PATROLL Claim Chart Submission

U.S. Patent 9,392,970

U.S. Patent 9,392,970 ("*Wristdocs*" or the "patent-at-issue") was filed on August 8, 2012, and claims an earliest priority date on August 10, 2011. Claim 1 of the patent-at-issue is directed to a biotelemetry system for disposition on the wrist. The device may be portable, untethered and in some instances, disposable. The features of the wrist biotelemetry system make it effective in stable, chronic, or emergency medical settings.

The primary reference, U.S. Patent 8,121,673 ("*Koninklijke Philips*"), was filed on April 18, 2009, and claims an earliest priority date on May 12, 2006. The patent is directed to a health monitoring system for a person. The system includes a wearable appliance in communication with one or more wireless nodes, the appliance including a heart disease recognizer to determine the person's cardiovascular health.

The secondary reference, U.S. Patent 7,892,178 ("*Impact Sports*"), was filed on July 17, 2010, and claims an earliest priority date on September 28, 2009. The patent is directed to a system and method of a monitoring device monitoring the vital signs of a user for an interactive game. The monitoring device is an article having an optical sensor and a circuitry assembly, and a pair of straps. The monitoring device provides for the display of the following information about the user: pulse rate, blood oxygenation levels, calories expended by the user of a pre-set time period; target zones of activity, time, distance traveled, and/or dynamic blood pressure. The article is a band worn on a user's wrist, arm, or ankle.

A sample claim chart comparing claim 1 of *Wristdocs* to *Koninklijke Philips* and *Impact Sports* is provided below.

US-9392970-B2 ("*Wristdocs*")	**A. US-8121673-B2** ("*Koninklijke Philips*") **B. US-7892178-B1** ("*Impact Sports*")
[1.pre] **A device comprising**:	**A. US-8121673-B2** "As will be discussed in more detail below, **one appliance is a patient monitoring device that can be worn by the patient**…" *Koninklijke Philips* at col. 5:61-63 "1. **A heart monitoring system for a person, comprising**…" *Koninklijke Philips* at claim 1 **B. US-7892178-B1** "The present invention is related to **real-time vital sign monitoring devices**." *Impact Sports* at col. 1:19-20
[1.a] (a) **two or more disposable pulse oximeter sensor modules**, each comprising;	**A. US-8121673-B2** "A **small sensor** can be mounted on the subject's finger in order to **detect blood-oxygen levels and pulse rate**." *Koninklijke Philips* at col. 6:53-57 "**The sensor should be water proof and disposable**." *Koninklijke Philips* at col. 36:7 "In an optical heartbeat **detector** embodiment, an optical transducer is positioned on a finger, wrist, or ear lobe. The ear, wrist or finger **pulse oximeter** waveform is then analyzed…" *Koninklijke Philips* at col. 38:48-50 **B. US-7892178-B1** "One such device is a **pulse oximetry device**." *Impact Sports* at col. 1:29 "**Pulse oximeter devices also contain sensors**…" *Impact Sports* at col. 1:35 "The monitoring device preferably comprises an article, a processor, **an optical sensor**, a motion sensor and a power source." *Impact Sports* at col. 2:56-58 "As shown in FIGS. 3, 3A and 3B, an alternative embodiment of the monitoring device 20 comprises a light shield 21 with the article 25 disposed on an exterior surface 21a of the light shield 21, and **the optical sensor 30 disposed on an interior**

	surface 21b of the light shield 21." *Impact Sports* at col. 7:33-37
[1.a.i] (i) **a light emitting source**, wherein said light emitting source is **capable of sequentially emitting a red light with a wavelength of about 660 nm** and **an infrared light with a wavelength of about 940 nm**;	**A. US-8121673-B2** "In one optical embodiment, the transducer can be an optical transducer. The optical transducer can be a light source and a photo-detector embedded in the wrist band portions 1374. The **light source can be light-emitting diodes** that generate **red (λ~630 nm)** and **infrared (λ~900 nm)** radiation, for example." *Koninklijke Philips* at col. 33:22-26 **B. US-7892178-B1** "Pulse oximeter devices typically contain two **light emitting diodes**: one in the **red band of light (660 nanometers)** and one in the **infrared band of light (940 nanometers)**." *Impact Sports* at col. 1:31-33" "In a preferred embodiment, the optical sensor 30 is a plurality of light emitting diodes ("LED") 135 based on green light wherein the LEDs 135 generate green light (wavelength of 500-570 nm), and a photodetector 130 detects the green light. Yet in an alternative embodiment, the optical sensor 30 is a photodetector 130 and **a single LED 135 transmitting light at a wavelength of approximately 900 nanometers as a pulsed infrared LED**. Yet further, the optical sensor is a combination of a green light LED and a pulsed infrared LED to offset noise affects of ambient light and sunlight." *Impact Sports* at col. 6:3-12
[1.a.ii] (ii) **a photodetector spaced apart from said light emitting source** and **capable of detecting reflected light from said light emitting source**;	**A. US-8121673-B2** "The light source and the **photo-detector** are **slidably adjustable and can be moved along the wrist band to optimize beam transmission and pick up**… The photo-detector **detects transmission at the predetermined wavelengths, for example red and infrared wavelengths**, and provides the detected transmission to a pulse-oximetry circuit embedded within the wrist-watch." *Koninklijke Philips* at col. 33:27-36 **B. US-7892178-B1** "As the heart pumps blood through the arteries in the user's arm, ankle or wrist, the **photodetector 130**, which is typically a photodiode, **detects reflectance/transmission at the wavelengths (green, red or infrared)**, and in response generates a radiation-induced signal." *Impact Sports* at col. 6:12-17

	"**Using two LEDs on each side of a photodetector creates a more mechanically stable optical sensor 30**." *Impact Sports* at col. 7:56-58
[1.a.iii] (iii) **a substrate adapted to support said light emitting source and said photodetector**, said substrate comprising **a molded plastic template**;	**A. US-8121673-B2** "**The wrist-band can be an expansion band or a wristwatch strap of plastic**, leather or woven material." *Koninklijke Philips* at col. 7:29-30 "A conductive carbon ink acts as the tag's antenna and is applied to a paper **substrate** through conventional printing means." *Koninklijke Philips* at col. 18:49-51 "In one embodiment, **the sensors 40 for monitoring vital signs are enclosed in a wrist-watch sized case supported on a wrist band. The sensors can be attached to the back of the case**." *Koninklijke Philips* at col. 37:6-8 **B. US-7892178-B1** "The strap 96 is preferably composed of neoprene, leather, synthetic leather, LYCRA, another similar material, or a combination thereof. The article 25 is preferably composed of a **semi-rigid or rigid plastic with a rubber-like or semi-flex plastic bottom layer for contact with the user's body**. The bottom layer of the **housing 95** may have a curve surface contact with a user's body… **The optical sensor 30 is preferably positioned on the interior surface 98 of the housing 95 and electrically connected to the circuitry assembly 35**." *Impact Sports* at col. 5:22-49
[1.a.iv] (iv) a **source-detector connection connecting said light emitting source to said photodetector**; and	**A. US-8121673-B2** "FIG. 9 shows an alternate finger cover embodiment where a **finger-mounted module housing the photo-detector and light source**." *Koninklijke Philips* at col. 45:32-34 **B. US-7892178-B1** "**The circuitry assembly and display member 40 are preferably separate components electrically connected within the housing 95**." *Impact Sports* at col. 6:37-39
[1.a.v] (v) **a sensor cover having an integral sensor window**, wherein said sensor cover is **positioned to retain said light emitting source, said photodetector, and said source-detector connection between said sensor cover and said substrate**; and	**A. US-8121673-B2** "The **device emits lights from a window** in the infrared spectrum and **receives reflected light in a second window**. When the heart beats, blood flow increases temporarily and more red blood cells flow through the windows, which **increases the light reflected back to the detector**. **The light can be reflected, refracted, scattered, and absorbed by one**

wherein said sensor window is **positioned to allow light from said light emitting source to pass through and to be detected by said photodetector**;	**or more detectors**. Suitable noise reduction is done, and the resulting optical waveform is captured by the CPU" *Koninklijke Philips* at col. 38:55-62 **B. US-7892178-B1** "As shown in FIGS. 3, 3A and 3B, an alternative embodiment of the monitoring device 20 **comprises a light shield 21 with the article 25 disposed on an exterior surface 21a of the light shield 21, and the optical sensor 30 disposed on an interior surface 21b of the light shield 21**… **The light shield 21 prevents or substantially eliminates environmental light from interfering with the optical sensor 30 thereby reducing interference with the signal**." *Impact Sports* at col. 7:33-42
[1.b] (b) **a banding mechanism**, **wherein said banding mechanism is configured to be worn around the wrist, and wherein the banding mechanism is capable of circumscribing the wrist**, said banding mechanism having:	**A. US-8121673-B2** "In one embodiment, the sensors 40 for monitoring vital signs are enclosed in a wrist-watch sized case supported on **a wrist band**." *Koninklijke Philips* at col. 7:5-7 "As shown in FIG. 6, **the device includes a wrist-watch sized case supported on a wrist band 1374… The wrist-band 1374 can be an expansion band or a wrist-watch strap of plastic, leather or woven material**." *Koninklijke Philips* at col. 30:67-31:6 **B. US-7892178-B1** "The monitoring device 20 preferably includes an article 25 and **an attachment band 26**, preferably composed of first strap 26a and second strap 26b… **The monitoring device is preferably worn on a user's wrist 71… The article 25 preferably has a housing 95 that is seized to securely attach to a user's wrist 71**…" *Impact Sports* at col. 5:7-16
[1.b.i] **a skin contacting surface, said skin contacting surface capable of maintaining contact with at least 50% of the wrist skin surface**; and	**A. US-8121673-B2** "In one embodiment, one EKG/ECG contact point is provided on the back of the wrist watch case and one or more EKG/ECG contact points are provided on the surface of the watch so that **when a user's finger or skin touches the contact points, an electrical signal indicative of heartbeat activity is generated**." *Koninklijke Philips* at col. 37:30-35 FIG. 14 shows an exemplary adhesive patch embodiment. **The patch may be applied to a persons skin** by anyone including the person themselves or an authorized person such as a family member or physician… In one embodiment, **the module 196 has a skin side** that may be coated with a conductive electrode

	lotion or gel to improve the contact… The conductive gel material provides transmission characteristics so as to provide an effective acoustic impedance match to the skin in addition to providing electrical conductivity for the electrical sensor." *Koninklijke Philips* at col. 46:30-52 **B. US-7892178-B1** "The bottom layer of the housing 95 **may have a curve surface for contact with a user's body**." *Impact Sports* at col. 5:27-29
[1.b.ii] **an integral pocket configured to receive said two or more disposable pulse oximeter sensor modules**;	**A. US-8121673-B2** "In yet another embodiment that provides continuous, beat-to-beat wrist arterial pulse rate measurements**, a pressure sensor is housed in a casing with a 'free-floating' plunger as the sensor applanates the radial artery. A strap provides constant force for effective applanation and ensuring the position of the sensor housing to remain constant after any wrist movements**." *Koninklijke Philips* at col. 7:14-21 **B. US-7892178-B1** "The monitoring device also includes an optical sensor, a circuitry assembly, a display member and a control component. **The optical sensor is disposed on the interior surface of the article. The circuitry assembly is preferably embedded within the annular body of the article. The display member is preferably attached to an exterior surface of the annular body of the article**. **The control component is disposed on the exterior surface of the annular body of the article. The control component controls the input of information and the output of information displayed on the display member**." *Impact Sports* at col. 3:25-35
[1.c] (c) **a strut enveloped lengthwise within said banding mechanism**, wherein the strut is **configured such that providing a bending pressure to the banding mechanism results in the coiling of the strut and ligature of the banding mechanism around the wrist**;	**A. US-8121673-B2** "In the electromagnetic sensor embodiment, **the wrist band 1374 is a flexible plastic material incorporated with a flexible magnet**. The magnet provides a magnetic field, and one or more electrodes similar to electrode 1383 are positioned on the wrist band to measure voltage drops which are proportional to the blood velocity." "In an electromagnetic embodiment where **the wrist band incorporates a flexible magnet** to provide a magnetic field and one or more electrodes positioned on the wrist band to measure voltage drops which are proportional to the blood velocity, instantaneously [sic] variation of the flow can be

	detected but not artery flow by itself." *Koninklijke Philips* at col. 41:38-43 **B. US-7892178-B1** "In a preferred embodiment, **the circuit assembly 35 is flexible to allow for the contour of the user's arm, wrist or ankle, and the movement thereof**. "As shown in FIGS. 20, 20A and 20B, **a monitoring device 20 is composed of several components including an armband 20S with a VELCRO loop, a sensor flap back 20T with a VELCRO hook and an elastic armband mount, a sensor board 20U with wiring, and non-allergic cotton liner 20V**. FIG. 20 illustrates the monitoring device 20 with elastic material…" *Impact Sports* at col. 14:34-39
[1.d] (d) **a window area on the skin contacting surface of said banding mechanism**, wherein said window area **comprises a pliable plastic sheet**, and wherein said window area is **integrated into said integral pocket** and **disposed to allow light to enter and exit the inner area of said integral pocket**; and	**A. US-8121673-B2** "**The device emits lights from a window in the infrared spectrum and receives reflected light in a second window**. **When the heartbeats, blood flow increases temporarily and more red blood cells flow through the windows**, **which increases the light reflected back to the detector. The light can be reflected, refracted, scattered, and absorbed by one or more detectors**. Suitable noise reduction is done, and the resulting optical waveform is captured by the CPU." "**The adhesive patch is shown generally at 190 having a gauze pad 194 attached to one side of a backing 192, preferably of plastic, and wherein the pad** can have an impermeable side 194 coating with backing 192 and **a module 196 which contains electronics for communicating with the mesh network and for sensing acceleration and EKG/ECG, heart sound, microphone, optical sensor, or ultrasonic sensor in contacts [sic] with a wearer's skin**." **B. US-7892178-B1** "It is desirous to adapt the monitoring device 20 to the anatomy of the users arm 72 or even the user's ankle. The strap 96 is preferably composed of neoprene, leather, synthetic leather, LYCRA, another similar material, or a combination thereof. **The article 25 is preferably composed of a semi-rigid or rigid plastic with a rubber-like or semi-flex plastic bottom layer for contact with the user's body**." *Impact Sports* at col. 5:21-27

	"**The light shield 21 prevents or substantially eliminates environmental light from interfering the optical sensor 30 thereby reducing interference with the signal**… A user preferably wears the monitoring device 20 on the user's arm 72 as shown in FIG. 3B, with a display member 40 visible to the user. In this embodiment, **the article 25 contains a circuitry assembly 35, as discussed above, within the housing 95 of the article 25. The display member 40 is preferably a LED display monitor, and alternatively a LCD display monitor**." *Impact Sports* at col. 7:39-49
[1.e] (e) **a signal processing unit**, wherein said signal processing unit is **capable of receiving one or more signal from said photodetector** and wherein said signal processing unit **determines the percent of hemoglobin molecules bound with oxygen molecules** by **determining the ratio of absorbance between said red light and said infrared light based on said one or more signal from said photodetector**.	**A. US-8121673-B2** "**An analog signal representative of the Doppler frequency of the echo is received by the transducer and converted to a digital representation of the ADC**, **and supplied to the CPU for signal processing**. Within the CPU, the digitized Doppler frequency is scaled to compute the blood flow velocity within the artery based on the Doppler frequency. Based on the real time blood flow velocity, the CPU applies the vital model to the corresponding blood flow velocity to produce the estimated blood pressure valve." *Koninklijke Philips* at col. 32:17-25 "As the heart pumps blood through the patient's finger, blood cells absorb and transmit varying amounts of the red and infrared radiation depending on how much oxygen binds to the cells hemoglobin. **The photo-detector detects transmission at the predetermined wavelengths, for example red and infrared wavelengths, and provides the detected transmission to a pulse-oximetry circuit embedded within the wrist-watch**. **The output of the pulse oximetry circuit is digitized into a time dependent optical waveform, which is then sent back to the pulse-oximetry circuit and analyzed to determine the user's vital signs**." *Koninklijke Philips* at col. 33:29-39 **B. US-7892178-B1** "**Pulse oximetry is used to determine the oxygen saturation of arterial blood**… Oxyhemoglobin absorbs infrared light while deoxyhemoglobin absorbs visible red light. **Pulse oximeter devices also contain sensors that detect the ratio of red/infrared absorption**…" *Impact Sports* at col. 1:29-36 "**FIG. 10 illustrates a block diagram of a flow chart of a signal processing method of the present invention**. As shown in FIG. 10, **the photodetector 130 of the optical sensor 30 receives light from the light source 135 while in**

	proximity to the user's artery… The signal 299 is sent to the microprocessor 41. At block 1300, the signal acquisition is performed." *Impact Sports* at col. 11:47-57