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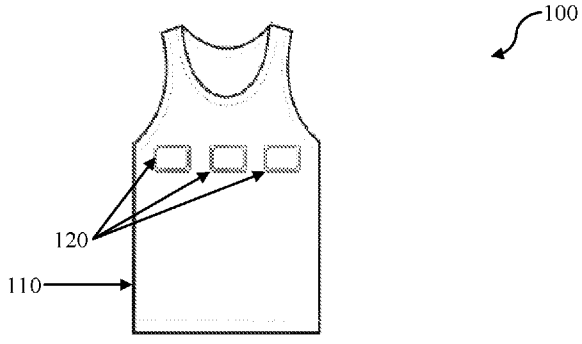

Figure 1a

(57) Abstract: The present invention relates to the field of wearable systems. A system (100), of the present invention, is comfortable for a user to wear, and is able to record the data when the user is at a remote location or away from an external device. The system (100) comprises a garment (110), an elastic region defined on the garment (110) and configured to be in continuous contact with the user's body, a plurality of sensing units configured on an inner surface of the garment (110), and a processing device (130). The sensing unit senses the vital signs of the body, and transmit sensed signals to the processing device (130). The processing device (130) analyzes received signals, and generates processed data. The processing device (130) transmits the processed data to an external device (155) for displaying the same.

A SYSTEM FOR MONITORING VITAL SIGNS OF A BODY TECHNICAL

FIELD OF THE INVENTION

The present invention relates to the field of systems for monitoring vital signs and activity level of a wearer.

BACKGROUND OF THE INVENTION

Nowadays, wearable monitoring systems are used to measure vital signs of a human body, such as electrocardiogram, impedance pneumography, sleep and activity monitoring, heart rate and respiration rate. Typically, such system comprises sensors to sense vital signs of the user's body, and electrical means for connecting the sensors to a monitoring device. The sensors need to be appropriately located such that when the garment is being worn by the user, the sensors are positioned against user's skin to detect electrical signals associated with a user's physiological activity. The conventional electrical means include arrangement of wires and/or connectors. Such connecting arrangement between the sensors and the monitoring device may be uncomfortable for some user, further it also makes the garment and overall system bulky.

Therefore, there is a need for a system that alleviates the aforementioned drawbacks of the conventional systems, and effectively monitors the vital signs and activity level of a user's body.

SUMMARY OF THE INVENTION

The present invention envisages a system for monitoring vital signs of a body. The system comprises a garment, an elastic region defined on the garment, a plurality of sensing units, and a processing device. The elastic region is configured to be in continuous contact with the body of a user. Thus, an interface is formed between the garment and the body of the user. Each sensing unit is configured on an inner surface of the garment. The sensing unit has a sensing part and a conductive part. The sensing part is arranged at the elastic region. The sensing part is configured to sense vital signs of the body of the user, and to conduct those sensed signals corresponding to sensed vital signs of the body towards the conductive part. The conductive part is connected to the sensing part. The system further comprises an insulating layer coated on each sensing unit such that a window is kept open on the sensing part to facilitate contact between the sensing part and the user's body. The processing device is mounted on the garment, and is in communication with the sensing part via the conductive part and with a handheld device. The processing device is configured to receive sensed signals from the sensing part, generate processed data corresponding to the received sensed signals, and transmit the processed data to the handheld device.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWING

A system, of the present invention, will now be described with reference to accompanying drawing, in which:

Figures 1a, 1b, 1c, and 1d illustrate schematic views depicting various configurations of a garment of the system of the present invention;

Figures 2a and 2b illustrate schematic views depicting positions of a sensing part of the sensing unit on the garment of the system, in accordance with embodiments of the present invention;

Figures 3a and 3b illustrate schematic views depicting arrangement of a conductive part of the sensing unit on the garment of the system, in accordance with embodiments of the present invention;

Figure 4 illustrates a block diagram of the system of the present invention;

Figures 5a, 5b, 5c, and 5d illustrate schematic views depicting positions of a processing device on the garment of the system, in accordance with embodiments of the present invention;

Figure 6a illustrates a schematic view of a snap-fit arrangement for connecting the device with the sensing unit, in accordance with an embodiment of the present invention;

Figure 6b illustrates a schematic view of a docking station arrangement for connecting the device with the sensing unit, in accordance with another embodiment of the present invention; and

Figure 6c illustrates a schematic view of a USB cable for connecting the device with the sensing unit, in accordance with yet another embodiment of the present invention.

LIST OF REFERENCE NUMERALS

100 – System

110 – Garment

111 – Loops

112 – Elastic belt

113 – Buckles

114 – Elastic portion

115a – Outer clothing

115b – Inner clothing

118 – Male snap

120 – Sensing part

125 – Conductive part

130 – Processing device

132 – Female snap

140 – Docking station

145 – Back plate

150 – USB cable

155 – External device

160 – Receiver

165 – Analogue to digital converter

170 – First repository

175 – Controller

176 – Analyzer

178 – Processor

180 – Second repository

185 – Synchronizer

190 – Notification unit

DETAILED DESCRIPTION OF THE INVENTION

Although specific terms are used in the following description for sake of clarity, these terms are intended to refer only to particular structure of the invention selected for illustration in the drawings, and are not intended to define or limit the scope of the invention.

References in the specification to "one embodiment" or "an embodiment" mean that a particular feature, structure, characteristic, or function described in connection with the embodiment is included in at least one embodiment of the invention. The appearances of the phrase "in one embodiment" in various places in the specification are not necessarily all referring to the same embodiment.

The present invention envisages a system to monitor vital signs and activity level of a user's body.

The system is now described with reference to Figure 1a to Figure 6c of the accompanying drawing.

Referring to Figure 1a to Figure 6c, a system (100) in accordance with an embodiment of the present invention is shown.

The system (100) comprises a garment (110), a plurality of sensing units mounted on the garment (110), and a processing device (130).

The garment (110) has a shape and size suitable for a user. An elastic region is defined on the garment (110). The elastic region is configured to be in continuous contact with the body of a user, thereby forming an interface between the user's body and the garment (110). The sensing units are mounted on an operative inner surface of the garment (110), which is in contact with the body of the user. The sensing unit has a sensing part (120) and a conductive part (125). The sensing part (120) is arranged at an inner surface of the elastic region or near the elastic region to keep it in continuous contact with the user's body.

Various garment designs are shown in Figures 1a, 1b, 1c, and 1d.

In an embodiment, as shown in Figure 1a, the garment (110) is made of high compression material. Elastomeric yarn in the fabric of the garment (110) provides necessary compression to the garment (110). The compression depends upon quantity of the elastomeric yarn. Higher the elastomeric yarn, higher the compression of the garment (110). In this embodiment, whole garment (110) acts as the high compression garment.

In another embodiment, as shown in Figure 1b, the garment (110) includes an elastic belt (112) provided on the fabric of the garment (110). In an embodiment, the elastic belt (112) is provided on the fabric just above a sensing part (120) of the sensing unit. The elastic belt (112) defines the elastic region. In an embodiment, loops (111) are provided on the fabric of the garment (110) to hold the belt (112) at its place. Further,

the buckles (113) are provided to adjust the tightness of the belt (112). Such garment (110) is useful for wearers who require comfort fit or lose fit design of garment. The wearer can put the elastic belt (112) provided with the garment (110) during the workout.

In yet another embodiment, as shown in Figure 1c, the garment (110) has a portion (114) on the fabric thereof that defines the elastic region. The garment (110) is formed by keeping the elastane content more in the portion (114) of the fabric or by sewing an elastic itself in the garment where the elastic region needs to be formed, and lower elastane content at other portions of the fabric of the garment (110). In such garment (110), the elastic region is created using a double rib knit structure with more elastane content or by sewing an elastic with soft touch and feel properties, running in continuous length wrapped around wearer girth wise starting and ending at the same seam.

The elastic portion (114) creates better gripping pressure on the sensing units. Such garment (110), where there is an elastic portion and the rest of the garment (having little less elastane content as compared to above high compression garment) is a normal fit, gives aesthetically a normal look to a wearer. When the wearer wears the garment (110), the sensing units are in firm contact with the user's body due to the elastic portion (114). Such garment (110) is useful in case of very high physical activity.

In yet another embodiment, as shown in Figure 1d, the garment (110) includes a loose-fitting outer garment (115a) and a tight-fitting inner garment (115b) integral

with each other. The sensing units are mounted on an inner surface of the tight fitting inner clothing (115b). The tight fitting inner clothing (115b) can be a compression wear with or without an elastic belt.

Various other designs of the garment (110) are also well within the scope and ambit of the present invention.

The aforementioned configurations of the garment (110) ensure close contact between the sensing part (120) of the sensing unit and the user's body without adversely affecting the comfort of the user. The close contact between the sensing part (120) and the user's body minimizes errors and give better signal accuracy.

The garment (110) may be manufactured with different type of yarns having elastomeric yarn content and different fabric constructions. Some of the yarns suitable for the garment (110) are synthetic yarn, artificial yarn, natural yarns, bi or tri blends of the aforementioned yarns in different proportions, filament yarn, spun yarn, combination of the filament yarn and spun yarn. The aforementioned yarns may have elastomeric fibres, elastomeric filaments, or combination of the elastomeric fibres and filaments ranging from 5% – 30 % of the fabric content.

Each of the sensing units comprises the sensing part (120) and the conductive part (125). The sensing part (120) is configured to sense vital signs of the body of the user. The sensing part (120) of each sensing unit is configured to measure vital signs of the user's body including physiological parameters including, but not limited to, electrocardiogram, impedance pneumograph, respiration rate, acceleration-deceleration cycles, sleep and activity monitoring of the user's body. More

specifically, the sensing part (120) senses the electrical impulses produced by cardiac rhythm or diaphragm movement due to inflation and deflation of lungs of the user's body. Further, the sensing part (120) is configured to generate sensed signals corresponding to the sensed vital signs of the user's body. Various types of sensors can be used to monitor different body related parameters. In an embodiment, the sensing part (120) is a position tracking sensor configured to track the position of a user and/or distance covered by the user. The position tracking sensor is mounted along a vertical axis or near spinal cord of the user to determine exact posture and position of the user. In an embodiment, the sensing unit is configured on the inner surface of the garment (110) such that the sensing part (120) is at an inner surface of the elastic region of the garment (110).

The conductive part (125) is connected to the sensing part (120), and is configured to electrically connect the sensing part (120) with the processing device (130). In an embodiment, the sensing part (120) and the conductive part (125) are integral.

In another embodiment, the sensing part (120) and the conductive part (125) are joined to each other. In this case, any suitable sensor can be used as the sensing part (120) and the conductive traces can be connected to the sensor. Here, the conductive trace acts as the conductive part (125) of the sensing unit.

The sensing unit communicate with the processing device (130). In an embodiment, three sensing units are embedded in the garment (110). Use of three sensing units minimizes or nullifies errors arising due to muscle movements and other external electrical interference.

The sensing units can be embedded in the garment (110) by various methods. Some of the methods are now illustrated.

In an embodiment, the sensing units (as shown in Figure 2a) are embedded in the garment (110) such that the sensing part (120) (as shown in Figure 2a) will be in contact with the chest area of the user. In another embodiment, as shown in Figure 2b, the sensing units are embedded such that the sensing part (120) of two of the sensing units is near the chest area, while the sensing part (120) of the remaining sensing unit is near abdomen (more specifically, near diaphragm) of the user.

In an embodiment, the conductive part (125) is fused on the garment (110) and then connected to the device (130).

In another embodiment, each of the sensing part (120) and the conductive part (125) is made of a conductive fabric/yarn. The conductive fabric/yarn is cut in a shape of the sensing part (120) and the conductive part (125).

In an embodiment, the conductive yarn is integral with the garment (110). In this embodiment, the conductive yarn is embedded in the garment (110) during the knitting or weaving process of the garment (110). More specifically, the sensing part (120) and the conductive part (125) are knitted during the manufacturing of the garment (110) itself. This seamless knitting is beneficial as there is minimal movement of sensing part (120) while any workout session or activity due to embedding the sensing part (120) within the garment (110). In another embodiment, the conductive yarns are attached/stitched separately to the garment (110).

In another embodiment, each of the sensing part (120) and the conductive part (125) is made of a conductive ink printed on an inner surface of the garment (110).

The sensing part (120) can be connected to the conductive part (125) by bonding them using silicon/vinyl/polyurethane based materials or by stitching them or by using fusible fabrics.

The system (100) further comprises an insulating layer coated on each of the sensing units. The insulating layer is coated on the sensing units such that a window is formed on the insulating layer coated over each sensing part (120) to facilitate contact between the sensing part (120) and user's body. The insulating layer can be of any suitable material. In an embodiment, the insulating layer is made of a material selected from the group consisting of silicon, rubber, Thermoplastic polyurethane, vinyl, and any suitable dielectric material. In another embodiment, the insulating layer is made of a dielectric material.

The insulating layer is coated on the conductive fabrics which are integral with the garment (110) or which are attached/stitched to the garment (110).

A method of coating an insulating layer on a conductive fabric is now illustrated. Initially, a layer of fusible vinyl material is coated on a fabric where the sensing units are to be connected. The vinyl layer fuses with the fabric of the garment. Further, the conductive fabric is placed on the vinyl layer. The insulating layer is then coated on the conductive fabric. It is to be noted that the insulating layer is not fully coated on sensing part of the sensing unit. The window is left open for sensing part touching the body by avoiding application of final silicon layer in that region. Rest of the portion

can be covered by insulating fusible materials so that it becomes water proof. This avoids any chances of shorting of sensing part/sensors by body or terminal shorting or shorting amongst the sensing part and conductive part, thereby ensuring minimal noise in the signals.

In an embodiment, the insulating layer is heat fused on the conductive fabric. In another embodiment, a viscous insulating material is deposited on the conductive fabric using a knife coating method or screen printing method. The process is repeated until a layer of the insulating material having 1 mm thickness is formed on the conductive fabric.

A method of coating an insulating layer on a conductive ink is now illustrated. In case of the conductive ink, printing of electrical conductive part/traces and sensing part/sensors using conductive ink and deposition of a layer of insulating material are done using a specialized printer.

It is to be noted that aforementioned methods are elaborated for example purposes, and they do not limit the scope of the present invention. Any other method for coating the insulated layer on the conductive yarn/fabric/ink is well within the scope and ambit of the present invention.

Figure 3a shows one arrangement of the conductive part (125) which is useful for mounting the device (130) on the garment (110) near the chest area of the user. Figure 3b shows another arrangement of the conductive part (125) which is useful for mounting the device (130) on the garment (110) near waist region of the user.

In an embodiment, the sensing part (120) is subjected to a specialised wetting finish application, so that that region becomes more hydrophilic, thereby resulting in better absorption of moisture from the body and surrounding atmosphere. Due to this, the sensor's skin interface becomes more conductive which results in better sensing of body parameters and reducing the noise in the signals. It is to be noted that the conductive part (125) of each sensing unit is not subjected to this wetting or hydrophilic finish treatment.

In another embodiment, for placement of sensing part (120), a separate elastic region can be designed on the garment (110) so that the portion of the garment (110) containing sensing parts (120) remains tightly close to the body to pick up the signals in such a way that the signals have minimal or nil amount of noise and artifacts produced by muscles or artifacts coming from any other means. Some of the ways of creating the separate region are as follows.

1. The garment (110) is made of fabrics having circular knit or warp knit structures having elastomeric yarn content may be 25% optimum to 5% minimum. The elastomeric yarn content can be 5% – 30 % of the fabric. The lose and tight fitting zone of the garment (110) are determined by the elastomeric yarn content within the garment and direction of laying of such yarns in the fabric structure and sizing of garment. In fabrics with low elastomeric yarn, the elastomeric yarn content should be more in horizontal (courses) direction so that girth wise compression is created on wearer's body. The sensing part (120) along with its conductive part (125)

can be cut from a conductive fabric and can be fixed on garment (110) by different methods discussed above.

2. The garment (110) can be made as discussed in above point no. 01 with normal or lose fit by sewing elastic above the sensing part (120) so that high compression zone is created just above the sensing part (120) for better signal quality. The sensing part (120) along with its conductive part can be cut from a conductive fabric and can be fixed on garment by different methods discussed above.

The processing device (130) is mounted on the garment (110). The processing device (130) is in communication with each of the sensing units, and is configured to receive sensed signals from the sensing part (120) of each sensing unit. The sensed signals have data related to the sensed body parameters. The processing device (130) is further configured to generate processed data corresponding to the received sensed signals from the sensing parts (120). The processed data includes information related to the vital body parameters of the user. For example, the sensing part (120) senses cardiac impulse and transmit the sensed signals to the processing device (130). The processing device (130) receives the sensed signals and generates processed data, i.e., Heart Rate and electrocardiogram of the heart of the user's body.

The processing device (130) is further configured to communicate with an external device (155) to transmit the processed data. The external device (155) is configured to receive and display the processed data thereon. In an embodiment, the external device (155) includes a display unit configured to display the processed data received from the processing device (130). In an embodiment, the external device (155) can be

a printer, a computer, or any digital display device. In an embodiment, the external device (155) is a handheld device such as a mobile phone.

Referring to Figure 4, the processing device (130) includes a receiver (160), an analogue to digital converter (165), a first repository (170), a controller (175), a second repository (180), and a synchronizer (185). The receiver (160) of the device (130) is in electrical contact with the sensing part (120) via the conductive part (125), and is configured to receive sensed signals from the sensors/ sensing part (120) of each sensing unit.

The analogue to digital converter (165) is configured to convert the received sensed signals into corresponding digital signals.

The first repository (170) is configured to store predetermined rules. The rules facilitate generation of processed data by the processing device (130). In an embodiment, the rules include various processor readable instructions to generate graphs, tables, or similar representations of the data analyzed by the controller (175).

In an embodiment, the first repository (170) is configured to store a data table having threshold values of various body related parameters. The controller (175) includes a crawler and extractor module configured to fetch data from the first repository (170).

The controller (175) is configured to receive the digital signals, analyze the received digital signals using the predetermined rules fetched from the first repository (170), and generate processed data. In an embodiment, the controller (175) includes an analyzer (176) configured to analyze the digital signals received by the controller

(175). The controller (175) includes a processor (178) having pre-loaded commands and instructions for functioning of the controller (175).

The second repository (180) is configured to store the processed data therein. More specifically, the controller (175) is configured to communicate with the second repository (180) and to store the processed data therein.

The synchronizer (185) is in communication with the controller (175), and is configured to transmit the processed data to the external device (155) under the commands of the controller (175).

In an embodiment, the synchronizer (185) is in communication with the external device (155) via a server. The synchronizer (185) is configured to communicate with the server wirelessly. The server can communicate with the external device (155). In another embodiment, the synchronizer (185) is in communication with the external device (155) wirelessly using an internet connection or Bluetooth module. In another embodiment, the synchronizer (185) includes an antenna to facilitate long range communication with the external device (155). The antenna makes it possible for the synchronizer (185) to communicate with the external device (155) when distance between them is up to 1 km. In yet another embodiment, the synchronizer (185) is in wired communication with the external device (155).

In an embodiment, the controller (175) is configured to store the processed data in the memory of the device (130), when the device (130) is not able to communicate with the server or the external device (155). The synchronizer (185) transmits the processed data when the connection between the device (130) and the server or the

external device (155) is established. In an embodiment, the device (130) is configured to communicate with the server or the external device (155) upon receiving instructions from the user. The device (130) includes an input unit configured to receive instructions from the user. The aforementioned features help the user to record the data in case the user is at a remote location or does not have an internet connection or an external device.

In an embodiment, the device (130) includes a notification unit (190). The notification unit (190) is configured to notify the user about the status of the device (130). The status includes, but not limited to, battery status of the device (130), whether the device (130) is connected with the sensing unit or not, whether the device (130) is recording the activity or not, and whether the device (130) is in online mode or offline mode. In an embodiment, the notification unit may include a display unit or LED bulbs.

The device (130) is light in weight and easy to operate.

The device (130) can be mounted on the garment (110) using any suitable method and at any suitable location on the garment (110). Figures 5a, 5b, 5c, and 5d show mounting of the device (130) at top front portion, middle front portion, side front portion, and back portion of the garment (110) respectively.

In an embodiment, as shown in Figure 6a, the device (130) is in communication with the sensing unit via a snap-fit arrangement. The arrangement includes a female snap (132) and a male snap (118). The female snap (132) is attached to the device (130), whereas the male snap (118) is attached to the garment (110) or visa-versa. The

female snap (132) snaps with the male snap (118). The male snap (118) is electrically connected to the conductive part (125) of the sensing units. The snaps can be mechanical or magnetic snaps.

In another embodiment, as shown in Figure 6b, the system (100) includes a docking station (140) configured to facilitate communication between the processing device (130) and the sensing units. The docking station (140) includes a back plate (145) connected to an inner surface of the garment (110) and electrically connected to the conductive part (125) of the sensing units. The docking station (140) is provided with 2 or 3 Pin arrangements with a holster. The device (130) contains a male part which is connected with the female part embedded in the holster casing mounted on the garment (110) or vice-versa.

In yet another embodiment, as shown in Figure 6c, the device (130) is connected with the conductive part (125) using a USB cable (150). In this case, the device (130) can be secured in a pocket of the garment (110) or any other pocket.

It is to be noted that the device (130) needs to be removed from the garment (110) before washing the garment (110). The sensing parts (120) and the conductive parts (125) are washable.

The garment (110) is subjected to various finishing processes before use. Sustainable stain protection is provided to the garment (110) along with sun and UV protection. The garment (110) may be subjected to antimicrobial finish to prevent growth of bacteria and microorganisms resulting in bad smell coming from the garment during workout or post workout due to excessive sweating. The garment (110) may be

further treated with microencapsulation containing fragrance material embedded in it which may last for predetermined washes. Further, wicking finish may be applied for humid climatic conditions, while for dry atmospheric conditions, a hydrophilic finish may be applied to the garment (110) for better signal quality. Furthermore, quick dry finish may be applied so that the garment (110) wicks out or throws away moisture from inner part of the garment to surface resulting in faster drying.

The embodiments were chosen and described in order to best explain the principles of the present invention and its practical application, to thereby enable others, skilled in the art to best utilize the present invention and various embodiments with various modifications as are suited to the particular use contemplated. It is understood that various omission and substitutions of equivalents are contemplated as circumstance may suggest or render expedient, but such are intended to cover the application or implementation without departing from the spirit or scope of the present invention.

Claims :

1. A system for monitoring vital signs of a body, said system comprising:

a garment;

a plurality of sensing units configured on an inner surface of the garment, each sensing unit having:

a sensing part arranged at an inner surface of said garment, said sensing part configured to sense vital signs of said body of the user, and generate sensed signals corresponding to vital signs of said body; and

a conductive part connected to said sensing part;

an insulating layer coated on each sensing unit to define a window on each of said sensing part to facilitate contact between said sensing part and the user's body;

an elastic region defined on said garment, said elastic region facilitates continuous contact of said sensing parts with the body of the user, thereby forming an interface between said body and said garment; and

a processing device mounted on said garment, and in communication with said sensing part via said conductive part and a handheld device, said processing device configured to receive sensed signals from said sensing part and generate processed data corresponding to said received sensed signals, said processing device configured to transmit said processed data to said handheld device.

2. The system as claimed in claim 1, wherein said sensing part and said conductive part are integral.

3. The system as claimed in claim 2, wherein said sensing part and said conductive part are made of a conductive yarn.

4. The system as claimed in claim 3, wherein said conductive yarns are integral with said garment.

5. The system as claimed in claim 3, wherein said conductive yarns are attached to said garment.

6. The system as claimed in claim 1, wherein said sensing part and said conductive part are made of a conductive ink printed on an inner surface of said garment.

7. The system as claimed in claim 1, wherein said insulating layer is made of a material selected from the group consisting of silicon, rubber, vinyl, and any dielectric material.

8. The system as claimed in claim 1, wherein said garment includes:

an elastic belt provided on a fabric thereof, and said elastic belt defines said elastic region; and

a plurality of loops mounted on said fabric of said garment to facilitate mounting of said elastic belt on said fabric.

9. The system as claimed in claim 1, wherein a portion of a fabric of said garment defines said elastic region.

10. The system as claimed in claim 1, wherein said garment includes a loose-fitting outer clothing and a tight-fitting inner clothing having said elastic region.

11. The system as claimed in claim 1, wherein said sensing part is arranged at an inner surface of said elastic region of said garment.

12. The system as claimed in claim 1, wherein said processing device includes:

a receiver configured to receive sensed signals from said sensing part;

an analogue to digital converter configured to convert said received sensed signals into corresponding digital signals;

a first repository configured to store predetermined rules;

a controller configured to receive said digital signals, analyze said digital signals using said predetermined rules, and generate processed data;

a second repository configured to store said processed data; and

a synchronizer configured to transmit said processed data to an external device.

13. The system as claimed in claim 12, wherein said controller is configured to store said processed data in said second repository when said processing device is not in communication with said external device.

14. The system as claimed in claim 12, wherein said processing device includes a notification unit configured to notify said user about the status of said processing device.

15. The system as claimed in claim 12, wherein said synchronizer includes an antenna to facilitate long range communication between the synchronizer and said external device.

16. The system as claimed in claim 1, wherein said processing device is in communication with said conductive part via a snap-fit arrangement.

17. The system as claimed in claim 1, wherein said system includes a docking station configured to facilitate communication between said processing device and said sensing unit.

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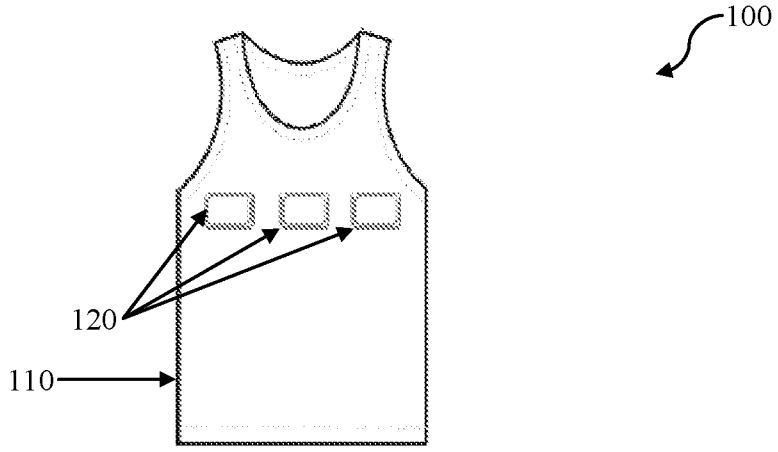

Figure 1a

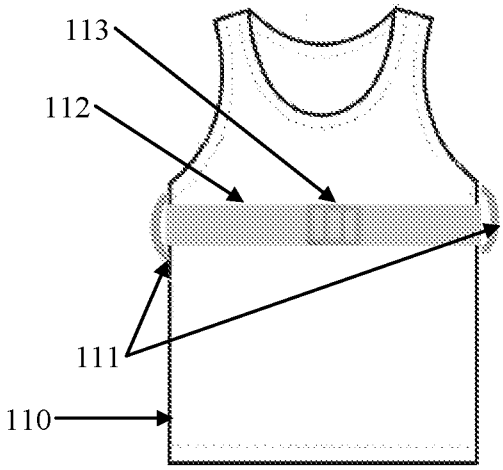

Figure 1b

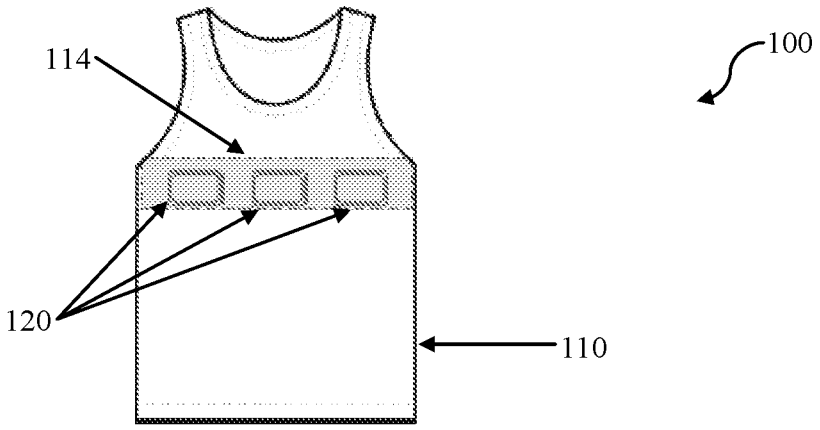

Figure 1c

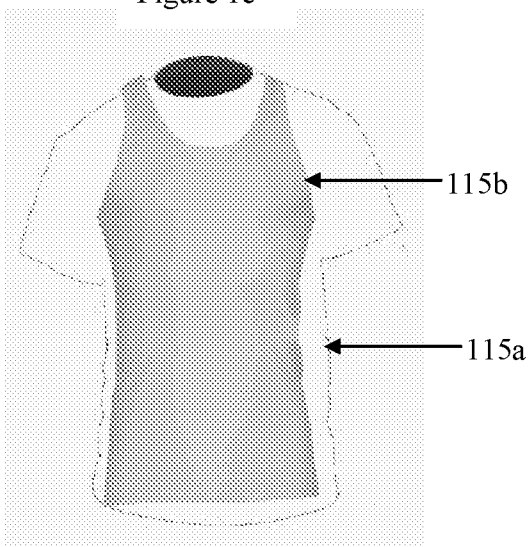

Figure 1d

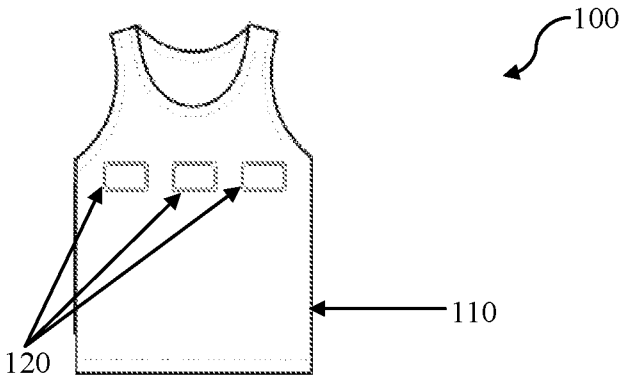

Figure 2a

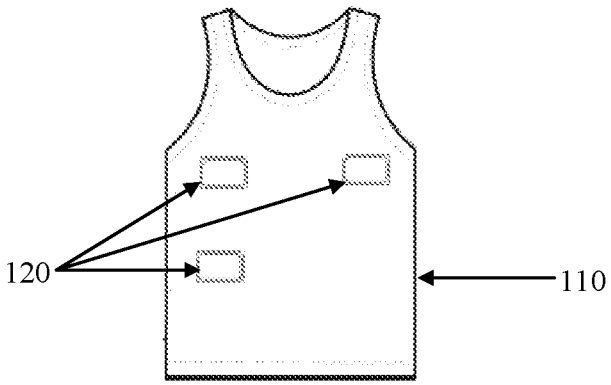

Figure 2b

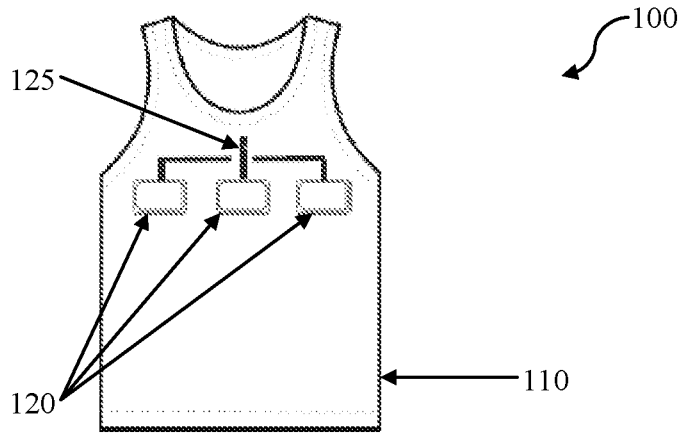

Figure 3a

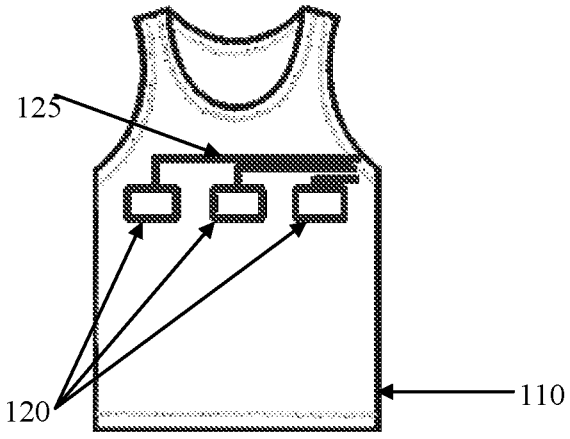

Figure 3b

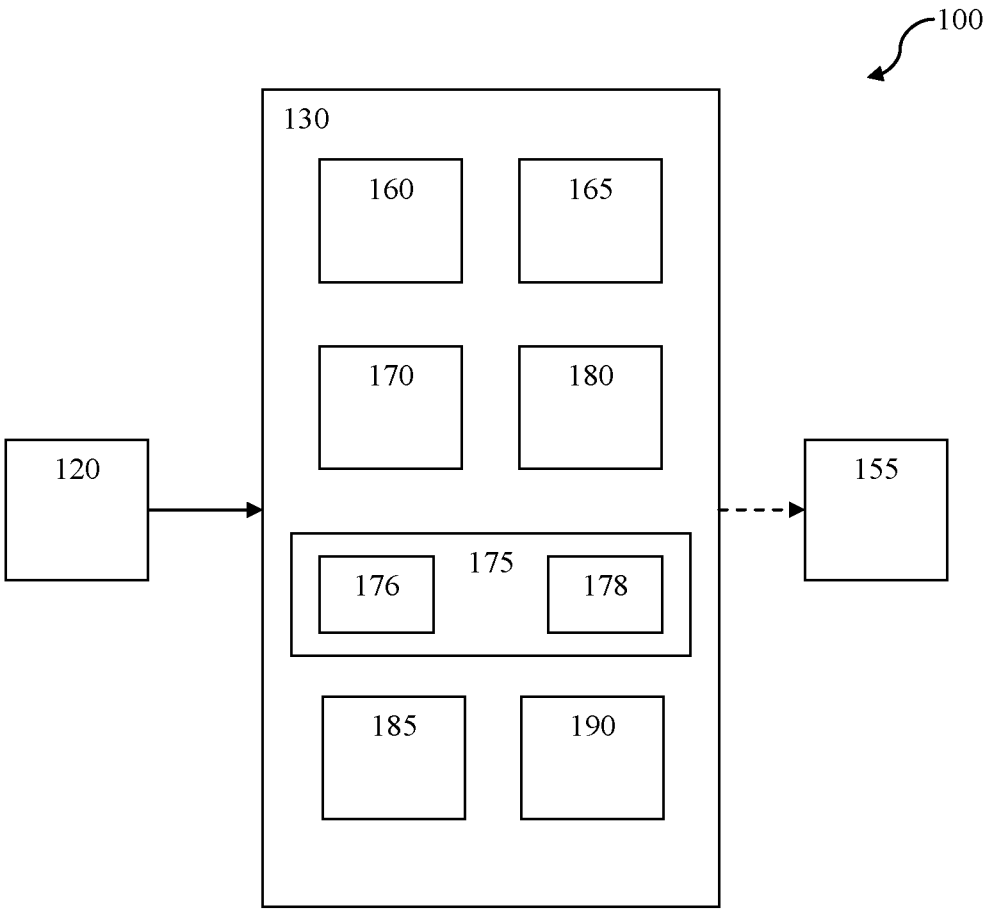

Figure 4

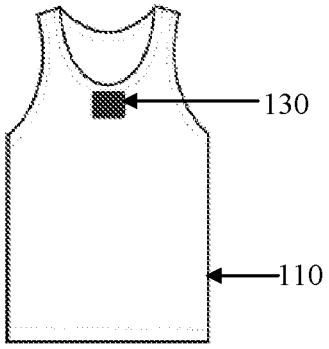

Figure 5a

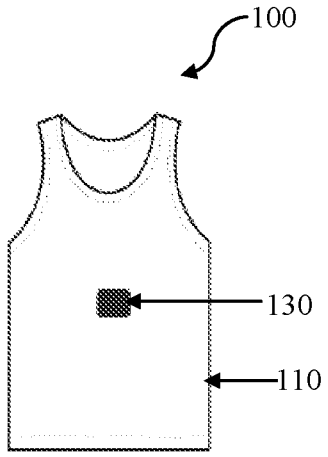

Figure 5b

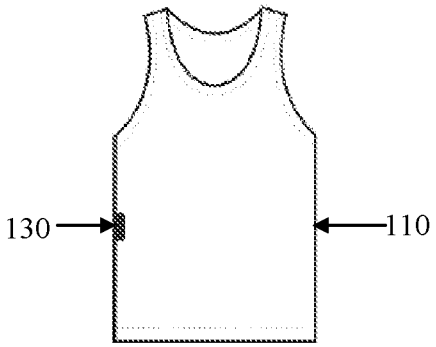

Figure 5c

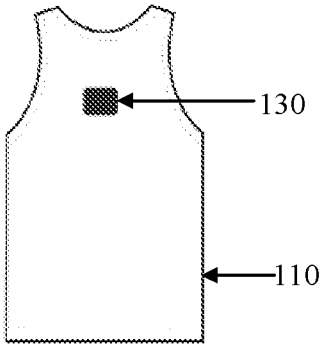

Figure 5d

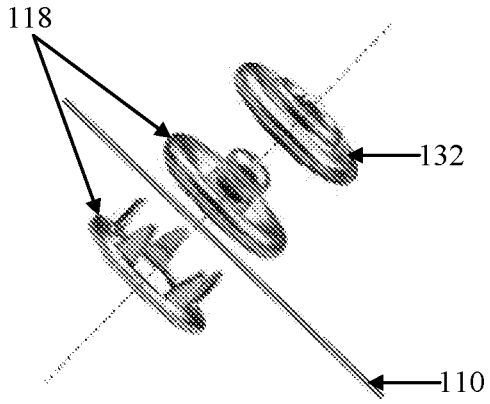

Figure 6a

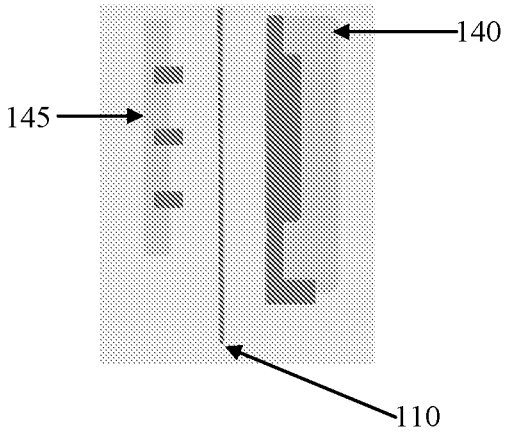

Figure 6b

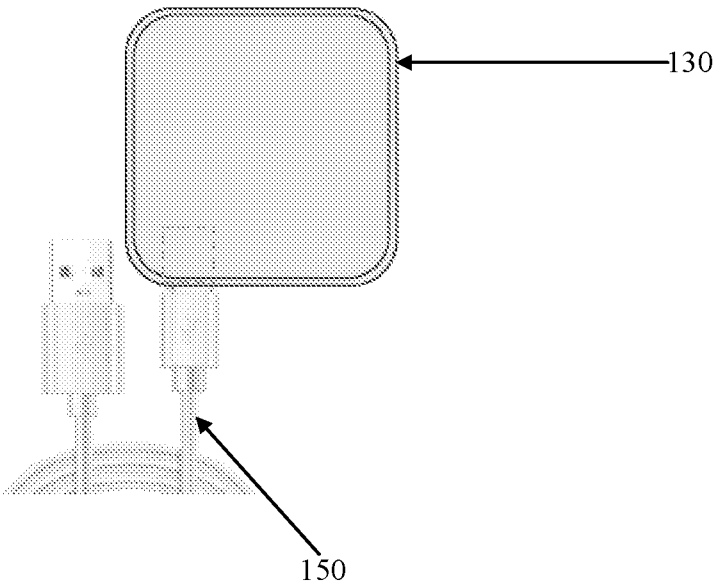

Figure 6c

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IN2019/050764

A. CLASSIFICATION OF SUBJECT MATTER
A61B5/00,A41D1/00 Version=2020.01

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, A41D

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

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

TotalPatent One, IPO Internal Database
Keywords: Garments, Sensor

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US8818478B2 (ADIDAS, Ag) 26 AUGUST 2014 (26-08-2014) Claims 1-31 and Paragraphs [0061]-[0063]	1-17

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

* Special categories of cited documents:
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"D" document cited by the applicant in the international application
"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 another 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
24-01-2020	24-01-2020

Name and mailing address of the ISA/	Authorized officer
Indian Patent Office Plot No.32, Sector 14,Dwarka,New Delhi-110075 Facsimile No.	Sudhir Kumar Telephone No. +91-1125300200

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IN2019/050764

Citation	Pub.Date	Family	Pub.Date
US 8818478 B2	26-08-2014	EP 2505090 A3	12-12-2012
		JP 2012214968 A	08-11-2012