FORM 2
THE PATENT ACT 1970 &
The Patents Rules, 2003
COMPLETE SPECIFICATION
(See section 10 and rule 13)

1. TITLE OF THE INVENTION:

COVID-19 Kit: INTELLIGENT THERMAL SCANNING KIT FOR TESTING THE COVID-19 POSITIVITY AND DISPLAYINGB REAL TIME COUNT OF POSITIVE CASE USING IOT.

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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

The invention "**COVID-19 Kit** "is related to the Covid-19 and their structure identification and also support and sensing structures positioned in a physiologic tunnel for measuring bodily functions and manage abnormal conditions indicated by the measurements.

BACKGROUND OF THE INVENTION

The interfering constituents and variables can introduce significant source of errors that prevent measured biologic parameters from being of clinical value. In order to bypass said interfering constituents and achieve undisturbed signals, invasive and semi-invasive techniques have been used. Such techniques have many drawbacks including difficulties in providing continuous monitoring for long periods of time. Non-invasive techniques also failed to deliver the clinical usefulness needed. The placement of a sensor on the skin characterized by the presence of interfering constituents do not allow obtaining clinically useful nor accurate signals due to the presence of said interfering constituents and background noise which greatly exceeds the signal related to the physiologic parameter being measured.

The most precise, accurate, and clinically useful way of evaluating thermal status of the body in humans and animals is by measuring brain temperature. Brain temperature measurement is the key and universal indicator of both disease and health equally, and is the only vital sign that cannot be artificially changed by emotional states. The other vital signs (heart rate, blood pressure, and respiratory rate) all can be influenced and artificially changed by emotional states or voluntary effort. Body temperature is determined by the temperature of blood, which emits heat as far-infrared radiation. Adipose tissue (fat tissue) absorbs far-infrared and the body is virtually completely protected with a layer of adipose tissue adherent to the skin. Thus measurement of temperature using the skin did not achieve precision nor accuracy because previous techniques used sensors placed on skin characterized by the presence of adipose tissue.

Because it appeared to be impossible with current technology to non-invasively measure brain temperature, attempts were made to determine internal body temperature, also referred to as core temperature. An invasive, artificial, inconvenient, and costly process is currently used to measure internal (core) temperature consisting of inserting a catheter with a temperature sensor in the urinary canal, rectum or esophagus. But such methodology is not suitable for routine measurement, it is painful, and has potential fatal complications. Semi-invasive techniques have also being tried. Abreu disclosed in U.S. Pat. No. 6,120,460 apparatus and methods for measuring core temperature continuously using a contact lens in the eyelid pocket, but the contact lens is a semi-invasive device which requires prescription by a physician and sometimes it is not easy to place the contact lens in the eye of an infant or even in adults and many people are afraid of touching their eyes.

There are several drawbacks and limitations in the prior art for continuous and/or core measurement of temperature.

Measurement of temperature today is non-continuous, non-core and nurse dependent. Nurses have to stick a thermometer in the patient's mouth, rectum or ear. To get core temperature nurses invasively place a tube inside the body which can cause infection and costly complications. Measurement of core temperature on a routine basis in the hospital and/or continuously is very difficult and risky because it requires an invasive procedure with insertion of tubes inside the body or by ingesting a thermometer pill. The thermometer pill can cause diarrhea, measure temperature of the fluid/food ingested and not body temperature, and have fatal complications if the pill obstructs the pancreas or liver ducts. Placement of sensors on the skin do not provide clinically useful measurements because of the presence of many interfering constituents including fat tissue.

It is not possible to acquire precise and clinically useful measurements of not only brain temperature, but also metabolic parameters, physical parameters, chemical parameters, and the like by simply placing a sensor on the skin. One key element is the presence of fat tissue. Fat varies from person to person, fat varies with aging, fat content varies from time to time in the same person, fat attenuates a signal coming from a blood vessel, fat absorbs heat, fat prevents delivery of undisturbed far-infrared radiation, fat increases the distance traveled by the element being measured inside the body and an external sensor placed on the surface of the skin.

There is a need to identify a method and apparatus that can non-invasively, conveniently and continuously monitor brain temperature in a painless, simple, external and safe manner with sensors placed on the skin. There is further a need to identify a method and apparatus that can conveniently, non-invasively, safely and precisely monitor biological parameters including metabolic parameters, physical parameters, chemical parameters, and the like.

PRIOR ART STATEMENT

This application is a continuation of U.S. patent application Ser. No. 13/709,676, filed Dec. 10, 2012, which is a continuation of U.S. patent application Ser. No. 11/585,344, filed Oct. 24, 2006, which is a complete application of U.S. Provisional applications 60/729,232 and 60/802,503, filed on Oct. 24, 2005 and May 23, 2006, respectively, and is a continuation-in-part of U.S. patent application Ser. No. 10/786,623, filed Feb. 26, 2004, which is a continuation-in-part of U.S. application Ser. No. 10/420,295, filed. Apr. 22, 2003.

OBJECTIVE OF THE INVENTION

1. The objective of the invention is to wherein the sensor assembly is slidable mounted on the support structure to accommodate individuals of different height and also support structure is a wall.

2. The other objective of the invention is to wherein said support structure is an electronic device and also the electronic device is a refrigerator and also electronic device is one of a television, a microwave oven, an oven, a cellular telephone and a camera.
3. The other objective of the invention is to further comprising another light source for aligning an eye of an individual and positioning the brain temperature tunnel with respect to the sensor assembly. The comprising an iris scanner for identifying an individual while detecting the reflected radiation.
4. The other objective of the invention is to wherein an identity of the individual and the detected reflected radiation are stored in a memory. The comprising a camera for recording a picture of the individual coupled with the identity of the individual and a temperature corresponding to the reflected radiation.
5. The other objective of the invention is to wherein the processing circuit identifies whether the temperature is outside of a range stored in the memory and also an alarm is activated when the temperature is outside of the range.
6. The other objective of the invention is to A method for detecting corona virus stricture and indicate.
7. The other objective of the invention is to the COVID-19 Kit display chemical and biological parameters of the body to detection status through sound.
8. The other objective of the invention is to after detecting sound IOT Kit active and send information real time storage database and also counter increase.

SUMMARY OF THE INVENTION

The invention provides methods, apparatus and systems that effectively address the needs of the prior art. In general, the invention provides a set of sensing systems and reporting means which may be used individually or in combination, which are designed to access a physiologic tunnel to measure biological, physical and chemical parameters. Anatomically and physiologically speaking, the tunnel discovered by the present invention is an anatomic path which conveys undisturbed physiologic signals to the exterior. The tunnel consists of a direct and undisturbed connection between the source of the function (signal) within the body and an external point at the end of the tunnel located on the skin. A physiologic tunnel conveys continuous and integral data on the physiology of the body. An undisturbed signal from within the body is delivered to an external point at the end of the tunnel. A sensor placed on the skin at the end of the tunnel allows optimal signal acquisition without interfering constituents and sources of error.

Included in the present invention are support structures for positioning a sensor on the skin at the end of the tunnel. The invention discloses devices directed at

measuring brain temperature, brain function, metabolic function, hydrodynamic function, hydration status, hemodynamic function, body chemistry and the like. The components include devices and methods for evaluating biological parameters using patches, clips, eyeglasses, head mounted gear and the like with sensing systems adapted to access physiologic tunnels to provide precise and clinically useful information about the physiologic status of the wearer and for enhancing the safety and performance of said wearer, and helping to enhance and preserve the life of said wearer by providing adequate reporting means and alert means relating to the biological parameter being monitored. Other components provide for producing direct or indirect actions, acting on another device, or adjusting another device or article of manufacture based on the biological parameter measured.

The search for a better way to measure biological parameters has resulted in long and careful research, which included the discovery of a Brain Temperature Tunnel (BTT) and other physiologic tunnels in humans and animals. The present invention was the first to recognize the physiologic tunnel in the body. The present invention was yet the first to recognize the end of the tunnel on the skin surface in which an optimal signal is acquired and measurements can be done without the presence of interfering constituents and background noise that exceeds the signal being measured. The invention was also the first to recognize and precisely map the special geometry and location of the tunnel including the main entry point. The invention was yet first to recognize the precise positioning of sensing systems at the main entry point for optimal signal acquisition. Careful studies have been undertaken including software development for characterizing infrared radiation to precisely determine the different aspects of the tunnel. This research has determined that the measurement of brain (core) temperature and other body parameters can be accomplished in a non-invasive and continuous manner in humans and animals with sensors positioned in a confined area of the skin at the end of a physiologic tunnel.

The key function and critical factor for life preservation and human performance is brain temperature. Brain tissue is the tissue in the body most susceptible to thermal damage, by both high and low temperature. Brain temperature is the most clinically relevant parameter to determine the thermal status of the body and the human brain is responsible for 18 to 20% of the heat produced in the body, which is an extraordinary fact considering that the brain represents only 2% of the body weight. The great amount of thermal energy generated in the brain is kept in a confined space and the scalp, skull, fat and CSF (cerebral spinal fluid) form an insulating layer. The recognition of the BTT by the present invention bypasses the insulating barriers and provides a direct connection to inside the brain physiology and physics. Anatomically and physiologically speaking, a Brain Temperature Tunnel consists of a continuous, direct, and undisturbed connection between the heat source within the brain and an external point at the end of the tunnel. The physical and physiological events at one end of the tunnel inside the brain are reproduced at the opposite end on the skin. A BTT enables the integral and direct heat transfer through the tunnel without interference by heat

absorbing elements, i.e., elements that can absorb far-infrared radiation transmitted as heat by blood within the brain. There are six characteristics needed to define a BTT. These characteristics are:

1. Area without heat absorbing elements, i.e., the area must not contain adipose tissue (fat tissue). This is a key and needed characteristic for defining a temperature tunnel,
2. Area must have a terminal branch of a vessel in order to deliver the integral amount of heat,
3. Erminal branch has to be a direct branch of a blood vessel from the brain,
4. Terminal branch has to be superficially located to avoid heat absorption by deep structures such as muscles,
5. Rea must have a thin and negligible interface between a sensor and the source of thermal energy to achieve high heat flow, and
6. Area must not have thermoregulatory arteriovenous shunts.

All six characteristics are present on the, skin on the medial central area adjacent to the medial corner of the eye above the medial central tendon and in the medial third of the upper eyelid. In more detail the end of BTT area on the skin measures about 11 mm in diameter measured from the medial corner of the eye at the medial canthal tendon and extends superiorly for about 6 mm and then extends into the upper eyelid in a horn like projection for another 22 mm. The BTT area is the only area in the body without adipose tissue, which is in addition supplied by a terminal branch, which has a superficial blood vessel coming from the brain vasculature, and which has a thin interface and no thermoregulatory shunts. The BTT area is supplied by a terminal branch of the superior ophthalmic vein which is a direct connection to the cavernous sinus, said cavernous sinus being an endothelium-lined system of venous channels inside the brain which collects and stores thermal energy. The blood vessel supplying the BTT area is void of thermoregulatory arteriovenous shunts and it ends on the skin adjacent to the medial corner of the eye and in the superior aspect of the medial canthal area right at the beginning of the upper eyelid. The blood vessels deliver undisturbed heat to the skin on the medial canthal area and upper eyelid as can be seen in the color as well as black and white photos of infrared images. The undisturbed thermal radiation from the brain is delivered to the surface of the skin at the end of the tunnel. The heat is delivered to an area of skin without fat located at the end of the tunnel. The blood vessel delivering heat is located just below the skin and thus there is no absorption of infrared radiation by deep structures.

If the blood vessel is located deep, other tissues and chemical substances would absorb the heat, and that can invalidate the clinical usefulness of the measurement. There is direct heat transfer and the skin in the BTT area is the thinnest skin in the body and is void of thermoregulatory arteriovenous shunts. A very important aspect for optimal measurement of temperature is no interference by fat tissue and direct heat transfer. The absence of fat tissue in this particular and unique area in the body at the end of the tunnel allows the undisturbed acquisition of the signal. The combination of those six elements allows the

undisturbed and integral emission of infrared radiation from the brain in the form of direct heat transfer at the BTT area location, which can be seen in the infrared image photographs. The BTT and physiologic tunnels are also referred in this description as the "Target Area".

From a physical standpoint, the BTT is the equivalent of a Brain Thermal Energy tunnel with high total radiant power and high heat flow. The temperature of the brain is determined by the balance between thermal energy produced due to metabolic rate plus the thermal energy delivered by the arterial supply to the brain minus the heat that is removed by cerebral blood flow. Convection of heat between tissue and capillaries is high and the temperature of the cerebral venous blood is in equilibrium with cerebral tissue. Accordingly, parenchymal temperature and thermal energy of the brain can be evaluated by measuring the temperature and thermal energy of the cerebral venous blood. The superior ophthalmic vein has a direct and undisturbed connection to the cavernous sinus and carries cerebral venous blood with a thermal energy capacity of 3.6 $J \cdot ml^{-1} \cdot (^{\circ} C.)^{-1}$ at hematocrit of 45%. Cerebral thermodynamic response, thermal energy, and brain temperature can be evaluated by placing a sensor to capture thermal energy conveyed by the cerebral venous blood at the end of the BTT.

The research concerning BTT and physiologic tunnels involved various activities and studies including:

1. In-vitro histologic analysis of mucosal and superficial body areas;
2. In-vivo studies with temperature evaluation of external areas in humans and animals;
3. In-vivo functional angiographic evaluation of heat source;
4. Morphologic studies of the histomorphometric features of the BTT area;
5. In-vivo evaluation of temperature in the BTT area using: thermocouples, thermistors, and far-infrared;
6. Comparison of the BTT area measurements with the internal eye anatomy and current standard most used (oral) for temperature measurement;
7. Cold and heat challenge to determine temperature stability of BTT;
8. Infrared imaging and isotherm determination. Software for evaluating geometry of tunnel was also developed and used. Simultaneous measurement of a reference temperature and temperature in the BTT area were done using pre-equally calibrated thermistors.

A specific circuit with multiple channels was designed for the experiments and data collection. The measurement of temperature in the BTT area showed almost identical temperature signal between the BTT area and the internal conjunctival anatomy of the eye, which is a continuation of the central nervous system. Measurement of the temperature in the internal conjunctival anatomy of eye as used in the experiment was described by Abreu in U.S. Pat. Nos. 6,120,460 and 6,312,393. The average temperature levels for BTT and internal eye were within

0.1° C. (0.18° F.) with an average normothermia value equivalent of 37.1° C. (98.8° F.) for the BTT and 37° C. (98.6° F.) for the internal eye. Comparison with the standard most used, oral temperature, was also performed. The temperature voltage signal of the BTT area showed an average higher temperature level in the BTT area of an equivalent of 0.3° C. (0.5° F.) when compared to oral.

Subjects underwent cold challenge and heat challenge through exercising and heat room. The lowering and rising of temperature in the BTT area was proportional to the lowering and rising in the oral cavity. However, the rate of temperature change was faster in the BTT area than for oral by about 1.2 minutes, and temperature at the BTT site was 0.5° C. (0.9° F.) higher on few occasions. Subjects of different race, gender, and age were evaluated to determine the precise location of the BTT area across a different population and identify any anatomic variation. The location of the BTT was present at the same location in all subjects with no significant anatomic variation, which can be seen in a sample of infrared imaging of different subjects.

The tunnel is located in a crowded anatomic area and thus the positioning of the sensor requires special geometry for optimal alignment with the end of the tunnel. The clinical usefulness of the tunnel can only be achieved with the special positioning of the sensor in relation to anatomic landmarks and the support structure. The tunnel is located in a unique position with distinctive anatomic landmarks that help define the external geometry and location of the end of the tunnel. The main entry point of the tunnel, which is the preferred location for positioning the sensor, requires the sensor to be preferably placed in the outer edge of a support structure. The preferred embodiment for the measurement of biological parameters by accessing a physiologic tunnel includes sensors positioned in a particular geometric position on the support structure.

The support structure includes patches containing sensors. For the purpose of the description any structure containing an adhesive as means to secure said structure to the skin at the end of the tunnel is referred to as a patch including strips with adhesive surfaces such as a “BAND-AID” adhesive bandage. It is understood that a variety of attachment means can be used including adhesives, designs incorporating spring tension pressure attachment, and designs based on other attachment methods such as elastic, rubber, jelly-pads and the like. The patches are adapted to position sensors at the end of the tunnel for optimal acquisition of the signal. The patch is preferably secured to the area by having an adhesive backing which lays against the skin, although a combination of adhesive and other means for creating a stable apposition of the sensor to the tunnel can be used such as fastening or pressure. Support structures also include clips or structures that are positioned at the end of the tunnel with or without adhesive and which are secured to the area by pressure means. Any structure that uses pressure means to secure said structure to the skin at the end of the tunnel is referred as a clip.

Head-mounted structures are structures mounted on the head or neck for positioning sensors on the end of the tunnel and include headbands with accessories that are adjacent to the tunnel, visors, helmets, headphone, structures wrapping around the ear and the like. For the purpose of this description Temp Alert is referred herein as a system that measures temperature in the BTT area and has means to report the measured value and that can incorporate alarm devices that are activated when certain levels are reached. Support structures yet include any article that has sensing devices in which said sensing devices are positioned at the end of the tunnel. Support structures further include medial canthal pieces of eyeglasses. A medial canthal piece is also referred to herein as a medial canthal pad and includes a pad or a piece which positions sensing devices on the skin at the medial canthal area on top of a tunnel, with said medial canthal piece being permanently attached to or mounted to an eyeglass. Any sensing devices incorporated in an eyeglass (fixed or removable) for accessing a tunnel are referred to herein as EyEXT including devices for sensing physical and chemical parameters. Any article of manufacture that has visual function, or ocular protection, or face protection with a part in contact with the tunnel is referred herein as eyeglasses and includes conventional eyeglasses, prescription eyeglasses, reading glasses, sunglasses, goggles of any type, masks (including gas masks, surgical masks, cloth masks, diving masks, eye mask for sleeping and the like) safety glasses, and the like.

For brain temperature evaluation the tunnel area consists of the medial canthal area and the superior aspect of the medial corner of the eye. For brain function evaluation the tunnel area consists of primarily the upper eyelid area. For metabolic function evaluation the tunnel area consists of an area adjacent to the medial corner of the eye and both the upper and lower eyelids. The measurement of metabolic function, brain function, immunogenic function, physical parameters, physico-chemical parameters and the like includes a variety of support structures with sensors accessing the physiologic tunnels. The sensors are placed in opposition to the skin immediately adjacent to the medial corner of the eye preferably in the superior aspect of the medial canthal area. The sensor can also be positioned in the medial third of the upper eyelid. The sensor is most preferably located at the main entry point of the tunnel which is located on the skin 2.5 mm medial to the corner of the eye and about 3 mm above the medial corner of the eye. The diameter of the main entry point is about 6 to 7 mm. The positioning of the sensor at the main entry point of the tunnel provides the optimum site for measuring physical and chemical parameters of the body.

Besides a sensor that makes contact with the skin at the Target Area, it is understood that sensors which do not make contact with the skin can be equally used. For instance, an infrared-based temperature measuring system can be used. The measurement is based on the Stefan-Boltzmann law of physics in which the total radiation is proportional to the fourth power of the absolute temperature, and the Wien Displacement law in which the product of the peak wavelength and the temperature are constant. The field of view of the non-contact infrared apparatus of the invention is adapted to match the size and geometry of the BTT

area on the skin. A variety of lenses known in the art can be used for achieving the field of view needed for the application. For example, but not by way of limitation, a thermopile can be adapted and positioned in a manner to have a field of view aimed at the main entry point of the BTT area on the skin. The signal is then amplified, converted into a voltage output and digitized by a MCU (microcontroller).

This infrared-based system can be integrated into a support structure that is in contact with the body such as any of the support structures of the present invention. In addition, it is understood that the infrared-based system of the present invention can be integrated as a portable or hand-held unit completely disconnected from the body. The apparatus of the present invention can be held by an operator that aims said apparatus at the BTT area to perform the measurement. The apparatus further includes an extension shaped to be comfortably positioned at the BTT site for measuring biological parameters without discomfort to the subject. The extension in contact with the skin at the BTT is shaped in accordance with the anatomic landmarks and the geometry and size of the BTT site. The infrared radiation sensor is positioned in the extension in contact with the skin for receiving radiation emitted from the BTT site.

The invention provides a method for measuring biological parameters including the steps of positioning a sensing device means on the skin area at the end of a tunnel, producing a signal corresponding to the biological parameter measured and reporting the value of the parameter measured. It is also including a method to measure biological parameters by non-contact infrared thermometry comprising the steps of positioning an infrared detector at the BTT site with a field of view that encompasses the BTT site and producing a signal corresponding to the measured infrared radiation. The biological parameters include temperature, blood chemistry, metabolic function and the like.

Temperature and ability to do chemical analysis of blood components is proportional to blood perfusion. The present invention recognizes that the tunnel area, herein also referred as a Target Area, has the highest superficial blood perfusion in the head and has a direct communication with the brain, and that the blood vessels are direct branches of the cerebral vasculature and void of thermoregulatory arteriovenous shunts. It was also recognized that the Target Area has the highest temperature in the surface of the body as can be seen in the photographs of experiments measuring infrared emission from the body and the eye.

The Target Area discovered not only has the thinnest and most homogeneous skin in the whole body but is the only skin area without a fat layer. Since fat absorbs significant amounts of radiation, there is a significant reduction of signal. Furthermore, other skin areas only provide imprecise and inaccurate signals because of the large variation of adipose tissue from person to person and also great variability of fat tissue according to age. This interference by a fat layer does not occur in the Target Area. Furthermore, the combined characteristics of the

Target Area, contrary to the skin in the rest of the body, enable the acquisition of accurate signals and a good signal to noise ratio which far exceeds background noise. In addition, body temperature such as is found in the surface of the skin in other parts of the body is variable according to the environment.

Another important discovery of the present invention was the demonstration that the Target Area is not affected by changes in the environment (experiments included cold and heat challenge). The Target Area provides an optimum location for temperature measurement which has a stable temperature and which is resistant to ambient conditions. The Target Area discovered has a direct connection to the brain, is not affected by the environment and provides a natural, complete thermal seal and stable core temperature. The apparatus and methods of the present invention achieve precision and clinical usefulness needed with the non-invasive placement of a temperature sensor on the skin in direct contact with the heat source from the brain without the interference of heat absorbing elements.

The Target Area is extremely vascularized and is the only skin area in which a direct branch of the cerebral vasculature is superficially located and covered by a thin skin without a fat layer. The main trunk of the terminal branch of the ophthalmic vein is located right at the BTT area and just above the medial canthal tendon supplied by the medial palpebral artery and medial orbital vein. The BTT area on the skin supplied by a terminal and superficial blood vessel ending in a particular area without fat and void of thermoregulatory arteriovenous shunts provides a superficial source of undisturbed biological signals including brain temperature, metabolic function, physical signals, and body chemistry such as glucose level, and the like.

Infrared spectroscopy is a technique based on the absorption of infrared radiation by substances with the identification of said substances according to its unique molecular oscillatory pattern depicted as specific resonance absorption peaks in the infrared region of the electromagnetic spectrum. Each chemical substance absorbs infrared radiation in a unique manner and has its own unique absorption spectra depending on its atomic and molecular arrangement and vibrational and rotational oscillatory pattern. This unique absorption spectrum allows each chemical substance to basically have its own infrared spectrum, also referred to as fingerprint or signature which can be used to identify each of such substances. Radiation containing various infrared wavelengths is emitted at the substance to be measured and the amount of absorption of radiation is dependent upon the concentration of said chemical substance being measured according to Beer-Lambert's Law.

Interfering constituents and variables such as fat, bone, muscle, ligaments and cartilage introduce significant source of errors which are particularly critical since the background noise greatly exceeds the signal of the substance of interest. Since those interfering constituents are not present on the skin at the BTT area, the sensing systems positioned at said BTT area can acquire optimal signal with

minimal noise including spectroscopic-based measurements. Spectroscopic devices integrated into support structures disclosed in the present invention can precisely non-invasively measure blood components since the main sources of variation and error, such as fat tissue, are not present in the Target Area. In addition, other key constituents which interfere with electromagnetic energy emission such as muscle, cartilage and bones, are not present in the Target Area either. The blood vessels delivering the infrared radiation are superficially located and the infrared radiation is delivered at the end of the tunnel without interacting with other structures. The only structure to be traversed by the infrared radiation is a very thin skin, which does not absorb the infrared wavelength. The present invention includes infrared spectroscopy means to provide a clinically useful measurement with the precise and accurate determination of the concentration of the blood components at the end of the tunnel.

In addition to spectroscopy in which electromagnetic energy is delivered to the Target Area, the present invention also discloses apparatus and methods for measuring substances of interest through far infrared thermal emission from the Target Area. Yet, besides near-infrared spectroscopy and thermal emission, other devices are disclosed for measurement of substances of interest at the Target Area including electro osmosis as a flux enhancement by iontophoresis or reverse iontophoresis with increased passage of fluid through the skin through application of electrical energy. Yet, transcutaneous optical devices can also be integrated into support structures including medial canthal pieces, modified nose pads, and the frame of eyeglasses, with said devices positioned to access the tunnel.

It is understood that application of current, ultrasonic waves as well as chemical enhancers of flow, electroporation and other devices can be used to increase permeation at the tunnel site such as for example increased flow of glucose with the use of alkali salts. In addition, creating micro holes in the target area with a laser, or other means that penetrate the skin can be done with the subsequent placement of sensing devices on the BTT site, with said devices capable of measuring chemical compounds. Furthermore, reservoirs mounted on or disposed within support structures, such as the frame and pads of eyeglasses, can deliver substances transdermal at the BTT site by various devices including iontophoresis, sonophoretic, electro compression, electroporation, chemical or physical permeation enhancers, hydrostatic pressure and the like.

In addition to measure the actual amount of oxygen in blood, the present invention also discloses devices to measure oxygen saturation and the amount of oxygenated hemoglobin. In this embodiment the medial canthal piece of a support structure or the modified nose pads of eyeglasses contain LEDs emitting at two wave lengths around 940 and 660 nanometers. As the blood oxygenation changes, the ratio of the light transmitted by the two frequencies changes indicating the oxygen saturation. Since the blood level is measured at the end of a physiologic brain tunnel, the amount of oxygenated hemoglobin in the arterial blood of the brain is measured, which is the most valuable and key parameter for athletic purposes and health monitoring.

BRIEF DESCRIPTION OF THE DIAGRAM

FIG. 1A: is a schematic diagram showing a physiologic tunnel.
FIG. 1B: is a cross-sectional schematic diagram of the human head showing the tunnel.
FIG. 1C: is a coronal section schematic diagram showing the cavernous sinus of FIG. 1B.
FIG. 2A: is a thermal infrared image of the human face showing the tunnel.
FIG. 2B: is a schematic diagram of the image in FIG. 2A showing the geometry at the end of the tunnel.
FIG. 3: is a perspective view of a preferred embodiment showing a person wearing a support structure comprised of a patch with a passive sensor positioned on the skin at the end of the tunnel in accordance with the present invention.
FIG. 4: is a perspective view of another preferred embodiment showing a person wearing a support structure comprised of a patch with a passive sensor positioned on the skin at the end of the tunnel in accordance with the present invention.
FIG. 5: is a schematic block diagram of one preferred embodiment.
FIG.6A: is perspective views of a preferred embodiment showing a person wearing support structures incorporated as patches.
FIG.6B: is perspective views of a preferred embodiment showing a person wearing support structures incorporated as patches.
FIG.6C: is perspective views of a preferred embodiment showing a person wearing support structures incorporated as patches.
FIG.7: is schematic views showing the infrared imaging system of the present invention mounted in a support structure in different locations for screening people for temperature changes.
FIG.8: is schematic views showing the infrared imaging system of the present invention mounted in a support structure in different locations for screening people for temperature changes.
FIG. 9: shows a flowchart illustrating a method used in the present invention.

DESCRIPTION OF THE INVENTION

FIG. 1A: shows the brain 10 with the thermal energy 12 stored in its body. The BTT 20 includes the brain 10, the thermal energy 12 stored in the brain 10, the thermal energy stored in the tunnel 14 and the thermal energy 16 transferred to the exterior at the end of the tunnel. The thermal energy 12, 14, 16 is represented by dark arrows of same size and shape. The arrows have the same size indicating undisturbed thermal energy from one end of the tunnel to the other and characterized by equivalent temperature within the tunnel. Thermal energy from the sinus cavernous in the brain 10 is transferred to the end of the tunnel 16 and a rapid rate of heat transfer occurs through the unimpeded cerebral venous blood path. The tunnel also has a wall 18 representing the wall of the vasculature storing the thermal energy with equivalent temperature and serving as a conduit from the inside of the body 10 to the exterior (skin surface) 19 which ends as a terminal vessel 17 transferring the total amount of thermal energy to said skin 19.

The skin 19 is very thin and allows high heat flow. The thickness of skin 19 is negligible compared to the skin 39, 49 in non-tunnel areas 30 and 40 respectively. Due to the characteristics of skin 19, high heat flow occurs and thermal equilibrium is achieved rapidly when a sensor is placed on the skin 19 at the end of the BTT 20. In other areas of skin in the face and in the body in general, and in the exemplary non-tunnel areas 30 and 40 of FIG.1 several interfering phenomena occur besides the lack of direct vasculature connection to the brain, and includes self-absorption and thermal gradient. 1. Self-absorption: This relates to the phenomena that deep layers of tissue selectively absorb wavelengths of infrared energy prior to emission at the surface. The amount and type of infrared energy self-absorbed is unknown. At the surface those preferred emissions are weak due to self-absorption by the other layers deriving disordered thermal emission and insignificant spectral characteristic of the substance being analyzed being illustratively represented by the various size, shapes and orientations of arrows 34 *a* to 36 *g* and 44 *a* to 46 *g*, of FIG. 1. Self-absorption in non-tunnel areas thus naturally prevents useful thermal emission for measurement to be delivered at the surface. 2. Thermal gradient: there is a thermal gradient with the deeper layers being warmer than the superficial layers, illustratively represented by thicker arrows 36 *d* and 46 *d* in the deeper layers compared to thinner arrows 36 *e* and 46 *e* located more superficially. There is excessive and highly variable scattering of photons when passing through various layers such as fat and other tissues such as muscles leading to thermal loss.

Contrary to that, the tunnel area 20 is homogeneous with no absorption of infrared energy and the blood vessels are located on the surface. This allows undisturbed delivery of infrared energy to the surface of the skin 19 and to a temperature detector such as an infrared detector placed in apposition to said skin 19. In the BTT area there is no thermal gradient since there is only a thin layer of skin 19 with terminal blood vessel 17 directly underneath said thin interface skin 19. The thermal energy 16 generated by the terminal blood vessel 17 exiting to the surface skin 19 corresponds to the undisturbed brain (true core) temperature of the body. The preferred path for achieving thermal equilibrium with brain tissue temperature is through the central venous system which exits the brain and enters the orbit as the superior ophthalmic vein. The arterial blood is 0.2 to 0.3 degrees Celsius lower when compared to the central venous blood, and said arterial blood is not the actual equivalent of the brain temperature. Thus although arterial blood may be of interest in certain occasions, the venous system is the preferred carrier of thermal energy for measurement of brain temperature. Arterial blood temperature may be of interest to determine possible brain cooling by the arterial blood in certain circumstances.

Non-tunnel areas 30 and 40 are characterized by the presence of heat absorbing elements. The non-tunnel areas 30 and 40 are defined by broken lines characterizing the vulnerability of interference by heat absorbing constituents and by the disorganized transferring of heat in said non-tunnel areas 30 and 40. Various layers and other constituents in non-tunnel areas 30 and 40 selectively absorb infrared energy emitted by the deeper layers before said energy reaches

the surface of skin, and the different thermal energy and the different areas are represented by the different shapes and sizes of arrows and arrow heads. Non-tunnel area 30 can be representative of measuring temperature with a sensor on top of the skin anatomically located above the heart 32. White arrows 34 represent the thermal energy in the heart 32. Non-tunnel area 30 includes the heart 32 and the various blood vessels and its branches 36 *a*, 36 *b*, 36 *c*, 36 *d* storing thermal energy.

Different amounts of heat are transferred and different temperatures measured depending on the location and anatomy of blood vessels 36 *a*, 36 *b*, 36 *c*. The blood vessels branch out extensively from the main trunk 34 *a*. The non-tunnel area 30 also includes heat absorbing structures 37 such as bone and muscles which thermal energy 34 from the heart 32 need to be traversed to reach the skin 39. The non-tunnel area 30 also includes a variable layer of fat tissue 38 which further absorbs thermal energy. The reduced amount of thermal energy reaching the skin surface due to the presence of fat 38 is represented by the arrows 36 *d* and 36 *e*, in which arrow 36 *d* has higher temperature than arrow 36 *e*. Non-tunnel area 30 also includes a thick skin 39 with low heat flow represented by arrows 36 *f.*

The thick skin 39 corresponds to the skin in the chest area and fat layer 38 corresponds to the variable amount of fat present in the chest area. Arrows 36 *g* represent the disordered and reduced total radiant power delivered after said thermal energy traverses the interfering constituents in the non-tunnel area including a thick interface and heat absorbing structures. In addition, BTT 20 has no fat layer as found in non-tunnel areas 30 and 40. Lack of a thick interface such as thick skin and fat, lack of thermal barriers such as fat, and lack of heat absorbing elements such as muscles allows undisturbed emission of radiation at the end of the BTT. Lack of a thick interface such as thick skin and fat, lack of thermal barriers such as fat, and lack of heat absorbing elements such as muscles allowed undisturbed emission of radiation at the end of the BTT.

Yet referring to FIG.1: non-tunnel area 40 can be representative of measuring temperature with a sensor on top of the skin in the arm 42. The heat transfers in non-tunnel area 40 has some similarity with non-tunnel area 30 in which the end result is a disordered and reduced total radiant power not representative of the temperature at the opposite end internally. The blood vessels branch out extensively from the main trunk 44 *a*. Thermal energy and temperature in blood vessels 46 *a*, 46 *b*, 46 *c* is different than in areas 36 *a*, 36 *b*, 36 *c*. The structures that thermal energy 44 needs to traverse to reach the skin are also different compared to non-tunnel 30. The amount of heat absorbing structures 47 is different and thus the end temperature at non-tunnel 40 is also different when compared to non-tunnel area 30. The amount of fat 48 also varies which changes the energy in areas 46 *d* and 46 *e*, wherein area 46 *d* is deeper than area 46 *e*. Thick skin 49 also reduces heat flow and the temperature of the area 46 *f*. Reduction of radiant power indicated by arrow 46 *g* when compared to radiant power 36 *g* is usually quite different, so different skin temperature is measured

depending on the area of the body. This applies to the whole skin surface of the body, with the exception of the skin at the end of the BTT.

Measurements of internal temperature such as rectal do not have the same clinical relevance as measurement in the brain. Selective brain cooling has been demonstrated in a number of mammalian species under laboratory conditions and the same process could occur in humans. For instance, the temperature in bladder and rectum may be quite different than the brain. High or low temperature in the brain may not be reflected in the temperature measured in other internal organs.

FIG. 1B: is a cross-sectional schematic diagram of the human head 9 showing the brain 10, spinal cord 10 *a*, the tunnel 20 represented by the superior ophthalmic vein, the cavernous sinus 1, which is the thermal energy storage compartment for the brain, and the various insulating barriers 2, 2 *a*, 3, 4, 4 *a*, 4 *b*, 5 that keep the brain as a completely thermally insulated structure. Insulating barriers include skin 2 corresponding to the scalp, skin 2 *a* corresponding to the skin covering the face, fat 3 covering the whole surface of the skull and face, skull bone 4, spinal bone 4 *a* surrounding spinal cord 10 *a*, facial bone 4 *b* covering the face, and cerebral spinal fluid (CSF) 5. The combined thickness of barriers 2,3,4,5 insulating the brain can reach 1.5 cm to 2.0 cm, which is a notable thickness and the largest single barrier against the environment in the whole body. Due to this completely confined environment the brain cannot remove heat efficiently and heat loss occurs at a very low rate. Skin 2 corresponds to the scalp which is the skin and associated structure covering the skull and which has low thermal conductivity and works as an insulator. Fat tissue 3 absorbs the majority of the far-infrared wavelength and works as a thermal buffer. Skull bone 4 has low thermal conductivity and the CSF works as a physical buffer and has zero heat production.

The heat generated by metabolic rate in the brain corresponds to 20% of the total heat produced by the body and this enormous amount of heat is kept in a confined and thermally sealed space. Brain tissue is the most susceptible tissue to thermal energy induced damage, both high and low levels of thermal energy. Because of the thermal insulation and physical inability of the brain to gain heat or lose heat, both hypothermic (cold) and hyperthermia (hot) states can lead to brain damage and death can rapidly ensue, as occur to thousands of healthy people annually besides seizures and death due to high fever in sick people. Unless appropriate and timely warning is provided by continuously monitoring brain temperature anyone affected by cold or hot disturbances is at risk of thermal induced damage to the brain.

FIG. 1B: also shows a notably small entry point 20 *a* measuring less than 0.5% of the body surface which corresponds to the end of the tunnel 20 on the skin 2 *b*. The skin 2 *b* is extremely thin with a thickness of 1 mm or less compared to the skin 2 and 2 *a* which are fivefold or more, thicker than skin 2 *b.* The tunnel 20 starts at the cavernous sinus 1 which is a conduit for venous drainage for the brain and for heat transfer at the end of the tunnel 20 as a radiant energy. Tunnel 20 provides an unobstructed passage to the cavernous sinus 1, a structure

located in the middle of the brain, and which is in direct contact with the two sources of heat to the brain: 1) thermal energy produced due to metabolic rate by the brain and carried by the venous system; and 2) thermal energy delivered by the arterial supply from the rest of the body to the brain. This direct contact arrangement is showed in detail in FIG. 1C, which is a coronal section of FIG. 1B corresponding to the line marked "A".

FIG. 1C: is a coronal section through the cavernous sinus 1 which is a cavity-like structure with multiple spaces 1 *a* filled with venous blood from the veins 9 and from the superior ophthalmic vein 6. Cavernous sinus 1 collects thermal energy from brain tissue 7, from arterial blood of the right and left internal carotid arteries 8 *a*, 8 *b*, and from venous blood from vein 9. All of the structures 7, 8 *a*, 8 *b*, 9 are disposed along and in intimate contact with the cavernous sinus 1. A particular feature that makes the cavernous sinus 1 of the tunnel a very useful gauge for temperature disturbances is the intimate association with the carotid arteries 8 *a*, 8 *b*. The carotid arteries carry the blood from the body, and the amount of thermal energy delivered to the brain by said vessels can lead to a state of hypothermia or hyperthermia. For instance, during exposure to cold, the body is cold and cold blood from the body is carried to the brain by internal carotid arteries 8 *a*, 8 *b*, and the cavernous sinus 1 is the entry point of those vessels 8 *a*, 8 *b* to the brain.

As soon as cold blood reaches the cavernous sinus 1 the corresponding thermal energy state is transferred to the tunnel and to the skin surface at the end of the tunnel, providing therefore an immediate alert even before the cold blood is distributed throughout the brain. The same applies to hot blood for instance generated during exercise which can lead to a 20-fold heat production compared to baseline. This heat carried by vessels 8 *a*, 8 *b* is transferred to the cavernous sinus 1 and can be measured at the end of the tunnel. In addition, the thermal energy generated by the brain is carried by cerebral venous blood and the cavernous sinus 1 is a structure filled with venous blood.

FIG. 2A: is a thermal infrared image of the human face in which the geometry of the end of the tunnel on the skin can be visualized. The white bright spots define the central area of the tunnel. FIG. 2B: is a schematic diagram of an exemplary geometry on the skin surface at the end of the tunnel. The medial aspect 52 of the tunnel 50 has a round shape. The lateral aspect 54 borders the upper lid margin 58 and caruncle 56 of the eye 60. The tunnel extends from the medial canthal area 52 into the upper eyelid 62 in a horn like projection. FIG.2A: is a perspective view of a preferred embodiment showing a person 100 wearing a support structure comprised of a patch 72 with a passive sensor 74 positioned on the skin at the end of the tunnel. Person 100 is laying on a mattress 76 which contains antenna 78. Wire 82 extends from antenna 78 to controller unit 84 with said controller 84 communicating with device 88 by communication line 86. Exemplary device 88 includes a decoding and display unit at the bedside or at the nursing station. It is understood that controller unit 84 besides communicating by cable 86, can also contain a wireless transmission device to wirelessly transmit

the signal acquired to a remote station. This inductive radio frequency powered telemetry system can use the same antenna 78 to transfer energy and to receive the signal.

The antenna 78 can be secured to a mattress, pillow, frame of a bed, and the like in a removable or permanent manner. The preferred embodiment includes a thin flat antenna encapsulated by a flexible polymer that is secured to a mattress and is not visible to the user. Alternatively, an antenna can be placed in any area surrounding the patient, such as on a night stand. The antenna 78 and controller unit 84 works as a receiver/interrogator.

A receiver/interrogator antenna 78 causes RF energy to radiate to the microcircuit in the patch 72. This energy would be stored and converted for use in the temperature measurement process and in the transmission of the data from the patch 72 to the antenna 78. Once sufficient energy has been transferred, the microcircuit makes the measurement and transmits that data to the receiver/interrogator antenna 78 with said data being processed at controller 84 and further communicated to device 88 for display or further transmission. The switching elements involved in the acquisition of the sensor data (measurement of the energy) is done in a sequence so that the quantitized answer is available and stored prior to the activation of the noise-rich transmission signal. Thus the two inherently incompatible processes successfully coexist because they are not active simultaneously.

The capability of the RF link to communicate in the presence of noise is accomplished by “spreading” the spectral content of the transmitted energy in a way that would inherently add redundancy to the transmission while reducing the probability that the transmission can ever be interpreted by the receiver/interrogator 78 as another transmission or noise that would cause the receiver/interrogator 78 to transmit and display incorrect information. This wireless transmission scheme can be implemented with very few active elements. The modulation purposely spreads the transmission energy across the spectrum and thus provides noise immunity and the system can be ultimately produced via batch processing and thus at a very low cost.

Since the energy to operate sensor 74 in patch 72 comes from the antenna 78, the microcircuit in said patch 72 can be very small and ultra-thin. Size of the patch 72 would be further minimized to extremely small dimensions by the design approach that places all the processing function of the RF link in the controller unit 84 working as a receiver. RF messaging protocol and the control of the sensor 74 resides in the receiver/interrogator controller powered by commercially available batteries or by AC current. Thus the RF messaging protocol and the control of the sensor 74 is directly controlled by the MCU of controller 84. The circuit resident in the patch 72 is preferably completely self-contained. The sensing system 74 in the patch 72 is preferably a silicon microcircuit containing the circuits needed to support the sensor, quantitized the data from the sensor, encode the data for radio frequency transmission, and

transmit the data, besides power conditioning circuits and digital state control. Sensor, support circuitry, RF power and communications are all deposited on a micro-chip die allowing the circuit to be built in large quantities and at very low cost. This scheme is preferably used for both passive and active devices.

The operational process can consist of two modes, manual or automated. In the manual mode, an operator such as a nurse activates the system and RF energy radiated to the microcircuit in the patch 72 would be stored and converted for use in the temperature measurement process and in the transmission of the data from the end of the BTT to the antenna 78. Once sufficient energy has been transferred (less than 1 second) the microcircuit would make the measurement and transmit the data to the antenna 78 receiver and controller 84 to be displayed for example on a back-lit LCD display at the nursing station. An audio "beep" will signal that the data had been received and is ready for view. In the automated mode, the process is done automatically and continuously by interrogation at preset frequency and an alarm being activated when the reading is outside the specified range. A tri-dimensional antenna can also be used and the controller 84 set up to search the three dimensions of the antenna to assure continued and proper connection between antenna 78 and sensing means 74. It is also understood that the sensor can modulate reflected RF energy. Accordingly, the energy will trigger the unit to acquire a temperature measurement, and then the unit will modulate the reflected energy. This reflected energy and information will be received at the interrogator and displayed as above.

The invention also provides a method for monitoring biological parameters, which comprises the steps of: securing a passive sensor to the body; generating electromagnetic radiation from a device secured to at least one of a mattress, a pillow and the frame of a bed; generating a signal from said passive sensor; receiving said signal by a device secured to at least one of a mattress, a pillow and the frame of a bed; and determining the value of the biological parameter based on said signal. It is understood that a variety of external power sources such as electromagnetic coupling can be used including an ultra-capacitor charged externally through electromagnetic induction coupling and cells that can be recharged by an external oscillator. It is also understood that the sensing system can be remotely driven by ultrasonic waves.

FIG. 4: is a perspective view of another preferred embodiment showing in closer detail a person 100 wearing a support structure comprised of patch 72 with a sensor 74, transmitter 71, and digital converter and control 73 positioned on the skin at the end of the tunnel. Person 100 is wearing a necklace which works as antenna 78 and a pendant in the necklace works as the controller unit and transmitting unit 79. Solar cells and/or specialized batteries power unit 79. Patients are used to carrying Holter monitoring and cards with cords around their necks and this embodiment can fit well with those currently used systems. It is understood that, besides a necklace, a variety of articles including clothing and electric devices can be used as a receiver/interrogator and this capability can be easily incorporated into cell phones, note book computers, hand held computers,

internet appliances for connecting to the internet, and the like, so a patient could use his/her cell phone or computer means to monitor his/her brain temperature.

The preferred embodiments shown in FIGS. 3 and 4 can preferably provide continuous monitoring of fever or temperature spikes for any surgery, for any patient admitted to a hospital, for nursing home patients, in ambulances, and to prevent death or harm by hospital infection. Hospital infection is an infection acquired during a hospital stay. Hospital infection is the fourth cause of death in the U.S. and kills more than 100,000 patients annually and occurs primarily due to lack of early identification of fever or temperature spikes. The present invention provides timely identification and therapy of an infection due to 24-hour automated monitoring of temperature. If there is a spike in temperature an alarm can be activated. This will allow timely identification and treatment of an infection and thus prevent death or costly complications such as septic shock that can occur due to delay in treating infectious processes. Besides, said preferred embodiments provide means for continuous fever monitoring at home including during sleeping for both children and adults

FIG. 5: shows a block diagram of a preferred embodiment of the present invention linking transmitter 120 to receiver 130. Transmitter 120 preferably includes a chip 112 incorporating a microcontroller (MCU) 114, a radio frequency transmitter (RF) 116 and a A/D converter 118 in addition to a power source 122, amplifier (A) 124, sensor 126, and antenna 128, preferably built-in in the chip. Exemplary chips include: (1) rfPIC12F675F, (available from Microchip Corporation, Arizona, USA) this is a MCU+ADC+433 Mhz Transmitter (2) CC1010, available from Chipcon Corporation of Norway. Receiver 130 preferably includes a chip RF transceiver 132 (e.g., CC1000 available from Chipcon Corporation), a microcontroller unit (MCU) 134, amplifier and filtering units (A/F) 136, display 138, clock 140, keypad 142, LED 144, speaker 146, in addition to a power source 150 and input/output units (I/O) 148 and associated modem 152, optical transceiver 154 and communication ports 156.

A variety of devices can be used for the transmission scheme besides the commercially available RF transmitter chips previously mentioned. One simple transmission devices include an apparatus with a single channel transmitter in the 916.48 MHz band that sends the temperature readings to a bed side receiver as a frequency proportional to the reading. The thermistor's resistance would control the frequency of an oscillator feeding the RF transmitter data input. If the duty cycle is less than 1%, the 318 MHz band would be usable. Rather than frequency, a period measurement technique can be used. The model uses a simple radio frequency carrier as the information transport and modulating that carrier with the brain temperature information derived from a transduction device capable of changing its electrical characteristics as a function of temperature (e.g.; thermistor). Either frequency or amplitude of the carrier would be modulated by the temperature information so that a receiver tuned to that frequency could demodulate the changing carrier and recover the slowly moving temperature data.

Another transmission technique suitable to transmit the signal from a sensor in a support structure is a chirp device. This means that when activated, the transmitter outputs a carrier that starts at a lower frequency in the ISM band and smoothly increases frequency with time until a maximum frequency is reached. The brain temperature information is used to modify the rate of change of frequency of the chirp. The receiver is designed to measure the chirp input very accurately by looking for two or more specific frequencies. When the first of the frequencies is detected, a clock measures the elapsed time until the second frequency is received. Accordingly, a third, fourth, etc., frequency could be added to aid in the rejection of noise. Since virtually all the direct sequence spread spectrum transmitters and frequency hopping transmitters are spread randomly throughout their part of the ISM band, the probability of them actually producing the "right" sequence of frequencies at exactly the right time is remote.

Once the receiver measured the timing between the target frequencies, that time is the value that would represent the brain temperature. If the expected second, third, or fourth frequency is not received by the receiver within a "known" time window, the receiver rejects the initial inputs as noise. This provides a spread spectrum system by using a wide spectrum for transmitting the information while encoding the information in a way that is unlike the expected noise from other users of the ISM band. The chirp transmitter is low cost and simple to build and the brain temperature transducer is one of the active elements that controls the rate of change of frequency.

Other preferred embodiments for local reporting include a sensor, an operational amplifier (LM358 available from National Semiconductor Corporation) and a LED in addition to a power source. It is understood that the operational amplifier (Op Amp) can be substituted by a MCU and the LED substituted by a piezoelectric component.

FIG.6A to 6C: are perspective views of preferred embodiments showing a person 100 wearing support structures 180 incorporated as patches. In a preferred embodiment shown in FIG. 6A, the support structure 180 contains LED 184, cell 186, and sensor 182. Sensor 182 is positioned at a main entry point on the superior aspect of the medial canthal area adjacent to the medial corner of the eye 25. LED 184 is activated when a signal reaches certain thresholds in accordance with the principles of the invention. FIG. 16B is another preferred embodiment showing a person 100 wearing support structure 180 with sensor 182 positioned at the general area of the main entry point of the tunnel with the superior edge 181 of support structure 180 being lined up with the corner of the eye 25. Support structure 180 contains an extension that rests on the cheek area 189 and houses transmitting means 183 for wireless transmission, processing means 185 and power source 187. FIG. 6C is an exemplary preferred embodiment showing person 100 wearing a two-piece structure 180 *a* comprised of support structure 180 *b* and housing structure 180 *c* connected by wires 192, preferably a flexible circuit. Support structure 180 *b* contains the sensor 182 which is positioned at the BTT site. Housing structure 180 *c* which can

comprise an adhesive strip on the forehead 21 houses processing device 183 *a*, transmitting device 183 *b* and power source 187 for transmitting the signal to unit 194, for example a cell phone.

FIG. 7: is a schematic view showing the thermal imaging system 560 of the present invention adapted to be used in an airport 580 including an infrared camera 582, a processor 584, and a display 586 which are mounted in a support structure 588 at an airport 580. Camera 582 scans the BTT area present in the medial corner of the eye 590 in a human face 591 and provides an output signal to a signal processor 584. The output signal is an electronic signal which is related to the characteristic of the thermal infrared energy of the BTT 590 in the human face 591 when people 592, 593 walking by look at or are viewed by the camera 582. The processor 584 processes the output signal so that an image of the BTT area 594 can be formed by the display 586 such as a computer monitor. Exemplarily, passenger 592 is looking at the camera 582 for sensing the thermal radiation from the BTT area 590, with said passenger 582 holding his/her eyeglasses since for the camera 582 to precisely view the BTT area 590 the eyeglasses have to be removed. If someone goes by the camera 582 without a thermal image of the BTT 590 being acquired an alarm will be activated. Likewise, if someone has a temperature disturbance an alert indicative of said temperature disturbance is activated.

FIG. 8: is a schematic view showing the thermal imaging system 560 of the present invention adapted to be used in any facility that has a gathering of people such as a movie theater, a convention, stadium, a concert, a trade show, schools, and the like. In FIG. 8 the infrared camera 596 of the BTT Thermos can 560 is located at the entrance of the aforementioned facilities and while people 598 show their identification or ticket to an agent 602, the BTT Thermos can 560 scans the side of the face of the people 598 to capture a thermal image 600 and temperature at the BTT tunnel which is displayed in a remote computer display 604. The camera 596 has adjustable height and a tracking system to track the heat, and therefore said camera 596 can position itself for sensing thermal radiation from people 598 at different distances and of different height. It is also understood that the BTT Thermos can 560 can be used in any facility including optical stores for adjusting positioning of sensors in eyeglasses.

FIG. 9: shows an illustrative method of the present invention represented in a flowchart. It is to be understood that the method may be accomplished using various signal processing and conditioning with various hardware, firmware, and software configurations, so the steps described herein are by way of illustration only, and not to limit the scope of the invention. The preferred embodiment includes detecting thermal radiation from a source that includes at least a portion of the BTT area (step 670). At step 672 an image from a radiation source that includes at least a portion of the BTT area is generated. At step 674 the image generated at step 672 is displayed. Step 676 identifies temperature levels from the image displayed at step 674. Step 678 determines whether the temperature identified at step 676 matches a temperature target. The temperature target can

be indicative of a temperature disturbance or indicative of the need to change the climate control level of the vehicle. Considering a temperature disturbance, if yes and there is a match between the detected temperature at the BTT and the stored target temperature, then an alarm is activated at step 680 informing the subject of the temperature disturbance (e.g., fever, hyperthermia, and hypothermia) and processing continues at step 670. If there is no match, step 678 proceeds to the next operation at step 670. To enhance the image generated by the BTT Thermos can, the method further includes aligning the BTT area with the field of view of the infrared detector and by removing eyeglasses during thermal detection of the BTT area.

WE CLAIMS

1. My Invention "**Covid-19 Kit**" is Support structures for positioning sensors on a physiologic tunnel for measuring physical, chemical and biological parameters of the body and to produce an action according to the measured value of the parameters. The support structure includes a sensor fitted on the support structures using a special geometry for acquiring continuous and undisturbed data on the physiology of the body. Signals are transmitted to a remote station by wireless transmission such as by electromagnetic waves, radio waves, infrared, sound and the like or by being reported locally by audio or visual transmission. The physical and chemical parameters include brain function, metabolic function, hydrodynamic function, hydration status, levels of chemical compounds in the blood, and the like. The support structure includes patches, clips, eyeglasses, head mounted gear and the like, containing passive or active sensors positioned at the end of the tunnel with sensing systems positioned on and accessing a physiologic tunnel. the invention provides a set of sensing systems and reporting means which may be used individually or in combination, which are designed to access a physiologic tunnel to measure biological, physical and chemical parameters. Anatomically and physiologically speaking, the tunnel discovered by the present invention is an anatomic path which conveys undisturbed physiologic signals to the exterior. The tunnel consists of a direct and undisturbed connection between the source of the function (signal) within the body and an external point at the end of the tunnel located on the skin. A physiologic tunnel conveys continuous and integral data on the physiology of the body. An undisturbed signal from within the body is delivered to an external point at the end of the tunnel. A sensing device for measurements at a brain temperature tunnel, said measuring device comprising a sensor assembly mounted on a support structure for capturing spectral information contained in radiation from the brain temperature tunnel, said sensor assembly including a light source for directing radiation at the brain temperature tunnel and generating a reflected radiation including a radiation signature, said sensor assembly also including a detector for detecting the reflected radiation and generating an electrical signal representative of said radiation signature, a processing circuit operatively coupled with a display, said processing circuit receiving said electrical signal and analyzing said electrical signal and displaying results of the analysis of the electrical signal on said display.

2. According to claim 1# The invention is to wherein the sensor assembly is slidable mounted on the support structure to accommodate individuals of different height and also support structure is a wall.

3. According to claim 1# The invention is to wherein said support structure is an electronic device and also the electronic device is a refrigerator and also electronic device is one of a television, a microwave oven, an oven, a cellular telephone and a camera.

4. According to claim 1,2# The invention is to further comprising another light source for aligning an eye of an individual and positioning the brain temperature tunnel with respect to the sensor assembly. The comprising an iris scanner for identifying an individual while detecting the reflected radiation.

5. According to claim 1,2# The invention is to wherein an identity of the individual and the detected reflected radiation are stored in a memory. The comprising a camera for recording a picture of the individual coupled with the identity of the individual and a temperature corresponding to the reflected radiation.
6. According to claim 1# The invention is to wherein the processing circuit identifies whether the temperature is outside of a range stored in the memory and also an alarm is activated when the temperature is outside of the range.
7. According to claim 1# The invention is to A method for detecting corona virus stricture and indicate.
8. According to claim 1,7# The invention is to the COVID-19 Kit display chemical and biological parameters of the body to detection status through sound.
9. According to claim 1,8# The invention is to after detecting sound IOT Kit active and send information real time storage database and also counter increase.

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COVID-19 Kit: **I**NTELLIGENT THERMAL SCANNING KIT FOR TESTING THE COVID-19 POSITIVITY AND DISPLAYINGB REAL TIME COUNT OF POSITIVE CASE USING IOT.

ABSTRACT

My Invention "Covid-19 Kit" is Support structures for positioning sensors on a physiologic tunnel for measuring physical, chemical and biological parameters of the body and to produce an action according to the measured value of the parameters. The support structure includes a sensor fitted on the support structures using a special geometry for acquiring continuous and undisturbed data on the physiology of the body. Signals are transmitted to a remote station by wireless transmission such as by electromagnetic waves, radio waves, infrared, sound and the like or by being reported locally by audio or visual transmission. The physical and chemical parameters include brain function, metabolic function, hydrodynamic function, hydration status, levels of chemical compounds in the blood, and the like. The support structure includes patches, clips, eyeglasses, head mounted gear and the like, containing passive or active sensors positioned at the end of the tunnel with sensing systems positioned on and accessing a physiologic tunnel. the invention provides a set of sensing systems and reporting means which may be used individually or in combination, which are designed to access a physiologic tunnel to measure biological, physical and chemical parameters. Anatomically and physiologically speaking, the tunnel discovered by the invention is an anatomic path which conveys undisturbed physiologic signals to the exterior. The tunnel consists of a direct and undisturbed connection between the source of the function (signal) within the body and an external point at the end of the tunnel located on the skin. A physiologic tunnel conveys continuous and integral data on the physiology of the body. An undisturbed signal from within the body is delivered to an external point at the end of the tunnel.