WEARABLE ELECTROCARDIOGRAPHIC MONITORING TECHNOLOGY (ECG) WITH AN AIRTIGHT CONTAINER FOR MEDICINES, AND INTEGRATED MEDICAL MONITORING SYSTEM

[001] The present invention refers to a wearable, individual, customized and different sized technology for men and women, composed of electrodes, electronic circuit and airtight container for medicines, coupled to one another, and a mini electrocardiogram (ECG) apparatus containing a GSM (Global System Mobile) modem and a GPS (Global Positioning System) or a Bluetooth system which, through a wireless network specification within a personal scope (Wireless Personal Area Networks – PANs) deemed as PAN-type or even WPAN, provides a way to connect to and exchange information between the device with the system and the mobile phones (smartphones) utilizing a specific application (app). The acquisition of electrical signals begins when the user presses the button down.

[002] The present invention is in the field of the medical applications, aiming at monitoring patients at high cardiovascular risk, being possible to diagnose it as soon as possible, aiming at shortening time to definite treatment of those who present acute coronary syndrome (ACS), acute myocardial infarction (AMI), acute atrial fibrillation-type (AAF) cardiac arrhythmias, and other cardiac arrhythmias or other cardiac pathologies detectable by electrocardiographic trace, by analyzing a bunch of data - big data analytics and deep learning - by utilizing artificial intelligence, utilizing the internet of things, as well as for recreational and/or sport applications, aiming at monitoring individuals who desire their electrocardiographical trace to be followed

up during their physical, recreational or sport activities, being possible to evaluate their performance in a single or evolutionary manner, or even to have their electrocardiogram recorded and written.

[003] The ECG apparatus captures electronic signals by the electrodes, allowing for a remote electrocardiogram monitoring. The data collected by the ECG vest and the location by the GPS are transferred online via GSM or Bluetooth to a user's mobile phone (smartphone), which has an app, and from this app to a datacenter having an Integrated Monitoring System (IMS) in a secure and reliable manner, with a 24 x 7 x 365 coverage. The GPS of the ECG apparatus or of the smartphone itself, in the case of transmission via Bluetooth to the smartphone, enables to locate the individual who is wearing electrocardiographical vest. The compartments for medicines are integrated to the electronic circuit of the ECG appa-ratus, and remotely controlled.

[004] This wearable hardware- and software-integrating device allows for the transmission of low voltage electronic signals through Internet of Things to an integrated monitoring center, as well as create an interface which enables to shorten time since early symptoms that may be a sign of an ACS, or an AMI, or an AAF, or another cardiac arrhythmia, even the definite treatment, which may also anticipate the beginning of treatment, from remote dispensation of the medicines available in the plastic box of medicines coupled to the box of mini ECG.

[005] The coronary artery disease (CAD) is the main cause of death worldwide. The acute myocardial infarction (AMI) is

the complete occlusion of coronary artery, vessel that irrigates the cardiac muscle. The best option of treatment is the primary angioplasty: unclogging of the coronary artery through balloon catheter. The earlier the coronary is opened the best will be the result of the treatment, therefore reducing the morbidity and mortality rates. The maximum optimal time among entry of the individual to emergency (door), diagnose and treatment is up to 90 min. The main metric in the treat-ment of AMI is Door to Balloon time: "D2B", which is the time from patient arrival at emergency to his or her coronary opening by primary angioplasty with a balloon catheter or stent.

[006] It is perceivable the need for the patient to be more autonomous, have information and be capable of using resources such as telehealth, for obtaining analysis, diagnoses and even to begin his or her treatment regardless the location. By means of continuous technological advance and computing and mobile communication facilities, it is proposed to widen the limits of this paradigm D2B in the AMI, the ACS and in the AAF approach, in addition to other cardiac arrhythmias.

[007] All data generated by the technology coupled to the cloth claimed in the present invention is based on monitoring center, hospital network and expert doctor. Through an electronic signal sent by the monitoring center, the doctor responsible for the electrocardiographic trace analysis provides the diagnose and remotely triggers, if necessary, the medicine compartment opening, thereby getting early start the treatment and also reducing time since early symptoms in patient with clogged coronary artery until

effective and definite time that is the coronary artery opening by primary angioplasty. The same process may be carried out with regard to cardiac arrhythmia, such as AAF, the symptoms having got started less than 24 to 48 hours, providing a definite treatment with proper medicine dispensing by remote opening of the compartments with medicines as soon as the patient is diagnosed.

[008] Individuals having CAD are instructed to monitor themselves having a support of telemedicine to speed up finding their symptoms. Thus, significantly reducing time from the beginning of symptoms to the coronary opening will occur through a combination of a remote monitoring network that generates reports and supports patients at AMI and ACS risk, getting popular the use of the wearable device. It may also occur with patients presenting AAF-type arrhythmia, from the moment they feel a cardiac rhythm change beginning in a period of time up to 48 hours.

[009] The development of wearable technologies and Internet of Things provide several possibilities of application in healthcare, such as remote monitoring of individuals at cardiovascular risk and seniors. With the available technology, in addition to preventing programs through educational initiatives, healthcare opportunities may be provided.

[0010] Data collected by the ECG vest and its location by the GPS (Global Positioning System) are transferred online via GSM (Global System Mobile) or via Bluetooth coupled to the electrocardiogram apparatus to the smartphone containing an app, and from this one to a datacenter with an Integrated Monitoring System (IMS). This IMS will assign the received

ECG data to a doctor, who will remotely provide the ECG report by electronic means.

[0011] The hospital network and the doctors capable to provide reports of the monitored patients will previously be entered the IMS. When identified AMI or ACS, the team acting on IMS will assist the patient, indicating first procedures and forward names and addresses of nearby hospitals able to take care of the patient. When identified AAF or other cardiac arrhythmias, by the registered doctor, the patient will be instructed to take the specific medicine for this pathology after remote opening of the plastic box containing proper drug by means of an electronic signal.

[0012] It was found out documents presenting technologies regarding to clothes with coupled ECG or GSM or GPS or Bluetooth technologies, however, without specific functionality of utilization of the complex monitoring system integrated to the patient, as well as access to the airtight plastic box containing medicines for quick use with remote opening through encrypted digital signature of an expert doctor.

[0013] The document Elastic garment for positioning and fixing ECG electrodes (US20160066809) only describes a cloth having position marks and electrodes fixation, and does not describe a fabric providing a tensile strength over body, such that the electrodes are close and tight to the skin. They are horizontally and vertically embroidered by crossing one another, with stainless steel yarns isolated or associated to the silver- or carbon-based dyes or pastes or conductive stretchable textiles over the cloth fabric, so as to form a mesh to widen the surface contacting the underlying

skin. Referring to any device containing airtight container for medicines which enables remote dispensing of medicines, in case of specific needs such as ACS, AMI, AAF and other cardiac arrhythmias, for early treatment to these pathologies to get started, is not made.

[0014] The document Wearable remote electrophysiological monitoring system (US201302818150) consists of an electrophysiological monitoring system that record ECG data which is coupled to a cloth. It presents a wireless transmitter and controller configured to collect data generated by the ECG, and in the case of a warning issued to a receiver due to any abnormality. The document Multi-layered sensor apparatus (WO2012088398) describes only a cloth formed by an interconnected sensor array without, however, demonstrating that these sensors are part of an ECG apparatus for continuous or intermittent monitoring, and no document describes the functionality of remote ECG monitoring in real time, and does not also make reference to any device containing airtight container for medicines enabling remote dispensing of medicines.

[0015] The document Wearable medical treatment device (EP2590710) makes reference to a wearable technology including a cardiac detection electrode, a treatment electrode, an user interface configured to receive information and a sensor configured to sense some abnormal physiological activity. But it neither demonstrates a complete ECG apparatus nor makes reference to any type of a monitoring intermittent or integrated to some system, remote or not. It does not make reference to any remote control device for opening the airtight plastic box containing proper

medicines for getting start quick use by means of an encrypted digital signature.

[0016] The document ECG method and system for optimal cardiac disease detection (US20070219454) describes a cardiac disease indicator method through electrocardiogram signals from a set of leads fixed to the patient body for detecting and mapping cardiac diseases in the body of an individual, and the document Wireless transmitted electrocardiogram monitoring device (US7412281) only refers to a wireless electrocardiogram monitoring system for monitoring of long-term physical state. Any of the documents makes no reference to a wearable technology with complex functionalities of remote data mapping and transmission to a monitoring center, as well as access to a treatment of cardiac disease, when necessary, by means of opening of an airtight plastic box containing medicines as previously describes.

[0017] The documents Apparatus for, and method of, determining the condition of a patient's heart (EP1673010), and Ambulatory physiological evaluation system including cardiac monitoring (WO8902246) describe a vest adapted to be used over the patient upper body, and a system of ambulatory evaluation to monitor the cardiac activities of a patient, but not comprising the whole data intermittent and remote reading integrated monitoring system of the patients having possibility of immediate service and immediate treatment.

[0018] In turn, the document Independent non-interfering wearable health monitoring and alert system (CA2839954) describes a cloth with a system including a multi-ECG metering device having alert markers from changes and

detection of health abnormality, the yellow level serving as an indicator for a medical check, and the red level serving as an alert to seek for immediately medical help. However, it does not present a specific functionality of utilization of complex monitoring system integrated to the patient, by which warnings are issued to a specific center that trigger a complete remote service, identifying the service location by the apparatus GPS coupled to the cloth, then the responsible doctor will, by remote access and encrypted digital signature, open a airtight plastic box containing medicines for the treatment to immediately get started until an ambulance arrives and the patient is at a properly assisted at a hospital or other suitable location.

[0019] Any documents found out in the state of art describes or alludes similar technology or one that presents performance, efficiency and integration of equipments similar to those of the present invention, as well as complex functionalities of mapping and transmission of remote data to a monitoring center, utilizing artificial intelligence, “deep learning” and big data analytics, as well as access to early treatment of the coronary artery disease, either AMI or ACS, AAF, in a period of time less than 48 hours, or other cardiac arrhythmias, when necessary, by means of opening of the airtight plastic box containing medicines as previously described, by remote transmission of electronic signal, authorized and carried out by the doctor who provides the ECG report.

[0020] SUMMARY OF THE INVENTION

[0021] The present system comprises a wearable electrocardiographic (ecg) monitoring technology with

airtight compartment for medicines, and an integrated medical monitoring system consisting of wearable, washable, medical, or recreational and/or sports technology, composed of electrodes, electronic circuit and conductive track and airtight compartment. The above items are coupled to each other and to a mini ECG device containing a GSM (Global System Mobile) modem and GPS (Global Positioning System) or Bluetooth (BLE) system for connection and exchange of information between the integrated devices to a datacenter and a remote monitoring center. In addition, the acquisition of the electrical signals of the ECG is get started automatically when the user presses the button down in the box containing the ECG device.

[0022] The airtight compartment is coupled to the electronic circuit of the ECG apparatus with GSM, GPS or BLE, and is controlled by a solenoid and an electromechanical system. Thus, the expert doctor, with an encrypted digital signature, can remotely trigger the opening of the doors of the airtight compartment containing medicines for proper dispensing, after the diagnostic confirmation.

[0023] The remote monitoring of the electrocardiogram has the optional function of automatic interpretation of the trace to be carried out by ECG analysis software, supported by an expert doctor and an expert system, a software of Integrated Monitoring System online and a software integrated to the smartphone receiving the electronic signals that enable:

[0024] the electronic signals captured by the electrocardiogram to transmit the trace and be visible on

the smartphone in real time, via BLE transmission coupled to the electrocardiogram for that smartphone; and

[0025] recording to be made for a period of 24 hours of that tracing.

[0026] In addition, on-screen technology allows for self-monitoring of symptoms by patients themselves, who can have their treatment instituted as soon as the symptom starts and their ECG is remotely done.

[0027] The application-based communication of screen technology takes place as follows:

[0028] the user accesses data via the smartphone, by GSM or BLE, in real time via the application, in addition to access the hardware with encompassed software, which performs the acquisition of the electrocardiographic signals;

[0029] the hardware with encompassed software has direct communication with the smartphone;

[0030] the smartphone communicates via Wi-Fi, 3G, 4G or 5G transmission with the integrated monitoring center and a second smartphone;

[0031] the second smartphone is accessed by a doctor or an expert.

[0032] the integrated monitoring center communicates with a hospital or similar treatment center and with the doctor or expert via a second smartphone or computer.

[0033] In addition, the wearable technology is comprised of polyamide textile yarn fabric or any fabrics similar to synthetic and expandable rubbers which can:

[0034] provide skin protection against the harmful effects of the sun;

[0035] offer bacteriostatic action, avoiding body odor;

[0036] be biodegradable.

[0037] enable the electrodes to have stainless steel yarns horizontally and vertically embroidered by crossing or meshing one another on the cloth, so as to form a mesh to widen the surface contacting the underlying skin, in a rectangular or square shape, with conductivity property of electronic signals or composed of silver- or carbon-based pastes or dyes or stretchable conductive fabrics, in a single manner or associated to the mesh of stainless steel yarns, singly or associated to a silver- or carbon-based dye or pastes or stretchable conductive fabrics, as well as for printing low voltage electronic circuits over elastic films and fabric substrates, and contains stretchable encapsulating which is used to protect the low voltage circuit printed over the elastic film and substrate fabric.

[0038] Data collected by the ECG system and its location by the GPS are transferred online via GSM or by integrating BLE to the smartphone that contains an application (app), for a datacenter with an Integrated Monitoring System (SMI). Thus, said ISM will assign the received ECG data to a professional who will immediately and remotely provide the ECG report to the users, indicating the first procedures, allowing immediate interaction with an emergency hospital medical service and forwarding the names and addresses of nearby hospitals able to serve.

[0039] The data storage is carried out by the electronic circuit U3, non-volatile memory responsible for recording the acquired data for later transmission, and the circuit U8 is composed of a solid state relay responsible for the

activation of the electromagnet to release the compartment for the medicines. In addition, there is an application request for USB input for protection against outbreaks and electrostatic discharges, formed by the U7 circuit, solid state TVS protector.

[0040] The said device that acquires the electrocardiographic signal is capable of acquiring 256 points per second and presents variation of the electric potentials generated by the electrical activity of the heart, which allows for the reading out of 8 channels and another 4 by means of mathematical calculations in at most 24 hours, and 8 seconds to adjust the impedance of each type of skin.

[0041] There is an application (app) installed on the smartphone to add the timestamp and the acquired GPS coordinate, and to submit the examination to the FTP server, in addition to be able to view both the recorded exam and the monitoring in real time of the cardiac signals, and the file being not successfully sent, an error log is stored and a new attempt will be made and this will be repeated until the exam is submitted to the server that is sent to the central along with the next valid exam.

[0042] The on-screen hardware is powered by a rechargeable LI-ION battery containing LEDs and a buzzer to notice the patient the stage of the examination process and battery status, a bluetooth module with antenna, for programming and setting up the device.

[0043] The on-screen system also enables the electrodes to be fixed directly under the skin of the patient and be arranged according to the EASI ECG system.

[0044] BRIEF DESCRIPTION OF FIGURES

[0045] For better understanding on how the "WEARABLE TECHNOLOGY OF ELECTIOCARDIOGRAPHIC (ECG) MONITORING WITH AIRTIGHT CONTAINER FOR MEDICINES AND INTEGRATED MEDICAL MONITORING SYSTEM", herein claimed, is constituted, the appended drawings are presented, wherein:

[0046] Figure 1 - wearable individual, customized and different sized technology (1), for men and women, composed of conductive track (2) and airtight container for medicines (3), and electrodes (4), coupled to one another, and an electrocardiogram (ECG) apparatus.

[0047] Figure 2 – airtight container for medicines, (5) the lower compartment being to fit electronic pieces, (6) the upper compartment being to fit electronic pieces, and (7) medicine compartment.

[0048] Figure 3 - communication system of the on-screen technology.

[0049] DETAILED DESCRIPTION OF THE TECHNOLOGY

[0050] DESCRIPTION OF THE CLOTH QUALITY

[0051] The cloth (1) is composed of a fabric of polyamide textile yarns 6.6, providing great comfort, lightness, softness, care easiness and functionality. Specifically, yarns are made which may i) offer protection to the skin against harmful effects of sun, ii) have bacteriostatic action, preventing body odor, iii) be biodegradable, allowing the clothes made therefrom to be decomposed less than 3 years, when correctly discarded on landfills.

[0052] These fabrics provide a tensile strength over body, such that the electrodes (4) are close and tight to the skin. The cloth electrodes (4) are composed of a conductive track (2) composed of horizontally and vertically

embroidered stainless steel yarns crossing one another over the cloth fabric, in a single manner or associated to silver- and/or carbon-based dye or paste or fabric, so as to form a mesh to widen the surface contacting the underlying skin in a rectangle or square shape about 5 x 5 cm^2 or 5 x 4 cm^2 or 4 x 4 cm^2 or 5 x 6 cm^2 or 6 x 6 cm^2 or 6 x 5 cm^2 or 6 x 4 cm^2. The electrodes (4) of the cloth composed of stainless steel yarn embroidered in a single manner or associated to a silver- and/or carbon-based dye or paste or fabric has a property of electrical signals conductivity. The “trace” conducting the electrical sign sensed by the embroidered electrodes contacting the skin comprises different yarns resulting from the stainless steel yarns embroidered, associated or not to the silver- and/or carbon-based dye or paste or fabric conducting electrical signal from the embroidered electrode to the connection to the electrocardiographic device. The electrodes (4) of the fabric are composed of stretchable silver- and/or carbon-based conductive pastes, dyes or fabrics to print low voltage electric circuits over elastic films and textile substrates, having excellent stretchability, gripping capability and conductibility. These conductive textiles, dyes or pastes contain an encapsulating stretchable component which is used to protect the low voltage circuit printed onto the elastic film and the substrate textile, since they have an excellent thin and stretchable protection, gripping property and abrasion resistance. This system may be designed to wearable electronic applications that may require repeatedly washing.

[0053] The device encompasses the variation of electric potentials generated by electrical activity of the heart. 8

channels are read out, and other 4 channels are generated by means of mathematical calculations. The acquisition of electrical signals get started when the patient presses the button down, 256 points per second being acquired during a span of 15 seconds. Having about more than 8 seconds to set the impedance of each type of skin. The read out values are stored in a NOR memory, until they can be sent to a server by means of a GPRS connection, meanwhile the GPS is get started to synchronize satellites and identify patient location, until coordinates are received or the limit of time is exceeded.

[0054] The wearable ECG monitoring technology (1) is individual, customized, is differently sized, and for men and women, in addition to be composed of a hardware, having 12 bypasses and an encompassed software with a feature of GPS access with interface for SIM card for GSM communication or through Bluetooth coupled to the ECG. This system will transmit the electronic signal of the ECG to an Analysis Software Module, generating graphics, thus allowing for a remote electrocardiogram monitoring, with optional function of automatic interpretation, coupled to a high technology of analysis of a bunch of data and utilizing artificial intelligence, big data analytics and deep learning. All data generated by the technology coupled to the cloth claimed in the present invention are based on monitoring center, hospital network and expert doctor.

[0055] The capture of the electronic signals by the electrodes allows for a remote monitoring of electrocar-diogram, with optional function of automatic interpretation, supported by an expert system, a software of Integrated

Monitoring System online that are the interfaces with doctors, hospitals and clients integrating with SMS Broker.

[0056] After reading out the signals, the exam is sent to the server along with the coordinates of the place where the device was at the time of sending. If the file is not successfully sent, an error log is stored, and a new attempt is made after a time x, this is repeated until the exam can be submitted to the server. The log will be sent to the remote monitoring center along with the next valid exam. The equipment contains two LEDs and a buzzer to notice the patient the stage of the exam process.

[0057] The data collected by the ECG vest and its location by the GPS will be transferred online via GSM or via Bluetooth to the smartphone and from this one to a datacenter with an Integrated Monitoring System (SMI) having a safe and reliable 24 x 7 x 365 coverage. This SMI will assign the received ECG data to a doctor who will immediately provide the ECG report in an electronic manner.

[0058] The device is coupled to an airtight compartment (3) containing specific medicines which are essential at the immediate beginning of the treatment of pathologies, such as ACS, AMI, AAF and other cardiac arrhythmias, integrated into the electronic circuit of the ECG apparatus controlled by a solenoid. The patient, the victim of ACS, AMI, FAA and other cardiac arrhythmias, may get the treatment started as soon as the symptom starts and his ECG is remotely done by self-monitoring.

[0059] The expert doctor, through an encrypted digital signature, will remotely trigger the opening of the compartment doors containing medicines for proper remote

dispensing, according to the diagnosis of the electrocardiographic trace. The server will identify the problem during the analysis, and remotely release access to the drug. The patient will receive a call informing that the drug has been released and, then, can press the button down for 5 seconds. The device, on the other hand, finds out the release file on the server and releases access to the medicine so it can be ingested. The server will have in its database all contacts of registered clients and doctors.

[0060] FUNCTIONAL DESCRIPTION OF THE CIRCUIT

[0061] ANALOG FRONT-END (FIGURE 1)

[0062] The biometric (analog) data are read out through the input connector J1, the signals pass through a high frequency filter formed by the components: R9, R5, R7, R11, R13, R15, R17, R19, R21, R25, R26, R22, R20, R18, R16, R14, R12, R8, R6, R23, C51, C52, C23, C24, C25, C26, C28, C29, C32, C33, C34, C35, C36, C37, C38, C3, C49, C50, C54, and C55.

[0063] The protection against electrostatic discharges at the input of the signals is made by the diodes D1 to D9, responsible for keeping the levels within the levels accepted by the A/D converter. Signal acquisition is performed by the U4 analog front-end, which consists of 8 24-bit delta-sigma A/D converters. The +2.5-Volt and -2.5-Volt symmetric voltage levels, required for the analog front-end signal levels to be suitable, are generated by the electronic circuits U1, U2 e U3.

[0064] GPS COORDINATE ACQUISITION MODULE, SIGNALING AND TRIGGERING BUTTON (FIGURE 2)

[0065] For the acquisition of geographical coordinate data, a GPS module formed for electronic circuit U1, delivering data to the processing unit in the NMEA 0183 format, having latitude and longitude data, is used. The LED1 and LED2 components are responsible for the operational signaling of the equipment and the key S1 to start up operating.

[0066] PROCESSING UNIT AND MÓDULO GPRS MODULE (FIGURE 3)

[0067] The circuit is powered by a rechargeable LI-ION battery whose management is the responsibility of the U1 electronic circuit, front-end dedicated battery charger. The electronic circuit U2 aims at regulating the voltage levels to + 3.3 V required for the operation of the other electronic circuits.

[0068] Data storage is performed by the electronic circuit U3, non-volatile memory, responsible for recording acquired data for later transmission. The circuit U8 is composed of a solid state relay responsible for the electromagnet triggering in order to release the compartment for medicines, according to the application request. For USB input, there is a protection against outbreaks and electrostatic discharges formed by the circuit U7, a solid-state TVS protection.

[0069] The communication via GPRS is carried out by the electronic circuit U6, Quad-Band GSM modem, responsible for sending data to the FTP server. The circuit U5 is composed of a solid state relay, responsible for disconnecting the GPRS Modem when it is not operating.

[0070] The connector J6 is a receptacle for GSM SIMCARD which has its own protection against electrostatic outbreaks

carried out by the electronic circuit TVS1. The data processing and treatment are responsibility of the electronic circuit U4, a microcontroller of the ARM family, responsible for executing the application software.

[0071] INTEGRATION OF MINI ECG-BLUETOOTH AND SMARTPHONE

[0072] The device acquires the variation of electrical potentials generated by the electrical activity of the heart. 8 channels are read out, and other 4 channels are generated by means of mathematical calculations. The acquisition of the electrical signals is get started when the user presses the button down. 256 points per second are acquired, in at most 24 h. About 8 seconds being required to set the impedance of each type of skin. The read out values are stored in a NOR memory until they are sent to a smartphone via Bluetooth communication. There is an application installed on the smartphone to add the timestamp and the acquired GPS coordinate, and submit the exam to the FTP server. It is possible both to see the recorded exam and monitor cardiac signals in real time. If the file is not successfully sent, an error log is stored, and a new attempt is made after a time x, this is repeated until the exam is submitted to the server. The log is sent to the server along with the next valid exam. The hardware is powered by a rechargeable battery of LI-ION. Containing three LEDs and a buzzer to notice the individual on the stage of the exam process and the battery status, a Bluetooth module 4.1 with an antenna, an USB input for programming and configuring the equipment.

[0073] The present invention, among all the technological benefits described above, contributes to the immedi-ate

diagnosis of symptoms in ACS, AMI, AAF and other cardiac arrhythmias, and allows to dramatically reduce the time between onset of symptoms and the primary angioplasty, definitive treatment of AMI, early initiation of treatment in ACS and AMI and definitive treatment of AAF and other cardiac arrhythmias by proper administration of the drug contained in the airtight compartment (3). The medical and hospital network will have access to the IMS to update data, register new care teams and obtain patient information that is directed to their service. This allows for unbureaucracy, agility and avoids time loss in attending to these cardiovascular emergencies, since time is a prime factor in reducing the aggravation of these pathologies, especially when undiagnosed or delayed at the beginning of treatment.

CLAIMS

1. Wearable electrocardiographic monitoring technology (ecg) with an airtight container for medicines and integrated medical monitoring system characterized for being a wearable, washable, recreation, sport and medical use technology (1), composed of electrodes (4), electronic circuit and conductive track (2), and airtight container (3), coupled to one another and to a mini ECG device containing a GSM (Global System Mobile) modem and GPS (Global Positioning System) or Bluetooth (BLE) system for connection and exchange of information among the devices integrated in a datacenter, and the acquisition of ECG electrical signals gets started automatically when the user presses the button down on the box containing the ECG device.

2. Wearable electrocardiographic monitoring technology (ecg) with airtight container for medicines, and integrated medical monitoring system, according to claim 1, characterized in that the airtight container (3) coupled to the electronic circuit of the ECG apparatus with GSM, GPS or BLE, is controlled by a solenoid and an electromechanical system through which the expert doctor, wiht an encrypted digital signature, can remotely trigger the opening of the doors of the airtight compartment containing medicines for proper dispensing, after confirmation of diagnosis.

3. Wearable electrocardiographic monitoring technology (ecg) with airtight container for medicines, and integrated medical monitoring system, according to claim 1, characterized in that the remote electrocardiogram monitoring with optional feature of automated interpretation of trace is performed by ECG analysis softwares, supported

by a doctor and an expert system, an online software of Integrated Monitoring System, and a software integrated to the smartphone receiving electronic signals which enable

- the electronic signals sensed by the electrocardiogram (803) to transmit the trace and to be visible in the smartphone (802) in real time, via BLE transmission coupled to the electrocardiogram for this smartphone (802), and

- the record to be done over a period of 24 hours of this trace.

4. Wearable electrocardiographic monitoring technology (ecg) with airtight container for medicines, and integrated medical monitoring system, according to claim 1, characterized for allowing for self-monitoring of symptoms by the patients, and beginning their treatment soon after symptom appears, and their ECG is remotely done.

5. Wearable electrocardiographic monitoring technology (ecg) with airtight container for medicines, and integrated medical monitoring system, according to claim 4, characterized in that the communication via application takes place as follows:

- the user (801) accesses via the smartphone (802), by GSM or BLE, the data in real time via the application, in addition to access the hardware (803) with encompassed software, which performs the acquisition of the electrocardiographic signals;

- hardware (803) with encompassed software has direct communication with the smartphone (802);

- the smartphone 802 communicates via wi-fi, 3G, 4G or 5G transmission with the integrated monitoring center (804) and with a second smartphone (805);

- the smartphone (802) communicates via wi-fi, 3G, 4G or 5G transmission with the integrated monitoring station (804) and with a second smartphone (805);

- the second smartphone (805) is accessed by a doctor (806) or an expert.

- the integrated monitoring center (804) communicates with a hospital (807) or a similar treatment center and with the doctor or expert (806) via a second smartphone (805) or computer.

6. Wearable electrocardiographic monitoring technology (ecg) with airtight container for medicines, and integrated medical monitoring system, according to the claim 1, characterized in that the wearable technology (1) is composed of fabric of polyamide textile yarns or any other fabrics similar to synthetic or expansible rubber that may:

- offer protection to the skin against harmful effects of the sun

- offer bacteriostatic action, avoiding body odor;

- be biodegradable;

- enable the electrodes to have stainless steel yarns horizontally and vertically embroidered by crossing or meshing one another on the cloth, so as to form a mesh to widen the surface contacting the underlying skin, in a rectangular or square shape, with conductivity property of electronic signals or composed of silver- or carbon-based pastes or dyes or stretchable conductive fabrics, in a single manner or associated to the mesh of stainless steel yarns, singly or associated to a silver- or carbon-based dye or pastes or stretchable conductive fabrics, as well as for printing low voltage electronic circuits over elastic films

and fabric substrates, and contains stretchable encapsulating which is used to protect the low voltage circuit printed over the elastic film and substrate fabric.

7. Wearable electrocardiographic monitoring technology (ecg) with airtight container for medicines, and integrated medical monitoring system characterized in that the data collected by the ECG system and its location made by GPS are transferred online via GSM or by integrating Bluetooth with a smartphone having an application (app) to a datacenter with an Integrated Monitoring System (IMS), and this IMS will assign the received ECG data to a doctor, who will immediately provide the users with the ECG report in an electronic or remote manner, indicating the first procedures, allowing for an immediate interaction with an emergency hospital service and forwarding to users names and addresses of nearby specialized hospitals.

8. Wearable electrocardiographic monitoring technology (ecg) with airtight container for medicines, and integrated medical monitoring system, according to claim 1, characterized in that data storage is performed by the electronic circuit U3, a non-volatile memory responsible for recording data acquired for later transmission, and the circuit U8 is composed of a solid state relay responsible for the electromagnet triggering in order to release the compartment for medicines, according to the application request for USB input, where there is a protection against outbreaks and electrostatic discharges formed by the circuit U7, a solid-state TVS protection (803).

9. Wearable electrocardiographic monitoring technology (ecg) with airtight container for medicines, and integrated

medical monitoring system, according to claim 1, characterized in that

the device acquiring electrocardiographic signals acquires 256 points per second, and the variation of the electrical potentials generated by the electrical activity in the heart reads out 8 channels, and other 4 by means of mathematical calculations, in a period of time of at most 24 hours, 8 seconds being required to set the impedance for each type of skin.

10. Wearable electrocardiographic monitoring technology (ecg) with airtight container for medicines, and integrated medical monitoring system characterized for having an application (app) installed on the smartphone to add the timestamp and the acquired GPS coordinate, and to submit the examination to the FTP server, in addition to be able to view both the recorded exam and the monitoring in real time of the cardiac signals, and the file being not successfully sent, an error log is stored and a new attempt will be made and this will be repeated until the exam is submitted to the server that is sent to the central along with the next valid exam.

11. Wearable electrocardiographic monitoring technology (ecg) with airtight container for medicines, and integrated medical monitoring system characterized the hardware is powered by a rechargeable LI-ION battery containing LEDs and a buzzer to notice the patient the stage the exam process is and the battery status, a Bluetooth module with the antenna, an USB input for programming and setting the equipment.

12. Wearable electrocardiographic monitoring technology (ecg) with airtight container for medicines, and integrated

medical monitoring system, according to claim 1, characterized in that the electrodes may be directly fixed under the skin of the patient.

13. Wearable electrocardiographic monitoring technology (ecg) with airtight container for medicines, and integrated medical monitoring system, according to claim 13, characterized in that the electrode arrangement (4) is the same as that of the ECG EASI system.