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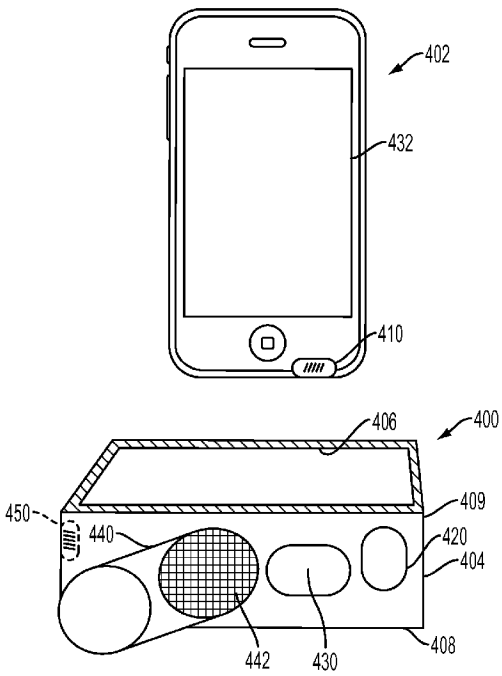

FIG. 4A

(57) Abstract: This disclosure is directed to devices, systems, kits and methods for measuring peak expiratory or inspiratory flow-rate and dynamically predicting respiratory episodes. Additionally, systems for analyzing and processing the measurement in a communication networked environment are also provided. An aspect of the disclosure is directed to a respiratory device, In some configurations the respiratory device comprises a housing adaptable and configurable to communicate with an electronic device, a mouth piece having a proximal end and a distal end configurable to engage a mouth of a patient and transmit an air flow, one or more diaphragm sensors configured to detect a breath vibration from the air flow in the mouth piece, and a processor adaptable and configurable to analyze the breath vibration detected by the one or more diaphragm sensors.

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SYSTEMS, METHODS AND KITS FOR MEASURING RESPIRATORY RATE AND DYNAMICALLY PREDICTING RESPIRATORY EPISODES

CROSS-REFERENCE

[0001] This application claims the benefit of U.S. Provisional Application No. **61/536,841**, filed September 20, 2011, entitled *Systems, Methods and Kits for Measuring Respiratory Rate,* by Chan, Tunnell and Thomas, which application is incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] Asthma is an episodic chronic disease that disrupts normal respiratory function in mammals. One aspect of asthma therapy involves preventing episodes of extreme worsening of respiratory function such as those associated with asthma attacks. During an asthma attack, or asthma exacerbation, the patient's airways become swollen and inflamed. Additionally, muscles associated with the patient's airways contract which causes the bronchial tubes to narrow. Patients will often wheeze, cough, and have trouble breathing. The severity of the attack can be minor or result in a life threatening emergency requiring a trip to the hospital.

[0003] The US National Institutes of Health (NIH) has recommended that asthma suffers take an Asthma Control Test (ACT) to assess the level of control of asthma. ACT is a tool that patients and healthcare providers use to assess asthma conditions and control. Patients answer a series of questions which look back over a period of time to assess whether shortness of breath was experienced, number of times a patient awoke during their sleep cycle from asthma relates symptoms (shortness of breath, chest tightness, or pain), the number of times a rescue inhaler was used (such as albuterol), as well as a subjective personal rating of the patient's impression of control over the same period of time.

[0004] The peak flow meter was invented by a British bioengineer, Basil Martin Wright (1912-2001) to provide a useful measurement to manage asthma symptoms. Peak Flow Meters work by mechanically measuring how fast air comes out of the lungs when a patient exhales forcefully after inhaling fully. This measurement is referred to as a "Peak Expiratory Flow" (PEF). Keeping track of PEF is one way a patient could monitor and understand if his/her asthma symptoms are controlled or worsening.

[0005] A classic flow metering system called Variable Area Orifice Metering (VAOM) is one type of system that is used for flow measurement. See, e.g., Wright BM, McKerrow CB. *Maximum forced expiratory flow-rate as a measure of ventilator capacity.* BMJ 1959; ii: 1043.

VAOM is one of the flow measurement methods defined in Mechanical Engineering field. Wright applied this methodology on peak expiratory flow measurement application and became the first peak flow meter.

[0006] Wright later applied rotameter, an advanced form of VAOM in his Peak Flow Meter. A rotameter contains a tapered metering elongated tube with a float positioned therein. When the air or fluid flows through the metering tube, a force will be generated against or opposing gravity and push the float up. A mechanical rider will mark the highest equilibrium the float reached, also known as the maximum flow-rate.

[0007] Wright adapted this method and applied on the peak-flow metering. Instead of relying solely on the gravity, Wright increased the tension by adding a mechanical spring. As described in his article, exhale air flows through the tapered metering tube and push a piston, which rides freely on the central rod (the float), against the attached mechanical spring. A rider being pushed by the piston marks the maximum equilibrium.

[0008] Currently, there are many peak-flow meters available in market, all of which rely on the mechanical principles established by Wright. See, for example, U.S. Design Patent **Des. 332,229** for *Peak Flow Meter* issued January 5, 1993, to Brown, and **Des. 586,248** for *Peak Flow Meter* issued February 10, 2009, to Baker; and U.S. Patent **6,889,564 B1**for *Peak Flow Meter* issued May 10, 2005, to Marcotte et al., and **3,862,628** for *Peak Flow Meters* issued January 28, 1975, to Williams. Other references relating to asthma include, for example, **US 8,231,541 B2** for *Asthma Status Scoring Method and System with Confidence Ratings* issued July 31, 2012 to Colquitt et al.

[0009] What is needed is: a peak expiratory flow-rate device that can take measurements electronically; a flow-rate device that is configurable to operate as part of a communication network; a respiratory functionality system assessment and predictor; and a method or system that can determine the likelihood of a respiratory incident, such as an asthma attack, prior to its onset and which is configurable to operate as part of a communication network.

SUMMARY OF THE INVENTION

[0010] Devices, systems and methods for obtaining higher accuracy peak flow measurements are disclosed. Users and health care practitioners can keep track of measurements from a peak flow meter, such as those disclosed, by using the networked systems and methods for tracking.

[0011] An aspect of the disclosure is directed to a respiratory device. In some configurations the respiratory device comprises: a housing adaptable and configurable to communicate with an electronic device (e.g. a form factor that is configurable to fit over or attaches to a portion of the

form factor of the electronic device); a mouth piece having a proximal end and a distal end configurable to engage a mouth of a patient and transmit an air flow; one or more diaphragm sensors configured to detect a breath vibration from the air flow in the mouth piece; and a processor adaptable and configurable to analyze the breath vibration detected by the one or more diaphragm sensors. The respiratory device is also adaptable and configurable to measure one or more patient flow-rate data including, for example, of peak expiratory flow-rate, peak inspiratory flow-rate, mean flow-rates, volumes, flow over time, Forced Vital Capacity, percentage of flow at certain time intervals, and slow and forced volumes at certain time intervals, the device. The respiratory device is also configurable to be in communication with a display adapted and configured to display a result of an analysis of the breath vibration. In at least some configurations a windscreen can be provided which is positionable relative to the mouth piece to reduce a secondary air flow from entering the mouth piece. The device is also configurable to be in communication with an environmental data source to obtain environmental data, including, but not limited to, one or more of each of an environmental sensor associated with one or more of the respiratory device and the electronic device. In some configurations the processor is further adaptable and configurable to correlate breath vibration data and environmental data. Additionally, the processor is adaptable and configurable to generate an asthma output. In other configurations the respiratory device is adaptable and configurable to be in communication with an audible indicator. Additionally, users can provide active or passive input. Active input occurs when the user enters information concerning, for example, current conditions, medications, etc. Passive input occurs when the system logs that the user took an action, such as using the device.

[0012] Another aspect of the disclosure is directed to a respiratory rate measuring system. The system is adaptable and configurable to comprise: measurement probe, the probe comprising; one or more diaphragm sensors adaptable and configurable to detect a breath vibration; a microphone; a mouth piece positioned proximally to the microphone; and a port, a computing system adaptable to communicate with the port and having a computer executable instruction that, when executed by a processor, performs a vibration analysis of the diaphragm vibration and display the result. In some configurations, the system is adaptable and configurable to measure one or more of peak expiratory flow-rate, peak inspiratory flow-rate, mean flow-rates, volumes, flow over time, Forced Vital Capacity, percentage of flow at certain time intervals, and slow and forced volumes at certain time intervals, the device. Additionally, the respiratory device is adaptable and configurable to be in communication with a display adapted and configured to display a result of an analysis of the breath vibration. In some configurations, a windscreen is provided which is positionable relative to the mouth piece to reduce a secondary air flow from

entering the mouth piece. In still other configurations, the system is in communication with an environmental data source, such as an environmental sensor associated with one or more of the respiratory device and the electronic device. Additionally, the processor is further adaptable and configurable to correlate breath vibration data and environmental data. The processor is also adaptable and configuration to generate an asthma output. In still other configurations, the respiratory device is in communication with an audible indicator. The computing systems are selectable from the group comprising a computer, a mobile phone, a smart phone, a handheld device.

[0013] Yet another aspect of the disclosure is directed to a system comprising: an electronic device having a microphone adaptable and configurable to be in communication with a communication network; a housing attachable to the electronic device, the housing further comprising: a mouth piece aligned with a microphone of the electronic device; and an optional windscreen resided in a mouth piece tube; a computer executable instruction that, when executed by a processor performs operations including vibration analysis of the microphone diaphragm of the probe and further adaptable to instruct that a result of the vibration analysis be displayed on a display. In some configurations, the system is adaptable and configurable to measure one or more of peak expiratory flow-rate, peak inspiratory flow-rate, mean flow-rates, volumes, flow over time, Forced Vital Capacity, percentage of flow at certain time intervals, and slow and forced volumes at certain time intervals, the device. Additionally, the respiratory device is adaptable and configurable to be in communication with a display adapted and configured to display a result of an analysis of the breath vibration. In some configurations, a windscreen is provided which is positionable relative to the mouth piece to reduce a secondary air flow from entering the mouth piece. In still other configurations, the system is in communication with an environmental data source, such as an environmental sensor associated with one or more of the respiratory device and the electronic device. Additionally, the processor is further adaptable and configurable to correlate breath vibration data and environmental data. The processor is also adaptable and configuration to generate an asthma output. In still other configurations, the respiratory device is in communication with an audible indicator. The computing systems are selectable from the group comprising a computer, a mobile phone, a smart phone, a handheld device.

[0014] In still another aspect of the disclosure, non-transitory computer readable medium storing instructions that, when executed by a computing device, causes the computing device to perform a method, the method comprising: receiving one or more of each of a peak expiratory flow-rate, a peak inspiratory flow-rate, and a spirometry measurement from a respiratory device having a

housing adaptable and configurable to communicate with an electronic device to receive a user respiratory input; at least one or more of analyzing, monitoring, evaluating, and responding to the received one or more of the peak expiratory flow-rate, the peak inspiratory flow-rate, and the spirometry measurement, is provided. In at least some configurations, the method performed by the medium can further comprise one or more of each of the steps of: communicating with a remote server; one or more of recording data and transmitting data; receiving data from a secondary measurement device (such as data from a heart rate monitor, a heart sound sensor, and saturation of oxygen in arterial blood flow (SpO2 or pulse oximetry) data), determining a GPS location for the measurement, acquiring environmental data (such as one or more of each of pollen count, air pollution data, airborne particulate matter data, airborne irritants data ambient temperature, temperature changes, and humidity data), acquiring behavioral data (such as one or more of each of data for compliance with medication protocol, compliance with testing protocol, compliance with monitoring protocol, compliance with system generated recommendations, compliance with health care provider recommendations).

[0015] Still another aspect of the disclosure is directed to a computing device comprising: a processor configured to: receive one or more of each of a peak expiratory flow-rate, a peak inspiratory flow-rate, and a spirometry measurement from respiratory device having a housing adaptable and configurable to communicate with an electronic device to receive a user respiratory input; at least one or more of analyze, monitor, evaluate, and respond to the received one or more of the peak expiratory flow-rate, the peak inspiratory flow-rate, and the spirometry measurement. In at least some configurations the processor is adaptable and configurable to perform one or more of the following: communicate with a remote server; record data; transmit data; receive data from a secondary measurement device (such as data from a heart rate monitor, a heart sound sensor, and saturation of oxygen in arterial blood flow (SpO2 or pulse oximetry) data); determine a GPS location for the measurement, acquire environmental data (such as one or more of each of pollen count, air pollution data, airborne particulate matter data, airborne irritants data ambient temperature, temperature changes, and humidity data); acquire behavioral data (which could be one or more of each of data for compliance with medication protocol, compliance with testing protocol, compliance with monitoring protocol, compliance with system generated recommendations, compliance with health care provider recommendations).

[0016] In yet other aspects of the disclosure, the disclosure provides methods comprising: receiving one or more of each of a peak expiratory flow-rate, a peak inspiratory flow-rate, and a spirometry measurement from a respiratory device having a housing adaptable and configurable to communicate with an electronic device to receive a user respiratory input; receiving an

environmental data input; at least one or more of analyzing, monitoring, evaluating, and responding to the received one or more of the peak expiratory flow-rate, the peak inspiratory flow-rate, and the spirometry measurement. The methods are also adaptable and configurable to include one or more the following steps: communicating with a remote server; recording data; transmitting data; receiving data from a secondary measurement device (such as data from a heart rate monitor, a heart sound sensor, and saturation of oxygen in arterial blood flow (SpO2 or pulse oximetry) data); determining a GPS location for the measurement; acquiring environmental data (such as one or more of each of pollen count, air pollution data, airborne particulate matter data, airborne irritants data ambient temperature, temperature changes, and humidity data); acquiring behavioral data (including, but not limited to one or more of each of data for compliance with medication protocol, compliance with testing protocol, compliance with monitoring protocol, compliance with system generated recommendations, compliance with health care provider recommendations).

[0017] Still another aspect of the disclosure is directed to a method comprising: transmitting, via a user computing device one or more of each of a peak expiratory flow-rate, a peak inspiratory flow-rate, and a spirometry measurement from a respiratory device having a housing adaptable and configurable to communicate with an electronic device to receive a user respiratory input to a web-server over a network; obtaining an environmental data input; at least one or more of analyzing, monitoring, evaluating, and responding to the received one or more of the peak expiratory flow-rate, the peak inspiratory flow-rate, and the spirometry measurement. The methods are also adaptable and configurable to include one or more the following steps: communicating with a remote server; recording data; transmitting data; receiving data from a secondary measurement device (such as data from a heart rate monitor, a heart sound sensor, and saturation of oxygen in arterial blood flow (SpO2 or pulse oximetry) data); determining a GPS location for the measurement; acquiring environmental data (such as one or more of each of pollen count, air pollution data, airborne particulate matter data, airborne irritants data ambient temperature, temperature changes, and humidity data); acquiring behavioral data (including, but not limited to one or more of each of data for compliance with medication protocol, compliance with testing protocol, compliance with monitoring protocol, compliance with system generated recommendations, compliance with health care provider recommendations).

[0018] Yet another aspect of the disclosure is directed to a system comprising: an electronic device configurable to be in communication with a communication network; a computer executable instruction that, when executed by a processor determines a likelihood of a respiratory event based on one or more of each of historical patient data, patient data input, current

environmental data, current data for other patients in a similar geographic location and historical data for other patients in a similar geographic location. In some configurations, the processor is further adaptable and configurable to, one or more of, communicate with a remote server; record data and transmit data; receive data from a secondary measurement device (such as data from a heart rate monitor, a heart sound sensor, and saturation of oxygen in arterial blood flow (SpO2 or pulse oximetry) data); determine a GPS location for the measurement; acquire environmental data (such as one or more of each of pollen count, air pollution data, airborne particulate matter data, airborne irritants data ambient temperature, temperature changes, and humidity data); acquire behavioral data (including, but not limited to one or more of each of data for compliance with medication protocol, compliance with testing protocol, compliance with monitoring protocol, compliance with system generated recommendations, compliance with health care provider recommendations).

[0019] In still other aspects of the disclosure, a non-transitory computer readable medium storing instructions that, when executed by a computing device, causes the computing device to perform a method, the method comprising: receiving one or more of a GPS location and a condition indication for each of one or more patients comprising a patient group; at least one or more of analyzing, monitoring, evaluating, and providing a prediction for a second patient based on the GPS location of the second patient and at least one or more of the GPS location and condition indication for the one or more patients comprising the patient group. In some configurations, the processor is further adaptable and configurable to, one or more of, communicate with a remote server; record data and transmit data; receive data from a secondary measurement device (such as data from a heart rate monitor, a heart sound sensor, and saturation of oxygen in arterial blood flow (SpO2 or pulse oximetry) data); determine a GPS location for the measurement; acquire environmental data (such as one or more of each of pollen count, air pollution data, airborne particulate matter data, airborne irritants data ambient temperature, temperature changes, and humidity data); acquire behavioral data (including, but not limited to one or more of each of data for compliance with medication protocol, compliance with testing protocol, compliance with monitoring protocol, compliance with system generated recommendations, compliance with health care provider recommendations).

[0020] Still other aspects of the disclosure are directed to a computing device comprising: a processor configured to: receive one or more of GPS location and condition indication for each of one or more patients comprising a patient group; at least one or more of analyze, monitor, evaluate, and provide a prediction for a second patient based on the GPS location and at least one or more of the GPS location and condition indication for the one or more patients comprising the

patient group. In some configurations, the processor is further adaptable and configurable to, one or more of, communicate with a remote server; record data and transmit data; receive data from a secondary measurement device (such as data from a heart rate monitor, a heart sound sensor, and saturation of oxygen in arterial blood flow (SpO2 or pulse oximetry) data); determine a GPS location for the measurement; acquire environmental data (such as one or more of each of pollen count, air pollution data, airborne particulate matter data, airborne irritants data ambient temperature, temperature changes, and humidity data); acquire behavioral data (including, but not limited to one or more of each of data for compliance with medication protocol, compliance with testing protocol, compliance with monitoring protocol, compliance with system generated recommendations, compliance with health care provider recommendations).

[0021] Another aspect of the disclosure is directed to a method comprising: receiving one or more of a GPS location and a condition indication for each of one or more patients comprising a patient group; at least one or more of analyzing, monitoring, evaluating, and providing a prediction for a second patient based on the GPS location of the second patient and at least one or more of the GPS location and the condition indication for the one or more patients comprising the patient group. The methods are also adaptable and configurable to include one or more the following steps: communicating with a remote server; recording data; transmitting data; receiving data from a secondary measurement device (such as data from a heart rate monitor, a heart sound sensor, and saturation of oxygen in arterial blood flow (SpO2 or pulse oximetry) data); determining a GPS location for the measurement; acquiring environmental data (such as one or more of each of pollen count, air pollution data, airborne particulate matter data, airborne irritants data ambient temperature, temperature changes, and humidity data); acquiring behavioral data (including, but not limited to one or more of each of data for compliance with medication protocol, compliance with testing protocol, compliance with monitoring protocol, compliance with system generated recommendations, compliance with health care provider recommendations).

INCORPORATION BY REFERENCE

[0022] All publications, patents, and patent applications mentioned in this specification are herein incorporated by reference to the same extent as if each individual publication, patent, or patent application was specifically and individually indicated to be incorporated by reference.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] The novel features of the disclosure are set forth with particularity in the appended claims. A better understanding of the features and advantages of the present disclosure will be

obtained by reference to the following detailed description that sets forth illustrative embodiments, in which the principles of the disclosure are utilized, and the accompanying drawings of which:

[0024] **FIG. 1A** is a block diagram showing a representative example of a logic device through which peak flow-rate measurement and management can be achieved;

[0025] **FIG. 1B** is a block diagram of an exemplary computing environment through which peak flow-rate measurement and management can be achieved;

[0026] **FIG. 1C** is an illustrative architectural diagram showing some structure that can be employed by devices through which peak flow-rate measurement and management is achieved;

[0027] **FIG. 2** is a block diagram showing the cooperation of exemplary components of a system suitable for use in a system where peak flow-rate measurement and management is achieved;

[0028] **FIG. 3** illustrates an operating principle of a condenser microphone, suitable for use in devices of the disclosure;

[0029] **FIGS. 4A-G** illustrates a flow-rate detection device adapted and configured to measure inspiratory and/or expiratory flow from a patient adaptable to be in communication with a secondary electronic device;

[0030] **FIGS. 5A-G** illustrates a flow-rate detection device adapted and configured to measure inspiratory and/or expiratory flow from a patient adaptable to be in communication with a secondary electronic device;

[0031] **FIG. 6-6D** illustrates an alternative embodiment of a flow-rate detection device adapted and configured to measure inspiratory and/or expiratory flow from a patient;

[0032] **FIGS. 7A-G** illustrates a flow-rate detection device adapted and configured to measure inspiratory and/or expiratory flow from a patient adaptable to be in communication with a secondary electronic device;

[0033] **FIG. 8** illustrates a flow-rate detection device adapted and configured to measure inspiratory and/or expiratory flow from a patient adaptable to be in communication with a secondary electronic device; and

[0034] **FIG. 9** illustrates an interrelationship between data components in the system.

DETAILED DESCRIPTION OF THE INVENTION

I. COMPUTING SYSTEMS

[0035] The systems and methods described herein rely on a variety of computer systems, networks and/or digital devices for operation. In order to fully appreciate how the system operates an understanding of suitable computing systems is useful. Aspects of the systems and

methods disclosed herein can be enabled as a result of application via a suitable computing system.

[0036] **FIG. 1A** is a block diagram showing a representative example logic device through which a browser can be accessed to implement the present invention. A computer system (or digital device) ***100,*** which may be understood as a logic apparatus adapted and configured to read instructions from media ***114*** and/or network port ***106***, is connectable to a server ***110***, and has a fixed media ***116***. The computer system ***100*** can also be connected to the Internet or an intranet. The system includes central processing unit (CPU) ***102***, disk drives ***104***, optional input devices, illustrated as keyboard ***118*** and/or mouse ***120*** and optional monitor ***108***. Data communication can be achieved through, for example, communication medium ***109*** to a server ***110*** at a local or a remote location. The communication medium ***109*** can include any suitable means of transmitting and/or receiving data. For example, the communication medium can be a network connection, a wireless connection or an internet connection. It is envisioned that data relating to the present disclosure can be transmitted over such networks or connections. The computer system can be adapted to communicate with a participant and/or a device used by a participant. The computer system is adaptable to communicate with other computers over the Internet, or with computers via a server.

[0037] **FIG. 1B** depicts another exemplary computing system ***100***. The computing system ***100*** is capable of executing a variety of computing applications ***138***, including computing applications, a computing applet, a computing program, or other instructions for operating on computing system ***100*** to perform at least one function, operation, and/or procedure. Computing system ***100*** is controllable by computer readable storage media for tangibly storing computer readable instructions, which may be in the form of software. The computer readable storage media adapted to tangibly store computer readable instructions can contain instructions for computing system ***100*** for storing and accessing the computer readable storage media to read the instructions stored thereon themselves. Such software may be executed within CPU ***102*** to cause the computing system ***100*** to perform desired functions. In many known computer servers, workstations and personal computers CPU ***102*** is implemented by micro-electronic chips CPUs called microprocessors. Optionally, a co-processor, distinct from the main CPU ***102***, can be provided that performs additional functions or assists the CPU ***102***. The CPU ***102*** may be connected to co-processor through an interconnect. One common type of coprocessor is the floating-point coprocessor, also called a numeric or math coprocessor, which is designed to perform numeric calculations faster and better than the general-purpose CPU ***102***.

[0038] As will be appreciated by those skilled in the art, a computer readable medium stores computer data, which data can include computer program code that is executable by a computer, in machine readable form. By way of example, and not limitation, a computer readable medium may comprise computer readable storage media, for tangible or fixed storage of data, or communication media for transient interpretation of code-containing signals. Computer readable storage media, as used herein, refers to physical or tangible storage (as opposed to signals) and includes without limitation volatile and non-volatile, removable and non-removable storage media implemented in any method or technology for the tangible storage of information such as computer-readable instructions, data structures, program modules or other data.
Computer readable storage media includes, but is not limited to, RAM, ROM, EPROM, EEPROM, flash memory or other solid state memory technology, CD-ROM, DVD, or other optical storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other physical or material medium which can be used to tangibly store the desired information or data or instructions and which can be accessed by a computer or processor.

[0039] Some embodiments may be implemented in one or a combination of hardware, firmware and software. Embodiments may also be implemented as instructions stored on a non-transitory computer-readable storage medium, which may be read and executed by at least one processor to perform the operations described herein. A non-transitory computer-readable storage medium may include any mechanism for storing information in a form readable by a machine (e.g., a computer). For example, a non-transitory computer-readable storage medium may include read-only memory (ROM), random-access memory (RAM), magnetic disk storage media, optical storage media, flash-memory devices, and other non-transitory media.

[0040] In operation, the CPU ***102*** fetches, decodes, and executes instructions, and transfers information to and from other resources via the computer's main data-transfer path, system bus ***140***. Such a system bus connects the components in the computing system ***100*** and defines the medium for data exchange. Memory devices coupled to the system bus ***140*** include random access memory (RAM) ***124*** and read only memory (ROM) ***126***. Such memories include circuitry that allows information to be stored and retrieved. The ROMs ***126*** generally contain stored data that cannot be modified. Data stored in the RAM ***124*** can be read or changed by CPU ***102*** or other hardware devices. Access to the RAM ***124*** and/or ROM ***126*** may be controlled by memory controller ***122***. The memory controller ***122*** may provide an address translation function that translates virtual addresses into physical addresses as instructions are executed.

[0041] In addition, the computing system ***100*** can contain peripherals controller ***128*** responsible for communicating instructions from the CPU ***102*** to peripherals, such as, printer ***142***, keyboard ***118***, mouse ***120***, and data storage drive ***143***. Display ***108***, which is controlled by a display controller ***163***, is used to display visual output generated by the computing system ***100***. Such visual output may include text, graphics, animated graphics, and video. The display controller ***134*** includes electronic components required to generate a video signal that is sent to display ***108***. Further, the computing system ***100*** can contain network adaptor ***136*** which may be used to connect the computing system ***100*** to an external communications network ***132***.

II. NETWORKS AND INTERNET PROTOCOL

[0042] As is well understood by those skilled in the art, the Internet is a worldwide network of computer networks. Today, the Internet is a public and self-sustaining network that is available to many millions of users. The Internet uses a set of communication protocols called TCP/IP (i.e., Transmission Control Protocol/Internet Protocol) to connect hosts. The Internet has a communications infrastructure known as the Internet backbone. Access to the Internet backbone is largely controlled by Internet Service Providers (ISPs) that resell access to corporations and individuals.

[0043] The Internet Protocol (IP) enables data to be sent from one device (e.g., a phone, a Personal Digital Assistant (PDA), a computer, etc.) to another device on a network. There are a variety of versions of IP today, including, e.g., IPv4, IPv6, etc. Other IPs are no doubt available and will continue to become available in the future, any of which can be used without departing from the scope of the invention. Each host device on the network has at least one IP address that is its own unique identifier and acts as a connectionless protocol. The connection between end points during a communication is not continuous. When a user sends or receives data or messages, the data or messages are divided into components known as packets. Every packet is treated as an independent unit of data and routed to its final destination - but not necessarily via the same path.

III. WIRELESS NETWORKS

[0044] Wireless networks can incorporate a variety of types of mobile devices, such as, e.g., cellular and wireless telephones, PCs (personal computers), laptop computers, wearable computers, cordless phones, pagers, headsets, printers, PDAs, etc. For example, mobile devices may include digital systems to secure fast wireless transmissions of voice and/or data. Typical mobile devices include some or all of the following components: a transceiver (for example a transmitter and a receiver, including a single chip transceiver with an integrated transmitter, receiver and, if desired, other functions); an antenna; a processor; display; one or more audio

transducers (for example, a speaker or a microphone as in devices for audio communications); electromagnetic data storage (such as ROM, RAM, digital data storage, etc., such as in devices where data processing is provided); memory; flash memory; and/or a full chip set or integrated circuit; interfaces (such as universal serial bus (USB), coder-decoder (CODEC), universal asynchronous receiver-transmitter (UART), phase-change memory (PCM), etc.). Other components can be provided without departing from the scope of the invention.

[0045] Wireless LANs (WLANs) in which a mobile user can connect to a local area network (LAN) through a wireless connection may be employed for wireless communications. Wireless communications can include communications that propagate via electromagnetic waves, such as light, infrared, radio, and microwave. There are a variety of WLAN standards that currently exist, such as Bluetooth®, IEEE 802.11, and the obsolete HomeRF.

[0046] By way of example, Bluetooth products may be used to provide links between mobile computers, mobile phones, portable handheld devices, personal digital assistants (PDAs), and other mobile devices and connectivity to the Internet. Bluetooth is a computing and telecommunications industry specification that details how mobile devices can easily interconnect with each other and with non-mobile devices using a short-range wireless connection. Bluetooth creates a digital wireless protocol to address end-user problems arising from the proliferation of various mobile devices that need to keep data synchronized and consistent from one device to another, thereby allowing equipment from different vendors to work seamlessly together.

[0047] An IEEE standard, IEEE 802.11, specifies technologies for wireless LANs and devices. Using 802.11, wireless networking may be accomplished with each single base station supporting several devices. In some examples, devices may come pre-equipped with wireless hardware or a user may install a separate piece of hardware, such as a card, that may include an antenna. By way of example, devices used in 802.11 typically include three notable elements, whether or not the device is an access point (AP), a mobile station (STA), a bridge, a personal computing memory card International Association (PCMCIA) card (or PC card) or another device: a radio transceiver; an antenna; and a MAC (Media Access Control) layer that controls packet flow between points in a network.

[0048] In addition, Multiple Interface Devices (MIDs) may be utilized in some wireless networks. MIDs may contain two independent network interfaces, such as a Bluetooth interface and an 802.11 interface, thus allowing the MID to participate on two separate networks as well as to interface with Bluetooth devices. The MID may have an IP address and a common IP (network) name associated with the IP address.

[0049] Wireless network devices may include, but are not limited to Bluetooth devices, WiMAX (Worldwide Interoperability for Microwave Access), Multiple Interface Devices (MIDs), 802.11x devices (IEEE 802.11 devices including, 802.11a, 802.11b and 802.11g devices), HomeRF (Home Radio Frequency) devices, Wi-Fi (Wireless Fidelity) devices, GPRS (General Packet Radio Service) devices, 3 G cellular devices, 2.5 G cellular devices, GSM (Global System for Mobile Communications) devices, EDGE (Enhanced Data for GSM Evolution) devices, TDMA type (Time Division Multiple Access) devices, or CDMA type (Code Division Multiple Access) devices, including CDMA2000. Each network device may contain addresses of varying types including but not limited to an IP address, a Bluetooth Device Address, a Bluetooth Common Name, a Bluetooth IP address, a Bluetooth IP Common Name, an 802.11 IP Address, an 802.11 IP common Name, or an IEEE MAC address.

[0050] Wireless networks can also involve methods and protocols found in, Mobile IP (Internet Protocol) systems, in PCS systems, and in other mobile network systems. With respect to Mobile IP, this involves a standard communications protocol created by the Internet Engineering Task Force (IETF). With Mobile IP, mobile device users can move across networks while maintaining their IP Address assigned once. See Request for Comments (RFC) 3344. NB: RFCs are formal documents of the Internet Engineering Task Force (IETF). Mobile IP enhances Internet Protocol (IP) and adds a mechanism to forward Internet traffic to mobile devices when connecting outside their home network. Mobile IP assigns each mobile node a home address on its home network and a care-of-address (CoA) that identifies the current location of the device within a network and its subnets. When a device is moved to a different network, it receives a new care-of address. A mobility agent on the home network can associate each home address with its care-of address. The mobile node can send the home agent a binding update each time it changes its care-of address using Internet Control Message Protocol (ICMP).

[0051] **FIG. 1C** depicts components that can be employed in system configurations enabling the systems and technical effect of this disclosure, including wireless access points to which client devices communicate. In this regard, **FIG. 1C** shows a wireless network ***150*** connected to a wireless local area network (WLAN) ***152***. The WLAN ***152*** includes an access point (AP) ***154*** and a number of user stations ***156, 156'***. For example, the network ***150*** can include the Internet or a corporate data processing network. The access point ***154*** can be a wireless router, and the user stations ***156, 156'*** can be portable computers, personal desk-top computers, PDAs, portable voice-over-IP telephones and/or other devices. The access point ***154*** has a network interface ***158*** linked to the network ***150***, and a wireless transceiver in communication with the user stations ***156, 156'***. For example, the wireless transceiver ***160*** can include an antenna ***162*** for

radio or microwave frequency communication with the user stations ***156, 156'***. The access point ***154*** also has a processor ***164***, a program memory ***166***, and a random access memory ***168***. The user station ***156*** has a wireless transceiver ***170*** including an antenna ***172*** for communication with the access point station ***154***. In a similar fashion, the user station ***156'*** has a wireless transceiver ***170'*** and an antenna ***172*** for communication to the access point ***154***. By way of example, in some embodiments an authenticator could be employed within such an access point (AP) and/or a supplicant or peer could be employed within a mobile node or user station. Desktop ***108*** and key board ***118*** or input devices can also be provided with the user status.

IV. COMPUTER NETWORK ENVIRONMENT

[0052] Computing system ***100***, described above, can be deployed as part of a computer network used to achieve the desired technical effect and transformation. In general, the above description for computing environments applies to both server computers and client computers deployed in a network environment. **FIG. 2** illustrates an exemplary illustrative networked computing environment ***200***, with a server in communication with client computers via a communications network ***250***. As shown in **FIG. 2**, server ***210*** may be interconnected via a communications network ***250*** (which may be either of, or a combination of a fixed-wire or wireless LAN, WAN, intranet, extranet, peer-to-peer network, virtual private network, the Internet, or other communications network) with a number of client computing environments such as tablet personal computer ***202***, smart phone ***208***, personal computer ***202***, and personal digital assistant. In a network environment in which the communications network ***250*** is the Internet, for example, server ***210*** can be dedicated computing environment servers operable to process and communicate data to and from client computing environments via any of a number of known protocols, such as, hypertext transfer protocol (HTTP), file transfer protocol (FTP), simple object access protocol (SOAP), or wireless application protocol (WAP). Other wireless protocols can be used without departing from the scope of the disclosure, including, for example Wireless Markup Language (WML), DoCoMo i-mode (used, for example, in Japan) and XHTML Basic. Additionally, networked computing environment ***200*** can utilize various data security protocols such as secured socket layer (SSL) or pretty good privacy (PGP). Each client computing environment can be equipped with operating system ***238*** operable to support one or more computing applications, such as a web browser (not shown), or other graphical user interface (not shown), or a mobile desktop environment (not shown) to gain access to server computing environment ***200***.

[0053] In operation, a user (not shown) may interact with a computing application running on a client computing environment to obtain desired data and/or computing applications. The data

and/or computing applications may be stored on server computing environment ***200*** and communicated to cooperating users through client computing environments over exemplary communications network ***250***. The computing applications, described in more detail below, are used to achieve the desired technical effect and transformation set forth. A participating user may request access to specific data and applications housed in whole or in part on server computing environment ***200***. These data may be communicated between client computing environments and server computing environments for processing and storage. Server computing environment ***200*** may host computing applications, processes and applets for the generation, authentication, encryption, and communication data and applications and may cooperate with other server computing environments (not shown), third party service providers (not shown), network attached storage (NAS) and storage area networks (SAN) to realize application/data transactions.

V. DEVICES FOR MEASURING PEAK FLOW-RATE WHICH ARE CONFIGURABLE TO OPERATE IN THE COMPUTING AND NETWORK ENVIRONMENTS TO ACHIEVE A DESIRED TECHNICAL EFFECT OR TRANSFORMATION

[0054] **FIG. 3** illustrates an operating principle of a condenser microphone, suitable for use in flow-rate detection devices of the disclosure. A condenser microphone has a front plate ***310*** (diaphragm), a back plate ***320*** positioned behind the diaphragm ***330***. The two plates act as the two plates of a capacitor. An electric charge can be stored between the two plates. When the front plate is vibrated or moved (e.g., with the application of sound waves), the distance between the two plates changes which results in a chance of capacitance. The capacitance of a diaphragm ***310*** –back plate ***320*** capacitor and the value of a built-in resistor form a filter which is high pass for an audio signal and low pass for a bias voltage. The voltage across the resistor (e.g., the output of the condenser microphone) is then amplifiable for recording. A wind screen ***340*** can also be provided to reduce the impact of air from secondary sources. The resulting output has the quality shown in the graph ***350***, where time from 0 to 700 msec is on the x axis and amplitude from -0.5 to 0.3 is on the y axis.

[0055] **FIGS. 4A-G** illustrate a flow-rate detection device ***400*** configurable in communication with a secondary electronic device ***402,*** such as a smart phone, that provides a microphone, such as ambient microphone ***410*** shown, a membrane sensor microphone, or any other suitable microphone device capable of capturing sound is provided. **FIG. 4A** illustrates a flow-rate detection device ***400*** and electronic device ***402*** from a front view. **FIG. 4B** illustrates a flow-rate detection device ***400*** and electronic device ***402*** from a side view. **FIG. 4C** illustrates a flow-rate detection device ***400*** from a front view with the mouth piece ***440*** in a second, folded, position.

FIG. 4D illustrates a flow-rate detection device ***400*** from a side view with the mouth piece ***440*** extended outward and ready for use. **FIG. 4E** illustrates a flow-rate detection device ***400*** from a bottom view with the mouth piece ***440*** extended outward and ready for use. **FIG. 4F** illustrates a flow-rate detection device ***400*** from a top view with the mouth piece ***440*** extended outward and ready for use. **FIG. 4E** illustrates a flow-rate detection device ***400*** from an elevated view with the mouth piece ***440*** extended outward and ready for use.

[0056] A processor can be provided on the flow-rate detection device ***400*** to control, for example, operation of the flow-rate detection device, communication with a secondary electronic device ***402***, and such other processes as would be desirable.

[0057] The flow-rate detection device ***400*** has a power supply (such as removable power supply ***450***) which is actuated by an on-off button ***420***. Power supplies include any suitable power supply including removable power supplies such as Li battery, NiCad battery, etc. An optional visual indicator ***430*** can be provided on the flow-rate detection device ***400,*** such as an LED display, wherein the visual indicator is configurable to provide a visual indication of status or operation of the flow-rate detection device. In alternative configurations, the flow-rate detection device ***400*** can communicate a visual indication to the secondary electronic device ***402,*** in addition to providing a visual indication or in lieu of providing a visual indication**.** In at least some configurations, the flow-rate detection device ***400*** is adaptable and configurable to transmit a display instruction to the secondary electronic device ***402*** having a visual indicator or display ***432***. Where the visual indicator information is transmitted or communicated to the secondary electronic device ***402***, the secondary electronic device display ***432*** then displays the visual indication of status or operation.

[0058] Additionally or alternatively, the flow-rate detection device ***400*** can be configured to include an audible indicator which is adapted to provide audible information to a user when the flow-rate detection device is in use. In alternative configurations, the flow-rate detection device ***400*** can communicate an audible indication to the secondary electronic device ***402,*** in addition to providing an audible indication or in lieu of providing an audible indication. As will be appreciated by those skilled in the art, audible indicators might be particularly useful to visually impaired users. Similarly, tactile displays can also be provided.

[0059] The flow-rate detection device is adaptable and configurable to communicate with an electronic device, such as a cell phone or smart phone, which has communication functionality. As shown in **FIGS. 4A-G**, the flow-rate detection device ***400*** has a housing ***404*** which is configurable to, for example, surround a portion of the secondary electronic device ***402***. As illustrated, the housing ***404*** has a lower surface ***408,*** side walls ***409*** and defines an opening

configured to receive the secondary electronic device ***402*** wherein the opening has an interior wall ***406.*** The form factor of the housing as been illustrated as rectangular for ease of illustration, but, as will be appreciated by those skilled in the art, the form factor of a particular housing will be optimized for interaction and/or communication with the form factor of a secondary electronic device ***402*** (e.g., Apple® iPhone, RIM Blackberry®, etc.) and a wide variety of form factors and cross-sectional shapes can be used (e.g., square, rectangular, oval, etc.) without departing from the scope of the disclosure. Additionally, although not depicted, the housing of any of the embodiments that engage a secondary electronic device ***402*** can be configured to abut, without enclosing, the form factor of the secondary electronic device. Alternatively, the housing can engage the rear surface of the secondary electronic device, enclose a bottom portion of the electronic device, or engage the front surface of the secondary electronic device.

[0060] In other configurations, the housing ***404*** can be configured to removeably engage the secondary electronic device in a position proximate to or adjacent to the speaker ***410*** or the camera. The housing ***404*** can further be configurable to engage a wide variety of secondary electronic device configurations.

[0061] The indicators provide information to a user about operational status and can, in some configurations, be used to communicate with a user to improve user interaction with the flow-rate detection device.

[0062] A mouth piece ***440*** can also be provided, as shown in **FIGS. 4A-B**. The flow-rate detection device is in communication with an electronic device ***402*** having a microphone ***410***. The flow-rate detection device has a mouth piece ***440*** is also configurable such that a filter ***442*** can be positioned between the mouth piece and the microphone ***410*** of the secondary electronic device. For example, as illustrated, the microphone is positioned on an upper surface of the secondary electronic device, and the mouth piece is positioned such that inspiration or expiration by a patient on the mouth piece will result in the sound be communicated to the microphone du to the proximity of the mouthpiece to the microphone. As will be appreciated any suitable material can be used as a filter. Typically the filter is configurable to prevent particulate matter, e.g. pollen, from entering into the respiratory system during use. The flow-rate detection device includes a power supply, such as removable power supply ***450.***

[0063] The mouth piece can be integrally formed such that it is formed from one piece or formed such that it has unitary operation when formed. In at least some configurations, the mouthpiece can be hinged ***444*** or bendable such that when the flow-rate detection device ***400*** is not connected to or in communication with the secondary electronic device, the mouth piece is

rotatable along a hinged section to achieve a lower profile flow-rate detection device as shown in the side view of the flow-rate detection device depicted in **FIG. 4C.**

[0064] As shown in **FIGS. 5A-G** the mouthpiece ***540*** can be configured on the bottom of the flow-rate detection device ***500.*** **FIG. 5A** illustrates a flow-rate detection device ***500*** and electronic device ***502*** from a front view. **FIG. 5B** illustrates a flow-rate detection device ***500*** and electronic device ***502*** from a side view. **FIG. 5C** illustrates a flow-rate detection device ***500*** from a front view with the mouth piece ***540*** in a second, folded, position. **FIG. 5D** illustrates a flow-rate detection device ***500*** from a side view with the mouth piece ***540*** extended outward and ready for use. **FIG. 5E** illustrates a flow-rate detection device ***500*** from a bottom view with the mouth piece ***540*** extended outward and ready for use. **FIG. 5F** illustrates a flow-rate detection device ***500*** from a top view with the mouth piece ***540*** extended outward and ready for use. **FIG. 5G** illustrates a flow-rate detection device ***500*** from an elevated view with the mouth piece ***540*** extended outward and ready for use.

[0065] The flow-rate detection device ***500*** has a housing ***504*** which is configurable to, for example, surround a portion of the secondary electronic device ***502***. As illustrated, the housing ***504*** has a lower surface ***508,*** side walls ***509*** and defines an opening configured to receive the secondary electronic device wherein the opening has an interior wall ***506.*** As with other configurations, the housing ***504*** can be configured to removeably engage the secondary electronic device in a position proximate to or adjacent to the speaker ***510***. As illustrated in this configuration, the speaker is positioned on the bottom side of the secondary electronic device. The housing ***504*** can further be configurable to engage a wide variety of secondary electronic device configurations. Additionally, an on-off button ***520,*** an optional visual indicator ***530,*** and a power supply ***550*** is provided. The mouth piece ***540*** is positioned on the lower surface ***508*** of the housing ***504.*** The mouth piece can be removeable and/or hinged to allow the mouth piece to be positioned flat, or substantially flat, against the housing ***504*** when not in use or when in a storage condition. The mouth piece ***540*** can be extended from the housing or rotated away from the housing to provide clearance off the end of the mouth piece away from the housing.

[0066] As will be appreciated by those skilled in the art, since condenser microphones are relying on the force of sound wave to vibrate the front-plate diaphragm to pick up the sound, it is possible for wind (natural wind or human generated vocal plosives) to push the diaphragm unintentionally. In a worst case scenario, the front diaphragm plate can be pushed by strong wind such that it translates into the back plate. As a result, the diaphragm cannot vibrate anymore and no audio signal is obtained from the microphone. This phenomenon is called plosive or pop.

[0067] The mouth piece can further be configurable to provide a removable and/or disposable unit which forms part of a kit. An integrally formed or removeable wind screen ***560*** can also be provided as shown in **FIG. 5**. Alternatively, the windscreen can also be removable and/or disposable as another kit component.

[0068] As further illustrated in **FIG. 5,** the flow-rate detection device is configurable to engage a portable electronic device such as a smart phone ***208***. The flow-rate detection device can be connected to or engage the portable electronic device or can communicate with the portable electronic device wirelessly. The flow-rate detection device in combination with the portable electronic device can further be configured or programmed to perform vibration analysis of the microphone diaphragm of the probe and display the result – either on the flow-rate detection device, on the portable electronic device, or on a computing device in communication with the flow-rate detection device via a communication network.

[0069] **FIGS. 6-6D** illustrates an alternative embodiment of a flow-rate detection device ***600*** adapted and configured to measure inspiratory and/or expiratory flow from a patient wherein a microphone ***610*** is provided on the flow-rate detection device housing ***604***. A power button ***620*** and visual indicator ***630*** can also be provided. As illustrated here acoustic sensors ***612*** can be provided in lieu of a mouth piece (as illustrated above). The flow-rate detection device ***600*** is configurable to communicate a detected respiration related value to a secondary electronic device, such as a cell phone. Alternatively, the flow-rate detection device can be configured to analyze the respiration related value and then to communicate the analyzed information to the secondary electronic device.

[0070] Additionally, the data from the diaphragm can be transmitted via a network to a central location where the vibration analysis of the microphone diaphragm of the probe can be performed, the results can then be transmitted back over the network to the user. In at least some configurations, the network can collect information regarding one or more readings from a patient and transmit that information to another location (e.g., to a healthcare provider, or to an emergency service if the readings indicate a dangerous reading), or can be made available to a user in a data management system.

[0071] **FIGS. 7A-G** illustrate a flow-rate detection device ***700*** configurable in communication with a secondary electronic device ***702*** that provides a camera ***711*** or any other suitable device capable of capturing an image. **FIG. 7A** illustrates a flow-rate detection device ***700*** and electronic device ***702*** from a front view. **FIG. 7B** illustrates a flow-rate detection device ***700*** and electronic device ***702*** from a side view. **FIG. 7C** illustrates a flow-rate detection device ***700*** from a front view with the mouth piece ***740*** in a second, folded, position. **FIG. 7D** illustrates a flow-rate

detection device ***700*** from a side view with the mouth piece ***740*** extended outward and ready for use. **FIG. 7E** illustrates a flow-rate detection device ***700*** from a bottom view with the mouth piece ***740*** extended outward and ready for use. **FIG. 7F** illustrates a flow-rate detection device ***700*** from a top view with the mouth piece ***740*** extended outward and ready for use. **FIG. 7E** illustrates a flow-rate detection device ***700*** from an elevated view with the mouth piece ***740*** extended outward and ready for use.

[0072] A processor can be provided on the flow-rate detection device ***700*** to control, for example, operation of the flow-rate detection device, communication with a secondary electronic device ***702***, and such other processes as would be desirable.

[0073] The flow-rate detection device ***700*** has a power supply (such as removable power supply ***750***) which is actuated by an on-off button ***720***. Power supplies include any suitable power supply including removable power supplies such as Li battery, NiCad battery, etc. An optional visual indicator ***730*** can be provided on the flow-rate detection device ***700,*** such as an LED display, wherein the visual indicator is configurable to provide a visual indication of status or operation of the flow-rate detection device. In at least some configurations, the flow-rate detection device ***700*** is adaptable and configurable to transmit a display instruction to the secondary electronic device having a visual indicator or display ***732***. Where the visual indicator information is transmitted or communicated to the secondary electronic device, the secondary electronic device display ***732*** then displays the visual indication of status or operation. Additionally or alternatively, an audible indicator can also be provided which provides audible information to a user when the flow-rate detection device is in use. Audible indicators might be particularly useful to visually impaired users. Similarly, tactile displays can also be provided.

[0074] The flow-rate detection device is adaptable and configurable to communicate with an electronic device, such as a cell phone or smart phone, which has communication functionality. As shown in **FIGS. 7A-G**, the flow-rate detection device ***700*** has a housing ***704*** which is configurable to, for example, surround a portion of the secondary electronic device ***702***. As illustrated, the housing ***704*** has a lower surface ***708,*** side walls ***709*** and defines an opening configured to receive the secondary electronic device wherein the opening has an interior wall ***706.*** The form factor of the housing as been illustrated as rectangular for ease of illustration, but, as will be appreciated by those skilled in the art, the form factor of a particular housing will be optimized for interaction with the form factor of a secondary electronic device (e.g., Apple® iPhone, RIM Blackberry®, etc.) and a wide variety of form factors and cross-sectional shapes can be used (e.g., square, rectangular, oval, etc.) without departing from the scope of the disclosure. Additionally, although not depicted, the housing of any of the embodiments that

engage a secondary electronic device can be configured to abut, without enclosing, the form factor of the secondary electronic device.

[0075] In other configurations, the housing ***704*** can be configured to removeably engage the secondary electronic device ***702*** in a position proximate to or adjacent to a camera ***711*** such that the camera can, for example, count the number, duration, and quality of breaths a user blows into a mouth piece of the flow-rate detection device ***700***. The housing ***704*** can further be configurable to engage a wide variety of secondary electronic device configurations taking into consideration, for example, positioning of a camera.

[0076] The indicators provide information to a user about operational status and can, in some configurations, be used to communicate with a user to improve user interaction with the flow-rate detection device.

[0077] A mouth piece ***740*** can also be provided, as shown in **FIGS. 7A-B**. The flow-rate detection device is in communication with an electronic device ***702*** having a camera ***710***. The flow-rate detection device has a mouth piece ***740*** is also configurable such that a filter ***742*** can be positioned between the mouth piece and the microphone ***710*** of the secondary electronic device. For example, as illustrated, the microphone is positioned on an upper surface of the secondary electronic device, and the mouth piece is positioned such that inspiration or expiration by a patient on the mouth piece will result in the sound be communicated to the microphone du to the proximity of the mouthpiece to the microphone. As will be appreciated any suitable material can be used as a filter. Typically the filter is configurable to prevent particulate matter, e.g. pollen, from entering into the respiratory system during use. The flow-rate detection device includes a power supply, such as removable power supply ***750.***

[0078] The mouth piece can be integrally formed such that it is formed from one piece or formed such that it has unitary operation when formed. In at least some configurations, the mouthpiece can be hinged ***744*** or bendable such that when the flow-rate detection device ***700*** is not connected to or in communication with the secondary electronic device, the mouth piece is rotatable along a hinged section to achieve a lower profile flow-rate detection device as shown in the side view of the flow-rate detection device depicted in **FIG. 7C.** The assessment made by the camera can be used by any suitable technique including.

[0079] Turning to **FIG. 8**, a device ***800*** is depicted which has a mouth piece ***840*** configurable to fit within the mouth of a patient and includes bite wings ***842***. The device ***800*** is adaptable and configurable to position a spinning vein or wheel ***844*** adjacent a secondary electronic device camera ***812***. The device ***800*** has a housing ***804*** that attaches, for example, to the phone ***802*** allowing the camera to view proximally the rotation of a turbine vein ***844*** that is connected within the housing ***804*** of

the device. The spinning vein or wheel ***844*** is constructed to allow the wheel or vein to rotate freely when air passes across an axis of the vein. The connection between the spinning wheel and housing can be by an axis or the wheel or vein itself can have integral to it a fulcrum or stem allowing it to be inserted into the housing again allowing free rotation of the wheel or vein. The housing ***804*** would then have two openings at each end and the housing would essentially look like a cylinder allowing for the persons mouth to attach to one end of the housing and the other end of the housing would remain open allowing the individual to freely breathe through the housing. As the person breathes the wheel or vein contained within the housing will spin and the camera from the phone will count the number of rotations. Those rotations are then correlated by the phone or processing device to provide an accurate measurement of the persons breathing flows and then calculate spirometery. The flow is then integrated over time to provide a calculation of volume. The direction of the wheel spinning will indicate the direction of the breath – inspiratory or expiratory breathing. The housing can have as an option a mouthpiece to improve the seal of the persons mouth to the housing/wheel assembly. The camera function can operate in either a series of photo shots or frames taken or a video sequence whereby a delineated number of frames per second can be optimized to measure the rotation numbers.

[0080] Other aspects include one or more networked devices. The networked devices comprise: a memory; a processor; a communicator; a display; and an apparatus for detecting expiry flow-rate as discussed herein.

[0081] In some aspects communication systems are provided. The communication systems comprise: an apparatus for detecting expiry flow-rate as described herein; a server computer system; a measurement module on the server computer system for permitting the transmission of a flow-rate measurement from the device for measuring the characteristic of the flow-rate over a network; at least one of an API engine connected to at least one of the system for measuring the characteristic of the flow-rate to create a message about the flow-rate measurement and transmit the message over an API integrated network to a recipient having a predetermined recipient user name, an SMS engine connected to at least one of the system for measuring the characteristic of the flow-rate to create an SMS message about the flow-rate measurement and transmit the SMS message over a network to a recipient device having a predetermined flow-rate measurement recipient telephone number, and an email engine connected to at least one of the system for measuring the characteristic of the flow-rate to create an email message about the flow-rate measurement and transmit the email message over the network to a flow-rate measurement recipient email having a predetermined flow-rate measurement recipient email address. A storing module can also be provided on the server computer system for storing the flow-rate measurement on the system for measuring the characteristic of the flow-rate server database. Moreover, at least one of the system for measuring the characteristic of the flow-rate is

connectable to the server computer system over at least one of a mobile phone network and an Internet network, and a browser on the flow-rate measurement recipient electronic device is used to retrieve an interface on the server computer system. Additionally, a plurality of email addresses are held in a system for measuring the characteristic of the flow-rate database and fewer than all the email addresses are individually selectable from the computer system, the email message being transmitted to at least one flow-rate measurement recipient email having at least one selected email address. In some instances at least one of the system for measuring the characteristic of the flow-rate is connectable to the server computer system over the Internet, and a browser on the flow-rate measurement recipient electronic device is used to retrieve an interface on the server computer system. Where the system is in communication with, for example, a healthcare provider a plurality of user names are held in the system for detecting expiry flow-rates database and fewer than all the user names are individually selectable from the computer system, the message being transmitted to at least one flow-rate measurement recipient user name via an API. The flow-rate measurement recipient electronic device can also be connectable to the server computer system over the Internet, and a browser on the flow-rate measurement recipient electronic device is used to retrieve an interface on the server computer system. The flow-rate measurement recipient electronic device may also be connected to the server computer system over a cellular phone network, such as where the electronic device is a mobile device. Additionally, the system can include an interface on the server computer system, the interface being retrievable by an application on the flow-rate measurement recipient mobile device. In some cases, the SMS flow-rate measurement is received by a message application on the flow-rate measurement recipient mobile device. Where a plurality of SMS flow-rate measurements are received for the flow-rate measurement, each by a respective message application on a respective flow-rate measurement recipient mobile device. At least one SMS engine can be configured to receive an SMS response over the cellular phone SMS network from the flow-rate measurement recipient mobile device and stores an SMS response on the server computer system. Additionally, a flow-rate measurement recipient phone number ID is transmitted with the SMS flow-rate measurement to the SMS engine and is used by the server computer system to associate the SMS flow-rate measurement with the SMS response. Moreover, the server computer system can be connectable over a cellular phone network to receive a response from the flow-rate measurement recipient mobile device. The SMS flow-rate measurement can also include a URL that is selectable at the flow-rate measurement recipient mobile device to respond from the flow-rate measurement recipient mobile device to the server computer system, the server computer system utilizing the URL to associate the response with

the SMS flow-rate measurement. The communication system can further comprise in at least some configurations: a downloadable application residing on the flow-rate measurement recipient mobile device, the downloadable application transmitting the response and a flow-rate measurement recipient phone number ID over the cellular phone network to the server computer system, the server computer system utilizing the flow-rate measurement recipient phone number ID to associate the response with the SMS flow-rate measurement. In other configurations, the system can comprise: a transmissions module that transmits the flow-rate measurement over a network other than the cellular phone SMS network to a flow-rate measurement recipient user computer system, in parallel with the flow-rate measurement that is sent over the cellular phone SMS network, and/or a downloadable application residing on the flow-rate measurement recipient host computer, the downloadable application transmitting a response and a flow-rate measurement recipient phone number ID over the cellular phone network to the server computer system, the server computer system utilizing the flow-rate measurement recipient phone number ID to associate the response with the SMS flow-rate measurement.

[0082] Other aspects include one or more networked apparatuses. The networked apparatuses comprise: a memory; a processor; a communicator; a display; and an apparatus for detecting the expiry flow-rates as described herein.

[0083] In some aspects the communication systems comprise: an apparatus for detecting the expiry flow-rates as described herein; a server computer system; a measurement module on the server computer system for permitting the transmission of a flow-rate measurement from the system for measuring the characteristic of the flow-rate over a network; at least one of an API engine connected to at least one of the system for measuring the characteristic of the flow-rate to create a message about the flow-rate measurement and transmit the message over an API integrated network to a recipient having a predetermined recipient user name, an SMS engine connected to at least one of the system for measuring the characteristic of the flow-rate to create an SMS message about the flow-rate measurement and transmit the SMS message over a network to a recipient device having a predetermined flow-rate measurement recipient telephone number, and an email engine connected to at least one of the system for measuring the characteristic of the flow-rate to create an email message about the flow-rate measurement and transmit the email message over the network to a flow-rate measurement recipient email having a predetermined flow-rate measurement recipient email address. A storing module can also be provided on the server computer system for storing the flow-rate measurement on the system for measuring the characteristic of the flow-rate server database. Moreover, at least one of the system for measuring the characteristic of the flow-rate is connectable to the server computer system

over at least one of a mobile phone network and an Internet network, and a browser on the flow-rate measurement recipient electronic device is used to retrieve an interface on the server computer system. Additionally, a plurality of email addresses are held in a system for measuring the characteristic of the flow-rate database and fewer than all the email addresses are individually selectable from the computer system, the email message being transmitted to at least one flow-rate measurement recipient email having at least one selected email address. In some instances at least one of the system for measuring the characteristic of the flow-rate is connectable to the server computer system over the Internet, and a browser on the flow-rate measurement recipient electronic device is used to retrieve an interface on the server computer system. Where the system is in communication with, for example, a healthcare provider a plurality of user names are held in the system for detecting expiry flow-rates database and fewer than all the user names are individually selectable from the computer system, the message being transmitted to at least one flow-rate measurement recipient user name via an API. The flow-rate measurement recipient electronic device can also be connectable to the server computer system over the Internet, and a browser on the flow-rate measurement recipient electronic device is used to retrieve an interface on the server computer system. The flow-rate measurement recipient electronic device may also be connected to the server computer system over a cellular phone network, such as where the electronic device is a mobile device. Additionally, the system can include an interface on the server computer system, the interface being retrievable by an application on the flow-rate measurement recipient mobile device. In some cases, the SMS flow-rate measurement is received by a message application on the flow-rate measurement recipient mobile device. Where a plurality of SMS flow-rate measurements are received for the flow-rate measurement, each by a respective message application on a respective flow-rate measurement recipient mobile device. At least one SMS engine can be configured to receive an SMS response over the cellular phone SMS network from the flow-rate measurement recipient mobile device and stores an SMS response on the server computer system. Additionally, a flow-rate measurement recipient phone number ID is transmitted with the SMS flow-rate measurement to the SMS engine and is used by the server computer system to associate the SMS flow-rate measurement with the SMS response. Moreover, the server computer system can be connectable over a cellular phone network to receive a response from the flow-rate measurement recipient mobile device. The SMS flow-rate measurement can also include a URL that is selectable at the flow-rate measurement recipient mobile device to respond from the flow-rate measurement recipient mobile device to the server computer system, the server computer system utilizing the URL to associate the response with the SMS flow-rate measurement. The communication system can further comprise in at least

some configurations: a downloadable application residing on the flow-rate measurement recipient mobile device, the downloadable application transmitting the response and a flow-rate measurement recipient phone number ID over the cellular phone network to the server computer system, the server computer system utilizing the flow-rate measurement recipient phone number ID to associate the response with the SMS flow-rate measurement. In other configurations, the system can comprise: a transmissions module that transmits the flow-rate measurement over a network other than the cellular phone SMS network to a flow-rate measurement recipient user computer system, in parallel with the flow-rate measurement that is sent over the cellular phone SMS network, and/or a downloadable application residing on the flow-rate measurement recipient host computer, the downloadable application transmitting a response and a flow-rate measurement recipient phone number ID over the cellular phone network to the server computer system, the server computer system utilizing the flow-rate measurement recipient phone number ID to associate the response with the SMS flow-rate measurement.

VI. KITS

[0001] Bundling all devices, tools, components, materials, and accessories needed to use a device to test expiry flow-rate into a kit may enhance the usability and convenience of the devices. Suitable kits, can also include, for example, an electronic expiry flow measurement device, filters, wind screens, electronic device connector or adapter, mouth pieces, filters, power supplies, software programs (apps) configurable to collect information from the devices and/or provide information to a central database or system, alcohol swabs, and the like.

VII. SYSTEMS CONFIGURABLE TO OPERATE IN COMPUTING AND NETWORK ENVIRONMENTS TO ACHIEVE A DESIRED TECHNICAL EFFECT OR TRANSFORMATION

[0084] **FIG. 9** illustrates the interrelationship between components of a suitable system according to the disclosure. Environmental data ***910*** can be obtained from a sensor associated with an electronic device, such as those disclosed above in reference to **FIG. 2,** or can be acquired from a remote source such as a website that provides environmental data based on a location for the electronic device, such as that determined by GPS. Patient flow-rate data ***912*** is also provided by the flow-rate detector. Additionally, user input ***914*** can be obtained, if desired, as well as electronic device data ***916***, such as location, altitude, temperature, etc. The information is then processed, using a data processing system ***920*** which is located either on a network or on the electronic device, to generate an asthma output ***930***. The information can then be transmitted back to one or more remote location (such as a physician's office or other users). Additionally, input can be active or passive input. Active input occurs when the user enters information

concerning, for example, current conditions, medications, etc. Passive input occurs when the system logs that the user took an action, such as using the device.

[0085] The system can also receive data from a secondary measurement device, such as data from a heart rate monitor, a heart sound sensor, and a pulse oximetry device (which senses saturation of oxygen in arterial blood flow). Additionally, the system can also receive behavioral data, such as one or more of data concerning compliance with a medication protocol prescribed by a healthcare provider, compliance with a testing and/or monitoring protocol, compliance with system generated recommendations, compliance with health care provider recommendations, etc.

[0086] The system can analyze the environmental information for a particular patient based on one or more of the following: the patient's prior history under similar conditions, the real time results of other system users having a similar profile or a similar history, and the historical results of other system users having a similar profile or a similar history under similar conditions previously experienced.

[0087] In at least some configurations, the system dynamically analyzes environmental information based on one or more of the following: the patient's prior history under similar conditions, the real time results of other system users having a similar profile or a similar history, and the historical results of other system users having a similar profile or a similar history under similar conditions previously experienced. Dynamic analysis or processing can be impacted by the passage of time and/or the presence or absence of a power source. In at least some configurations, data is refreshed and/or analyzed at a time interval determined by the system or selected by the user. In some configurations, analysis and processing may occur at a greater rate, e.g. where a detection of travel is sensed or at a smaller rate, where there is no significant movement detected.

[0088] The system is configurable to send a patient an alert to the potential of a respiratory episode, suggestions for preparing for a change in environment, historical information about reactions to current or predicted future conditions in a specific geography, and so on. Additionally, the system can provide additional data, alerts, or reports to the user's healthcare provider to enable to healthcare provider to monitor conditions and propose changes in treatment protocol, if desired. In some configurations, the system is configurable to alert emergency services to the location of the user and the nature of the respiratory event.

[0089] In some configurations the environmental data can be continuously received during operation of an onboard environmental sensor. Environmental sensor data can, for example, be collected by sensors on or near the body of the patient which may include a humidity sensor, a temperature sensor, an altitude sensor, a GPS sensor, and an airborne particle sensor, or other

suitable sensor. The sensor can be associated with the device or with an electronic device. In some instances, environmental data can be pre-processed to generate an indication of environmental asthma triggers. The information can also be compared to historical data for that patient. In other configurations, the environmental information is available from an external source such as www.pollen.com. In some configurations, altitude is determinable based on the GPS location. Other environmental data can be reviewed including, for example, air pollution data, airborne particulate matter date, airborne irritant data, ambient temperature, temperature changes, and humidity data.

[0090] Other aspects include one or more networked devices. The networked devices comprise: a memory; a processor; a communicator; a display; and an apparatus for detecting expiry flow-rate as discussed herein.

[0091] Communication systems are configurable to have at least one of an API engine connected to at least one of the electronic device to create a message about respiratory episode data and transmit the message over an API integrated network to a recipient having a predetermined recipient user name, an SMS engine connected to the system to create an SMS message about the respiratory episode data and transmit the SMS message over a network to a recipient device having a predetermined respiratory episode data recipient telephone number, and an email engine connected to the system to create an email message about the respiratory episode data and transmit the email message over the network to a recipient email.

[0092] A storing module can also be provided on the server computer system for storing the respiratory episode data on the system for measuring the characteristic of the flow-rate server database. Moreover, the system is connectable to a server computer system over at least one of a mobile phone network and an Internet network, and a browser on the recipient electronic device which can be used to retrieve an interface on the server computer system. Additionally, a plurality of email addresses are held in a system database and fewer than all the email addresses are individually selectable from the computer system, the email message being transmitted to at least one data recipient email having at least one selected email address. In some instances the system is connectable to the server computer system over the Internet, and a browser on the electronic device to retrieve an interface on the server computer system. A plurality of user names are held in the system database and fewer than all the user names are individually selectable from the computer system, enabling a message to be transmitted to at least one respiratory episode data recipient user name via an API.

[0093] Other aspects include one or more networked apparatuses. The networked apparatuses comprise: a memory; a processor; a communicator; a display; and an apparatus for receiving user input rates as described herein.

VIII. EXAMPLES

[0002] Example 1: A first user uses a peak-flow rate device which obtains flow-rate data from that user and stores the information on the handheld device. Additionally, the user can also enter additional data which may be relevant or desirable to record at the time of taking the peak-flow measurement into a program on the handheld device, including, for example, how the user is feeling, whether the user is stressed (and the level of stress), whether the user has a headache, etc. This input of additional data can, for example, be achieved by providing for periodic question(s) that display at various times throughout the day or via a more comprehensive patient data input and/or query process. Information can also include geographic positioning data, such as a GPS tag, date and time information, as well as ambient conditions data. Ambient condition data includes, but is not limited to, weather conditions, temperature, pollution, pollen count, air quality, etc. The status of the first user is uploaded to a server via a network. One or more of a second user or subsequent user, who has not necessarily provided peak-flow data, reports that there has been a condition change and the one or more of a second or subsequent user report (or reports) is uploaded to a server via a network. An assessment is then made that both the first and second users are located within a geographic area set by the system for that area (e.g., 0.5 mile radius, 1 mile radius, 1.5 mile radius, 2 mile radius, 2.5 mile radius, 3.0 mile radius, 3.5 mile radius, 4.0 mile radius,. 4.5 mile radius, 5.0 mile radius, etc.). In at least some configurations, another assessment can be made (either concurrently or sequentially to the geographic assessment) to determine whether a pattern exists. Once a geographic link is established between the first and one or more of a second or subsequent user, or users, a comparison of user profile data and/or trending data is performed to identify other users having similar profiles and/or trending data positioned in the same geographic region(s). Additionally, an assessment can be made of a historical response and/or historical trends by users to similar conditions and/or similar geographies. An alert is then generated advising those users, as well as any other users on the network, to be aware that conditions exist that may cause them to have an episode. The alert can also be configured to provide specific suggestions for action by the users. The alert can be sent to the users via email, text message, pop-up, or any other mechanism selected by the user.

[0003] Example 2: A first user reports to the handheld device (e.g., by entering text, responding to periodic inquiries, or interfacing with a device that takes a biological measurement), that there has been a condition change, e.g., a condition change to high risk. The report includes geographic

positioning data, such as a GPS tag. The status of the first user is uploaded to a server via a network. A second user reports that there has been a condition change and the second user report is uploaded to a server via a network. An assessment is then made that both the first and second users are located within a geographic area set by the system for that area (e.g.,0.5 mile radius, 1 mile radius, 1.5 mile radius, 2 mile radius, 2.5 mile radius, 3.0 mile radius, 3.5 mile radius, 4.0 mile radius,. 4.5 mile radius, 5.0 mile radius, etc.). Once a geographic link is established between the first and second user a comparison of user profile data is performed to identify other users having similar profiles positioned in the same geographic region. Additionally, an assessment can be made of a historical response by users to similar conditions. An alert is then generated advising the users to be aware that conditions exist that may cause them to have an episode. The alert can also be configured to provide specific suggestions for action by the users. The alert can be sent to the users via email, text message, pop-up, or any other mechanism selected by the user.

[0004] Example 3: A first user reports to the handheld device (e.g., by entering text and/or interfacing with a device that takes a biological measurement and/or responding to periodic queries), that there has been a condition change, e.g., a condition change to high risk. The report includes geographic positioning data, such as a GPS tag. The status of the first user is uploaded to a server via a network. A second user reports that there has been a condition change and the second user report is uploaded to a server via a network. An assessment is made that both users are located within a geographic area set by the system (e.g.,0.5 mile radius, 1 mile radius, 1.5 mile radius, 2 mile radius, 2.5 mile radius, etc.). The system determines that both users are located within a geographic area that is a forest. An assessment is made of current environmental triggers in the geographic area. An assessment is made of users in the network who are, based on GPS positioning, approaching the area. An alert is then generated advising the users to be aware that conditions exist that may cause them to have an episode in the area they are approaching. The alert can also be configured to provide specific suggestions for action by the users or can be in the form of a personalized forecast for the user. The alert can be sent to the users via email, text message, pop-up, or any other mechanism selected by the user.

[0005] In some configurations, the alert can compare conditions to a prior incident experienced by the user to give additional context to the user.

[0006] Example 4: A first user's handheld electronic device sends GPS location coordinates to the network via a communication network. Based on the location, data is retrieved about environmental conditions including, but not limited to, local weather, air quality, and pollen count. A report of predicted probability of experiencing a respiratory episode is developed and provided via the communication network to the user. The report can be based on the user's

history, the user's profile, the probability of experiencing a problem based on other user's histories, or combinations thereof.

[0007] At the time of detecting a new location, the system can query the user to determine whether the change is temporary (e.g., a vacation) or permanent (e.g., a relocation). Additionally, for temporary changes, the system can query the length of time and provide information concerning environmental factors impacting respiratory function based on known or historical data.

[0008] **Example 5**: A first user's handheld electronic device sends GPS location coordinates to the network via a communication network. The system keeps track of the user's history, including geographic location. When the user relocates, permanently or semi-permanently, to a new geographic area, the system sends a medication reminder to the handheld electronic device over the network. If a user relocates to a geographic location where a change in medication might be appropriate a notice can be delivered that identifies current medication and its optimal application, change in environmental factors, and a suggestion that the user visit his or her healthcare practitioner to ensure no change in medication or treatment protocol is appropriate due to the change in circumstances.

[0009] **Example 6**: A first user provides information associated with the user of a rescue inhaler or other interventional procedures into a program accessible via an electronic device. The device associates a data and time stamp along with GPS data and environmental information from the device or from third party sources. The information is analyzed to identify potential triggers for the patient. When the system detects that the user is in conditions approaching those associated with an earlier incident, an alert is generated to facilitate the patient's ability to take evasive behavioral steps to avoid or minimize the likelihood of a respiratory episode.

[0010] **Example 7**: GPS data for a user indicates that the user is traveling at a rate of 60 MPH and is approaching an area with a high pollen count. The system is adaptable to consider data on the rate of change of location with a projected destination (or a destination provided by a user input) and provides a dynamic projection to the user of the likelihood of experiencing a respiratory episode. Information can be analyzed and refreshed at a rate or frequency determined from the rate of change of location, elevation, or mere passage of time.

[0094] While preferred embodiments of the present invention have been shown and described herein, it will be obvious to those skilled in the art that such embodiments are provided by way of example only. Numerous variations, changes, and substitutions will now occur to those skilled in the art without departing from the invention. It should be understothat various alternatives to the embodiments of the invention described herein may be employed in practicing the invention. It is intended that the following claims define the scope of the invention and that methods and structures within the scope of these claims and their equivalents be covered thereby.

CLAIMS

WHAT IS CLAIMED IS:

1. A respiratory device comprising:
    a. a housing adaptable and configurable to communicate with an electronic device;
    b. a mouth piece having a proximal end and a distal end configurable to engage a mouth of a patient and transmit an air flow;
    c. one or more diaphragm sensors configured to detect a breath vibration from the air flow in the mouth piece; and
    d. a processor adaptable and configurable to analyze the breath vibration detected by the one or more diaphragm sensors.
2. The respiratory device of claim **1** wherein the respiratory device is adapted and configured to measure one or more of peak expiratory flow-rate, peak inspiratory flow-rate, mean flow-rates, volumes, flow over time, Forced Vital Capacity, percentage of flow at certain time intervals, and slow and forced volumes at certain time intervals, the device.
3. The respiratory device of claim **1** wherein the respiratory device is in communication with a display adapted and configured to display a result of an analysis of the breath vibration.
4. The respiratory device of claim **1** further comprising: a windscreen positionable relative to the mouth piece to reduce a secondary air flow from entering the mouth piece.
5. The respiratory device of claim **1** in communication with an environmental data source.
6. The respiratory device of claim **5** wherein the environmental data source is an environmental sensor associated with one or more of the respiratory device and the electronic device.
7. The respiratory device of claim **1** wherein the processor is further adaptable and configurable to correlate breath vibration data and environmental data.
8. The respiratory device of claim **1** wherein the processor generates an asthma output.
9. The respiratory device of claim **1** wherein the respiratory device is in communication with an audible indicator.

10. A system comprising:
    a. a measurement probe, the probe comprising;
        i. one or more diaphragm sensors adaptable and configurable to detect a breath vibration;
        ii. a microphone;
        iii. a mouth piece positioned proximally to the microphone; and
        iv. a port,
    b. a computing system adaptable to engage the port and having a computer executable instruction that, when executed by a processor, performs a vibration analysis of the diaphragm vibration and display the result.
11. The system of claim **10** wherein the system is adapted and configured to measure one or more of peak expiratory flow-rate, peak inspiratory flow-rate, mean flow-rates, volumes, flow over time, Forced Vital Capacity, percentage of flow at certain time intervals, and slow and forced volumes at certain time intervals, the device.
12. The system of claim **10** wherein the respiratory device is in communication with a display adapted and configured to display a result of an analysis of the breath vibration.
13. The system of claim **10** further comprising: a windscreen positionable relative to the mouth piece to reduce a secondary air flow from entering the mouth piece.
14. The system of claim **10** in communication with an environmental data source.
15. The system of claim **14** wherein the environmental data source is an environmental sensor associated with one or more of the respiratory device and the electronic device.
16. The system of claim **10** wherein the processor is further adaptable and configurable to correlate breath vibration data and environmental data.
17. The system of claim **10** wherein the processor generates an asthma output.
18. The respiratory device of claim **10** wherein the respiratory device is in communication with an audible indicator.

19. A system comprising:
    a. an electronic device having a microphone adaptable and configurable to be in communication with a communication network;
    b. a housing attachable to the electronic device, the housing further comprising:
        i. a mouth piece aligned with a microphone of the electronic device; and
        ii. an optional windscreen resided in a mouth piece tube;
    c. a computer executable instruction that, when executed by a processor performs operations including vibration analysis of the microphone diaphragm of the probe and further adaptable to instruct that a result of the vibration analysis be displayed on a display.
20. The system of claim **19** wherein the system is adapted and configured to measure one or more of peak expiratory flow-rate, peak inspiratory flow-rate, mean flow-rates, volumes, flow over time, Forced Vital Capacity, percentage of flow at certain time intervals, and slow and forced volumes at certain time intervals, the device.
21. The system of claim **19** further comprising: a display adapted and configured to display a result of the vibration analysis.
22. The system of claim **19** further comprising: a windscreen positionable relative to the mouth piece to reduce a secondary air flow from entering the mouth piece.
23. The system of claim **19** in communication with an environmental data source.
24. The system of claim **23** wherein the environmental data source is an environmental sensor associated with one or more of the respiratory device and the electronic device.
25. The system of claim **19** wherein the processor is further adaptable and configurable to correlate breath vibration data and environmental data.
26. The system of claim **19** wherein the processor generates an asthma output.
27. The system of claim **19** wherein the respiratory device is in communication with an audible indicator.
28. The systems of claims **10** and **19** wherein said computing system is selected from the group comprising a computer, a mobile phone, a smart phone, a handheld device.

29. A non-transitory computer readable medium storing instructions that, when executed by a computing device, causes the computing device to perform a method, the method comprising:

receiving one or more of each of a peak expiratory flow-rate, a peak inspiratory flow-rate, and a spirometry measurement from a respiratory device having a housing adaptable and configurable to communicate with an electronic device to receive a user respiratory input;

at least one or more of analyzing, monitoring, evaluating, and responding to the received one or more of the peak expiratory flow-rate, the peak inspiratory flow-rate, and the spirometry measurement.

30. The non-transitory computer readable medium of claim **29** further comprising the step of communicating with a remote server.
31. The non-transitory computer readable medium of claim **29** further comprising the step of one or more of recording data and transmitting data.
32. The non-transitory computer readable medium of claim **29** further comprising the step of receiving data from a secondary measurement device.
33. The non-transitory computer readable medium of claim **32** wherein the secondary measurement device is one or more of a heart rate monitor and a pulse oximetry device.
34. The non-transitory computer readable medium of claim **29** further comprising the step of determining a GPS location for the measurement.
35. The non-transitory computer readable medium of claim **29** further comprising the step of acquiring environmental data.
36. The non-transitory computer readable medium of claim **35** wherein the environmental data is one or more of each of pollen count, air pollution data, ambient temperature, temperature changes, and humidity.
37. The non-transitory computer readable medium of claim **29** further comprising the step of acquiring behavioral data.
38. The non-transitory computer readable medium of claim **37** wherein the behavioral data includes one or more of each of data for compliance with medication protocol, compliance with testing protocol, compliance with monitoring protocol, compliance with system generated recommendations, compliance with health care provider recommendations.

39. A computing device comprising:

a processor configured to:

receive one or more of each of a peak expiratory flow-rate, a peak inspiratory flow-rate, and a spirometry measurement from respiratory device having a housing adaptable and configurable to communicate with an electronic device to receive a user respiratory input;

at least one or more of analyze, monitor, evaluate, and respond to the received one or more of the peak expiratory flow-rate, the peak inspiratory flow-rate, and the spirometry measurement.

40. The computing device of claim **39** wherein the processor is configured to communicate with a remote server.
41. The computing device of claim **39** wherein the processor is configured to one or more of record data and transmit data.
42. The computing device of claim **39** wherein the processor is configured to receive data from a secondary measurement device.
43. The computing device of claim **42** wherein the secondary measurement device is one or more of a heart rate monitor and a pulse oximetry device.
44. The computing device of claim **39** wherein the processor is configured to determine a GPS location for the measurement.
45. The computing device of claim **39** wherein the processor is configured to acquire environmental data.
46. The computing device of claim **45** wherein the environmental data is one or more of each of pollen count, air pollution data, ambient temperature, temperature changes, and humidity.
47. The computing device of claim **39** wherein the processor is configured to acquire behavioral data.
48. The computing device of claim **47** wherein the behavioral data includes one or more of each of data for compliance with medication protocol, compliance with testing protocol, compliance with monitoring protocol, compliance with system generated recommendations, compliance with health care provider recommendations.
49. A method comprising:

receiving one or more of each of a peak expiratory flow-rate, a peak inspiratory flow-rate, and a spirometry measurement from a respiratory device having a housing adaptable and configurable to communicate with an electronic device to receive a user respiratory input;

receiving an environmental data input;

at least one or more of analyzing, monitoring, evaluating, and responding to the received one or more of the peak expiratory flow-rate, the peak inspiratory flow-rate, and the spirometry measurement.

50. The method of claim **49** further comprising the step of communicating with a remote server.
51. The method of claim **49** further comprising the step of one or more of recording data and transmitting data.
52. The method of claim **49** further comprising the step of receiving data from a secondary measurement device.
53. The method of claim **52** wherein the secondary measurement device is one or more of a heart rate monitor and a pulse oximetry device.
54. The method of claim **49** further comprising the step of determining a GPS location for the measurement.
55. The method of claim **49** further comprising the step of acquiring environmental data.
56. The method of claim **55** wherein the environmental data is one or more of each of pollen count, air pollution data, ambient temperature, temperature changes, and humidity.
57. The method of claim **49** further comprising the step of acquiring behavioral data.
58. The method of claim **57** wherein the behavioral data includes one or more of each of data for compliance with medication protocol, compliance with testing protocol, compliance with monitoring protocol, compliance with system generated recommendations, compliance with health care provider recommendations.
59. A method comprising:

transmitting, via a user computing device one or more of each of a peak expiratory flow-rate, a peak inspiratory flow-rate, and a spirometry measurement from a respiratory device having a housing adaptable and configurable to communicate with an electronic device to receive a user respiratory input to a web-server over a network;

obtaining an environmental data input;

at least one or more of analyzing, monitoring, evaluating, and responding to the received one or more of the peak expiratory flow-rate, the peak inspiratory flow-rate, and the spirometry measurement.

60. The method of claim **59** further comprising the step of communicating with a remote server.
61. The method of claim **59** further comprising the step of one or more of recording data and transmitting data.
62. The method of claim **59** further comprising the step of receiving data from a secondary measurement device.
63. The method of claim **62** wherein the secondary measurement device is one or more of a heart rate monitor and a pulse oximetry device.
64. The method of claim **59** further comprising the step of determining a GPS location for the measurement.
65. The method of claim **59** further comprising the step of acquiring environmental data.
66. The method of claim **65** wherein the environmental data is one or more of each of pollen count, air pollution data, ambient temperature, temperature changes, and humidity.
67. The method of claim **59** further comprising the step of acquiring behavioral data.
68. The method of claim **67** wherein the behavioral data includes one or more of each of data for compliance with medication protocol, compliance with testing protocol, compliance with monitoring protocol, compliance with system generated recommendations, compliance with health care provider recommendations.

69. A system comprising:
    a. an electronic device configurable to be in communication with a communication network;
    b. a computer executable instruction that, when executed by a processor determines a likelihood of a respiratory event based on one or more of each of historical patient data, patient data input, current environmental data, current data for other patients in a similar geographic location and historical data for other patients in a similar geographic location.
70. The system of claim **69** wherein the processor is configured to communicate with a remote server.
71. The system of claim **69** wherein the processor is configured to one or more of record data and transmit data.

72. The system of claim **69** wherein the processor is configured to receive data from a secondary measurement device.
73. The system of claim **72** wherein the secondary measurement device is one or more of a heart rate monitor and a pulse oximetry device.
74. The system of claim **69** wherein the processor is configured to determine a GPS location for the measurement.
75. The system of claim **69** wherein the processor is configured to acquire environmental data.
76. The system of claim **75** wherein the environmental data is one or more of each of pollen count, air pollution data, ambient temperature, temperature changes, and humidity.
77. The system of claim **69** wherein the processor is configured to acquire behavioral data.
78. The system of claim **77** wherein the behavioral data includes one or more of each of data for compliance with medication protocol, compliance with testing protocol, compliance with monitoring protocol, compliance with system generated recommendations, compliance with health care provider recommendations.

79. A non-transitory computer readable medium storing instructions that, when executed by a computing device, causes the computing device to perform a method, the method comprising:

receiving one or more of a GPS location and a condition indication for each of one or more patients comprising a patient group;

at least one or more of analyzing, monitoring, evaluating, and providing a prediction for a second patient based on the GPS location of the second patient and at least one or more of the GPS location and condition indication for the one or more patients comprising the patient group.

80. The non-transitory computer readable medium of claim **78** further comprising the step of communicating with a remote server.
81. The non-transitory computer readable medium of claim **78** further comprising the step of one or more of recording data and transmitting data.
82. The non-transitory computer readable medium of claim **78** further comprising the step of receiving data from a secondary measurement device.
83. The non-transitory computer readable medium of claim **81** wherein the secondary measurement device is one or more of a heart rate monitor and a pulse oximetry device.

84. The non-transitory computer readable medium of claim **78** further comprising the step of determining a GPS location for the measurement.
85. The non-transitory computer readable medium of claim **78** further comprising the step of acquiring environmental data.
86. The non-transitory computer readable medium of claim **84** wherein the environmental data is one or more of each of pollen count, air pollution data, ambient temperature, temperature changes, and humidity.
87. The non-transitory computer readable medium of claim **78** further comprising the step of acquiring behavioral data.
88. The non-transitory computer readable medium of claim **86** wherein the behavioral data includes one or more of each of data for compliance with medication protocol, compliance with testing protocol, compliance with monitoring protocol, compliance with system generated recommendations, compliance with health care provider recommendations.

89. A computing device comprising:

a processor configured to:

receive one or more of GPS location and condition indication for each of one or more patients comprising a patient group;

at least one or more of analyze, monitor, evaluate, and provide a prediction for a second patient based on the GPS location and at least one or more of the GPS location and condition indication for the one or more patients comprising the patient group.

90. The computing device of claim **88** wherein the processor is configured to communicate with a remote server.
91. The computing device of claim **88** wherein the processor is configured to one or more of record data and transmit data.
92. The computing device of claim **88** wherein the processor is configured to receive data from a secondary measurement device.
93. The computing device of claim **91** wherein the secondary measurement device is one or more of a heart rate monitor and a pulse oximetry device.
94. The computing device of claim **88** wherein the processor is configured to determine a GPS location for the measurement.

95. The computing device of claim **88** wherein the processor is configured to acquire environmental data.
96. The computing device of claim **94** wherein the environmental data is one or more of each of pollen count, air pollution data, ambient temperature, temperature changes, and humidity.
97. The computing device of claim **88** wherein the processor is configured to acquire behavioral data.
98. The computing device of claim **96** wherein the behavioral data includes one or more of each of data for compliance with medication protocol, compliance with testing protocol, compliance with monitoring protocol, compliance with system generated recommendations, compliance with health care provider recommendations.

99. A method comprising:

receiving one or more of a GPS location and a condition indication for each of one or more patients comprising a patient group;

at least one or more of analyzing, monitoring, evaluating, and providing a prediction for a second patient based on the GPS location of the second patient and at least one or more of the GPS location and the condition indication for the one or more patients comprising the patient group.

100. The method of claim **98** further comprising the step of communicating with a remote server.
101. The method of claim **98** further comprising the step of one or more of recording data and transmitting data.
102. The method of claim **98** further comprising the step of receiving data from a secondary measurement device.
103. The method of claim **102** wherein the secondary measurement device is one or more of a heart rate monitor and a pulse oximetry device.
104. The method of claim **98** further comprising the step of determining a GPS location for the measurement.
105. The method of claim **98** further comprising the step of acquiring environmental data.

106. The method of claim **104** wherein the environmental data is one or more of each of pollen count, air pollution data, ambient temperature, temperature changes, and humidity.

107. The method of claim **98** further comprising the step of acquiring behavioral data.

108. The method of claim **106** wherein the behavioral data includes one or more of each of data for compliance with medication protocol, compliance with testing protocol, compliance with monitoring protocol, compliance with system generated recommendations, compliance with health care provider recommendations.

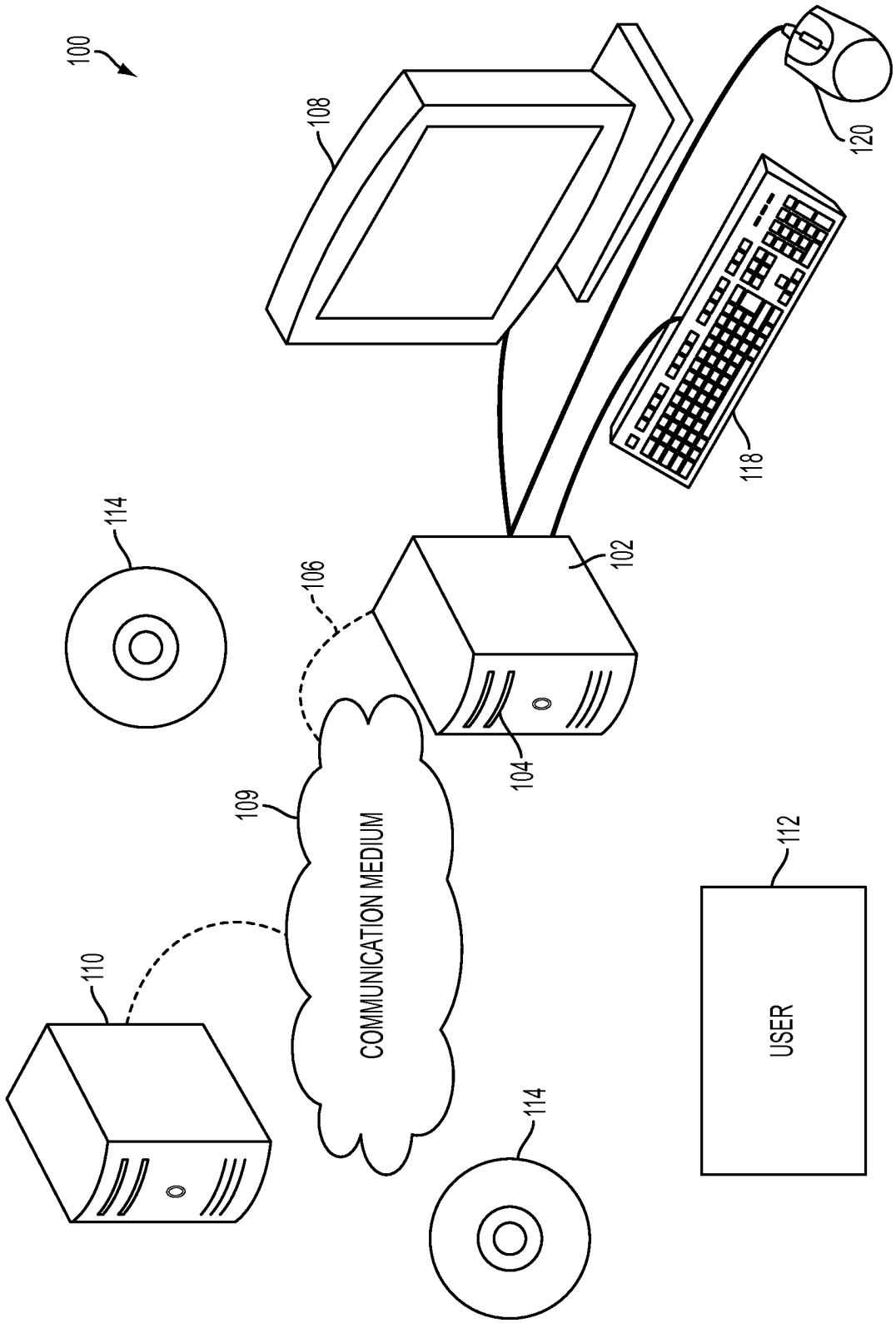

100
108
120
118
114
106
102
104
109
COMMUNICATION MEDIUM
110
114
112
USER

FIG. 1A

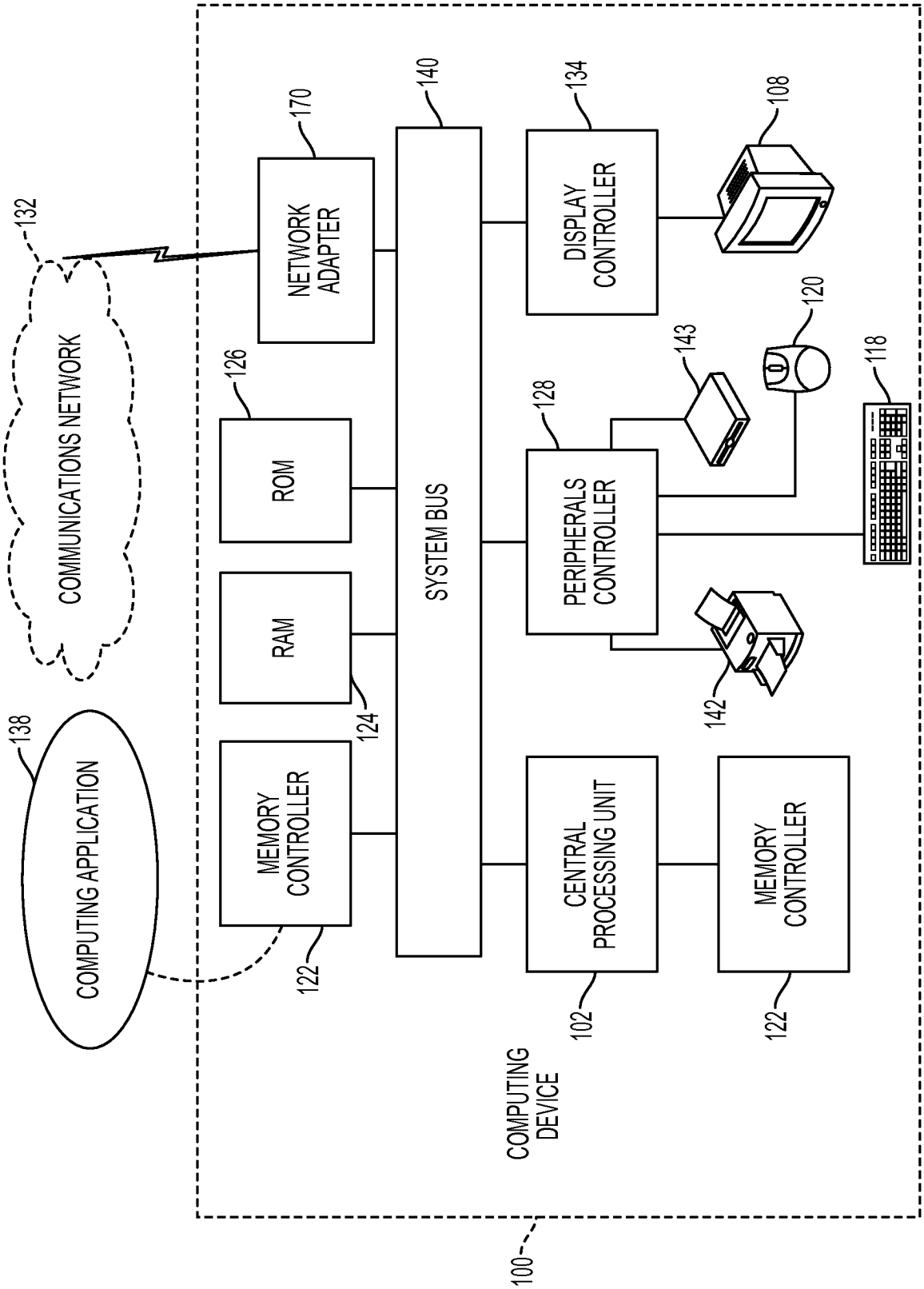

COMPUTING DEVICE
100
COMMUNICATIONS NETWORK
132
COMPUTING APPLICATION
138
NETWORK ADAPTER
170
SYSTEM BUS
140
DISPLAY CONTROLLER
134
108
ROM
126
RAM
124
MEMORY CONTROLLER
122
PERIPHERALS CONTROLLER
128
143
120
118
142
CENTRAL PROCESSING UNIT
102
MEMORY CONTROLLER
122

FIG. 1B

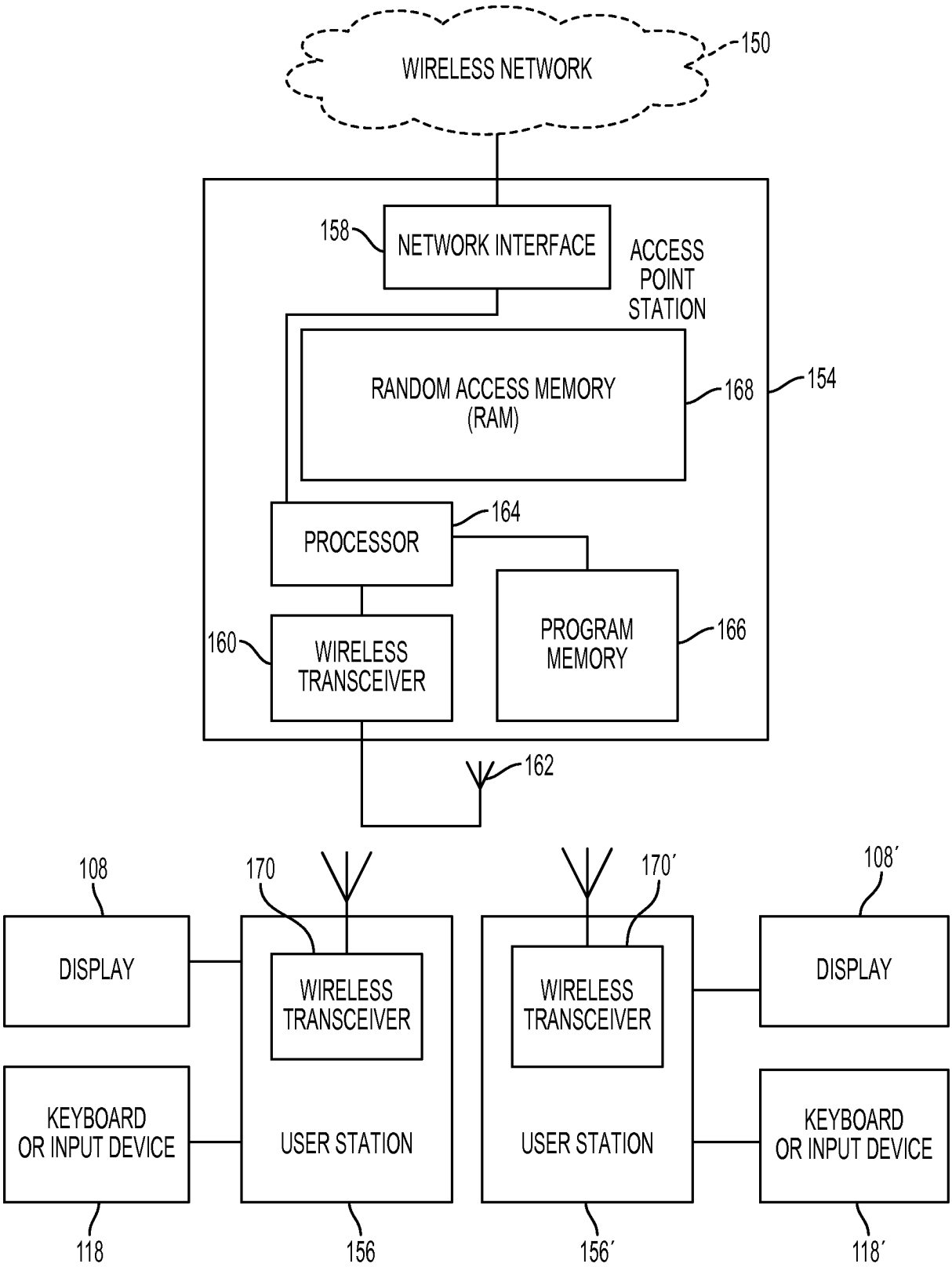

WIRELESS NETWORK
150
158
NETWORK INTERFACE
ACCESS POINT STATION
RANDOM ACCESS MEMORY (RAM)
168
154
PROCESSOR
164
160
WIRELESS TRANSCEIVER
PROGRAM MEMORY
166
162
108
DISPLAY
KEYBOARD OR INPUT DEVICE
118
170
WIRELESS TRANSCEIVER
USER STATION
156
170´
WIRELESS TRANSCEIVER
USER STATION
156´
108´
DISPLAY
KEYBOARD OR INPUT DEVICE
118´

FIG. 1C

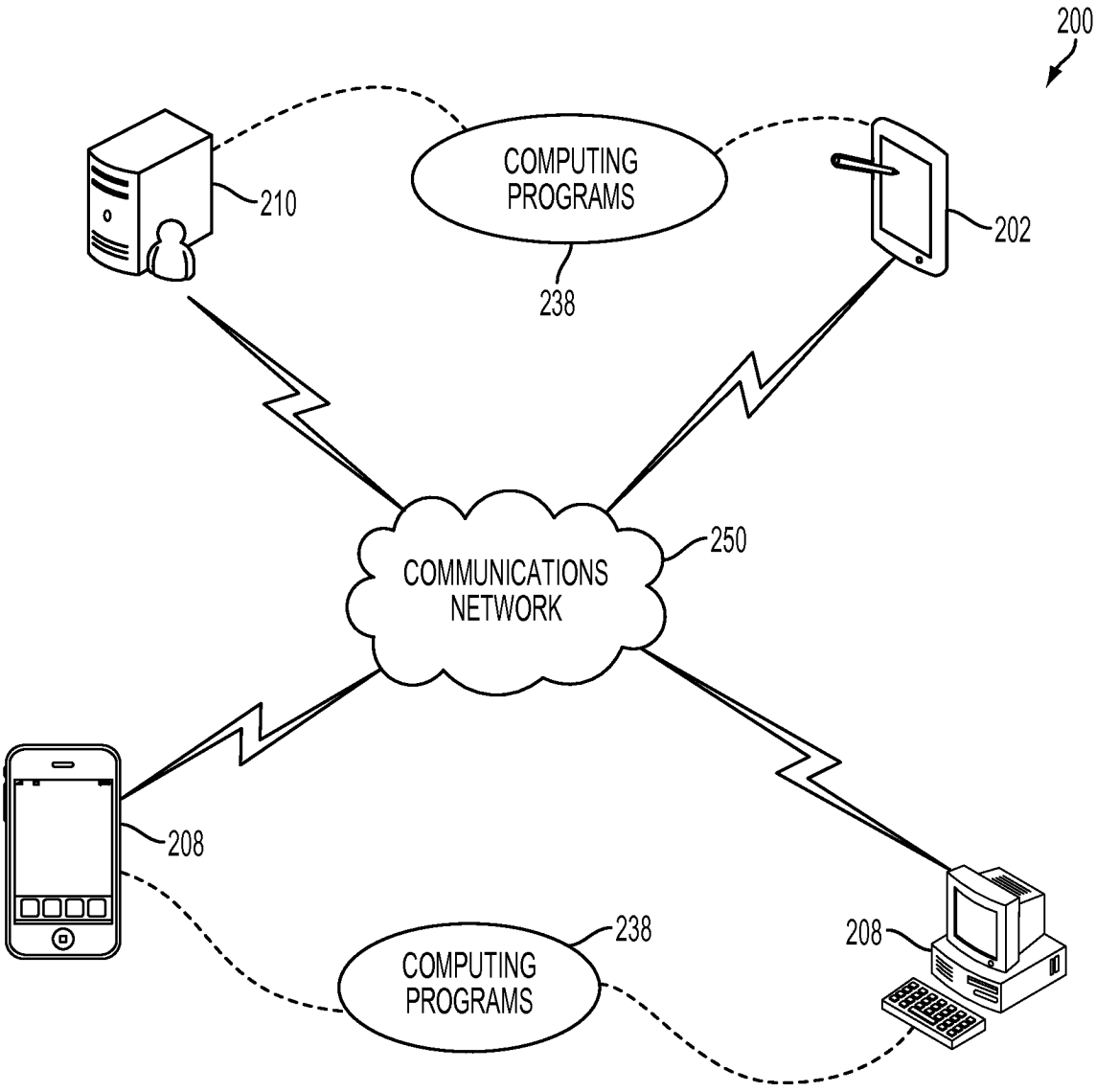

200
COMPUTING PROGRAMS
238
210
202
COMMUNICATIONS NETWORK
250
208
238
COMPUTING PROGRAMS
208

FIG. 2

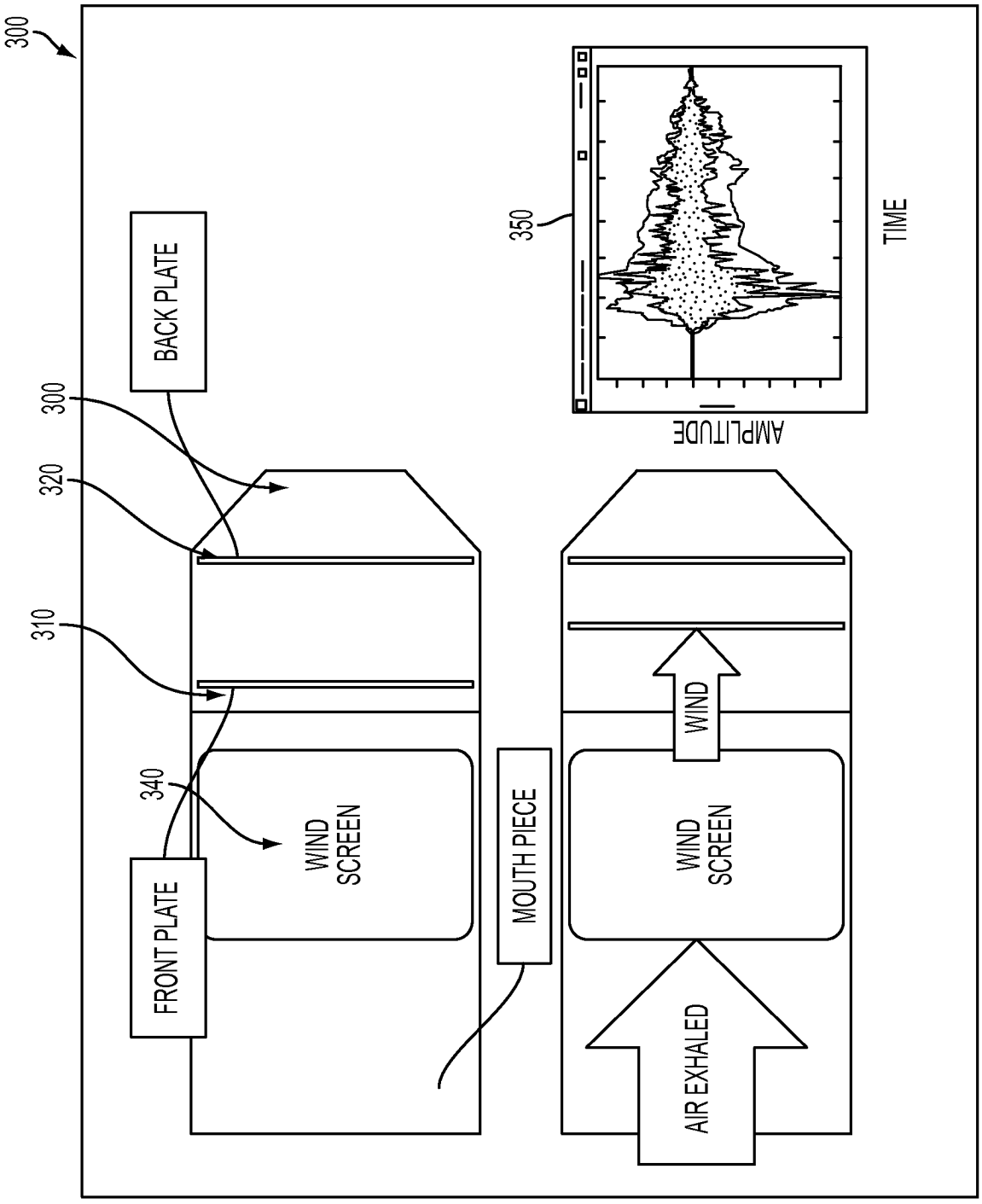

300
BACK PLATE
300
320
310
340
FRONT PLATE
WIND SCREEN
MOUTH PIECE
350
AMPLITUDE
TIME
WIND
WIND SCREEN
AIR EXHALED

FIG. 3

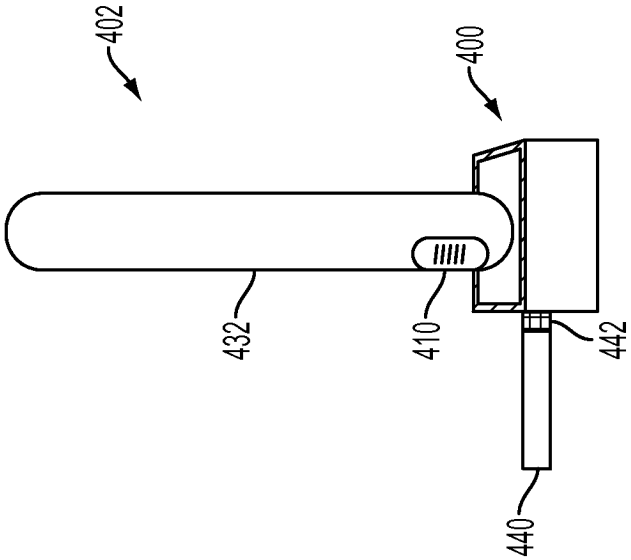


FIG. 4B

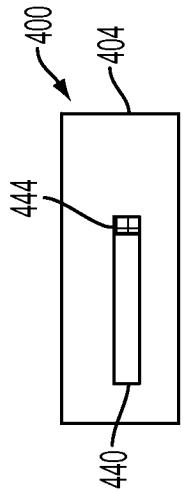


FIG. 4C

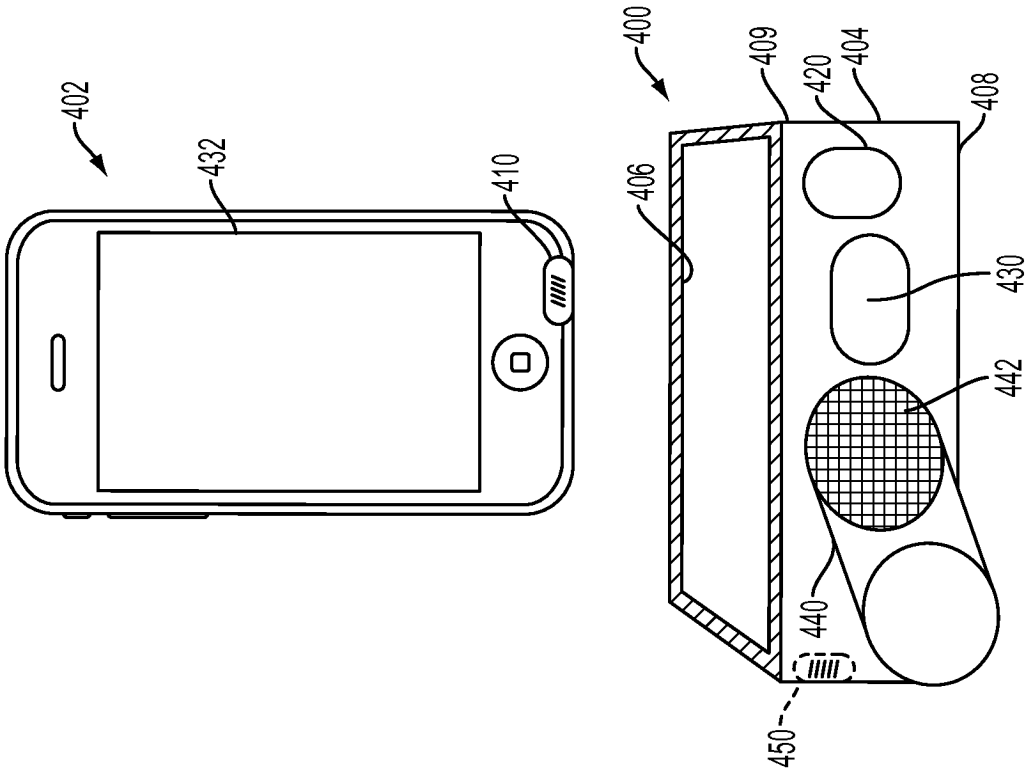


FIG. 4A

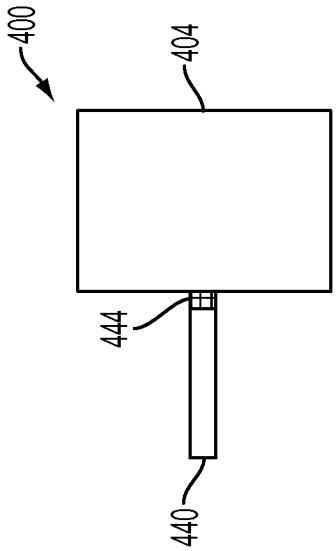


FIG. 4E

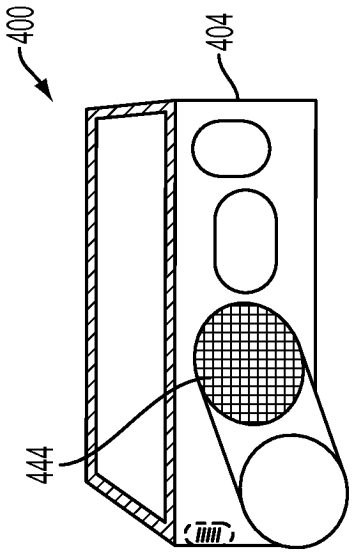


FIG. 4G

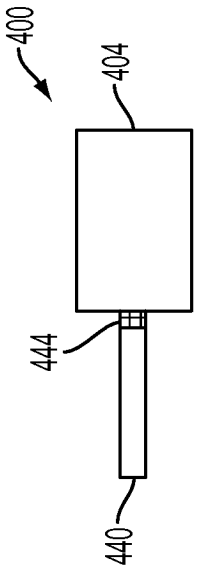


FIG. 4D

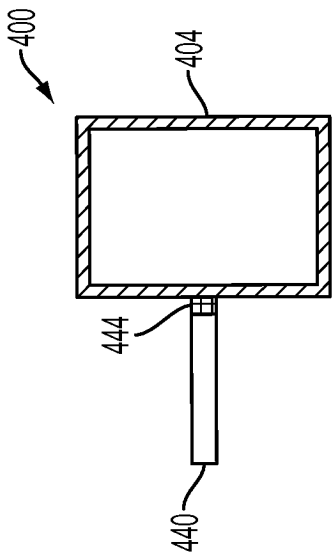


FIG. 4F

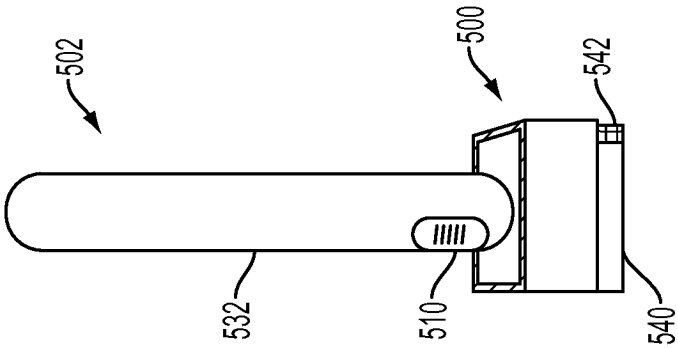


FIG. 5B

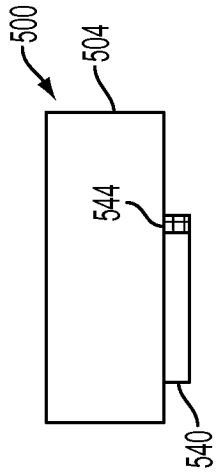


FIG. 5C

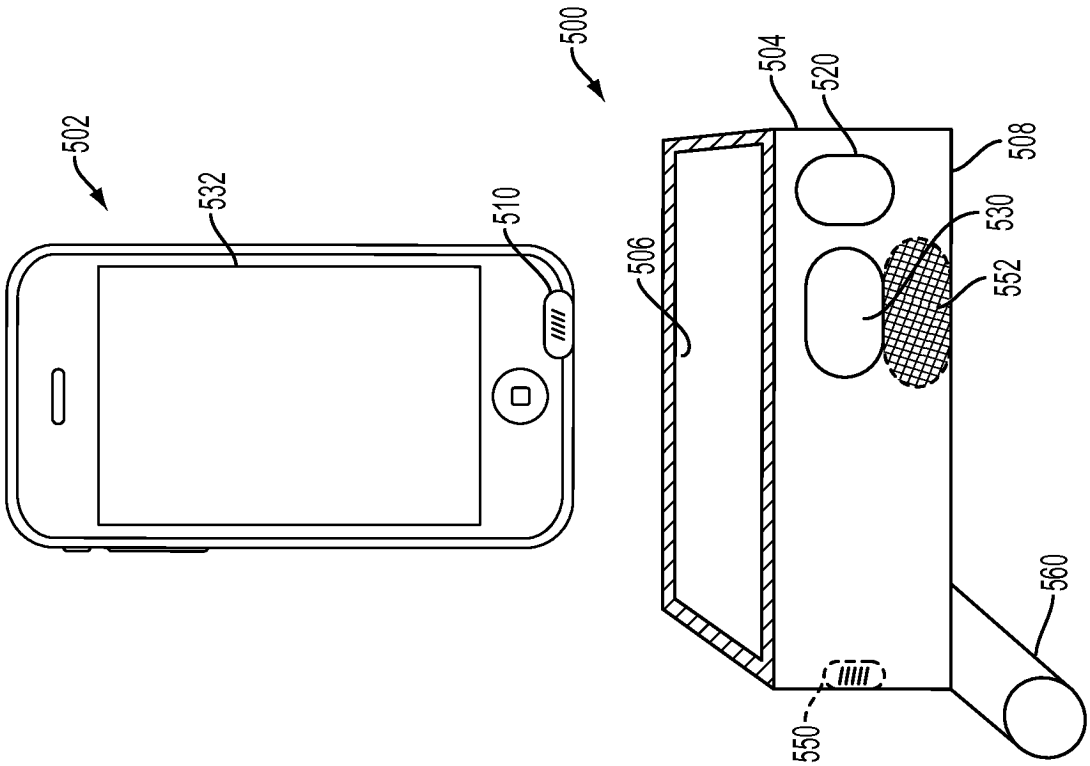


FIG. 5A

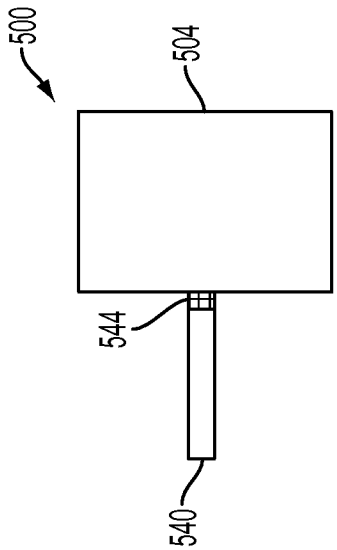


FIG. 5E

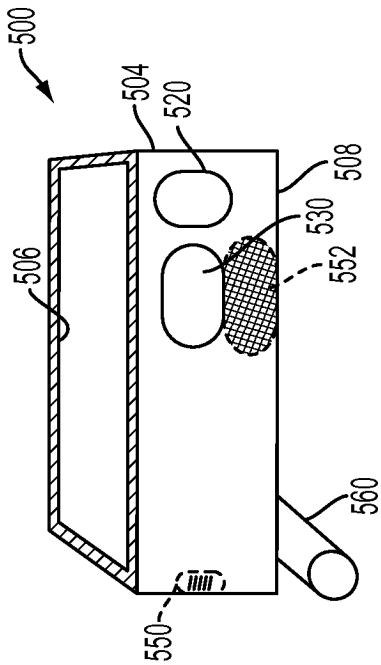


FIG. 5G

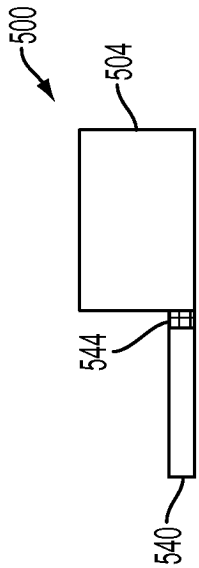


FIG. 5D

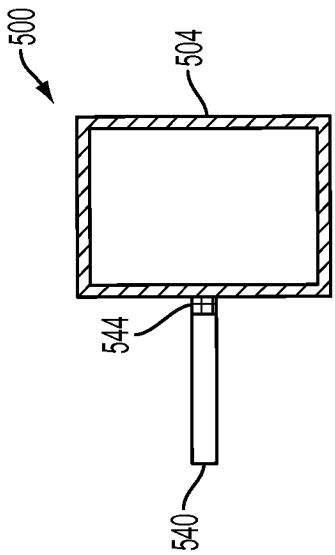


FIG5F

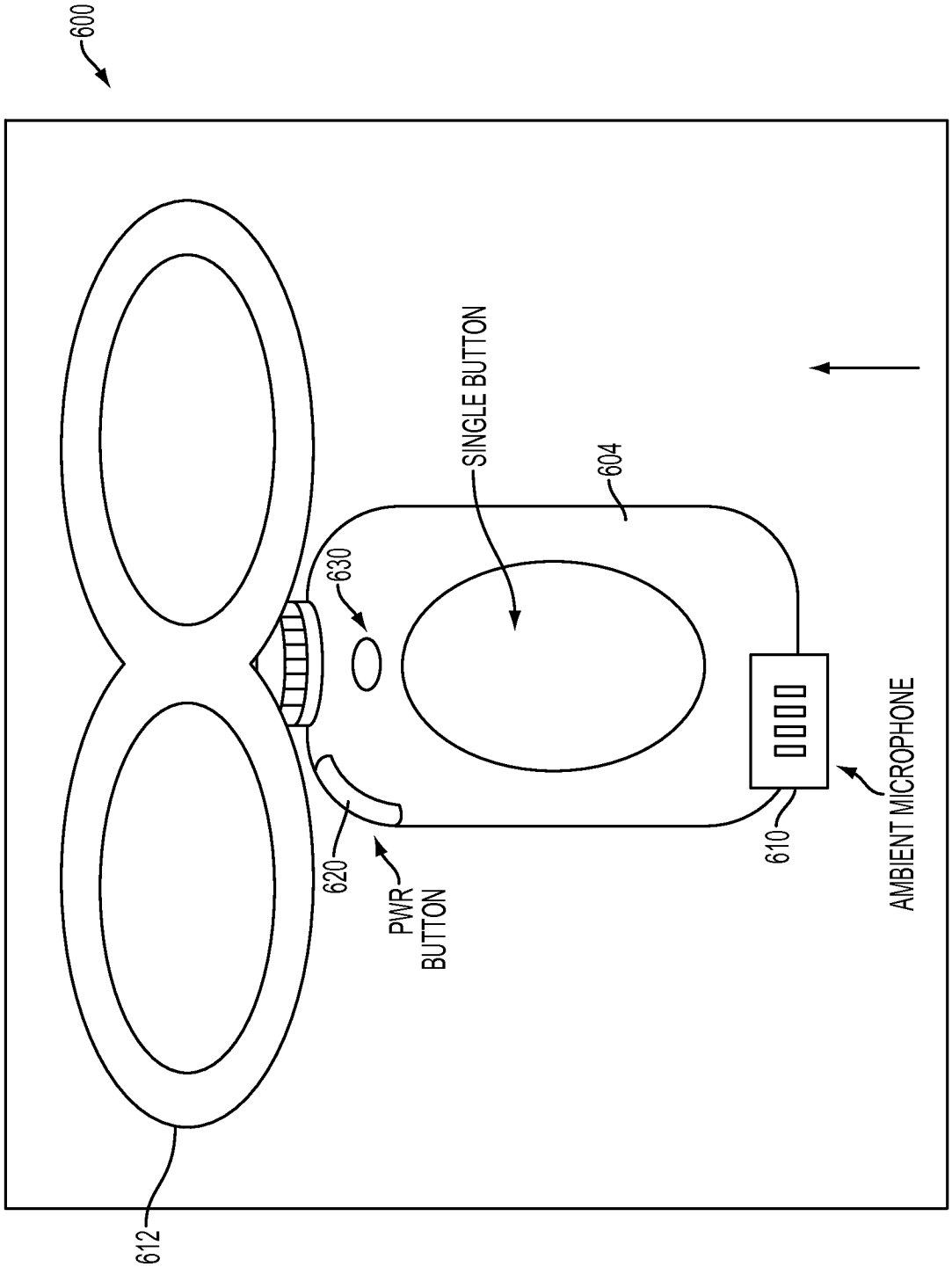

600
SINGLE BUTTON
604
630
620
PWR BUTTON
610
AMBIENT MICROPHONE
612

FIG. 6

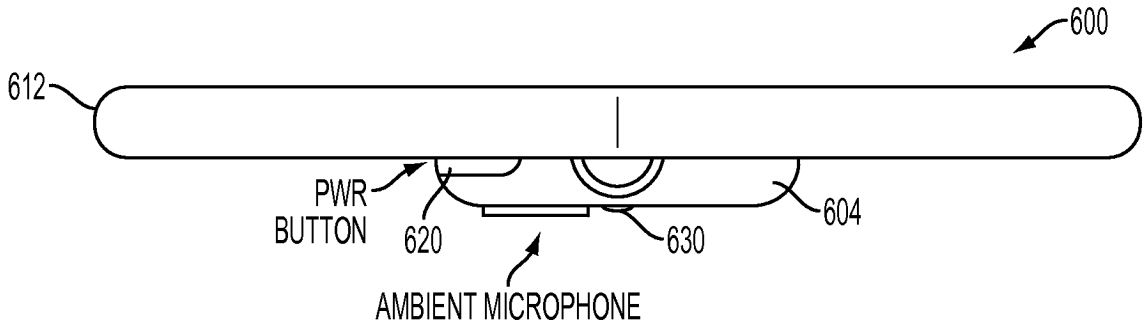

600
612
PWR
BUTTON
620
630
604
AMBIENT MICROPHONE

FIG. 6A

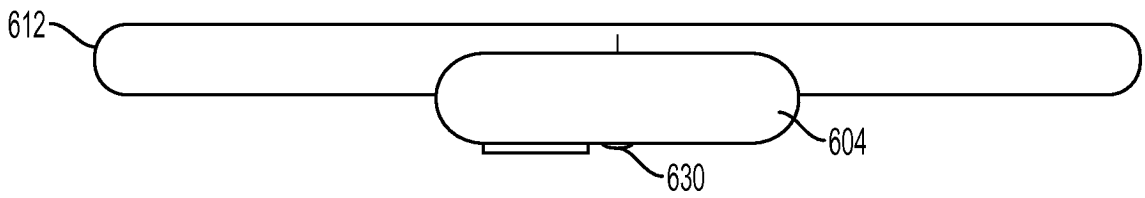

612
604
630

FIG. 6B

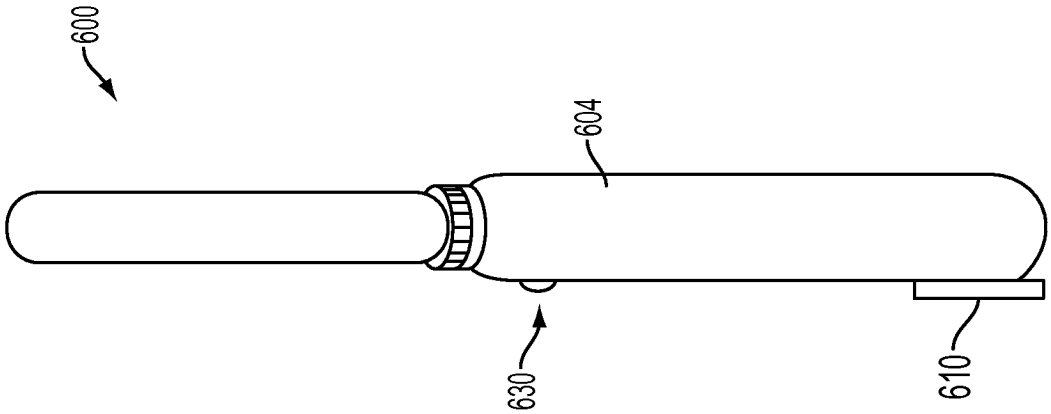


FIG. 6D

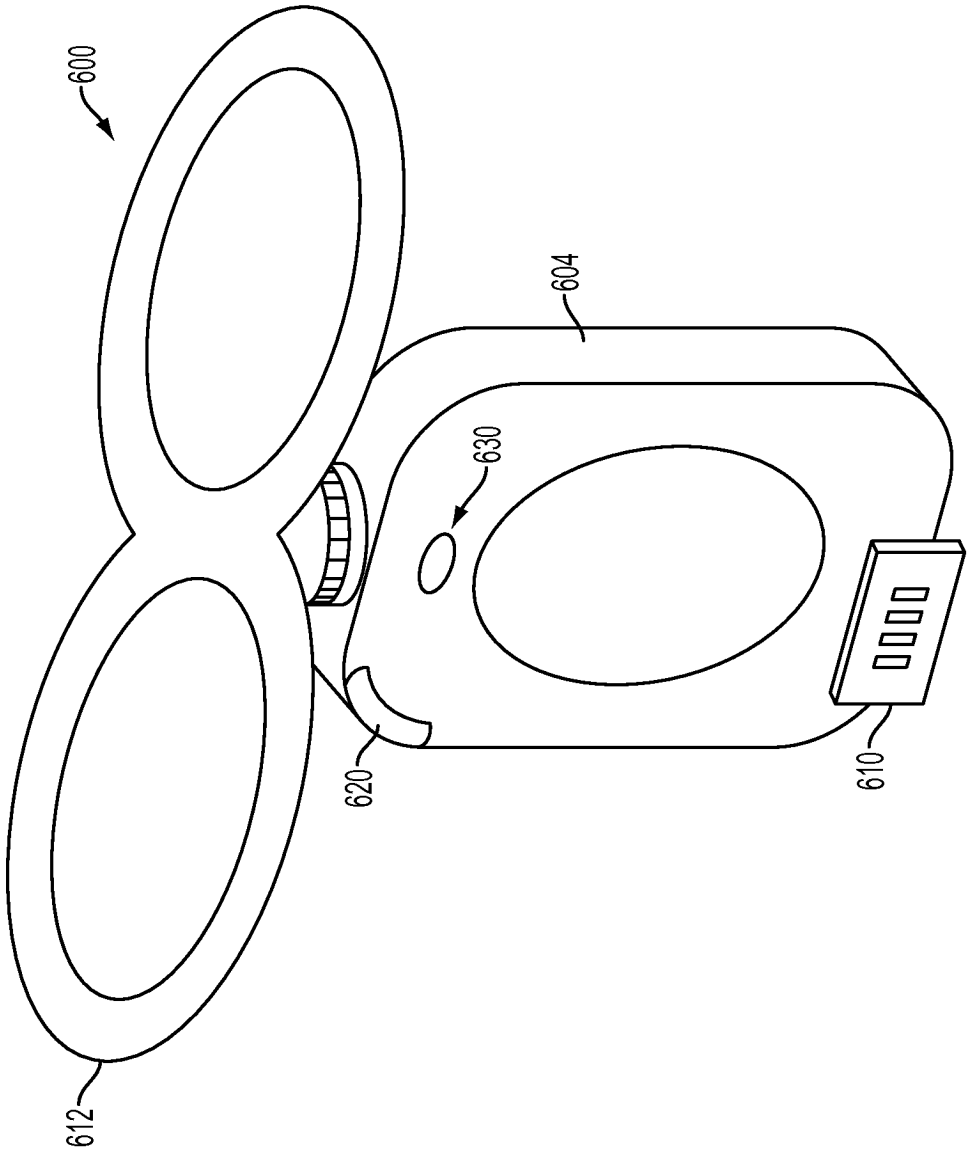


FIG. 6C

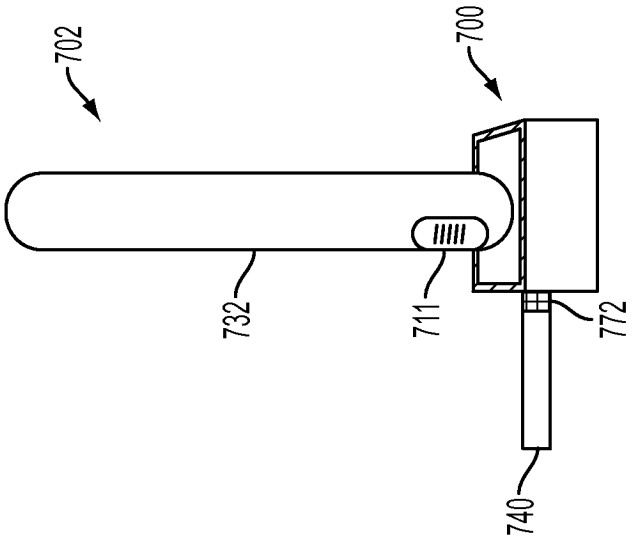


FIG. 7B

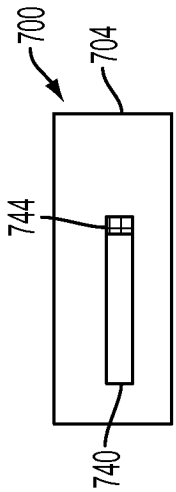
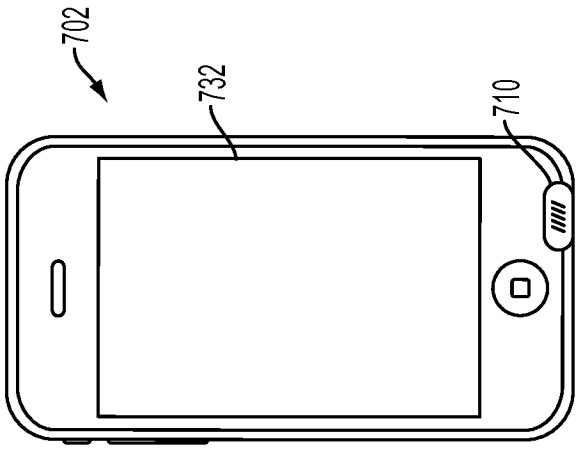


FIG.7C



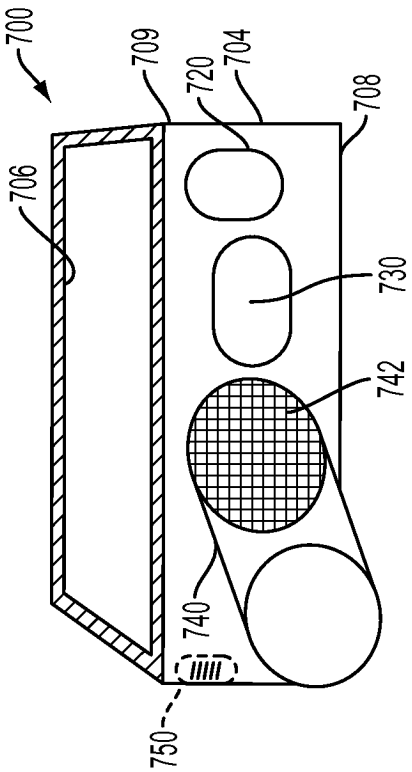


FIG. 7A

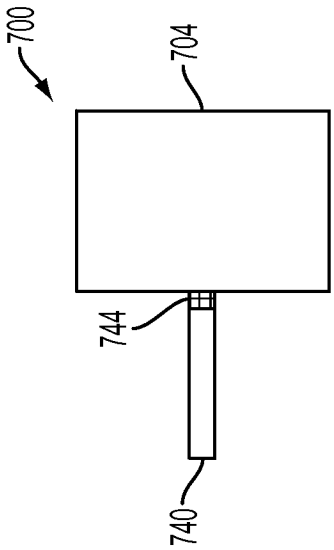


FIG. 7E

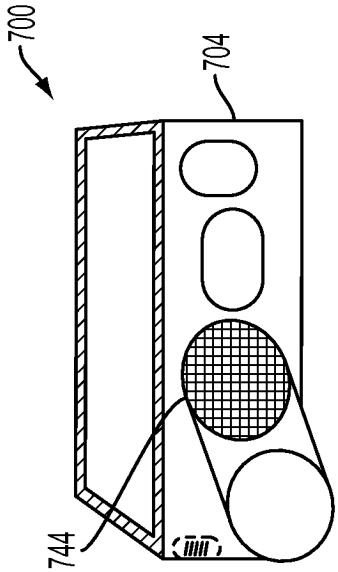


FIG. 7G

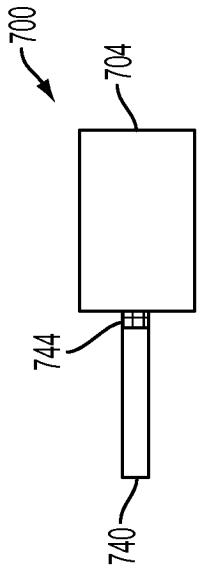


FIG. 7D

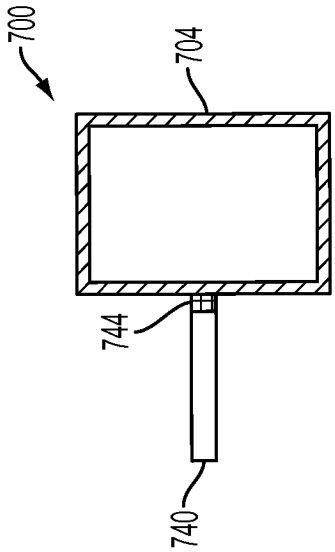


FIG. 7F

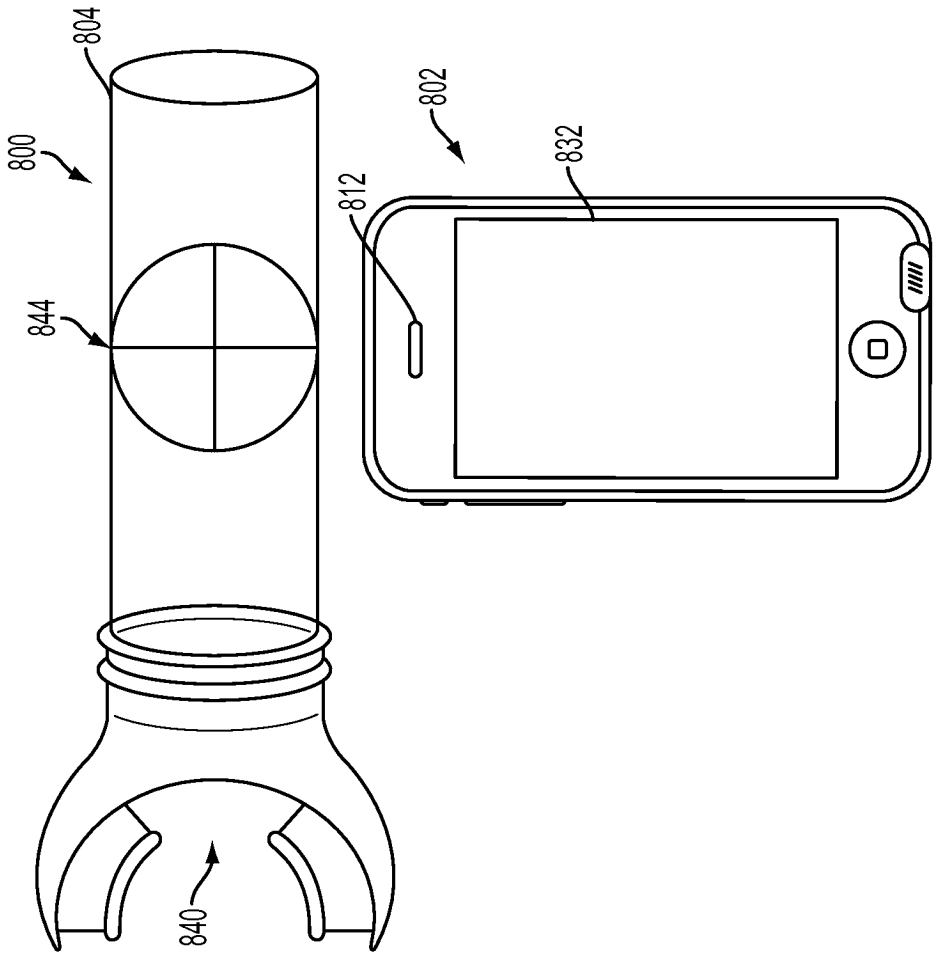


FIG. 8

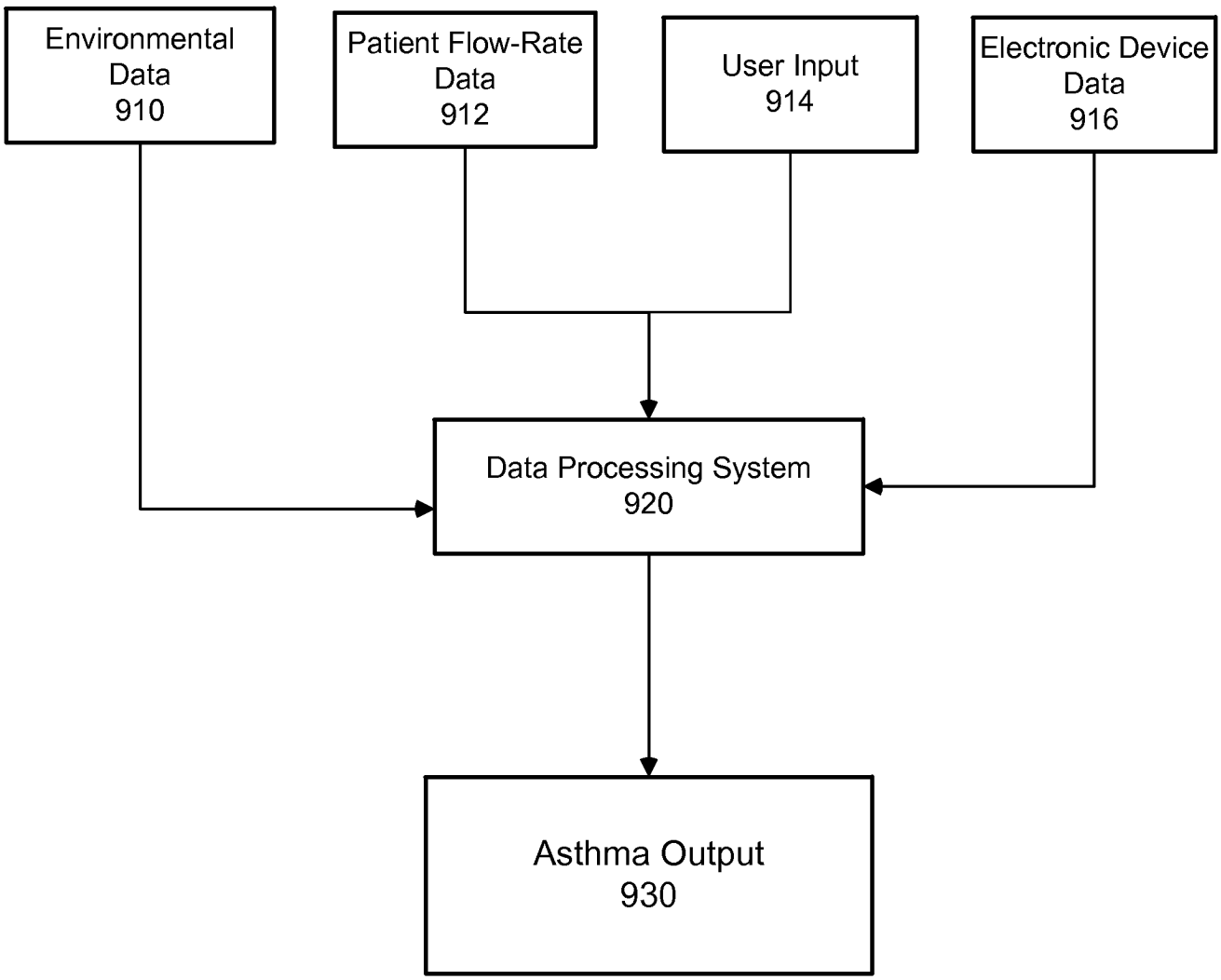

Environmental Data 910
Patient Flow-Rate Data 912
User Input 914
Electronic Device Data 916
Data Processing System 920
Asthma Output 930

FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/056293

A. CLASSIFICATION OF SUBJECT MATTER

A61B 5/087(2006.01)i, A61B 5/091(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A61B 5/087, A61B 5/091, A61B 5/08, A61B 5/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & keywords: respiratory, mouth piece, diaphragm

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	WO 2010-086851 A1 (PULMONE ADVANCED MEDICAL DEVICES, LTD.) 05 August 2010 See abstract, page 16, line 3 - page 20, line 28, page 29, line 30 - page 32, line 17, claims 1-41 and figures 3-7.	29-33,39-43 1-3,8-9,11-12,17, 34-38,44-68,70-73, 80-83,90-93, 100-103
A		4-7,10,13-16, 18-27,69,74-79, 84-89,94-99, 104-108
X Y	US 2007-0161918 A1 (GANSHORN PETER) 12 July 2007 See abstract, paragraphs [0014]-[0031], claims 13-16 and figure 1.	10,18 1-3,8-9,11-12,17
X Y	US 2008-0146892 A1 (LEBOEUF STEVEN FRANCIS et al.) 19 June 2008 See abstract, paragraphs [0099]-[0101] and figures 1-2.	69,74-79,84-89,94-99,104-108 34-38,44-68,70-73, 80-83,90-93, 100-103
A	US 2009-0151718 A1 (HUNTER C ERIC et al.) 18 June 2009 See abstract, paragraphs [0022]-[0027] and figures 1-2.	1-27,29-108

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 FEBRUARY 2013 (28.02.2013)	**04 MARCH 2013 (04.03.2013)**
Name and mailing address of the ISA/KR Facsimile No. 82-42-472-7140	Authorized officer KIM, Tae Hoon Telephone No. 82-42-481-8407

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/056293

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

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

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

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

3. ☒ Claims Nos.: 28
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

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

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required addtional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/056293

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 02-41777 A1 (UNIVERSITY OF LIMERICK) 30 May 2002 See abstract, claims 1-3,26-38 and figures 1,6.	1-27,29-108

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/056293

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		IE S20011006 A2	11.06.2003

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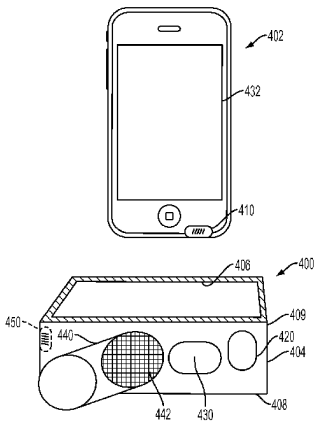
权利要求书7页 说明书20页 附图28页

(54)发明名称

用于测量呼吸率以及动态地预测呼吸发作的系统、方法和套件

(57)摘要

本公开涉及用于测量呼气或吸气峰值流率并且动态地预测呼吸发作的设备、系统、套件和方法。另外，还提供了用于在通信联网环境中分析和处理该测量的系统。本公开的一方面涉及一种呼吸设备。在某些配置中，该呼吸设备包括：可适配为且可配置为与电子设备通信的外壳；具有近端和远端的咬嘴，可配置为接合病人的嘴并传送气流；一个或多个膜片传感器，被配置为从咬嘴中的气流检测呼吸振动；和处理器，可适配为且可配置为分析由该一个或多个膜片传感器检测到的呼吸振动。



CN 103987314 A

1. 一种呼吸设备，包括：

a. 可适配为且可配置为与电子设备通信的外壳；

b. 具有近端和远端的咬嘴，可配置为接合病人的嘴并传送气流；

c. 一个或多个膜片传感器，被配置为从咬嘴中的气流检测呼吸振动；和

d. 处理器，可适配为且可配置为分析由所述一个或多个膜片传感器检测到的呼吸振动。

2. 根据权利要求 1 所述的呼吸设备，其中所述呼吸设备被适配为且被配置为测量呼气峰值流率、吸气峰值流率、平均流率、容量、随时间的流量、用力肺活量、在某时间间隔处的流量的百分比以及在某时间间隔处设备的缓慢且用力的容量中的一个或多个。

3. 根据权利要求 1 所述的呼吸设备，其中所述呼吸设备与被适配为且被配置为显示呼吸振动的分析的结果的显示器进行通信。

4. 根据权利要求 1 所述的呼吸设备，进一步包括：挡风屏，其能够相对于咬嘴定位以减小二次气流进入咬嘴。

5. 根据权利要求 1 所述的呼吸设备，其中所述呼吸设备与环境数据源进行通信。

6. 根据权利要求 5 所述的呼吸设备，其中环境数据源是与所述呼吸设备和所述电子设备中的一个或多个相关联的环境传感器。

7. 根据权利要求 1 所述的呼吸设备，其中处理器进一步可适配为且可配置为使呼吸振动数据和环境数据相关。

8. 根据权利要求 1 所述的呼吸设备，其中处理器生成哮喘输出。

9. 根据权利要求 1 所述的呼吸设备，其中所述呼吸设备与可听指示器进行通信。

10. 一种系统，包括：

a. 测量探头，该探头包括；

i. 一个或多个膜片传感器，可适配为且可配置为检测呼吸振动；

ii. 麦克风；

iii. 接近麦克风定位的咬嘴；和

iv. 端口，

b. 计算系统，可适配为接合端口，并具有当由处理器执行时执行膜片振动的振动分析且显示结果的计算机可执行指令。

11. 根据权利要求 10 所述的系统，其中所述系统被适配为且被配置为测量呼气峰值流率、吸气峰值流率、平均流率、容量、随时间的流量、用力肺活量、在某时间间隔处的流量的百分比以及在某时间间隔处设备的缓慢且用力的容量中的一个或多个。

12. 根据权利要求 10 所述的系统，其中呼吸设备与被适配为且被配置为显示呼吸振动的分析的结果的显示器进行通信。

13. 根据权利要求 10 所述的系统，进一步包括：挡风屏，其能够相对于咬嘴定位以减小二次气流进入咬嘴。

14. 根据权利要求 10 所述的系统，其中所述系统与环境数据源进行通信。

15. 根据权利要求 14 所述的系统，其中环境数据源是与呼吸设备和电子设备中的一个或多个相关联的环境传感器。

16. 根据权利要求 10 所述的系统，其中处理器进一步可适配为且可配置为使呼吸振动

数据和环境数据相关。

17. 根据权利要求 10 所述的系统，其中处理器生成哮喘输出。

18. 根据权利要求 10 所述的呼吸设备，其中呼吸设备与可听指示器进行通信。

19. 一种系统，包括：

a. 电子设备，具有可适配为且可配置为与通信网络进行通信的麦克风；

b. 能附接到电子设备的外壳，该外壳进一步包括：

i. 与电子设备的麦克风对准的咬嘴；和

ii. 驻留于咬嘴导管中的可选挡风屏；

c. 计算机可执行指令，当由处理器执行时执行包括对探头的麦克风膜片的振动分析的操作，且进一步可适配为指示振动分析的结果被显示在显示器上。

20. 根据权利要求 19 所述的系统，其中所述系统被适配为且被配置为测量呼气峰值流率、吸气峰值流率、平均流率、容量、随时间的流量、用力肺活量、在某时间间隔处的流量的百分比以及在某时间间隔处设备的缓慢且用力的容量中的一个或多个。

21. 根据权利要求 19 所述的系统，进一步包括：显示器，其被适配为且被配置为显示振动分析的结果。

22. 根据权利要求 19 所述的系统，进一步包括：挡风屏，其能够相对于咬嘴定位以减小二次气流进入咬嘴。

23. 根据权利要求 19 所述的系统，其中所述系统与环境数据源进行通信。

24. 根据权利要求 23 所述的系统，其中环境数据源是与呼吸设备和电子设备中的一个或多个相关联的环境传感器。

25. 根据权利要求 19 所述的系统，其中处理器进一步可适配为且可配置为使呼吸振动数据和环境数据相关。

26. 根据权利要求 19 所述的系统，其中处理器生成哮喘输出。

27. 根据权利要求 19 所述的系统，其中呼吸设备与可听指示器进行通信。

28. 根据权利要求 10 和 19 所述的系统，其中所述计算系统是从包括以下各项的组中选择的：计算机、移动电话、智能电话、手持设备。

29. 一种存储指令的非瞬变计算机可读介质，所述指令在由计算设备执行时使计算设备执行一方法，该方法包括：

从具有可适配为且可配置为与电子设备通信以接收用户呼吸输入的外壳的呼吸设备接收呼气峰值流率、吸气峰值流率和肺活量测定法测量中的每一个中的一个或多个；

对所接收的呼气峰值流率、吸气峰值流率和肺活量测定法测量中的一个或多个进行分析、监视、评估和响应中的至少一个或多个。

30. 根据权利要求 29 所述的非瞬变计算机可读介质，进一步包括与远程服务器进行通信的步骤。

31. 根据权利要求 29 所述的非瞬变计算机可读介质，进一步包括记录数据和传送数据中的一个或多个的步骤。

32. 根据权利要求 29 所述的非瞬变计算机可读介质，进一步包括从辅助测量设备接收数据的步骤。

33. 根据权利要求 32 所述的非瞬变计算机可读介质，其中辅助测量设备是心率监视器

和脉搏血氧定量设备中的一个或多个。

34. 根据权利要求 29 所述的非瞬变计算机可读介质，进一步包括确定用于测量的 GPS 位置的步骤。

35. 根据权利要求 29 所述的非瞬变计算机可读介质，进一步包括获得环境数据的步骤。

36. 根据权利要求 35 所述的非瞬变计算机可读介质，其中环境数据是花粉计数、空气污染数据、周围温度、温度改变和湿度中的每一个中的一个或多个。

37. 根据权利要求 29 所述的非瞬变计算机可读介质，进一步包括获得行为数据的步骤。

38. 根据权利要求 37 所述的非瞬变计算机可读介质，其中行为数据包括符合药物方案、符合测试方案、符合监视方案、符合系统生成的推荐、符合保健提供者推荐的数据中的每一个中的一个或多个。

39. 一种计算设备，包括：

处理器，被配置为：

从具有可适配为且可配置为与电子设备通信以接收用户呼吸输入的外壳的呼吸设备接收呼气峰值流率、吸气峰值流率和肺活量测定法测量中的每一个中的一个或多个；

对所接收的呼气峰值流率、吸气峰值流率和肺活量测定法测量中的一个或多个进行分析、监视、评估和响应中的至少一个或多个。

40. 根据权利要求 39 所述的计算设备，其中处理器被配置为与远程服务器进行通信。

41. 根据权利要求 39 所述的计算设备，其中处理器被配置为记录数据和传送数据中的一个或多个。

42. 根据权利要求 39 所述的计算设备，其中处理器被配置为从辅助测量设备接收数据。

43. 根据权利要求 42 所述的计算设备，其中辅助测量设备是心率监视器和脉搏血氧定量设备中的一个或多个。

44. 根据权利要求 39 所述的计算设备，其中处理器被配置为确定用于测量的 GPS 位置。

45. 根据权利要求 39 所述的计算设备，其中处理器被配置为获得环境数据。

46. 根据权利要求 45 所述的计算设备，其中环境数据是花粉计数、空气污染数据、周围温度、温度改变和湿度中的每一个中的一个或多个。

47. 根据权利要求 39 所述的计算设备，其中处理器被配置为获得行为数据。

48. 根据权利要求 47 所述的计算设备，其中行为数据包括符合药物方案、符合测试方案、符合监视方案、符合系统生成的推荐、符合保健提供者推荐的数据中的每一个中的一个或多个。

49. 一种方法，包括：

从具有可适配为且可配置为与电子设备通信以接收用户呼吸输入的外壳的呼吸设备接收呼气峰值流率、吸气峰值流率和肺活量测定法测量中的每一个中的一个或多个；

接收环境数据输入；

对所接收的呼气峰值流率、吸气峰值流率和肺活量测定法测量中的一个或多个进行分析、监视、评估和响应中的至少一个或多个。

50. 根据权利要求 49 所述的方法，进一步包括与远程服务器进行通信的步骤。

51. 根据权利要求 49 所述的方法，进一步包括记录数据和传送数据中的一个或多个的步骤。

52. 根据权利要求 49 所述的方法，进一步包括从辅助测量设备接收数据的步骤。

53. 根据权利要求 52 所述的方法，其中辅助测量设备是心率监视器和脉搏血氧定量设备中的一个或多个。

54. 根据权利要求 49 所述的方法，进一步包括确定用于测量的 GPS 位置的步骤。

55. 根据权利要求 49 所述的方法，进一步包括获得环境数据的步骤。

56. 根据权利要求 55 所述的方法，其中环境数据是花粉计数、空气污染数据、周围温度、温度改变和湿度中的每一个中的一个或多个。

57. 根据权利要求 49 所述的方法，进一步包括获得行为数据的步骤。

58. 根据权利要求 57 所述的方法，其中行为数据包括符合药物方案、符合测试方案、符合监视方案、符合系统生成的推荐、符合保健提供者推荐的数据中的每一个中的一个或多个。

59. 一种方法，包括 ：

通过网络、从具有可适配为且可配置为与电子设备通信以接收用户呼吸输入的外壳的呼吸设备、经由用户计算设备，将呼气峰值流率、吸气峰值流率和肺活量测定法测量中的每一个中的一个或多个传送到 web 服务器 ；

获取环境数据输入 ；

对所接收的呼气峰值流率、吸气峰值流率和肺活量测定法测量中的一个或多个进行分析、监视、评估和响应中的至少一个或多个。

60. 根据权利要求 59 所述的方法，进一步包括与远程服务器进行通信的步骤。

61. 根据权利要求 59 所述的方法，进一步包括记录数据和传送数据中的一个或多个的步骤。

62. 根据权利要求 59 所述的方法，进一步包括从辅助测量设备接收数据的步骤。

63. 根据权利要求 62 所述的方法，其中辅助测量设备是心率监视器和脉搏血氧定量设备中的一个或多个。

64. 根据权利要求 59 所述的方法，进一步包括确定用于测量的 GPS 位置的步骤。

65. 根据权利要求 59 所述的方法，进一步包括获得环境数据的步骤。

66. 根据权利要求 65 所述的方法，其中环境数据是花粉计数、空气污染数据、周围温度、温度改变和湿度中的每一个中的一个或多个。

67. 根据权利要求 59 所述的方法，进一步包括获得行为数据的步骤。

68. 根据权利要求 67 所述的方法，其中行为数据包括符合药物方案、符合测试方案、符合监视方案、符合系统生成的推荐、符合保健提供者推荐的数据中的每一个中的一个或多个。

69. 一种系统，包括 ：

a. 电子设备，可配置为与通信网络进行通信 ；

b. 计算机可执行指令，当由处理器执行时，基于历史病人数据、病人数据输入、当前环境数据、类似地理位置中的其他病人的当前数据和类似地理位置中的其他病人的历史数据

中的每一个中的一个或多个来确定呼吸事件的可能性。

70. 根据权利要求 69 所述的系统，其中处理器被配置为与远程服务器进行通信。

71. 根据权利要求 69 所述的系统，其中处理器被配置为记录数据和传送数据中的一个或多个。

72. 根据权利要求 69 所述的系统，其中处理器被配置为从辅助测量设备接收数据。

73. 根据权利要求 72 所述的系统，其中辅助测量设备是心率监视器和脉搏血氧定量设备中的一个或多个。

74. 根据权利要求 69 所述的系统，其中处理器被配置为确定用于测量的 GPS 位置。

75. 根据权利要求 69 所述的系统，其中处理器被配置为获得环境数据。

76. 根据权利要求 75 所述的系统，其中环境数据是花粉计数、空气污染数据、周围温度、温度改变和湿度中的每一个中的一个或多个。

77. 根据权利要求 69 所述的系统，其中处理器被配置为获得行为数据。

78. 根据权利要求 77 所述的方法，其中行为数据包括符合药物方案、符合测试方案、符合监视方案、符合系统生成的推荐、符合保健提供者推荐的数据中的每一个中的一个或多个。

79. 一种存储指令的非瞬变计算机可读介质，所述指令在由计算设备执行时使计算设备执行一方法，该方法包括：

接收用于包括病人组的一个或多个病人中的每一个的 GPS 位置和条件指示中的一个或多个；

基于第二病人的 GPS 位置以及用于包括病人组的一个或多个病人的 GPS 位置和条件指示中的至少一个或多个来分析、监视、评估和提供用于第二病人的预测中的至少一个或多个。

80. 根据权利要求 78 所述的非瞬变计算机可读介质，进一步包括与远程服务器进行通信的步骤。

81. 根据权利要求 78 所述的非瞬变计算机可读介质，进一步包括记录数据和传送数据中的一个或多个的步骤。

82. 根据权利要求 78 所述的非瞬变计算机可读介质，进一步包括从辅助测量设备接收数据的步骤。

83. 根据权利要求 81 所述的非瞬变计算机可读介质，其中辅助测量设备是心率监视器和脉搏血氧定量设备中的一个或多个。

84. 根据权利要求 78 所述的非瞬变计算机可读介质，进一步包括确定用于测量的 GPS 位置的步骤。

85. 根据权利要求 78 所述的非瞬变计算机可读介质，进一步包括获得环境数据的步骤。

86. 根据权利要求 84 所述的非瞬变计算机可读介质，其中环境数据是花粉计数、空气污染数据、周围温度、温度改变和湿度中的每一个中的一个或多个。

87. 根据权利要求 78 所述的非瞬变计算机可读介质，进一步包括获得行为数据的步骤。

88. 根据权利要求 86 所述的非瞬变计算机可读介质，其中行为数据包括符合药物方

案、符合测试方案、符合监视方案、符合系统生成的推荐、符合保健提供者推荐的数据中的每一个中的一个或多个。

89. 一种计算设备，包括：

处理器，被配置为：

接收用于包括病人组的一个或多个病人中的每一个的 GPS 位置和条件指示中的一个或多个；

基于 GPS 位置和用于包括病人组的一个或多个病人的 GPS 位置和条件指示中的至少一个或多个来分析、监视、评估和提供用于第二病人的预测中的至少一个或多个。

90. 根据权利要求 88 所述的计算设备，其中处理器被配置为与远程服务器进行通信。

91. 根据权利要求 88 所述的计算设备，其中处理器被配置为记录数据和传送数据中的一个或多个。

92. 根据权利要求 88 所述的计算设备，其中处理器被配置为从辅助测量设备接收数据。

93. 根据权利要求 91 所述的计算设备，其中辅助测量设备是心率监视器和脉搏血氧定量设备中的一个或多个。

94. 根据权利要求 88 所述的计算设备，其中处理器被配置为确定用于测量的 GPS 位置。

95. 根据权利要求 88 所述的计算设备，其中处理器被配置为获得环境数据。

96. 根据权利要求 94 所述的计算设备，其中环境数据是花粉计数、空气污染数据、周围温度、温度改变和湿度中的每一个中的一个或多个。

97. 根据权利要求 88 所述的计算设备，其中处理器被配置为获得行为数据。

98. 根据权利要求 96 所述的计算设备，其中行为数据包括符合药物方案、符合测试方案、符合监视方案、符合系统生成的推荐、符合保健提供者推荐的数据中的每一个中的一个或多个。

99. 一种方法，包括：

接收用于包括病人组的一个或多个病人中的每一个的 GPS 位置和条件指示中的一个或多个；

基于第二病人的 GPS 位置以及用于包括病人组的一个或多个病人的 GPS 位置和条件指示中的至少一个或多个来分析、监视、评估和提供用于第二病人的预测中的至少一个或多个。

100. 根据权利要求 98 所述的方法，进一步包括与远程服务器进行通信的步骤。

101. 根据权利要求 98 所述的方法，进一步包括记录数据和传送数据中的一个或多个的步骤。

102. 根据权利要求 98 所述的方法，进一步包括从辅助测量设备接收数据的步骤。

103. 根据权利要求 102 所述的方法，其中辅助测量设备是心率监视器和脉搏血氧定量设备中的一个或多个。

104. 根据权利要求 98 所述的方法，进一步包括确定用于测量的 GPS 位置的步骤。

105. 根据权利要求 98 所述的方法，进一步包括获得环境数据的步骤。

106. 根据权利要求 104 所述的方法，其中环境数据是花粉计数、空气污染数据、周围温度、温度改变和湿度中的每一个中的一个或多个。

107. 根据权利要求 98 所述的方法，进一步包括获得行为数据的步骤。

108. 根据权利要求 106 所述的方法，其中行为数据包括符合药物方案、符合测试方案、符合监视方案、符合系统生成的推荐、符合保健提供者推荐的数据中的每一个中的一个或多个。

用于测量呼吸率以及动态地预测呼吸发作的系统、方法和套件

[0001] 交叉引用

本申请要求由 Chan、Tunnell 和 Thomas 在 2011 年 9 月 20 日提交的名称为“Systems, Methods and Kits for Measuring Respiratory Rate(用于测量呼吸率的系统、方法和套件)”的美国临时申请 No. 61/536,841 的权益,该申请通过引用合并于此。

背景技术

[0002] 哮喘是使哺乳动物中的正常呼吸机能中断的阵发性慢性疾病。哮喘治疗的一个方面涉及防止诸如与哮喘发病相关联的那些呼吸机能之类的呼吸机能的极度恶化的发作。在哮喘发病或哮喘加重期间,病人的气道变得肿胀且发炎。另外,与病人的气道相关联的肌肉发生收缩,这使支气管变窄。病人将往往喘息、咳嗽且在呼吸方面有困难。发病的严重性可能是微小的或导致要求前往医院的危急生命的紧急事件。

[0003] 美国国立卫生研究院(NIH)已经推荐,哮喘遭受参加哮喘控制测试(ACT)以评定哮喘的控制水平。ACT 是病人和保健提供者用以评定哮喘状况和控制的工具。病人回答一系列问题,该一系列问题回顾一段时间来评定是否经历了呼吸短促、病人因哮喘相关症状(呼吸短促、胸部紧迫感或疼痛)而在他们的睡眠周期期间醒来的次数、使用救助吸入剂(诸如舒喘灵)的次数、以及在相同的一段时间内病人对控制的印象的主观个人评级。

[0004] 峰值流量计由英国的生物工程师 Basil Martin Wright(1912-2001)发明来提供有用的测量以管理哮喘症状。峰值流量计通过在病人在充分地吸气之后有力地呼气时机械地测量空气多快地从肺出来,来进行工作。该测量被称为“呼气峰值流量”(PEF)。保持跟踪 PEF 是病人能够监视和理解他的 / 她的哮喘症状是被控制还是恶化的一种方式。

[0005] 称作变面积锐孔计量(VAOM)的经典流量计量系统是被用来进行流量测量的一种类型的系统。例如参见Wright BM, McKerrow CB的Maximum forced expiratory flow-rate as a measure of ventilator capacity (作为呼吸机容量的测量的最大强制呼吸流率) BMJ1959; ii: 1043。VAOM 是在机械工程领域中定义的流量测量方法之一。Wright 将该方法论应用到呼气峰值流量测量应用上,并变为第一峰值流量计。

[0006] Wright 稍后在他的峰值流量计中应用转子流量计——VAOM 的高级形式。转子流量计包含具有位于其中的浮子的锥形计量细长导管。当空气或流体流过计量导管时,将生成抵抗或对抗重力的力,并且该力将浮子向上推。机械游码将标记浮子所到达的最高平衡,亦称为最大流率。

[0007] Wright 改编了该方法并对峰值流量计量应用了该方法。代替仅仅依赖于重力,Wright 通过添加机械弹簧,提高了张力。如在他的文章中所描述,呼出气体流过锥形计量导管并抵抗附接的机械弹簧来推动在中央柱(浮子)上自由漂游的活塞。由活塞推动的游码标记最大平衡。

[0008] 当前,在市场中存在许多可用的峰值流量计,其全部都依赖于由 Wright 确立的机械原理。例如参见 Brown 的 1993 年 1 月 5 日发布的美国外观设计专利 Des. 332,229 Peak

Flow Meter 和 Baker 的 2009 年 2 月 10 日发布的美国外观设计专利 Des. 586,248 Peak Flow Meter ;以及 Marcotte 等的 2005 年 5 月 10 日发布的美国专利 6,889,564 B1 Peak Flow Meter 和 Williams 的 1975 年 1 月 28 日发布的 3,862,628 Peak Flow Meters。关于哮喘的其他参考文献例如包括 Colquitt 等的 2012 年 7 月 31 日发布的 US 8,231,541 B2 Asthma Status Scoring Method and System with Confidence Ratings (利用置信度评级的哮喘状态评分方法和系统)。

[0009] 所需要的是 :呼气峰值流率设备,其能够以电子方式进行测量 ;流率设备,其可配置为操作为通信网络的一部分 ;呼吸功能系统评定和预测器 ;以及能够在诸如哮喘发病之类的呼吸偶发事件(incident)的发动之前确定该呼吸偶发事件的可能性且可配置为操作为通信网络的一部分的方法或系统。

发明内容

[0010] 公开了用于获取更高准确度峰值流量测量的设备、系统和方法。用户和保健执业者能够通过使用用于跟踪的联网系统和方法来从峰值流量计(诸如所公开的那些峰值流量计)保持跟踪测量。

[0011] 本公开的一方面涉及一种呼吸设备。 在某些配置中,该呼吸设备包括 :可适配为且可配置为与电子设备通信的外壳(例如,可配置为安装在电子设备的形状因数的一部分上或者附接到电子设备的形状因数的一部分的形状因数) ;具有近端和远端的咬嘴,可配置为接合病人的嘴并且传送气流 ;一个或多个膜片传感器,被配置为从咬嘴中的气流检测呼吸振动 ;和处理器,可适配为且可配置为分析由该一个或多个膜片传感器检测到的呼吸振动。该呼吸设备也可适配为且可配置为测量例如包括呼气峰值流率、吸气峰值流率、平均流率、容量、随时间的流量、用力肺活量、在某时间间隔处的流量的百分比以及在某时间间隔处设备的缓慢且用力的容量的一个或多个病人流率数据。该呼吸设备也可配置为与被适配为且被配置为显示呼吸振动的分析的结果的显示器进行通信。在至少一些配置中,能够提供挡风屏,其可相对于咬嘴定位以减小二次气流进入咬嘴。该设备也可配置为与环境数据源进行通信以获取环境数据,该环境数据源包括但不限于与呼吸设备和电子设备中的一个或多个相关联的环境传感器中的每一个中的一个或多个。在某些配置中,处理器进一步可适配为且可配置为使呼吸振动数据和环境数据相关。另外,处理器可适配为且可配置为生成哮喘输出。在其他配置中,该呼吸设备可适配为且可配置为与可听指示器进行通信。另外,用户能够提供主动或被动输入。当用户录入例如关于当前状况、药物等等的信息时,主动输入发生。当系统记录用户采取了诸如使用设备之类的行动时,被动输入发生。

[0012] 本公开的另一个方面涉及一种呼吸率测量系统。该系统可适配为且可配置为包括 :测量探头,该探头包括 :一个或多个膜片传感器,可适配为且可配置为检测呼吸振动 ;麦克风 ;接近麦克风定位的咬嘴 ;和端口,计算系统,可适配为与端口进行通信并且具有当由处理器执行时执行膜片振动的振动分析且显示结果的计算机可执行指令。在某些配置中,该系统可适配为且可配置为测量呼气峰值流率、吸气峰值流率、平均流率、容量、随时间的流量、用力肺活量、在某时间间隔处的流量的百分比以及在某时间间隔处设备的缓慢且用力的容量中的一个或多个。另外,呼吸设备可适配为且可配置为与被适配为且被配置为显示呼吸振动的分析的结果的显示器进行通信。在某些配置中,提供挡风屏,其可相对于咬

嘴定位以减小二次气流进入咬嘴。在另外其他配置中，该系统与环境数据源进行通信，该环境数据源诸如是与呼吸设备和电子设备中的一个或多个相关联的环境传感器。另外，处理器进一步可适配为且可配置为使呼吸振动数据和环境数据相关。处理器也可适配为且配置为生成哮喘输出。在另外其他配置中，呼吸设备与可听指示器进行通信。计算系统可从包括以下的组中选择：移动电话、智能电话、手持设备。

[0013] 本公开的又一个方面涉及一种系统，其包括：电子设备，具有可适配为且可配置为与通信网络进行通信的麦克风；可附接到电子设备的外壳，该外壳进一步包括：与电子设备的麦克风对准的咬嘴；和驻留于咬嘴导管中的可选挡风屏；计算机可执行指令，当由处理器执行时执行包括对探头的麦克风膜片的振动分析的操作，并且进一步可适配为指示振动分析的结果被显示在显示器上。在某些配置中，该系统可适配为且可配置为测量呼气峰值流率、吸气峰值流率、平均流率、容量、随时间的流量、用力肺活量、在某时间间隔处的流量的百分比以及在某时间间隔处设备的缓慢且用力的容量中的一个或多个。另外，呼吸设备可适配为且可配置为与被适配为且被配置为显示呼吸振动的分析的结果的显示器进行通信。在某些配置中，提供挡风屏，其可相对于咬嘴定位以减小二次气流进入咬嘴。在另外其他配置中，该系统与环境数据源进行通信，该环境数据源诸如是与呼吸设备和电子设备中的一个或多个相关联的环境传感器。另外，处理器进一步可适配为且可配置为使呼吸振动数据和环境数据相关。处理器也可适配为且配置为生成哮喘输出。在另外其他配置中，呼吸设备与可听指示器进行通信。计算系统可从包括以下的组中选择：移动电话、智能电话、手持设备。

[0014] 在本公开的又一个方面中，提供了一种存储指令的非瞬变计算机可读介质，当由计算设备执行时，该指令使计算设备执行一方法，该方法包括：从具有可适配为且可配置为与电子设备通信以接收用户呼吸输入的外壳的呼吸设备接收呼气峰值流率、吸气峰值流率和肺活量测定法测量中的每一个中的一个或多个；对所接收的呼气峰值流率、吸气峰值流率和肺活量测定法测量中的一个或多个进行分析、监视、评估和响应中的至少一个或多个。在至少一些配置中，由介质执行的方法能够进一步包括下述步骤中的每一个中的一个或多个：与远程服务器进行通信；记录数据和传送数据中的一个或多个；从辅助测量设备接收数据（诸如来自心率监视器、心音传感器的数据和动脉血流中的氧的饱和度（SpO2 或脉搏血氧定量法）数据），确定用于测量的 GPS 位置，获得环境数据（诸如花粉计数、空气污染数据、空中颗粒物质数据、空中刺激物数据周围温度、温度改变和湿度数据中的每一个中的一个或多个），获得行为数据（诸如符合药物方案、符合测试方案、符合监视方案、符合系统生成的推荐、符合保健提供者推荐的数据中的每一个中的一个或多个）。

[0015] 本公开的又一个方面涉及一种计算设备，其包括：处理器，被配置为：从具有可适配为且可配置为与电子设备通信以接收用户呼吸输入的外壳的呼吸设备接收呼气峰值流率、吸气峰值流率和肺活量测定法测量中的每一个中的一个或多个；对所接收的呼气峰值流率、吸气峰值流率和肺活量测定法测量中的一个或多个进行分析、监视、评估和响应中的至少一个或多个。在至少一些配置中，处理器可适配为且可配置为执行以下各项中的一个或多个：与远程服务器进行通信；记录数据；传送数据；从辅助测量设备接收数据（诸如来自心率监视器、心音传感器的数据和动脉血流中的氧的饱和度（SpO2 或脉搏血氧定量法）数据）；确定用于测量的 GPS 位置，获得环境数据（诸如花粉计数、空气污染数据、空中颗粒物质

数据、空中刺激物数据周围温度、温度改变和湿度数据中的每一个中的一个或多个）；获得行为数据（其能够是符合药物方案、符合测试方案、符合监视方案、符合系统生成的推荐、符合保健提供者推荐的数据中的每一个中的一个或多个）。

[0016] 在本公开的另外其他方面中，本公开提供了方法，其包括：从具有可适配为且可配置为与电子设备通信以接收用户呼吸输入的外壳的呼吸设备接收呼气峰值流率、吸气峰值流率和肺活量测定法测量中的每一个中的一个或多个；接收环境数据输入；对所接收的呼气峰值流率、吸气峰值流率和肺活量测定法测量中的一个或多个进行分析、监视、评估和响应中的至少一个或多个。该方法也可适配为且可配置为包括下面步骤中的一个或多个：与远程服务器进行通信；记录数据；传送数据；从辅助测量设备接收数据（诸如来自心率监视器、心音传感器的数据和动脉血流中的氧的饱和度（SpO2 或脉搏血氧定量法）数据）；确定用于测量的 GPS 位置；获得环境数据（诸如花粉计数、空气污染数据、空中颗粒物质数据、空中刺激物数据周围温度、温度改变和湿度数据中的每一个中的一个或多个）；获得行为数据（包括但不限于符合药物方案、符合测试方案、符合监视方案、符合系统生成的推荐、符合保健提供者推荐的数据中的每一个中的一个或多个）。

[0017] 本公开的又一个方面涉及一种方法，其包括：通过网络、从具有可适配为且可配置为与电子设备通信以接收用户呼吸输入的外壳的呼吸设备、经由用户计算设备将呼气峰值流率、吸气峰值流率和肺活量测定法测量中的每一个中的一个或多个传送到 web 服务器；获取环境数据输入；对所接收的呼气峰值流率、吸气峰值流率和肺活量测定法测量中的一个或多个进行分析、监视、评估和响应中的至少一个或多个。该方法也可适配为且可配置为包括下面步骤中的一个或多个：与远程服务器进行通信；记录数据；传送数据；从辅助测量设备接收数据（诸如来自心率监视器、心音传感器的数据和动脉血流中的氧的饱和度（SpO2 或脉搏血氧定量法）数据）；确定用于测量的 GPS 位置，获得环境数据（诸如花粉计数、空气污染数据、空中颗粒物质数据、空中刺激物数据周围温度、温度改变和湿度数据中的每一个中的一个或多个）；获得行为数据（包括但不限于符合药物方案、符合测试方案、符合监视方案、符合系统生成的推荐、符合保健提供者推荐的数据中的每一个中的一个或多个）。

[0018] 本公开的又一个方面涉及一种系统，其包括：电子设备，可配置为与通信网络进行通信；计算机可执行指令，当由处理器执行时，基于历史病人数据、病人数据输入、当前环境数据、类似地理位置中的其他病人的当前数据和类似地理位置中的其他病人的历史数据中的每一个中的一个或多个来确定呼吸事件的可能性。在某些配置中，处理器进一步可适配为且可配置为进行以下各项中的一个或多个：与远程服务器进行通信；记录数据和传送数据；从辅助测量设备接收数据（诸如来自心率监视器、心音传感器的数据和动脉血流中的氧的饱和度（SpO2 或脉搏血氧定量法）数据）；确定用于测量的 GPS 位置；获得环境数据（诸如花粉计数、空气污染数据、空中颗粒物质数据、空中刺激物数据周围温度、温度改变和湿度数据中的每一个中的一个或多个）；获得行为数据（包括但不限于符合药物方案、符合测试方案、符合监视方案、符合系统生成的推荐、符合保健提供者推荐的数据中的每一个中的一个或多个）。

[0019] 在本公开的另外其他方面中，一种存储指令的非瞬变计算机可读介质，当由计算设备执行时，该指令使计算设备执行一方法，该方法包括：接收用于包括病人组的一个或多个病人中的每一个的 GPS 位置和条件指示中的一个或多个；基于第二病人的 GPS 位置以及

用于包括病人组的一个或多个病人的GPS位置和条件指示中的至少一个或多个来分析、监视、评估和提供用于第二病人的预测中的至少一个或多个。在某些配置中，处理器进一步可适配为且可配置为进行以下各项中的一个或多个：与远程服务器进行通信；记录数据和传送数据；从辅助测量设备接收数据（诸如来自心率监视器、心音传感器的数据和动脉血流中的氧的饱和度（SpO2或脉搏血氧定量法）数据）；确定用于测量的GPS位置；获得环境数据（诸如花粉计数、空气污染数据、空中颗粒物质数据、空中刺激物数据周围温度、温度改变和湿度数据中的每一个中的一个或多个）；获得行为数据（包括但不限于符合药物方案、符合测试方案、符合监视方案、符合系统生成的推荐、符合保健提供者推荐的数据中的每一个中的一个或多个）。

[0020] 本公开的另外其他方面涉及一种计算设备，其包括：处理器，被配置为：接收用于包括病人组的一个或多个病人中的每一个的GPS位置和条件指示中的一个或多个；基于GPS位置和用于包括病人组的一个或多个病人的GPS位置和条件指示中的至少一个或多个来分析、监视、评估和提供用于第二病人的预测中的至少一个或多个。在某些配置中，处理器进一步可适配为且可配置为进行以下各项中的一个或多个：与远程服务器进行通信；记录数据和传送数据；从辅助测量设备接收数据（诸如来自心率监视器、心音传感器的数据和动脉血流中的氧的饱和度（SpO2或脉搏血氧定量法）数据）；确定用于测量的GPS位置；获得环境数据（诸如花粉计数、空气污染数据、空中颗粒物质数据、空中刺激物数据周围温度、温度改变和湿度数据中的每一个中的一个或多个）；获得行为数据（包括但不限于符合药物方案、符合测试方案、符合监视方案、符合系统生成的推荐、符合保健提供者推荐的数据中的每一个中的一个或多个）。

[0021] 本公开的另一个方面涉及一种方法，其包括：接收用于包括病人组的一个或多个病人中的每一个的GPS位置和条件指示中的一个或多个；基于第二病人的GPS位置以及用于包括病人组的一个或多个病人的GPS位置和条件指示中的至少一个或多个来分析、监视、评估和提供用于第二病人的预测中的至少一个或多个。该方法也可适配为且可配置为包括下面步骤中的一个或多个：与远程服务器进行通信；记录数据；传送数据；从辅助测量设备接收数据（诸如来自心率监视器、心音传感器的数据和动脉血流中的氧的饱和度（SpO2或脉搏血氧定量法）数据）；确定用于测量的GPS位置；获得环境数据（诸如花粉计数、空气污染数据、空中颗粒物质数据、空中刺激物数据周围温度、温度改变和湿度数据中的每一个中的一个或多个）；获得行为数据（包括但不限于符合药物方案、符合测试方案、符合监视方案、符合系统生成的推荐、符合保健提供者推荐的数据中的每一个中的一个或多个）。

[0022] 通过引用的合并

在本说明书中提到的所有出版物、专利和专利申请以与好像每个个体出版物、专利或专利申请具体地且分别地被指示以通过引用而被合并相同的程度通过引用而被合并于此。

附图说明

[0023] 在所附权利要求中特别地阐述本公开的新颖特征。将通过参考陈述说明性实施例的以下具体实施方式来获取对本公开的特征和优点的更好理解，在说明性实施例中利用本公开的原理，并且其附图：

图1A是示出通过其能够实现峰值流率测量和管理的逻辑设备的代表性示例的框图；

图 1B 是通过其能够实现峰值流率测量和管理的示例性计算环境的框图；

图 1C 是示出能够由设备采用的通过其实现峰值流率测量和管理的某种结构的说明性架构图；

图 2 是示出适合于在实现峰值流率测量和管理的系统中使用的系统的示例性组件的协作的框图；

图 3 图示出适合于在本公开的设备中使用的电容式麦克风的操作原理；

图 4A-G 图示出可适配为与辅助电子设备通信的、被适配为且被配置为测量来自病人的吸气和 / 或呼气流的流率检测设备；

图 5A-G 图示出可适配为与辅助电子设备通信的、被适配为且被配置为测量来自病人的吸气和 / 或呼气流的流率检测设备；

图 6-6D 图示出被适配为且被配置为测量来自病人的吸气和 / 或呼气流的流率检测设备的替换实施例；

图 7A-G 图示出可适配为与辅助电子设备通信的、被适配为且被配置为测量来自病人的吸气和 / 或呼气流的流率检测设备；

图 8 图示出可适配为与辅助电子设备通信的、被适配为且被配置为测量来自病人的吸气和 / 或呼气流的流率检测设备；以及

图 9 图示出系统中的数据组件之间的相互关系。

具体实施方式

[0024] I. 计算系统

在此描述的系统和方法依赖于各种计算机系统、网络和 / 或数字设备来进行操作。为了充分地理解系统如何操作，对适当计算系统的理解是有用的。作为经由适当计算系统的应用的结果，能够启用这里公开的系统和方法的方面。

[0025] 图 1A 是示出通过其能够访问浏览器以实施本发明的代表性示例逻辑设备的框图。可被理解为被适配为且被配置为从介质 114 和 / 或网络端口 106 读取指令的逻辑装置的计算机系统(或数字设备)100 可连接到服务器 110，且具有固定介质 116。计算机系统 100 也能够连接到互联网或内联网。系统包括中央处理单元(CPU)102、磁盘驱动器 104、被图示为键盘 118 和 / 或鼠标 120 的可选输入设备、以及可选监视器 108。例如通过到本地或远程位置处的服务器 110 的通信介质 109，能够实现数据通信。通信介质 109 能够包括传送和 / 或接收数据的任何合适的手段。例如，通信介质能够是网络连接、无线连接或互联网连接。可设想，能够通过这样的网络或连接来传送关于本公开的数据。计算机系统能够被适配为与参与者和 / 或由参与者使用的设备进行通信。计算机系统可适配为通过互联网与其他计算机通信或者经由服务器与计算机通信。

[0026] 图 1B 描绘另一个示例性计算系统 100。计算系统 100 能够执行包括计算应用、计算小程序、计算程序或其他指令的各种计算应用 138，用于在计算系统 100 上操作，以执行至少一个功能、操作和 / 或过程。计算系统 100 可由用于有形地存储可以是软件的形式的计算机可读指令的计算机可读存储介质来控制。被适配为有形地存储计算机可读指令的计算机可读存储介质能够包含用于计算系统 100 的、用于存储和访问计算机可读存储介质以对存储在它们自身上的指令进行读取的指令。可以在 CPU 102 内执行这样的软件以使计算系

统 100 执行期望的功能。在许多已知的计算机服务器中，由称作微处理器的微电子芯片 CPU 来实施工作站和个人计算机 CPU 102。可选地，能够提供不同于主 CPU 102 的、执行附加功能或协助 CPU 102 的协处理器。CPU 102 可以通过互连而连接到协处理器。一种常见类型的协处理器是也称作数值或数学协处理器的浮点协处理器，其被设计为比通用 CPU 102 更快且更好地执行数值计算。

[0027] 如本领域技术人员将理解的是，计算机可读介质存储计算机数据，该数据能够以机器可读形式包括可由计算机执行的计算机程序代码。举例来说，而不是进行限制，计算机可读介质可以包括用于对数据进行有形或固定存储的计算机可读存储介质，或用于包含代码的信号的瞬时解释的通信介质。如在这里所使用的，计算机可读存储介质指的是物理或有形的贮存器（与信号相对），并且不作为限制，包括以任何方法或技术实施的易失和非易失性的、可移除的和非移除的存储介质，用于有形地存储诸如计算机可读的指令、数据结构、程序模块或其他数据之类的信息。计算机可读存储介质包括但不限于 RAM、ROM、EPROM、EEPROM、闪存或其他固态存储器技术、CD- ROM、DVD、或其他光存储器、磁带盒、磁带、磁盘存储器或其他磁存储设备，或能够用来有形地存储期望的信息或数据或指令并且能够由计算机或处理器访问的任何其他物理或材料介质。

[0028] 可以以硬件、固件和软件之一或其组合来实施一些实施例。实施例也可以被实施为存储在非瞬变计算机可读存储介质上的指令，该指令可以由至少一个处理器来读取和执行，以执行在此描述的操作。非瞬变计算机可读存储介质可以包括用于以机器（例如计算机）可读的形式存储信息的任何机制。例如，非瞬变计算机可读存储介质可以包括只读存储器（ROM）、随机存取存储器（RAM）、磁盘存储器介质、光存储介质、闪存存储器设备和其他非瞬变介质。

[0029] 在操作中，CPU 102 取出、解码和执行指令，并经由计算机的主数据传递路径、系统总线 140 来向其他资源和从其他资源传递信息。这样的系统总线连接计算系统 100 中的组件，并定义用于数据交换的介质。耦合到系统总线 140 的存储器设备包括随机存取存储器（RAM）124 和只读存储器（ROM）126。这样的存储器包括允许存储和调取信息的电路。ROM 126 通常包含不能被修改的所存储的数据。RAM 124 中所存储的数据能够由 CPU 102 或其他硬件设备读取或改变。对 RAM 124 和 / 或 ROM 126 的访问可以由存储器控制器 122 来控制。存储器控制器 122 可以提供在指令被执行时将虚拟地址转换为物理地址的地址转换功能。

[0030] 另外，计算系统 100 能够包含负责从 CPU 102 向诸如打印机 142、键盘 118、鼠标 120 和数据储存驱动器 143 之类的外围设备传送指令的外围控制器 128。由显示器控制器 163 控制的显示器 108 用于显示由计算系统 100 生成的视觉输出。这样的视觉输出可以包括文本、图形、动画图形和视频。显示器控制器 134 包括生成被发送到显示器 108 的视频信号所需的电子组件。此外，计算系统 100 能够包含可以用于将计算系统 100 连接到外部通信网络 132 的网络适配器 136。

[0031] II. 网络和互联网协议

如本领域技术人员很好地理解的，互联网是计算机网络的全球性网络。现今，互联网是数百万用户可用的公共且自持的网络。互联网使用称作 TCP/IP（即，传输控制协议 / 互联网协议）的通信协议的集合来连接主机。互联网具有被称为互联网主干的通信基础结构。

对互联网主干的访问主要由将访问转售给公司和个人的互联网服务提供商(ISP)来控制。

[0032] 互联网协议(IP)使得能够将数据从一个设备(例如电话、个人数字助理(PDA)、计算机等等)发送到网络上的另一个设备。现今存在各种版本的IP,例如包括IPv4、IPv6等等。无疑其他IP也是可用的,且将继续在将来变得可用,在不背离本发明的范围的情况下能使用其中任一个。网络上的每个主机设备具有作为其自身的唯一标识符且充当无连接协议的至少一个IP地址。在通信期间端点之间的连接是不连续的。当用户发送或接收数据或消息时,该数据或消息被划分为被称为分组的分量。每个分组被视为数据的独立单元且被路由到其最终目的地——但不必然经由相同路径。

[0033] III. 无线网络

无线网络能够合并各种类型的移动设备,诸如例如蜂窝和无线电话、PC(个人计算机)、膝上型计算机、可佩戴计算机、无绳电话、寻呼机、头戴式耳机、打印机、PDA等等。例如,移动设备可以包括数字系统以保护语音和/或数据的快速无线传输。典型的移动设备包括以下组件中的一些或所有:收发信机(例如,发射机和接收机,包括具有集成的发射机、接收机和其他功能(如果期望的话)的单芯片收发信机);天线;处理器;显示器;一个或多个音频换能器(例如,如在设备中用于音频通信的扬声器或麦克风);电磁数据贮存器(诸如在提供数据处理的设备中的诸如ROM、RAM、数字数据贮存器等等);存储器;闪存;和/或完整芯片集或集成电路;接口(诸如通用串行总线(USB)、编解码器(CODEC)、通用异步收发信机(UART)、相变存储器(PCM)等等)。能够在不背离本发明的范围的情况下提供其他组件。

[0034] 可以采用其中移动用户能够通过无线连接而连接到局域网(LAN)的无线LAN(WLAN),来进行无线通信。无线通信能够包括经由诸如光、红外线、无线电和微波之类的电磁波传播的通信。存在当前现有的各种WLAN标准,诸如蓝牙(Bluetooth®)、IEEE 802.11和过时的家庭RF(HomeRF)。

[0035] 举例来说,蓝牙产品可以用于提供移动计算机、移动电话、便携式手持设备、个人数字助理(PDA)和其他移动设备之间的链路以及到互联网的连接。蓝牙是详述移动设备能够如何使用短程无线连接容易地互相互连且与非移动设备互连的计算和电信行业规范。蓝牙创建了一种数字无线协议来解决由需要保持数据从一个设备到另一个设备同步且一致的各种移动设备的增殖引发的终端用户问题,从而允许来自不同出售者的设备一起无缝地工作。

[0036] IEEE标准IEEE802.11指定用于无线LAN和设备的技术。使用802.11,可以利用支持若干设备的每个单个基站来实现无线联网。在一些示例中,设备可以开始预先装备有无线硬件,或者用户可以安装可包括天线的诸如卡之类的单独件的硬件。举例来说,在802.11中使用的设备典型地包括三个显著的要素:设备是接入点(AP)、移动站(STA)、桥、个人计算存储卡国际协会(PCMCIA)卡(或PC卡)、还是另一设备:无线电收发信机;天线;和控制网络中的点之间的分组流量MAC(媒体接入控制)层。

[0037] 另外,可以在一些无线网络中利用多接口设备(MID)。MID可以包含两个独立的网络接口,诸如蓝牙接口和802.11接口,从而允许MID参与到两个单独的网络上以及与蓝牙设备对接。MID可以具有IP地址和与IP地址相关联的公共IP(网络)名称。

[0038] 无线网络设备可以包括但不限于蓝牙设备、WiMAX(全球微波接入互操作性)、多接口设备(MID)、802.11x设备(IEEE 802.11设备,包括802.11a、802.11b和802.11g设备)、

家庭 RF（家庭射频）设备、Wi-Fi（无线保真）设备、GPRS（通用分组无线电服务）设备、3G 蜂窝设备、2.5 G 蜂窝设备、GSM（全球移动通信系统）设备、EDGE（用于 GSM 演进的增强数据）设备、TDMA 类型（时分多址）设备或包括 CDMA2000 的 CDMA 类型（码分多址）设备。每个网络设备可以包含变化类型的地址，其包括但不限于 IP 地址、蓝牙设备地址、蓝牙通用名称、蓝牙 IP 地址、蓝牙 IP 通用名称、802.11 IP 地址、802.11 IP 通用名称或 IEEE MAC 地址。

[0039] 无线网络也能够涉及在移动 IP（互联网协议）系统中、在 PCS 系统中和在其他移动网络系统中找到的方法和协议。就移动 IP 而言，这涉及由互联网工程任务组（IETF）创建的标准通信协议。利用移动 IP，移动设备用户能够在网络上移动，同时维持他们的一次指派的 IP 地址。请参见请求注解（RFC）3344. NB: RFC 是互联网工程任务组（IETF）的正式文件。移动 IP 将互联网协议（IP）增强，并添加用于当在移动设备的归属网络外部连接时将互联网业务转发到移动设备的机制。移动 IP 给每个移动节点指派其归属网络上的归属地址以及标识设备在网络和其子网内的当前位置的转交地址（CoA）。当设备被移动到不同的网络时，其接收新的转交地址。归属网络上的移动性代理能够将每个归属地址与其转交地址相关联。移动节点能够在其每次改变其转交地址时使用互联网控制消息协议（ICMP）向归属代理发送绑定更新。

[0040] 图 1C 描绘在实现本公开的系统和技术效果的系统配置中能够采用的组件，包括客户端设备与之进行通信的无线接入点。在这点上，图 1C 示出连接到无线局域网（WLAN）152 的无线网络 150。WLAN 152 包括接入点（AP）154 和多个用户站 156、156'。例如，网络 150 能够包括互联网或公司数据处理网络。接入点 154 能够是无线路由器，并且用户站 156、156' 能够是便携式计算机、个人台式计算机、PDA、便携式的基于 IP 的语音的电话和 / 或其他设备。接入点 154 具有链接到网络 150 的网络接口 158 以及与用户站 156、156' 通信的无线收发信机。例如，无线收发信机 160 能够包括天线 162，其用于与用户站 156、156' 进行射频或微波频率通信。接入点 154 还具有处理器 164、程序存储器 166 和随机存取存储器 168。用户站 156 具有无线收发信机 170，其包括用于与接入点站 154 进行通信的天线 172。以类似的方式，用户站 156' 具有用于到接入点 154 的通信的天线 172 和无线收发信机 170'。举例来说，在一些实施例中，能够在这样的接入点（AP）内采用认证器，和 / 或能够在移动节点或用户站内采用恳求者或对等端。台式机 108 和键盘 118 或输入设备也能够被提供有用户状态。

[0041] IV. 计算机网络环境

上述计算系统 100 能够被部署为用于实现期望的技术效果和变换的计算机网络的一部分。通常，计算环境的以上描述适用于网络环境中部署的服务器计算机和客户端计算机两者。图 2 图示出示例性说明性联网计算环境 200，其中服务器经由通信网络 250 与客户端计算机通信。如图 2 中所示，服务器 210 可以经由通信网络 250（其可以是固定线路或无线 LAN、WAN、内联网、外联网、对等网络、虚拟专用网、互联网或其他通信网络中的任一个或其组合）与诸如平板个人计算机 202、智能电话 208、个人计算机 202 和个人数字助理之类的多个客户端计算环境互连。在通信网络 250 是例如互联网的网络环境中，服务器 210 能够是可操作为处理数据且经由诸如超级文本传输协议（HTTP）、文件传送协议（FTP）、简单对象存取协议（SOAP）或无线应用协议（WAP）之类的多个已知协议中的任一个向和从客户端计算环境传递数据的专用计算环境服务器。在不背离本公开的范围的情况下，能够使用其他

无线协议，例如包括无线标记语言(WML)、DoCoMo i 模式(例如，用在日本)和 XHTML Basic。另外，联网计算环境 200 能够利用诸如安全套接字层(SSL)或良好隐私(PGP)之类的各种数据安全性协议。每个客户端计算环境能够装备有可操作为支持诸如 web 浏览器(未示出)、或其他图形用户界面(未示出)、或移动桌面环境(未示出)之类的一个或多个计算应用的操作系统 238，来获得对服务器计算环境 200 的访问。

[0042] 在操作中，用户(未示出)可以与在客户端计算环境上运行的计算应用交互，以获取期望的数据和 / 或计算应用。数据和 / 或计算应用可以存储在服务器计算环境 200 上且经由示例性通信网络 250 通过客户端计算环境而被传送到协作用户。下面更详细地描述的计算应用用于实现所阐述的期望技术效果和变换。参与的用户可以请求对整体或部分地容纳于服务器计算环境 200 上的特定数据和应用的访问。可以在客户端计算环境和服务器计算环境之间传递这些数据，以用于处理和存储。服务器计算环境 200 可以托管用于生成、认证、加密以及通信数据和应用的计算应用、进程和小程序，并可以与其他服务器计算环境(未示出)、第三方服务提供商(未示出)、网络附接储存(NAS)和存储区域网络(SAN)协作，以实现应用 / 数据事务。

[0043] V. 可配置为在计算和网络环境中操作以实现期望的技术效果或变换的用于测量峰值流率的设备

图 3 图示出适合于在本公开的流率检测设备中使用的电容式麦克风的操作原理。电容式麦克风具有前板 310(膜片)、位于膜片 330 后面的背板 320。这两个板充当电容器的两个板。电荷能够存储在这两个板之间。当(例如在施加声波的情况下)使前板振动或移动时，这两个板之间的距离改变，这导致电容的机会。膜片 310- 背板 320 电容器的电容和内置电阻器的值形成对音频信号来说高通且对偏置电压来说低通的滤波器。然后，可放大电阻器两端的电压(例如，电容式麦克风的输出)以用于记录。还能够提供挡风屏 340 来减小来自辅助源的空气的影响。所得到的输出具有曲线图 350 中示出的质量，其中从 0 到 700 msec 的时间在 x 轴上，并且从 -0.5 到 0.3 的振幅在 y 轴上。

[0044] 图 4A-G 图示出可配置为与诸如智能电话之类的辅助电子设备 402 通信的流率检测设备 400 被提供，该辅助电子设备 402 提供诸如所示出的环绕麦克风 410、薄膜传感器麦克风之类的麦克风或能够捕捉声音的任何其他适当的麦克风设备。图 4A 图示出从前视图的流率检测设备 400 和电子设备 402。图 4B 图示出从侧视图的流率检测设备 400 和电子设备 402。图 4C 图示出从前视图的具有处于第二折叠位置的咬嘴 440 的流率检测设备 400。图 4D 图示出从侧视图的具有向外延伸且准备好以供使用的咬嘴 440 的流率检测设备 400。图 4E 图示出从底视图的具有向外延伸且准备好以供使用的咬嘴 440 的流率检测设备 400。图 4F 图示出从顶视图的具有向外延伸且准备好以供使用的咬嘴 440 的流率检测设备 400。图 4E 图示出从高视角的具有向外延伸且准备好以供使用的咬嘴 440 的流率检测设备 400。

[0045] 能够在流率检测设备 400 上提供处理器，以便例如控制流率检测设备的操作、与辅助电子设备 402 的通信以及如将期望的此类其他过程。

[0046] 流率检测设备 400 具有由开关按钮 420 促动的电源(诸如可移除的电源 450)。电源包括任何适当的电源，其包括诸如锂电池、镍镉电池等等的可移除的电源。能够在流率检测设备 400 上提供诸如 LED 显示器之类的可选可视指示器 430，其中可视指示器可配置为提供流率检测设备的状态或操作的可视指示。在替换配置中，除提供可视指示之外或者代替

提供可视指示，流率检测设备 400 能够向辅助电子设备 402 传递可视指示。在至少一些配置中，流率检测设备 400 可适配为且可配置为向具有可视指示器或显示器 432 的辅助电子设备 402 传送显示指令。在可视指示器信息被传送或传递到辅助电子设备 402 的情况下，辅助电子设备显示器 432 然后显示状态或操作的可视指示。

[0047] 另外或替换地，流率检测设备 400 能够被配置为包括被适配为在流率检测设备在使用中时向用户提供可听信息的可听指示器。在替换配置中，除提供可听指示之外或者代替提供可听指示，流率检测设备 400 能够向辅助电子设备 402 传递可听指示。如本领域技术人员将理解的是，可听指示器对于视力受损的用户来说可能特别有用。类似地，还能够提供触觉显示器。

[0048] 流率检测设备可适配为且可配置为与诸如蜂窝电话或智能电话之类的具有通信功能的电子设备通信。如图 4A-G 中所示，流率检测设备 400 具有可配置为例如围绕辅助电子设备 402 的部分的外壳 404。如所图示的，外壳 404 具有下表面 408、侧壁 409，并限定被配置为接纳辅助电子设备 402 的开口，其中该开口具有内壁 406。为了便于说明，外壳的形状因数已被图示为矩形，但是如本领域技术人员将理解的是，将优化特定外壳的形状因数，来与辅助电子设备 402 (例如，Apple® iPhone、RIM Blackberry® 等等) 的形状因数进行交互和 / 或通信，并且，在不背离本公开的范围的情况下，能够使用各式各样的形状因数和横截面形状(例如正方形、矩形、椭圆等等)。另外，虽然没有描绘，接合辅助电子设备 402 的实施例中的任何实施例的外壳能够被配置为与辅助电子设备的形状因数邻接，而不包围辅助电子设备的形状因数。替换地，外壳能够接合辅助电子设备的后表面、包围电子设备的底部、或接合辅助电子设备的前表面。

[0049] 在其他配置中，外壳 404 能够被配置为在接近于或邻近于扬声器 410 或摄像机的位置中可移除地接合辅助电子设备。外壳 404 能够进一步可配置为接合各式各样的辅助电子设备配置。

[0050] 指示器向用户提供关于操作状态的信息，并在某些配置中能够用于与用户通信以改善与流率检测设备的用户交互。

[0051] 还能够提供咬嘴 440，如图 4A-B 中所示。流率检测设备与具有麦克风 410 的电子设备 402 进行通信。流率检测设备具有咬嘴 440，咬嘴 440 也可配置为使得过滤器 442 能够位于咬嘴与辅助电子设备的麦克风 410 之间。例如，如所图示的，麦克风位于辅助电子设备的上表面上，并且咬嘴被定位为使得病人在咬嘴上的吸气或呼气将由于咬嘴与麦克风的接近而导致声音被传递到麦克风。如将理解的，任何适当的材料能够被用作过滤器。典型地，过滤器可配置为在使用期间防止颗粒物质(例如花粉)进入呼吸系统。流率检测设备包括诸如可移除的电源 450 之类的电源。

[0052] 能够整体地形成咬嘴，使得其由单件形成或者被形成为使得其在被形成时具有单一操作。在至少一些配置中，咬嘴能够是装铰链的 444 或可弯曲的，使得当流率检测设备 400 未与辅助电子设备连接或通信时，咬嘴可沿着装铰链的段旋转，以实现如图 4C 中描绘的流率检测设备的侧视图中所示的较低剖面流率检测设备。

[0053] 如图 5A-G 中所示，咬嘴 540 能够被配置在流率检测设备 500 的底部上。图 5A 图示出从前视图的流率检测设备 500 和电子设备 502。图 5B 图示出从侧视图的流率检测设备 500 和电子设备 502。图 5C 图示出从前视图的具有处于第二折叠位置中的咬嘴 540 的流率

检测设备 500。图 5D 图示出从侧视图的具有向外延伸且准备好以供使用的咬嘴 540 的流率检测设备 500。图 5E 图示出从底视图的具有向外延伸且准备好以供使用的咬嘴 540 的流率检测设备 500。图 5F 图示出从顶视图的具有向外延伸且准备好以供使用的咬嘴 540 的流率检测设备 500。图 5G 图示出从高视角的具有向外延伸且准备好以供使用的咬嘴 540 的流率检测设备 500。

[0054] 流率检测设备 500 具有可配置为例如围绕辅助电子设备 502 的部分的外壳 504。如所图示的，外壳 504 具有下表面 508、侧壁 509，并限定被配置为接纳辅助电子设备的开口，其中该开口具有内壁 506。如同其他配置那样，外壳 504 能够被配置为在接近于或邻近于扬声器 510 的位置中可移除地接合辅助电子设备。如本配置中所图示的，扬声器位于辅助电子设备的底侧上。外壳 504 能够进一步可配置为接合各式各样的辅助电子设备配置。另外，提供了开关按钮 520、可选可视指示器 530 和电源 550。咬嘴 540 位于外壳 504 的下表面 508 上。咬嘴能够是可移除的和 / 或装铰接的，以允许咬嘴在未使用时或在处于储存条件时靠着外壳 504 而平坦地或基本上平坦地定位。咬嘴 540 能够从外壳延伸或旋转远离外壳，以提供从咬嘴的末端远离外壳的间隙。

[0055] 如本领域技术人员将理解的是，因为电容式麦克风依赖于声波的力来使前板膜片振动以拾取声音，所以风（自然风或人类生成的元音爆破音）无意地推动膜片是有可能的。在最坏情况场景中，前膜板能够由强风推动，使得其转变为后板。结果，膜片不能再振动，并且未从麦克风获取音频信号。该现象被称作爆破音或爆出。

[0056] 咬嘴能够进一步可配置为提供形成套件的一部分的可移除的和 / 或可随意处理的单元。如图 5 中所示，还能够提供整体地形成的或可移除的挡风屏 560。替换地，挡风屏还能够是可移除和 / 或可随意处理的，作为另一个套件组件。

[0057] 如在图 5 中进一步图示的，流率检测设备可配置为接合诸如智能电话 208 之类的便携式电子设备。流率检测设备能够连接到或接合便携式电子设备，或能够与便携式电子设备无线通信。与便携式电子设备结合的流率检测设备能够进一步被配置或编程为执行对探头的麦克风膜片的振动分析，并在流率检测设备上、在便携式电子设备上或者在经由通信网络与流率检测设备通信的计算设备上显示结果。

[0058] 图 6-6D 图示出流率检测设备 600 的替换实施例，其被适配为且被配置为测量来自病人的吸气和 / 或呼气流，其中在流率检测设备外壳 604 上提供麦克风 610。还能够提供电源按钮 620 和可视指示器 630。如这里所图示的，能够代替（如上所图示的）咬嘴来提供声传感器 612。流率检测设备 600 可配置为将所检测到的呼吸相关值传递到诸如蜂窝电话之类的辅助电子设备。替换地，流率检测设备能够被配置为分析呼吸相关值，并且然后向辅助电子设备传递所分析的信息。

[0059] 另外，能够经由网络向能够执行对探头的麦克风膜片的振动分析的中央位置传送来自膜片的数据，然后能够通过网络将结果传送回到用户。在至少一些配置中，网络能够从病人收集关于一个或多个读数的信息，并将该信息传送到另一个位置（例如，传送到保健提供者或者在读数指示危险的读数的情况下传送到紧急服务），或者，能够使网络对于数据管理系统中的用户来说可用。

[0060] 图 7A-G 图示出可配置为与提供摄像机 711 或能够捕捉图像的任何其他适当的设备的辅助电子设备 702 通信的流率检测设备 700。图 7A 图示出从前视图的流率检测设备

700 和电子设备 702。图 7B 图示出从侧视图的流率检测设备 700 和电子设备 702。图 7C 图示出从前视图的具有处于第二折叠位置中的咬嘴 740 的流率检测设备 700。图 7D 图示出从侧视图的具有向外延伸且准备好以供使用的咬嘴 740 的流率检测设备 700。图 7E 图示出从底视图的具有向外延伸且准备好以供使用的咬嘴 740 的流率检测设备 700。图 7F 图示出从顶视图的具有向外延伸且准备好以供使用的咬嘴 740 的流率检测设备 700。图 7E 图示出从高视角的具有向外延伸且准备好以供使用的咬嘴 740 的流率检测设备 700。

[0061] 能够在流率检测设备 700 上提供处理器，以便例如控制流率检测设备的操作、与辅助电子设备 702 的通信以及如将期望的此类其他过程。

[0062] 流率检测设备 700 具有由开关按钮 720 促动的电源(诸如可移除的电源 750)。电源包括任何适当的电源，其包括诸如锂电池、镍镉电池等等的可移除的电源。能够在流率检测设备 700 上提供诸如 LED 显示器之类的可选可视指示器 730，其中可视指示器可配置为提供流率检测设备的状态或操作的可视指示。在至少一些配置中，流率检测设备 700 可适配为且可配置为向具有可视指示器或显示器 732 的辅助电子设备传送显示指令。在可视指示器信息被传送或传递到辅助电子设备的情况下，辅助电子设备显示器 732 然后显示状态或操作的可视指示。另外或替换地，还能够提供可听指示器，其在流率检测设备在使用中时向用户提供可听信息。可听指示器对于视力受损的用户来说可能特别有用。类似地，还能够提供触觉显示器。

[0063] 流率检测设备可适配为且可配置为与诸如蜂窝电话或智能电话之类的具有通信功能的电子设备通信。如图 7A-G 中所示，流率检测设备 700 具有可配置为例如围绕辅助电子设备 702 的部分的外壳 704。如所图示的，外壳 704 具有下表面 708、侧壁 709，并限定被配置为接纳辅助电子设备的开口，其中该开口具有内壁 706。为了便于说明，外壳的形状因数已被图示为矩形，但是如本领域技术人员将理解的是，将优化特定外壳的形状因数，来与辅助电子设备 402 (例如，Apple® iPhone、RIM Blackberry® 等等)的形状因数进行交互，并且，在不背离本公开的范围的情况下，能够使用各式各样的形状因数和横截面形状(例如正方形、矩形、椭圆等等)。另外，虽然没有描绘，接合辅助电子设备的实施例中的任何实施例的外壳能够被配置为与辅助电子设备的形状因数邻接，而不包围辅助电子设备的形状因数。

[0064] 在其他配置中，外壳 704 能够被配置为在接近于或邻近于摄像机 711 的位置中可移除地接合辅助电子设备 702，使得摄像机能够例如对用户吹到流率检测设备 700 的咬嘴中的呼吸的次数、持续时间和质量进行计数。外壳 704 能够进一步可配置为接合考虑例如摄像机的定位的各式各样的辅助电子设备配置。

[0065] 指示器向用户提供关于操作状态的信息，并在某些配置中能够用于与用户通信以改善与流率检测设备的用户交互。

[0066] 还能够提供咬嘴 740，如图 7A-B 中所示。流率检测设备与具有摄像机 710 的电子设备 702 进行通信。流率检测设备具有咬嘴 740，咬嘴 740 也可配置为使得过滤器 742 能够位于咬嘴与辅助电子设备的麦克风 710 之间。例如，如所图示的，麦克风位于辅助电子设备的上表面上，并且咬嘴被定位为使得病人在咬嘴上的吸气或呼气将由于咬嘴与麦克风的接近而导致声音被传递到麦克风。如将理解的，任何适当的材料能够被用作过滤器。典型地，过滤器可配置为在使用期间防止颗粒物质(例如花粉)进入呼吸系统。流率检测设备包

括诸如可移除的电源 750 之类的电源。

[0067] 能够整体地形成咬嘴，使得其由单件形成或者被形成为使得其在被形成时具有单一操作。在至少一些配置中，咬嘴能够是装铰链的 744 或可弯曲的，使得当流率检测设备 700 未与辅助电子设备连接或通信时，咬嘴可沿着装铰接的段旋转，以实现如图 7C 中描绘的流率检测设备的侧视图中所示的较低剖面流率检测设备。由摄像机进行的评定能够由任何适当的技术使用。

[0068] 转向图 8，描绘了设备 800，其具有可配置为配合在病人的嘴内的咬嘴 840 并包括咬合翼片 842。设备 800 可适配为且可配置为邻近于辅助电子设备摄像机 812 来定位自旋管或轮 844。设备 800 具有附接到例如电话 802 的外壳 804，允许摄像机接近地查看连接在该设备的外壳 804 内的涡轮管 844 的旋转。自旋管或轮 844 被构造为当空气在该管的轴上经过时允许该轮或管自由地旋转。自旋轮和外壳之间的连接能够借助轴，或者该轮或管自身能够具有对其来说构成整体所必需的支点或杆，允许其被插入到外壳中，而且允许该轮或管的自由旋转。外壳 804 于是将在每端处具有两个开口，并且外壳将本质上看起来好像圆柱体，允许人嘴附接到外壳的一端，并且外壳的另一端将保持打开，允许个人通过外壳自由地呼吸。随着人呼吸，外壳内包含的轮或管将自旋，并且来自电话的摄像机将对旋转的次数进行计数。然后由电话或处理设备使那些旋转相关，以提供人呼吸流的精确测量并且然后计算肺活量测定。然后随时间整合该流，以提供容量的计算。轮自旋的方向将指示呼吸的方向——吸气还是呼气呼吸。作为选项，外壳能够具有咬嘴来改善人嘴与外壳 / 轮组件的密封。摄像机功能能够以所进行的一系列照片拍摄或帧或者视频序列来进行操作，借此能够优化每秒所勾画的帧数来测量旋转次数。

[0069] 其他方面包括一个或多个联网设备。联网设备包括 :存储器、处理器、通信器、显示器、和如此处讨论的用于检测呼气流率的装置。

[0070] 在一些方面中，提供了通信系统。该通信系统包括 :如此处描述的用于检测呼气流率的装置 ;服务器计算机系统 ;服务器计算机系统上的测量模块，用于允许流率测量通过网络从用于测量流率的特性的设备的传输 ;API 引擎、SMS 引擎和电子邮件引擎中的至少一个，API 引擎连接到用于测量流率的特性的至少一个系统以创建关于流率测量的消息并且通过 API 集成网络将该消息传送到具有预定收件人用户名的收件人，SMS 引擎连接到用于测量流率的特性的至少一个系统以创建关于流率测量的 SMS 消息并且通过网络将 SMS 消息传送到具有预定流率测量收件人电话号码的收件人设备，电子邮件引擎连接到用于测量流率的特性的至少一个系统以创建关于流率测量的电子邮件消息并且通过网络将电子邮件消息传送到具有预定流率测量收件人电子邮件地址的流率测量收件人电子邮件。还能够在服务器计算机系统上提供存储模块，用于在用于测量流率的特性的系统的服务器数据库上存储流率测量。此外，用于测量流率的特性的至少一个系统可通过移动电话网络和互联网网络中的至少一个连接到服务器计算机系统，并且流率测量收件人电子设备上的浏览器用于调取服务器计算机系统上的接口。另外，在用于测量流率的特性的系统的数据库中保持多个电子邮件地址，并且可从计算机系统分别地选择少于全部的电子邮件地址，电子邮件消息被传送到具有至少一个所选择的电子邮件地址的至少一个流率测量收件人电子邮件。在一些实例中，用于测量流率的特性的至少一个系统可通过互联网连接到服务器计算机系统，并且流率测量收件人电子设备上的浏览器用于调取服务器计算机系统上的接口。在系

统例如与保健提供者通信的情况下，在用于检测呼气流率的系统的数据库中保持多个用户名，并且可从计算机系统分别地选择少于全部的用户名，消息经由 API 而被传送到至少一个流率测量收件人用户名。流率测量收件人电子设备也能够通过互联网可连接到服务器计算机系统，并且流率测量收件人电子设备上的浏览器用于调取服务器计算机系统上的接口。诸如在电子设备是移动设备的情况下，流率测量收件人电子设备也可以通过蜂窝电话网络连接到服务器计算机系统。另外，系统能够包括服务器计算机系统上的接口，接口可由流率测量收件人移动设备上的应用调取。在一些情况下，SMS 流率测量由流率测量收件人移动设备上的消息应用来接收。其中针对流率测量接收多个 SMS 流率测量，每个 SMS 流率测量由相应流率测量收件人移动设备上的相应消息应用来接收。至少一个 SMS 引擎能够被配置为通过蜂窝电话 SMS 网络从流率测量收件人移动设备接收 SMS 响应，并将 SMS 响应存储在服务器计算机系统上。另外，流率测量收件人电话号码 ID 与 SMS 流率测量一起被传送到 SMS 引擎，并由服务器计算机系统用来将 SMS 流率测量与 SMS 响应相关联。此外，服务器计算机系统能够通过蜂窝电话网络可连接以从流率测量收件人移动设备接收响应。SMS 流率测量还能够包括在流率测量收件人移动设备处可选择的 URL 以从流率测量收件人移动设备向服务器计算机系统进行响应，服务器计算机系统利用 URL 将响应与 SMS 流率测量相关联。在至少一些配置中通信系统能够进一步包括 ：驻留于流率测量收件人移动设备上的可下载的应用，可下载的应用通过蜂窝电话网络将响应和流率测量收件人电话号码 ID 传送到服务器计算机系统，服务器计算机系统利用流率测量收件人电话号码 ID 将响应与 SMS 流率测量相关联。在其他配置中，通信系统能够包括 ：传输模块，与通过蜂窝电话 SMS 网络发送的流率测量并行地，通过除蜂窝电话 SMS 网络外的网络将流率测量传送到流率测量收件人用户计算机系统 ；和 / 或驻留于流率测量收件人主机计算机上的可下载的应用，可下载的应用通过蜂窝电话网络将响应和流率测量收件人电话号码 ID 传送到服务器计算机系统，服务器计算机系统利用流率测量收件人电话号码 ID 将响应与 SMS 流率测量相关联。

[0071] 其他方面包括一个或多个联网装置。网络装置包括 ：存储器、处理器、通信器、显示器、和如此处描述的用于检测呼气流率的装置。

[0072] 在一些方面中，通信系统包括 ：如此处描述的用于检测呼气流率的装置 ；服务器计算机系统 ；服务器计算机系统上的测量模块，用于允许流率测量通过网络从用于测量流率的特性的系统的传输 ；API 引擎、SMS 引擎和电子邮件引擎中的至少一个，API 引擎连接到用于测量流率的特性的至少一个系统以创建关于流率测量的消息并且通过 API 集成网络将该消息传送到具有预定收件人用户名的收件人，SMS 引擎连接到用于测量流率的特性的至少一个系统以创建关于流率测量的 SMS 消息并且通过网络将 SMS 消息传送到具有预定流率测量收件人电话号码的收件人设备，电子邮件引擎连接到用于测量流率的特性的至少一个系统以创建关于流率测量的电子邮件消息并且通过网络将电子邮件消息传送到具有预定流率测量收件人电子邮件地址的流率测量收件人电子邮件。还能够在服务器计算机系统上提供存储模块，用于在用于测量流率的特性的系统的服务器数据库上存储流率测量。此外，用于测量流率的特性的至少一个系统可通过移动电话网络和互联网网络中的至少一个连接到服务器计算机系统，并且流率测量收件人电子设备上的浏览器用于调取服务器计算机系统上的接口。另外，在用于测量流率的特性的系统的数据库中保持多个电子邮件地址，并且可从计算机系统分别地选择少于全部的电子邮件地址，电子邮件消息被传送到具有至

少一个所选择的电子邮件地址的至少一个流率测量收件人电子邮件。在一些实例中，用于测量流率的特性的至少一个系统可通过互联网连接到服务器计算机系统，并且流率测量收件人电子设备上的浏览器用于调取服务器计算机系统上的接口。在系统例如与保健提供者通信的情况下，在用于检测呼气流率的系统的数据库中保持多个用户名，并且可从计算机系统分别地选择少于全部的用户名，消息经由 API 而被传送到至少一个流率测量收件人用户名。流率测量收件人电子设备也能够通过互联网可连接到服务器计算机系统，并且流率测量收件人电子设备上的浏览器用于调取服务器计算机系统上的接口。诸如在电子设备是移动设备的情况下，流率测量收件人电子设备也可以通过蜂窝电话网络连接到服务器计算机系统。另外，系统能够包括服务器计算机系统上的接口，该接口是可由流率测量收件人移动设备上的应用调取。在一些情况下，由流率测量收件人移动设备上的消息应用来接收 SMS 流率测量。其中针对流率测量接收多个 SMS 流率测量，每个 SMS 流率测量由相应流率测量收件人移动设备上的相应消息应用来接收。至少一个 SMS 引擎能够被配置为通过蜂窝电话 SMS 网络从流率测量收件人移动设备接收 SMS 响应，并将 SMS 响应存储在服务器计算机系统上。另外，流率测量收件人电话号码 ID 与 SMS 流率测量一起被传送到 SMS 引擎，并由服务器计算机系统用来将 SMS 流率测量与 SMS 响应相关联。此外，服务器计算机系统能够通过蜂窝电话网络可连接以从流率测量收件人移动设备接收响应。SMS 流率测量也能够包括在流率测量收件人移动设备处可选择的 URL 以从流率测量收件人移动设备向服务器计算机系统进行响应，服务器计算机系统利用 URL 将响应与 SMS 流率测量相关联。在至少一些配置中通信系统能够进一步包括 :驻留于流率测量收件人移动设备上的可下载的应用，该可下载的应用通过蜂窝电话网络将响应和流率测量收件人电话号码 ID 传送到服务器计算机系统，服务器计算机系统利用流率测量收件人电话号码 ID 将响应与 SMS 流率测量相关联。在其他配置中，系统能够包括 :传输模块，与通过蜂窝电话 SMS 网络发送的流率测量并行地，通过除蜂窝电话 SMS 网络外的网络将流率测量传送到流率测量收件人用户计算机系统 ;和 / 或驻留于流率测量收件人主机计算机上的可下载的应用，可下载的应用通过蜂窝电话网络将响应和流率测量收件人电话号码 ID 传送到服务器计算机系统，服务器计算机系统利用流率测量收件人电话号码 ID 将响应与 SMS 流率测量相关联。

[0073] VI. 套件

将使用设备对呼气流率进行测试所需的所有设备、工具、组件、材料和附件捆绑到套件中可以增强设备的可用性和便利性。适当的套件也能够例如包括电子呼气流量测量设备、过滤器、挡风屏、电子设备连接器或适配器、咬嘴、过滤器、电源、可配置为从设备收集信息和 / 或将信息提供给中央数据库或系统的软件程序(apps)、酒精棉签等等。

[0074] VII. 可配置为在计算和网络环境中操作以实现期望的技术效果或变换的系统

图 9 图示出根据本公开的适当系统的组件之间的相互关系。能够从与诸如上面参考图 2 公开的那些电子设备之类的电子设备相关联的传感器获取环境数据 910，或者能够从诸如基于诸如由 GPS 确定的电子设备的位置提供环境数据的网站之类的远程源获得环境数据 910。病人流率数据 912 也由流量传感器来提供。另外，如果期望的话，能够获取用户输入 914 以及诸如位置、高度、温度等等的电子设备数据 916。然后使用位于网络上或电子设备上的数据处理系统 920 来处理信息，以生成哮喘输出 930。然后能够将信息传送回到一个或多个远程位置(诸如内科医师的办公室或其他用户)。另外，输入能够是主动或被动输入。

当用户录入例如关于当前状况、药物等等的信息时，主动输入发生。当系统记录用户采取了诸如使用设备之类的行动时，被动输入发生。

[0075] 系统也能够从辅助测量设备接收数据，诸如来自心率监视器、心音传感器和脉搏血氧定量设备(其感测动脉血流中的氧的饱和度)的数据。另外，系统还能够接收行为数据，诸如关于符合由保健提供者规定的药物方案、符合测试和/或监视方案、符合系统生成的推荐、符合保健提供者推荐等等的数据中的一个或多个。

[0076] 系统能够基于以下各项中的一个或多个来分析特定病人的环境信息：在类似条件下病人的在先历史、具有类似简档或类似历史的其他系统用户的实时结果、以及在先前经历的类似条件下具有类似简档或类似历史的其他系统用户的历史结果。

[0077] 在至少一些配置中，系统基于以下各项中的一个或多个来动态地分析环境信息：在类似条件下病人的在先历史、具有类似简档或类似历史的其他系统用户的实时结果、以及在先前经历的类似条件下具有类似简档或类似历史的其他系统用户的历史结果。动态分析或处理可能受时间的推移和/或电源的存在或不存在的影响。在至少一些配置中，以由系统确定或由用户选择的时间间隔刷新和/或分析数据。在某些配置中，例如在感测到行进的检测的情况下，分析和处理可以以较大速率发生，或者，在不存在被检测到的显著移动的情况下，分析和处理可以以较小速率发生。

[0078] 系统可配置为向病人发送对呼吸发作的潜在性的警报、针对环境中的改变做准备的建议、关于对特定地理学中的当前或预测的将来状况作出的反应的历史信息等等。另外，系统能够向用户的保健提供者提供附加的数据、警报或报告，以使保健提供者能够监视状况并在治疗方案中提出改变，如果期望的话。在某些配置中，系统可配置为报警对用户的位置的紧急服务以及呼吸事件的性质。

[0079] 在某些配置中，能够在机载环境传感器的操作期间连续地接收环境数据。例如，能够由病人的身体上或附近的传感器来收集环境传感器数据，该传感器可以包括湿度传感器、温度传感器、高度传感器、GPS传感器和空中微粒传感器、或其他适当的传感器。传感器能够与设备或与电子设备相关联。在一些实例中，环境数据能够被预处理以生成环境哮喘触发的指示。还能够将该信息与该病人的历史数据相比较。在其他配置中，可从诸如www.pollen.com之类的外部源得到环境信息。在某些配置中，可基于GPS位置确定高度。能够检查其他环境数据，例如包括空气污染数据、空中颗粒物质数据、空中刺激物数据、周围温度、温度改变和湿度数据。

[0080] 其他方面包括一个或多个联网设备。联网设备包括：存储器、处理器、通信器、显示器、和如此处讨论的用于检测呼气流率的装置。

[0081] 通信系统可配置为具有API引擎、SMS引擎和电子邮件引擎中的至少一个，API引擎连接到至少一个电子设备来创建关于呼吸发作数据的消息并且通过API集成网络将该消息传送到具有预定收件人用户名的收件人，SMS引擎连接到系统来创建关于呼吸发作数据的SMS消息并且通过网络将SMS消息传送到具有预定呼吸发作数据收件人电话号码的收件人设备，电子邮件引擎连接到系统来创建关于呼吸发作数据的电子邮件消息并且通过网络将电子邮件消息传送到收件人电子邮件。

[0082] 还能够在服务器计算机系统上提供存储模块，用于在用于测量流率的特性的系统的服务器数据库上存储呼吸发作数据。此外，系统可通过移动电话网络和互联网网络中的

至少一个连接到服务器计算机系统，并且收件人电子设备上的浏览器能够用于调取服务器计算机系统上的接口。另外，在系统数据库中保持多个电子邮件地址，并且可从计算机系统分别地选择少于全部的所有电子邮件地址，电子邮件消息被传送到具有至少一个所选择的电子邮件地址的至少一个数据收件人电子邮件。在一些实例中，系统可通过互联网连接到服务器计算机系统，并且电子设备上的浏览器用于调取服务器计算机系统上的接口。在系统数据库中保持多个用户名，并且可从计算机系统分别地选择少于全部的用户名，使消息能够经由 API 而被传送到至少一个呼吸发作数据收件人用户名。

[0083] 其他方面包括一个或多个联网装置。联网装置包括：存储器、处理器、通信器、显示器、和如此处描述的用于接收用户输入率的装置。

[0084] VIII. 示例

示例 1：第一用户使用峰值流率设备，该峰值流率设备从该用户获取流率数据，并将信息存储在手持设备上。另外，用户也能够将可能是相关的或期望在采取峰值流量测量时记录的附加数据录入到手持设备上的程序中，例如包括：用户感觉如何、用户是否有压力（以及压力水平）、用户是否头痛等等。例如能够通过提供在白天的各个时间处显示的（一个或多个）周期性问题或经由更全面的病人数据输入和 / 或询问过程来实现附加数据的这种输入。信息也能够包括诸如 GPS 标签之类的地理定位数据、日期和时间信息以及周围条件数据。周围条件数据包括但不限于天气条件、温度、污染、花粉计数、空气质量等等。经由网络将第一用户的状态上载到服务器。未曾必要地提供峰值流量数据的第二用户或随后用户中的一个或多个报告已经存在条件改变，并且（一个或多个）第二或随后用户报告中的一个或多个经由网络而被上载到服务器。然后对下述内容进行评定：第一和第二用户两者都位于由系统针对该区域设定的地理区域（例如 0.5 英里半径、1 英里半径、1.5 英里半径、2 英里半径、2.5 英里半径、3.0 英里半径、3.5 英里半径、4.0 英里半径、4.5 英里半径、5.0 英里半径等等）内。在至少一些配置中，能够（相对于地理评定同时地或顺序地）进行另一评定，来确定是否存在图案。一旦在第一用户与一个或多个第二或随后用户中的一个或多个之间建立地理链路，就执行用户简档数据和 / 或趋势数据的比较，以识别位于（一个或多个）相同地理区中的具有类似简档和 / 或趋势数据的其他用户。另外，能够对由用户对类似条件和 / 或类似地理学的历史响应和 / 或历史趋势进行评定。然后生成警报，劝告那些用户以及网络上的任何其他用户要意识到存在可能使他们患有发作的条件。警报也能够被配置为提供针对由用户做出的行动的特定建议。警报能够经由电子邮件、文本消息、弹出菜单或由用户选择的任何其他机制而被发送到用户。

[0085] 示例 2：第一用户（例如，通过录入文本、对周期性询问进行响应或与采取生物学测量的设备对接）向手持设备报告已经存在条件改变，例如向高风险的条件改变。该报告包括诸如 GPS 标签之类的地理定位数据。经由网络将第一用户的状态上载到服务器。第二用户报告已经存在条件改变，并且经由网络将第二用户报告上载到服务器。然后对下述内容进行评定：第一和第二用户两者都位于由系统针对该区域设定的地理区域（例如 0.5 英里半径、1 英里半径、1.5 英里半径、2 英里半径、2.5 英里半径、3.0 英里半径、3.5 英里半径、4.0 英里半径、4.5 英里半径、5.0 英里半径等等）内。一旦在第一用户与第二用户之间建立地理链路，就执行用户简档数据的比较以识别位于相同地理区中的具有类似简档的其他用户。另外，能够对由用户对类似条件的历史响应进行评定。然后生成警报，劝告用户要意识

到存在可能使他们患有发作的条件。警报也能够被配置为提供针对由用户做出的行动的特定建议。警报能够经由电子邮件、文本消息、弹出菜单或由用户选择的任何其他机制而被发送到用户。

[0086] 示例 3 :第一用户(例如,通过录入文本和 / 或与采取生物学测量的设备对接和 / 或对周期性询问进行响应)向手持设备报告已经存在条件改变,例如向高风险的条件改变。该报告包括诸如 GPS 标签之类的地理定位数据。经由网络将第一用户的状态上载到服务器。第二用户报告已经存在条件改变,并且经由网络将第二用户报告上载到服务器。对下述内容进行评定 :这两个用户都位于由系统设定的地理区域(例如,0.5 英里半径、1 英里半径、1.5 英里半径、2 英里半径、2.5 英里半径等等)内。系统确定这两个用户都位于作为森林的地理区域内。对地理区域中的当前环境触发进行评定。对网络中的基于 GPS 定位、接近该区域的用户进行评定。然后生成警报,劝告用户要意识到在他们正在接近的区域中存在可能使他们患有发作的条件。警报也能够被配置为提供针对由用户做出的行动的特定建议,或能够具有用于用户的个性化预报的形式。警报能够经由电子邮件、文本消息、弹出菜单或由用户选择的任何其他机制而被发送到用户。

[0087] 在某些配置中,警报能够将条件与由用户经历的在先偶发事件相比较,以向用户给出附加上下文。

[0088] 示例 4 :第一用户的手持电子设备经由通信网络将 GPS 位置坐标发送到网络。基于位置,调取关于包括但不限于局部天气、空气质量和花粉计数的环境条件的数据。开发出经历呼吸发作的预测概率的报告,并且经由通信网络将其提供给用户。报告能够基于用户的历史、用户的简档、基于其他用户的历史经历问题的概率或其组合。

[0089] 在检测到新位置时,系统能够询问用户来确定改变是暂时的(例如假期)还是永久的(例如重新安置)。另外,对于暂时的改变,系统能够询问时间的长度,并基于已知或历史数据来提供关于影响呼吸机能的环境因素的信息。

[0090] 示例 5 :第一用户的手持电子设备经由通信网络将 GPS 位置坐标发送到网络。系统保持跟踪包括地理位置的用户历史。当用户永久地或半永久地重新安置到新的地理区域时,系统通过网络将药物提醒发送到手持电子设备。如果用户重新安置到药物的改变可能适当的地理位置,则能够递送通告,其标识当前药物及其最优应用、环境因素的改变以及下述建议 :用户访问他的或她的保健执业者来确保由于情境的改变而使药物或治疗方案的改变不适当。

[0091] 示例 6 :第一用户将与救助吸入剂或其他介入过程的用户相关联的信息提供到经由电子设备可访问的程序中。设备将与 GPS 数据一起的数据和时间戳与来自设备或第三方源的环境信息相关联。分析信息以识别病人的潜在触发。当系统检测到用户处于接近与较早偶发事件相关联的那些偶发事件的条件时,生成警报以促进病人采取规避行为步骤以避免或最小化呼吸发作的可能性的能力。

[0092] 示例 7 :用于用户的 GPS 数据指示用户正在以 60 MPH 的速率行进且正在接近于具有高花粉计数的区域。系统可适配为考虑关于针对所规划的目的地(或通过用户输入而提供的目的地)的位置改变率的数据,并提供向经历呼吸发作的可能性的用户的动态投射。能够以根据位置、海拔的改变率确定的速率或频率或者仅仅以时间推移来分析和刷新信息。

[0093] 尽管此处已经示出和描述了本发明的优选的实施例,但对本领域技术人员来说将

显而易见的是，仅仅作为示例来提供这样的实施例。在不背离本发明的情况下，本领域技术人员现在将想到许多的变化、改变和替代。应当理解，可以在实践本发明时采用对此处描述的本发明的实施例的各种替换。意图是，下面的权利要求限定本发明的范围，并且由此覆盖这些权利要求及其等同物的范围内的方法和结构。

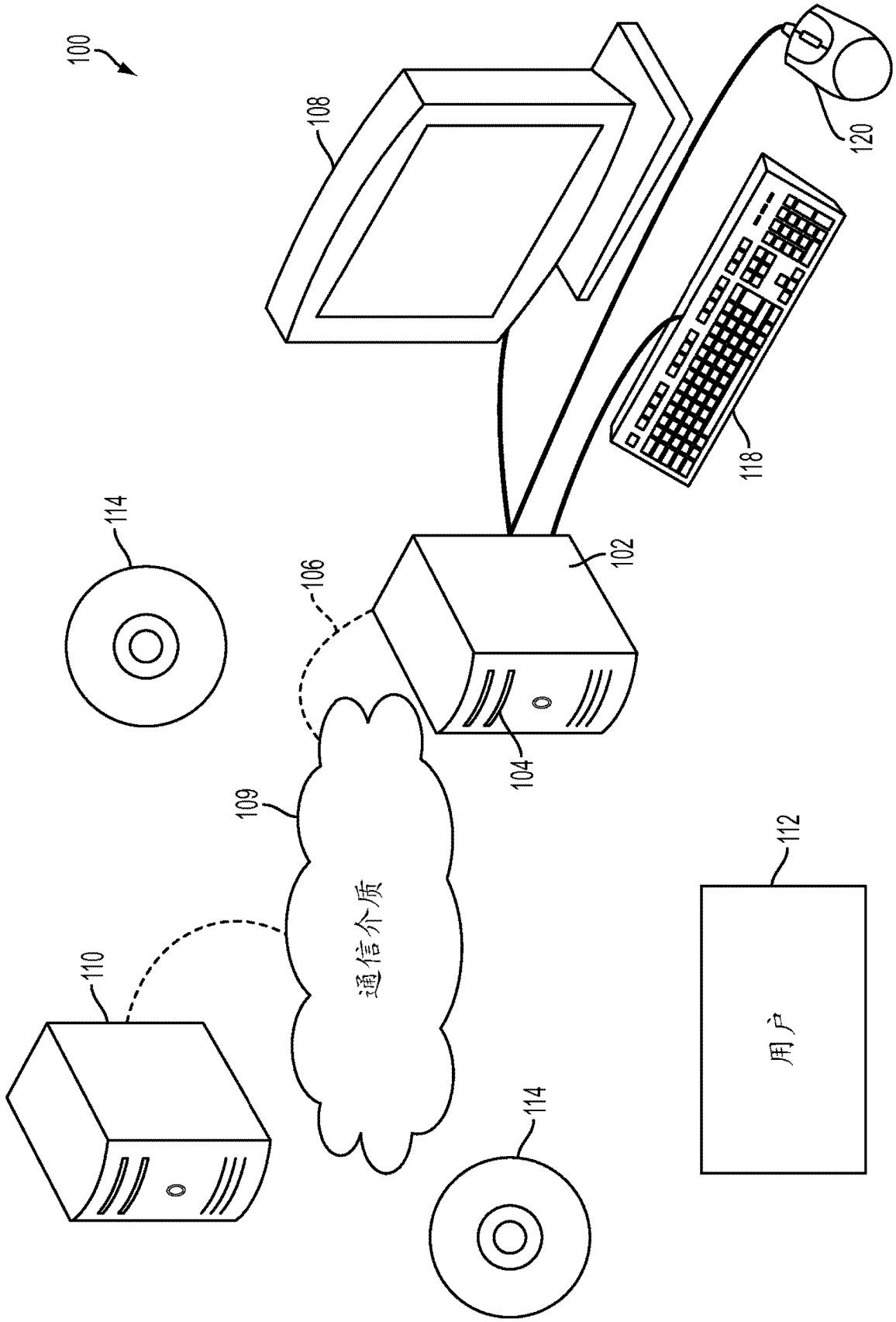


图 1A

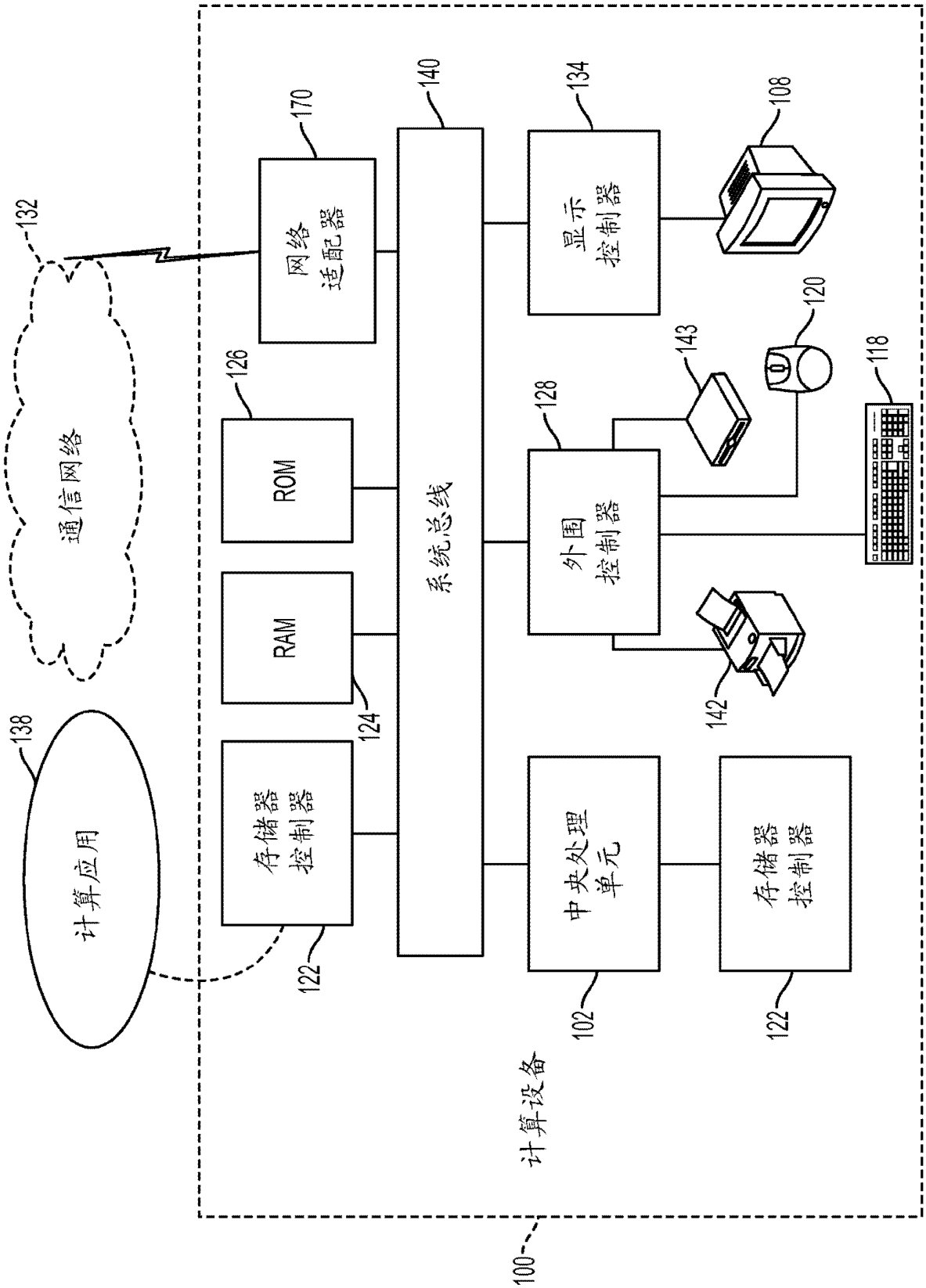

计算设备
100
处理单元
102
系统总线
140
存储器控制器
122
存储器
RAM
124
ROM
126
外围控制器
128
显示控制器
134
网络适配器
170
通信网络
132
计算应用
138
中央处理单元
存储器控制器
122
显示
108
外围
120
118
143
142

图 1B

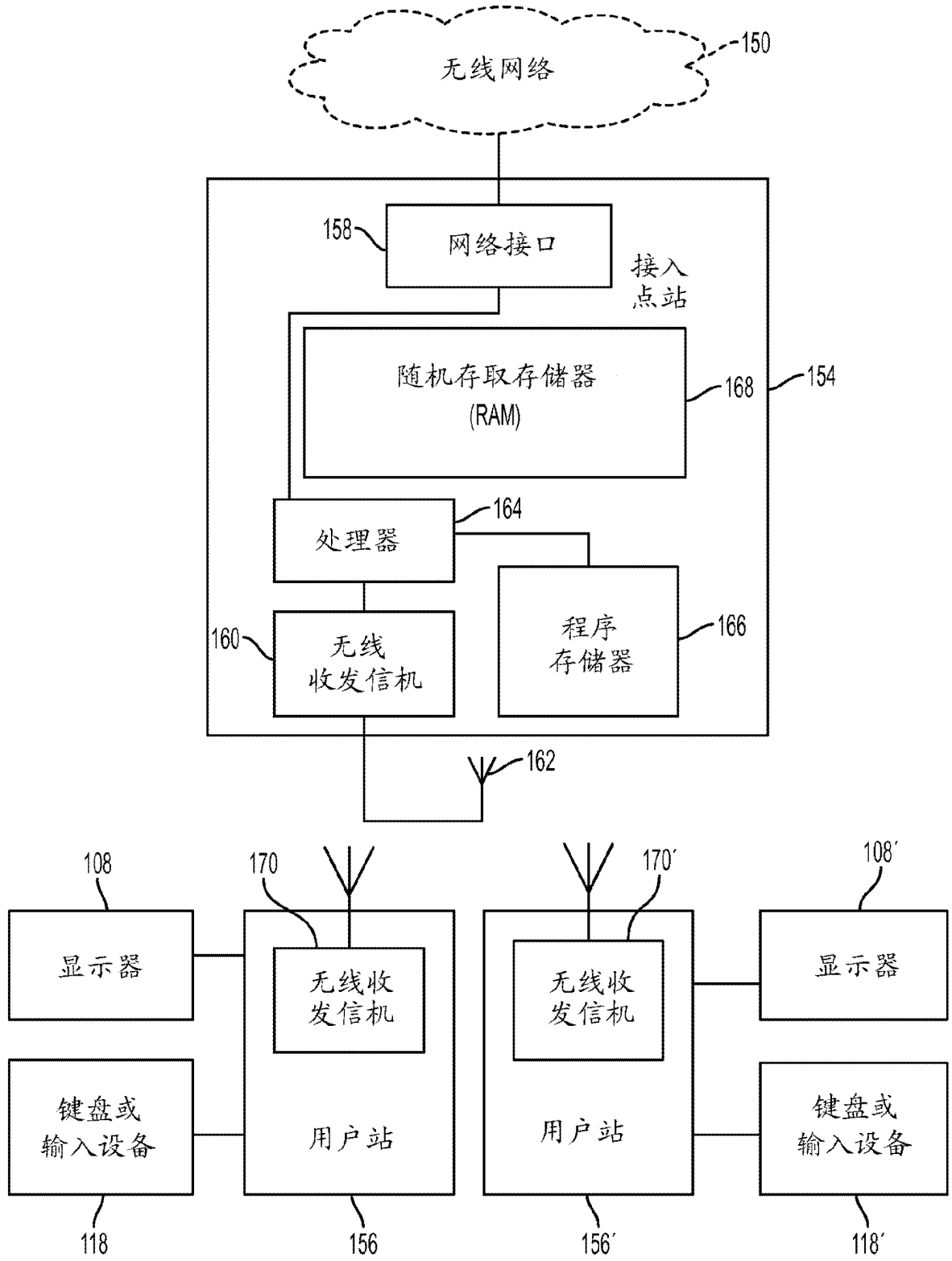

无线网络
150
158
网络接口
接入
点站
随机存取存储器
(RAM)
168
154
处理器
164
160
无线
收发信机
程序
存储器
166
162
108
显示器
键盘或
输入设备
118
170
无线收
发信机
用户站
156
170′
无线收
发信机
用户站
156′
108′
显示器
键盘或
输入设备
118′

图 1C

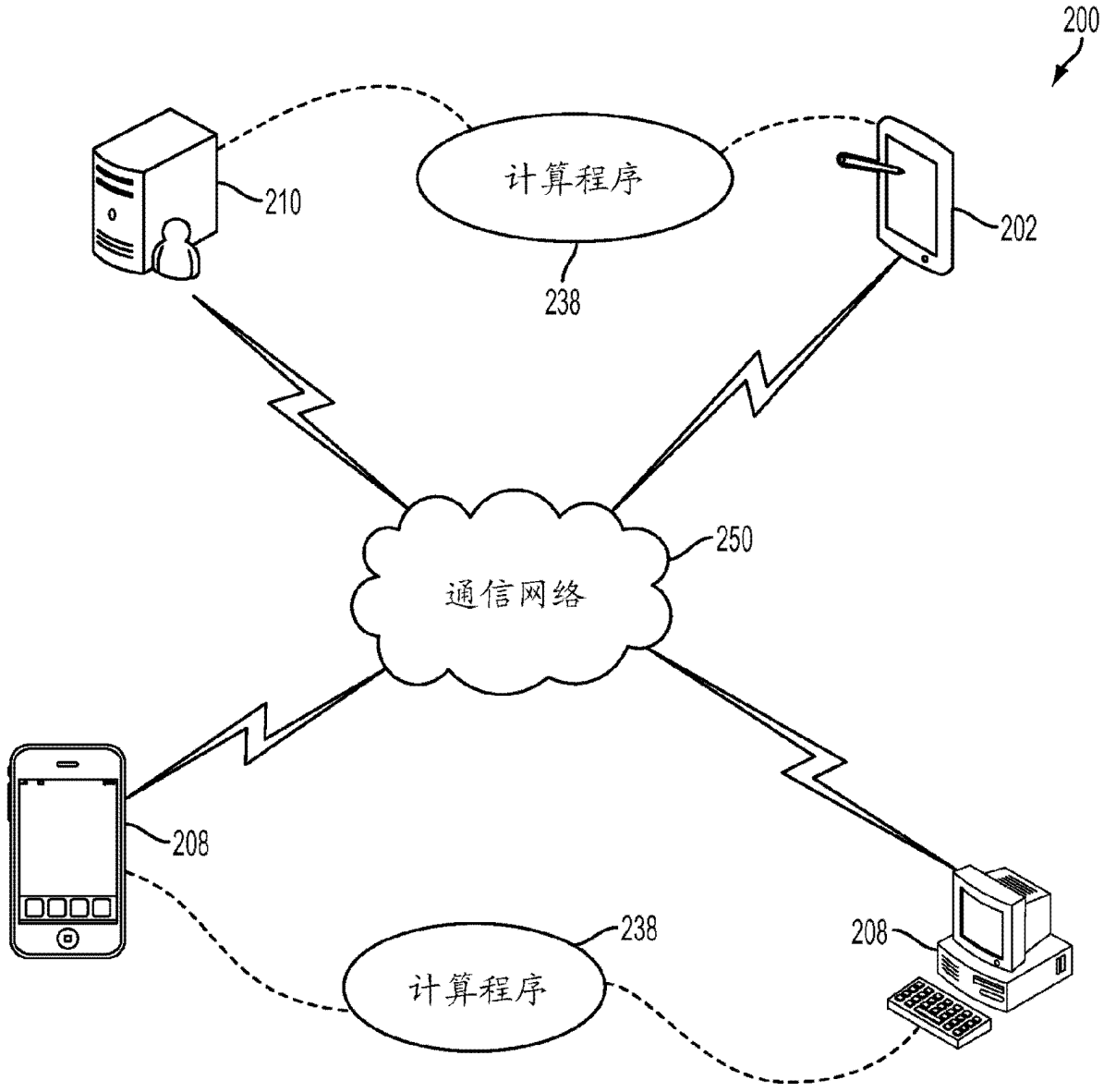


图 2

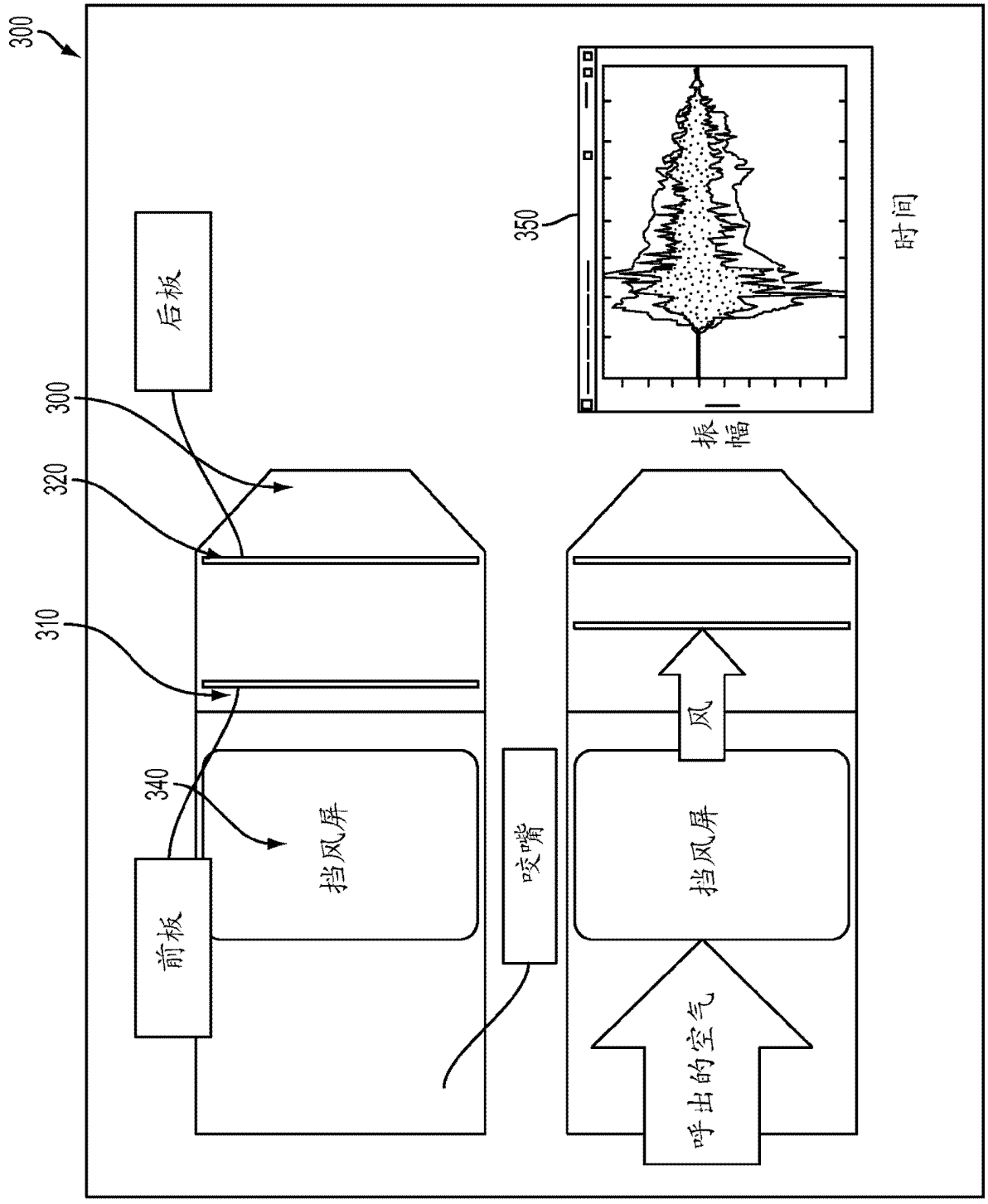


图 3

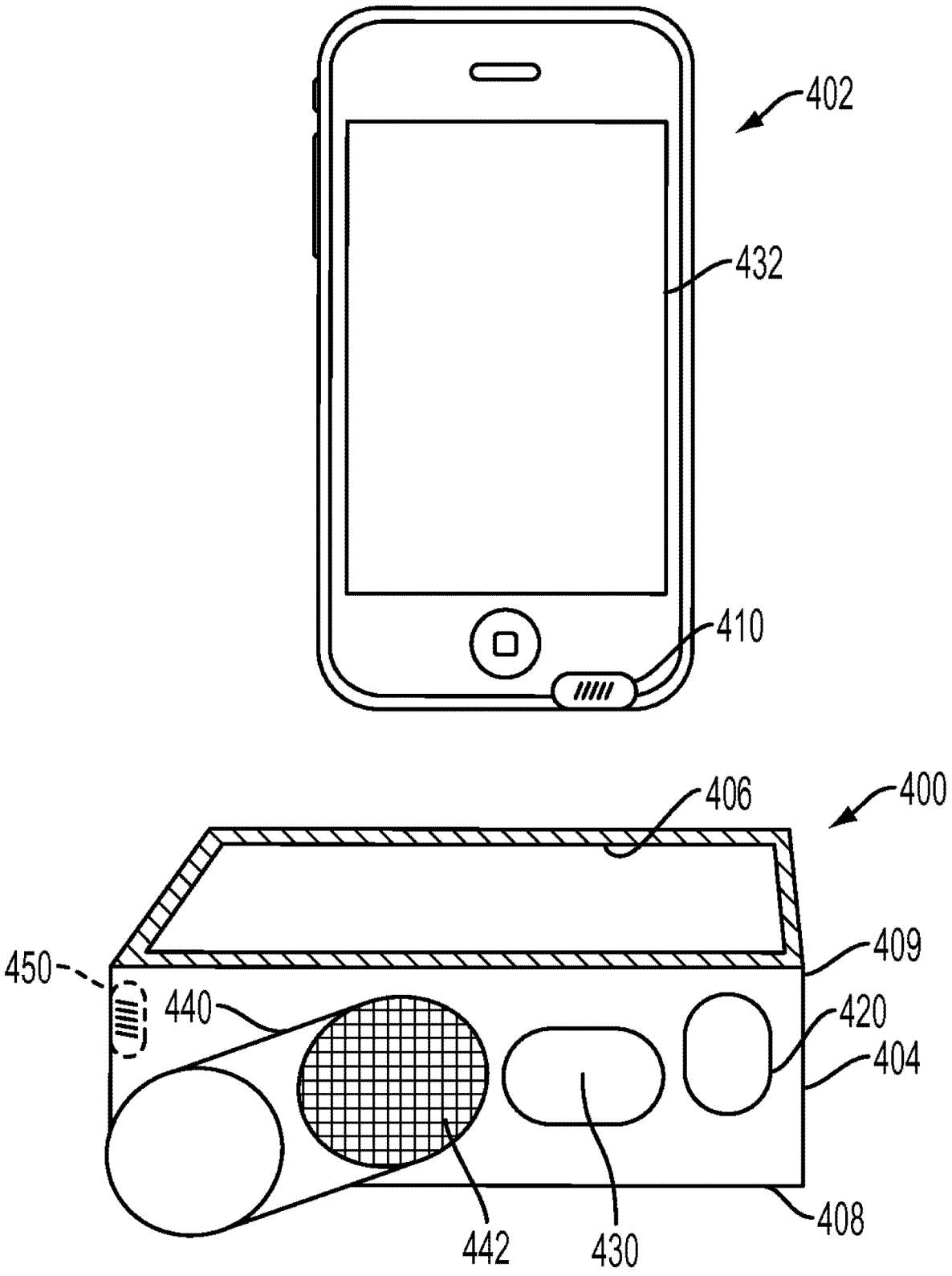


图 4A

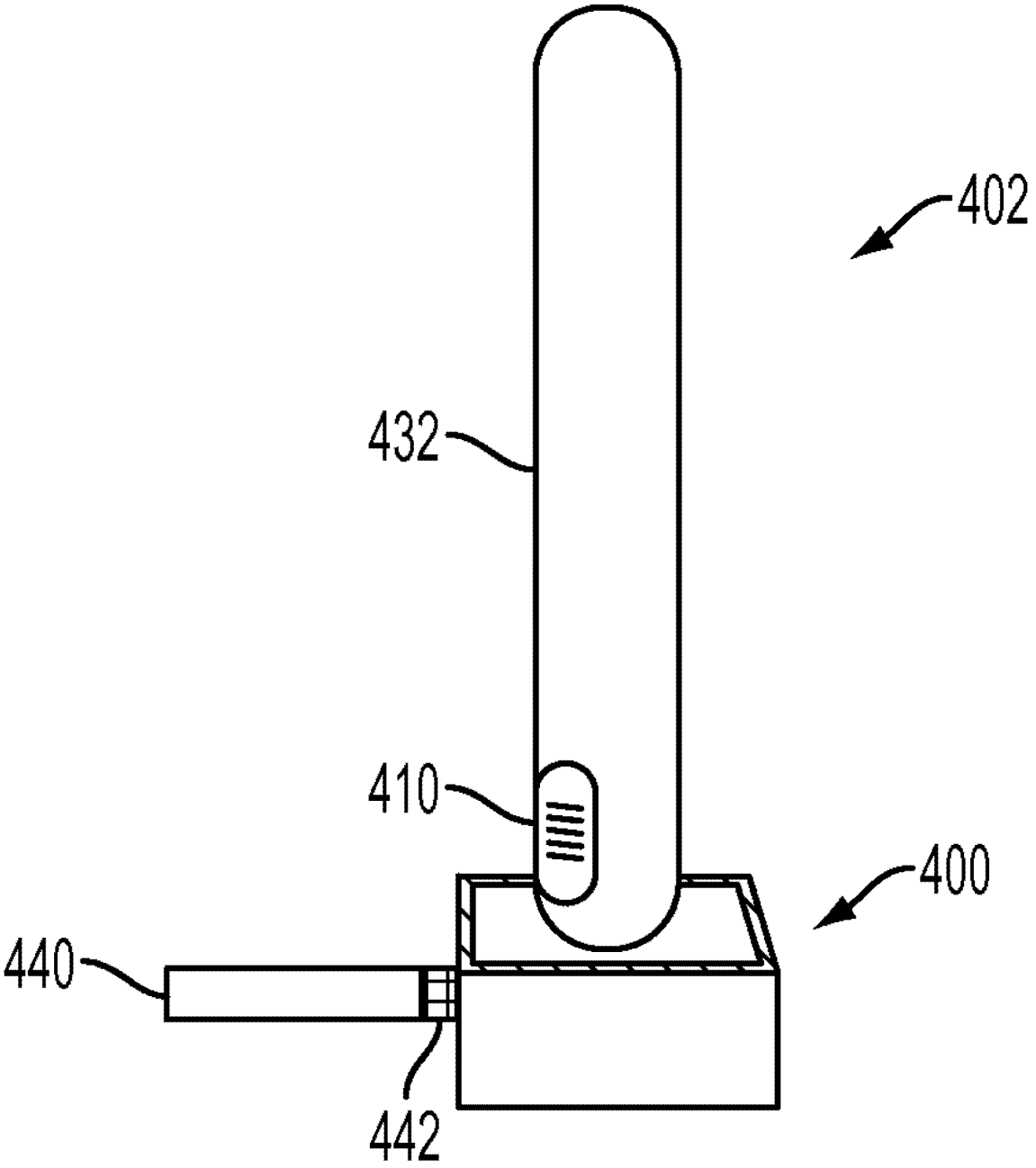


图 4B

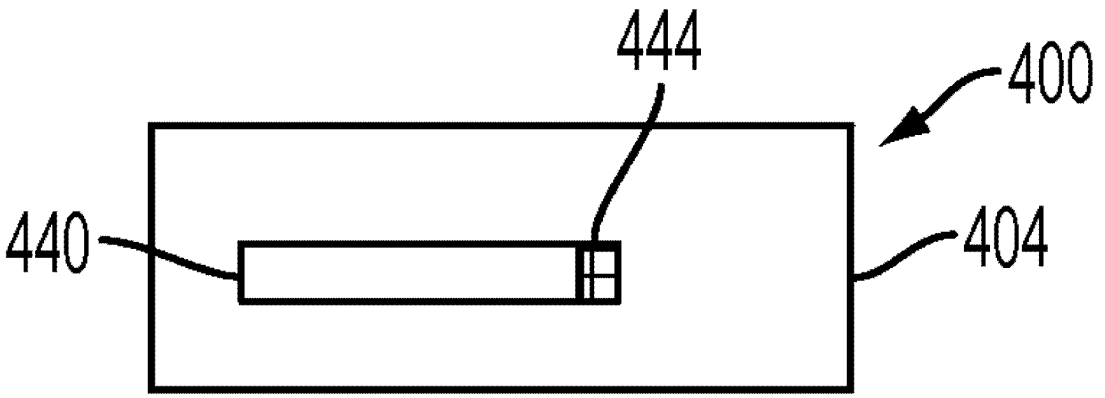


图 4C

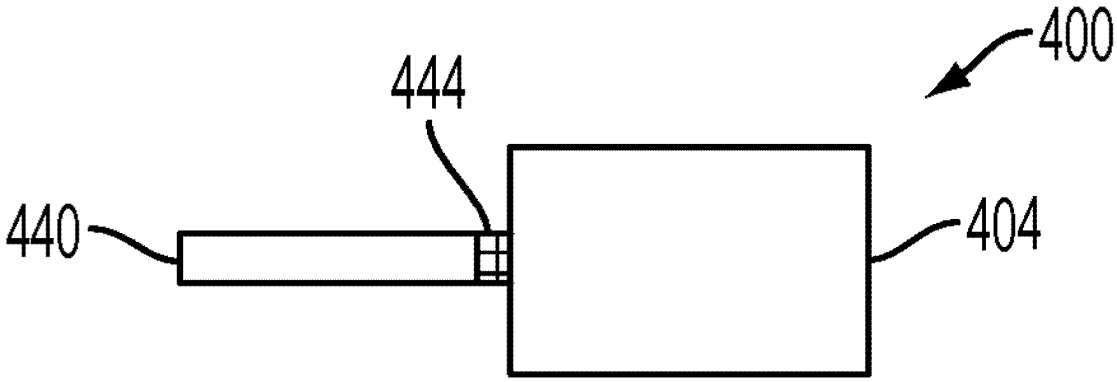


图 4D

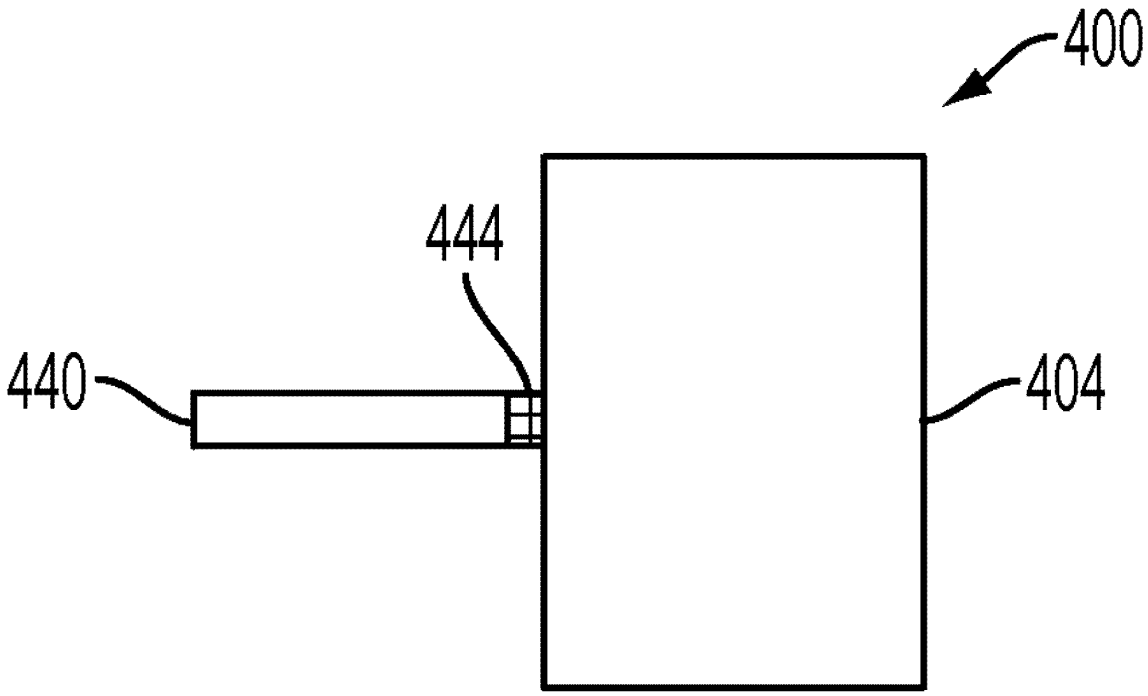


图 4E

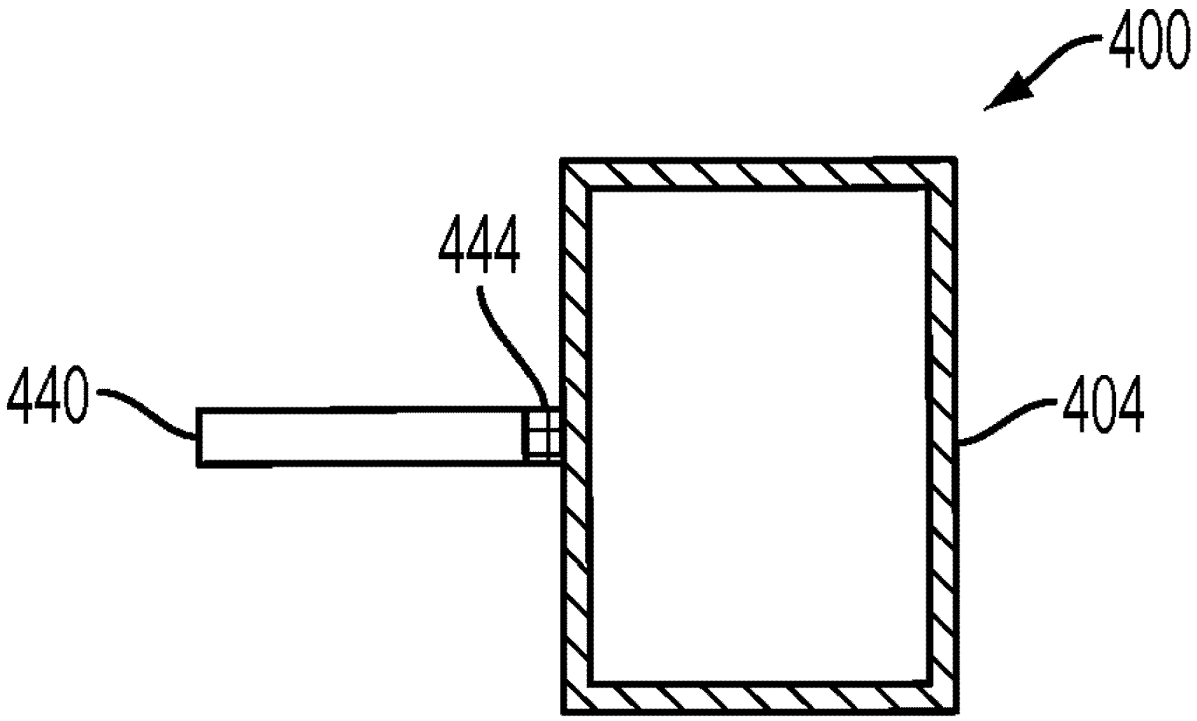


图 4F

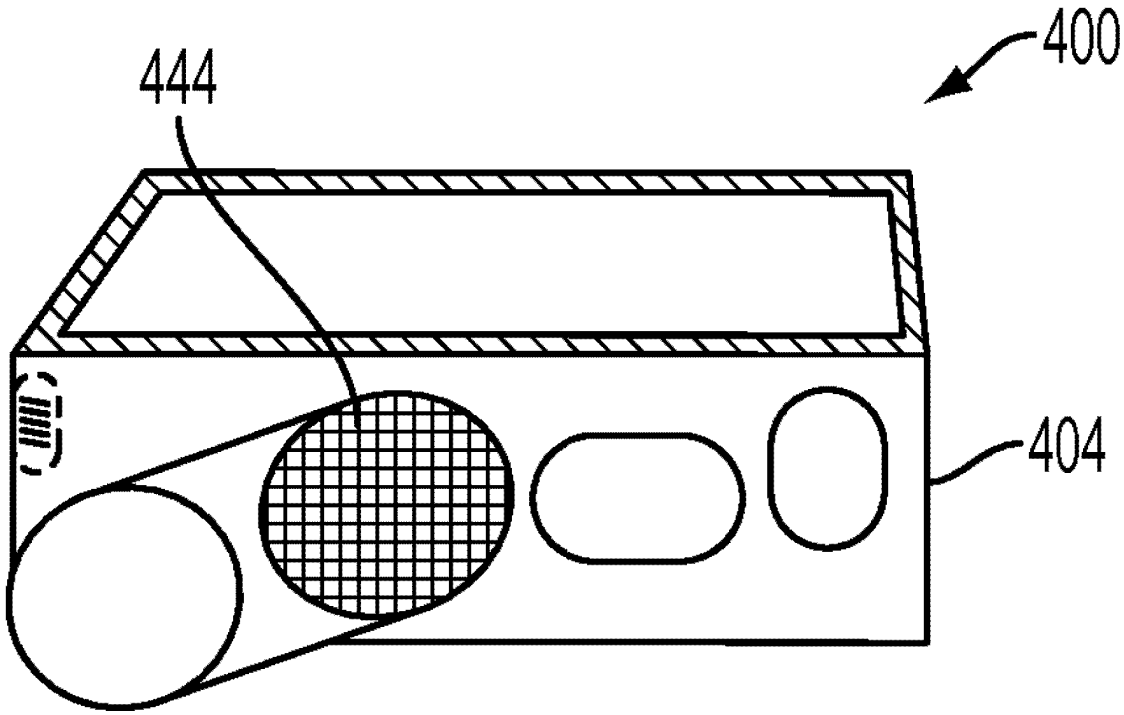


图 4G

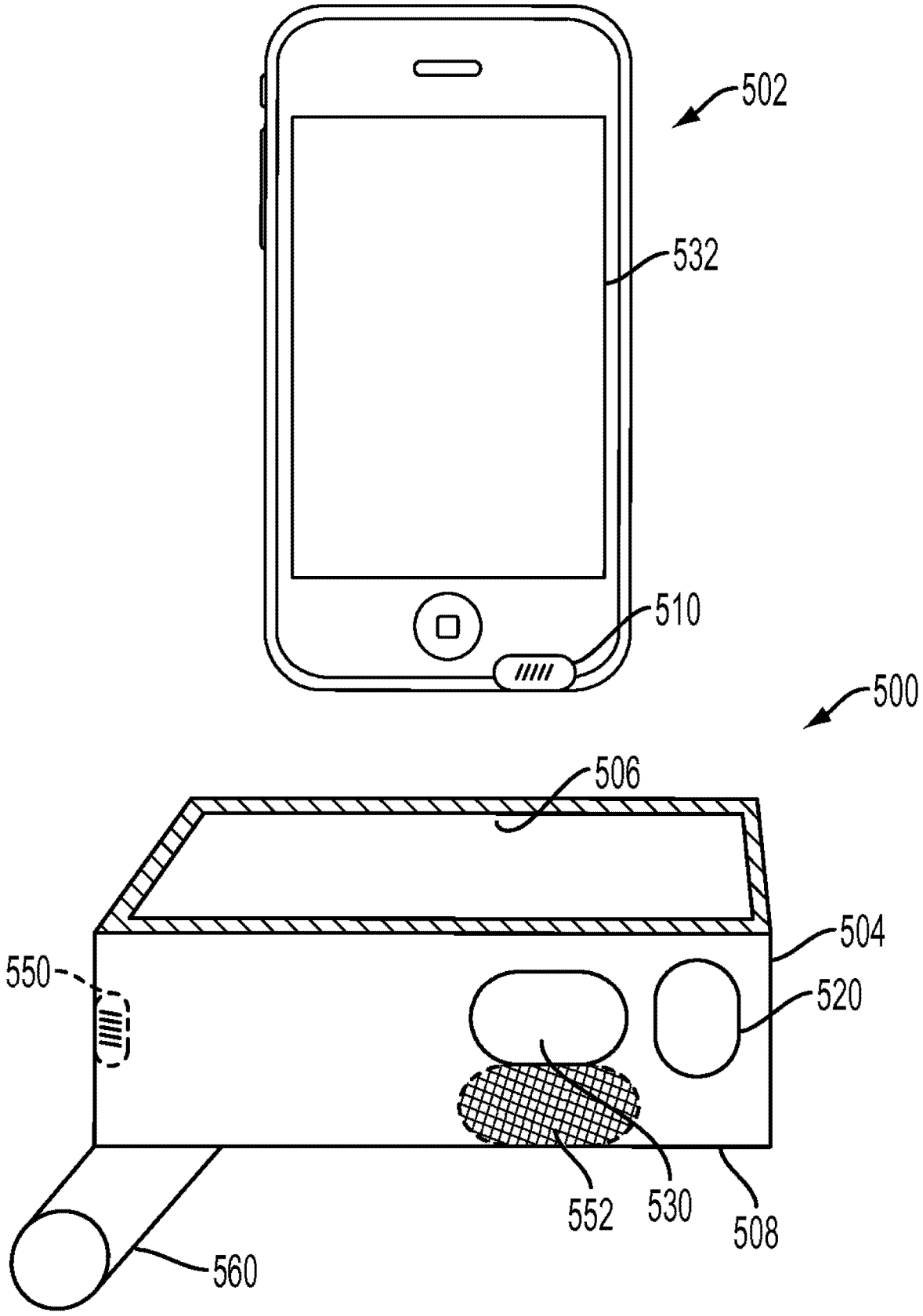


图 5A

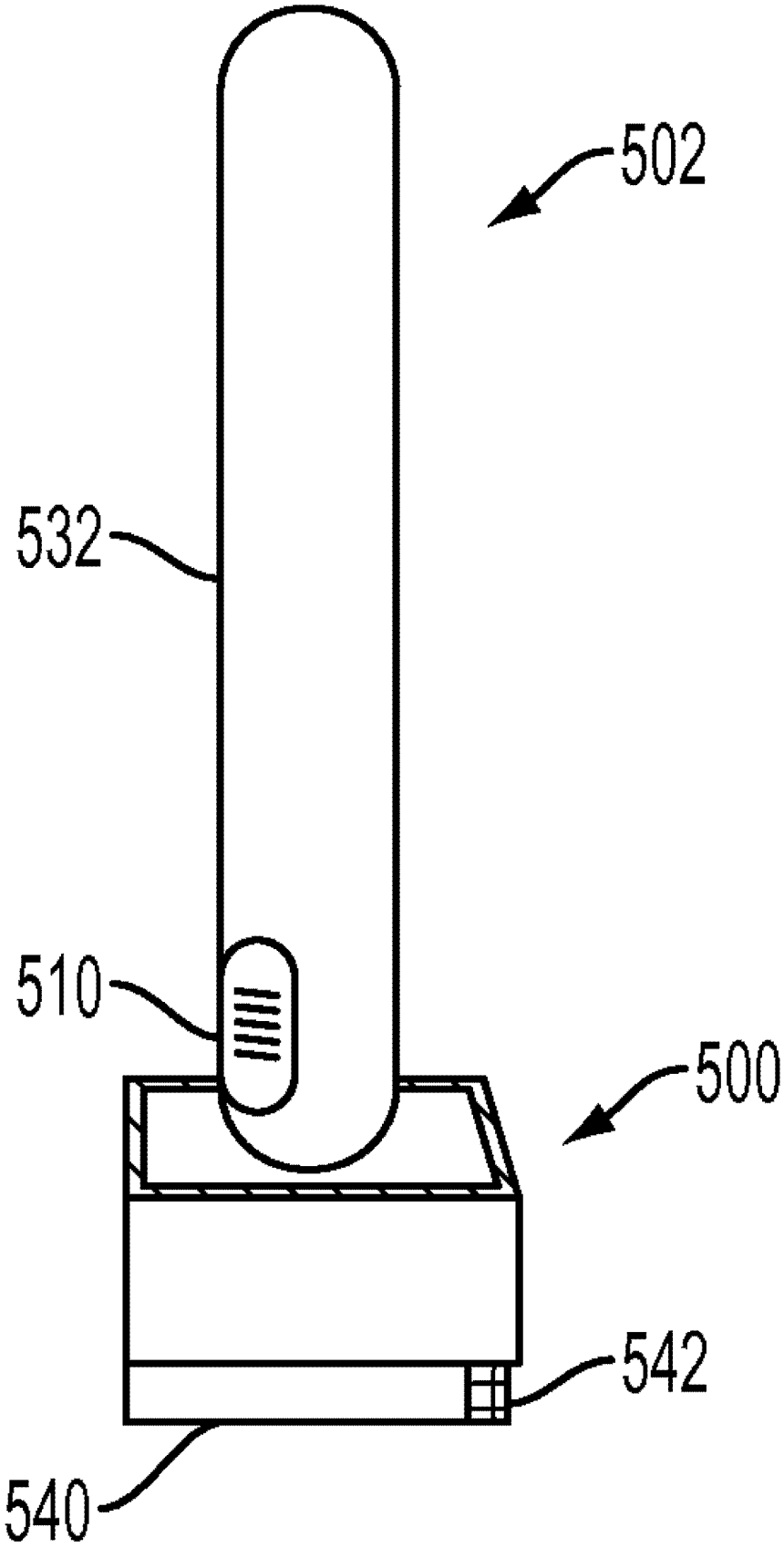


图 5B

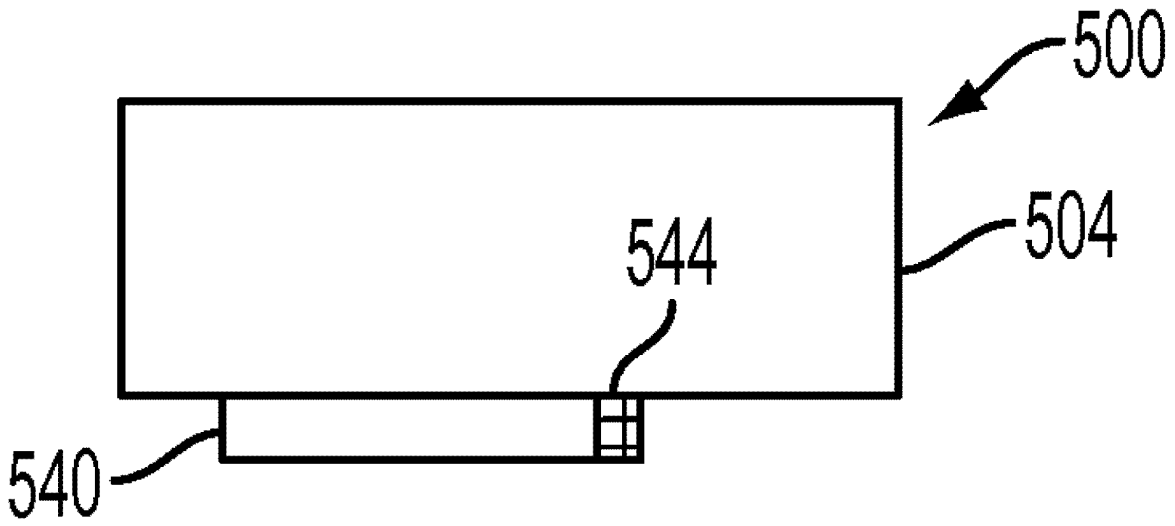


图 5C

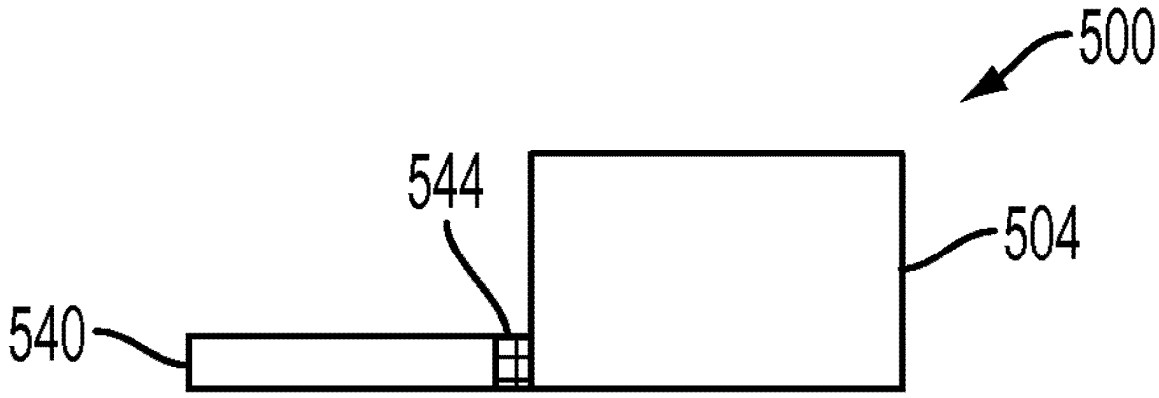


图 5D

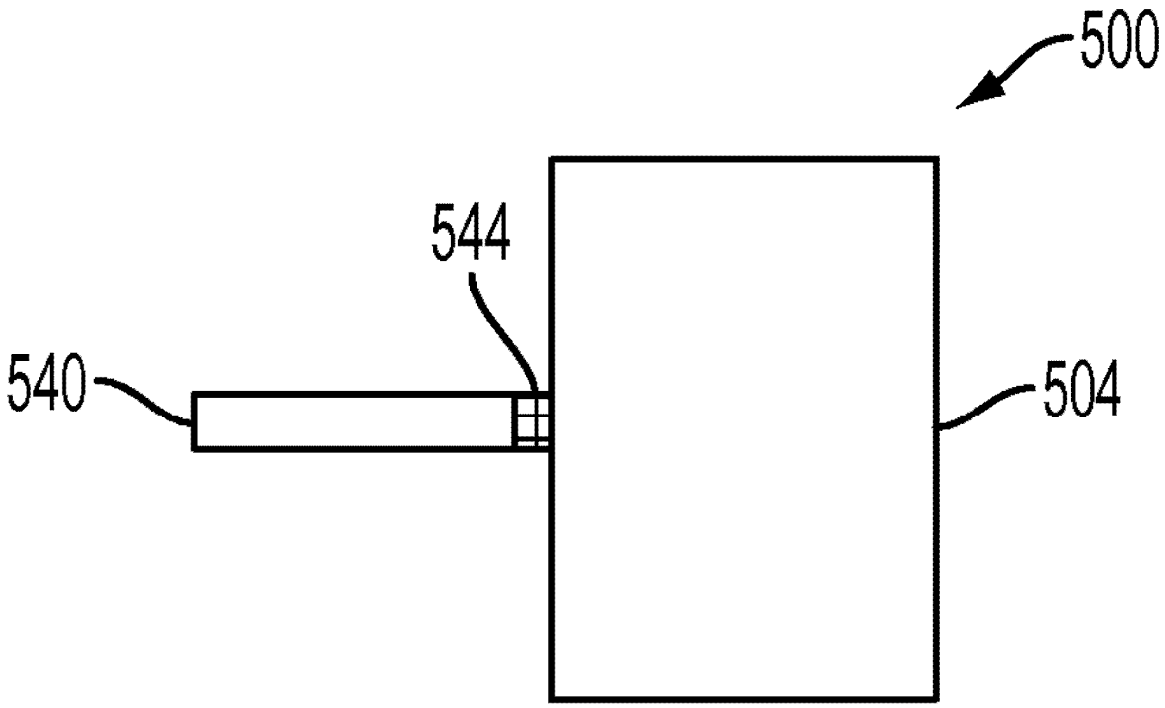


图 5E

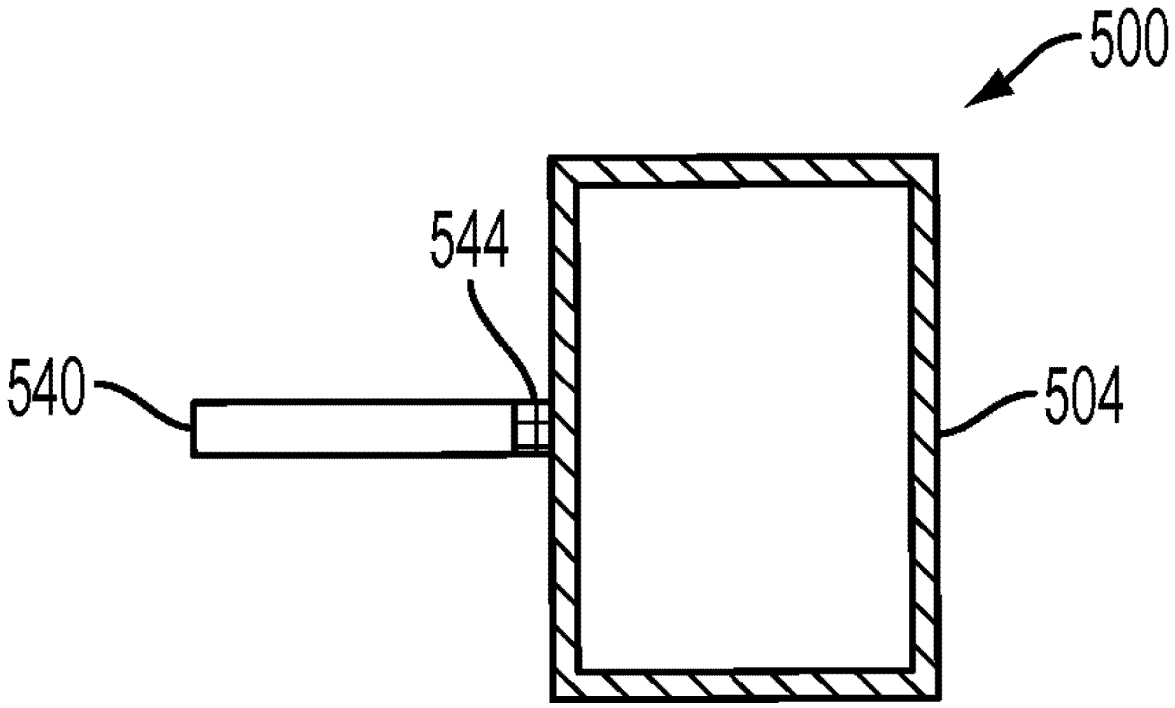


图 5F

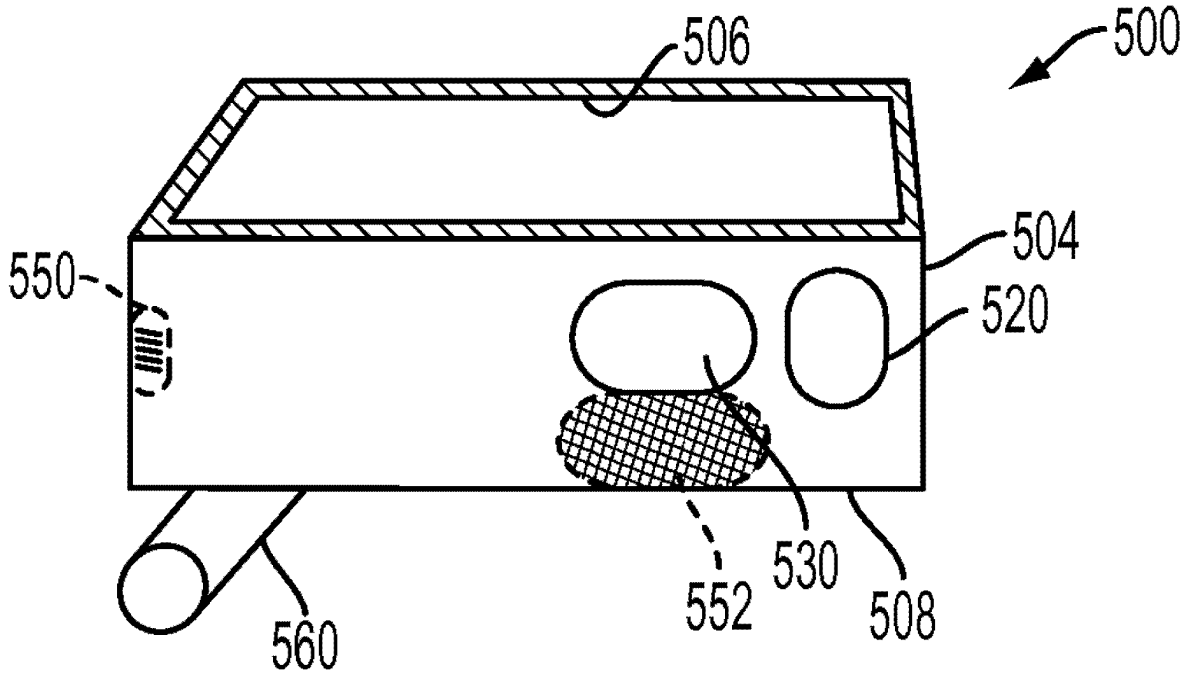


图 5G

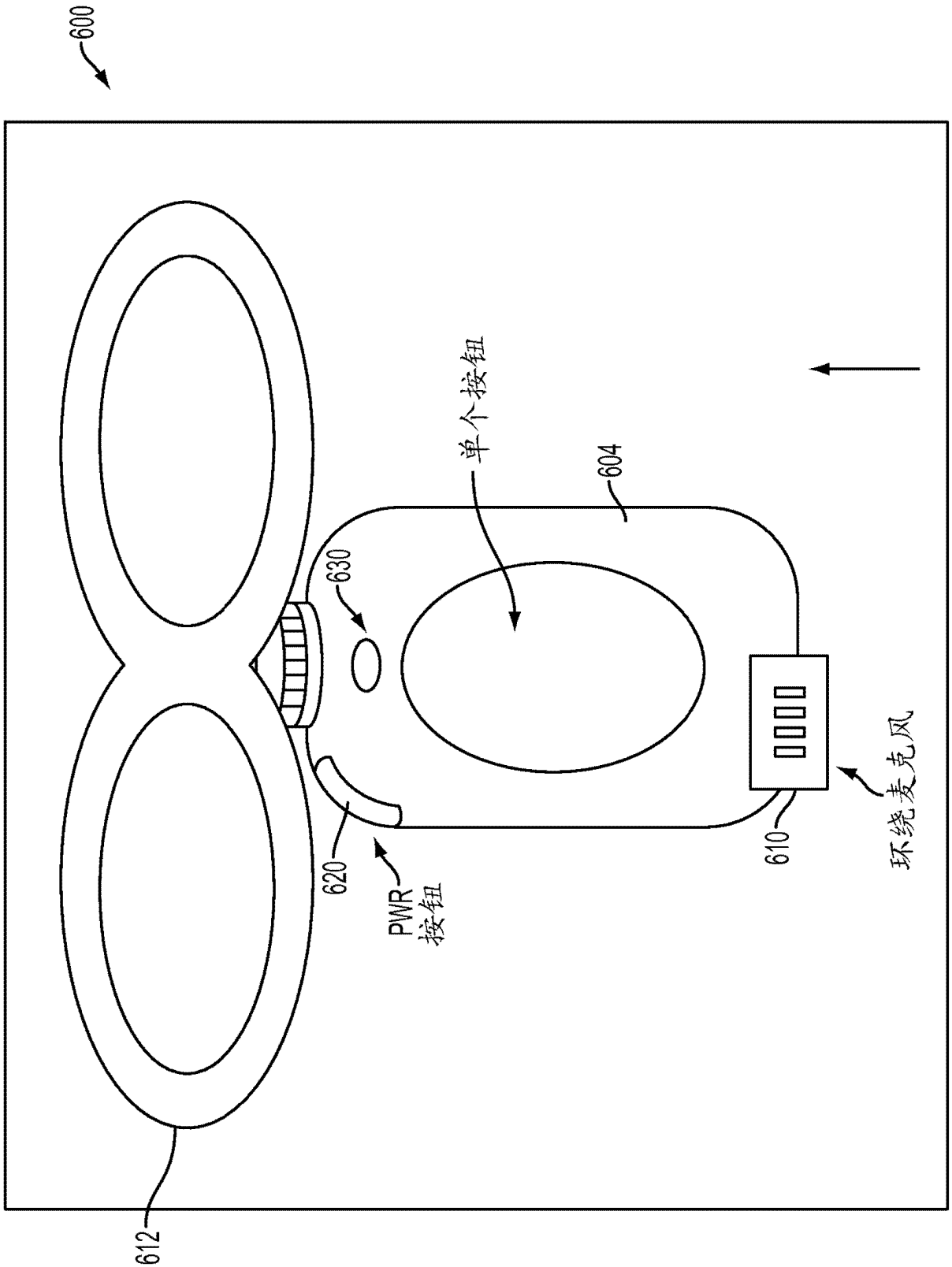


图 6

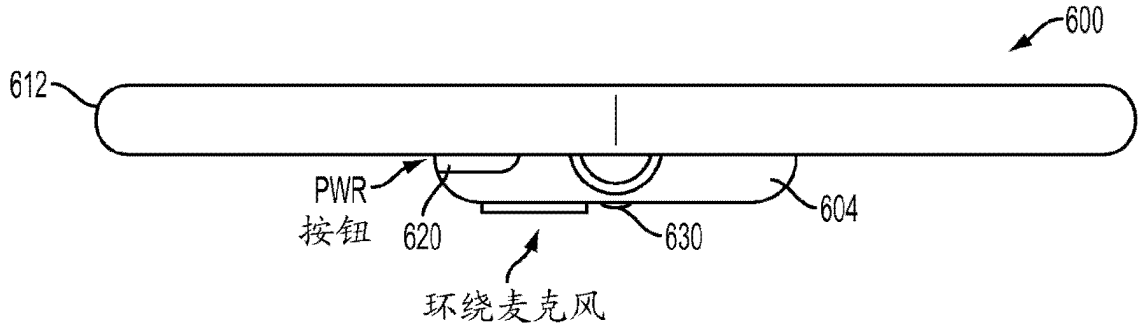


图 6A

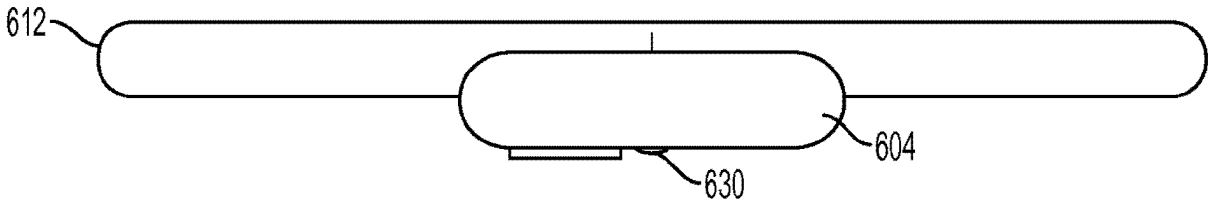


图 6B

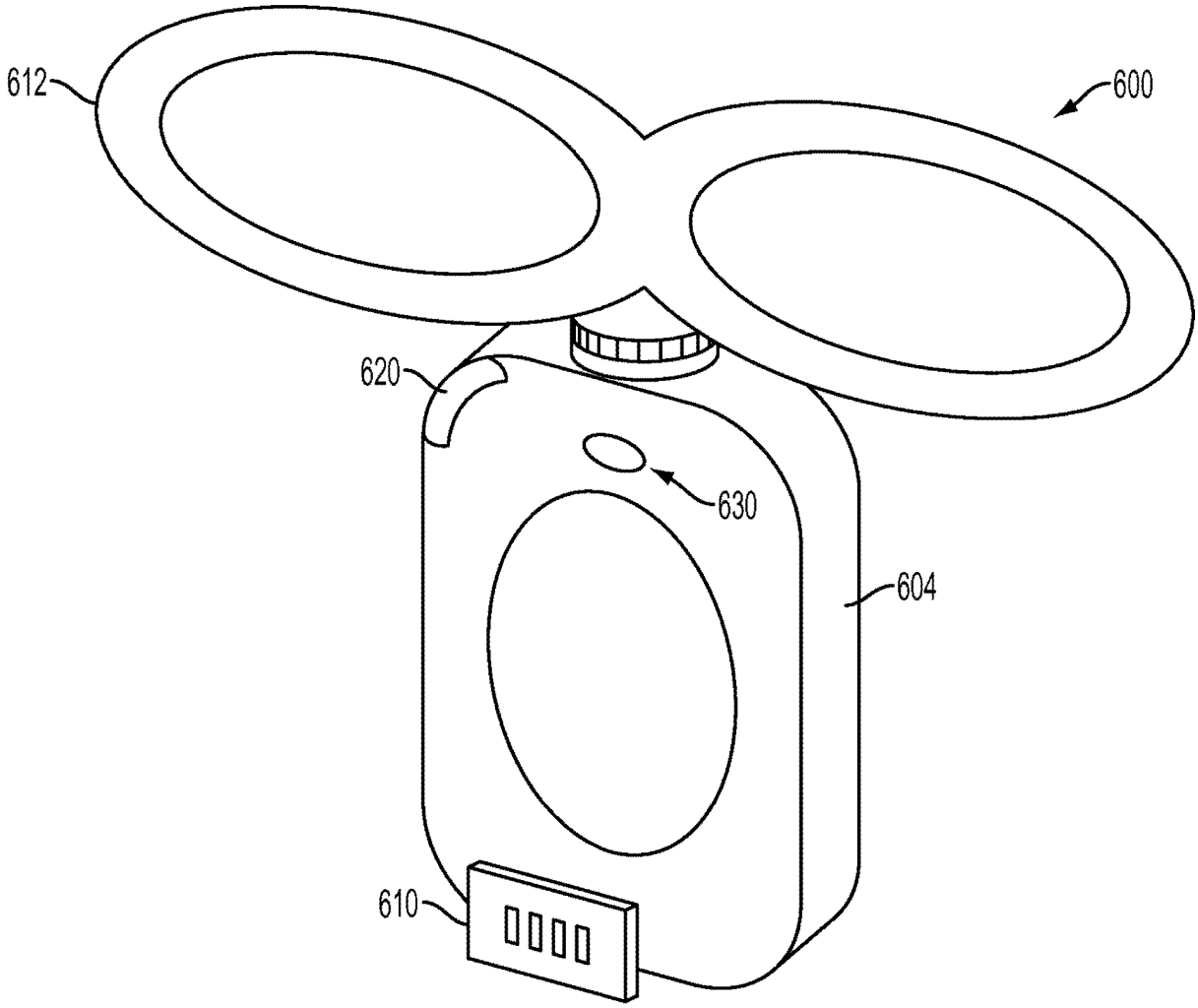


图 6C

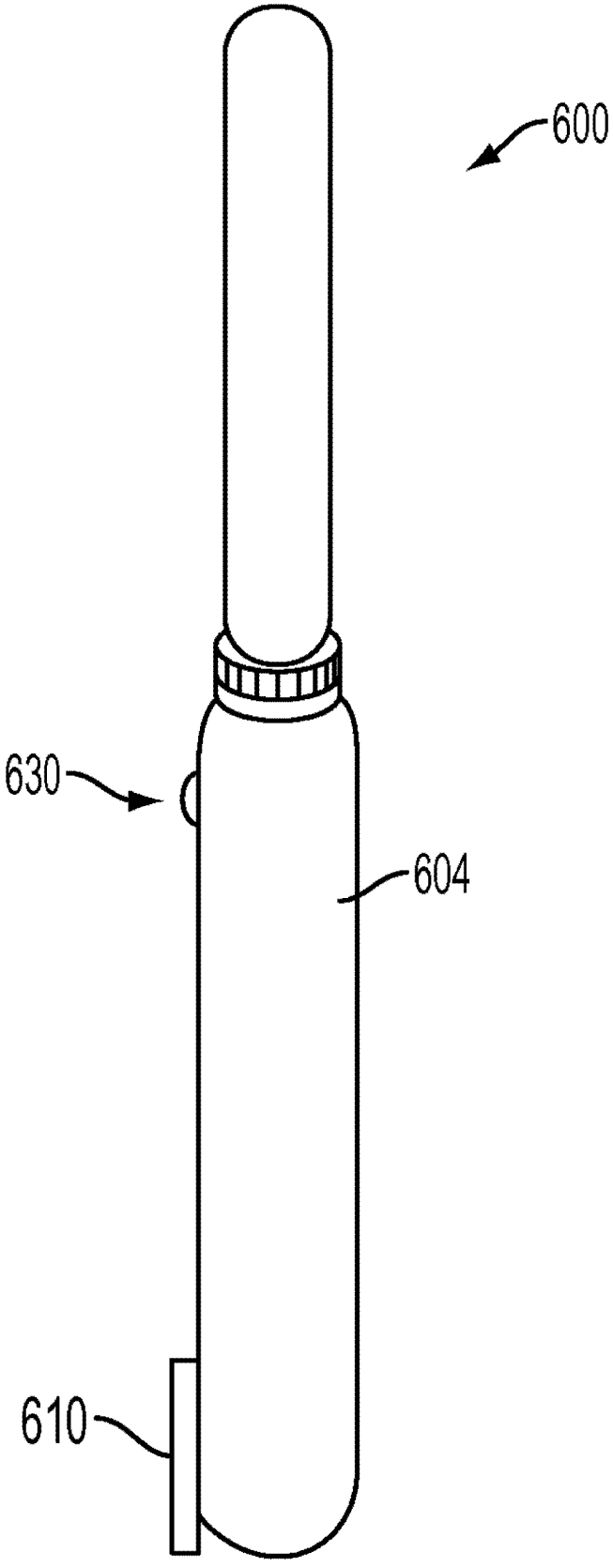


图 6D

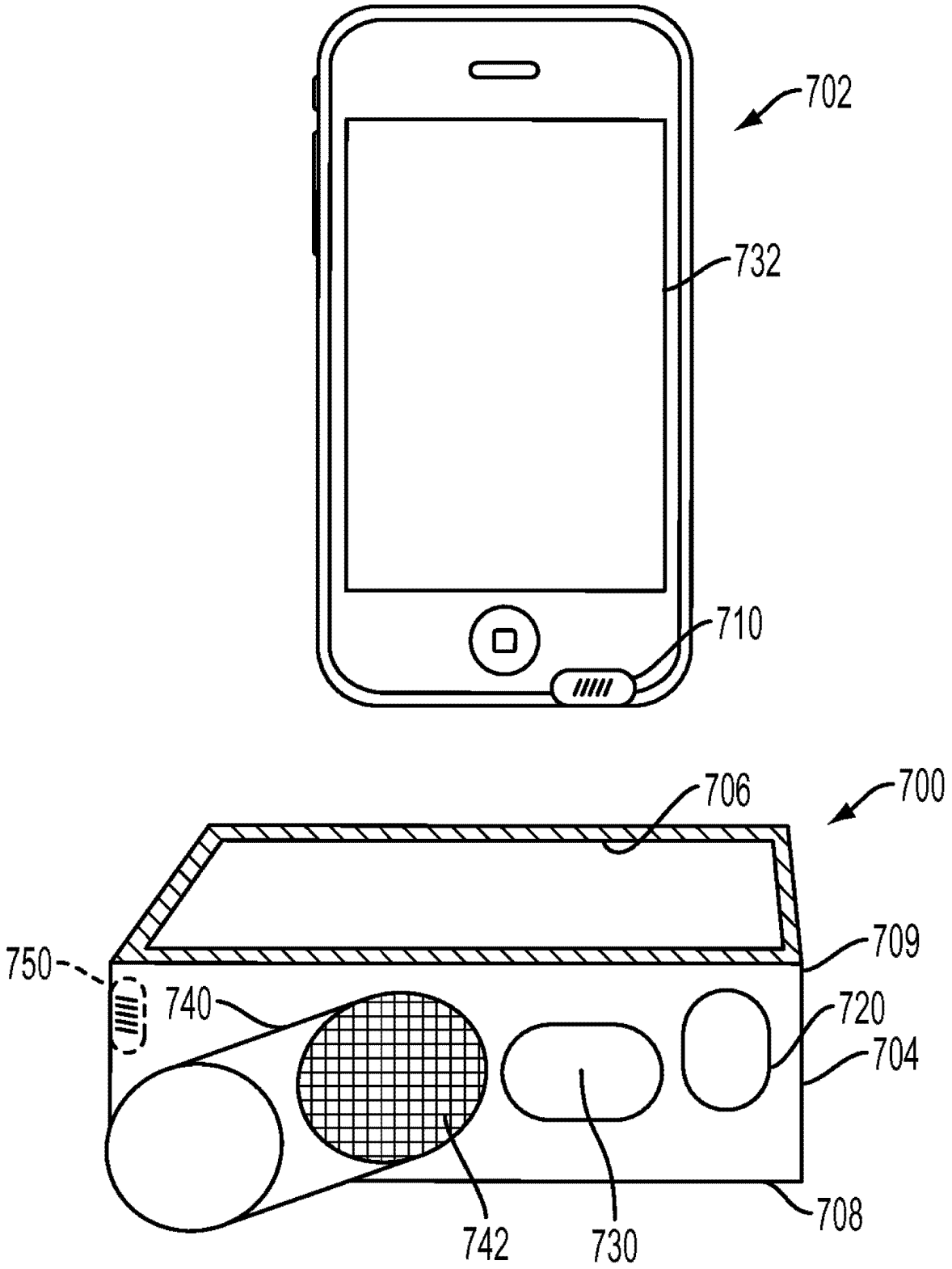


图 7A

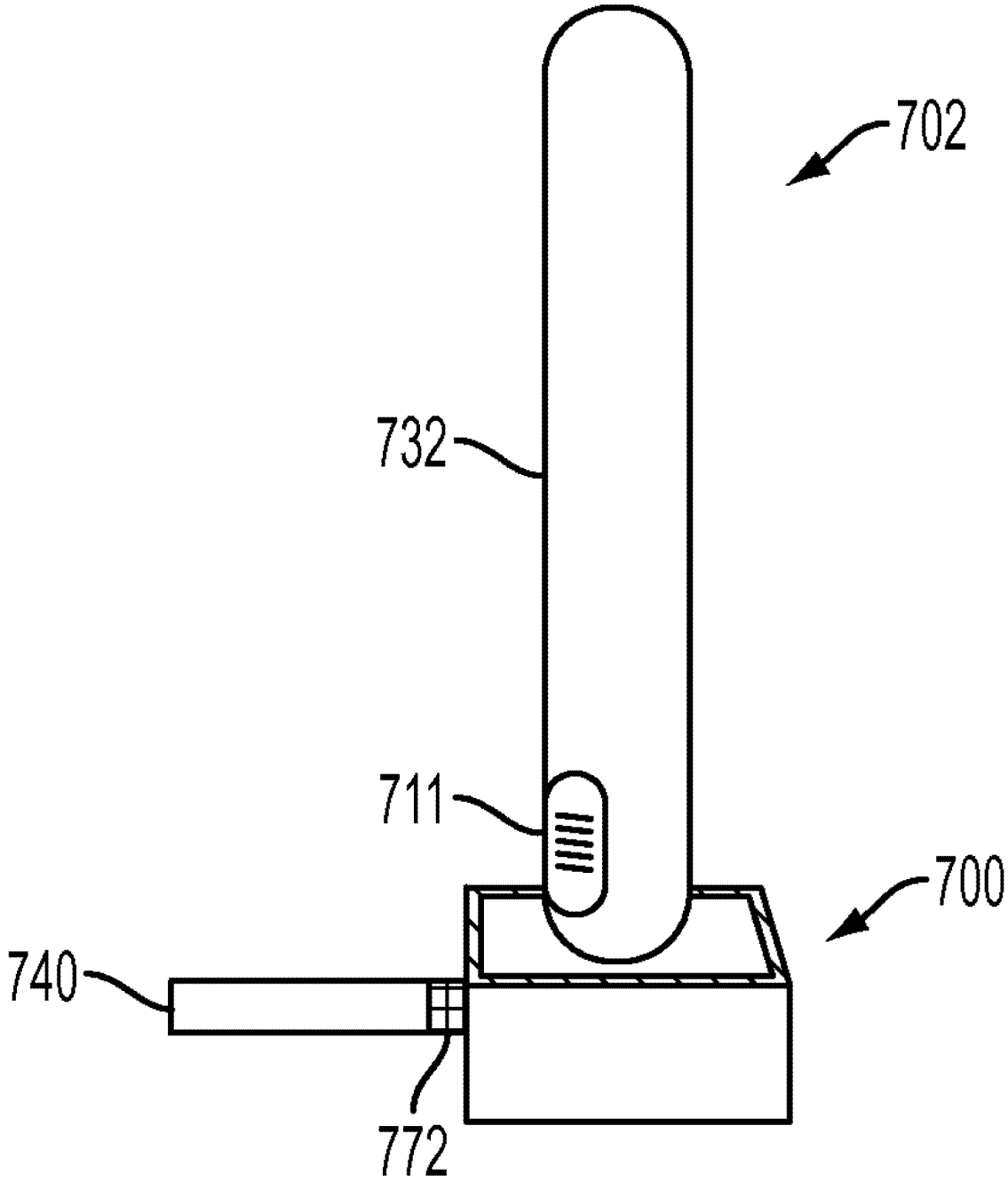


图 7B

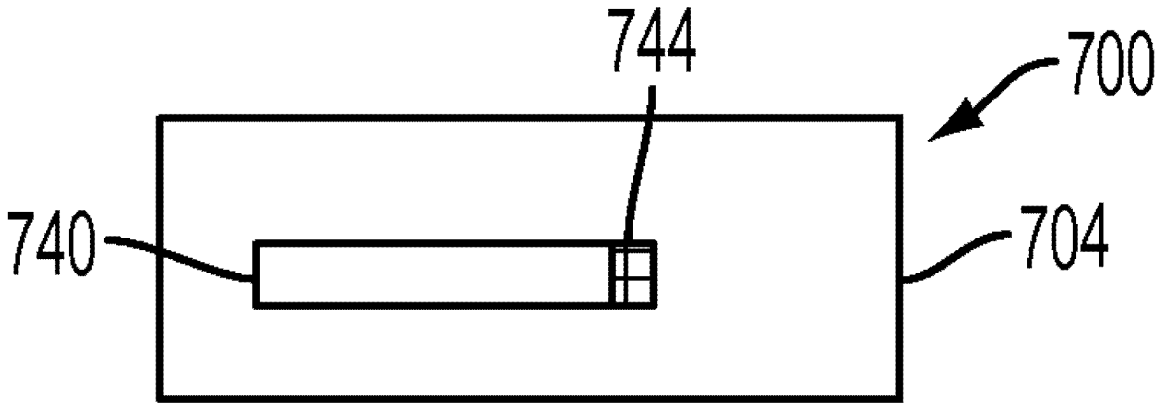


图 7C

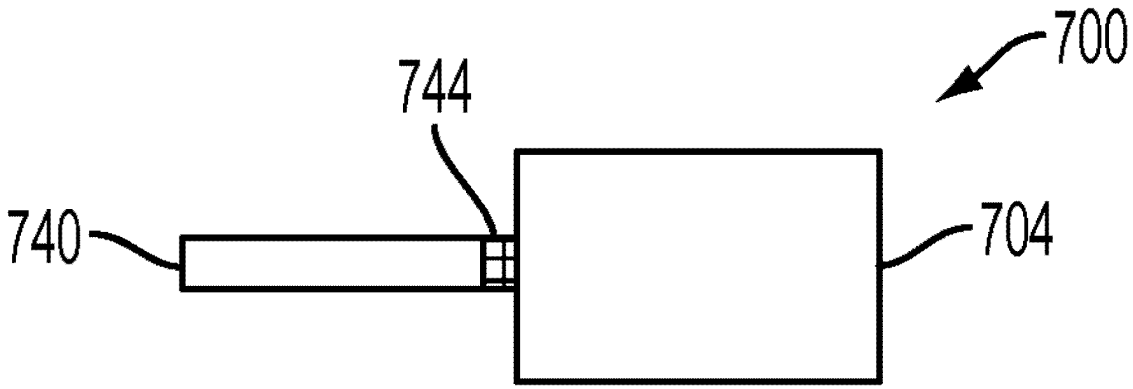


图 7D

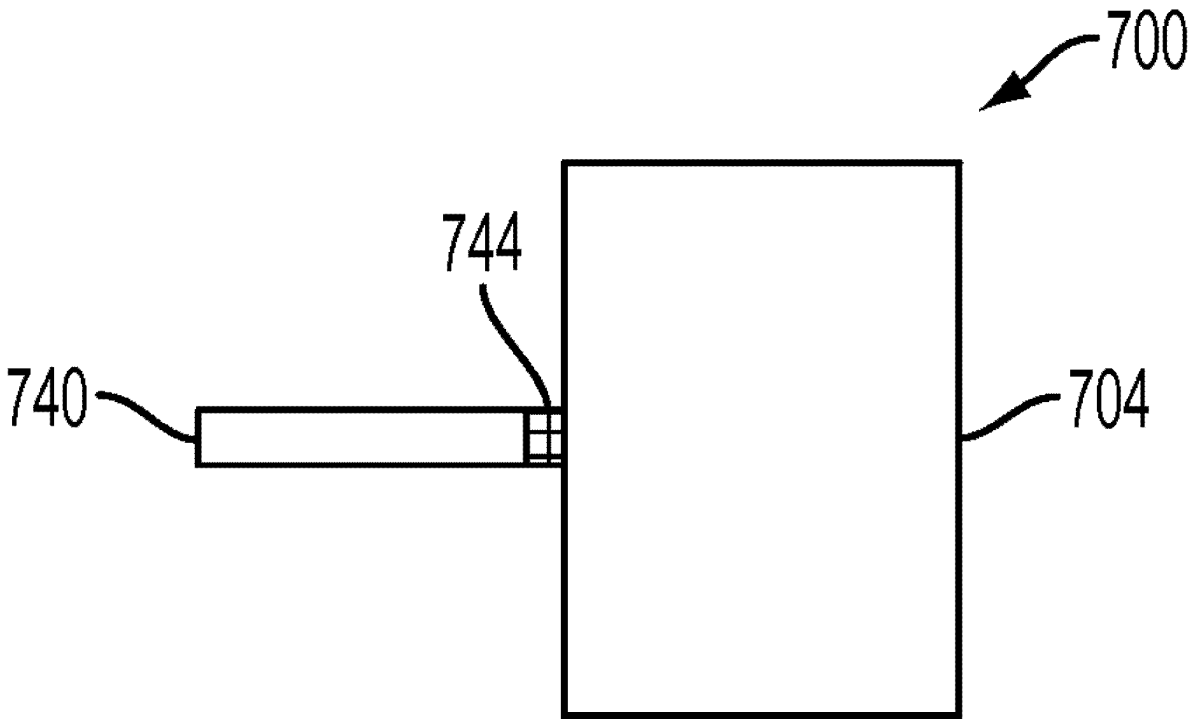


图 7E

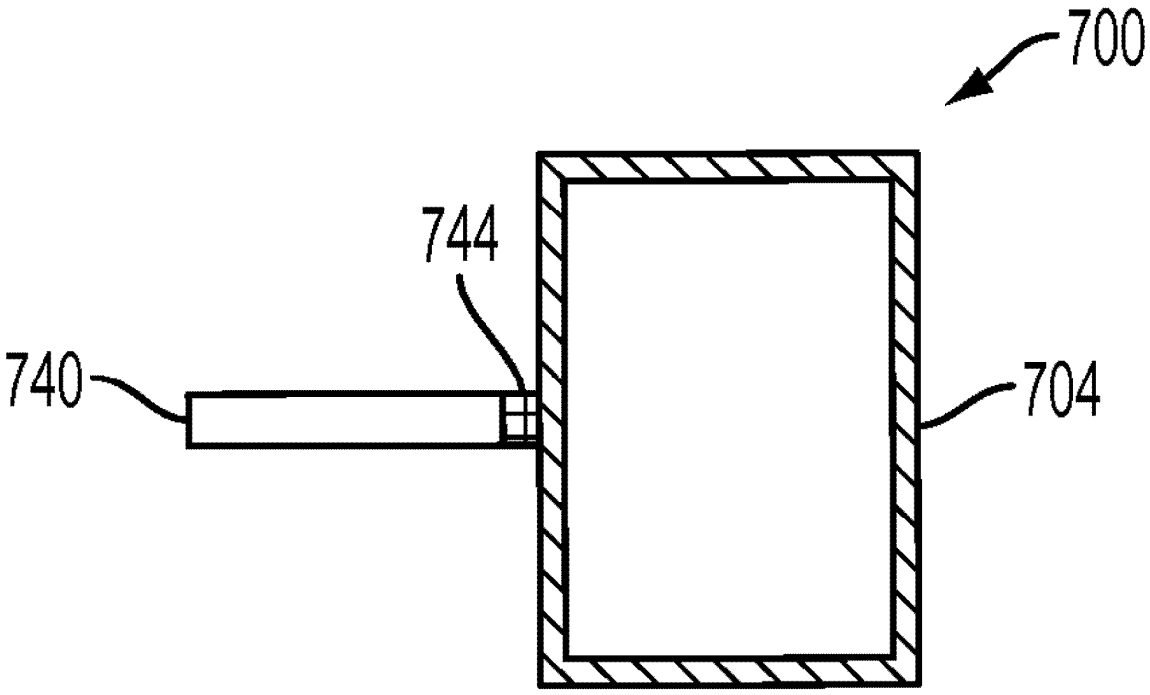


图 7F

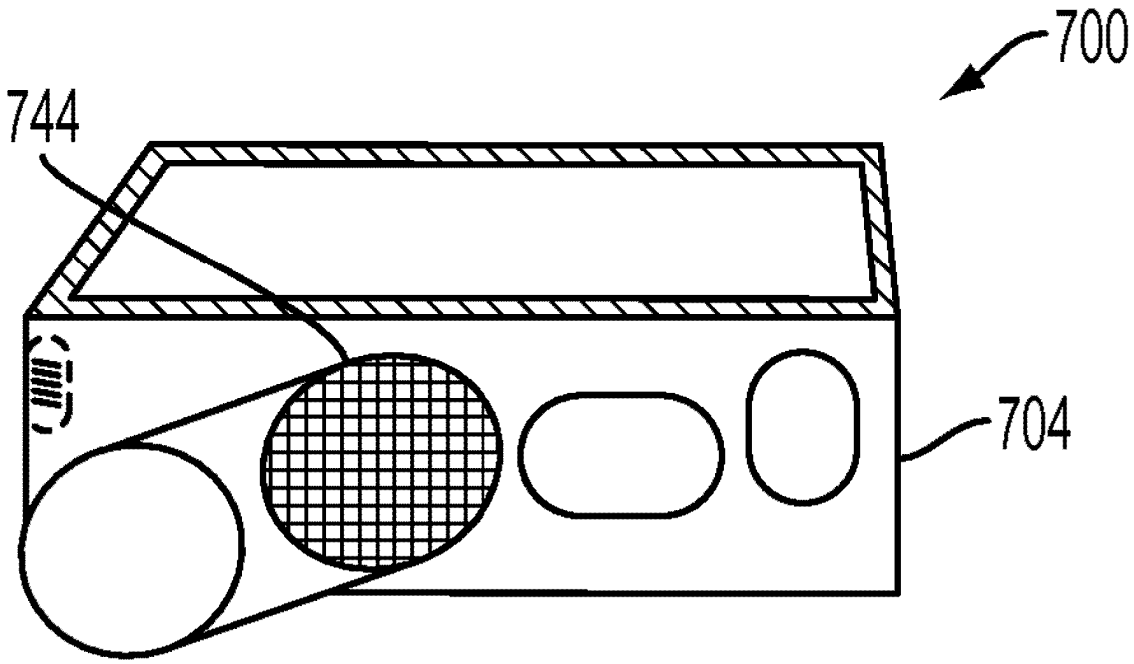


图 7G

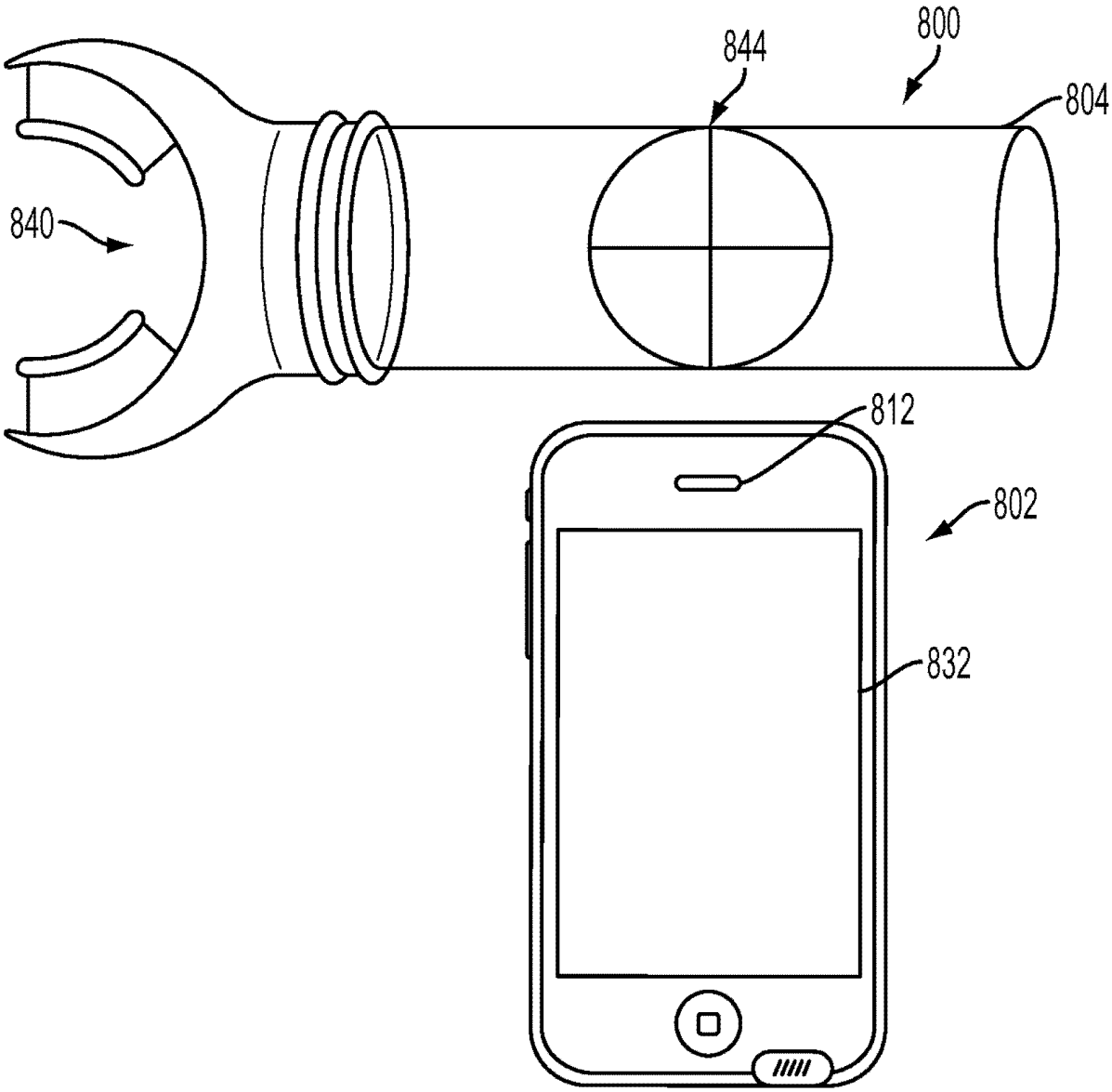


图 8

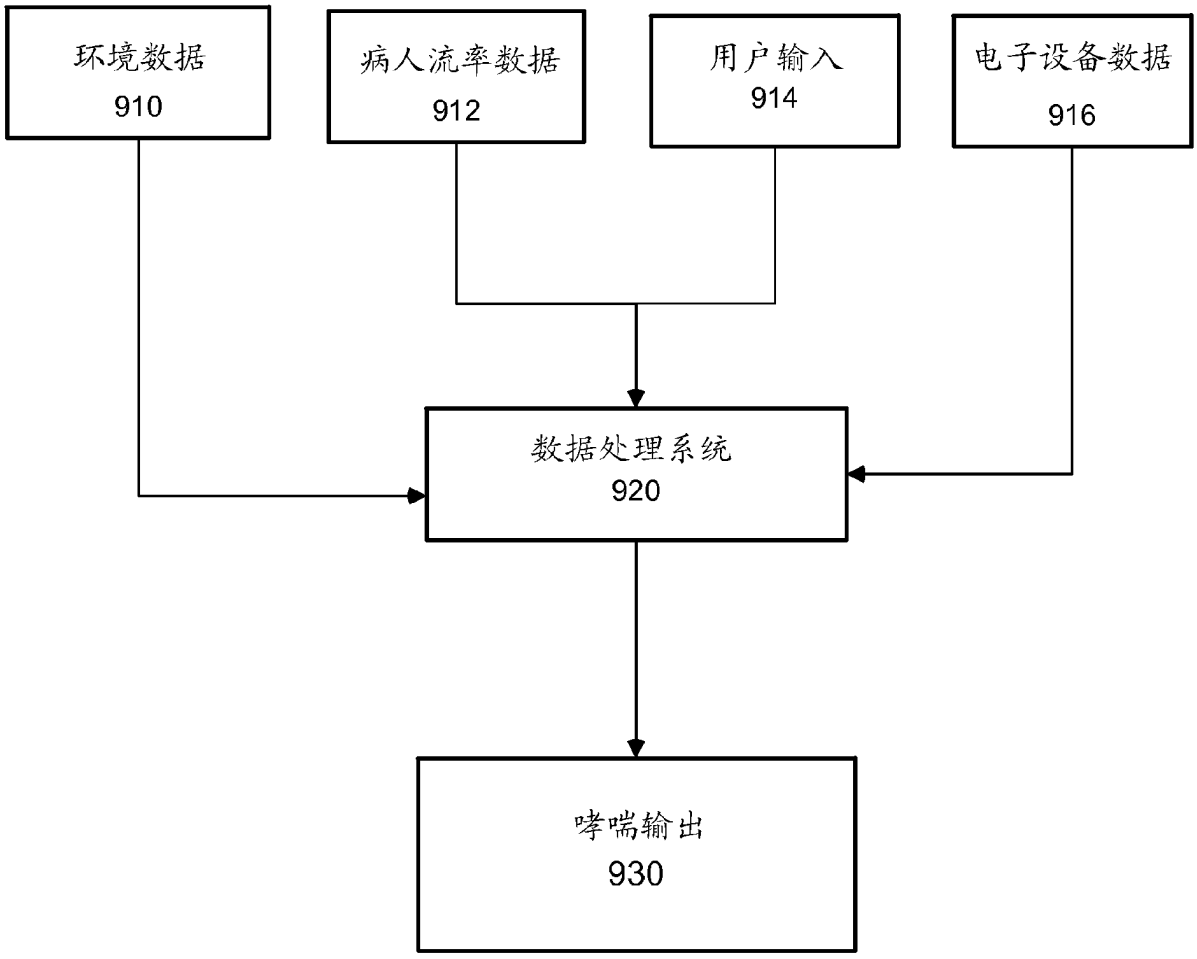


图 9