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(54) **VITAL SIGN SENSING DEVICE**

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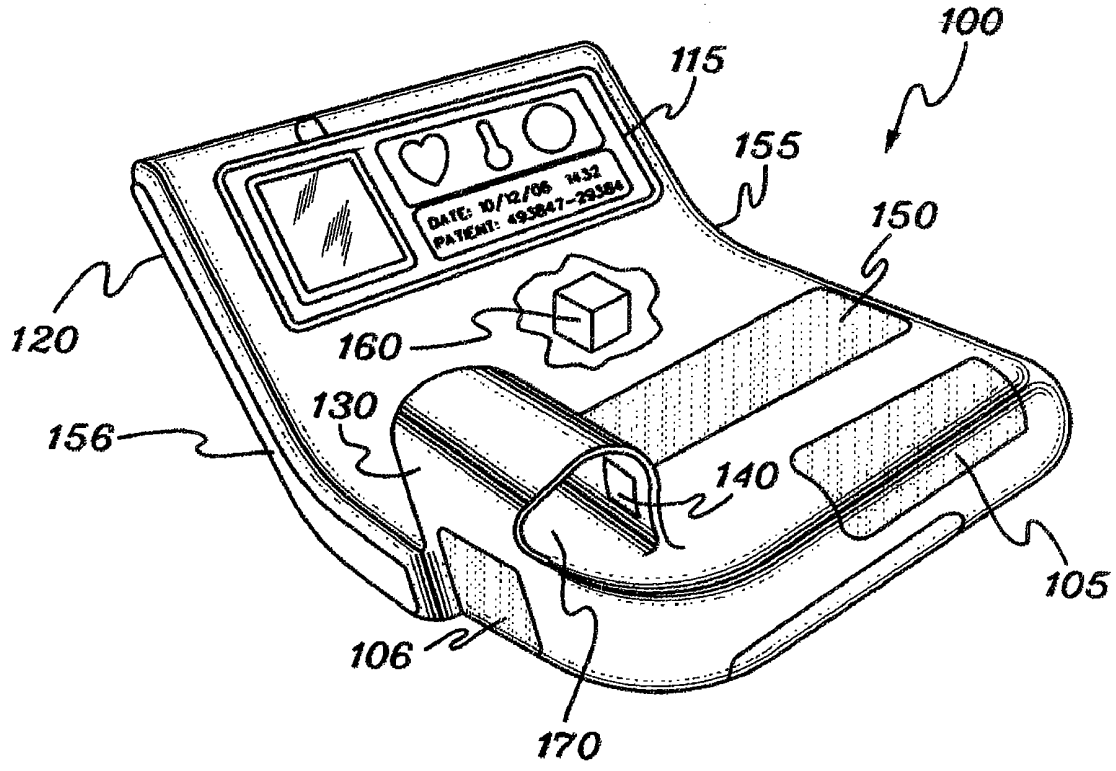
(57) **ABSTRACT**

Vital sign sensing device includes a housing adapted to support a hand of a user and sensors adapted to detect vital signs of the user. The sensor device includes an arithmetic processor adapted to receive the electrical signal, manipulate the signal, and generate an electrical signal representative of the vital signs. The vital sign sensing device can be incorporated into various structures and equipment, such as, an armrest or seating device, a stretcher, or a kiosk.



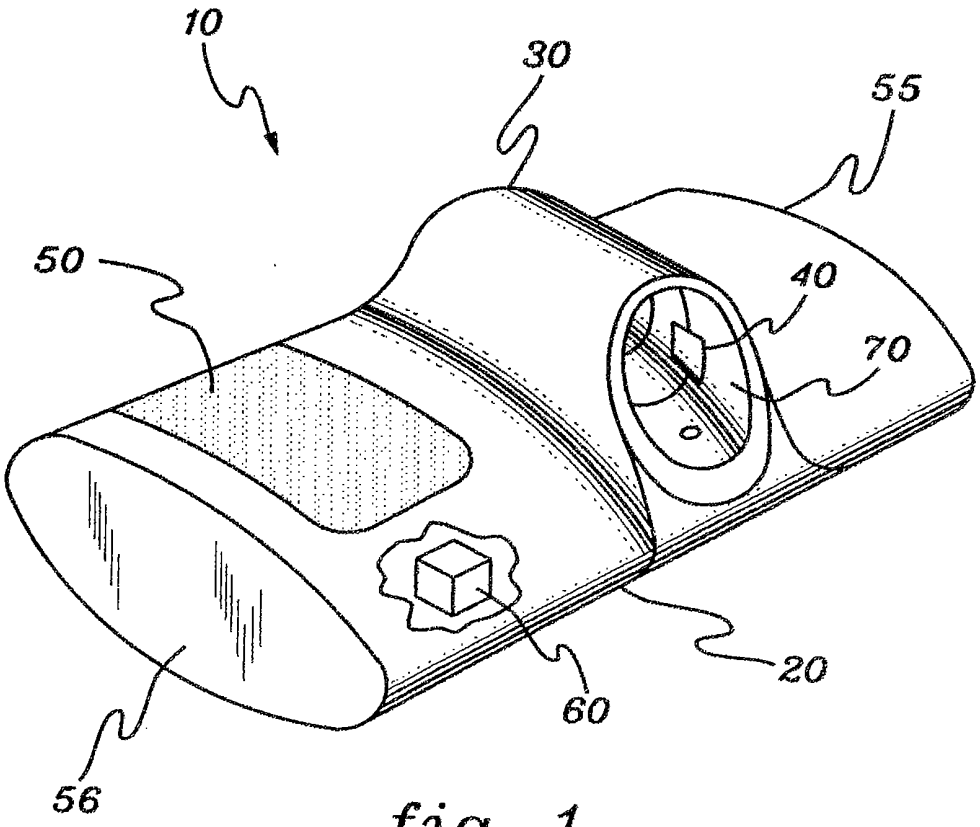


fig. 1

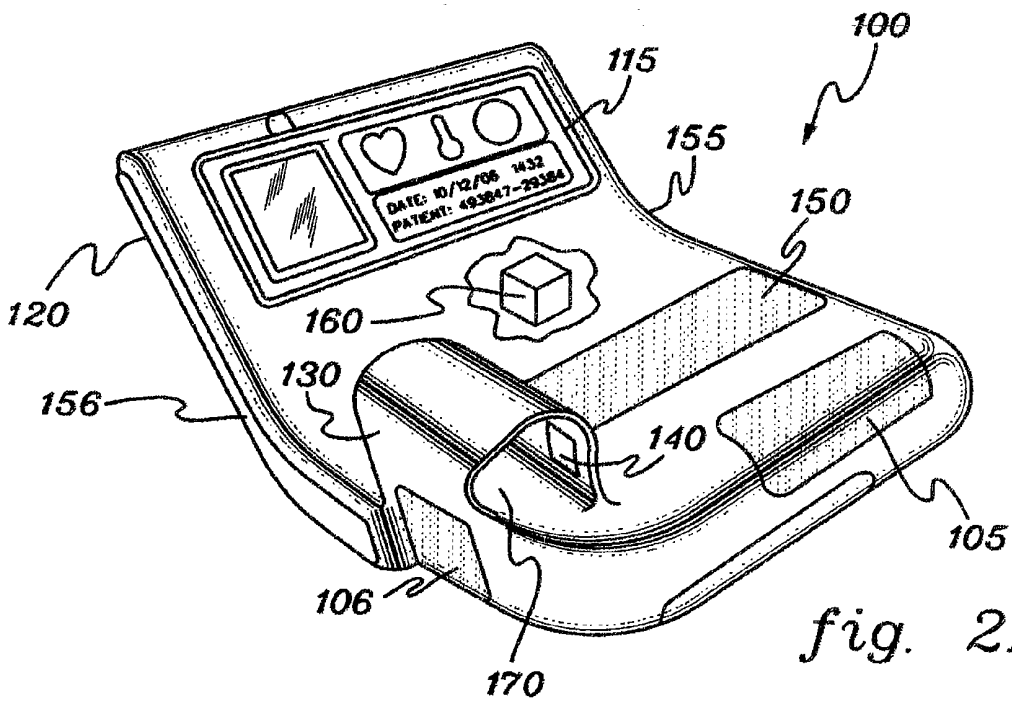

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fig. 2A

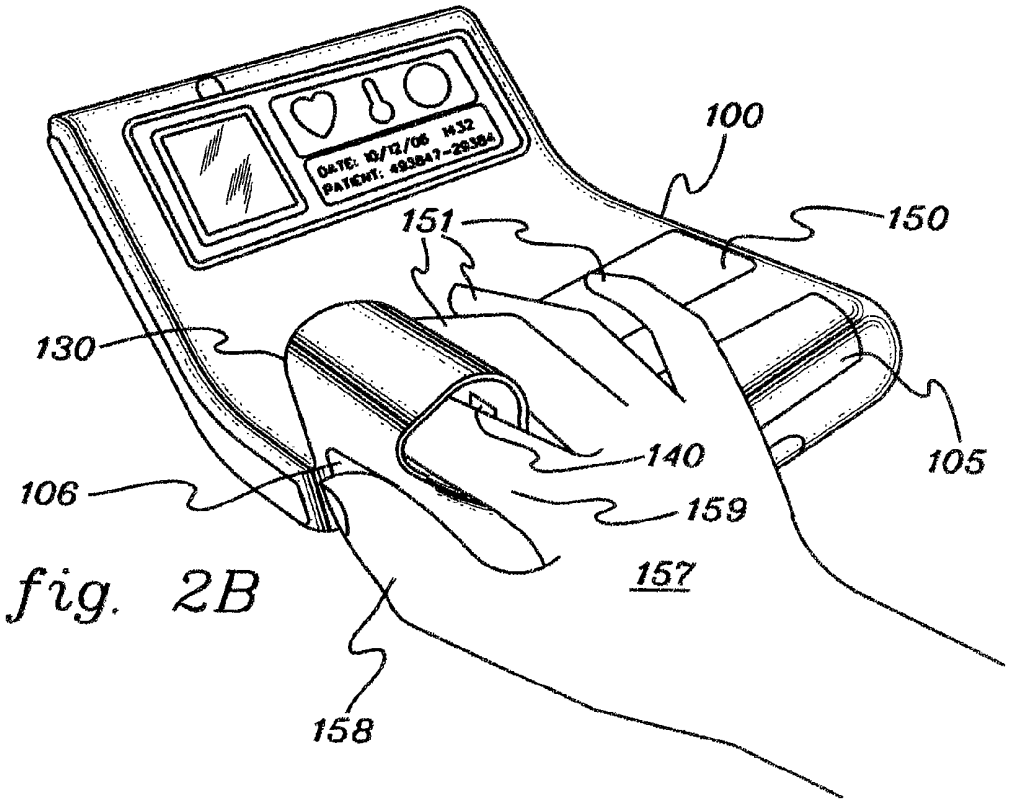
100
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fig. 2B

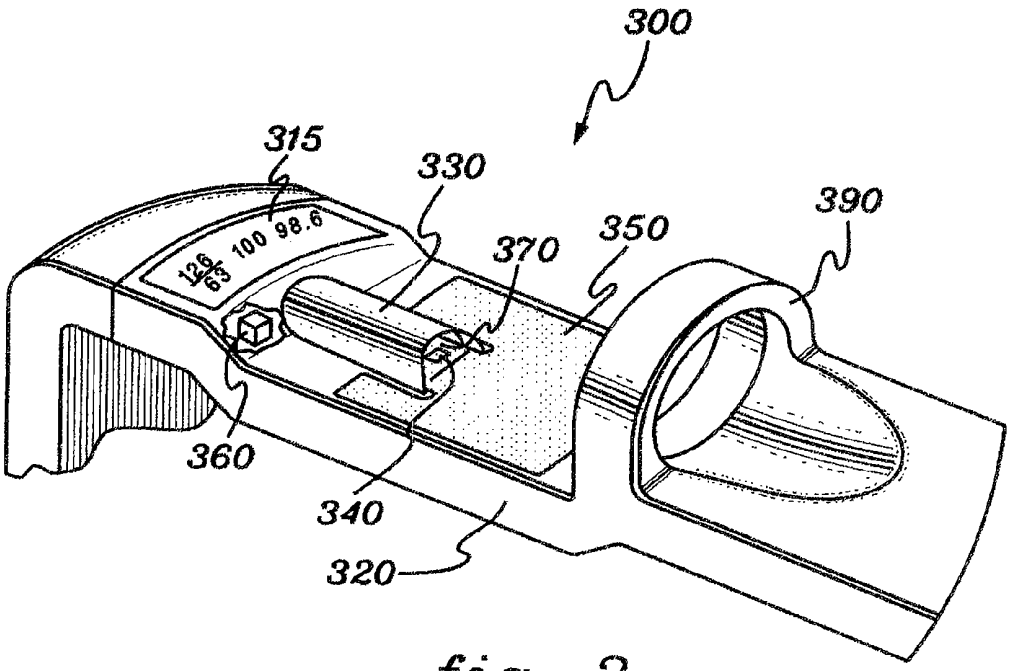

fig. 3

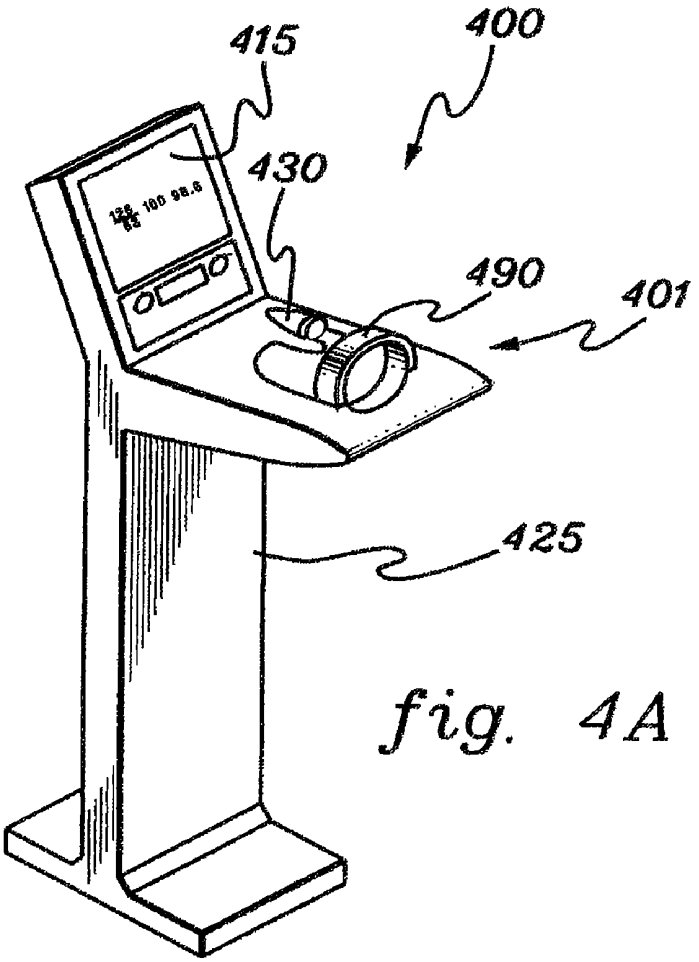

fig. 4A

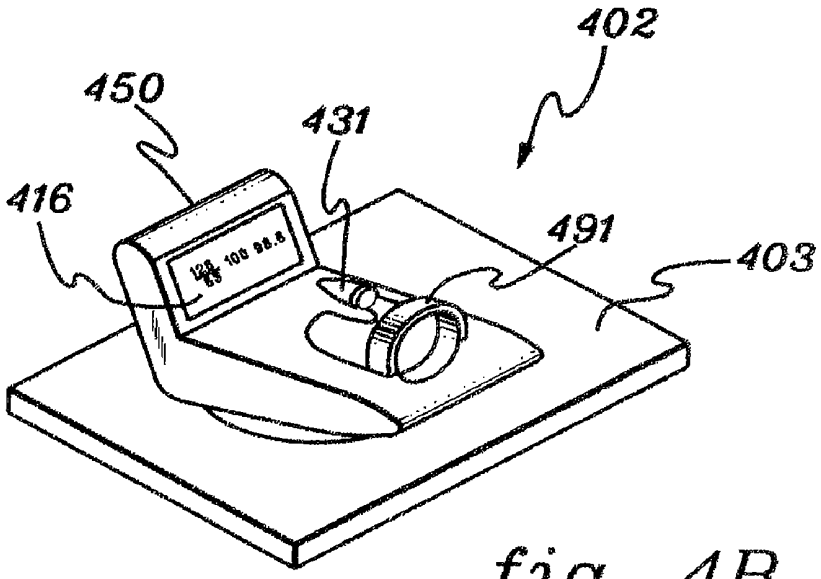

fig. 4B

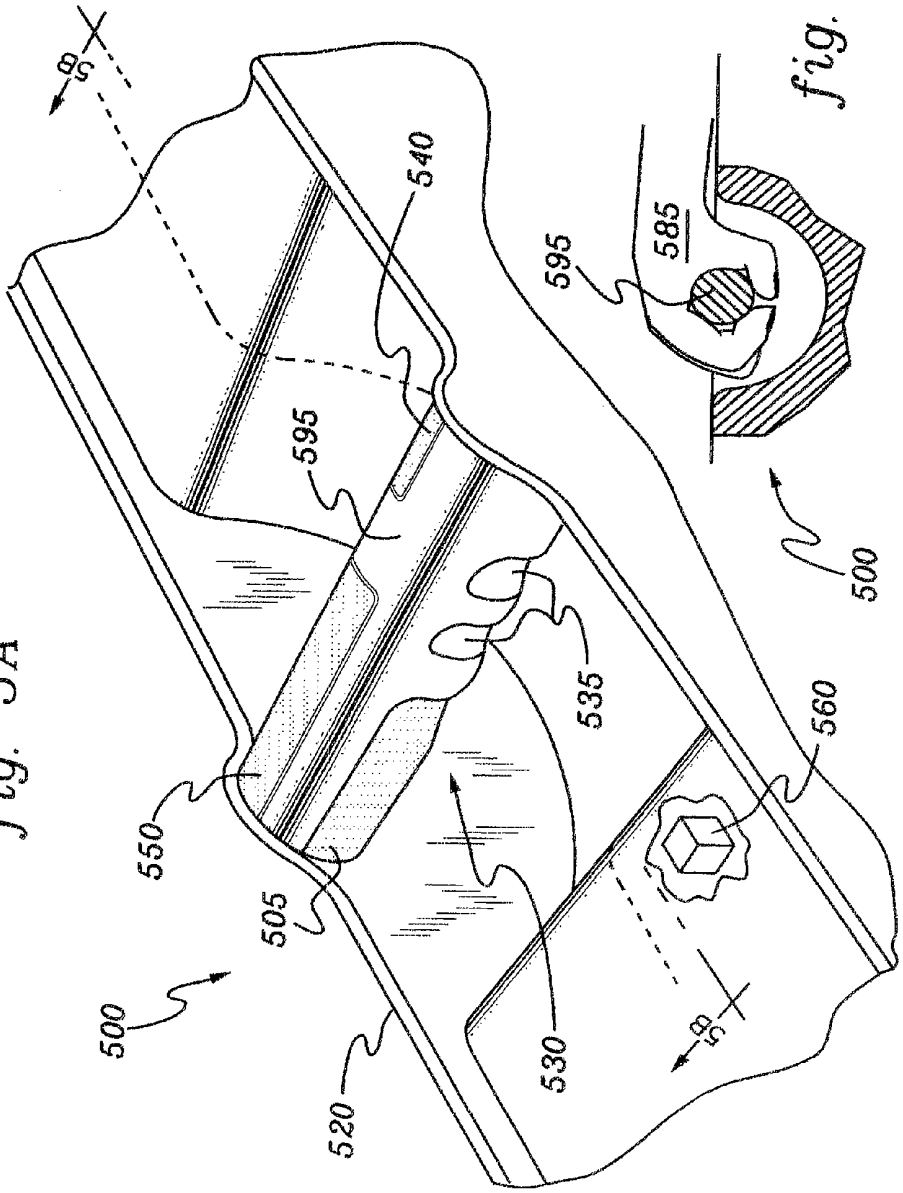

fig. 5A

fig. 5B

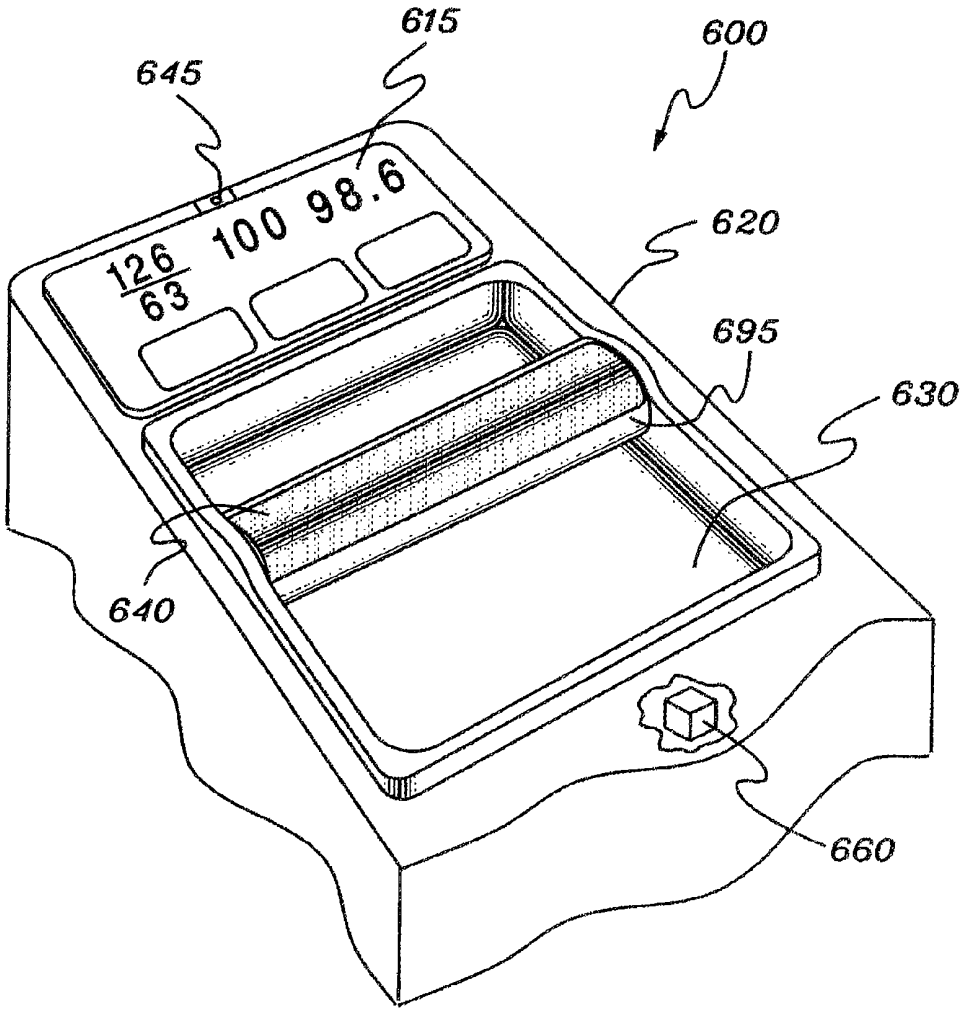

fig. 6

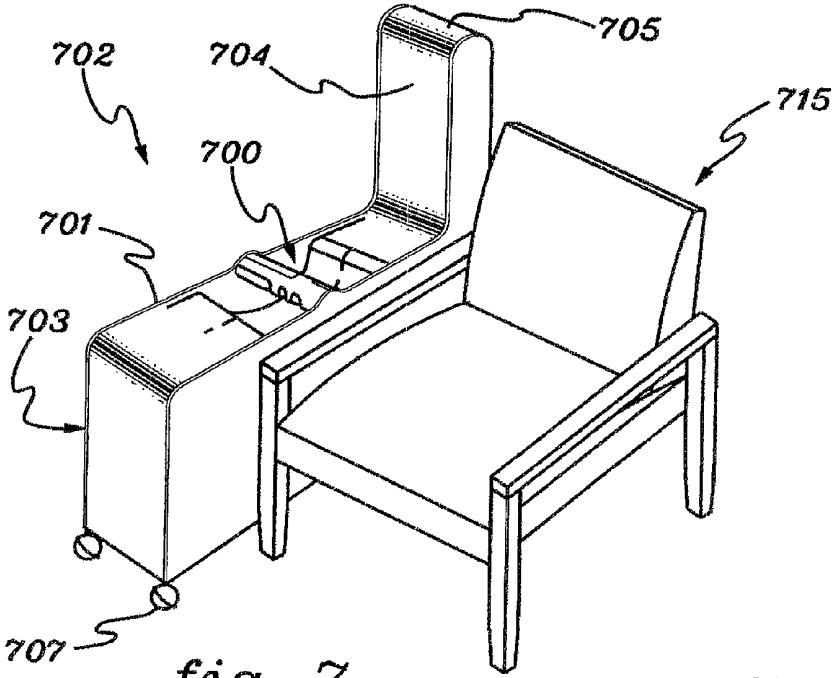
705
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fig. 7

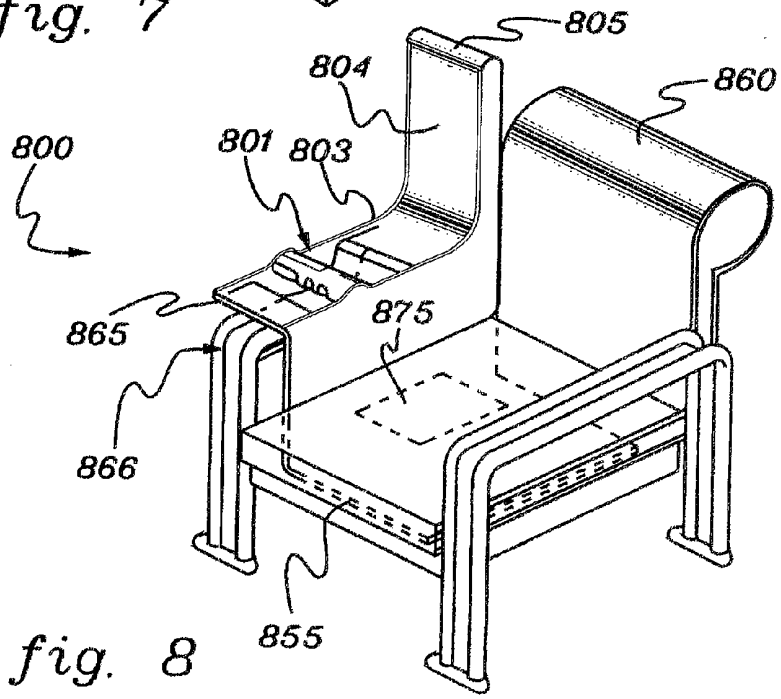
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fig. 8

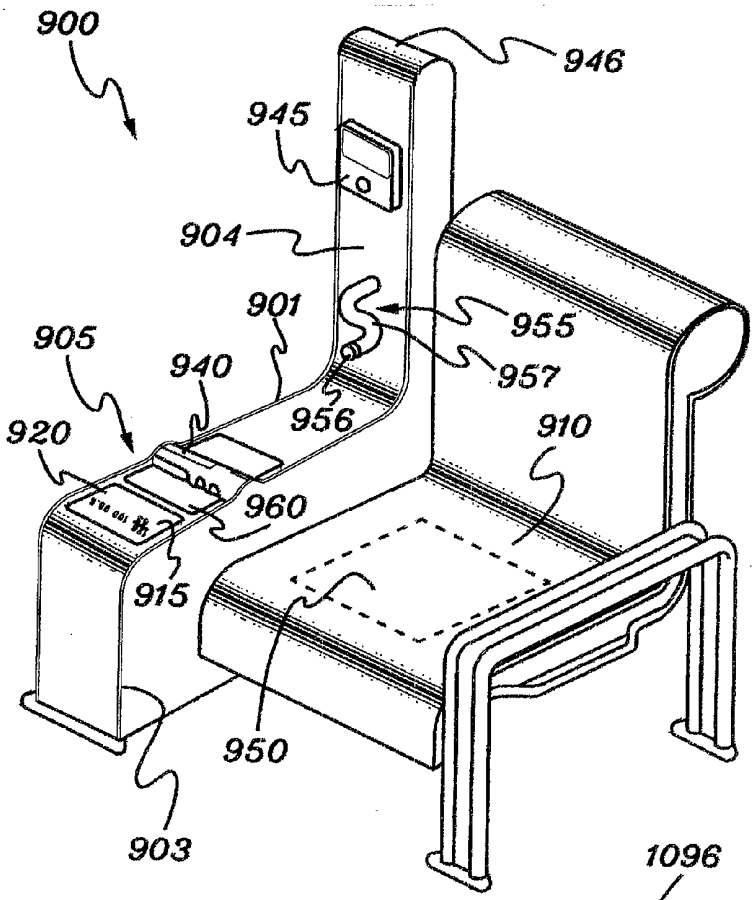
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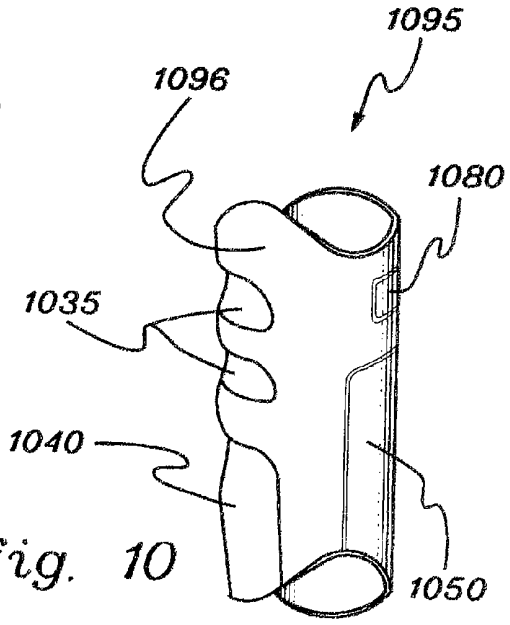
fig. 9


1095
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1050

fig. 10

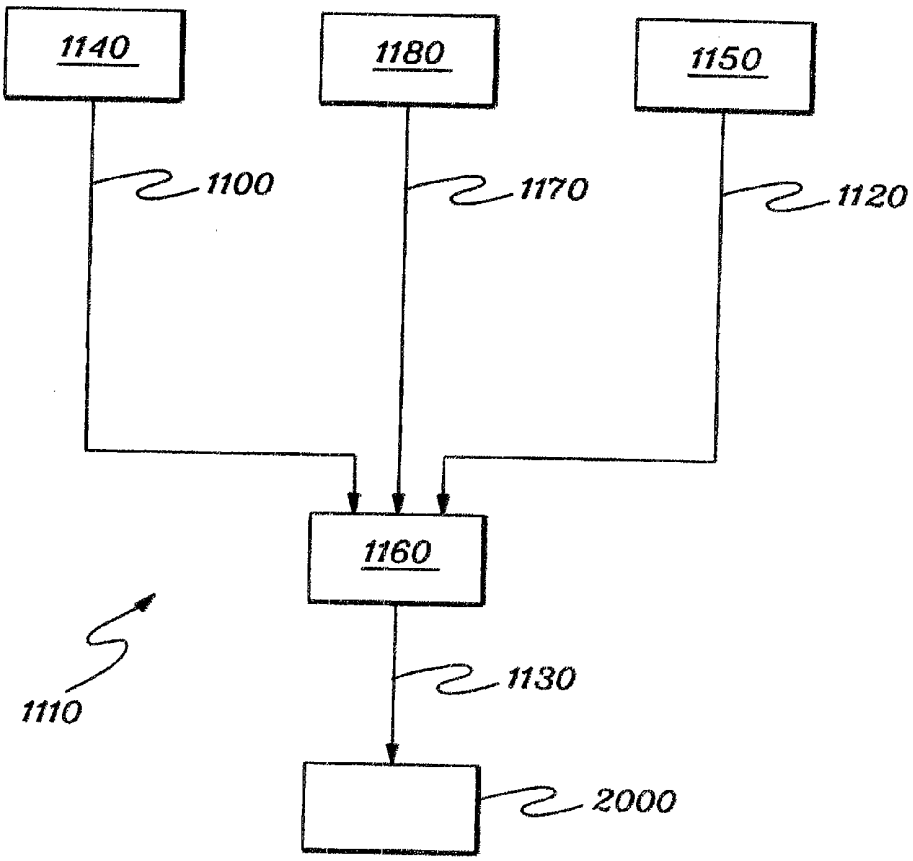

fig. 11

VITAL SIGN SENSING DEVICE

CROSS-REFERENCES TO RELATED APPLICATIONS

[0001] This application claims priority from co-pending U.S. provisional patent application No. 60/763,641, filed Jan. 31, 2006, which is hereby incorporated in its entirety by reference.

TECHNICAL FIELD

[0002] This invention relates to a vital sign sensing device adapted to measure a multitude of vital signs. The vital sign sensing device can collect, analyze and relay vital sign data.

BACKGROUND OF THE INVENTION

[0003] The efficient detection and monitoring of a patient's vital signs is critical to ensuring proper treatment. In most health care settings, patients are faced with long wait times and overcrowded waiting rooms. Assessing a patient's vital signs is expensive and time consuming. Healthcare workers benefit from tools and equipment that improve their efficiency. The present invention has the ability to revolutionize the monitoring and treatment of patients by allowing for the collection and analysis of vital sign measurements, without the necessary assistance of a healthcare provider.

[0004] The vital sign sensing device of the present invention can aid the medical profession to more efficiently and effectively assist patients by reducing care givers' workloads resulting in reducing the time patients spend waiting for care. In the US, the average patient spends about an hour and a half waiting to be seen by a medical professional. Likewise, the process of admitting patients and measuring vital signs requires, on average, an additional 35 minutes. As a result of long waiting periods, patient are less satisfied, and those that require immediate attention often suffer.

SUMMARY OF THE INVENTION

[0005] According to aspects of the present invention, the vital sign sensing device is patient-friendly and easy to use. Some aspects include the ability to measure a multitude of physiological indicators, collect and analyze the physiological data and relay the data to remote locations. The vital sign sensing device embodies multiple sensors adapted to measure vital signs. It also embodies an arithmetic processor adapted to receive vital sign data, manipulate the data, and generate an output based on the data analysis. The present invention also has the capability of measuring, analyzing and communicating a patient's physiological indicators on an ongoing basis and alerting health care providers of medical emergencies. Additional embodiments include an arm cuff for measuring blood pressure and a display screen for displaying data.

[0006] The present invention will reduce healthcare costs by enabling more efficient vital sign measurements. The present invention will significant impact hospital procedures, reduce care-givers' workloads and improve a patient's waiting room experience. The multiple and diverse embodiments of the invention provide for applications beyond the emergency room or waiting room setting. The vital sign sensing device is easily mountable and can be mounted or incorporated into any apparatus, such as a chair, kiosk, stretcher, bed, home product, ambulance and more to allow for the safe, easy and efficient monitoring of vital signs. Further, the invention will allow for vital sign measurements to be more easily assessed in less common locations, for example, at-home, on the battlefield and during patient transport.

[0007] The present invention will radically change the waiting room experience by allowing the patient to measure, analyzing, and communicate their vital signs without the assistance of a healthcare worker. As part of its functionality, the present invention has the capability to measure a multitude of physiological indicators, analyze the measurements taken and relay the information. Further, the vital sign sensing device can track a patient's vital signs over time, and therefore, can help identify trends. Also, the vital sign data collected can be stored in digital form and can therefore be integrated into existing hospital digital records. The present invention may reduce healthcare costs by reducing caregivers' workloads, enable more efficient patient admitting processes, enable more accurate vital sign measurements, automatically integrate digital patient records, and allow for vital sign measurements to be obtained in diverse settings (for instance, at the hospital, at home, on the battlefield, or at the office).

[0008] One embodiment of the invention is a vital sign sensing device that includes a housing adapted to support the hand of the user. The housing includes a cavity, and the cavity is adapted to receive one or more fingers of the user. The cavity may further include a sensor adapted to detect one or more vital signs of the user and to output an electrical signal representative of the vital sign(s). Another aspect of the invention includes a second sensor which may also be mounted in the housing of the vital sign sensing device. The second sensor may be adapted to further contact the arm the user, detect at least one further vital sign of the user, and output an additional electrical signal representative of the further vital sign(s). One embodiment may also include an arithmetic processor adapted to receive electrical signals, manipulate electrical signals, and generate an additional electrical signal representative of one or more of the vital signs.

[0009] Another embodiment of the present invention is a vital sign sensing device, which includes a housing, a cavity, and a handgrip. The handgrip may be mounted across a cavity or in any other configuration. The vital sign sensing device includes a sensor mounted in the handgrip. The sensor is adapted to detect one or more vital signs from the user and to output an electrical signal representative of the vital sign(s). An additional feature of the vital sign sensing device includes an arithmetic processor adapted to receive an electrical signal, manipulate the electrical signal, and generate a further electrical signal representative of the vital sign.

[0010] An additional embodiment of the invention is the vital sign sensing device as discussed above, incorporated into an arrangement, such as a chair. The arrangement may include a console which may further include an armrest. The vital sign sensing device is positioned in the console and includes one or more sensors adapted to contact the user seated in the seating device. The sensors are adapted to detect one or more vital signs and are adapted to output an electrical signal representative of one or more of the vital signs. Further, the device may include an arithmetic processor as discussed above.

BRIEF DESCRIPTION OF THE DRAWING

[0011] The present invention will be better understood from the detailed description given herein below and the accompanying drawings which are given by way of illustration only, and thus are not a limitative of the present invention and wherein:

[0012] FIG. **1** is a perspective view of a vital sign sensing device according to one aspect of the invention.

[0013] FIG. **2**A is a perspective view of a vital sign sensing device according to another embodiment of the invention.

[0014] FIG. **2**B is a perspective view of the vital sign sensing device shown in FIG. **2**A as used by a user.

[0015] FIG. **3** is a perspective view of a vital sign sensing device according to another aspect of the invention.

[0016] FIG. **4**A is a perspective view of a vital sign sensing device mounted to a freestanding structure according to another aspect of the invention.

[0017] FIG. **4**B is a perspective view of a vital sign sensing device mounted to a surface according to another aspect of the invention.

[0018] FIG. **5**A is a perspective view of a vital sign sensing device according to a further embodiment of the invention.

[0019] FIG. **5**B is a cross-sectional view of the device as shown in FIG. **5**A as viewed along section lines **5**B-**5**B in FIG. **5**A.

[0020] FIG. **6** is a perspective view of a vital sign sensing device according to another aspect of the present invention.

[0021] FIG. **7** is a perspective view of a vital sign sensing device according to a further embodiment as associated with a chair.

[0022] FIG. **8** is a perspective view of a further embodiment of the present invention shown mounted to a chair.

[0023] FIG. **9** is a perspective view of a further embodiment of the present invention.

[0024] FIG. **10**. is a perspective view of another embodiment of the present invention.

[0025] FIG. **11** is a schematic diagram of an electrical system according to a further embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0026] Reference is now made to the above drawings wherein the identical numbers refer to the like parts throughout. It is noted that while the invention is described herein, all such adaptations and alternate embodiments are considered to fall within the scope of the claims appended hereto.

[0027] FIG. **1** is a perspective view of a vital sign sensing device **10** according to one aspect of the invention. FIG. **1** shows a vital sign sensing device **10**, which includes a housing **20** adapted to support a hand of the user (not shown), and a cavity **30** adapted to receive at least one finger of the user. First sensor **40** may be mounted in any part of cavity **30**. Cavity **30** can be cylindrical or non-cylindrical and typically has at least one aperture **70**. Aperture **70** may be located anywhere in cavity **30**, including, but not limited to, the top and sides of cavity **30**. Further, cavity **30** may comprise a first cylindrical section and a second cylindrical section, where the first cylindrical section may be pivotally mounted to the second cylindrical section. For example, the first section is a cylindrical tube pivotally mounted to the second section which is also a cylindrical tube. Cavity **30** also may be adjustable to fit the finger of the user and may receive any finger of the hand. Further, multiple sensors may be mounted in cavity **30**.

[0028] According to one aspect of the invention, at least one first sensor **40** may be mounted in cavity **30**. First sensor **40** may be adapted to detect one or more vital signs of the user and to output at least one electrical signal, for example, a first electrical signal, representative of the vital sign(s). First sensor **40** may be adapted to include a physiological indicator sensor, which may include one or more of a pulse rate sensor, a pulse oxygenation sensor, a temperature sensor, an EKG sensor, a blood glucose sensor, a basal metabolism sensor, a body mass index sensor, a body fat sensor, or any other type of physiological sensor.

[0029] As shown in FIG. **1**, Housing **20** may include a second sensor **50** adapted to contact the hand of the user. Second sensor **50** may be adapted to detect one or more vital signs of the user and to output an electrical signal, for example, a second electrical signal, representative of the vital sign(s). Second sensor **50** may be adapted to include a physiological indicator sensor, which may include one or more of a pulse rate sensor, a pulse oxygenation sensor, a temperature sensor, an EKG sensor, a blood glucose sensor, a basal metabolism sensor, a body mass index sensor, a body fat sensor, or any other type of physiological sensor. Second sensor **50** may be located anywhere on housing **20** or in cavity **30**. Either first sensor **40** or second sensor **50** or both first sensor **40** and second sensor **50** may be contacted by the hand of the user for device **10** to measure vital sign(s). Additionally, housing **20** may include a first end **55** and a second end **56**. Second sensor **50** may be located at or adjacent to first end **55** or second end **56**, or in between first end **55** and second end **56**. Further, cavity **30** may be located at or adjacent to either first end **55** or second end **56**, or, as shown in FIG. **1**, cavity **30** may be located in between first end **55** and second end **56**.

[0030] According to one aspect of the invention, the vital sign sensing device **10** may further include one or more additional sensors adapted to detect additional vital signs of the user and to output further electrical signals, for example, a third or a fourth electrical signal output, representative of at least one vital sign. The additional sensor(s) may contact any portion of the hand of the patient (not shown) and may be adapted to include a physiological indicator sensor which may include one or more of a pulse rate sensor, a pulse oxygenation sensor, a temperature sensor, an EKG sensor, a blood glucose sensor, a basal metabolism sensor, a body mass index sensor, a body fat sensor, or any other type of physiological sensor. The additional sensor(s) may be incorporated in any one or more embodiments of the present invention disclosed herein.

[0031] As shown in FIG. **1**, the vital sign sensing device **10** may further include one or more arithmetic processors **60** positioned in housing **20**. Arithmetic processor **60** may be

adapted to receive electrical signals, such as a first, second, or fourth electrical signal, manipulate the electrical signals, and generate an additional electrical signal, for example a third electrical signal output, representative of one or more vital signs. The electrical signals can be one of a wired or wireless signal. The wireless signal may include an RFID signal, a WIFI signal, a cellular signal, or other related signal. Arithmetic processor **60** may be adapted to store one or more electrical signals corresponding to one or more vital signs and may further be adapted to record the electrical signals for one or more time periods. The terminology describing first, second, third and fourth electrical signals and their relationships is common in all aspects of the invention disclosed herein.

[**0032**] An additional aspect of vital sign sensing device **10** may include a means for communicating with an information system, for instance, a healthcare information system. Also, vital sign sensing device **10** may further comprise a finger print reader or other identification indicator. A finger print reader or other identification indicator may be incorporated into any embodiment of the invention disclosed herein.

[**0033**] Additionally, vital sign sensing device **10** may also include a source of power adapted to supply the physiological sensors and the arithmetic processor **60** with power. The source of power may include electric power, solar power, battery power, or other source of power.

[**0034**] Vital sign sensing device **10** is mountable to various structures. For instance, vital sign sensing device **10** can be mounted to handles, poles, bars, tables, and counters, among other structures. Vital sign sensing device **10** may also be easily mounted and dismounted to any of these structures, for example, by conventional fasteners (not shown). The device **10** may also be mounted so device **10** can be rotated. Vital sign sensing device **10** may also be incorporated into sports equipment, medical equipment, office equipment, security products, and furniture, among other equipment.

[**0035**] Further, vital sign sensing device **10** may include an arm cuff (not shown), for example, as shown and described in FIG. **3** below. The arm cuff may be adapted to detect one or vital signs, including blood pressure and pulse rate or any other physiological indicator that can be detected on the arm of the user. The arm of the user is intended to broadly encompass the fingers, hand, wrist, forearm, bicep and upper region of the arm. The arm-cuff may be adjustable to fit the arm of a user and may be made out of any type of material, rigid or flexible.

[**0036**] FIG. **2**A is a perspective view of vital sign sensing device **100** according to another embodiment of the invention. As shown in FIG. **2**A, vital sign sensing device **100** includes a housing **120** for supporting the hand of a user (not shown), and a cavity **130** for supporting one or more fingers of the user (not shown). According to one aspect of the invention, cavity **130** may be cylindrical or non-cylindrical and may include aperture **170**. Aperture **170** may be located anywhere on cavity **130**, including, but not limited to, the top and sides of cavity **130**. Cavity **130** may include a first section and a second section and the first section may be pivotally mounted to the second section, as described above. Cavity **130** may be adjustable to fit the finger(s) of the user (not shown). Further, cavity **130** may receive any finger(s) of the hand of the user and multiple sensors may be mounted in cavity **130**.

[**0037**] According to one aspect of the invention as shown in FIG. **2**A, a first sensor **140** may be located anywhere in cavity **130**. First sensor **140** may be adapted to detect at least one vital sign of the user (not shown) and to output at least one electrical signal representative of the vital sign(s). First sensor **140** includes a physiological indicator sensor, which may include one or more of a pulse rate sensor, a pulse oxygenation sensor, a temperature sensor, an EKG sensor, a blood glucose sensor, a basal metabolism sensor, a body mass index sensor, a body fat sensor, or any other type of physiological sensor.

[**0038**] Further, housing **120** may also include a second sensor **150**, and second sensor **150** may be adapted to contact the hand of the user (not shown). Second sensor **150** may be adapted to detect one or more vital signs of the user and to output an electrical signal representative of the vital sign(s). Second sensor **150** may include a physiological indicator sensor, which may include one or more of a pulse rate sensor, a pulse oxygenation sensor, a temperature sensor, an EKG sensor, a blood glucose sensor, a basal metabolism sensor, a body mass index sensor, a body fat sensor, or any other type of physiological sensor. Second sensor **150** may be located anywhere in housing **120** or cavity **130**. Either first sensor **140** or second sensor **150** may be contacted for device **100** to function. Housing **120** may include first end **155** and second end **156** and the second sensor **150**, may be positioned at or adjacent to first end **155** and second end **156** or in between first end **155** and second end **156**. As shown in FIG. **2**A, second sensor **150** may be positioned at or adjacent to first end **155**. Further, cavity **130** may be located at or adjacent to either first end **155** or second end **156** or in between first end **155** and second end **156**. As shown in FIG. **2**A, cavity **130** is located at first end **155**.

[**0039**] As shown in FIG. **2**A, device **100** may comprise at least one third sensor **105** adapted to detect one or more vital signs of the user and to output one or more electrical signals representative of the vital signs. Vital sign sensing device **100** may include more than three sensors. Third sensor **105** may contact any portion of the hand of the patient. Third sensor **105** may include a physiological indicator sensor, as described above. At least one third sensor **105** may be incorporated in any embodiments of the invention disclosed herein.

[**0040**] An additional aspect of the invention may include a fourth sensor **106** adapted to detect a vital sign of the user (not shown) and to output an electrical signal representative of a vital sign. Vital sign sensing device **100** may include more than four sensors. Fourth sensor **106** may contact any portion of the hand of the patient, for example, the thumb of a patient as shown in FIG. **4**B. Fourth sensor **106** may include a physiological indicator sensor discussed above. Fourth sensor **106** may be incorporated in any embodiments of the present invention disclosed herein.

[**0041**] As shown in FIG. **2**A, vital sign sensing device **100** may further comprise an arithmetic processor **160** adapted to receive one or more electrical signals, manipulate electrical signals, and generate an additional electrical signal(s) representative of a vital sign(s). The electrical signals can be a wired or wireless as discussed above. Arithmetic processor

160 may be adapted to store one or more electrical signals corresponding to a vital sign(s) and is adapted to record the electrical signal(s) for one or more time periods. Vital sign sensing device **100** may further includes a means for communicating with an information system(s), including, but not limited to, a healthcare information system. Vital sign sensing device **100** may further include a finger print reader or other identification indicator.

[**0042**] Additionally, vital sign sensing device **100** may include a source of power adapted to supply sensors **140**, **150**, **105**, and **106** and arithmetic processor **160** with power. The source of power may include electric power, solar power, battery power, or other source of power.

[**0043**] In contrast to device **10** as shown in FIG. **1**, device **100** is adapted to include a display screen **115** mounted to housing **120**. Display screen **115** is adapted to receive input from arithmetic processor **160**, a human operator, and an external interface. Display screen **115** can include one or more of a touchpad and a keypad and any conventional means for inputting information. Display screen **115** may display data and an electrical signal representative of one or more vital signs, and display screen **115** may display information received from a remote location, such as a nursing station. Further, display screen **115** may include multiple display screens and may be mounted in housing **120** to separate from housing **120**, and may display information provided by a hard-wired communication, a radio-frequency communication, optical communication, or any other type of communication. Information displayed on display screen **115** may be communicated to a printer either mounted in the housing **120** or remote to the housing **120**. Display screen **115** may be adapted to tilt or move in any manner to allow for optimal viewing of display screen by user or healthcare provider (not shown). This aspect may be incorporated into any embodiments of the present invention disclosed herein. Housing **120** may also be able to adjust to allow for more comfortable viewing of display screen **115**. For instance, housing **120** may include hinges, or other movable structures, extending the length of the housing between first section **155** and second section **156** to allow for housing **120** to adjust. This aspect may be incorporated into any embodiments of the present invention disclosed herein.

[**0044**] In another aspect of the invention, vital sign sensing device **100** may be mounted to a broad variety of structures. For instance, vital sign sensing device **100** may be mounted to handles, poles, bars, tables, and counters, among other structures. Vital sign sensing device **100** may be incorporated into sports equipment, medical equipment, office equipment, security products, and furniture among other structures. Vital sign sensing device **100** can be easily mounted and dismounted to any of these structures, for example by way of conventional fasteners. Device **100** may rotate when mounted.

[**0045**] Further, vital sign sensing device **100** may include an arm cuff (not shown). The arm-cuff is adapted to detect at least one of blood pressure and pulse rate or any other physiological indicator that can be detected on the arm of the user. The arm of the user (not shown) is intended to broadly include the fingers, hand, wrist, forearm, bicep and upper region of the arm. The arm-cuff may be adjustable to fit the arm of a user.

[**0046**] FIG. **2**B is a further perspective view of a vital sign sensing device **100** shown in FIG. **2**A as used by a user as represented by hand of user **157**. Pointer finger of user **159** is inserted into cavity **130**. Any finger may contact any of sensors **140**, **150**, **105** and **106**. Second sensor **150** may be contacted by one or more fingers of user **151**. Third sensor **105** may be contacted by any part of the hand of the user **157**.

[**0047**] FIG. **3** is a perspective view of a vital sign sensing device **300** according to another aspect of the invention. As shown in FIG. **3**, the vital sign sensing device **300** includes a housing **320** adapted to support the hand of the user (not shown), and a cavity **330** adapted to receive one or more fingers of the user (not shown).

[**0048**] At least a first sensor **340** and a second sensor **350** may be mounted anywhere in cavity **330**. First sensor **340** and second sensor **350** may comprise any of the physiological indicator sensors as disclosed above. Cavity **330** can be cylindrical or non-cylindrical and may have at least one open first aperture **370**. As discussed with respect to other aspects of the invention, aperture **370** may be located anywhere on cavity **330**, including but not limited to the top and sides of the cavity **330**. Cavity **330** may comprise a first section and a second section, wherein the first section is pivotally mounted to the second section as discussed above. Cavity **330** may be adjustable to fit the finger(s) of the user. Cavity **330** may receive any finger(s) of the user. Multiple physiological sensors may be mounted in cavity **330**. The third and fourth sensors may also be provided in device **300**.

[**0049**] As shown in FIG. **3**, vital sign sensing device **300** may further include an arm cuff **390** mounted to housing **320**. Arm cuff **390** may be adapted to detect at least one of blood pressure and pulse rate or any other physiological indicator that can be detected on the arm of the user (not shown). The arm of the user is broadly intended to include the fingers, hand, wrist, forearm, bicep and upper region of the arm. Arm cuff **390** may be adjustable to fit the arm of a user.

[**0050**] As shown in FIG. **3**, as is typical of other aspects of the invention, vital sign sensing device **300** further comprises arithmetic processor **360** adapted to receive, manipulate, and generate electrical signals representative of vital signs as discussed above.

[**0051**] Vital sign sensing device **300** may further comprise a source of power as discussed above. Vital sign sensing device **300** may also comprise a display screen **315** mounted to housing **320**. Similar to display screen **215** in FIG. **2**A, display screen **315** is adapted to receive input and display data, for example physiological data of the user. Display screen **315** may be adapted to move and adjust for more comfortable viewing of data displayed on display screen **315**, as discussed above.

[**0052**] Further, vital sign sensing device **300** may be mounted. For instance, vital sign sensing device **300** can be mounted to handles, poles, bars, tables, counters, etc. Vital sign sensing device **300** can be incorporated into sports equipment, medical equipment, office equipment, security products, and furniture, among other equipment and related products. Vital sign sensing device **300** can be easily mounted dismounted and rotated as discussed above.

[**0053**] FIG. **4**A is a perspective view of an apparatus **400** incorporating a vital sign sensing device **401** mounted to a freestanding structure, for example, a kiosk. Vital sign

sensing device **401** may be mounted, for instance, to free a standing structure **425**, a handle, a pole, a bar, a table, a kiosk, and a counter, among other structures. Vital sign sensing device **401** may be incorporated into sports equipment, medical equipment, office equipment, security products, and furniture, among other equipment or products. Likewise, vital sign sensing device **401** can be easily mounted and dismounted to any of these structures, for example, by conventional fastners. Also, vital sign sensing device **401** may be mounted in a manner to allow device **401** to rotate. The vital sign sensing device **401** can incorporate any embodiments of the invention. Vital sign sensing device **401** may be similar to vital sign sensing device **100** and vital sign sensing device **300** as shown in FIG. **2**A and FIG. **3** respectively and may incorporate any of the features of vital sign sensing device **100** and vital sign sensing device **300**. Vital sign sensing device **401** may include cavity **430**, and display screen **415**, similar to cavity **130** and display screen **115** as shown in FIG. **2**A. Vital sign sensing device **401** may also include arm cuff **490**, similar to arm cuff **390** as disclosed in FIG. **3**.

[**0054**] FIG. **4**B is a perspective view of apparatus **402** incorporating a vital sign sensing device **450** mounted to a surface **403**, for example, a table top. Similar to device **401** shown in FIG. **4**A, vital sign sensing device **450** may be similar to vital sign sensing device **100** and vital sign sensing device **300** as shown in FIG. **2**A and FIG. **3** and may incorporate all of the features of vital sign sensing device **100** and vital sign sensing device **300**, including but not limited arm cuff **491**, cavity **431** and display screen **416**.

[**0055**] FIG. **5**A is a perspective view of vital sign sensing device **500** according to a further embodiment of the invention. As shown in FIG. **5**A, vital sign sensing device **500** includes a housing **520** for supporting the hand of the user (not shown), a hand grip **595** and a cavity **530** to provide space for user to comfortable and easily grip handgrip **595**.

[**0056**] According to FIG. **5**A, a first sensor **540** may be mounted in handgrip **595**. Handgrip **595** may be cylindrical or non-cylindrical and may be mounted across cavity **530**. Handgrip **595** may be mounted on either or both sides of cavity **530**, or may be supported in the center of cavity **530** by a pedestal or post (not shown). Handgrip **595** may be mounted across the cavity **530** as shown in FIG. **5**A, or may extend vertically from cavity **530**, for example in a fashion similar to a flight controller stick. First sensor **540** is adapted to detect one ore more vital signs of the user and to output one or more electrical signals representative of the vital sign(s), as discussed above. Additional sensors may be mounted in cavity **530** and in handgrip **595**, for example, a sensor **505** and a sensor **550** may be provided on handgrip **598** or anywhere on or in housing **520** and may include aspects of first sensor, as discussed above.

[**0057**] As shown in FIG. **5**A, handgrip **595** may further include finger indentations **535** to guide the user's fingers (not shown) into placement on handgrip **595** and for ease of gripping. Further, according to FIG. **5**A, vital sign sensing device **500** may include at least one arithmetic processor **560** adapted to receive, manipulate and generate electrical signals representative of one or more vital signs, as discussed above.

[**0058**] Vital sign sensing device **500** further comprises a means for communicating with an information system (not shown). Vital sign sensing device **500** may further include a finger print reader (not shown) or other identification indicator (not shown) and vital sign sensing device **500** may further include a source of power adapted to supply the physiological sensors and the arithmetic processor **560** with power. The source of power may include electric power, solar power, battery power, or other source of power.

[**0059**] Vital sign sensing device **500** may be mounted, as discussed above. Additionally, vital sign sensing device **500** can include two or more handgrips, each with or without a separate housing **520**. Device **500** may further include a finger print reader or other identification indicator.

[**0060**] FIG. **5**B is a cross-sectional view of the vital sign sensing device **500** as shown in FIG. **5**A as viewed along section lines **5**B-**5**B. FIG. **5**B shows handgrip **595** of another sensing device **500** being gripped by hand of a user **585**.

[**0061**] FIG. **6** is a perspective view of another vital sign sensing device **600**, similar to device **500** as shown in FIG. **5**A and FIG. **5**B. As shown in FIG. **6**, vital sign sensing device **600** includes a housing **620** for supporting the hand of the user (not shown), a handgrip **695** and a cavity **630** to provide space for hand of the user to comfortably and easily grip handgrip **695**. According to FIG. **6**, first sensor **640** is mounted in handgrip **695**. Handgrip **695** can be cylindrical or non-cylindrical and may be mounted as described above. First sensor **640** is adapted to detect one or more vital signs of the user and to output at least one electrical signal representative of the vital sign(s). First sensor **640** may include a physiological indicator sensor as described above. Additional sensors may be mounted in handgrip **630**.

[**0062**] Vital sign sensing device **600**, as shown in FIG. **6**, may further include one or more of audio visual mechanism **645**, including, but no limited to, a video camera adapted to transmit video images, a speaker adapted to transmit audio speech, and/or a microphone adapted to receive audio speech. Audio visual mechanism **645** may also consist of a palpable mechanism. A palpable mechanism may include a mechanism other than an audio or visual mechanism, for example, a mechanism that vibrates. Vital sign sensing device **600** may include a means for transmitting one or more of a video image or audio speech to a remote location. Audio visual mechanism **645** may be part of any embodiment of the invention described herein.

[**0063**] Further, vital sign sensing device **600** may be mounted. For instance, vital sign sensing device **600** can be mounted to handles, poles, bars, tables, counters, and the like. Vital sign sensing device **600** can be incorporated into sports equipment, medical equipment, office equipment, security products, and furniture, among other equipment or products. Vital sign sensing device **600** can be easily mounted and removed and can additionally have the ability to rotate when mounted. Also, vital sign sensing device **600** can include two or more handgrips, each with or without a separate housing **620**.

[**0064**] FIG. **7** is a perspective view of an arrangement **702**. Arrangement **701** includes a console **703** having a vital sign sensing device **700** adjacent to a chair **715**. As shown in FIG. **7**, console **703** includes and arm rest **701**. Vital sign sensing device **700** includes any of the embodiments of the present invention disclosure herein, and is similar to vital sign sensing device **500** as shown in FIG. **5**A. Console **703** may

be portable and may have wheels **707** for easy mobility and stationing. Wheels **707** may be adapted to lock and unlock. Console **703** can be placed next to a seating apparatus, such as chair **715**, a bench, a couch, or next to a bed, a stretcher, or other apparatus. Console **703** may include a means for adjusting height. For instance, the height of console **703** may be adjusted so that arm rest **701** is at a comfortable and convenient height in relation to chair **715**. Console **703** may further include a tower assembly **704** which may include an emergency beacon **705** adapted to receive an electrical signal from the arithmetic processor (not shown). Emergency beacon **705** may be programmed to emit one or more visual, audio or palpable signals if a particular physiological indicator has reached a specified level or measurement.

[**0065**] FIG. **8** is a perspective view of a further arrangement **800** according to a further embodiment of the present invention having a console **803** mounted to a seating device **860** having a vital sign sensing device **801**. Console **803** may be adapted to mount to any apparatus, including, but not limited to, seating device **860**, a bench, a couch, a bed, a stretcher, or other apparatus. In this aspect, console **803** includes platform **855** adapted to be placed beneath or on top of the seat or applicable place of seating device **860**, and an arm rest **865** positioned to support a user's arm (not shown). Arm rest **865** may be placed on arm rest of chair **866** or arm rest **865** may act as an arm rest to seating device **860** if seating device **860** does not have an arm rest **866**. Vital sign sensing device **801** may be incorporated in the arm rest **865** of the console **803**, but may be positioned anywhere on console **803**.

[**0066**] In a further aspect of the invention, console **803** can also include multiple arm rests **865** and multiple vital sign sensing devices **801**. Vital sign sensing device **801** may include any embodiments of the present invention disclosed herein. Further, console **803** may be adjustable in anyway possible and may be made of a flexible or rigid material. Platform **855** may comprise at least one platform sensor **875** adapted to detect at least one of pressure, weight, movement, ingress, and egress of the user. Platform sensor **875** may include a physiological indicator as discussed above.

[**0067**] FIG. **9** shows a perspective view of another arrangement **900** of the present invention. According to FIG. **9**, arrangement **900** includes a console **903** having a vital sign sensing device **905** and further positioned in arm rest **901**. First sensor **940** may be positioned in console **903** and may further positioned in vital sign sensing device **905**. Vital sign sensing device **905** may include any embodiments of the present invention, including one or more sensors. First sensor **940** may detect at least one vital sign and may output at least one electrical signal representation of the vital sign. First sensor **940** may include one or more of a pulse rate sensor, a pulse oxygenation sensor, a temperature sensor, an EKG sensor, a blood glucose sensor, a basal metabolism sensor, a body mass index sensor, a body fat sensor, or other physiological related sensor.

[**0068**] As shown in FIG. **9**, arrangement **900** further includes seat **910**. A second sensor **950** may be mounted in seat **910**, but may also be mounted anywhere on seating device **900**. Second sensor **950** is adapted to contact the user (not shown) seated in arrangement **900** and second sensor **950** may detect one or more vital signs and may further output at least one electrical signal representative of one or more vital signs. Second sensor **950** may be adapted to detect one or more of movement, respiration, heartbeat, position changes of the user, or other physiological related indicator. Arrangement **900** may contain more than two sensors, which may be located anywhere on the arrangement **900**. Arithmetic processor **960** may be mounted in arm rest **901** or anywhere in arrangement **900** and further mounted in the vital sign sensing device **905** and includes all embodiments discussed above.

[**0069**] In a further aspect of the invention, vital sign sensing device **905** further comprises a means for communicating with an information system, including but not limited to a healthcare information system. Identification indicator (not shown).

[**0070**] Arrangement **900** may further include a source of power adapted to supply the physiological sensors and arithmetic processor **960** with power. The source of power may include one or more of electric power, solar power, battery power, or other source of power or a combination thereof, and may be located anywhere on or in arrangement **900**.

[**0071**] Further, vital sign sensing device **905** may also include one or more display screens **915** adapted to be mounted anywhere on housing **920** of vital sign sensing device **905**. Display screen **915** may be similar to and have all of the functionalities of display screen shown in FIG. **2**A and may be mounted any where on console **903**.

[**0072**] Seating device **900** is further adapted to include a means **955** for analyzing the breath of a user (not shown), for example a sensor **956** mounted on an arm or rigid cable **957**. Means **955** may include a chemical analyzer adapted to identify markers of one or more of oxidative stress and disease or other physiological related indicators. Means **955** for analyzing the breath of a user (not shown) may be incorporated into any embodiment of the invention disclosed herein.

[**0073**] According to another aspect of the invention, arrangement **900** may also include an emergency beacon **946** mounted in tower assembly **904**, which is further mounted in console **903**. The tower assembly and emergency beacon is similar to that shown in FIG. **7**. Tower assembly **904** may be adapted to receive an electrical signal from the arithmetic processor **960**. Emergency beacon **946** may be programmed to emit one or more visual, audio or palpable signals if a particular physiological indicator has reached a specified level and may be incorporated into any aspect of the invention disclosed herein. Arrangement **900** will further comprise an emergency button (not shown) adapted to energize the emergency beacon **946**. The emergency button may also energize a signal to be relayed to a remote location, for example, a nursing station. The emergency button may be incorporated into any embodiment of the present invention disclosed herein.

[**0074**] Arrangement **900** may further include one or more audio visual mechanisms **945**, including, but not limited to, at least one video camera adapted to transmit video images, speaker adapted to transmit audio speech, and a microphone adapted to receive audio speech. The audio visual mechanism **945** can also include a palpable mechanism as discussed above. Vital sign sensing device **905** may also be adapted to include a means for transmitting at least one of a

video image or audio speech to a remote location. Audio visual mechanism **945** may be incorporated into any embodiment of the invention disclosed herein.

[**0075**] FIG. **10**. shows a perspective view of vital sign sensing device **1095** according to another embodiment of the present invention. As shown in FIG. **10**, device **1095** includes handgrip **1095** having finger indentations **1035** to guide a user's fingers (not shown) into placement on handgrip **1096** and for ease of gripping. Device **1095** is also adapted to include at least a first sensor **1040** and second sensor **1050** which are adapted to contact the hand of the user (not shown). First sensor **1040** and second sensor **1050** may include the same embodiment of first sensor **40** and second sensor **50** of FIG. **1**.

[**0076**] According to FIG. **10**, sensors **1040** and **1050** may be mounted on the surface of handgrip **1096**. Handgrip **1095** may be cylindrical or non-cylindrical. Multiple physiological sensors may be mounted in handgrip **1095**, including on finger indentations **1035**.

[**0077**] First sensor **1040** and second sensor **1050** may be adapted to detect one or more vital signs of the user (not shown) and to output at least one electrical signal representative of the first vital sign, as discussed above. A third sensor **1080** may also be mounted in device **1095**.

[**0078**] FIG. **11** shows a schematic diagram **1110** of an electrical system of the present invention. Diagram **1110** includes arithmetic processor **1160** of one of the vital sign sensing devices (not shown) disclosed herein. Arithmetic processor **1160** is adapted to receive electrical signals, for example, a first electrical signal **1110**, second electrical signal **1120**, and fourth electrical signal **1170**, representative of vital signs. The first electrical signal **1110**, second electrical signal **1120** and fourth electrical signal **1170** are emitted from vital sign sensors **1140**, **1150**, and **1180** respectively. For example, first sensor **1150** emits first electrical signal **1110**. Second sensor **1150** emits electrical signal **1120** and third sensor **1180** emits electrical signal **1170**. Arithmetic processor **1160** is further adapted to manipulate the electrical signals **1110**, **1120** and **1170**, and generate an additional electrical signal, such as third electrical signal **1130**, representative of one or more vital signs. Electrical signal **1130** may typically be forwarded to device **2000** for various uses, for example, for storage, or for output such as to a screen printer or emergency beacon. The electrical signals **1110**, **1120**, **1170**, and **1130** can be one of a wired or wireless signal. The wireless signal may include an RFID signal, a WIFI signal, a cellular signal, or other related signal. Arithmetic processor **1160** may be adapted to store one or more electrical signals corresponding to one or more vital signs and may further adapted to record the electrical signal(s) for one or more time periods. The electrical system disclosed in FIG. **11** may be included in any embodiment of the invention as disclosed herein.

[**0079**] It is noted that many variations of the embodiments described above may be utilized consistent with the present invention. Specifically, many features of the invention are optional.

[**0080**] While the above detailed description has shown, described, and pointed out novel features of the invention as applied to various embodiments, it will be understood that various omissions, substitutions, and changes in the form and details of the device or arrangements illustrated may be made by those skilled in the art without departing from the invention. The foregoing description is of the best mode presently contemplated of carrying out the invention. This description is in no way meant to be limiting, but rather should be taken as a mere illustration of the general principles of the invention. The scope of the invention should be determined with reference to the claims.

I claim:

1. A vital sign sensing device comprising:

a housing adapted to support a hand of a user, the housing comprising a cavity adapted to receive at least one finger of the user;

a first sensor mounted in the cavity, the first sensor adapted to detect a first vital sign of the user and to output a first electrical signal representative of the first vital sign;

a second sensor mounted on the housing, the second sensor adapted to contact the arm of the user and to detect a second vital sign of the user and to output a second electrical signal representative of the second vital sign; and

an arithmetic processor adapted to receive the first and second electrical signals, adapted to manipulate the first and second electrical signals, and adapted to generate a third electrical signal representative of at least one of the first and second vital signs.

2. The device as recited in claim 1, wherein the first sensor comprises a physiological indicator sensor.

3. The device as recited in claim 2, wherein the physiological indicator sensor comprises at least one of a pulse rate sensor, a pulse oxygenation sensor, a temperature sensor, an EKG sensor, a blood glucose sensor, a basal metabolism sensor, a body mass index sensor, and a body fat sensor or other physiological sensor.

4. The device as recited in claim 1, wherein the second sensor comprises a physiological indicator sensor.

5. The device as recited in claim 4, wherein the physiological indicator sensor comprises at least one of a pulse rate sensor, a pulse oxygenation sensor, a temperature sensor, an EKG sensor, a blood glucose sensor, a basal metabolism sensor, a body mass index sensor, and a body fat sensor or other physiological sensor.

6. The device as recited in claim 1, further comprising at least one third sensor, the third sensor adapted to detect a third vital sign of the user and to output a fourth electrical signal representative of the third vital sign.

7. The device as recited in claim 6, the at least one third sensor comprising a physiological indicator sensor.

8. The device as recited in claim 7, wherein the physiological indicator sensor comprises at least one of a pulse rate sensor, a pulse oxygenation sensor, a temperature sensor, an EKG sensor, a blood glucose sensor, a basal metabolism sensor, a body mass index sensor, and a body fat sensor or other physiological sensor.

9. The device as recited in claim 1, wherein the cavity comprises a cylindrical cavity having at least one aperture.

10. The device as recited in claim 1, wherein the cavity comprises a first cylindrical section and a second cylindrical section, the first section pivotally mounted to the second section.

11. The device as recited in claim 1, further comprising a display screen mounted in the housing.

12. The device as recited in claim **11**, wherein the display screen is adapted to receive input from at least one of a user and a healthcare provider.

13. The device as recited in claim 1, wherein the device is mounted to a structure or piece of equipment.

14. The device as recited in claim 1, further comprising an arm cuff mounted to the housing, the arm cuff adapted to detect at least one of blood pressure and pulse rate.

15. The device as recited in claim 14, the arm cuff comprising an adjustable arm cuff.

16. The device a recited in claim 1, wherein the arithmetic processor is adapted to store at least one electrical signal corresponding to at least one vital sign.

17. The device as recited in claim 1, wherein the arithmetic processor is adapted to record the third electrical signal for at least one time period.

18-30. (canceled)

31. A console comprising the device as recited in claim 1.

32. (canceled)

33. An arrangement comprising the console as recited in claim 31 and a seating device.

34. (canceled)

35. A seating device comprising the device as recited in claim 1.

36-38. (canceled)

39. A console comprising a platform adapted to be inserted into a seating device and comprising a device as recited in claim 1.

40-58. (canceled)

* * * * *

专利名称(译)	生命体征感应装置		
公开(公告)号	US20070208241A1	公开(公告)日	2007-09-06
申请号	US11/668772	申请日	2007-01-30
[标]申请(专利权)人(译)	德鲁克MARC		
申请(专利权)人(译)	德鲁克MARC		
当前申请(专利权)人(译)	德鲁克MARC		
[标]发明人	DRUCKER MARC		
发明人	DRUCKER, MARC		
IPC分类号	A61B5/00 A61B5/02 A61B5/04 A61B5/05		
CPC分类号	A61B5/00 A61B5/0002 A61B5/01 A61B5/0205 A61B5/024 A61B5/6888 A61B5/14532 A61B5/1455 A61B5/4872 A61B5/6887 A61B5/0402		
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摘要(译)

生命体征传感装置包括适于支撑使用者的手的壳体和适于检测使用者的生命体征的传感器。传感器装置包括算术处理器，其适于接收电信号，操纵信号，并产生代表生命体征的电信号。生命体征传感装置可以结合到各种结构和设备中，例如扶手或座椅装置，担架或售货亭。