gather various types of data, as described above, and notification may be provided to a person associated with the non-human subject (e.g., a pet owner, a zookeeper, an animal trainer, etc.) for the administration of various treatments or preventative measures.

[0056] FIG. **6** illustrates a transition between modes of operation for a band in accordance with various embodiments. A band can transition between modes by either entering a mode at **602** or exiting a mode at **660**. The flow to enter a mode begins at **602** and flows downward, whereas the flow to exit the mode begins at **660** and flows upward. A mode can be entered and exited explicitly **603** or entered and exited implicitly **605**. In particular, a user can indicate explicitly whether to enter or exit a mode of operation by using inputs **620**. Examples of inputs **620** include a switch with one or more positions that are each associated with a selectable mode, and a display I/O **624** that can be touch-sensitive for entering commands explicitly to enter or exit a mode. Note that entry of a second mode of operation can extinguish implicitly the first mode of operation. Further, a user can explicitly indicate whether to enter or exit a mode of operation by using motion signatures **610**. That is, the motion of the band can facilitate transitions between modes of operation. A motion signature is a set of motions or patterns of motion that the band can detect using the logic of the band, whereby the logic can infer a mode from the motion signature. Examples of motion signatures are discussed below in FIG. **11**. A set of motions can be predetermined, and then can be associated with a command to enter or exit a mode. Thus, motion can select a mode of operation. In some embodiments, modes of operation include a "normal" mode, an "active mode," a "sleep mode" or "resting mode," among other types of modes. A normal mode includes usual or normative amount of activities, whereas, an "active mode" typically includes relatively large amounts of activity. Active mode can include activities, such as running and swimming, for example. A "sleep mode" or "resting mode" typically includes a relatively low amount of activity that is indicative of sleeping or resting can be indicative of the user sleeping.

[0057] A mode can be entered and exited implicitly **605**. In particular, a band and its logic can determine whether to enter or exit a mode of operation by inferring either an activity or a mode at **630**. An inferred mode of operation can be determined as a function of user characteristics **632**, such as determined by user-relevant sensors (e.g., heart rate, body temperature, etc.). An inferred mode of operation can be determined using motion matching **634** (e.g., motion is analyzed and a type of activity is determined). Further, an inferred mode of operation can be determined by examining environmental factors **636** (e.g., ambient temperature, time, ambient light, etc.). To illustrate, consider that: (1.) user characteristics **632** specify that the user's heart rate is at a resting rate and the body temperature falls (indicative of resting or sleeping), (2.) motion matching **634** determines that the user has a relatively low level of activity, and (3.) environment factors **636** indicate that the time is 3:00 am and the ambient light is negligible. In view of the foregoing, an inference engine or other logic of the band likely can infer that the user is sleeping and then operate to transition the band into sleep mode. In this mode, power may be reduced. Note that while a mode may transition either explicitly or implicitly, it need not exit the same way.

[0058] FIG. **7A** illustrates a perspective view of an exemplary data-capable band configured to receive overmolding. Here, band **700** includes framework **702**, covering **704**, flexible circuit **706**, covering **708**, motor **710**, coverings **714-724**, plug **726**, accessory **728**, control housing **734**, control **736**, and flexible circuits **737-738**. In some examples, band **700** is shown with various elements (i.e., covering **704**, flexible cir-

cuit 706, covering 708, motor 710; coverings 714-724, plug 726, accessory 728, control housing 734, control 736, and flexible circuits 737-738) coupled to framework 702. Coverings 708, 714-724 and control housing 734 may be configured to protect various types of elements, which may be electrical, electronic, mechanical, structural, or of another type, without limitation. For example, covering 708 may be used to protect a battery and power management module from protective material formed around band 700 during an injection molding operation. As another example, housing 704 may be used to protect a printed circuit board assembly ("PCBA") from similar damage. Further, control housing 734 may be used to protect various types of user interfaces (e.g., switches, buttons (e.g., control 736), lights, light-emitting diodes, or other control features and functionality) from damage. In other examples, the elements shown may be varied in quantity, type, manufacturer, specification, function, structure, or other aspects in, order to provide data capture, communication, analysis, usage, and other capabilities to band 700, which may be worn by a user around a wrist, arm, leg, ankle, neck or other protrusion or aperture, without restriction. Band 700, in some examples, illustrates an initial unlayered device that may be protected using the techniques for protective overmolding as described above. Alternatively, the number, type, function, configuration, ornamental appearance, or other aspects shown may be varied without limitation.

[0059] FIG. 7B illustrates, a side view of an exemplary data-capable band. Here, band 740 includes framework 702, covering 704, flexible circuit 706, covering 708, motor 710, battery 712, coverings 714-724, plug 726, accessory 728, button/switch/LED 730-732, control housing 734, control 736, and flexible circuits 737-738 and is shown as a side view of band 700. In other examples, the number, type, function, configuration, ornamental appearance, or other aspects shown may be varied without limitation.

[0060] FIG. 8A illustrates a perspective of an exemplary data-capable band having a first molding. Here, an alternative band (i.e., band 800) includes molding 802, analog audio TRRS-type plug (hereafter "plug") 804, plug housing 806, button 808, framework 810, control housing 812, and indicator light 814. In some examples, a first protective overmolding (i.e., molding 802) has been applied over band 700 (FIG. 7) and the above-described elements (e.g., covering 704, flexible circuit 706, covering 708, motor 710, coverings 714-724, plug 726, accessory 728, control housing 734, control 736, and flexible circuit 738) leaving some elements partially exposed (e.g., plug 804, plug housing 806, button 808, framework 810, control housing 812, and indicator light 814). However, internal PCBAs, flexible connectors, circuitry, and other sensitive elements have been protectively covered with a first or inner molding that can be configured to further protect band 800 from subsequent moldings formed over band 800 using the above-described techniques. In other examples, the type, configuration, location, shape, design, layout, or other aspects of band 800 may be varied and are not limited to those shown and described. For example, TRRS plug 804 may be removed if a wireless communication facility is instead attached to framework 810, thus having a transceiver, logic, and antenna instead being protected by molding 802. As another example, button 808 may be removed and replaced by another control mechanism (e.g., an accelerometer that provides motion data to a processor that, using firmware and/or an application, can identify and resolve different types of motion that band 800 is undergoing), thus enabling

molding 802 to be extended more fully, if not completely, over band 800. In other examples, the number, type, function, configuration, ornamental appearance, or other aspects shown may be varied without limitation.

[0061] FIG. 8B illustrates a side view of an exemplary data-capable band. Here, band 820 includes molding 802, plug 804, plug housing 806, button 808, control housing 812, and indicator lights 814 and 822. In other examples, the number, type, function, configuration, ornamental appearance, or other aspects shown may be varied without limitation.

[0062] FIG. 9A illustrates a perspective view of an exemplary data-capable band having a second molding. Here, band 900 includes molding 902, plug 904, and button 906. As shown another overmolding or protective material has been formed by injection molding, for example, molding 902 over band 900. As another molding or covering layer, molding 902 may also be configured to receive surface designs, raised textures, or patterns, which may be used to add to the commercial appeal of band 900. In some examples, band 900 may be illustrative of a finished data-capable band (i.e., band 700 (FIG. 7), 800 (FIG. 8) or 900) that may be configured to provide a wide range of electrical, electronic, mechanical, structural, photonic, or other capabilities.

[0063] Here, band 900 may be configured to perform data communication with one or more other data-capable devices (e.g., other bands, computers, networked computers, clients, servers, peers, and the like) using wired or wireless features. For example, plug 900 may be used, in connection with firmware and software that allow for the transmission of audio tones to send or receive encoded data, which may be performed using a variety of encoded waveforms and protocols, without limitation. In other examples, plug 904 may be removed and instead replaced with a wireless communication facility that is protected by molding 902. If using a wireless communication facility and protocol, band 900 may communicate with other data-capable devices such as cell phones, smart phones, computers (e.g., desktop, laptop, notebook, tablet, and the like), computing networks and clouds, and other types of data-capable devices, without limitation. In still other examples, band 900 and the elements described above in connection with FIGS. 1-9, may be varied in type, configuration, function, structure, or other aspects, without limitation to any of the examples shown and described.

[0064] FIG. 9B illustrates a side view of an exemplary data-capable band. Here, band 910 includes molding 902, plug 904, and button 906. In other examples, the number, type, function, configuration, ornamental appearance, or other aspects shown may be varied without limitation.

[0065] FIG. 10 illustrates an exemplary computer system suitable for use with a data-capable band. In some examples, computer system 1000 may be used to implement computer programs, applications, methods, processes, or other software to perform the above-described techniques. Computer system 1000 includes a bus 1002 or other communication mechanism for communicating information, which interconnects subsystems and devices, such as processor 1004, system memory 1006 (e.g., RAM), storage device 1008 (e.g., ROM), disk drive 1010 (e.g., magnetic or optical), communication interface 1012 (e.g., modem or Ethernet card), display 1014 (e.g., CRT or LCD), input device 1016 (e.g., keyboard), and cursor control 1018 (e.g., mouse or trackball).

[0066] According to some examples, computer system 1000 performs specific operations by processor 1004 execut-

ing one or more sequences of one or more instructions stored in system memory **1006**. Such instructions may be read into system memory **1006** from another computer readable medium, such as static storage device **1008** or disk drive **1010**. In some examples, hard-wired circuitry may be used in place of or in combination with software instructions for implementation.

[0067] The term “computer readable medium” refers to any tangible medium that participates in providing instructions to processor **1004** for execution. Such a medium may take many forms, including but not limited to, non-volatile media and volatile media. Non-volatile media includes, for example, optical or magnetic disks, such as disk drive **1010**. Volatile media includes dynamic memory, such as system memory **1006**.

[0068] Common forms of computer readable media includes, for example, floppy disk, flexible disk, hard disk, magnetic tape, any other magnetic medium, CD-ROM, any other optical medium, punch cards, paper tape, any other physical medium with patterns of holes, RAM, PROM, EPROM, FLASH-EPROM, any other memory chip or cartridge, or any other medium from which a computer can read.

[0069] Instructions may further be transmitted or received using a transmission medium. The term “transmission medium” may include any tangible or intangible medium that is capable of storing, encoding or carrying instructions for execution by the machine, and includes digital or analog communications signals or other intangible medium to facilitate communication of such instructions. Transmission media includes coaxial cables, copper wire, and fiber optics, including wires that comprise bus **1002** for transmitting a computer data signal.

[0070] In some examples, execution of the sequences of instructions may be performed by a single computer system **1000**. According to some examples, two or more computer systems **1000** coupled by communication link **1020** (e.g., LAN, PSTN, or wireless network) may perform the sequence of instructions in coordination with one another. Computer system **1000** may transmit and receive messages, data, and instructions, including program, i.e., application code, through communication link **1020** and communication interface **1012**. Received program code may be executed by processor **1004** as it is received, and/or stored in disk drive **1010**, or other non-volatile storage for later execution.

[0071] FIG. 11 depicts a representative implementation of one or more bands and equivalent devices, as wearable devices, to form unique motion profiles, according to various embodiments. In diagram **1100**, bands and an equivalent device are disposed on locomotive members of the user, whereby the locomotive members facilitate motion relative to and about a center point **1130** (e.g. a reference point for a position, such as a center of mass). A headset **1110** is configured to communicate with bands **1111**, **1112**, **1113** and **1114** and is disposed on a body portion **1102** (e.g., the head), which is subject to motion relative to center point **1130**. Bands **1111** and **1112** are disposed on locomotive portions **1104** of the user (e.g., the arms or wrists), whereas bands **1113** and **1114** are disposed on locomotive portion **1106** of the user (e.g., the legs or ankles). As shown, headset **1110** is disposed at distance **1120** from center point **1130**, bands **1111** and **1112** are disposed at distance **1122** from center point **1130**, and bands **1113** and **1114** are disposed at distance **1124** from center point **1130**. A great number of users have different values of distances **1120**, **1122**, and **1124**. Further, different wrist-to-

elbow and elbow-to-shoulder lengths for different users affect the relative motion of bands **1111** and **1112** about center point **1130**, and similarly, different hip-to-knee and knee-to-ankle lengths for different users affect the relative motion of bands **1113** and **1114** about center point **1130**. Moreover, a great number of users have unique gaits and styles of motion. The above-described factors, as well as other factors, facilitate the determination of a unique motion profile for a user per activity (or in combination of a number of activities). The uniqueness of the motion patterns in which a user performs an activity enables the use of motion profile data to provide a “motion fingerprint.” A “motion fingerprint” is unique to a user and can be compared against detected motion profiles to determine, for example, whether a use of the band by a subsequent wearer is unauthorized. In some cases, unauthorized users do not typically share common motion profiles. Note that while four are shown, fewer than four can be used to establish a “motion fingerprint,” or more can be shown (e.g., a band can be disposed in a pocket or otherwise carried by the user). For example, a user can place a single band at different portions of the body to capture motion patterns for those body parts in a serial fashion. Then, each of the motions patterns can be combined to form a “motion fingerprint.” In some cases, a single band **1111** is sufficient to establish a “motion fingerprint.” In other examples, one or more of bands **1111**, **1112**, **1113** and **1114** can be configured to operate with multiple users, including non-human users, such as pets or other animals.

[0072] FIGS. 12-13 are diagrams representing examples of networks formed using one or more bands, according to some embodiments. Diagram **1200** of FIG. 12 depicts a personal, wearable network including a number of bands **1211**, **1212**, **1213**, and **1214** (more or less) disposed on locomotive bodily members of a user or an entity (e.g., a human, an animal, such as a pet, etc.), according to one example. In some embodiments, bands **1211**, **1212**, **1213**, and **1214** can communicate with each other via, for example, Bluetooth® to form a peer-to-peer network. Further, a wearable communication device **1210** configured for aural communication, such as a headset, can communicate with bands **1211**, **1212**, **1213**, and **1214**, and can serve as a router to route data among bands **1211**, **1212**, **1213**, and **1214**, and with a mobile communications device **1216** (e.g., a mobile phone). As shown, wearable communication device **1210** forms communication links **1217** with one or more bands **1211**, **1212**, **1213**, and **1214**. Any of bands **1211**, **1212**, **1213**, and **1214** can communicate on communication link **1219** via networks **1220** to a remote band **1230**. Or, bands **1211**, **1212**, **1213**, and **1214** can communicate via communication links **1218** and networks **1220** to a remote band **1230**. Note that in some embodiments, bands **1211**, **1212**, **1213**, and **1214** form a secured personal, wearable network based on security keys that consider, for example, motion (e.g., all bands **1211**, **1212**, **1213**, and **1214** are moving in the same direction and can be indicative of a single person using bands **1211**, **1212**, **1213**, and **1214**).

[0073] Diagram **1300** of FIG. 13 depicts a number of bands that form a local network between the bands, according to one example. A band **1312** is associated with a user **1301**. Bands **1312** can communicate via communication links **1317** and **1318** to communication device **1316**, and, in turn, to one or more network **1320**. Note that group **1302** of users **1301** may be engaging in a common event, such as a yoga class or a marathon. Given this common activity, and some other optional activity or information, a secured (or unsecured)

local network can be established, for example, without explicit request by users 1301. Rather, the common activity and general permissions can facilitate establishment of an ad hoc network among band 1312, which, for example, can cease to operate as network once users cease to participate in the common activity.

[0074] In at least some examples, the structures and/or functions of any of the above-described features can be implemented in software, hardware, firmware, circuitry, or a combination thereof. Note that the structures and constituent elements above, as well as their functionality, may be aggregated with one or more other structures or elements. Alternatively, the elements and their functionality may be subdivided into constituent sub-elements, if any. As software, the above-described techniques may be implemented using various types of programming or formatting languages, frameworks, syntax, applications, protocols, objects, or techniques. As hardware and/or firmware, the above-described techniques may be implemented using various types of programming or integrated circuit design languages, including hardware description languages, such as any register transfer language ("RTL") configured to design field-programmable gate arrays ("FPGAs"), application-specific integrated circuits ("ASICs"), or any other type of integrated circuit. These can be varied and are not limited to the examples or descriptions provided.

[0075] Although the foregoing examples have been described in some detail for purposes of clarity of understanding, the above-described inventive techniques are not limited to the details provided. There are many alternative ways of implementing the above-described invention techniques. The disclosed examples are illustrative and not restrictive.

What is claimed:

1. A medical band, comprising:
one or more sensors configured to gather data associated with at least one symptom of a medical condition;
a memory configured to store the data and an application, the application being configured to determine the medical condition using the data;
a processor configured to execute the application; and
a notification facility configured to provide a notification upon receiving from the application an instruction associated with the notification.
2. The medical band of claim 1, wherein the notification is associated with a drug regimen.
3. The medical band of claim 1, wherein the notification is associated with a diet.
4. The medical band of claim 1, wherein the notification is configured to prompt movement.
5. The medical band of claim 1, wherein the notification comprises an alarm.
6. The medical band of claim 1, wherein the one or more sensors comprises a plurality of temperature sensors, one of the plurality of temperature sensors configured to gather data associated with body temperature, another of the plurality of temperature sensors configured to gather data associated with ambient temperature.
7. The medical band of claim 1, wherein the notification facility is configured to provide a vibratory energy.
8. The medical band of claim 1, wherein the notification facility is configured to provide an audio signal.
9. The medical band of claim 1, wherein the notification facility is configured to provide a visual signal.

10. The medical band of claim 1, wherein the medical band is configured to be worn by an animal.

11. The medical band of claim 1, wherein the one or more sensors is configured to gather data associated with an indicator of an animal's health.

12. The medical band of claim 1, wherein the application is configured to determine a medical condition associated with an animal.

13. The medical band of claim 1, wherein the medical band is configured to provide a notification using another device.

14. A medical diagnosis and monitoring system, comprising:

a medical band comprising one or more sensors configured to gather data associated with at least one symptom of a medical condition and a communications facility configured to communicate with another device;

a memory configured to store the data;

a notification facility configured to provide a notification; and

an application implemented on the another device, the application configured to determine the medical condition using the data and to provide an instruction to the medical band.

15. The medical diagnosis and monitoring system of claim 13, wherein the another device comprises a computer.

16. The medical diagnosis and monitoring system of claim 13, wherein the another device comprises another medical band.

17. The medical diagnosis and monitoring system of claim 13, wherein the another device comprises a mobile communication device.

18. The medical diagnosis and monitoring system of claim 13, wherein the another device comprises a mobile computing device.

19. The medical diagnosis and monitoring system of claim 13, wherein the instruction is associated with the notification.

20. The medical diagnosis and monitoring system of claim 13, wherein the notification facility is configured to provide a notification using a remote device.

21. The medical diagnosis and monitoring system of claim 20, wherein the notification is provided using an application implemented on the remote device.

22. The medical diagnosis and monitoring system of claim 20, wherein the medical band is configured to be worn by a child and the remote device is operable by a caretaker.

23. A medical diagnosis and monitoring system, comprising:

a plurality of medical bands, each of the plurality of medical bands comprising one or more sensors configured to gather data associated with at least one symptom of a medical condition and a communications facility configured to communicate with another of the plurality of medical bands;

a memory configured to store the data;

a notification facility configured to provide a notification; and

an application implemented on one of the plurality of medical bands, the application configured to determine the medical condition using the data and to provide to another of the plurality of medical bands an instruction associated with the notification.