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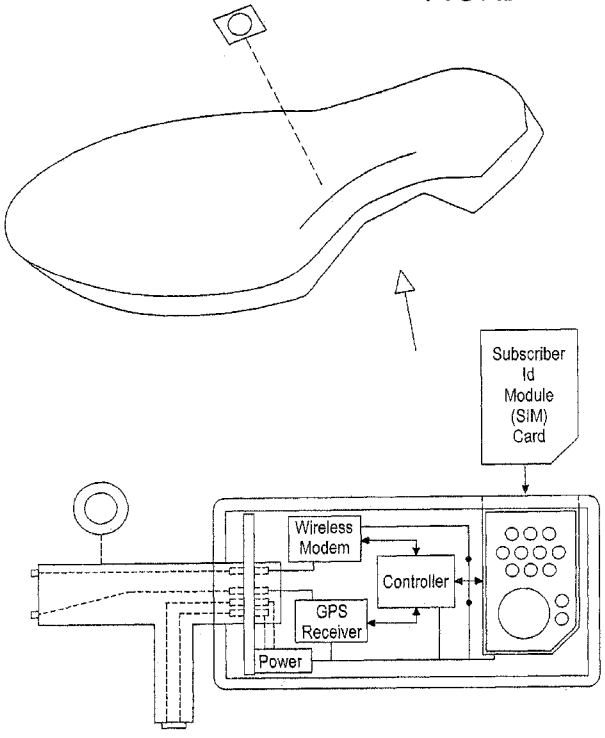
(54) Title: IMRPOVED FOOTWEAR WITH POSITION DETERMINATION UNIT

FIG. 2



(57) Abstract: The present disclosure provides a footwear article containing a position determination unit for locating an individual. A system for locating an individual is also provided, the system comprises a position determining unit integrated with a footwear article and at least one of a central station and an output device.

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IMPROVED FOOTWEAR WITH POSITION DETERMINATION UNIT

BACKGROUND OF THE DISCLOSURE

This application claims the benefit of U.S. provisional application No. 61/477,419, filed 20 April 2011. This application also claims the benefit of U.S. application 13/358,480, filed on 25 January 2012, which incorporated by reference in its entirety herein.

Field of the Disclosure

The present disclosure related generally to footwear articles and methods for tracking and/or locating individuals. The present disclosure relates specifically to footwear articles and inner soles with an integrated position determination unit and methods for using such footwear articles and inner soles to track and or provide location information for an individual.

Background

In today's world, security of both persons and property is a growing concern. It is no longer safe to trust to the better nature of mankind for personal safety. Crimes against persons continue to be a serious problem in many countries. For example, abduction of children is unfortunately a common occurrence in certain countries.

This alarming trend is amplified by the more active lifestyles of modern families. In many households, both parents work and children are often engaged in a myriad of activities. With such an active lifestyle, a lack of communication often develops between children and caregivers and the safety of family can become an issue. If would be advantageous for a caregiver to be able to track and/or determine the location of a child at any given point in time. In addition, those persons caring for individuals with physical or mental disabilities will also benefit from being able to track and/or determine the location of such individuals at any given point in time. In addition, may individuals engage in hobbies, lifestyles or professional/business activities where they would benefit from the devices and systems of the present disclosure.

Modern technology has addressed the issues above. For example, the widespread use of cell phones has provided a partial solution. However, for many individuals, especially children and those with physical or mental disabilities, cell phones are often not a practical solution. Therefore, the art is lacking devices and methods that will track and/or provide location information for an individual that is automated, accurate and simple to maintain and use.

Furthermore, shoes are, in many cases, created with an eye toward fashion and cost savings and not proper biomechanics. This is especially true for children's shoes where a child can rapidly outgrow a shoe, making providing a shoe with proper biomechanical support to expensive to manufacture.

The present disclosure provides a solution to these issues by disclosing an inner sole with at least a portion of a position determination unit located therein, a footwear article with at least a portion of a position determination unit located therein and a system for using the foregoing. Furthermore, the present disclosure provides the foregoing benefits while at the same time providing an inner sole and a footwear article that provides proper biomechanical support to the foot of an individual, such as through the provision of an inner sole. In addition to providing proper biomechanical support, the inner sole provides an element of sufficient depth and strength to contain and protect the elements of the position determination unit described herein.

SUMMARY OF THE DISCLOSURE

In a first aspect, the present disclosure provides an inner sole that contains at least one element of a position determination unit. In one embodiment of this aspect, the position determination unit comprises a GPS module and a communication unit. In another embodiment of this aspect, the position determination unit comprises a GPS module, a communication unit and an antenna. In another embodiment of this aspect, the position determination unit comprises a GPS module, a communication unit, an antenna and a power source. In the foregoing embodiments, the position determination unit may optionally comprise a storage device and other ancillary components. In another embodiment of this aspect, the inner sole is configured to receive at least a portion of the position determination unit in a removable manner. In yet another aspect, the components of the position determination unit are modular and can be exchanged between inner soles. In yet a further embodiment of this aspect, the inner sole is configured to conform to the foot of a user to provide proper biomechanical support to the foot of the user and acts as an orthotic device. In still a further embodiment of this aspect, the inner sole is configured to be used in conjunction with a footwear article that has been previously manufactured (such as being positioned on top of an existing component of the footwear article). Such a pre-manufactured footwear article may be one that contains at least a portion of a position determination unit as disclosed herein or a footwear article that does not contain any portion of a position determination unit as disclosed herein. In still a further embodiment, the inner sole extends less than the length of the user's foot and can be transferred between footwear articles.

In a second aspect, the present disclosure provides an inner sole that contains a position determination unit. In one embodiment of this aspect, the position determination unit comprises a GPS module, a communication unit, an antenna and a power source. The position determination unit may optionally comprise a storage device and other ancillary components. In another embodiment of this aspect, the inner sole is configured to receive the position determination unit in a removable manner. In yet another aspect, the components of the position determination unit are modular and can be exchanged between inner soles. In yet a further embodiment of this aspect, the inner sole is configured to conform to the foot of a user to provide proper biomechanical support to the foot of the user and acts as an orthotic device. In still a further embodiment of this aspect, the inner sole is configured to be used in conjunction with a footwear article that has been previously manufactured (such as being positioned on top of an existing component of the footwear article). Such a pre-manufactured footwear article may be one that contains at least a portion of a position determination unit as disclosed herein or a footwear article that does not contain any portion of a position determination unit as disclosed herein. In still a further embodiment, the inner sole extends less than the length of the user's foot and can be transferred between footwear articles.

In a third aspect, the inner sole of the first and second aspects is a partial inner sole. A partial inner sole is defined as an inner sole that extends less than the length of a user's foot. In such an embodiment, the inner sole may be configured to be used in conjunction with a footwear article that has been previously manufactured (such as being positioned on top of an existing component of the footwear article). Such a pre-manufactured footwear article may be one that contains at least a portion of a position determination unit as disclosed herein or a footwear article that does not contain any portion of a position determination unit as disclosed herein. In still a further embodiment, the inner sole extends less than the length of the user's foot and can be transferred between footwear articles.

In a fourth aspect, the present disclosure provides a footwear article containing a position determination unit for locating an individual. In an embodiment of this aspect, the position determination unit comprises a GPS module, a communication unit, an antenna and a power source. The position determination unit may also comprise a storage device and other ancillary components. In one embodiment of this aspect, at least a portion of the position determination unit is contained within an inner sole, the inner sole being a component of the footwear article. In still another embodiment of this aspect, the footwear article may contain accessory elements for use with the position determination unit.

In a fifth aspect, the present disclosure provides a footwear article, the footwear article containing an inner sole of the first and third aspects and optionally one or more elements of a position determination unit. In an embodiment of this aspect, the position determination unit comprises a GPS module, a communication unit and an antenna as well as a power source. The position determination unit may also comprise a storage device and other ancillary components. In another embodiment of this aspect, the inner sole may contain a GPS module, a power source and a communication unit and the footwear article may contain an antenna. In still another embodiment of this aspect, the footwear article may contain accessory elements for use with the position determination unit.

In a sixth aspect, the present disclosure provides a footwear article, the footwear article containing an inner sole of the second and third aspects. In an embodiment of this aspect, the position determination unit comprises a GPS module, a communication unit and an antenna as well as a power source. The position determination unit may also comprise a storage device and other ancillary components. In another embodiment of this aspect, the footwear article may contain accessory elements for use with the position determination unit.

In a seventh aspect, the present disclosure provides a system for tracking and/or providing location information regarding an individual. In one embodiment of this aspect, the system comprises an inner sole containing at least a portion of a position determining unit integrated within the inner sole and at least one of a central station and an output device. In another embodiment of this aspect, the inner sole is an inner sole of the first through third aspects. In one embodiment of this aspect, location information regarding an individual may be provided on request of a caregiver through the output device, may be provided continuously or may be provided at a predetermined interval.

In an eighth aspect, the present disclosure provides a system for tracking and/or providing location information regarding an individual. In one embodiment of this aspect, the system comprises a position determining unit integrated within a footwear article and at least one of a central station and an output device. In another embodiment of this aspect, the footwear article is a footwear article of the fourth through sixth aspects. In one embodiment of this aspect, location information regarding an individual may be provided on request of a caregiver through the output device, may be provided continuously or may be provided at a predetermined interval.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

FIG. 1 shows an illustration of an exemplary footwear article.

FIG. 2 shows one embodiment of a position determination unit of the present disclosure along with the location in an arch support of a footwear article.

FIG. 3 shows one embodiment of the position determination unit of the present disclosure integrated into a footwear article.

FIG. 4 shows one embodiment of the position determination unit of the present disclosure integrated into an arch support.

FIG. 5 shows a diagram illustrating one embodiment of the communication between various elements of the system disclosed herein.

DETAILED DESCRIPTION

The articles of the present disclosure may be embodied as illustrated in the accompanying drawings. It should be noted, however, that the drawings are illustrative only, and that changes may be made in the specific construction illustrated and described within the scope of the claims submitted herewith.

As used herein, a caregiver may be any person responsible for the safety of an individual. The caregiver may be, for example, a parent, teacher, sitter or relative that is responsible for the safety and welfare of an individual.

As used herein, an individual that may be subject to position determination through the articles and methods of the present disclosure may be any individual. The individual may be, for example, a child, a person with physical, cognitive or mental disabilities (such as, but not limited to, a person with autism spectrum disorder or similar conditions), an outdoor enthusiast (such as, but not limited to, a hiker), a member of the military, a prison inmate or other person subject to restricted movement, government workers (such as, but not limited to, a mail carrier) or an elderly person. In addition, the individual may be any person having an occupation or hobby where location tracking and/or determination would provide additional security.

The present disclosure provides a solution to the problem of locating individuals through the provision of various articles, such as inner soles and footwear articles, with an integrated position determination unit and a system for using such articles. In one embodiment, the individual is a child or a person with physical, cognitive or mental disabilities.

Position Determination Unit

The position determination unit functions to determine the location of an individual and transmit the determined location information to a third party, such as a caregiver. In one embodiment, the position determination unit comprises a global positioning system (GPS)

module and a communication unit. In another embodiment, the position determination unit comprises a global positioning system (GPS) module, a communication unit and a power source. In another embodiment, the position determination unit comprises a global positioning system (GPS) module, a communication unit, an antenna and a power source. In another embodiment, the position determination unit comprises a global positioning system (GPS) module, a communication unit, an antenna, a power source and a storage module (such as, but not limited to, flash memory, RAM or ROM). In any of the foregoing embodiment, the position determination unit and/or the associated inner sole and/or footwear article may contain other ancillary components as well. Furthermore, in each of the foregoing embodiment, the components of the position determination unit may be in communication with one another to form an operating unit.

In specific embodiments, the position determination unit comprises a global positioning system (GPS) module, a communication unit, an antenna and a power source.

In the foregoing embodiment, the components of the position determination unit may be placed in a single unit or in two or more units in communication with one another. The GPS module and the communication unit may be a single unit or multiple units. In such an embodiment, any GPS module that is known in the art may be used. In a particular embodiment, the GPS module is of a size to fit within the footwear as described herein. The GPS module may provide an acceptable radius of actual location, such as a 10 meter radius, a 50 meter radius or greater. By radius of location, it is meant that the actual location of the individual will be within 10 meters of the location provided by the GPS module if a GPS with a 10 meter location radius is used. The position determination unit may store the calculated position information determined in memory or a storage module; the storage module or memory may be a part of the GPS module or the communication unit or may be a separate device. Alternatively, the central station or the output device, described below, can store the location information it receives from the position determination unit.

The communication unit functions to receive signals (such as a request for location information) from a central station and/or an output device through a communication conduit and to transmit information, such as location information, to the central station or directly to an output device through a communication conduit. The location information allows a caregiver to determine the location of an individual in real time. Any communication unit known in the art may be used. In one embodiment, the communication unit is specifically adapted for mobile to mobile communications with the central station and/or the output device and adheres to applicable standards and protocols for such mobile to mobile

communication. A specific example of such a protocol is the gpsOne capability. The GPS module may also incorporate a standard or extended AT command set, an interface set, with inter-integrated circuit (IIC) and general purpose input/output (GPIO) definable elements and be compatible with various computer network protocols.

An exemplary GPS module that may be used in the described footwear article is manufactured by Telit (Raleigh North Carolina).

The communication conduit may be any communication medium known in the art. In one embodiment, the communication conduit is a satellite based communication system, a wireless communication system, a cellular communication system or a radio-wave based communication system. The communication unit may be capable of receiving and transmitting through all available communication conduits or through one or more of all available communication conduits.

The position determination unit may also comprise an antenna. In one embodiment, the antenna is a passive antenna; in an alternate embodiment the antenna is an active antenna. The antenna may be located in the inner sole or in the footwear article. In one embodiment, the antenna is positioned so that it is exposed to the sky in order to receive required signals efficiently. However, the antenna may be positioned at any location in the inner sole of the footwear article and be functional. In one embodiment, the antenna is located in the tongue portion of the footwear article. In another embodiment, the antenna is located in a sidewall of the footwear article. In still another embodiment, the antenna is located in an inner sole. In yet another embodiment, the antenna is located under the inner sole, such as under the insert pad in the forefoot. However, other placements may be possible. In a particular embodiment, the antenna comprises a flexible circuit board to allow the antenna to be integrated into the inner sole or footwear article without damage to the antenna during use. Such a flexible antenna can be passive or active. The antenna is connected, directly or indirectly, to the GPS module. In a particular embodiment, a passive antenna supplied by Taoglas Limited (Boston, MA) is used.

The position determination unit is also coupled to a power source. In one embodiment, the power source is a battery as is known in the art that is compatible with the components of the position determination unit. The battery may be conventional battery, a rechargeable battery or a self-charging battery. In one embodiment of a self-charging battery, kinetic energy resulting from acceleration and movement of the footwear article is harvested using piezoelectric elements that are positioned to receive forces along multiple different axes. This phenomenon is explained in a recent application filed by Nokia for cellular phone

batteries (which application is hereby incorporated by reference for such teachings). In another embodiment, the self charging battery may employ an induction coil and oscillating magnet that converts the kinetic energy to electricity and a storage area to store such energy. Such technology is currently employed in small batteries by companies such as Livecell. The power source is in communication with one or more components of the position determination unit.

In the embodiment where the battery is a rechargeable battery, the inner sole or footwear device may include a charging port for recharging the battery. When the recharging port is in communication with an external power source, the external power source recharges the battery.

In a particular embodiment, the GPS module, communication unit and power source are part of a single device, such as a circuit board, and the individual units are in communication with one another, either directly or indirectly. The unit may also be in communication with the antenna. The circuit board may be enclosed in a case or enclosure for protection.

Modes of Operation

The position determination unit can function is several modes. In a first mode (which may be referred to as an on-demand mode), the position determination unit does not continuously calculate location information. In the on-demand mode, the position determination unit is activated through receipt of a signal from the central station and/or the output device. Such signal may be received by the communication unit through a communication conduit. The signal directs the GPS module to calculate location information. In operation, the GPS module provides location information by calculating position information supplied by a GPS system. The GPS module receives a signal, such as via the antenna, from one or more GPS satellites and determines location information as is known in the art; in one embodiment, the GPS module uses an algorithm embedded in the GPS module to determine location information. The location information is then transmitted to the central station and/or an individual output device via the communication unit through a communication conduit. When the location information is transmitted to a central station, the central station disseminates the location information to one or more output devices. In one embodiment, the central station uses the internet to transmit location information to an output device; in an alternate embodiment, the central station uses a communication conduit, such as a cellular network, to transmit location information to an output device. In embodiments where the location information is provided directly to an output device, a communication

conduit may be used to transmit the information from the communication unit to the output device. In either embodiment, the location information is provided to a caregiver through the output device or the central station. Location information may be provided to more than one output device or a single output device.

In a second mode (which may be referred to as an autonomous mode), the position determination unit is active and calculates location information continuously or at selected intervals (for example, 1 minute, 5 minute or 30 minute intervals or longer). The location information may then be transmitted by the communication unit as described above. The location information may be transmitted as it is generated or may be sent at selected intervals or as queried by a caregiver (as in mode 1 above). In a variation of this mode, the position determination unit may also compare the last generated location information to previously determined location information. If the location information does not change over a period of time, for example, 30 minutes, 1 hour, 4 hours or greater length of time, the position determination unit automatically transmits position information to the central station and/or output device.

In a third mode (which may be referred to as a wearer-directed mode), the position determination unit calculates location information on a signal from the wearer of the footwear article. In this mode, the wearer of the footwear article directs the position determination unit to calculate location information continuously or at a selected interval and to transmit such location information to the central station and/or an output device as soon as it is generated along with an alert message. The wearer of the footwear article may direct the position determination unit to enter such a mode by triggering the unit, such as by pushing a button on the footwear article. In such an embodiment, the button may be located at any convenient location, such as on the tongue portion. This mode is useful when the wearer of the footwear article may feel threatened.

In a fourth mode (which may be referred to as an out of range mode), the position determination unit calculates location information continuously or at selected intervals as in mode two. In this mode, the position determination unit has a base location coordinate (for example, the location of a house) input into the system and the position determination unit determines the location information and compares it to the base location coordinate. The position determination unit is programmed to send location information and an alert message when the location information determined is outside a given radius of the base location coordinate (for example, over ½ mile, 1 mile or greater from the base location coordinate). In a variation of the fourth mode, the base location coordinate is determined by the position of

the output device, such as, for example, a cell phone or a smart phone. In this embodiment, the output device communicates its position to the communication unit directly or to the central station and the central station communicates the position of the output device to the position determination unit; the position determination unit uses the position of the output device as the base location coordinate. The system may be programmed to update the position of the output device continuously or at a predetermined time interval. The position determination unit is updated as to the location of the output device and updates the base location coordinate at a selected interval (for example, 1 minute, 5 minute or 30 minute intervals or longer) and the position determination unit is programmed to send location information and an alert message when the location information determined is outside a given radius of the base location coordinate (for example, over 100 meters, 250 meters, ½ mile, 1 mile or greater from the base location coordinate). This variation of the fourth mode is useful in crowded environments where a wearer of the footwear article and a caregiver may become separated, such as a theme park.

The position determination unit may be programmed to operate in the various modes (either remotely or at the site of the device) and can be switched from one mode to the other as desired by the caregiver or as demanded by a particular situation. For example, if an individual is in a crowded area, such as a theme park, the position determination unit may transmit location information continuously or at a short interval (such as 5 minutes). However, if an individual is in familiar surroundings, such as a neighborhood, the position determination unit may transmit location information on demand from the caregiver or at an extended interval (such as 1 hour).

In one embodiment, the position determination unit communicates via a communication conduit with a central station and the central station communicates this information through a communication conduit to the output device. In another embodiment, the position determination unit communicates via a communication conduit directly with the output device. Algorithms or software programs (collectively software) may be used to present the location information to a user. The software may be resident on the output device and/or on the central station. The software may use the location information to provide a number of features to a user and to activate or deactivate the features described herein.

In one embodiment, a software program is used to integrate the location information to a graphical output providing the location of an individual, such as, but not limited to, a map. In another embodiment, a software program is used to integrate the location information to a text output providing the location of an individual, such as, but not limited

to, street location or other location coordinates known in the art. The software program may be resident on the central station or the output device.

In one embodiment, the system provides an alert function when an individual is believed to be missing. The alert function may be initiated by a caregiver through software on the central station and/or the output device. In a particular embodiment, a website may be used to facilitate initiation of the alert function. When an individual is missing and/or presumed to be lost or abducted, the most critical time period is the three-six hour window immediately following the event. During this time there is significant confusion and concern on the part of the caregiver which may lead to indecision and delay in initiating a plan of action to locate the individual. Furthermore, locating an individual by calling selected individuals may be time consuming and inefficient. The alert function provides a solution to this problem.

The software of the alert function contains a predetermined list of contacts. The contacts may be friends, family members and/or law enforcement agencies or any other persons or agencies. The contact list may be updated as desired and in one embodiment may be updated through an output device, such as a smart phone. The alert function provides a caregiver the ability to quickly contact the list of contacts with an alert message notifying the list of contacts that the individual is missing is presumed to be lost or abducted. The alert message may be in the form of an e-mail, a text message or both. The alert function allows for the alert message to be pre-composed, allowing a caregiver to quickly initiate action, or to be composed by the caregiver in real time. In one aspect, when the alert function is initiated, the last known location of the individual is added to the alert message prior to the alert message being sent. Furthermore, the alert function allows the caregiver to add additional information to a pre-composed alert message if desired, such as what the individual was last wearing, other people the individual was with or other important information. The alert message may contain a recent photograph of the individual. Through this mechanism the alert function provides a rapid dissemination of information regarding an individual to the groups of people most likely to be able to assist in locating the individual.

An additional function is a call home feature. This feature enables a caregiver to communicate with an individual wearing the footwear article and instruct them to call the caregiver or return to a pre-determined location. The call home feature may be activated by the caregiver through the output device and/or the central station. In one embodiment the call home feature uses a visual indicator (such as a flashing light or LED), an audible indicator (such as an alarm) or a tactile indicator (such as vibrating buzzer) to indicate the individual

should contact the caregiver or return to the pre-determined location. The call home feature may be activated or deactivated as desired.

A further function that may be provided is a fitness function. The footwear article may incorporate a pedometer. The pedometer may be in communication with the position determination unit, particularly the GPS unit, and track the number of steps a child has taken. This information may be used to gauge the activity of the child on a daily basis and allow a caregiver o assess the physical activity of an individual.

The output device is used for monitoring by a caregiver. The output device may be a cell phone, including a smart phone, or a computer. The output device may also be a dedicated unit designed specifically to receive signals from the transmission unit.

Placement of Position Determination Unit

The position determination unit may be provided in a number of embodiments. In one embodiment, a portion of the position determination unit is located within an inner sole portion. In another embodiment, the entire position determination unit is located within an inner sole portion. In a further embodiment, a portion of the position determination unit is located within an inner sole portion and a portion of the position determination unit is located within a footwear article associated with the inner sole portion.

In one embodiment, at least a portion of the position determination unit is placed within an inner sole portion. In such an embodiment, the inner sole portion is placed within a footwear article for use; the footwear article may also contain a portion of the position determination unit. In a particular embodiment, the inner sole has a cavity constructed therein to receive components of the position determination unit, such as at least one of the GPS module, power source, storage device and the communication unit. In a specific embodiment, the cavity is formed, at least partially, on the medial arch side of the inner sole as this portion of the inner sole is thicker than other portions and provides sufficient room to house the components and structural support to protect the components. In one embodiment, the cavity is formed on the underside of the inner sole (opposite the side of the arch support that contacts a wearer's foot); in an alternate embodiment, the cavity is formed on the top side of the inner sole. In one embodiment, the inner sole is configured to be used in conjunction with a footwear article that has been previously manufactured (such as being positioned on top of an existing component of the footwear article). Such a pre-manufactured footwear article may be one that contains at least a portion of a position determination unit as disclosed herein or a footwear article that does not contain any portion of a position determination unit as disclosed

herein. In still a further embodiment, the inner sole extends less than the length of the user's foot and can be transferred between footwear articles.

In one application of this embodiment, the inner sole contains a GPS module and a communication unit and the footwear article contains an antenna and a power source. In another application of this embodiment, the inner sole contains a GPS module, a communication unit and an antenna and the footwear article contains a power source. In another application of this of this aspect, the inner sole contains a GPS module, a communication unit and a power source and the footwear article contains the antenna. In another application of this of this aspect, the inner sole contains a GPS module, a communication unit, an antenna and a power source. In the foregoing embodiments, inner sole and/or the footwear article may optionally comprise a storage device and other ancillary components as described herein.

In another embodiment, the position determination unit is placed within an inner sole portion. In such an embodiment, the inner sole portion is placed within a footwear article for use. In a particular embodiment, the inner sole has a cavity constructed therein to receive components of the position determination unit, such as the GPS module, power source, storage device and the communication unit. In a specific embodiment, the cavity is formed, at least partially, on the medial arch side of the inner sole as this portion of the inner sole is thicker than other portions and provides sufficient room to house the components and structural support to protect the components. In one embodiment, the cavity is formed on the underside of the inner sole (opposite the side of the arch support that contacts a wearer's foot); in an alternate embodiment, the cavity is formed on the top side of the inner sole. In one embodiment, the inner sole is configured to be used in conjunction with a footwear article that has been previously manufactured (such as being positioned on top of an existing component of the footwear article). Such a pre-manufactured footwear article may be one that contains at least a portion of a position determination unit as disclosed herein or a footwear article that does not contain any portion of a position determination unit as disclosed herein. In still a further embodiment, the inner sole extends less than the length of the user's foot and can be transferred between footwear articles.

In still another embodiment, the inner sole is a partial inner sole that extends less than the length of a user's foot. In such an embodiment, the partial inner sole is configured to be used in conjunction with a footwear article that has been previously manufactured (such as being positioned on top of an existing component of the footwear article). Such a pre-manufactured footwear article may be one that contains at least a portion of a position

determination unit as disclosed herein or a footwear article that does not contain any portion of a position determination unit as disclosed herein. In still a further embodiment, the inner sole extends less than the length of the user's foot and can be transferred between footwear articles. The partial inner sole may contain all of the components of the position determination unit or one or more components of the position determination unit as described above.

In the foregoing embodiments, the inner sole is configured to receive at least a portion of the position determination unit in a removable manner. In the foregoing embodiments, the components of the position determination unit are modular and can be exchanged between inner soles. In the foregoing embodiments, the inner sole is configured to conform to the foot of a user to provide proper biomechanical support to the foot of the user and acts as an orthotic device. In one embodiment, the inner sole portion is a modified arch support. In this embodiment, the arch support is manufactured from materials known in the art, such as, but not limited to, ethylene vinyl acetate (EVA), cork or similar materials. The material from which the arch support is manufactured may be selected to provide a desired hardness. In one embodiment, a hardness of 65 or greater as measured by a durometer. So constructed, the arch support provides protection for the portions of the position determination unit contained therein. The modified arch support may be manufactured specifically to fit a particular wearer of the footwear article.

The portions of the position determination unit located in the inner sole may be contained within a protective enclosure, such as a waterproof bag to protect the components from damage to exposure to moisture.

The antenna and its purpose are described above. In one embodiment, the antenna is placed in a position so that it has an unobstructed view of the sky in order to more efficiently receive signals. In this embodiment, the antenna may be placed in the tongue of the footwear article. In another embodiment, the antenna is located in the sidewall of the footwear article. In still another embodiment, the antenna is located in the inner sole. However, other positions may be possible. Regardless of placement, the inner sole or footwear article may be constructed so that it forms a pouch for receiving the antenna. The pouch may be closed on all 4 sides or may be open on 1 or more sides. In a particular embodiment, the tongue comprises a reversible engagement element, such as Velcro, snaps, zippers and the like, to allow access the pouch portion in the event the antenna needs to be removed. The antenna is in communication with at least one other portion of the position determination unit such as the GPS module, such as, for example, flexible wires. The footwear article or inner sole may

further comprise a cutout portion for the antenna receiver to allow efficient reception of signals.

In embodiments where the antenna is placed in a position that has unobstructed access to the outside, several advantages may be recognized. First, because of the optimal placement of the antenna, less expensive antennas can be used with superior results as compared to the prior art. Second, the bulk of the antenna is removed from the inner sole portion of the footwear article, making placement of the remaining components of the position determination element more efficient. Third, the other components of the position determination unit can be placed in a more secure environment, the inner sole, for optimal protection of these components. As a result, each component of the unit is placed in an optimal position.

Therefore, the present disclosure provides various inner sole articles for use as described in the present disclosure.

The present disclosure also describes footwear articles containing a position determination unit. As described above, in certain embodiment, the footwear article may contain one or more elements of the position determination unit with the remaining components present in the inner sole. The inner sole is contained within the footwear article. In one embodiment, the footwear article contains the antenna and the inner sole contains the GPS module, the communication unit and the power source. In another embodiment, the footwear article contains the antenna and the power source and the inner sole contains the GPS module and the communication unit. When components are present in the inner sole, any embodiment of the inner sole described above may be used. The footwear article may further contain accessory elements for use with the position determination unit.

In other embodiment, the footwear article contains no components of the position determination unit as such components are contained in the inner sole as described herein. The footwear article may contain accessory elements for use with the position determination unit.

In another embodiment, the footwear article contains other components for use with the position determination unit. The footwear article may contain a trigger element in communication with a component of the position determination unit, such as the GPS module. The trigger element may be, for example, a button or other similar device. The function of the button is described above with reference to the modes of operation (specifically, mode 3).

In addition, the footwear article may comprise a recharging port. The recharging port functions as described above. The recharging port may be located at any convenient location on the footwear article. In one embodiment the recharging port is located in the heel or the sidewall of the footwear article. In another embodiment, the recharging port is located in the inner sole. Regardless of location, the recharging port is in communication with the power source so that the battery can be recharged.

The footwear article may also comprise a signaling element such as a low power indicator. The signaling element may be a visual indicator (such as a flashing light or LED), an audible indicator (such as an alarm) or a tactile indicator (such as vibrating buzzer). A combination of the foregoing may also be used. The signaling element would remain off when the position determination unit was functioning properly. The signaling element would turn on when the position determination unit was not functioning properly, or when the power source was low.

The footwear article may also contain a notification element (for use with the call home feature described above). The notification element may be a visual indicator (such as a flashing light or LED), an audible indicator (such as an alarm) or a tactile indicator (such as vibrating buzzer). A combination of the foregoing may also be used. The notification element indicates the individual should contact the caregiver or return to the pre-determined location. When the signaling device and the notification element are the same indicator, the indicators may be differentiated based on use. For example, if the signaling element and the notification element are each a visual indicator, the signaling element may utilize continuous light while the notification element may utilize a flashing light; if the signaling element and the notification element are each an audible indicator, the signaling element may utilize continuous tone while the notification element may utilize an intermittent tone. The

The signaling element and the notification element when present are each in communication with the position determination unit.

The present disclosure contemplates that only one footwear article of a pair will contain the components of the position determination unit. The other footwear article of the pair can be designed to match so as to match the first while lacking the components.

As used herein, a footwear article may be any type of footwear known. For example, the footwear article may be a dress shoe, a tennis shoe, an athletic shoe, a boot, a sandal or a baby shoe. Furthermore, the footwear article can comprise a specially designed inner sole (i.e., a modified arch support) compatible with a wearer to provide orthopedic support. It is also noted that the components of the position determination unit present in the inner sole of

the footwear article can be exchanged between different types of footwear so as to avoid purchasing duplicate equipment. In addition, when the wearer outgrows a pair of shoes, the components of the position determination unit present in the inner sole of the footwear article can be switched to the new footwear article. In one embodiment, the footwear article contains the antenna and the other ancillary components, such as the recharging port and the signaling device, and these components may be connected to the components of the position determination unit present in the inner sole of the footwear article. In another embodiment, the footwear article contains the ancillary components, such as the flexible wires connecting the antenna to the GPS module, the recharging port and the signaling device, and these components may be connected to the components of the position determination unit present in the inner sole of the footwear article while the components of the position determination unit present in the inner sole of the footwear article and the antenna are switched to the new footwear article.

The present disclosure also provides a system for providing location information regarding an individual. In one embodiment of this aspect, the system comprises an inner sole containing at least a portion of a position determining unit integrated within the inner sole and at least one of a central station and an output device. Any inner sole described herein may be used with such system. The system may operate in various modes as described herein.

The present disclosure also provides a system for providing location information regarding an individual. In one embodiment of this aspect, the system comprises a position determining unit integrated within a footwear article and at least one of a central station and an output device. Any footwear article described herein may be used with such system. The system may operate in various modes as described herein.

The footwear article described may be used in communication with a subscription service to allow a caregiver to determine the location of a wearer of the footwear article. The subscription service may include a website. Any of the features or methods described herein may be accessed through the website. In addition, the website may be accessed by an output device as is known in the art. Alternatively, when the output device is a smart phone or cell phone, the features described herein may be resident on the output device and the location information provided directly to the output device. As described above, the position determination unit transmits location information to a central station and/or an output device. A caregiver may access the location information by accessing the central server through a communication conduit, such as the internet or directly though the output device. In one

embodiment, the caregiver enters identification information, such as a password and/or a unique identifier associated with a particular position determination unit. The central station then processes the request and provides the location information to the caregiver through an output device. In one embodiment, just a password is entered as identification information and the password is automatically associated with one or more position determination units. Additionally, the central station may be configured to provide location information to the caregiver continuously or at selected intervals as described herein.

CLAIMS

What is claimed:

1. A footwear article, the footwear article comprising an inner sole, the footwear article containing at least one element of a position determination unit to provide location information for an individual wearing the footwear article.
2. The footwear article of claim 1, wherein the position determination unit comprises a global positioning system (GPS) module, a communication unit, a power source and an antenna and optionally a storage device.
3. The footwear article of claim 1, wherein the inner sole configured to receive at least one element of the position determination unit, said at least one element of the position determination element selected from the group consisting of a GPS module, a communication unit, a power source, an antenna and a storage device.
4. The footwear article of claim 3, wherein the inner sole contains a GPS module and a communication unit and the footwear article contains a power source and an antenna.
5. The footwear article of claim 3, wherein the inner sole contains a GPS module, a communication unit and a power source and the footwear article contains an antenna.
6. The footwear article of claim 3, wherein the inner sole contains a GPS module, a communication unit, a power source and an antenna.
7. The footwear article of claim 1, wherein the footwear article contains a signaling element, a notification element, a trigger element, a recharging port or a combination of the foregoing.
8. The footwear article of claim 2, wherein at least one of the elements of the position determination unit are removable.
9. The footwear article of claim 3, wherein the inner sole provides proper biomechanical support to the foot of a user.
10. The footwear article of claim 3, wherein the inner sole is a partial inner sole.
11. The footwear article of claim 3, wherein the inner sole is configured to be used in a footwear article that has been previously manufactured.
12. An inner sole for use with a footwear article, the inner sole containing at least one element of a position determination unit to provide location information for an individual wearing the footwear article.
13. The inner sole of claim 12, wherein the position determination unit comprises a global positioning system (GPS) module, a communication unit, a power source and an antenna and optionally a storage device.

14. The inner sole of claim 12, wherein the inner sole contains a GPS module and a communication unit and the footwear article contains a power source and an antenna.

15. The inner sole of claim 12, wherein the inner sole contains a GPS module, a communication unit and a power source and the footwear article contains an antenna.

16. The inner sole of claim 12, wherein the inner sole contains a GPS module, a communication unit, a power source and an antenna.

17. The inner sole of claim 12, wherein the footwear article contains a signaling element, a notification element, a trigger element, a recharging port or a combination of the foregoing.

18. The inner sole of claim 12, wherein at least one of the elements of the position determination unit are removable.

19. The inner sole of claim 12, wherein the inner sole provides proper biomechanical support to the foot of a user.

20. The inner sole of claim 12, wherein the inner sole is a partial inner sole.

21. The inner sole of claim 12, wherein the inner sole is configured to be used in a footwear article that has been previously manufactured.

FIG. 1

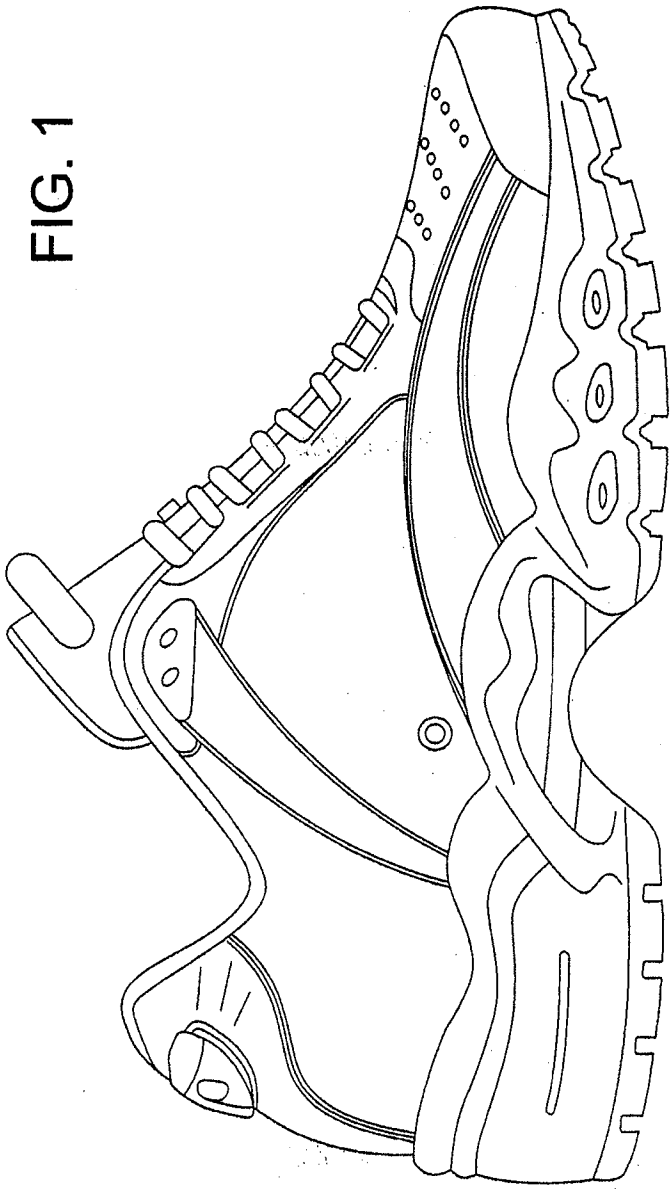


FIG. 2

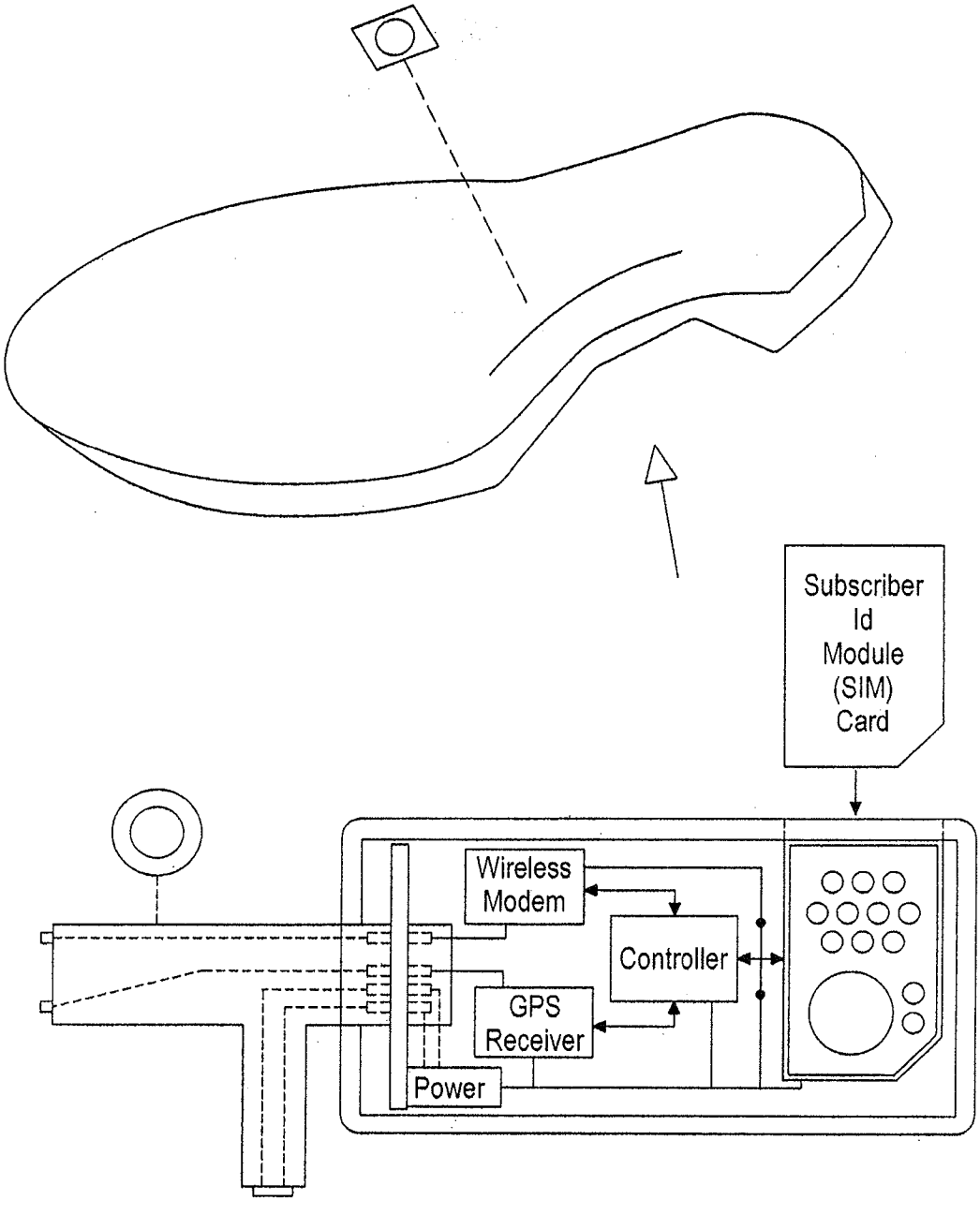

Subscriber Id Module (SIM) Card
Wireless Modem
Controller
GPS Receiver
Power

FIG. 3

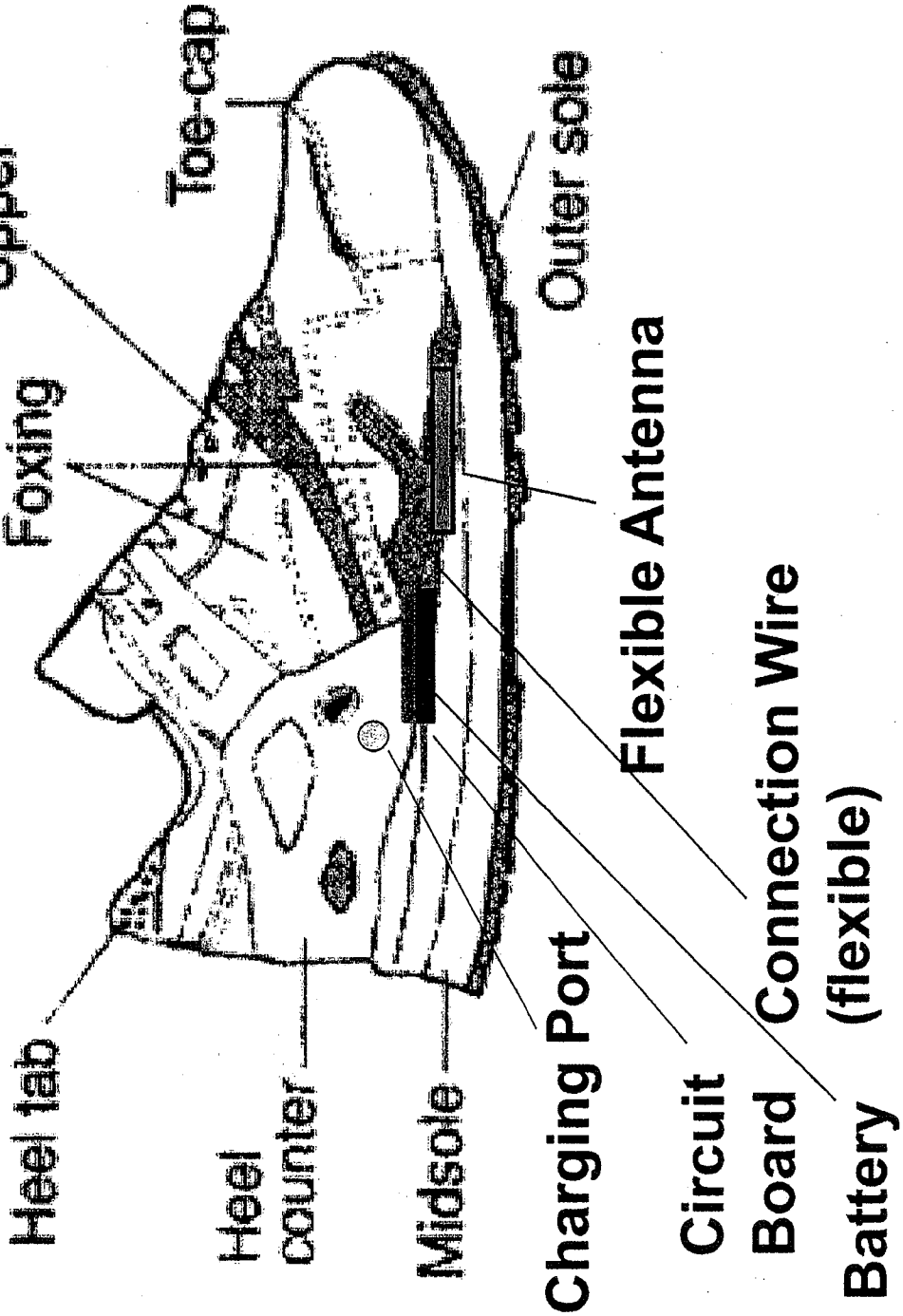

Upper
Toe-cap
Foxing
Outer sole
Flexible Antenna
Connection Wire
(flexible)
Heel tab
Heel counter
Midsole
Charging Port
Circuit Board
Battery

FIG. 4

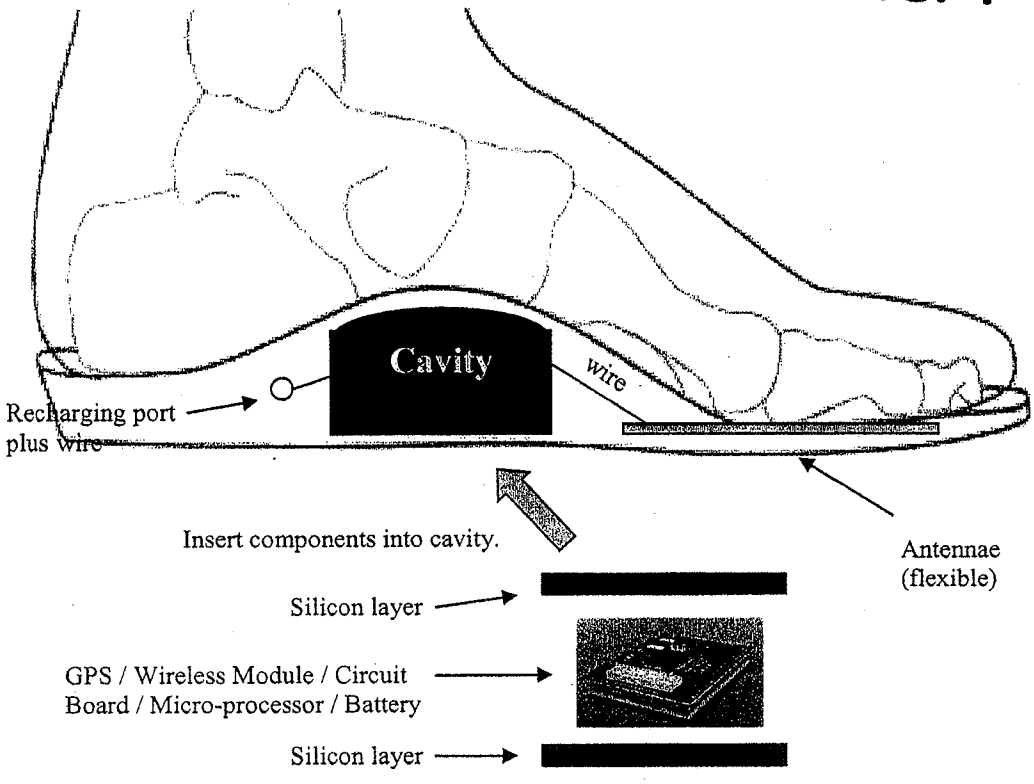
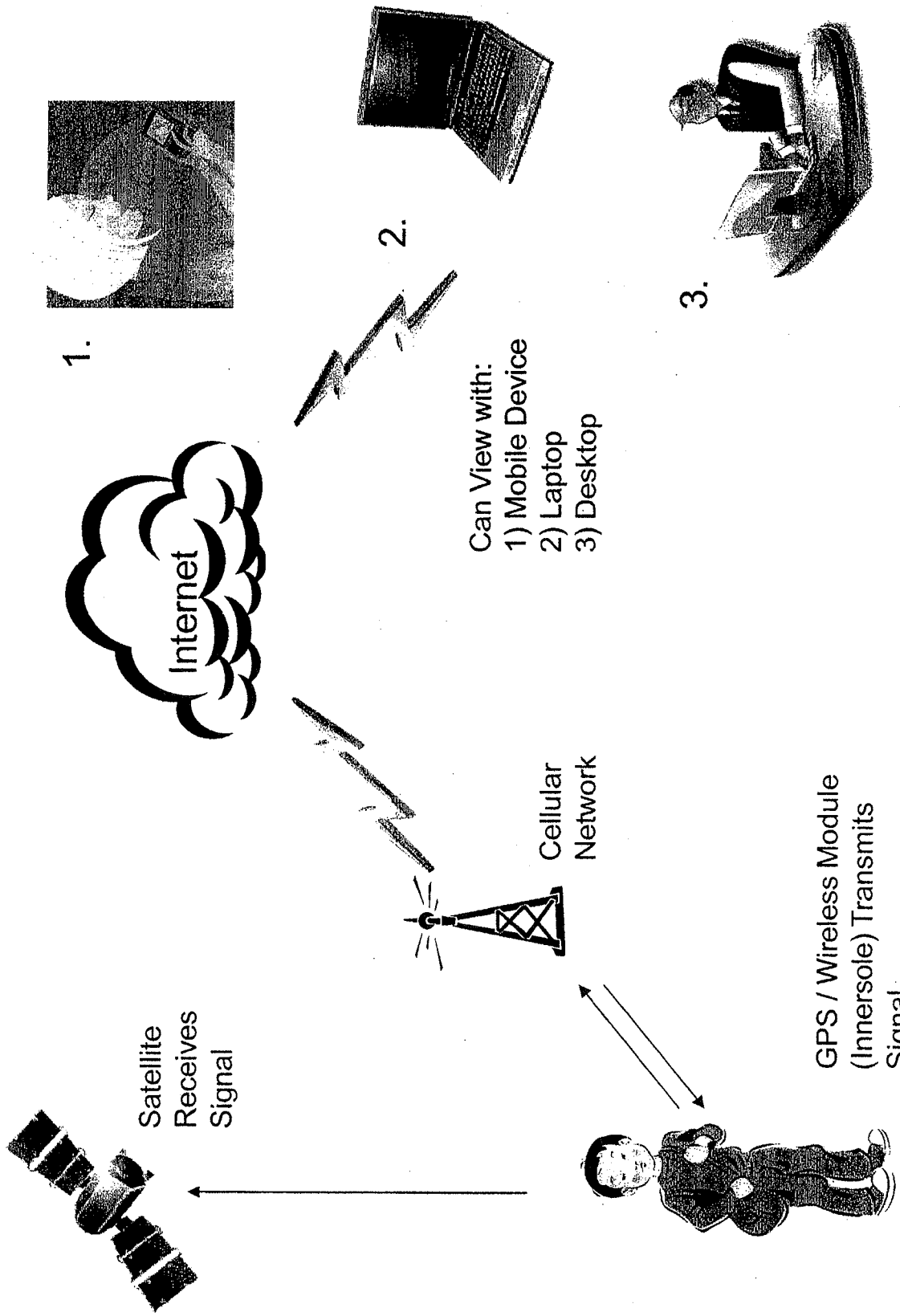

Cavity
wire
Recharging port
plus wire
Insert components into cavity.
Antennae
(flexible)
Silicon layer
GPS / Wireless Module / Circuit
Board / Micro-processor / Battery
Silicon layer

FIG. 5


1.
2.
3.
Internet
Can View with:
1) Mobile Device
2) Laptop
3) Desktop
Cellular
Network
Satellite
Receives
Signal
GPS / Wireless Module
(Innersole) Transmits
Signal