

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner,

v.

OMNI MEDSCI, INC.,
Patent Owner.

Case IPR2019-00913
Patent 9,651,533 B2

Before GRACE KARAFFA OBERMANN, JOHN F. HORVATH, and
SHARON FENICK, *Administrative Patent Judges*.

HORVATH, *Administrative Patent Judge*.

DECISION
Denying Institution of *Inter Partes* Review
35 U.S.C. § 314(a)

I. INTRODUCTION

A. Background

Apple Inc. (“Petitioner”) filed a Petition requesting *inter partes* review of claims 5, 7–10, 13, and 15–17 (“the challenged claims”) of U.S. Patent No. 9,651,533 B2 (Ex. 1001, “the ’533 patent”). Paper 1 (“Pet.”), 4. Omni MedSci Inc. (“Patent Owner”), filed a Preliminary Response. Paper 8 (“Prelim. Resp.”). We have authority under 35 U.S.C. § 314. Upon consideration of the Petition and Preliminary Response we are persuaded that Petitioner has failed to demonstrate a reasonable likelihood that it would prevail in showing the unpatentability of at least one challenged claim of the ’533 patent. Accordingly, we deny institution of *inter partes* review.

B. Related Matters

Petitioner and Patent Owner identify the following as matters that can affect or be affected by this proceeding: pending U.S. Patent Application Nos. 10/188,299, 10/172,523, 15/594,053, 16/015,737, and 16/241,628; *Apple Inc. v. Omni MedSci Inc.*, IPR2019-00916 (PTAB); and *Omni MedSci Inc. v. Apple Inc.*, 2-18-cv-00134-RWD (E.D.Tex).¹ See Pet. xi; Paper 5, 1–2.

¹ This case has been transferred to the Northern District of California, however, has yet to be assigned a case number by that Court. See Paper 9, 1; Paper 11, 1; Ex. 1058, 9.

C. Evidence Relied Upon²

Reference		Publication Date	Exhibit
Valencell 093 ³	U.S. 2012/0197093 A1	Aug. 2, 2012	1005
Valencell 099 ⁴	U.S. 2010/0217099 A1	Aug. 26, 2010	1006
Mannheimer	U.S. 5,746,206	May 5, 1998	1008
Carlson	U.S. 2005/0049468 A1	Mar. 3, 2005	1009

D. Asserted Grounds of Unpatentability⁵

Claims Challenged	Basis	References
5, 7–10, 13, and 15–17	§ 103(a)	Valencell 093 and Valencell 099
5, 7–10, 13, and 15–17	§ 103(a)	Valencell 093, Valencell 099, and Carlson
8, 9, 16, and 17	§ 103(a)	Valencell 093, Valencell 099, and Mannheimer

² Petitioner also relies upon the Declaration of Brian Anthony, Ph.D., (Ex. 1003).

³ Valencell is not listed as an inventor on the '093 patent application publication. Nonetheless, we follow Petitioner's convention and name the reference "Valencell 093."

⁴ Valencell is not listed as an inventor on the '099 patent application publication. Nonetheless, we follow Petitioner's convention and name the reference "Valencell 099."

⁵ Petitioner identifies the third ground as obviousness of claims 8, 9, 16, and 17 over Valencell 093 and Valencell 099 in view of Mannheimer, with or without Carlson. *See* Pet. 4. We treat this as two separate grounds: (1) obviousness over Valencell 093, Valencell 099, and Mannheimer; and (2) obviousness over Valencell 093, Valencell 099, Carlson, and Mannheimer.

Claims Challenged	Basis	References
8, 9, 16, and 17	§ 103(a)	Valencell 093, Valencell 099, Carlson, and Mannheimer

II. ANALYSIS

A. The '533 Patent

The '533 patent is directed toward a physiological measurement system. The system is depicted in Figure 24 of the '533 patent, which is reproduced below.

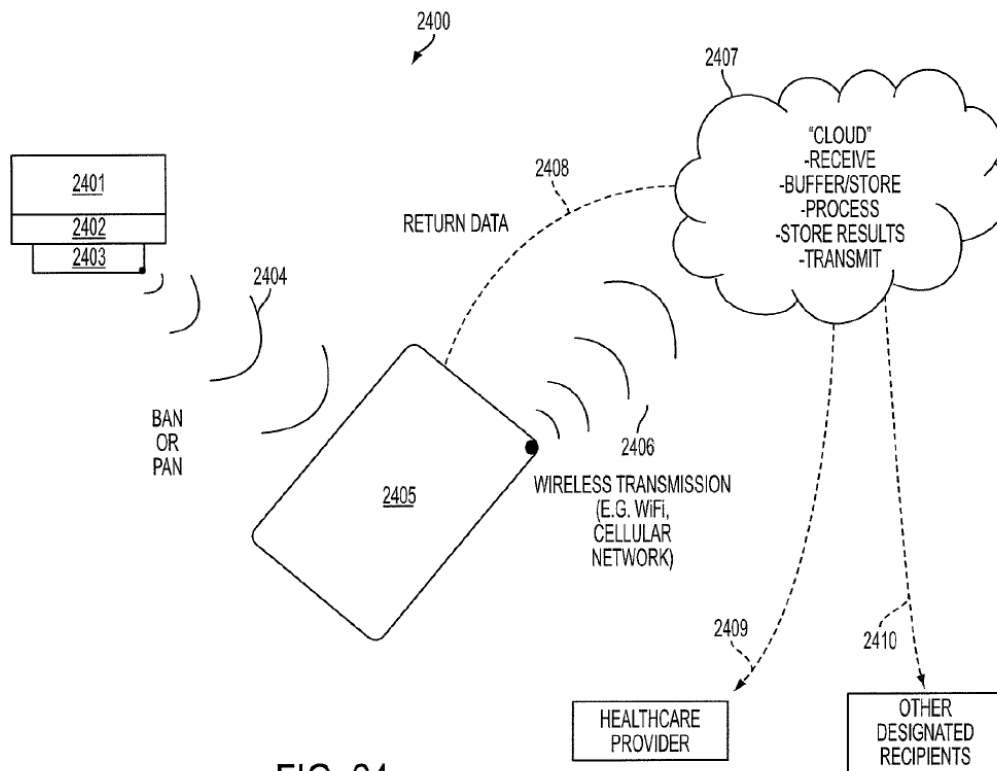


FIG. 24

Figure 24 is a schematic illustration of a physiological measurement system. Ex. 1001, 7:7–10. The system includes wearable measurement device 2401, personal device 2405, and cloud based server 2407. *Id.* at 26:49–27:20.

The “wearable measurement device [is] for measuring one or more physiological parameters.” *Id.* at 5:35–37. A schematic illustration of such

a measurement device is shown in Figure 18 of the '533 patent, which is reproduced below.

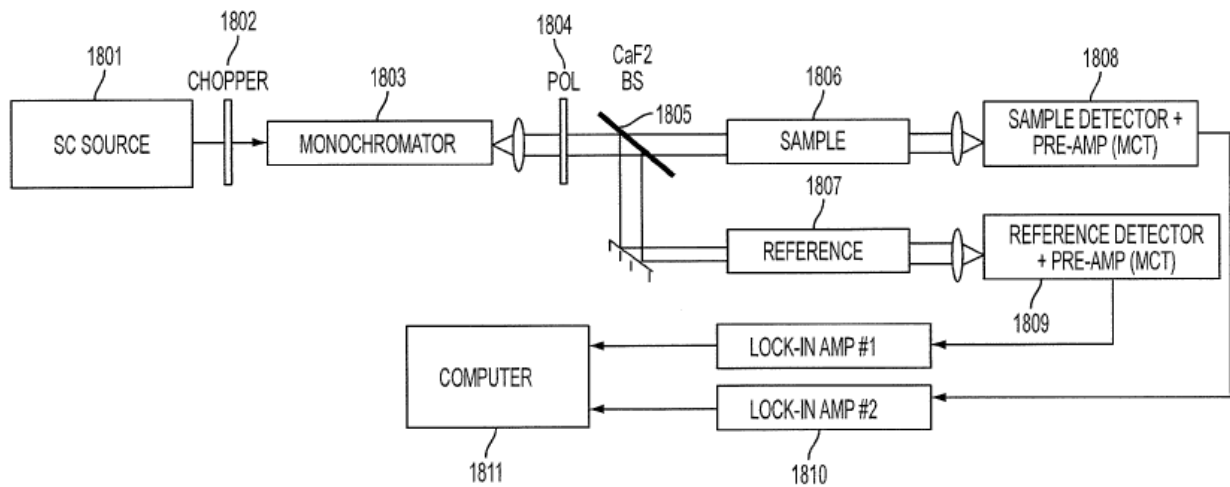


FIG. 18

Figure 18 is a schematic diagram of a device for measuring physiological parameters that may be used to “subtract out (or at least minimize the adverse effects of) light source fluctuations.” *Id.* at 18:43–46.

Wearable measurement device 2401 includes light source 1801 made from a plurality of light emitting diodes that generate an output optical beam at one or more optical wavelengths, wherein at least one of the optical wavelengths is between 700 and 2500 nanometers. *Id.* at 5:37–43, 18:46–48. The light source can increase a signal-to-noise ratio by increasing either the LED intensity or pulse rate. *Id.* at 5:43–47. Wearable measurement device 2401 also includes a plurality of lenses that receive a portion of the output optical beam from the light source and deliver an analysis beam to a sample. *Id.* at 5:47–50. Lastly, wearable measurement device 2401 includes a receiver that receives at least a portion of the analysis beam that has been

reflected from or transmitted through the sample, and processes that signal to generate an output signal. *Id.* at 5:51–54.

The physiological measurement system also includes personal device 2405 having a wireless receiver, a wireless transmitter, a display, a microphone, a speaker, one or more buttons or knobs, a microprocessor and a touch screen. *Id.* at 5:54–59, 27:3–7. Personal device 2405 receives and processes at least a portion of the output signal generated by wearable measurement device 2401, and stores and displays the processed output signal. *Id.* at 5:59–61, 27:10–12. Personal device 2405 also transmits at least a portion of the processed output signal over a wireless transmission link to a remote device, such as an internet or “cloud” based server. *Id.* at 5:61–63, 26:30–34, 27:12–15. Personal device 2405 can be “a smart phone, tablet cell phone, PDA, or computer,” or some “other microprocessor-based device.” *Id.* at 26:37–40, 26:49–55.

The physiological measurement system also includes remote device 2407 that receives the at least a portion of the processed output signal transmitted by personal device 2405 as an output status. *Id.* at 5:63–66, 26:30–42, 27:12–15. Remote device 2407 processes the output status to generate and store processed data, and stores a history of the output status over a period of time. *Id.* at 5:66–6:1–3, 27:21–29, 27:34–37.

B. Illustrative Claim

Claim 13 of the ’533 patent is an independent and representative claim, and is reproduced below.

13. A measurement system comprising:

a wearable measurement device for measuring one or more physiological parameters, including a light

source comprising a plurality of semiconductor sources that are light emitting diodes [LEDs], the light emitting diodes configured to generate an output optical beam with one or more optical wavelengths, wherein at least a portion of the one or more optical wavelengths is a near-infrared wavelength between 700 nanometers and 2500 nanometers,

the light source configured to increase signal-to-noise ratio [SNR] by increasing a light intensity from at least one of the plurality of semiconductor sources and by increasing a pulse rate of at least one of the plurality of semiconductor sources;

the wearable measurement device comprising a plurality of lenses configured to receive a portion of the output optical beam and to deliver an analysis output beam to a sample;

the wearable measurement device further comprising a receiver configured to receive and process at least a portion of the analysis output beam reflected or transmitted from the sample and to generate an output signal, wherein the wearable measurement device receiver is configured to be synchronized to the light source;

a personal device comprising a wireless receiver, a wireless transmitter, a display, a microphone, a speaker, one or more buttons or knobs, a microprocessor and a touch screen, the personal device configured to receive and process at least a portion of the output signal, wherein the personal device is configured to store and display the processed output signal, and wherein at least a portion of the processed output signal is configured to be transmitted over a wireless transmission link; and

a remote device configured to receive over the wireless transmission link an output status comprising the at least a portion of the processed output signal, to process the received output status to generate processed data and to store the processed data, and wherein the remote device is capable of storing a history of at least a portion of the received output status over a specified period of time.

Ex. 1001, 30:46–31:20.

Claim 5 is an independent claim that recites a measurement system that is substantially similar to the measurement system recited in claim 13, but does not require the light source, plurality of lenses, and receiver to be components of a wearable measurement device. *Compare id.* at 29:43–30:10, *with id.* at 30:46–31:20. Claims 7–10 depend from claim 5, and claims 15–17 depend from claim 13. *Id.* at 30:15–37, 32:1–18.

C. Level of Ordinary Skill in the Art

Petitioner, relying on the testimony of Dr. Anthony, identifies a person of ordinary skill in the art (“POSITA”) as someone who “would have [had] a good working knowledge of optical sensing techniques and their applications, and familiarity with optical system design and signal processing techniques.” Pet. 17; Ex. 1003 ¶ 35. Such a person, according to Petitioner, would have obtained such knowledge through “an undergraduate education in engineering (electrical, mechanical, biomedical, or optical) or a related field of study, along with relevant experience in studying or developing physiological monitoring devices . . . in industry or academia.” Pet. 17–18. Patent Owner does not offer an opinion on Petitioner’s definition, either agreeing or disagreeing, and does not offer a counter

definition of a person of ordinary skill in the art.

On this record, we find Petitioner’s definition to be consistent with the problems and solutions disclosed in the patent and prior art of record. *See, e.g., In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995). Accordingly, we accept that definition for purposes of this Decision.

D. Claim Construction

In *inter partes* reviews, we interpret a claim “using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b).” 37 C.F.R. § 42.100(b). Under this standard, we construe the claim “in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” *Id.* Only claim terms which are in controversy need to be construed and only to the extent necessary to resolve the controversy. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017).

Petitioner requests construction of the terms “beam,” “plurality of lenses,” and “pulse rate.” Pet. 20–22. For the reasons discussed below, construction of these terms is not needed to resolve the fundamental controversy between the parties, i.e., whether Petitioner has demonstrated a reasonable likelihood of showing the unpatentability of claims 5, 7–10, 13, and 15–17. *See Nidec*, 868 F.3d at 1017.

1. Light source

Neither party requests construction of “a light source comprising a plurality of semiconductor sources that are light emitting diodes. . . configured to increase signal-to-noise ratio by increasing a light intensity from at least one of the plurality of semiconductor sources,” recited in

independent claims 5 and 13. A construction of the term is necessary, however, to resolve the parties' dispute about whether Valencell 093 discloses such a light source.

The Specification provides scant support for the meaning of “a light source comprising a plurality of semiconductor sources that are light emitting diodes . . . configured to increase signal-to-noise ratio by increasing a light intensity from at least one of [a] plurality of semiconductor sources.” This exact phrase is repeated in two passages of the Specification, without further explanation of its meaning. *See* Ex. 1001, 5:10–14, 5:43–47.⁶

Patent Owner argues that, in addition to one of the passages cited above, the '533 patent supports an LED based light source increasing signal-to-noise by increasing LED light intensity. Prelim. Resp. 20 (citing Ex. 1001, 4:15–17). The cited passage discloses “[m]ore light intensity can help to increase the signal levels, and, hence, the signal-to-noise ratio.” Ex. 1001, 4:15–17. However, this disclosure appears in the context of discussing the difficulties encountered detecting certain signals “when a weak light source is used, such as a lamp.” *Id.* at 4:9–15.

Elsewhere, the '533 patent reinforces the notion of selecting a high intensity LED as a light source over a weak intensity lamp. *See id.* at 8:17–24 (“[I]n hyper-spectral imaging a lamp may be used as the light source. However . . . it would be advantageous to have a broadband light source

⁶ We note that these phrases were added to the Specification by an amendment dated July 6, 2016, the same date then pending claims 5 and 14 (which issued as claims 5 and 13) were amended to contain the same limitation. *See* Ex. 1002, 495–496, 500–503. The applicant, in its remarks accompanying these amendments, did not indicate where they were supported by the Specification as originally filed. *See id.* at 505–507.

covering the SWIR [short wave infrared] that may be used in place of a lamp.”); 10:6–8 (“[U]sing a non-lamp based light source could lead to contact-free control and analysis of drugs.”), 19:36–46 (“Different light sources may be selected for the SWIR based on the needs of the application. Some of the features for selecting a particular light source include power or intensity. . . . Depending on the application, lamps [or] light emitting diodes (LEDs) . . . may be advantageously used.”), 19:50–66 (“Lamps may be used if low power or intensity of light is required in the SWIR. . . . LED’s can be used that have a higher power level in the SWIR wavelength range.”). These passages, which disclose the advantages of selecting a high intensity LED light source over a low intensity lamp, do not disclose increasing the intensity of at least one LED in a multi-LED based light source. Therefore, they are not relevant to the construction of the disputed claim term, which requires “a light source comprising a plurality of semiconductor sources that are light emitting diodes.” *Id.* at 30:48–50.

Other passages of the ’533 patent disclose increasing the light intensity of a laser diode (LD) based light source, rather than an LED based light source, by combining the light output of the LDs. For example, the ’533 patent discloses a “block diagram 1900 with building blocks for constructing the high power LDs” using “one or more diode bar stacks 1901,” each of which may be “an array of several single emitter LDs.” *Id.* at 20:51–55, Fig. 19. The brightness or intensity of this LD based light source “may be increased by spatially combining the beams from multiple stacks 1903.” *Id.* at 20:59–60. This allows the power or intensity of the light source to be “increase[d] in multiples depending on the number of [laser] diodes multiplexed.” *Id.* at 21:14–17. These passages are also not relevant

to the construction of the disputed claim term, which requires a “light source comprising a plurality of semiconductor sources that are light emitting diodes,” and “increasing a light intensity from at least one of the plurality of semiconductor sources,” rather than by increasing light intensity by combining the light from a plurality of semiconductor sources. *Id.* at 30:48–50, 30:56–58.

Given the scant disclosures in the Specification discussed above, for the purposes of this Decision, we construe “a light source comprising a plurality of semiconductor sources that are light emitting diodes . . . configured to increase signal-to-noise ratio by increasing a light intensity from at least one of [a] plurality of semiconductor sources” to mean “a light source containing two or more light emitting diodes (semiconductor sources), wherein at least one of the light emitting diodes has a variable intensity that can be increased in order to increase a signal-to-noise ratio.” This construction is supported by the Specification at column 5, lines 10 through 14, and lines 43 through 47, and is consistent with the plain words used in the claim term at issue.⁷

E. Overview of the Prior Art

1. Valencell 093

Valencell 093 discloses a wearable monitoring apparatus, such as an earpiece or earbud, having a sensor module that “includes an energy emitter, a detector, a filter, and at least one processor.” Ex. 1005 ¶ 6. “The energy emitter directs energy (e.g., optical energy . . .) at a target region of the subject and the detector detects an energy response signal” indicative of “a

⁷ See note 6, *supra*.

physiological condition of the subject.” *Id.* The “processor controls operations of the energy emitter, detector, and/or filter.” *Id.* ¶ 7.

A system level diagram of Valencell 093’s wearable monitoring apparatus is shown in Figure 1, reproduced below.

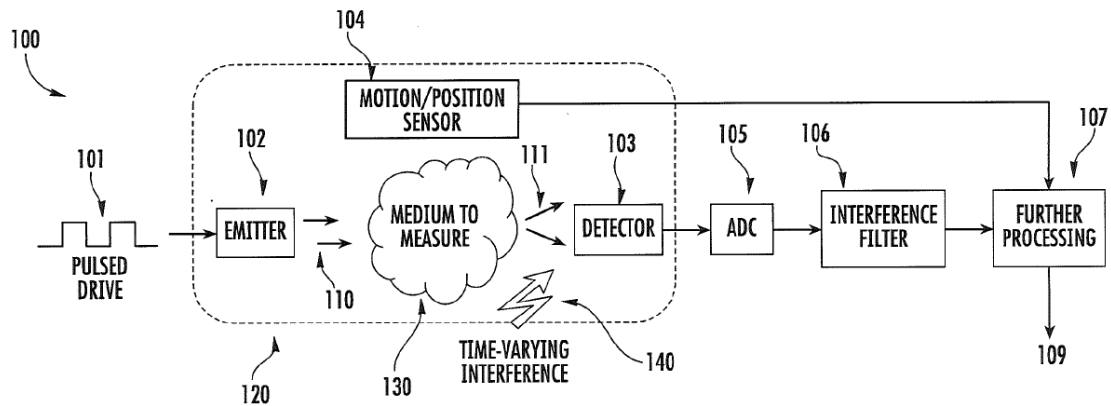


FIG. 1

Figure 1 of Valencell 093 is a schematic illustration of a “filtering apparatus/method 100.” *Id.* ¶ 107. “A pulsed driving circuit 101 is used to drive at least one energy emitter 102 at one or more pulsed frequencies to interrogate at least one target region of . . . medium 130 with . . . pulsed energy 110.” *Id.* Energy emitter 102 can include “one or more optical sources,” such as LEDs, “emitting one or more optical wavelengths,” such as “UV, visible, and IR wavelengths.” *Id.* ¶¶ 9, 109.

The optical energy reaching medium 130 “generate[s] at least one energy response signal 111, such as an optical scatter signal 111.” *Id.* ¶ 107. Optical scatter signal 111 “is detected by at least one detector 103, configured to detect energy . . . in the form of optical energy scattered from the medium 130.” *Id.* The output of detector 103 is “sent to at least one analog-to-digital converter (ADC) 105 and the digitized output may be sent

to at least one interference filter 106 . . . to remove the effects of time-varying environmental interference 140.” *Id.*

Pulsed driving circuit 101 modulates the intensity of pulsed optical energy 110 “such that the intensity is time-varying with at least two states, preferably an on state and an off state.” *Id.* ¶ 108. “A first optical interaction response is obtained by at least one detector 103 . . . when the pulsed optical energy 110 is in the on state,” and a “second energy response . . . is obtained by the optical detector 103 when the pulsed optical energy 110 is in the off state.” *Id.* “The first and second energy response signals . . . are processed via an interference filter 106 to produce a processed energy response signal.” *Id.* Interference filter 106 “removes time-varying environmental interference caused by an interferant, such as sunlight, ambient light, airflow, temperature, etc.” *Id.* “The output of the interference filter 106 is then processed by a signal extraction filter 107 to accurately extract at least one physiological property of the subject.” *Id.*

2. *Valencell 099*

Valencell 099 discloses “a method of monitoring the health of one or more subjects [by] receiving physiological . . . information from each subject via respective portable monitoring devices.” Ex. 1006 ¶ 14. Each monitoring device contains a physiological sensor “to detect and/or measure physiological information from the subject” that may be “analyzed locally via the monitoring device or may be transmitted to a location geographically remote from the subject for analysis.” *Id.* The monitoring device may be a “headset, and earbud of a headset, or another portable device.” *Id.* ¶ 7. The monitoring device can “transmit information wirelessly to a recording device, such as . . . a cell phone, a personal digital assistant (PDA), and/or a

computer” that is “capable of processing and organizing the data into meaningful displays.” *Id.* ¶ 18. This allows a user to “monitor health . . . data in real-time, and [to] access records of collected data throughout the day, week, month, etc., by observing charts and data through an audio-visual display.” *Id.*

Valencell 099’s health monitoring system is shown in Figure 2, which is reproduced below.

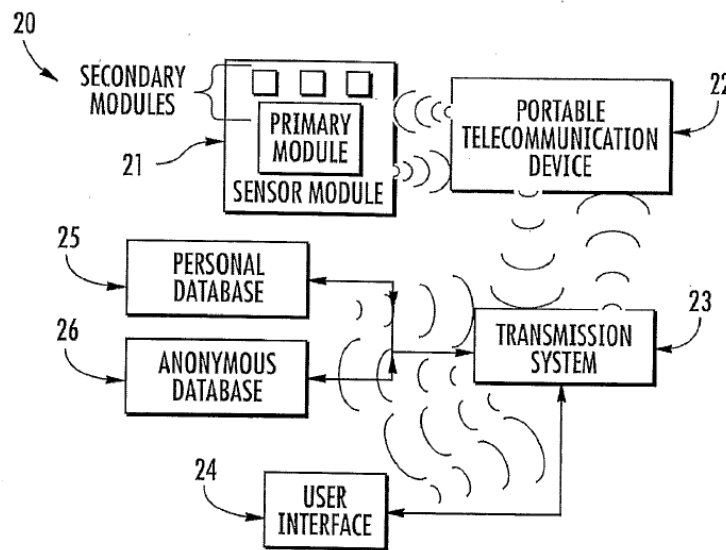


FIG. 2

Figure 2 of Valencell 099 is a “block diagram of a telemetric network for health . . . monitoring through portable telemetric monitoring devices.” *Id.* ¶ 21. The network consists of portable or wearable sensor module 21, portable telecommunication device 22, transmission system 23, user interface 24, personal database 25, and anonymous database 26. *Id.* ¶ 94. “The wearable sensor module 21 communicates wirelessly with the portable telecommunication device 22,” which can be “any portable device, such as a cell phone . . . PDA, laptop computer, Blackberry . . . or other portable,

telemetric device.” *Id.* ¶ 96. “[T]he main purpose of the portable telecommunication device is to transmit the local wireless signal from the sensor module 21 over longer distances.” *Id.* Portable telecommunication device 22 may contain user interface 24 to allow “data from the wearable sensor module 21 [to] be stored, analyzed, summarized, and displayed.” *Id.* ¶ 97. Portable telecommunication device 22 also “sends/receives wireless information directly to/from a transmission system 23 for transmission to a database (such as personal database 25 and/or anonymous database 26) for storage, analysis, and retrieval of data.” *Id.* ¶ 98. The database is “typically located far away from the user and telecommunication module,” and information from the wearable sensor module 21 and telecommunication device 21 is “sent to [the] database through the Internet.” *Id.*

3. Carlson

Carlson discloses an “optical pulsoximetry [device] used for non-invasive measurement of pulsation and oxygen saturation in arterial human or animal blood.” Ex. 1009 ¶ 2. The device measures the light “absorption of reduced (Hb)—and oxidized (HbO₂) h[e]moglobin at two optical wavelengths, where the relative absorption coefficients differ significantly.” *Id.* ¶ 3. Figure 2 of Carlson is reproduced below.

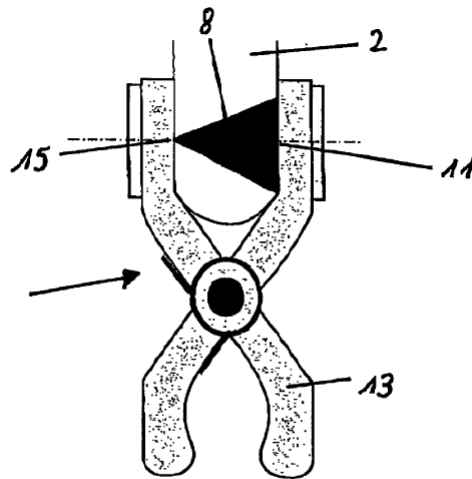


Figure 2

Figure 2 of Carlson is a schematic illustration of an ear clip sensor 1 of a pulsoximeter device. *Id.* ¶¶ 33, 49. Sensor 1 includes light source 15, which transmits light beam 8 through a patient's earlobe 2, and light detector 11 to detect the transmitted light. *Id.* ¶ 49. Light source 15 emits light at two wavelengths—660nm and 890nm—and can consist of two LEDs. *Id.* ¶ 50.

Carlson's pulsoximeter can be used to "survey the health condition of a person or an animal [that] is mobile," and is "not restricted for use in, e.g., a hospital." *Id.* ¶ 72. Carlson teaches that "standard pulsoximeter sensors suffer from signal instability and insufficient robustness versus environmental disturbances." *Id.* ¶ 4. For example, when a pulsoximeter sensor is worn by a person driving along a tree-lined avenue, the sensor will receive sunlight "at a certain frequency," such that "every time when passing a tree, sunlight is attenuated and between the trees sunlight is influencing the measurement of the pulsoximeter sensor." *Id.* ¶ 68. To address such problems, Carlson's pulsoximeter includes "optical and/or electronic means for increasing the Signal-to-Noise ratio (S/N) . . . of a pulsoximeter sensor

for robust application of pulseoximetry in telemedicine- and near patient testing applications in rough (optical) environmental conditions.” *Id.* ¶ 10. In particular, the device’s LEDs emit light “not as a current or continuous light but as pulsed light.” *Id.* ¶ 69. The device also uses “AC-Coupling or Lock-In Amplification (synchronous detection) . . . to temporarily modulate the amplitude of the optical radiation of . . . the LED at a carrier frequency f_0 in order to shift the power spectrum of the pulseoximeter signals into a higher frequency range.” *Id.* ¶ 20. Modulation frequency f_0 is chosen so that “it is outside the frequency spectrum of sunlight and of ambient light.” *Id.* ¶ 69. This allows the pulseoximeter signals to be easily discriminated from environmental signals, such as variable amounts of sunlight and ambient light, and “increas[es] significantly the Signal-to-Noise and Signal-to-Background ratio.” *Id.*

Carson further discloses the pulseoximeter sensor can be wirelessly connected to “a special unit worn by [a] person or patient,” where “a signal is generated if [a] measured value is not within a predetermined range.” *Id.* ¶¶ 77–78. The generated signal can be “transmitted to a respective person, to a medical doctor, to a hospital, etc.” *Id.* ¶ 78. The pulseoximeter can also include a “GPS device which at any time gives the location of the person using the pulseoximetric sensor monitoring configuration.” *Id.*

4. Mannheim

Mannheimer discloses a pulse oximetry device that “non-invasively measure[s] oxygen saturation of arterial blood flow in vivo.” Ex. 1008, 1:10–13. Mannheimer’s device performs a “pulsed oximetry measurement [that] isolates arterial saturation levels for particular ranges of tissue layers

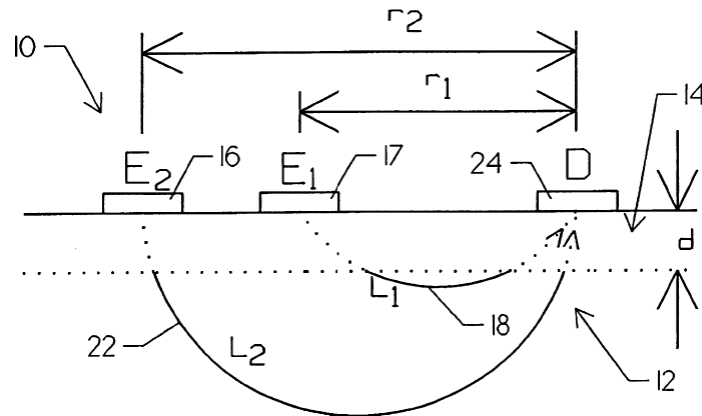


FIG. 1 B

Figure 1B of Mannheimer is a schematic diagram of a second embodiment of a pulse oximeter having two emitters 16/17 and one detector 24. *Id.* at 2:43–44, 3:37–39. As shown in Figure 1B, emitter 17 is separated from detector 24 by a first distance r_1 , and emitter 16 is separated from detector 24 by a second distance r_2 . Mannheimer discloses that “[t]hose of skill in the art will appreciate that the operation” of the second embodiment shown in Figure 1B “is similar to that described above” in reference to the first embodiment shown in Figure 1A. *Id.* at 5:58–62.

F. Patentability of claims 5, 7–10, 13, and 15–17

Petitioner argues claims 5, 7–10, 13, and 15–17 are unpatentable as obvious over the combination of Valencell 093 and Valencell 099, and over the combination of Valencell 093, Valencell 099, and Carlson. Pet. 23–69. Petitioner further argues claims 8, 9, 16, and 17 are unpatentable as obvious over the combination of Valencell 093, Valencell 099, and Mannheimer, and over the combination of Valencell 093, Valencell 099, Carlson, and Mannheimer. *Id.* at 69–75.

Independent claim 13 recites a measurement system comprising “a light source comprising a plurality of semiconductor sources that are light emitting diodes . . . configured to increase signal-to-noise ratio by increasing a light intensity from at least one of the plurality of semiconductor sources.” Ex. 1001, 30:46–58. Claim 5, the only other independent challenged claim, recites a measurement system having the same light source. *Compare id.* at 29:43–53, *with id.* at 30:46–58. As discussed above, we construe this limitation to mean “a light source containing two or more light emitting diodes (semiconductor sources), wherein at least one of the light emitting diodes (semiconductor sources) has a variable intensity that can be increased in order to increase a signal-to-noise ratio.”

Petitioner argues, in each of the grounds presented, that Valencell 093 discloses a light source “configured to increase signal-to-noise ratio by increasing a light intensity from at least one of the plurality of semiconductor sources.” *See* Pet. 36–37, 55; *id.* at 64–69 (relying on Valencell 093 to teach increasing signal-to-noise ratio by increasing the *intensity* of at least one LED, and Carlson to teach increasing signal-to-noise ratio by increasing the *pulse rate* of at least one LED); *id.* at 69–74 (relying on Valencell 093 to teach increasing signal-to-noise ratio by increasing the *intensity* of at least one LED). Specifically, Petitioner argues that Valencell 093 discloses a Bluetooth headset having a physiological sensor that includes one or more LED emitters 102. *Id.* at 33–34 (citing Ex. 1005 ¶¶ 6, 38, 104, 108, Figs. 1, 14). Petitioner further argues that LED emitters 102 are controlled by a processor such that “the *intensity* of the optical emitter 102 may be increased to increase the ratio of physiological optical scatter 111 from blood vessels with respect to unwanted sunlight.” *Id.* at 36 (citing

Ex. 1005 ¶¶ 7, 107, 117; quoting *id.* ¶ 123). Therefore, Petitioner argues, Valencell 093 teaches increasing LED light intensity to increase the signal-to-noise ratio as required by claims 5 and 13. *Id.* at 36–37.

Patent Owner argues Valencell 093 fails to disclose increasing light intensity to increase the signal-to-noise ratio. Prelim. Resp. 23–25. Rather, Patent Owner argues, Valencell 093’s “disclosure of increasing intensity refers to **a design process** where a human sets a fixed light intensity value, not the claimed configuration in which the light source of the sensor module 207 increases light intensity to increase the SNR.” *Id.* at 24. In particular, Patent Owner argues that Valencell 093 teaches using an “interference filter 106 . . . to remove the effects of time-varying environmental interference 140,” and that such filters “may reduce ‘the amount of optical scatter 111 (FIG. 1) of interest from the medium 130.’” *Id.* at 23–24 (quoting Ex. 1005 ¶¶ 107, 123). Therefore, Patent Owner argues, Valencell 093 teaches “designing the emitter 102 to emit light at a higher intensity ‘[t]o offset this unwanted reduction in optical scatter 111.’” *Id.* at 24 (quoting Ex. 1005 ¶ 123). That is, Patent Owner argues Valencell 093 teaches selecting a filter 106 to remove sunlight, and selecting an LED of sufficient intensity to offset the attenuation of LED light intensity caused by filter 106.

We are persuaded by Patent Owner’s argument. Valencell 093 discloses an embodiment in which an optical filter 710 “serve[s] as . . . an attenuation filter.” Ex. 1005 ¶ 123. Regarding this embodiment, Valencell 093 explains: “Because sunlight is so powerful, it may be beneficial to reduce sunlight interference as much as possible, even if that means *also reducing the amount of optical scatter* 111 (FIG. 1) of interest from the

medium 130.” *Id.* (emphasis added). Figure 1 of Valencell 093 is reproduced below.

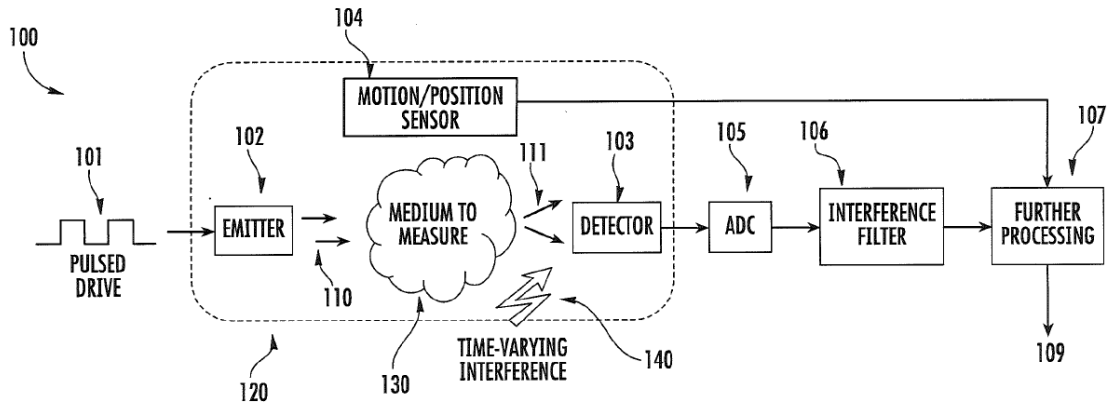


FIG. 1

Figure 1 of Valencell 093 is a schematic illustration of an interference filtering apparatus. *Id.* ¶ 53. Light produced by emitter 102 is reflected by or transmitted through medium 130, producing scattered light 111 that is detected by detector 103. *Id.* ¶ 107. Detector 103 simultaneously detects light from time-varying interference source 140, which can be sunlight. *Id.* ¶¶ 107, 110, 123.

To reduce the amount of sunlight reaching detector 103, Valencell 093 includes, in one embodiment, optical filter 710, which “serves as . . . an attenuation filter.” *Id.* ¶ 123, Fig. 7. However, in addition to attenuating unwanted sunlight, filter 710 “also reduc[es] the amount of optical scatter 111” reaching detector 103. *Id.* “To offset this unwanted reduction in optical scatter 111,” Valencell 093 teaches “the intensity of the optical emitter 102 may be increased.” *Id.* That is, Valencell 093 teaches deploying an optical filter 710 that attenuates both unwanted sunlight 140 and optical scatter 111 from medium 130, and selecting an emitter 102 of sufficient intensity to compensate for the attenuation of optical scatter 111 by optical

filter 710. Valencell 093 fails to teach an LED-based light source configured to increase signal-to-noise by increasing LED light intensity as required by claims 5 and 13. For example, Valencell 093 fails to teach that optical filter 710 has variable attenuation, and increasing the LED intensity when the attenuation of optical filter 710 is increased.

Accordingly, for the reasons discussed above, Petitioner fails to demonstrate sufficiently that Valencell 093 teaches “a light source comprising a plurality of semiconductor sources that are light emitting diodes . . . configured to increase signal-to-noise ratio by increasing a light intensity from at least one of the plurality of semiconductor sources,” and, therefore, fails to demonstrate a reasonable likelihood that it would prevail in showing the unpatentability of claims 5, 7–10, 13, and 15–17 of the ’533 patent.

III. CONCLUSION

For the above reasons, we determine that Petitioner fails to demonstrate a reasonable likelihood of showing claims 5, 7–10, 13, and 15–17 of the ’533 patent are unpatentable on the grounds presented. Accordingly, we decline to institute *inter partes* review of these claims on these grounds.

IV. ORDER

It is ORDERED that the Petition for *inter partes* review is *denied*.

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Patent 9,651,533 B2

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