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(54) **MULTIFUNCTIONAL PERSONAL HEALTH MONITOR WITH AN ACTIVITY TRACKER EMBEDDED INTO A PET LEASH.**

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A61B 5/0205	(2006.01)
G01S 19/13	(2006.01)

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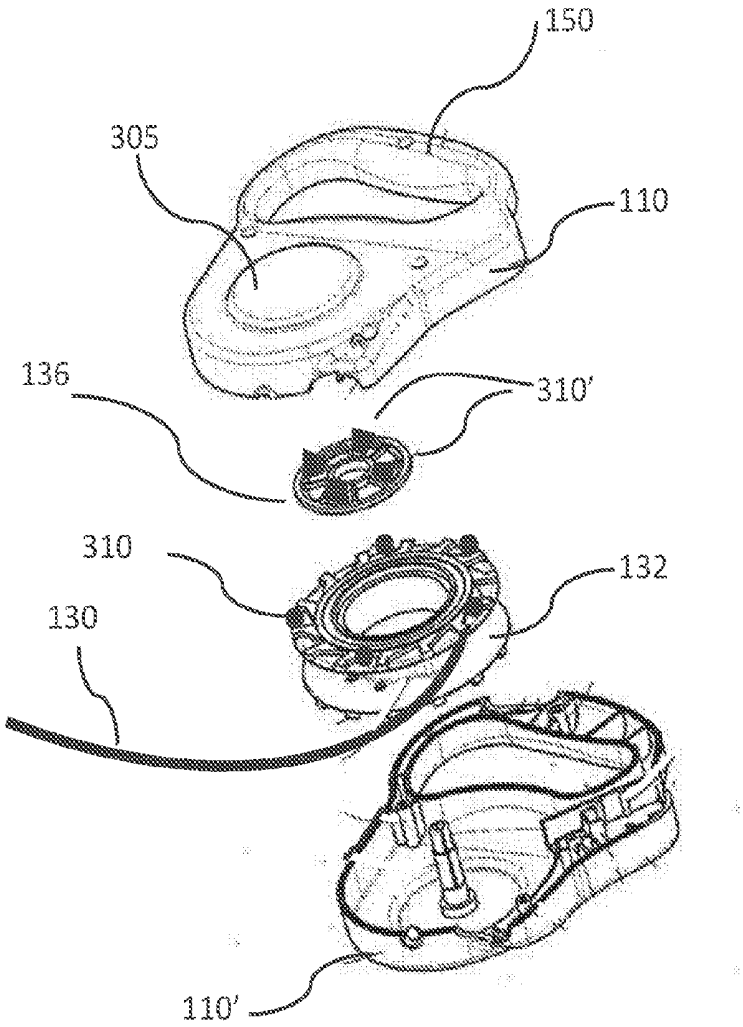
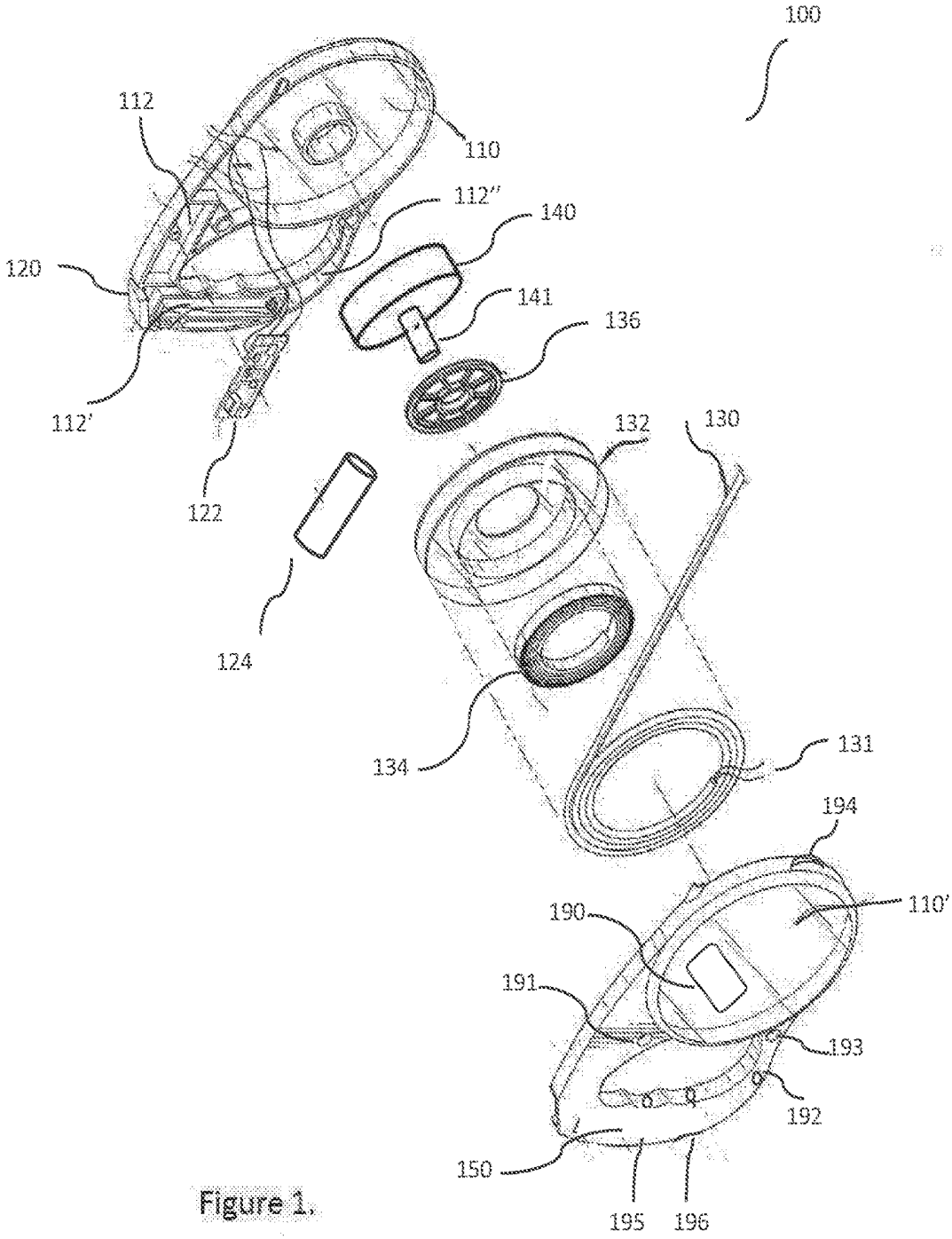
(57) **ABSTRACT**

A multifunctional personal health monitor with an activity tracker embedded into a pet leash is provided. The energy of a pet pulling the leash cord is converted to an electrical power to run and to analyze operation of multiple biometric sensors embedded into the leash. The physical activities of the pet and its owner may be tracked. The obtain biometric information may be wirelessly transmitted for additional processing or an emergency call can be initiated. The generated by pet movement electrical power may be used to charge various external devices.




100
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110
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190
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193
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150
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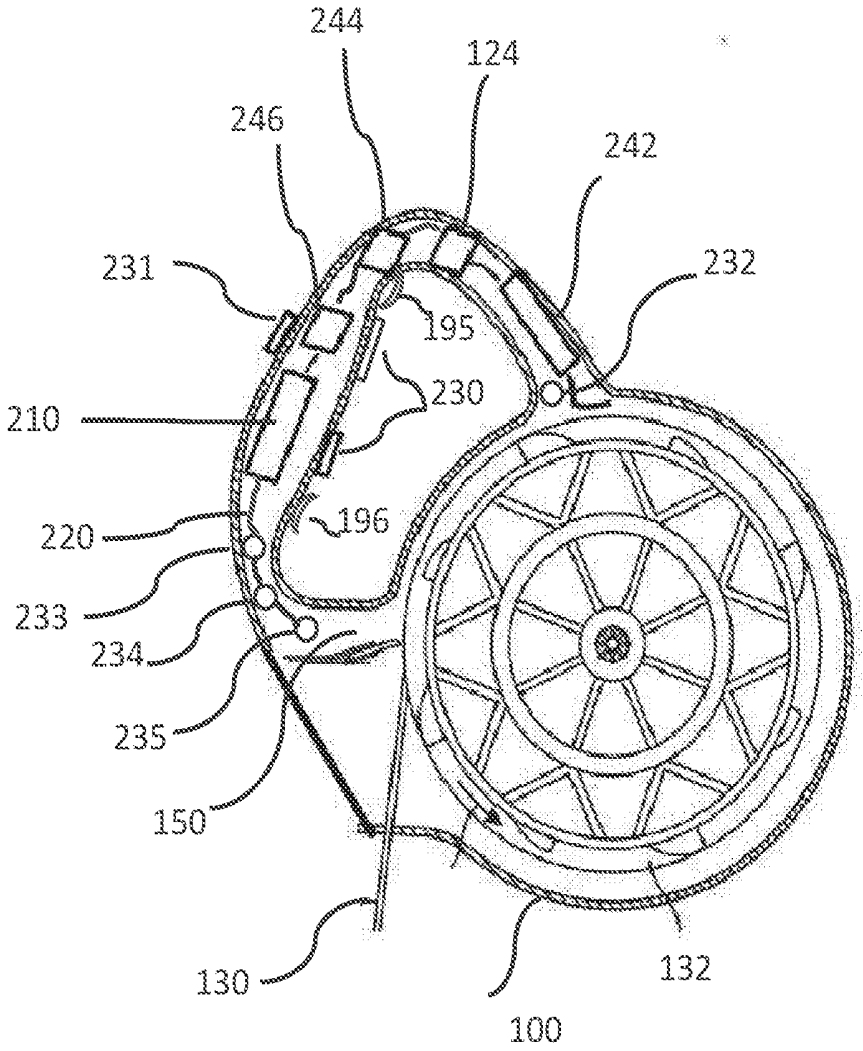
196

Figure 1.


244
124
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220
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100

Figure 2

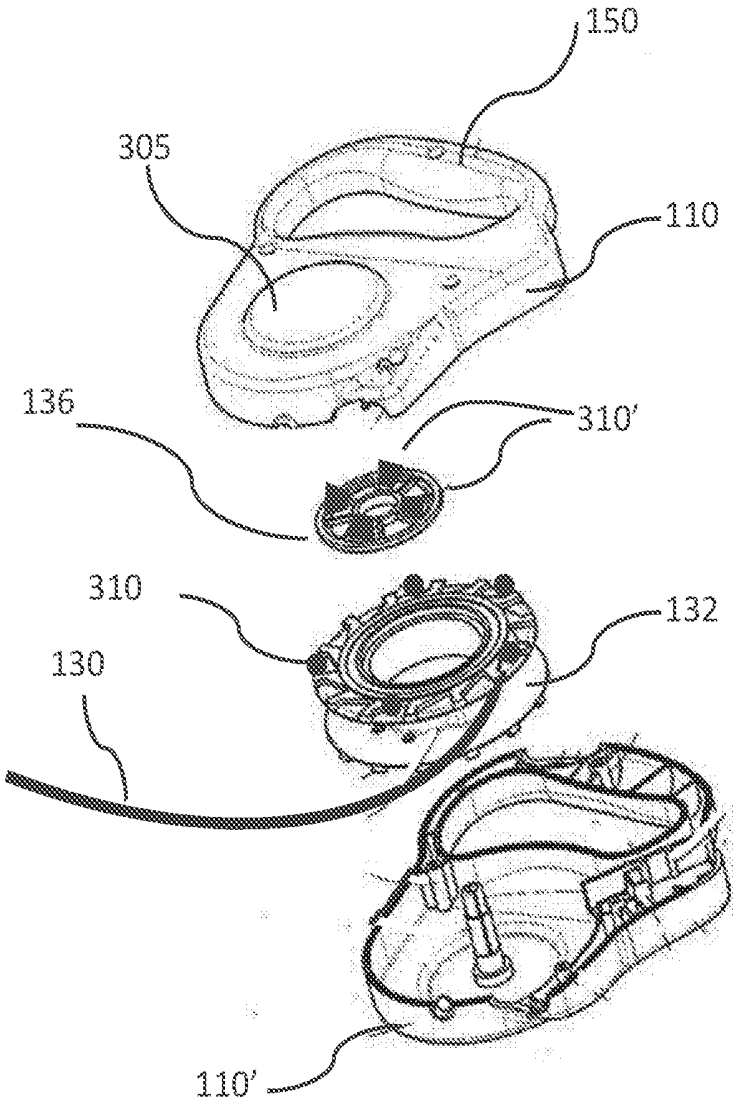

Figure 3.

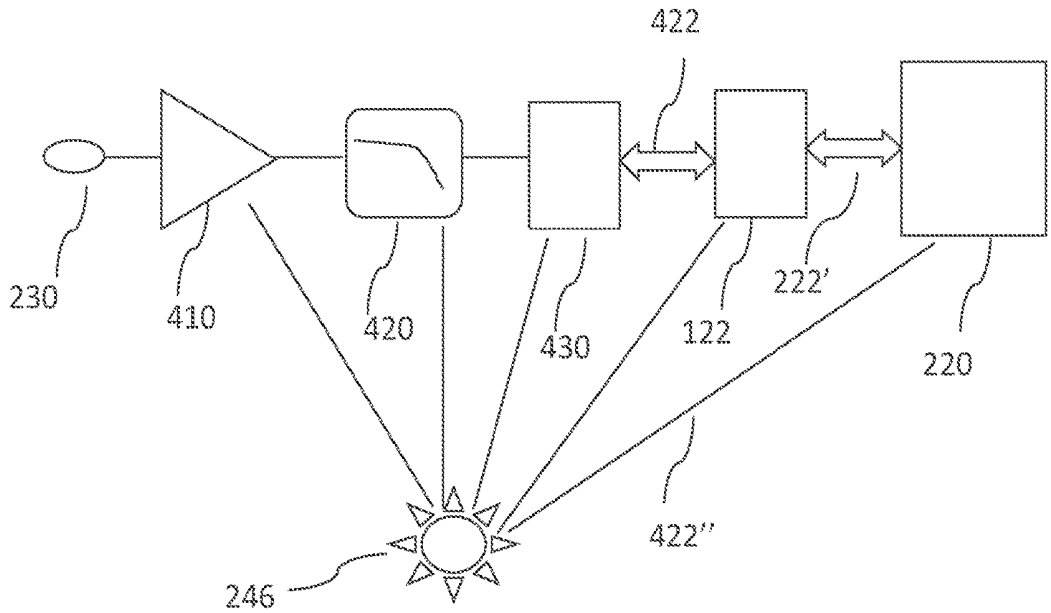

Figure 4.

MULTIFUNCTIONAL PERSONAL HEALTH MONITOR WITH AN ACTIVITY TRACKER EMBEDDED INTO A PET LEASH.

CROSS REFERENCES TO RELATED APPLICATIONS

[0001] This application claims the benefit of Applicants' prior Provisional Application No. 62354748 filed on Jun. 25, 2016.

BACKGROUND

[0002] Growing consumer interest in personal health has led to a variety of personal health monitoring devices being offered on the market. Such devices were typically designed to cover a limited number of monitoring features. Recent advances in sensor, electronics, and power source miniaturization have brought to the market new generation of personal health monitoring devices referred herein also as biometric monitoring devices. Currently, available personal health and activity monitors are worn on a wrist and thus have to be made small. The small size of the device restricts the size of an internal battery thus limiting the amount of available electrical power and time duration to acquire and to process the biometric signals. Ironically, the main limiting factor for the personal health monitors or activity trackers is not the processing power of the internal processor, but the minuscule amount of electrical power stored inside such devices. The operational time of such devices is inversely proportional to the power drained from the battery, so the device operation is forced to low power or sleep mode most of the time. The wrist-based health monitor shifts during normal physical activity thus making signal acquisition not reliable. The finite stored energy and a *small size of the wrist-worn devices limit the number of embedded sensors and limit the scope of biometric monitoring mainly to a heart or pulse rate.

[0003] To acquire a more delicate signal, such as Electrocardiogram, the physical connection between the electrodes of the device and a user's skin must be tight and reliable, which is impossible for loosely worn an armband-based personal health monitor. Emerging more advanced health monitoring devices, such as non-invasive glucose level monitors consume at least order of magnitude more power than current heart and pulse monitors, making operational time of a device based solely on a rechargeable internal battery non-practical.

SUMMARY

[0004] The present invention is related to a handheld biometric monitoring device that is placed into a retractable pet leash. The leash housed generator converts the kinetic energy of a pet into an electrical power; the electrical energy is stored to support continuous operation of a plurality of biometric sensors, to process, record and transmit multiple biometric signals, and to power external devices through a connector and by wireless power transfer. The biometric sensors are placed into the leash handle with the holder's grip providing reliable signal interaction with the sensors. The surface area and the volume of the leash allow placement of multiple communication modules and biometric sensors with multi-functional variety. Multiple types of wireless communication, user interfaces such as a microphone, display, GPS accelerometer to detect falling and emergency button allow to track activity and location through a constantly present cellular connection and to make an outreach call in an emergency situation.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] Various embodiments of the invention are disclosed in the following detailed description and accompanying drawings.

[0006] FIG. **1** illustrates an exploded view of the multifunctional personal health monitor with an activity tracker embedded into a pet leash.

[0007] FIG. **2** shows an example of sensor plurality comprised by the device housing.

[0008] FIG. **3** illustrates another embodiment of power generation for multifunctional health monitor embedded into a pet leash.

[0009] FIG. **4** illustrates possible embodiment of an electronic module, biometric signal acquisition and processing chain.

DETAILED DESCRIPTION AND PREFERRED EMBODIMENT

[0010] The following is a detailed description of exemplary embodiments to illustrate the principles of the invention. The embodiments are provided to illustrate aspects of the invention, but the invention is not limited to any embodiment. The scope of the invention encompasses numerous alternatives, modifications and equivalent; it is limited only by the claims.

[0011] Numerous specific details are set forth in the following description in order to provide a thorough understanding of the invention. However, the invention may be practiced according to the claims without some or all of these specific details. For the purpose of clarity, technical material that is known in the technical fields related to the invention has not been described in detail so that the invention is not unnecessarily obscured.

[0012] Recent developments in electronics make possible to create very powerful data and signal processors that occupy very little space. Ironically, it is not an internal processor data acquisition and processing power put a limit on personal health monitor capabilities but the finite and small amount of stored electrical energy needed for the device operation. A small physical area of such devices restricts an introduction of a new variety of biometric sensors, communication means, and health and safety features. The invention demonstrates how embedding a health monitor and activity tracker into a retractable pet leash allows building devices with functionality not being limited by a power drain while expanding to a variety of new features. Converting a kinetic energy of a pet, restrained by a retractable leash and utilizing the natural dimensions of the leash allows building a different generation of health monitors and activity trackers that are not limited by the described above hurdles.

[0013] One embodiment of a health monitor device is shown in FIG. **1**. Health monitor device container **100** consists of the container's two halves **110** and **110'**. The device container holds few compartments **112**, **112'**, and **112"** to keep various operational modules, such as: sensor acquisition and processing module, data communication module, power conversion and storage module.

[0014] The device container houses leash cord **130**; the cord is winded on spool **132**. If the cord is not pulled out by external force, coil spring **134** rewinds leash cord **130** to spool **132**.

[0015] A roaming pet attached to leash cord **130** and a free-will individual holding handle **150** create the dynamic system with leash cord **130** being pulled by the animal and retracted by coil spring **134**, thus constantly rotating spool **132**, thus winding and unwinding leash cord **130** to spool **132**. As long as a distance between a person holding health monitor device container **100** and a pet attached to leash cord **130** is changing, an electrical power is being generated and passed to energy storage element **124**.

[0016] The device container also houses electrical generator **140**. Generator **140** comprises of a rotor and a stator, an electrical power is generated while the rotor moves against the stator. Shaft **141** of generator **140** is mechanically attached through joint coupler **136** to spool **132**. A fixed mechanical attachment, a V-belt or any type of a motion coupler capable to transfer movement from one mechanical part to another mechanical part can be used as joint coupler **136**. Based on such or similar arrangements, spool **132** transfers rotational motion to shaft **141** attached to a rotor of electrical generator **140**. Electrical generator **140** converts kinetic energy of leash cord **130** to electrical energy. That energy is stored in energy storage element **124**. Some examples of such energy storage element are: a capacitor, a rechargeable battery, a fuel cell.

[0017] Energy storage element **124** supplies electrical power to signal and data processor **122**. Signal and data processor **122** communicates with plurality of user's interfaces such as: touch sensitive display **190**, microphone **191**, speakerphone **192**, video camera **193**, emergency pushbutton **194**. Two biometric sensors **195** and **196** are shown for this embodiment and are placed on the surface of handle **150**. The sensors can be picked from the plurality of biometric sensors shown on FIG. **2**. As an example, biometric Sensors **195** can be implemented as an optical transmitter and receiver pair and biometric sensor **196** can be implemented as Galvanic Skin Response. Or, pair of biometric sensors **230** can be implemented as Electro Cardiogram electrode. An individual who holds health monitor device **100** has a firm grip on handle **150** providing reliable contact between the individual hand and sensors which are placed on handle **150**. Contrarily biological signal monitor, from prior art such as FitBit, is worn loosely on a wrist, resulting in not accurate pulse reading and rendering electrocardiogram acquisition as impossible task.

[0018] This embodiment also shows connector **120** to transfer electrical power from and data outside. Connector **120** is used to recharge outside devices by getting power from energy storage element **124** and data communicating between processor module **122** and external devices. Possible implementation of such connector is USB or Lightning connector.

[0019] Leash cord may comprise flexible conductive wire **131**. Conductive wire **131** is used as antenna to enhance communication between multifunctional personal health monitor and external devices.

[0020] If a necessity arises emergency pushbutton **194** can initiate cellular call or data transmission. By its nature pet walkers can wander into a remote area with sparse population in such cases fast emergency communication initiated by emergency pushbutton **194** and communication enhanced by antenna implemented as elongated embedded wire **131** can be appreciated.

[0021] FIG. **2**. Demonstrates possible arrangement and an assortment of plurality biometric sensors and electronic modules comprised by another embodiment of multifunctional personal health monitor and activity tracker.

[0022] In comparison to wristband worn monitor, an internal housing of a pet leash naturally meant to store a long leash cord, provides much larger volume and surface area. Access to continuously generated power supports operation of a plurality of sensors and electronic accessories. An access to greater amount of available electrical power permits Bluetooth, Wi-Fi and cellular communication, lifting restriction on the distance between the transmitter and the receiver. A multifunctional personal health monitor may employ one or more power demanding, constantly operational biosensors, placed either inside a device or on the device surface. In addition to optical transmitter receiver pair **195** and galvanic skin response **196**, biometric sensors may be chosen from the following plurality: a set of electrocardiogram electrodes **230**, electromagnetic transmitter-receiver for under skin penetration **231**, capacitive sensor **232**, glucose meter **233**, ph-meter **234**, accelerometer **235**. The signal from plurality of biometric sensors is acquired by front-end signal and data processing module **210**. Front-end signal processing module **210** is further depicted on FIG. **4**. Operation of all electronic modules and sensors is supported by data and power harness **220** that connects all internal modules and components which are dependent on electrical power and data exchange. Front-end signal and data processing module **210** can be a part of signal and data processor **122**.

[0023] Additional set of electronic modules may augment operation of biometric sensors. These electronic modules may include but not limited to: GPS or Global Positioning System **242**, module combining various wireless communication **244**. Possible but not all approaches for wireless communication are: cellular, WiFi, Bluetooth, ANT, broadcast radio. Power conversion module **246** provides power for any internal component that requires power. Also, power conversion module **246** brings power to connector **120** to charge external devices if needed. Also, power conversion module **246** brings power to embedded wire **131**, to wirelessly transmit power and data.

[0024] FIG. **3** shows a preferred embodiment of health monitor apparatus embedded into a pet leash. On FIG. **3**. only power generation section of the apparatus is shown. Instead of having a distinctive electrical generator **140** as it is shown on FIG. **1**., the electrical generator is built by embedding its parts into parts of a leash. For one example, permanent magnets **310** and **310'** are embedded into rotational parts of the apparatus such as joint coupler **136** or into spool **132**. With that approach, shaft **141** can be eliminated and spool **136** itself becoming a rotor of generator **140**. Internal conductive windings or coils **305** convert magnetic field movement from permanent magnets **310** and **310'** into electrical energy to be stored in energy storage element **124**.

[0025] FIG. **4** shows embodiment of front end signal and data processing module. Electrocardiogram electrode **230** is used as an example of biometric sensor to demonstrate operation of front-end signal and data processing module **210**. A signal from biometric sensor is acquired and amplified by amplifier **410**. The signal is passed to frequency

conversion module **420** that increase signal-to-noise ratio by attenuating frequency components outside of biosensor signal bandwidth. Then signal from frequency conversion module **420** is passed to Analog-to-Digital Converter **430** that converts signal that was originated by electrocardiogram electrode **230** to digital data suitable for processor **122**. Signal and data processor **122**, through mutually acceptable protocol **422**, controls data exchange between itself, Analog-to-Digital converter **430** and all electronic modules. Such mutually acceptable protocols can be but not limited to: 1-Wire interface, I2C interface, SPI interface, parallel interface. Communication bus of mutually acceptable protocols **422** is delivered through data and power harness **220**. In addition, signal and data processor **122** monitors energy storage element **246** in order to measure through time the amount and profile of generated electrical power. Because the amount of the generated energy correlates with a behavior of an individual holding the device handle **150** and a behavior of a pet attached to the device leash cord **130**, the information of the pet activity can be deduced.

[0026] Thus, a Multifunctional Personal Health Monitor with an Activity Tracker Embedded into a Pet Leash has been described. While various embodiments have been described herein, it should be understood that they have been presented by way of example only, and not limitation. It will thus be appreciated that those skilled in the art will be able to devise numerous systems and methods which, although not explicitly shown or described herein, embody said principles of the invention and are thus within the spirit and scope of the invention as defined by the following claims.

What is claimed is:

1. A handheld device comprising:
- a housing with an opening for passing a cord;
- a spool for storing the cord;
- an electrical generator mounted in said housing;
- said spool mechanically coupled with the rotor of said electrical generator;
- a rechargeable electrical power storage element;
- means for said electrical generator to deliver generated power to the electrical power storage element;
- a signal and data processor;
- means for supplying the electrical power from said electrical power storage element to said signal and data processor;
- at least one biometric sensor mounted either inside said housing or on the housing surface;
- means for communication between said signal and data processor and said biometric sensor.
- whereby the electrical generator converts kinetic energy of the cord to electrical power that is provided to the signal and data processor for processing the biometric sensor's data acquired from a person holding the handheld device.

2. The handheld device according to the claim **1** whereas the plurality of biometric sensors comprises of but not limited to the following types of biometric sensors:
- a type of the biometric sensor for converting physical property signals such as: light, pressure, mechanical displacement, electromagnetic field, temperature, acceleration into an electrical signal;
- a type of the biometric sensor for accepting electrical signals from a human body such as: Electro Cardio electrodes, Galvanic Skin response, capacitive, resistive;
- a type of the biometric sensor comprising at least one pair of an electromagnetic frequency transmitter and an electromagnetic frequency receiver for under skin penetration;
- a type of the biometric sensor comprising at least one pair of an acoustic frequency transmitter and an acoustic frequency receiver for under skin penetration.

3. The handheld device according to the claim **1** whereas said handheld device comprising means for the data and signal processor to communicate with the plurality of the biometric sensors.

4. The handheld device according to the claim **1** comprising:
- at least one wireless communicational device;
- means for said data and signal processor to communicate with said wireless communication device.

5. The handheld device according to the claim **1** comprising a Global Positioning System and means for said data and signal processor to communicate with said Global Positioning System.

6. The handheld device according to the claim **1** comprising:
- a pushbutton;
- means for said data and signal processor to communicate with said pushbutton;
- means for said data and signal processor to initiate an emergency communication with said wireless communication device whenever said button is in pressed state.

7. The handheld device according to the claim **1** comprising:
- a microphone, a speakerphone, a touch-sensitive display, and a camera;
- means for said processor to communicate with the microphone, the speakerphone, the touch-sensitive display, and the camera.

8. The handheld device according to the claim **1** comprising:
- an internal rechargeable battery;
- means for said generator to charge the internal rechargeable battery.

9. The handheld device according to the claim **1** comprising:
- a power and data connector to connect to external mating part;
- means for connecting the internal rechargeable battery to said power and data connector.

10. The handheld device according to the claim **1** comprising:
- a wireless power transmitter;
- means for supplying power and controlling transfer from said energy storage element to the wireless power transmitter.

11. The handheld device according to the claim **1** whereas:
- said cord is embedded with a conductive material;
- means for the cord with embedded conductive material to communicate with said wireless communication device if in need to transmit data;
- means for the cord with embedded conductive material to communicate with said wireless power transmitter to transmit power.

12. The handheld device according to the claim **1** whereas at least some parts of said spool is made from magnetic material.

13. The handheld device according to the claim **1** whereas wire windings are molded into the housing of the handheld device such way said windings became part of the electrical generator.

14. The handheld device according to the claim **1** comprising means for the data and signal processor to acquire the distance which said cord travelled between measurements.

15. A method to monitor physical activity of a person, based on information from the Global Positioning Sensor and to correlate the physical activity of the person with an information from the plurality of the biometric sensors.

16. A method to monitor and to process the distance of the cord travelled between measurements and to correlate a pet physical activity with the distance the cord attached to the pet travelled between the measurements.

* * * * *

专利名称(译)	多功能个人健康监视器，其中包含嵌入宠物皮带的活动跟踪器。		
公开(公告)号	US20180368776A1	公开(公告)日	2018-12-27
申请号	US15/633628	申请日	2017-06-26
[标]申请(专利权)人(译)	KEREM SAMUEL		
申请(专利权)人(译)	KEREM，SAMUEL		
当前申请(专利权)人(译)	KEREM，SAMUEL		
[标]发明人	KEREM SAMUEL KEREM MICHAELA		
发明人	KEREM, SAMUEL KEREM, MICHAELA		
IPC分类号	A61B5/00 G08B25/01 A01K27/00 A61B5/01 A61B5/11 A61B5/0408 A61B5/0205 G01S19/13		
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外部链接	Espacenet USPTO		

摘要(译)

提供一种多功能个人健康监视器，其中活动跟踪器嵌入宠物皮带中。拉动牵引绳的宠物的能量被转换成电力以运行并分析嵌入皮带中的多个生物识别传感器的操作。可以跟踪宠物及其主人的身体活动。可以无线传输获得的生物信息以进行附加处理，或者可以启动紧急呼叫。由宠物移动电力产生的电力可用于给各种外部设备充电。