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TITLE OF INVENTION	THE INTERNET OF THINGS BASED SMART MATTRESSES FOR SOMNAMBULISM (SLEEPWALKING) PATIENT
FIELD OF INVENTION	BIO-MEDICAL ENGINEERING
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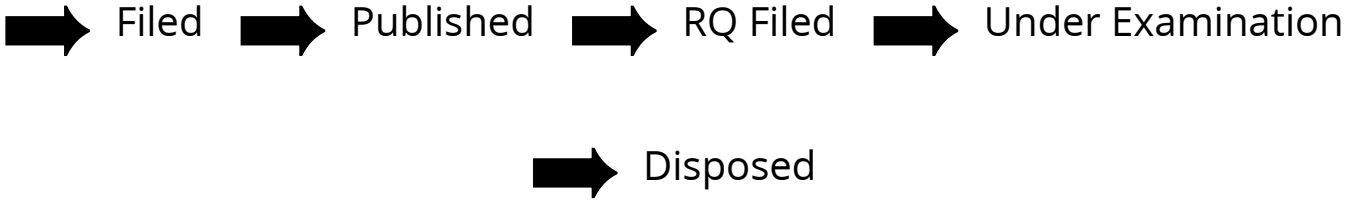

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FORM 2

THE PATENT ACT 1970 &

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COMPLETE SPECIFICATION

(See section 10 and rule 13)

1. TITLE OF THE INVENTION:

THE INTERNET OF THINGS BASED SMART MATTRESSES FOR SOMNAMBULISM (SLEEPWALKING) PATIENT

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REAMBLE TO THE DESCRIPTION

PROVISIONAL	**COMPLETE**
The following specification describes the	the following specification Invention. Particularly describes the invention and the manner in which it is to be performed.

FIELD OF THE INVENTION

This invention "**THE INTERNET OF THINGS BASED SMART MATTRESSES FOR SOMNAMBULISM (SLEEPWALKING) PATIENT**" is relates to a smart mattress which integrated with the pressure-sensitive sensor and IoT platform to make aware of patient movement during the sleep.

BACKGROUND OF THE INVENTION

The gold standard for warning sleepwalkers and their care givers that immediate action to prevent harm is necessary are portable but not mobile sleepwalker alarm systems. The current gold standard for sleep research is known as polysomnography (PSG), which involves at least the recording of an electroencephalogram (EEG), a measurement of brain waves, an electrooculogram (EOG), a measurement of muscle activity in the eye area, and an electromyogram (EMG), a measurement of muscle activity in specific areas such as the arm or leg. Similarly, these systems are portable but not mobile. A less intrusive way to study sleep uses actigraphs. These devices can be attached to any of the limbs and provide movement data based on the same principles behind accelerometers. This type of sensor, however, has its limitations both acquiring data, for example, if a patient places a hand on his or her chest the motion data recorded by the actigraph can be misinterpreted. These devices are also dependent on patient journals to help correlate the data recorded on the actigraph which have been found to be less than reliable. Now that global positioning satellite (GPS) location data acquisition systems are commonplace and the cost of comparing collections of GPS data acquisitions have been greatly reduced, wearable GPS devices (such as wrist watch mounted devices) have become common. Similarly, wearable computer devices are common. Due to the number of people that suffer from sleep related disorders, as well as the need for protecting sleepwalkers by alarming caregivers when potentially dangerous behavior by sleep walkers occurs, and the need for non-invasive collection of medical data to diagnose the underlying medical difficulties which result in sleep, there is a need for such a device which both collects data and helps keep sleepwalkers safe. In the short term, sleepwalking injuries may be ameliorated or eliminated by proactive measures, particularly safeguarding the sleepwalker's environment with devices suitable for waking the sleepwalker and/or alerting others in the sleepwalker's vicinity when the sleepwalker is on the move. In the long term, data about the sleepwalker's activity have the capacity for allowing medical practitioners to cure the difficulties which result in sleepwalking. Sleepwalkers have been known to be awakened by various stimuli, including light, sound, touch and smell.

PRIOR ART STATEMENT

Sleepwalking may be due to certain physiological characteristics which are susceptible to detection. Systems and method for detecting, monitoring and analyzing physiological characteristics are known, such as U.S. Pat. No. 7,785,257 (Mack, et al.), which is a system and process for non-invasive collection and analysis of physiological signals. The disclosures in Mack teach that signals from a subject are acquired from a suite of sensors, such as those which detect movement in a non-invasive manner. Mack teaches that the signals are processed and physiological characteristics are isolated for analysis and then used to analyze sleep patterns. Mack, et al., and prior sleep monitoring systems such as mattress-type devices for monitoring sleep taught by U.S. Pat. No. 6,485,441 (Woodward), are not mobile. Generally, the prior art teaches the use of sensors embedded in a person's environment for non-invasive analysis of physiological signals related to sleepwalking. In particular, the prior art teaches systems and processes for detecting, collecting and processing physiological characteristics acquired by a suite of sensors embedded in a person's environment and hence portable but not designed to move with the user.

US9384644B1 discloses a wearable and mobile system for using GPS location signals for performing sleepwalking alarm services and sleepwalking medical monitoring service, said system having a GPS location detector; a recorder which is capable of recording GPS locations diurnally; a signal processor, which is capable of storing signals and comparing stored signals; an external signal generator capable of generating a signal suitable for reception by a person in proximity to the user such as flashing lights, chime or other signal perceivable by a person and capable of generating a signal suitable for reception by an external receptor via radio wave, Bluetooth signal or other machine readable signal; a communication system which is capable of sending and receiving signals to and from the GPS location detector, recorder, signal processor and external signal generator, and software which periodically allows the signal processor to compare a GPS location sent front said GPS location detector to said recorder via said communication system with previously sent GPS locations sent from said GPS location detector to the recorder via the communication system and to activate the external signal generator when the comparison exceeds three feet.

Sleepwalking may be due to certain physiological characteristics which are susceptible to detection. Systems and method for detecting, monitoring and analyzing physiological characteristics are known, such as U.S. Pat. No. 7,785,257 (Mack, et al.), which is a system and process for non-invasive collection and analysis of physiological signals. The disclosures in Mack teach that signals from a subject are acquired from a suite of sensors, such as those which detect movement in a non-invasive manner. Mack teaches that the signals are

processed and physiological characteristics are isolated for analysis and then used to analyze sleep patterns. U.S. Pat. Nos. 5,684,460 and 5,796,340 describe fluid filled sensing pads or cavities extending across a sleeping area of a mattress and being connected to transducers. The apparatus is also configured to count movements rather than interpreting the nature and source of the movements. The recognition of individual localized movements, for example, of thorax and abdominal region are limited. In addition, the volume of the sensing pad has a certain flexibility, that alters pressure information derived especially from low frequency and high amplitude impulses as they result for instance from breathing movements. U.S. Pat. No. 5,844,488 discloses a sensor pad for installation on top and across the width of a mattress proximate the midsection of a reclining patient. The sensor pad is configured to recognize a patients movement toward an edge of the bed. The configuration includes central and edge switching areas. Hence, the sensor pad is solely able to recognize if or if not a patient is within an area defined by the switching areas' extensions. The sensor pad is not able to make qualitative interpretation of the patient's sleeping location or sleeping behaviour. U.S. Pat. No. 5,989,193 describes the use of a pressure area sensor placed in a mattress below a patient. The sensor provides only a single signal stream with all limitations described above. In addition, the placement of the sensor beneath the mattress reduces the recording sensibility significantly, since the mattress has a major damping effect especially on high frequency and low amplitude movements like, for example, heart beat.

OBJECTIVE OF THE INVENTION

1. The objective of the invention is to construct a mattress to monitor the somnambulism (sleepwalking patient).

2. The objective of the invention is to place the pressure-sensitive sensor on the top of the mattress to monitor the patient.

3. The objective of the invention is to integrate the pressure-sensitive sensor signals to the alarm circuit to make sound when the patient moves from the bed.

4. The objective of the invention is to use of IoT platform with this mattress to make aware of the patient condition to the caretaker when they far away.

5. The objective of the invention is to integrate all the components with the line to work smoother to monitor the somnambulism (sleepwalking patient).

SUMMARY OF THE INVENTION

The present invention brings IoT platform and alarm circuit to monitor the somnambulism patient. A mattress device for monitoring the patient introduced that may be configured as a commercially available product or be placed as an additional mattress device on top of a commercial mattress. The mattress device provides sleeping comfort compatible to that of conventional mattresses and encourages a patient to monitor the particular disorder. The present invention combines a sleepwalking alarm system and IoT technique to for monitoring the patient. A pressure-sensitive sensor gives continues signal to the receiver when the patient available on the bed during sleeping. Signal will be disconnected when the patient go from the bed and this makes alarm to ring to make aware to caretaker. The IoT brings information about the patient when caretaker long away from the patient.

DESCRIPTION OF THE INVENTION

Figure.1 shows the plan of invention. The sensor switch of the invention, reference number 10. Sensor switch assembly 10 is soft, flexible assembly designed for easy installation across the width the mattress of a patient's bed. In the preferred embodiment, the overall length "L" of the sensor switch assembly 10 is 6.0 ft and the width "W" is approximately 2.0 ft. It should be obvious to those of skill in the art that the assembly could be built in a variety of widths and/or lengths to accommodate other operating environments or circumstances. Sensor switch assembly 10 is constructed using a polyester substrate 11. A central pressure-sensitive switch area 12 is designed to monitor the presence or absence of a patient at the center of a bed. In the preferred embodiment, central switch area 12 has a width of approximately 2.5 ft. Plural end pressure-sensitive switch areas 14a, 14b located at each end of sensor switch assembly 10 are designed to indicate the presence or absence of a patient at either edge of the mattress. An attachment cord 16 provides electrical interconnection between switch areas 12, 14a, 14b and a remote monitoring system (not shown). A pair of holes 18 allow for attaching anchoring ties to sensor switch assembly 10. Referring Figure. 2, rubber bands 20, each approximately 8-10 inches in length are looped through holes 18 in substrate 11. The other end of rubber bands 20 is attached to a spring clip 22. Clip 22 allows for securing the distal end of each rubber band 20 to the bed frame (not shown) or other suitable fastening point. The length of rubber bands 20 has been chosen to provide adequate tension in a typical hospital or home bed installation. 12, 14a, 14b and an electrical connector 30, 30^1 at one end of sensor switch assembly 10. DuPont part number 65801-004 has been found to be a suitable connector for this application. Electrical cable 16 is attached to connector 30, 30^1. A wide variety of connector devices and/or interfacing techniques well known in the art could also be

used. The interface between connector 30, 30^1 and cord 16 is designed to be permanent i.e., cord 16 is not designed for removal from connector 30, 30^1 on switch sensor assembly 10 once the unit is assembled. It has been found that for the edge sensing areas 14a, 14b to be actuated by a patient moving to the edge of the bed, these areas 14a, 14b must be less sensitive than the central sensing region 12 to minimize unwanted contact closure (i.e., false alarms) due to the more concentrated weight of an upright patient. Without the decreased sensitivity in regions 14a, 14b, the weight of a patients arm could possibly trigger the alarm. Sensor switch assembly 10 is designed to function as part of a novel bed-egress alarm system. Referring Figure.3, Central switch contact 102 and edge switch contacts 104a, 104b are connected to monitor 100 by lines 106 and 108 respectively. An operator-accessible push button switch 110 is used to toggle edge sense select circuit 112, a divide-by-two flip-flop, between one of two output states. In the first output state, monitor 100 is adapted to operate with the inventive sensor 10 fully utilizing its bed edge sensing capability. In the second output state, monitor 100 is configured to work as a conventional, single-output monitor.

WE CLAIMS

1. The Internet of Things Based Smart Mattresses For Somnambulism (Sleepwalking) Patient, comprising:

   Pressure sensitive sensor, electrically conductive areas, room alarm array circuit, IoT platform and relay contacts having selectable output closure modes are also provided allowing easy attachment of the monitor to a typical sleepwalking patient.

2. Claim in claim 1, having multiple interconnects with permanent and without permanent electrically conductive areas.
3. Claim in claim 1, mattress core layer for creating a dynamic response signal in response to a mechanical impulse induced by a patient lying on said mattress device with the help of sensors.
4. A pair of holes allow for attaching anchoring ties to sensor switch assembly for the benefit of monitoring the patient.
5. An operator-accessible push button switch is used to toggle edge sense select circuit, a divide-by-two flip-flop, between one of two output states.

THE INTERNET OF THINGS BASED SMART MATTRESSES FOR SOMNAMBULISM (SLEEPWALKING) PATIENT

ABSTRACT

The invention "**THE INTERNET OF THINGS BASED SMART MATTRESSES FOR SOMNAMBULISM (SLEEPWALKING) PATIENT**" is based on the IoT implemented mattress to monitor the patient who comes across the somnambulism issues. Somnambulism also knows as sleepwalking is a behaviour disorder amongst kids and even adults. This invention uses a pressure-sensitive sensor on the top of the mattress to monitor presence of a somnambulism patient. The mattress makes sound when the particular patient moved from the mattress. The IoT platform gives signal to the caretaker when for away from the patient.