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Title: PHYSIOLOGICAL MONITOR WITH MOBILE COMPUTING
DEVICE CONNECTIVITY

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**PETITION FOR *INTER PARTES* REVIEW OF UNITED STATES PATENT
NO. 10,736,507 PURSUANT TO 35 U.S.C. §§ 311–319, 37 C.F.R. § 42**

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LIST OF EXHIBITS

APPLE-1001	U.S. Patent No. 10,736,507 (“the ’507 patent”)
APPLE-1002	File History of U.S. Patent No. 10,736,507
APPLE-1003	Declaration of Dr. Thomas Kenny
APPLE-1004	Brian Bailey, et al., Development of a Remote Pulse Oximeter, the University of Arizona, May 2010 (“Bailey”)
APPLE-1005	U.S. Patent Application Pub. No. 2008/0004904 to Tran (“Tran”)
APPLE-1006	U.S. Patent No. 6,658,276 to Kianl et al. (“Kianl”)
APPLE-1007	Lorenzo T. D’Angelo, et al., A Sensor Network to iPhone Interface Separating Continuous and Sporadic Processes in Mobile Telemedicine, 33rd Annual International Conference of the IEEE EMBS Boston, Massachusetts USA, August 30 - September 3, 2011 (“D’Angelo”)
APPLE-1008	U.S. Patent No. 7,812,826 to Ording et al. (“Ording”)
APPLE-1009	U.S. Patent Application Pub. No. 2007/0093786 to Goldsmith et al. (“Goldsmith”)
APPLE-1010	U.S. Patent Application Pub. No. 2010/0324387 to Moon et al. (“Moon”)
APPLE-1011	[RESERVED]
APPLE-1012	Leslie R. Martin, et al., The Challenge of Patient Adherence, 1(3) Therapeutics Clinical Risk Mgmt. 189 (Sep. 2005)
APPLE-1013	Jimmy Beena, et al., Patient Medication Adherence: Measures in Daily Practice, 26(3) Oman MED. J. 155 (May 2011)

APPLE-1014	U.S. Patent Application Pub. No. 2009/0247850 to Charles E. Porges
APPLE-1015	Pulse Oximetry: An Essential Tool for the Busy Med-Surg Nurse, AMERICAN NURSE (Nov. 11, 2009), available at https://www.myamericannurse.com/pulse-oximetry-an-essential-tool-for-the-busy-med-surg-nurse/ (retrieved July 29, 2023)
APPLE-1016	U.S. Patent Application Pub. No. 2013/0245408 to Porges (“Porges”)
APPLE-1017	Declaration of June Munford
APPLE-1018	U.S. Patent No. 8,626,255 to Ammar Al-Ali, et al. (“Al-Ali”)
APPLE-1019	U.S. Patent No. 8,666,467 to Lawrence A. Lynn (“Lynn”)
APPLE-1020	U.S. Patent No. 8,195,848 to Zach Jones (“Jones”)
APPLE-1021	Exemplary Infringement Claim Chart for the ’507 patent from <i>Apple Inc. v. Masimo Corporation et al.</i> , Case No. 1-22-cv-01378 (D. Del. Oct. 20, 2022)
APPLE-1022	Exemplary Infringement Claim Chart for the ’911 patent from <i>Apple Inc. v. Masimo Corporation et al.</i> , Case No. 1-22-cv-01378 (D. Del. Oct. 20, 2022)
APPLE-1023	U.S. Patent No. 8,515,979 to Japan A. Mehta
APPLE-1024	U.S. Patent No. 8,310,492 to Rex McCrary, et al.
APPLE-1025 – 1059	[RESERVED]
APPLE-1060	U.S. District Courts–Combined Civil and Criminal Federal Court Management Statistics (Sep. 30, 2023) United States Courts (uscourts.gov),

https://www.uscourts.gov/sites/default/files/data_tables/fcms_na_distprofile0630.2023.pdf

- APPLE-1061 Memorandum, Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation (USPTO June 21, 2022) (“Director’s Guidance”)
- APPLE-1062 Apple’s Complaint for Patent Infringement (Design), *Apple Inc., v Masimo Corporation, et al.*, Case No. 1-22-cv-01377 (D. Del. Oct. 20, 2022)
- APPLE-1063 Apple’s Complaint for Patent Infringement (Utility), *Apple Inc., v Masimo Corporation, et al.*, Case No. 1-22-cv-01378 (D. Del. Oct. 20, 2022)
- APPLE-1064 Defendant Masimo Corporation’s Answer to Complaint and Counterclaims, *Apple Inc., v Masimo Corporation, et al.*, Case No. 1-22-cv-01378 (D. Del. Dec. 12, 2022)
- APPLE-1065 Order Granting Joint Motion to Amend the Case Schedule, *Apple Inc., v Masimo Corporation, et al.*, Case No. 1-22-cv-01378 (D. Del. Sep. 21, 2023)
- APPLE-1066 Stipulation by Apple Inc.
- APPLE-1067 Email Identifying Masimo’s District Court Invalidity Grounds (Nov. 16, 2023)
- APPLE-1068 Excerpt of Apple’s District Court Expert Invalidity Report, *Apple Inc., v Masimo Corporation, et al.*, Case No. 1-22-cv-01378 (Nov. 22, 2023)
- APPLE-1069 Order Granting Unopposed Motion to Stay Certain Patent Counterclaims, *Apple Inc., v Masimo Corporation, et al.*, Case No. 1-22-cv-01378 (Jan. 10, 2023)

LISTING OF CLAIMS

Claim 1	
[1pre]	A mobile pulse oximetry system for informing a user of mobile measurement of oxygen saturation (“SpO2”), the mobile pulse oximetry system comprising:
[1a]	an SpO2 measurement system including:
[1b]	an optical sensor configured to output one or more signals responsive to light from a light source attenuated by tissue of the user at a measurement site, said one or more signals responsive to an oxygen saturation of said tissue; and
[1c]	a processing board in data communication with the optical sensor and a mobile computing device including a display and cellular communication, wherein the processing board is configured to:
[1d]	receive said one or more signals from the optical sensor;
[1e]	process said one or more signals to generate SpO2 measurement values; and
[1f]	output the SpO2 measurement values to the mobile computing device; and
[1g]	one or more hardware processors of the mobile computing device configured to execute an application, the application configured to execute commands to:
[1h]	generate a graphical user interface having a plurality of display portions;
[1i]	display, in at least one portion of the plurality of display portions, a representation of a physiological parameter of a plurality of physiological parameters comprising at least the SpO2 measurement values; and

[1j]	display, in a different portion of the plurality of display portions, a plurality of user inputs configured to allow the user to interact with at least one of the plurality of display portions or the application;
[1k]	wherein the processing of the one or more signals to generate SpO2 measurement values is performed only on the processing board, thereby freeing up memory available to the mobile computing device; and
[1l]	wherein the processing board is configured to draw power for operation from the mobile computing device.
Claim 2	
[2pre]	The mobile pulse oximetry system of claim 1, wherein the application is configured to execute commands to:
[2a]	perform a trend analysis on received SpO2 measurement values; and
[2b]	display results of the trend analysis in at least one portion of the plurality of display portions.
Claim 3	
[3]	The mobile pulse oximetry system of claim 2, wherein the display is touch-sensitive, and wherein the application is configured to execute commands to narrow or expand the displayed results of the trend analysis in response to the user using a pinch gesture.
Claim 4	
[4]	The mobile pulse oximetry system of claim 1, wherein the application is configured to execute commands to set reminders to take future measurements.
Claim 5	
[5]	The mobile pulse oximetry system of claim 1, wherein the application is configured to execute commands to output one or more alarms associated with SpO2 measurement values that are above or below threshold SpO2 measurement values.

Claim 6	
[6]	The mobile pulse oximetry system of claim 1, wherein the application is configured to execute commands to output one or more reminders to use the optical sensor to take measurements of SpO2 measurement values at predetermined times or cycles.
Claim 7	
[7]	The mobile pulse oximetry system of claim 1, wherein the application is configured to execute commands to update the representation of the physiological parameter to comprise one or more of a plurality of graphical representations of the SpO2 measurement values, the plurality of graphical representations comprising at least one of bar graphs or charts.
Claim 8	
[8]	The mobile pulse oximetry system of claim 1, wherein the application is configured to execute commands to output an alert, via a network to a designated physician or other care provider, regarding abnormal SpO2 readings.
Claim 9	
[9]	The mobile pulse oximetry system of claim 1, wherein the mobile computing device comprises a smartphone.
Claim 10	
[10]	The mobile pulse oximetry system of claim 1, wherein the mobile computing device comprises a wearable computing device.
Claim 11	
[11]	The mobile pulse oximetry system of claim 1, wherein the mobile computing device comprises a wristwatch.
Claim 12	

[12]	The mobile pulse oximetry system of claim 1, wherein the SpO2 measurement system is configured to wirelessly transmit the SpO2 measurement values to the mobile computing device.
Claim 13	
[13]	A computer-implemented method of informing a user of mobile measurement of oxygen saturation (“SpO2”), the computer-implemented method comprising:
[13a]	outputting, from an optical sensor of an SpO2 measurement system, one or more signals responsive to light from a light source attenuated by tissue of the user at a measurement site, said one or more signals responsive to an oxygen saturation of said tissue; and
[13b]	via a processing board of the SpO2 measurement system, the processing board in data communication with the optical sensor and a mobile computing device including a display:
[13c]	receiving said one or more signals from the optical sensor;
[13d]	processing said one or more signals to generate the SpO2 measurement values; and
[13e]	outputting the SpO2 measurement values to the mobile computing device; and
[13f]	via an application configured to execute commands on the mobile computing device:
[13g]	generating a graphical user interface having a plurality of display portions;
[13h]	displaying, in at least one portion of the plurality of display portions, a representation of a physiological parameter of a plurality of physiological parameters comprising at least the SpO2 measurement values; and
[13i]	displaying, in a different portion of the plurality of portions, a plurality of user inputs configured to allow the user to interact with at least one of the plurality of display portions or the application.

Claim 14	
[14pre]	The computer-implemented method of claim 13, further comprising, via the application:
[14a]	performing a trend analysis on received SpO2 measurement values; and
[14b]	displaying results of the trend analysis in at least one portion of the plurality of display portions.
Claim 15	
[15]	The computer-implemented method of claim 13, further comprising, via the application, outputting one or more alarms associated with SpO2 measurement values that are above or below threshold SpO2 measurement values.
Claim 16	
[16]	The computer-implemented method of claim 13, further comprising, via the application, outputting one or more reminders to use the optical sensor to take measurements of SpO2 measurement values at predetermined times or cycles.
Claim 17	
[17]	The computer-implemented method of claim 13, further comprising, via the application, updating the representation of the physiological parameter to comprise one or more of a plurality of graphical representations of the SpO2 measurement values, the plurality of graphical representations comprising at least one of bar graphs or charts.
Claim 18	
[18]	The computer-implemented method of claim 13, further comprising, via the application, outputting an alert, via a network to a designated physician or other care provider, regarding abnormal SpO2 readings.
Claim 19	

[19]	The computer-implemented method of claim 13, further comprising wirelessly transmitting the SpO2 measurement values from the SpO2 measurement system to the mobile computing device.
Claim 20	
[20]	The computer-implemented method of claim 13, further comprising, via the application, enabling the user to set reminders to take future measurements.

I. INTRODUCTION

Apple Inc. (“Apple” or “Petitioner”) petitions for *Inter Partes* Review (“IPR”) of claims 1-20 (“Challenged Claims”) of U.S. Patent No. 10,736,507 (“the ’507 patent”).

II. REQUIREMENTS FOR IPR UNDER 37 C.F.R. § 42.104

A. Standing

Apple certifies that the ’507 Patent is available for IPR. Apple is not barred or estopped from requesting this review.

B. Challenged Claims

Requested IPR grounds are listed below. Accompanying explanations and support are provide in a Declaration from Dr. Thomas Kenny provided herewith. APPLE-1003, [23]-[251].

Ground	Claims	§103
1A	13-15, 19	Bailey
1B	16, 18, 20	Bailey, Tran
1C	14, 17	Bailey, Kianl
1D	1, 2, 5, 7, 9, 12-15, 17, 19	Bailey, D’Angelo
1E	3	Bailey, D’Angelo, Ording
1F	4-6, 8, 16, 18, 20	Bailey, D’Angelo, Tran
1G	2, 7, 14, 17	Bailey, D’Angelo, Kianl
1H	3	Bailey, D’Angelo, Kianl, Ording
1I	10, 11	Bailey, D’Angelo, Goldsmith
2A	13-15, 19	Bailey, Moon

Ground	Claims	§103
2B	16, 18, 20	Bailey, Moon, Tran
2C	14, 17	Bailey, Moon, Kianl
2D	1, 2, 5, 7, 9, 12-15, 17, 19	Bailey, Moon, D'Angelo
2E	3	Bailey, Moon, D'Angelo, Ording
2F	4-6, 8, 16, 18, 20	Bailey, Moon, D'Angelo, Tran
2G	2, 7, 14, 17	Bailey, Moon, D'Angelo, Kianl
2H	3	Bailey, Moon, D'Angelo, Kianl, Ording
2I	10, 11	Bailey, Moon, D'Angelo, Goldsmith

Each applied reference pre-dates U.S. provisional application 61/703,729, filed September 20, 2012, which is the earliest filed application from which the '507 patent claims priority, and thus qualifies as prior art as shown in the table below. Petitioner does not take a position as to whether the '507 patent is entitled to the priority date of September 20, 2012 ("Critical Date").

Reference	Date	Section
Bailey	October 2011 (published)	§102(a)
Tran	January 3, 2008 (published)	§102(b)
Kianl	December 2, 2003 (issued)	§102(b)
D'Angelo	September 2011 (published)	§102(b)
Ording	October 12, 2010 (issued)	§102(b)
Goldsmith	April 26, 2007 (published)	§102(b)
Moon	December 23, 2010 (published)	§102(b)

C. Claim Construction

Petitioner submits that all claim terms should be construed according to the

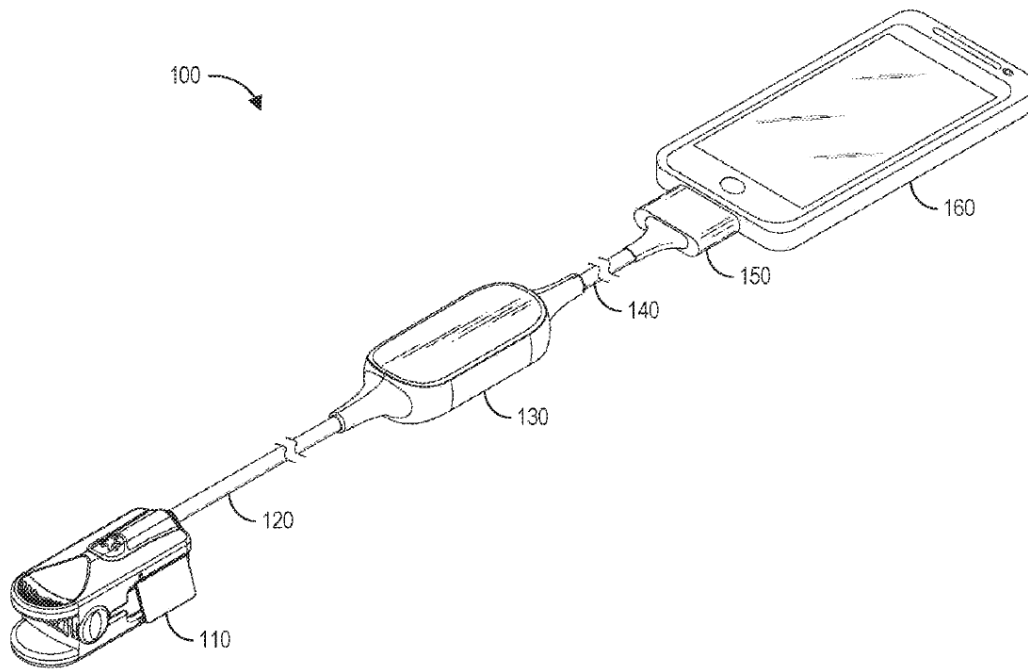
Phillips standard. *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005); 37 C.F.R. § 42.100. Here, based on the evidence below and the prior art's description of the claimed elements being similar to that of the '507 patent specification, no formal claim constructions are necessary in this proceeding because "claim terms need only be construed to the extent necessary to resolve the controversy." *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011). APPLE-1003, [24]-[25].

III. THE '507 PATENT

A. Brief Description

The '507 patent's physiological monitoring system includes a sensor 110, processing module 130, and mobile computing device 160. APPLE-1001, 3:57-62; APPLE-1003, [26]-[29]. The sensor 110 can be "a pulse oximeter capable of being secured to a digit such as a finger." *Id.*, 4:9-10. The mobile computing device 160 "can be one of a wide range of mobile devices such as . . . a smartphone . . . wristwatch, [or] wearable computing device." *Id.*, 3:65-67, 4:1-4. The processing module 130 receives sensor data from the sensor 110 and processes the signal "to provide output data for display on the smartphone 160." *Id.*, 4:65-10. The processing module 130 can wirelessly transmit data to the mobile computing device 160. *Id.*, 4:39-45. In some embodiments, "[t]he processing module 130 and sensor 110 draw power for operation from the mobile computing device." *Id.*,

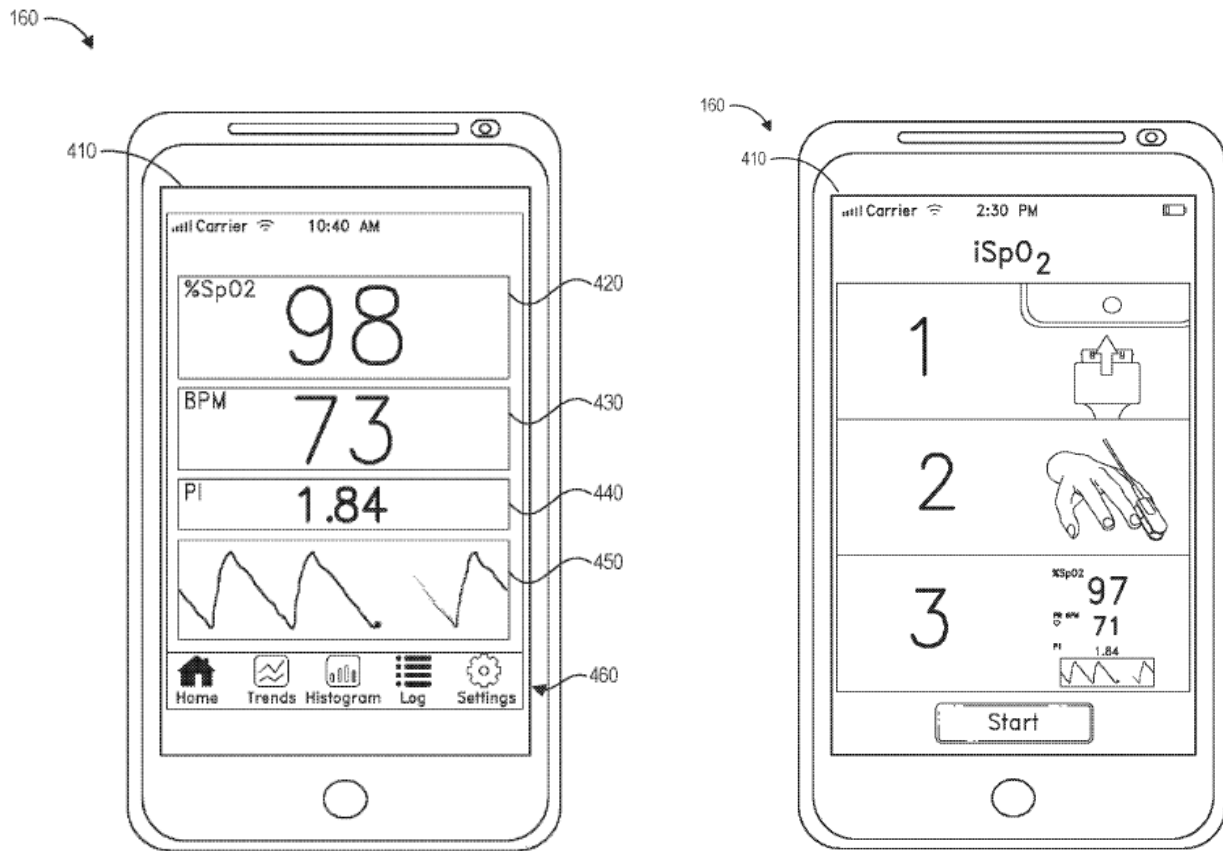
7:63-66.



APPLE-1001, Figure 1A

The mobile computing device 160 can include “an application configured to manage output measurement data from the processing module 130.” APPLE-1001, 5:25-27. “The application functionality can include trend analysis, current measurement information, alarms associated with above/below threshold readings, [and] reminders to take measurement data at certain times or cycles.” *Id.*, 5:27-32. In Figure 4A, a display 410 of the smartphone 160 displays a user interface with “a plurality of display portions in which a plurality of physiological parameters can be displayed, such as SpO2 display 420, heart rate display 430.” *Id.*, 13:25-33. A

user can interact with his physiological monitoring data through an options display portion 460, for example, choosing to view trends in the data by viewing a histogram or other graph. *Id.*, 13:44-50.



APPLE-1001, Figures 4A (left) and 4D

B. Prosecution History

The '507 patent was allowed after receiving a single office action. APPLE-1002, 107-120. Then-pending claims 2 and 14 (corresponding to issued claims 1 and 13) were amended to include display-related limitations. *Id.*, 96-106. A notice of allowability was issued with further amendments from the examiner adding,

“generating a graphical user interface having a plurality of display portions.” *Id.*, 30-41. However, as demonstrated below, the more pertinent references, including Bailey, D’Angelo, and Moon, provide the recited claim elements in a manner highly consistent with Masimo’s application of the claims for purposes of infringement.

IV. APPLICATION OF PRIOR ART TO THE ’507 PATENT CLAIMS

A. GROUND 1A: Bailey Over Claims 13-15 and 19

1. Bailey

Bailey describes a “remotely monitored pulse oximeter, a device that measures blood oxygen saturation.” APPLE-1004, 8; APPLE-1003, [30]-[43]. Bailey employs “[t]ypical pulse oximeters” that “utilize two light emitting diodes (LEDs), one red and one infrared, to measure relative levels of HbO₂ and Hb as blood is pumped through the body.” *Id.*, 10, Figure 1 (below). “The LEDs are positioned on one side of an extremity of the body, usually a finger, ear or toe, and a photodetector is placed on the opposite side, as in Figure 1.” *Id.* Bailey further describes that “[i]n operation the LEDs are pulsed alternately, with one off while the other is on, allowing the photodetector to measure the transmitted light intensity at each wavelength separately.” *Id.*, 11.

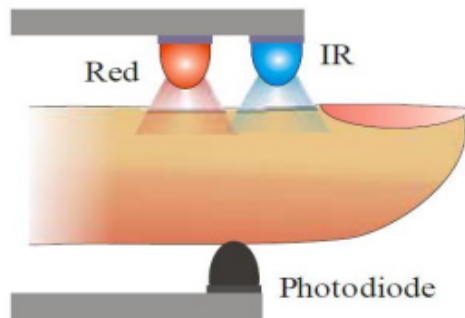


Figure 1: Typical pulse oximeter configuration [4]

APPLE-1004, Figure 1

Bailey’s pulse oximeter includes “three main systems: the LED driver control, analog signal processing, and digital signal processing systems.” APPLE-1004, 22. The “digital signal processing system” is in data communication with the “LED driver control” and “analog signal processing” and further in data communication with a smartphone (e.g., iPhone). *Id.*, 23, 8, Figure 7. Bailey’s “pulse oximeter housing” is “divided into two main parts: the main circuitry housing and the sensor housing. The main housing contains a LED driver circuit, temperature sensor, microcontroller circuit, antenna, and battery, while the sensor housing contains the LEDs, photodiode, and signal amplifier circuit.” *Id.*, 24, Figure 11 (below).



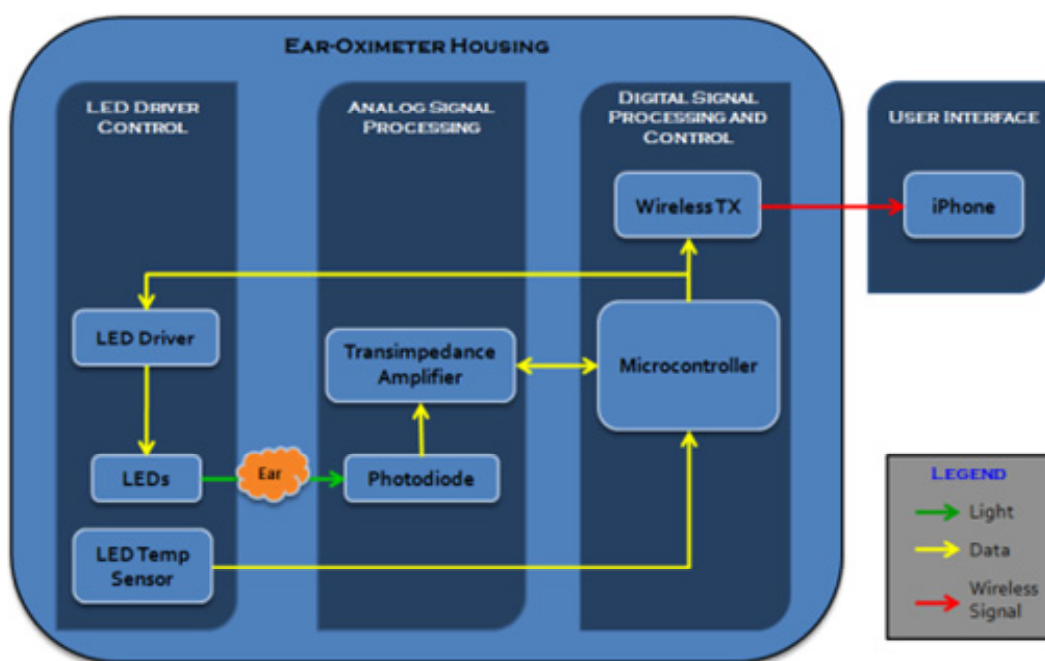
APPLE-1004, Figure 11¹

Bailey describes that components (e.g., LEDs, photodiode and signal amplifier circuit) of “LED driver control” and “analog signal processing” systems are contained in the sensor housing. APPLE-1004, 23-24, Figure 11. Further, components (e.g., LED driver circuit and temperature sensor) of the LED driver control system and components (e.g., microcontroller circuit and antenna) of the digital signal processing system are contained in the main circuitry housing. *Id.* LEDs in the LED driver control system “produce a consistent and accurate light output,” and “[t]he photodiode senses the optical power (light) present on the other side of the sample (the ear in this case) and proportionally produces a current. *Id.*, 23. This signal, in the form of an electrical current, is sent to the transimpedance amplifier where it is converted into a voltage and amplified.” *Id.*, 23, Figure 7 (below). “The amplified signal is sent to the microcontroller where the signal data

¹ All annotations are added unless indicated otherwise.

is processed and then sent to the wireless transmitter.” *Id.* The processed signals are “mathematically related to the actual oxygen saturation of the user.” *Id.*, 22.

Bailey’s “digital signal processing system,” which is contained in the main circuitry housing, includes a microprocessor that receives amplified signal from the analog signal processing system contained in the sensor housing. APPLE-1004, 23, Figure 7. Bailey’s digital signal processing system includes a wireless transmitter that “communicates with the application on the iPhone to send and display the data on the user interface.” *Id.*, 22-23.



APPLE-1004, Figure 7

The mobile device (e.g., iPhone) runs an application and includes a display. APPLE-1004, 23, 47-48, Figure 32. Bailey describes that “the user interface [is] implemented for an iPhone” to “display the recorded data from the microcontroller

via wireless interface.” *Id.*, 47. Further, Bailey’s graphical user interface has a plurality of display portions, as illustrated in Figure 32 (below). *Id.*, 48. Bailey’s mobile device displays at least a SpO2 value and a heart rate in respective display portions, as shown in Figure 32. *Id.* Bailey’s mobile phone also displays the results of the trend analysis in one display portion. *Id.*, 14.



APPLE-1004, Figure 32

Bailey’s mobile device also displays an “Options” menu so users can select several options including “O2 Alert Threshold,” “Volume,” and “File Name,” which are displayed in respective display portions. APPLE-1004, Figure 32. These options allow the user to interact with the display portions or the application.

APPLE-1003, [43]. For example, by adjusting the “Volume,” the user can interact with the application that generates a sound. APPLE-1004, Figure 32; APPLE-1003, [43]. By adjusting the “O2 Alert Threshold,” the user can interact with the display portion outputting an low O2 level alert. APPLE-1004, 47, 62, 8, 14, Figure 32.

2. Analysis

(a) Claim 13

[13pre]

To the extent that the preamble is limiting, Bailey describes a “remotely monitored pulse oximeter, a device that measures blood oxygen saturation.” APPLE-1004, 8. Bailey’s pulse oximeter is “intended primarily for consumer user” and designed for *mobile measurement of oxygen saturation* (under Masimo’s asserted definition for purposes of infringement) by providing “the ability to communicate data to a smartphone or other portable device” so that the device can be made “smaller by not needing to incorporate a display and user interface on the oximeter itself.” APPLE-1004, 8. Further, Bailey’s pulse oximeter is “intended to be worn by a person” and “needed to be durable enough to handle the daily rigors of being worn by an adult or child.” APPLE-1004, 14. Bailey’s pulse oximeter system needs to be “relatively small and as unobstructive as possible.” APPLE-1004, 15, 27 (“as small and as lightweight as possible”). A

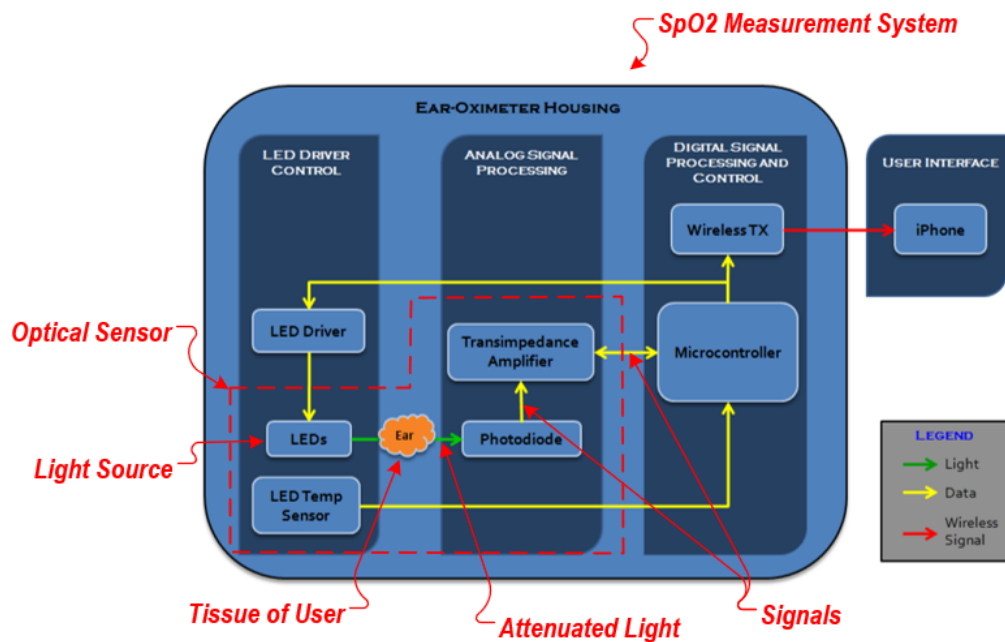
person of ordinary skill in the art (POSITA)² would have understood and found obvious that, given its small form factor and portable nature, Bailey's pulse oximeter is adapted for mobile measurement of oxygen saturation. APPLE-1003, [44].

Further, Bailey's system includes a mobile device (e.g., iPhone), which is in data communication with the "digital signal processing system," runs an application and includes a display, thereby implementing a ***computer-implemented method***. APPLE-1004, 23, 47-48, Figure 32. Bailey's mobile device is used to "display the recorded data from the microcontroller via wireless interface." APPLE-1004, 47. The device is also designed to "warn of dangerously low oxygen conditions." *Id.* Therefore, Bailey teaches ***a computer-implemented method of informing a user of mobile measurement of SpO2***. APPLE-1003, [45].
[13a]

Bailey's "device that measures blood oxygen saturation" (***SpO2 measurement system***) includes "the LED driver control, analog signal processing, and digital signal processing systems." APPLE-1004, 22, Figures 7 and 11 (below). As an example, Bailey describes that components (e.g., LEDs) of the "LED driver control system" and components (e.g., photodiode and

² APPLE-1003, [24]-[25] (defining a POSITA)

transimpedance amplifier) of the “analog signal processing system” are contained in the sensor housing, as illustrated in Figure 7, thereby implementing an *optical sensor*. APPLE-1004, 23-24; APPLE-1003, [46].



APPLE-1004, Figure 7



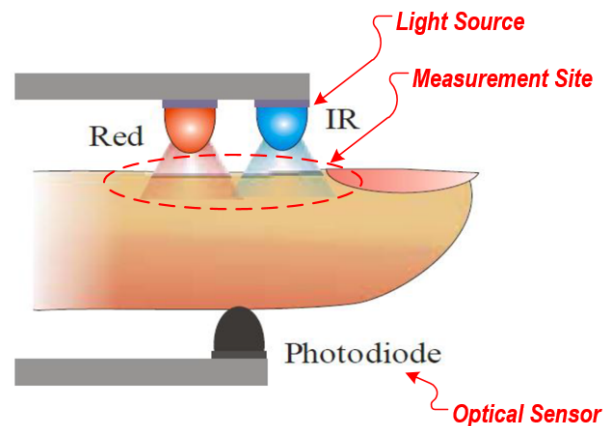
APPLE-1004, Figure 11

Bailey’s system (*SpO2 measurement system*) employs “[t]ypical pulse

oximeters” that “utilize two light emitting diodes (LEDs), one red and one infrared, to measure relative levels of HbO₂ and Hb as blood is pumped through the body.”

APPLE-1004, 9, Figure 1 (below). “The LEDs are positioned on one side of an extremity of the body, usually a finger, ear or toe, and a photodetector is placed on the opposite side, as in Figure 1,” thereby serving the *light source* for the system.

*Id.*³ Further, as shown in Figure 1, the optical sensor is configured to produce signals associated with light that is attenuated by tissue of the user at a measurement site, such as a finger in the illustrated example. APPLE-1003, [47]-[48].



APPLE-1004, Figure 1

Bailey further describes that “[i]n operation the LEDs are pulsed alternately, with one off while the other is on, allowing the photodetector to measure the transmitted light intensity at each wavelength separately. The

³ All emphases are added unless indicated otherwise.

transmitted light intensity differs greatly at each wavelength and can be attributed to the attenuation as it travels through the body, which results from a combination of reflection, scattering, and absorption by tissue and bone, venous blood, and arterial blood in the region. These values */signals/* are then also related to the absorption of light by the oxyhemoglobin and deoxyhemoglobin molecules.”

APPLE-1004, 11; APPLE-1003, [49].

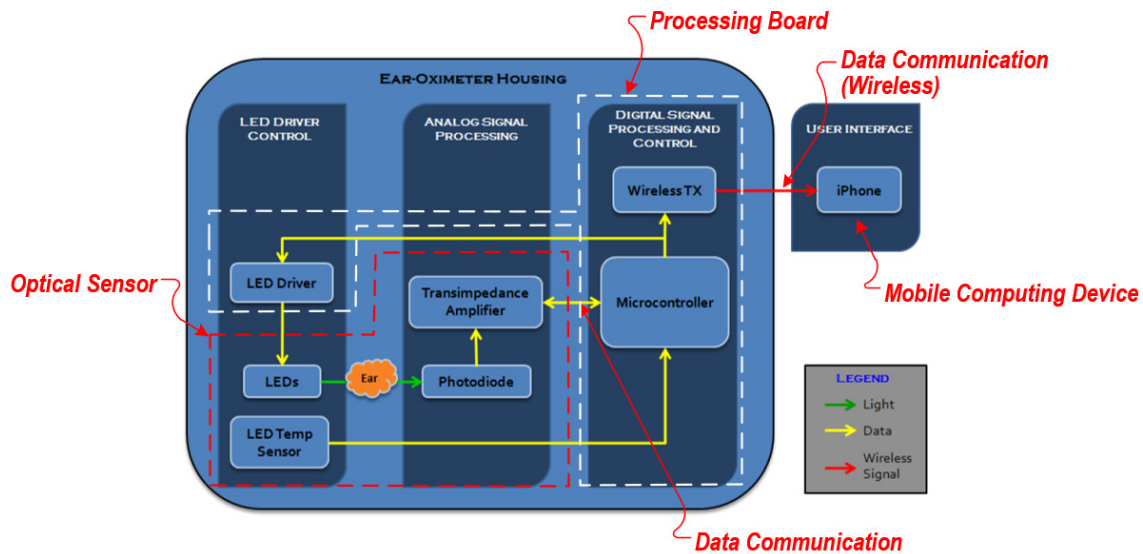
Referring to Figure 7, Bailey’s “LED driver control” and “analog signal processing” systems are at least partially contained in the sensor housing (*optical sensor*). APPLE-1004, 23-24. LEDs in the LED driver control system “produce[s] a consistent and accurate light output,” and “[t]he photodiode senses the optical power (light) present on the other side of the sample (the ear in this case) and proportionally produces a current. This *signal*, in the form of an electrical current, is then sent to the transimpedance amplifier where it is converted into a voltage and amplified.” *Id.*, 23. Further, the “amplified *signal* is sent to the microcontroller where the signal data is processed and then sent to the wireless transmitter.” *Id.* As such, Bailey’s sensor housing (*optical sensor*) outputs *signals*, including the signal produced by the photodiode and the signal amplified by the transimpedance amplifier, which are responsive to light that is produced by the LED driver control system and the LEDs (*light source*) and *attenuated by tissue of the user at a measurement site* as the light travels through the user’s

body. APPLE-1004, 9-11, 23-24, 27-28. Further, as noted above, the above signals are *responsive to an oxygen saturation of the tissue*. *Id.*; APPLE-1003, [50]-[51]. Bailey's description of outputting signals corresponds to the patent owner's apparent interpretation of this element in its exemplary infringement claim charts. APPLE-1021, 3; APPLE-1022, 5-6.

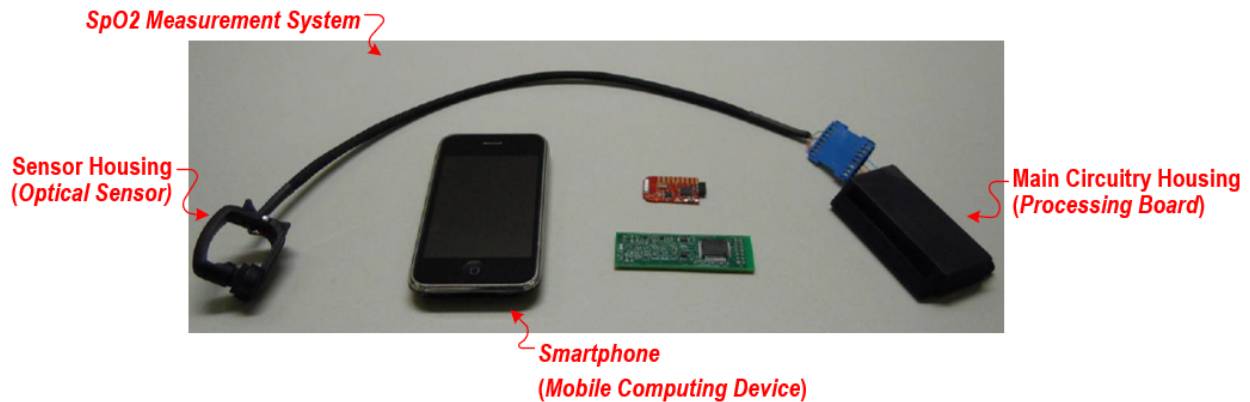
[13b]

As illustrated in Figure 7, Bailey's pulse oximeter includes "three main systems: the LED driver control, analog signal processing, and digital signal processing systems." APPLE-1004, 22. In particular, Bailey's "digital signal processing system" (or "digital signal processing and control" in Figure 7), or the main circuitry housing that contains the digital signal processing system, corresponds to a *processing board* in [13b]. APPLE-1003, [52].

Bailey's "digital signal processing system" is *in data communication with* a set of "LED driver control" and "analog signal processing," which are at least partially housed in the sensor housing (*optical sensor*), through a cable shown in Figure 11 below. APPLE-1004, 24, Figure 7; APPLE-1003, [53]. Further, the digital signal processing system, which is at least partially housed in the main circuitry housing, is *in data communication with* a smartphone (e.g., iPhone) (*mobile computing device*) through a wireless connection. *Id.*



APPLE-1004, Figure 7 (annotated)



APPLE-1004, Figure 11

As illustrated, Bailey's smartphone (e.g., iPhone) includes a *display*.

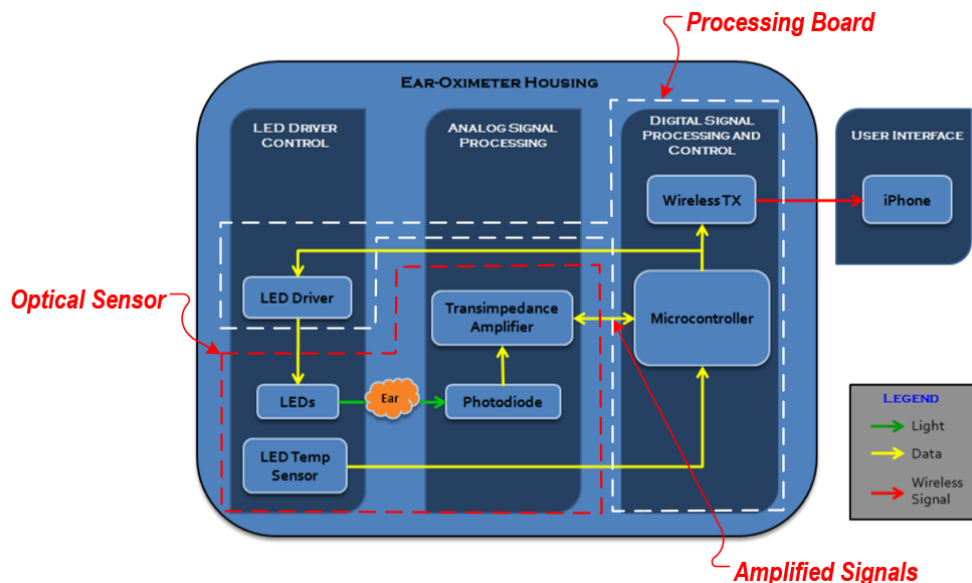
APPLE-1004, 48, Figure 32; APPLE-1003, [54].

To the extent that the processing board is considered to be separately configured from the optical sensor and the mobile computing device, Bailey's main circuitry housing (*processing board*), which contains components of the

digital signal processing system, is separate from, and connected via a cable to, Bailey's sensor housing (*optical sensor*), which contains components of the LED driver control system and the analog signal processing system. APPLE-1004, 23-24, Figures 7 and 11. Therefore, a POSITA would have understood that Bailey's main circuitry housing (*processing board*) is separate from Bailey's sensor housing (*optical sensor*) and the mobile device (*mobile computing device*). APPLE-1003, [55].

[13c]

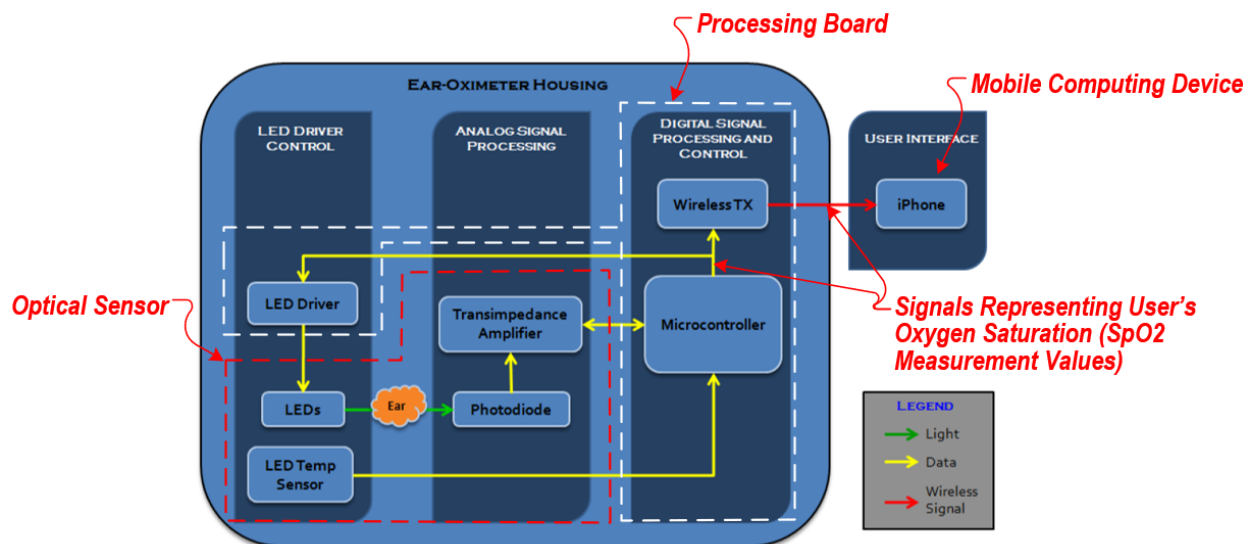
Referring to Figure 7, Bailey's digital signal processing system (*processing board*) includes a "microcontroller" that receives "amplified *signal*" from the "analog signal processing system" contained in the sensor housing (*optical sensor*). APPLE-1004, 23; *supra* [13a]; APPLE-1003, [56].



APPLE-1004, Figure 7

[13d]

Referring to Figure 7, Bailey describes that “[t]he amplified signal is sent to the microcontroller where the signal data is processed and then sent to the wireless transmitter.” APPLE-1004, 23. This amplified and processed signals, which were generated from the LEDs, are “mathematically related to the actual oxygen saturation of the user.” *Id.*, 22. As such, Bailey’s digital signal processing system (*processing board*) *processes the signals*, which were output from the sensor housing (*optical sensor*, [13a]), such that the processed signals represent the actual oxygen saturation of the user (*generate the SpO2 measurement values*). APPLE-1003, [57].



APPLE-1004, Figure 7

[13e]

Referring to Figure 7 above, Bailey's digital signal processing system (*processing board*) includes the wireless transmitter that "communicates with the application on the iPhone to send and display the data [*SpO2 measurement values* shown in [13d]] on the user interface." APPLE-1004, 23, 22 ("Afterward, the device would transmit the oxygen saturation as well as the pulsatile signal to an iPhone or iPod Touch and be displayed on a user interface that would allow the data to be monitored and stored."); APPLE-1003, [58].

[13f]

Bailey describes that the mobile device (e.g., iPhone) runs an *application*. APPLE-1004, 23 ("The transmitter wirelessly communicates with the application on the iPhone to send and display the data on the user interface."), 47 ("TI also had a separate requirement that the user interface be implemented for an iPhone. This was attainable because Apple makes a software development kit (SDK) available for the public to develop software for the iPhone OS."); APPLE-1003, [59].

A POSITA would have understood and found obvious that an application running on a mobile device like Bailey's iPhone is configured to *execute commands* to perform various functions at the mobile device, including the display functions and other operations described in the '507 patent. APPLE-1003, [60] (citing APPLE-1023, APPLE-1024). For example, Bailey's iPhone executes a program for operating the user interface to "manage[] the WiFi connection, listens

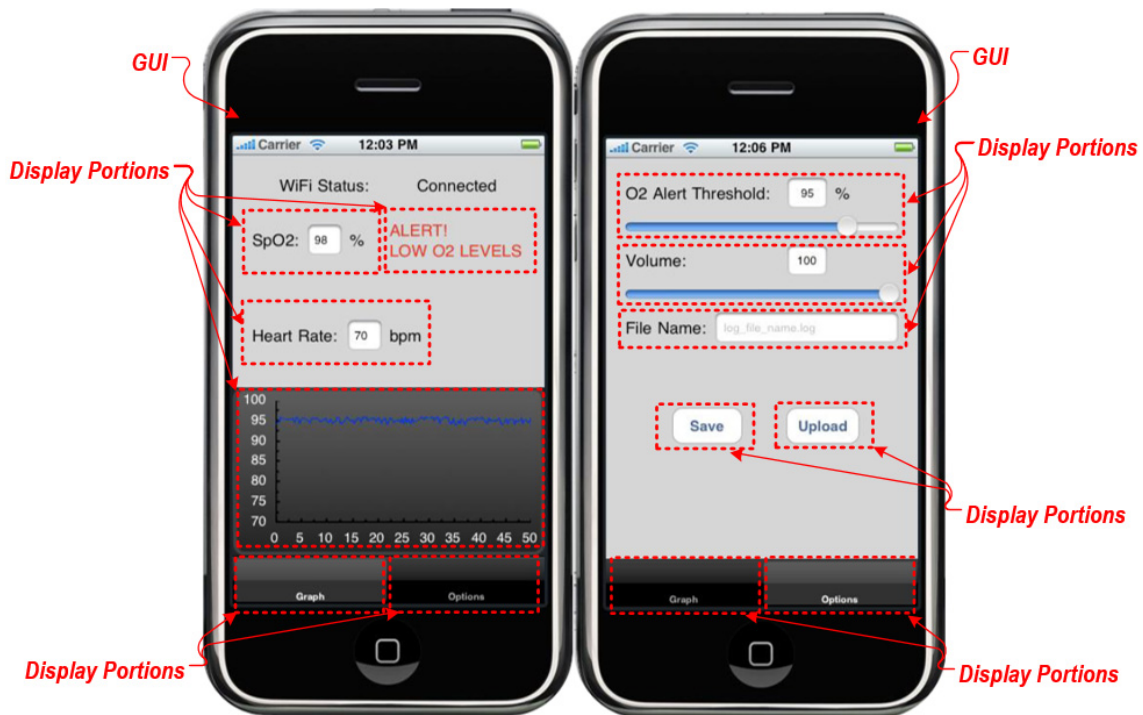
for data, verifies the data, updates the GUI, and manages the alert sound.”

APPLE-1004, 49, Figure 33. With these teachings, a POSITA would have understood and found obvious that the code running at the iPhone includes a series of commands consistent with the elements of the program flow shown in Bailey’s Figure 33. APPLE-1003, [60].

[13g]

Bailey describes that “the user interface [is] implemented for an iPhone” to “display the recorded data from the microcontroller via wireless interface.”

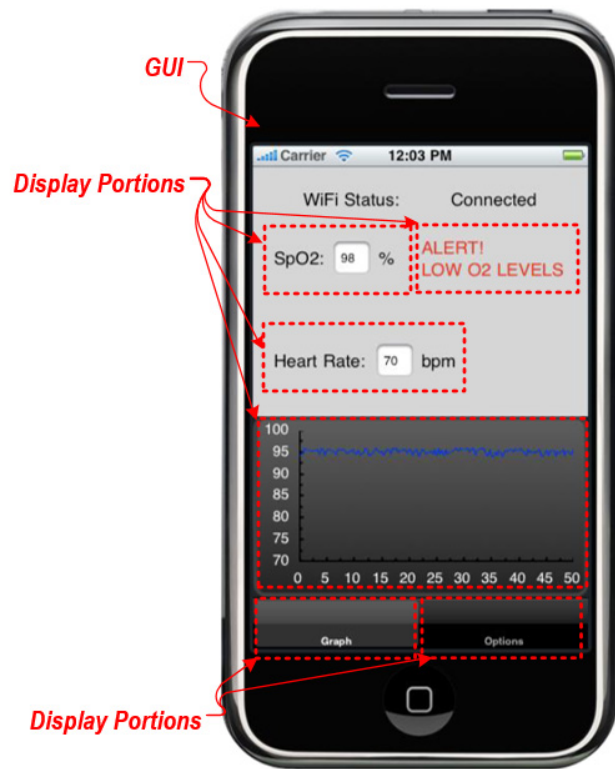
APPLE-1004, 47 (“an LCD to display the GUI”). Further, Bailey’s GUI (*graphical user interface*) has *a plurality of display portions*, as illustrated in Figure 32 below. *Id.*, Figures 32-33; APPLE-1003, [61].



APPLE-1004, Figure 32

[13h]

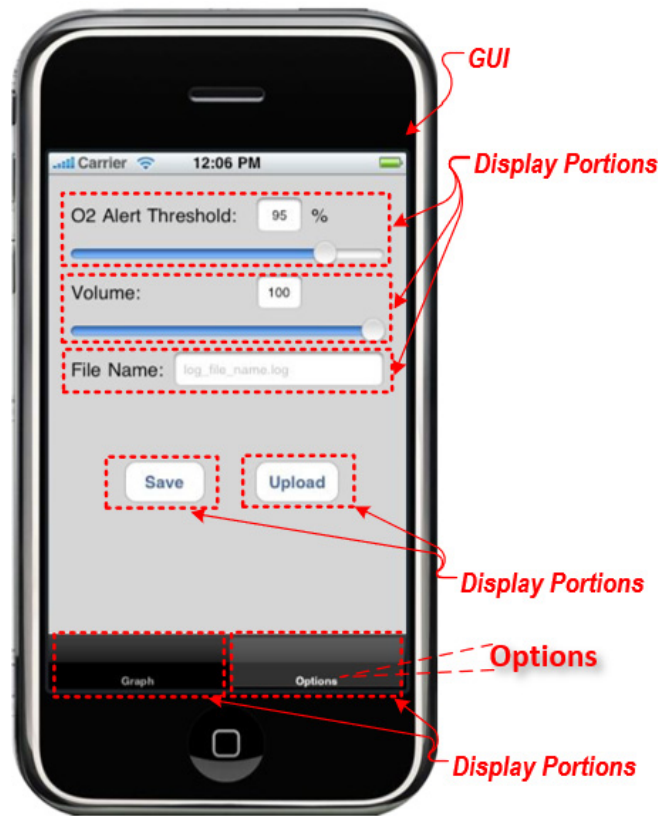
As shown in Figure 32 below, Bailey's mobile device displays at least a SpO2 value and a heart rate (*a plurality of physiological parameters comprising at least the SpO2 measurement values*). APPLE-1004, Figure 32. Further, the display of Bailey's mobile device has different *display portions* used for displaying different pieces of information, such as SpO2 and heart rate. APPLE-1003, [62]. For example, Bailey's SpO2 is represented as a numerical value (%) and a graph, which correspond to *representations of a physiological parameter*. APPLE-1004, Figure 32. Bailey's teaching of display portions is consistent with the '507 patent's disclosure. APPLE-1003, [63].



APPLE-1004, Figure 32 (partial)

[13i]

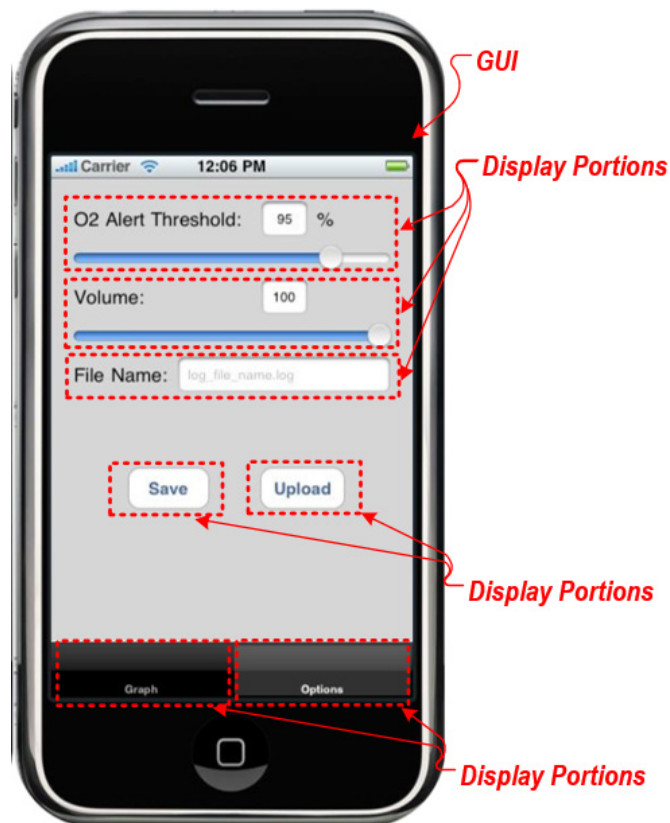
As shown in Figure 32 below, Bailey's mobile device displays a user-selectable "Options" menu where the user can select several options including "O2 Alert Threshold," "Volume," and "File Name" (*a plurality of user inputs*), which are displayed in respective *display portions*. APPLE-1004, Figure 32; APPLE-1003, [64].



APPLES-1004, Figure 32

The language “configured to allow the user to interact with at least one of the plurality of display portions or the application” does not appear to be limiting. However, to the extent that this language is given weight, a POSITA would have understood and found obvious that the options described in Bailey are *configured to allow the user to interact with the display portions or the application*. APPLE-1003, [65]. For example, the “O2 Alert Threshold” display portion includes a slider that a user can manipulate, or a text box to which the user can enter a value, to set the alert threshold. Through this user interaction with the display, the user is able to determine the threshold O2 level that will trigger an alert of low O2 levels.

APPLE-1004, Figure 32. Such user manipulation and entry of a value allow the user to interact with the display portion or the application that displays the display portion and receives and processes the entered value. APPLE-1003, [65]-[66]. The same analysis applies for the “Volume” display portion, “Save” display portion, and “Upload” display portion. *Id.*



APPLE-1004, Figure 32 (partial)

(b) Claim 14

[14pre]

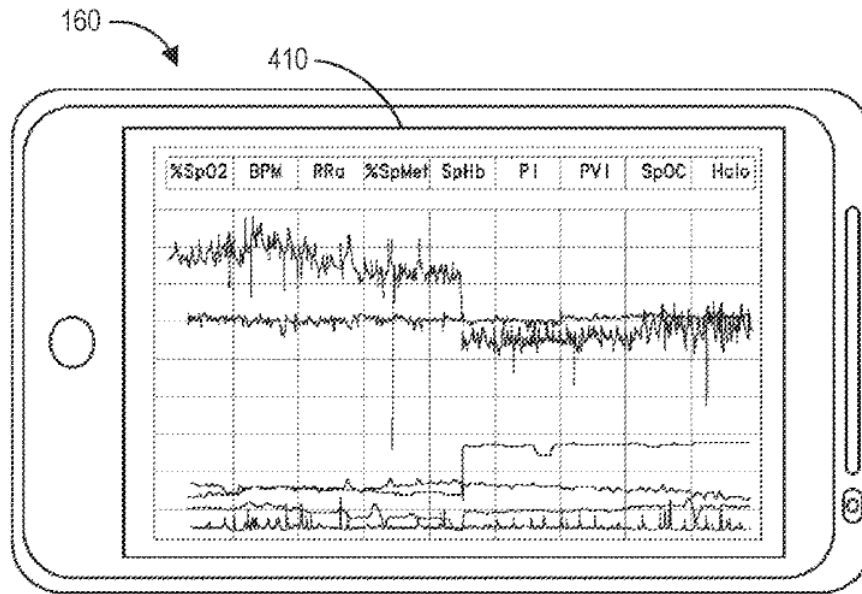
Supra [13f]; APPLE-1003, [67].

[14a]

Bailey's mobile device is configured to perform a trend analysis on the SpO2 measurement values received from the digital signal processing system (*processing board*, [13c]). APPLE-1003, [68]. Bailey's system includes "a means to record and store data" to "monitor trends in the blood oxygen saturation of the user." APPLE-1004, 14. Bailey's mobile device receives "continuous oxygen saturation data" collected over a certain period of time and stores it in a format that is "accessible and readable using common software." *Id.* ("[a] metric of one week's worth of continuous oxygen saturation data" or "over long period of time"), 55, Table 7 ("Data Logging – ability to continuously monitor data for specified time period"). For example, Bailey's mobile device can "output a file that was easily accessible and readable using common software, such as Microsoft Excel, so that both the user and medical personnel alike could easily read and analyze the recorded blood oxygen levels over long periods of time." APPLE-1004, 14. With these teachings, a POSITA would have understood and found obvious that a record of the blood oxygen levels over a long period of time would provide the data to look for trends in the blood oxygen measurement values. APPLE-1003, [68]. With access to a record of the blood oxygen levels over a long period of time, the process of performing a trend analysis would be straightforward and obvious to a POSITA. For example, the data could be displayed as a graph of measured blood oxygen level as a function of time, allowing a user to look at the data and visualize

the trend. Alternatively, a POSITA would have found it obvious to implement code on the mobile device to execute known data analysis methods (e.g., least-square fitting) on the data to look for increasing or decreasing trends. APPLE-1003, [68]-[69]. As such, a POSITA would have understood and found obvious that Bailey's mobile device *performs a trend analysis on received SpO2 measurement values* by receiving and storing the oxygen saturation data over a course of days and compiling the data into the "file" for output to the user. *Id.*; APPLE-1004, 14. Indeed, it was well-known to provide a display of the record of the data over a period of time at the mobile device, enabling the user to visualize the trend, as evidenced in several references. APPLE-1003, [70]-[71] (discussing APPLE-1018 and APPLE-1019).

The above analysis aligns with the '507 patent's disclosure of "trend analysis." APPLE-1003, [72]. The '507 patent describes a "trend analysis" as one of several application functions, stating that this function allows users "to manipulate the data to visualize trends in the data." APPLE-1001, 5:25-35, 5:50-52. The '507 specifies that "the user can choose to view trends in the data, as illustrated in FIG. 4C." APPLE-1001, 13:44-56.



APPLE-1001, Figure 4C

While the '507 patent describes changing the view (e.g., zooming in/out) and printing such trend information, there is no other disclosure of trend analysis in the '507 patent. APPLE-1003, [73]. A POSITA would have therefore recognized that displaying a graph of SpO₂ information collected and plotted over time in one of the display portions satisfies this element. *Id.*

[14b]

Bailey's mobile device displays a graph of SpO₂ values over time in a portion of the display screen, as illustrated in Figure 7 below. APPLE-1004, 48. Through this and above teachings, a POSITA would have understood and found obvious that Bailey's mobile device displays the **results of the trend analysis** in one of the **display portions**. APPLE-1003, [74].



APPLE-1004, Figure 32

(c) Claim 15

Bailey's mobile device generates the user interface ([13g]), via the *application* running on the mobile device, and implements "an alarm in the event that the blood oxygen level of the user fell below a safe level." APPLE-1004, 14, 47, 62. For example, Bailey's mobile device can "sound an alarm when a low oxygen level was reached," thereby teaching *outputting alarms associated with SpO2 measurement values that are above or below threshold SpO2 measurement values*. *Id.*; APPLE-1003, [75]. Further, Bailey's mobile device outputs the alarm on the display and provides an option for a user to set up the "O2 Alert Threshold" (*threshold SpO2 measurement values*) as shown in Figure 32 below. *Id.*



APPLE-1004, Figure 32

(d) Claim 19

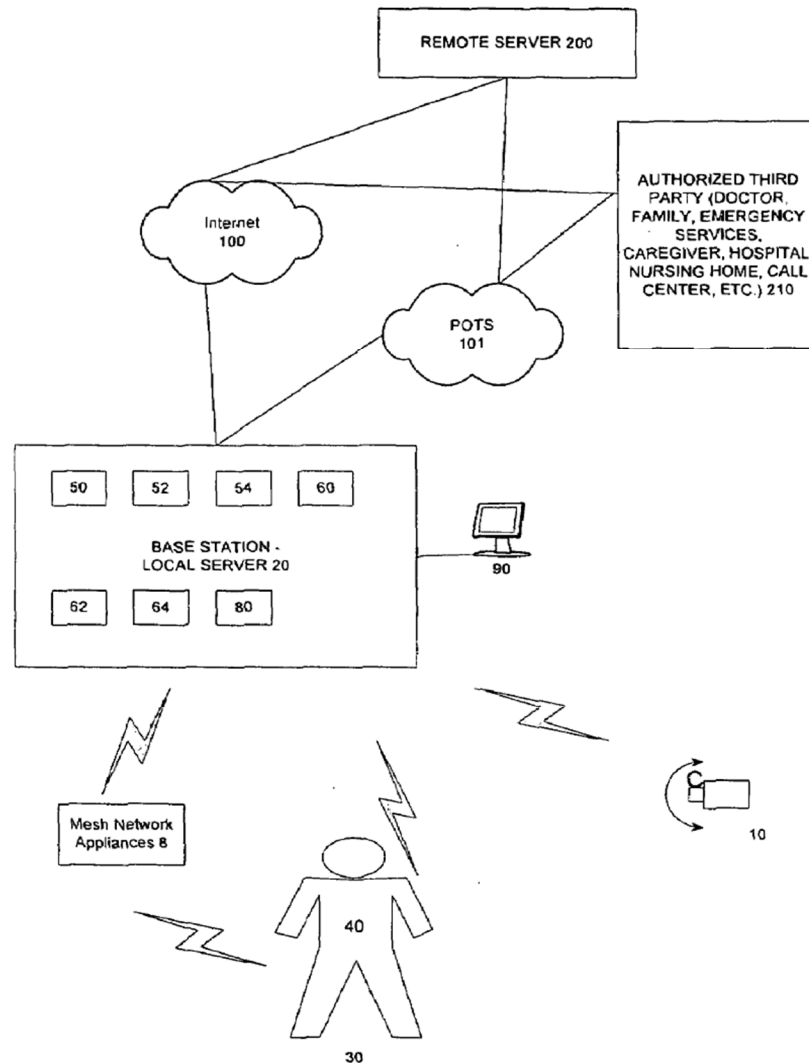
Bailey's *SpO2 measuring system* ([13a]) includes the digital signal processing system (*processing board*) that *wirelessly* communicates with the mobile device, such as iPhone (*mobile computing device*), via the wireless transmitter. APPLE-1004, 22, Figure 7; [13d]-[13e]; APPLE-1003, [76].

B. GROUND 1B: Bailey-Tran Over Claims 16, 18, and 20

1. Tran

Tran describes a “patient monitoring system.” APPLE-1005, [0054]. The system can include multiple physiological sensors, including a pulse oximeter. APPLE-1005, [0054], [0057], [0288], [0335], [0379], [0387]-[0389], [0417]. For example, the system can include “a blood oxygen saturation monitor, using an

infra-red or laser source, to alert the user if the patient's blood in the brain or some brain region is deoxygenated." APPLE-1005, [0335], [0057] (describing detecting "blood-oxygen levels and pulse rate"); APPLE-1003, [77]-[81]



APPLE-1005, Figure 1A

Tran describes allowing users to "set up alerts or reminders that are triggered when one or more reading meet a certain set of conditions, depending on parameters defined by the user." APPLE-1005, [0255]. An alert may be sent out

when a data parameter exceeds a predetermined value. *Id.*, [0260]. A user can designate authorized individuals, such as clinicians or caregivers, to receive alerts and set reminders and alerts. *Id.*, [0257], [0261].

2. Bailey-Tran

A POSITA would have been motivated to apply to Bailey's oximeter system based on Tran's teachings to issue reminders to the user to take SpO₂ measurements, allow the user to set such reminders to take future measurements, and output an alert via a network to a designated physician or other care provider in response to abnormal SpO₂ readings. APPLE-1003, [82].

First, a POSITA would have been prompted to modify Bailey to output reminders to take SpO₂ measurements, as taught by Tran, to ensure that the user's SpO₂ levels are being monitored at regular intervals so that SpO₂ values outside of preset thresholds can be identified and appropriate action can be taken in response. APPLE-1003, [83]. Bailey already specifies the importance of "an alarm in the event that the blood oxygen level of the user fell below a safe level." APPLE-1004, 14, 47, 52, 62. Taking such measurements is an integral part of Bailey's goal of "ensur[ing] that the wearer's ability to transport oxygen to the cells in his or her body has not been compromised." APPLE-1004, 9. Tran complements this functionality by teaching that "users may set up alerts or reminders" that occur according to a user specified "time duration in units such as hours, days, weeks or

months.” APPLE-1005, [0255]. Such reminders could be included in a “to do list” displayed to the user. *Id.*, [0418]. Such reminders would ensure that the user is checking physiological parameters, including SpO₂, at regular intervals such that problems can be readily identified and addressed. APPLE-1003, [84]. Such an application of Tran to Bailey would have been particularly beneficial in the use cases of Bailey in which the user is monitoring their own vital signs rather than the vital signs being monitored by a remote care giver. *Id.*

Second, a POSITA would have recognized that providing such reminders to take periodic measurements, including SpO₂, would have negated the need for continual monitoring of such parameters in at least some scenarios. APPLE-1003, [85]. Bailey is clear that one of its objectives is to ensure that the oximeter operates on battery power for an extended period of time (e.g., “for at least 12 hours”), and thus considers a battery consumption as a “functional requirement” for oximeters and selects “the electronic design and components” “to result in low power consumption in order to meet the requirement. APPLE-1004, 15 (“low power consumption”), 21 (“Power Consumption” in Table 2), 28 (“in an attempt to reduce the overall power consumption of the device”). A POSITA would have recognized that allowing for a configuration in which the system does not continually monitor SpO₂ levels in at least some scenarios while providing the user with reminders to make such measurements, as taught by Tran, would have

increased the power savings and therefore extended battery longevity while ensuring that SpO₂ measurements are still collected at sufficient intervals, thus providing both a sufficient level of patient monitoring while also extending battery life. APPLE-1003, [85].

Third, allowing the user to “set up alerts or reminders” according to “parameters defined by the user” can ensure that the reminders to take future SpO₂ measurements are provided to the user at proper intervals to ensure that any abnormal readings are properly captured and addressed. APPLE-1005, [0255]; APPLE-1003, [86]. Allowing the user to set the parameters for such reminders, as taught by Tran, would have allowed for flexibility such that the user is reminded to take such measurements at a time that is most convenient to them (such as when the user is awake, not likely to be engaged in another activity, not in the shower, etc.), to ensure proper compliance with taking such measurements and improve health outcomes. APPLE-1003, [86].

Fourth, a POSITA would have applied Tran to Bailey to send alerts to a designated physician or other care provider regarding abnormal SpO₂ readings for several known benefits. APPLE-1003, [87]; *infra* [18]. To the extent that Bailey’s disclosure of providing such alerts to remote care providers is not sufficiently express, Tran describes that providing such alerts to remote care providers beneficially alerts “remote healthcare provider[s]” to sudden changes in

physiological parameters that can “indicate a problem” to allow such healthcare providers to quickly and accurately respond to the healthcare event. APPLE-1005, [0028], [0129], [0260]; APPLE-1003, [88]. The user or caretaker can “choose[] the condition that they would like to be alerted to and [provide] the parameters (e.g. threshold value for the reading) for alert generation.” APPLE-1005, [0255]. This allows the healthcare provider to ensure that they are only alerted to physiological parameter readings (including abnormal SpO₂) when such a reading is concerning for that particular patient. APPLE-1003, [88].

Fifth, a POSITA would have recognized that applying Tran’s teachings to Bailey’s oximeter system allows for a wider variety of uses for the resulting system, such as leveraging communication via the Internet to expand the features and customize operations of the Bailey system. APPLE-1003, [89]. A POSITA would have appreciated that the addition of Tran’s features to Bailey’s system would require only straightforward modifications to software for interfacing with facilities and other users through the Internet, and that the result of these modifications would provide the simple and clear additive benefit of these features from Tran to the system of Bailey. *Id.*

Finally, a POSITA would have been prompted to modify Bailey’s system to allow users to set reminders for future measurements of SpO₂ at predetermined times, and output such reminders, as well as send alerts to remote care providers

regarding abnormal SpO₂ readings (as suggested by Tran) because doing so would be merely the application of a known technique to a known system ready for improvement to yield predictable results. APPLE-1003, [90]. Indeed, “when a patent ‘simply arranges old elements with each performing the same function it had been known to perform and yields no more than one would expect from such an arrangement, the combination is obvious.’” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007). Here, both Bailey and Tran disclose systems for remotely monitoring vital signs, including blood oxygenation, for users, and a POSITA would have recognized that applying Tran’s suggestions to Bailey’s system would have led to predictable results with a reasonable expectation of success without significantly altering or hindering the functions performed by Bailey’s system. APPLE-1003, [91]-[92].

3. Analysis

(a) Claim 16

Bailey’s mobile device (e.g., iPhone) runs the application ([13f]) configured to generate the user interface ([13g]) for outputting various pieces of information and menus for user interaction. APPLE-1004, 15, 50-51, 61-63; APPLE-1003, [93]. Tran similarly describes a “patient monitoring system” having multiple physiological sensors, such as a pulse oximeter and a heart rate monitor. APPLE-1005, [0054]. Further, similar to Bailey, Tran’s “blood oxygen saturation monitor,

using an infra-red or laser source,” can “alert the user if the patient’s blood in the brain or some brain region is deoxygenated.” APPLE-1005, [0335], [0057].

Tran’s system enables users to “set up alerts or *reminders* that are triggered” at certain “interval[s] which may be either the number of data points or a time duration in units such as hours, days, weeks or months,” “depending on parameters defined by the user.” APPLE-1005, [0255], [0257]. Such reminders would have been beneficially applied to “one or more reading[s]” including the SpO₂ and heart rate readings disclosed by both Bailey and Tran. APPLE-1005, [0255]; APPLE-1003, [94]. The Bailey-Tran combination would have modified Bailey’s mobile device to, via the application running at the device, output reminders to periodically check physiological parameters, including SpO₂ and heart rate, by *using the optical sensor to take measurements of SpO₂ measurement values at predetermined times or cycles*. APPLE-1003, [94]. A POSITA would have readily recognized that the combination would negate the necessity of continually monitoring such parameters, thereby providing additional power savings. *Id.* Further, a POSITA would have understood and found obvious that Tran’s teachings of reminders would be implemented via the application and user interface described in Bailey. *Id.* Indeed, Bailey’s application for the user interface (GUI) “manages the WiFi connection, listens for data, verifies the data, updates the GUI, and manages the alert sound.” APPLE-1004, 48-49, 52. Further,

Bailey describes that the user interface is implemented using a publicly-available “software development kit (SDK).” *Id.*, 47. Therefore, using Bailey’s application for the user interface and other available SDKs to implement and issue the reminders would have been the most straightforward way to implement Tran’s teachings in Bailey’s system. APPLE-1003, [94]. In addition to the reasons discussed above, several additional benefits would have prompted a POSITA for this Bailey-Tran combination. APPLE-1003, [95] (citing APPLE-1012 and APPLE-1013).

(b) Claim 18

As discussed above, Bailey describes “remote monitoring of an infant’s oxygen levels during sleep to warn of dangerously low oxygen conditions that may be associated with Sudden Infant Death Syndrome (SIDS) or suffocation.” APPLE-1004, 8. Further, Bailey’s mobile device transmits SpO₂ data wirelessly via a network, such as WiFi and Bluetooth. APPLE-1004, 47. With these teachings, a POSITA would have understood and found obvious that Bailey’s system desirably outputted an alert to a parent or other care providers regarding abnormal SpO₂ readings. APPLE-1004, 13-14, 47, 49, 52, 55, 62; APPLE-1003, [96].

Tran provides additional details that would modify Bailey’s oximeter system to provide the application that outputs an alert, via a network, to a designated

physician or other care provider, regarding abnormal SpO₂ readings. The predictable Bailey-Tran combination would allow users to “*set up alerts* or reminders that are triggered when one or more *reading meet a certain set of conditions*, depending on parameters defined by the user” including when readings, such as blood oxygen level meet a “threshold value for the reading.” APPLE-1005, [0255], [0252], [0054], [0246], [0335], [0417]. In Tran, “[t]he user chooses the destination where the alert may be sent.” APPLE-1005, [0255]. A POSITA would have understood that such alerts would have beneficially applied to “one or more reading[s]” including the SpO₂ and heart rate readings disclosed by both Bailey and Tran so that care givers could be promptly alerted to abnormal conditions. APPLE-1005, [0255]; APPLE-1003, [97]. This includes “alert[ting] caretakers to out-of-the-ordinary” readings to allow such caretakers to take proper action for the patient. APPLE-1005, [0129], [0252], [0260], [0320]. Tran teaches that “[t]he remote healthcare provider may receive alerts over the Internet” which a POSITA would have recognized as an example of a network. APPLE-1005, [0028], [0005], [0009]. A POSITA would have understood and found obvious that Trans’s teachings of outputting alerts would be implemented in Bailey’s system via the application because Bailey describes that the implementation of the user interface can be achieved using a publicly-available “software development kit (SDK).” APPLE-1004, 47-48; APPLE-1003, [97]. In addition to the reasons

discussed above, several additional benefits would have prompted a POSITA for this Bailey-Tran combination. APPLE-1003, [98] (citing APPLE-1015).

(c) Claim 20

As noted in [16], Tran provides that in the predictable combination, “*users may set* up alerts or *reminders*” that occur at certain “interval[s]” which can be “a time duration in units such as hours, days, weeks or months” based on “*parameters defined by the user.*” APPLE-1005, [0255]. In another example, “[a]n authorized person could set the reminders and alerts parameters.” *Id.*, [0257]. The reminder can be part of a “to do list.” *Id.*, [0418]. A POSITA would have understood and found obvious that such reminders would have beneficially applied to “one or more reading[s]” including the SpO₂ and heart rate readings disclosed by both Bailey and Tran and that such reminders to take readings are reminders to *take future measurements*. APPLE-1005, [0255]; APPLE-1003, [99]. Further, a POSITA would have recognized that such reminders would have been set via the application in the predictable combination because Bailey describes that the user interface can be implemented using a publicly-available “software development kit (SDK).” APPLE-1003, [99].

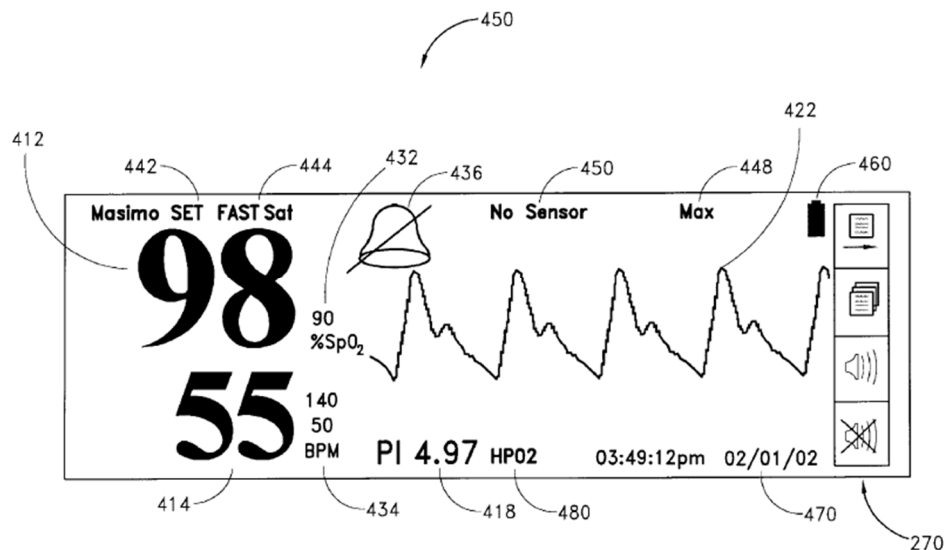
C. GROUND 1C: Bailey-Kianl Over Claims 14 and 17

While Bailey renders claim 14 obvious (Ground 1A), Kianl supplements Bailey’s teachings of performing and displaying a trend analysis on SpO₂ data

(claim 14), and further discloses graphical representations (e.g., charts) of SpO₂ measurement values (claim 17).

1. Kianl

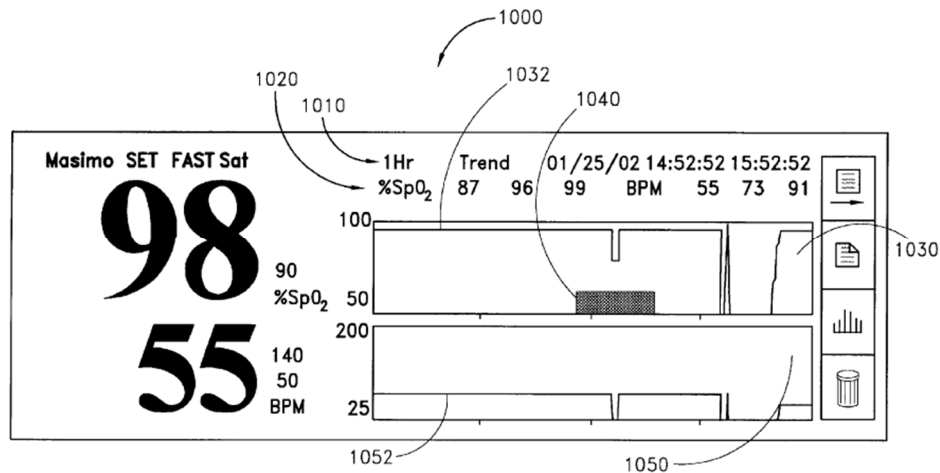
Kianl's blood oxygen saturation measurement system includes “[a] pulse oximetry user interface ha[ving] a display and a plurality of views each configured to occupy the display.” APPLE-1006, Abstract; APPLE-1003, [100]-[105]. The system switches between interface displays including “a pleth view that presents a pulse waveform” and “a trend view that presents a trend graph” with a selectable icon for switching between views. APPLE-1006, Abstract, 2:18-46.



APPLE-1006, Figure 4

“The oxygen saturation 412 displays a functional arterial hemoglobin oxygen saturation measurement in units of percentage SpO₂.” APPLE-1006, 6:1-3. The display also includes a “pulse waveform 422” of blood oxygen level. *Id.*,

6:10-15. Figure 10 includes “a pulse rate trend graph 1050” along with blood oxygen trend information over time. APPLE-1006, 11:6-49, 12:18-26.



APPLE-1006, Figure 10.

Kianl further describes a trend setup menu that allows the user to identify which trend analyses should be performed on the SpO₂ data. APPLE-1006, 15:10-56. Kianl also describes printing trend data and other data collected and generated by the system in various analog charts, including “printing” such information to various “trend views” of the system displayed on the user device, as shown in Figure 10. *Id.*

2. Bailey-Kianl

Multiple reasons would have prompted a POSITA to apply Kianl to Bailey to perform a trend analysis on received SpO₂ data, display the trend analysis results, and display SpO₂ measurement values in a plurality of graphical representations including charts. APPLE-1003, [106]. First, a POSITA would

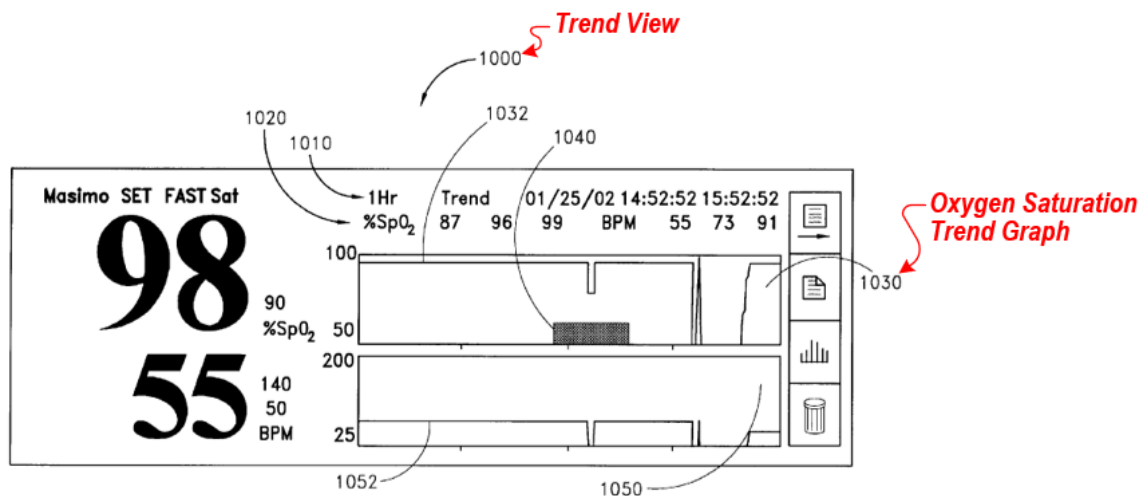
have recognized that “calculating a data trend” of measured SpO₂ data would have allowed health practitioners to more easily identify abnormal patterns, conditions, and other health concerns based on the blood oxygen saturation data. APPLE-1006, 2:32-41; APPLE-1003, [107]. Providing such data trend analysis automatically in the system would have led to more efficient identification of potential health concerns. APPLE-1003, [107]. Second, allowing the user to easily switch between various SpO₂ data views, including trend analysis views and real-time measurement values and waveforms would have provided the most complete information for healthcare providers and users to allow for consideration of all such relevant information when assessing the patient’s condition. APPLE-1003, [108]. Third, providing various graphical representations of SpO₂ values would have allowed healthcare providers and other users to more easily mentally process such information, leading to quicker and more accurate responsiveness to potential health conditions indicated by such information. APPLE-1003, [109]. A POSITA would have recognized that making processed physiological data easier to understand and react to would have improved the overall usefulness of the resulting system. *Id.* Fourth, providing touch screen user interface options for switching between such views would have increased the overall usability of the system. APPLE-1003, [110]. Finally, such a modification also would have been merely the application of a known technique to a known system ready for

improvement to yield predictable results and therefore a POSITA would have had a reasonable expectation of success in such a modification. APPLE-1003, [111]-[112]; *KSR*, 550 U.S. at 417.

3. Analysis

(a) Claim 14

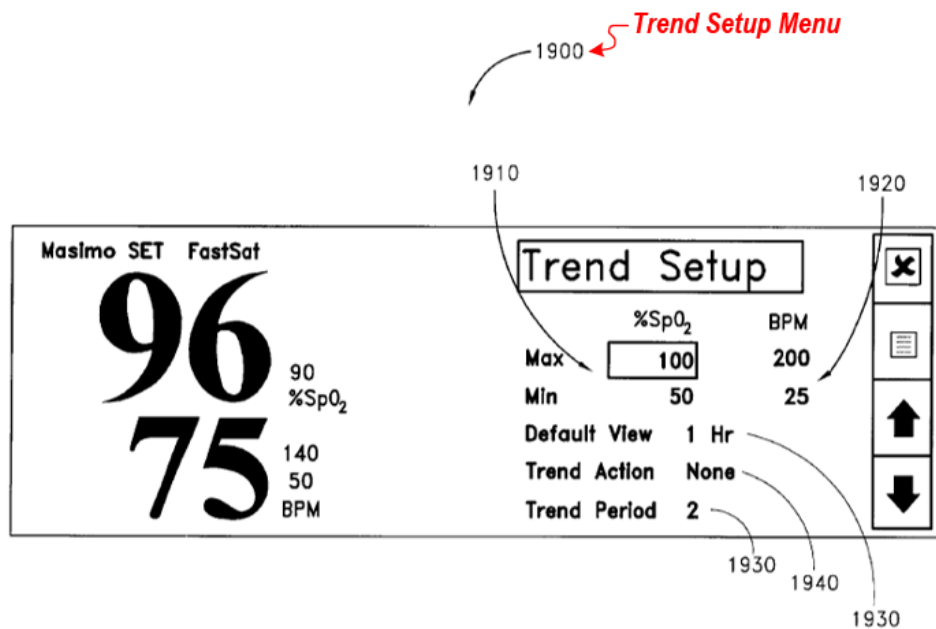
Kianl discloses that in the predictable combination the system “calculat[es] a data trend responsive to the physiological signal and provid[es] the pulse waveform in a first display view” as part of “a pulse oximetry user interface.” APPLE-1006, 2:32-36. Figure 10 shows “a trend view 1000” that includes “an oxygen saturation trend graph 1030.” APPLE-1006, 11:6-31; APPLE-1003, [113]-[114].



APPLE-1006, Figure 10

Kianl further discloses a “trend setup menu 1900” that allows the user to specify what trends are calculated and displayed based on the SpO₂ measurement

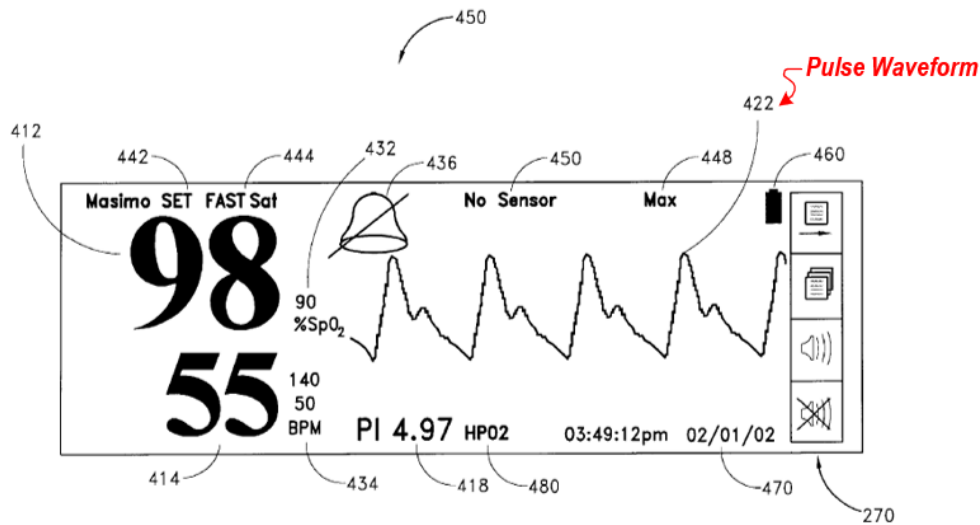
data. APPLE-1006, 15:11-40, Figure 19; APPLE-1003, [115].



APPLE-1006, Figure 19

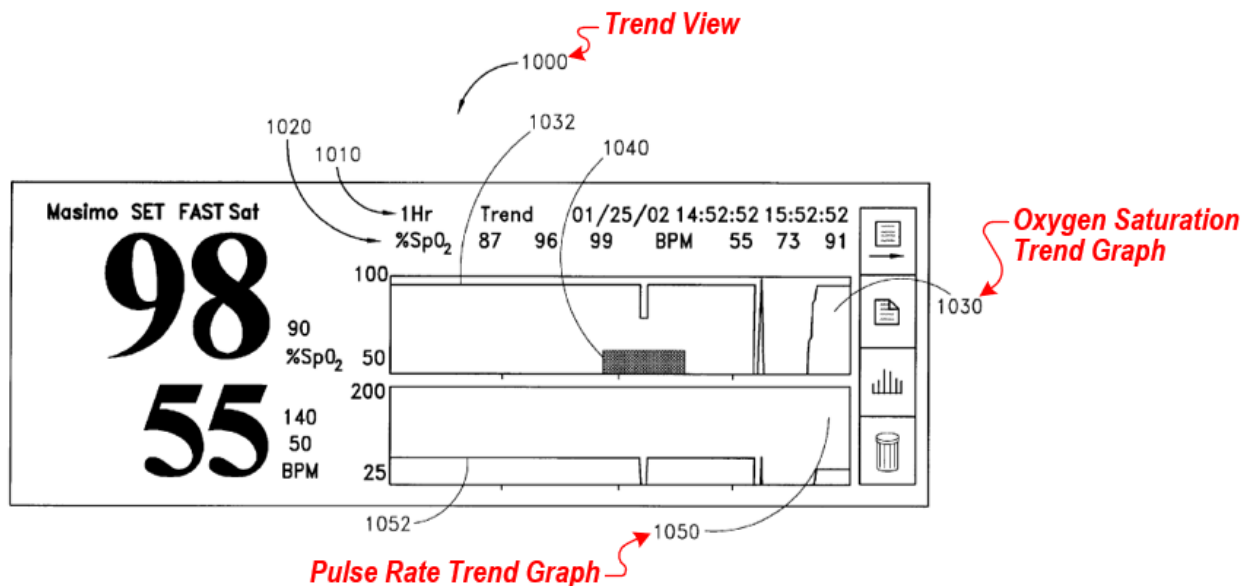
(b) Claim 17

Kianl discloses that in the resulting combination, the system provides a plurality of graphical representations of the SpO₂ measurement values including “a pleth view that presents a pulse waveform” and “a trend view that presents a trend graph.” APPLE-1006, 2:18-31, 1:33-37; APPLE-1003, [116]-[117]. The “pulse waveform 422” of Figure 4 shows the pleth SpO₂ waveform while Figure 10 demonstrates the “trend view 1000” including “oxygen saturation trend graph 1030.” APPLE-1006, 5:65-6:15, 11:6-49.



APPLE-1006, Figure 4

“The oxygen saturation 412 displays a functional arterial hemoglobin oxygen saturation measurement in units of percentage SpO₂.” APPLE-1006, 6:1-3. The display also includes a “pulse waveform 422” of blood oxygen level. *Id.*, 6:10-15. Figure 10 includes “a pulse rate trend graph 1050” along with blood oxygen trend information over time. *Id.*, 11:6-49, 12:18-26; APPLE-1003, [118].



APPLE-1006, Figure 10

These trends are plotted over time and therefore a POSITA would have recognized that the display of these different representations of SpO₂ measurement data are updated with each new measurement. APPLE-1006, 11:6-49, 14:18-30; APPLE-1003, [119]. Kianl further discloses a “trend setup menu 1900” that allows the user to specify what trends are calculated and displayed based on the SpO₂ measurement data. APPLE-1006, 15:11-40. This menu includes an option to output the measured SpO₂ data as an “analog dump” including “an analog chart” of the data. A POSITA would have recognized that it would have been beneficial to include this chart as displayed data on Bailey’s GUI in addition to or in place of printing such information to more readily provide the information “so that both the user and medical personnel alike could easily read and analyze the recorded blood oxygen levels over long periods of time,” as described in Bailey. APPLE-1004, 14; APPLE-1003, [119]. Displaying such information on the interface rather than in print would have negated the need for a printer which would have been beneficial “for consumer use” in such remote settings outside of a healthcare facility. APPLE-1004, 8, 13, 15; APPLE-1003, [119].

D. GROUND 1D: Bailey-D’Angelo Over Claims 1-2, 5, 7, 9, 12-15, 17, and 19

1. D’Angelo

D'Angelo describes a system “for interfacing assistant devices and smartphones.” APPLE-1007, 1528; APPLE-1003, [120]-[127]. The system includes a management device, shown below in Figure 4, that communicates with a variety of sensor network nodes that monitor and process various health parameters in real time. APPLE-1007, 1528-30. The management device processes the data received from the sensors and can interface with a smartphone to display the measurements. *Id.*, 1529-31.



APPLE-1007, Figure 4

D'Angelo teaches that its management device, when connected to a smartphone, draws power directly from the smartphone to allow it to operate even when the battery is dead. APPLE-1007, 1530. As shown in Figure 3 below, “[t]he

second addition is a connection between the smartphone's power output pin and the management device's charging pin, allowing to read out the management device with the smartphone even when its battery is empty.” *Id.*

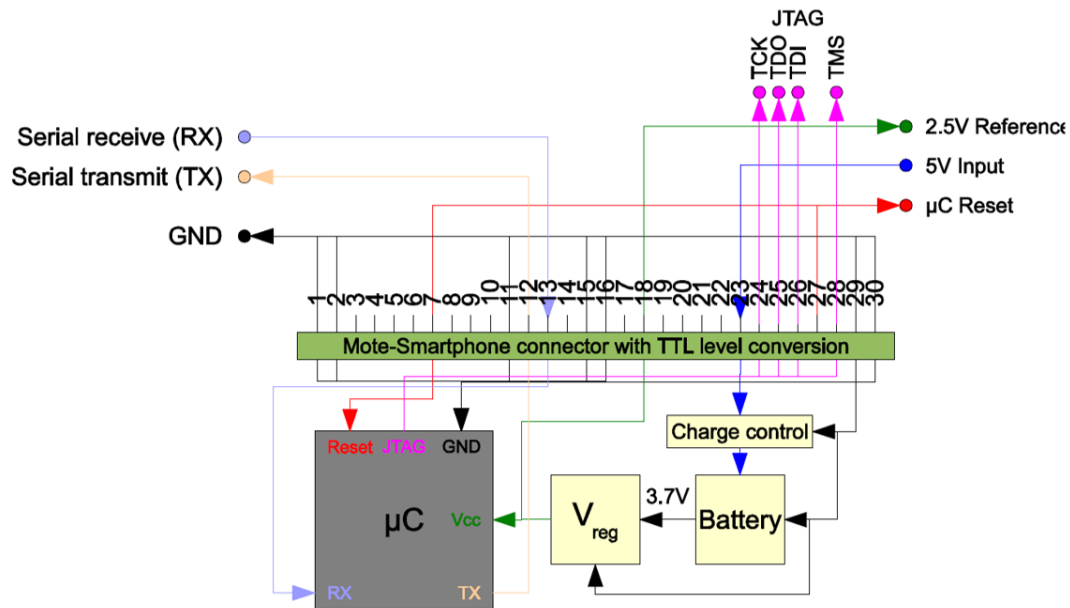


Fig. 3 Pin assignment of the mote-smartphone connector.

APPLE-1007, Figure 3

D’Angelo further describes a user interface displayed by the smartphone that includes multiple views for displaying measured physiological parameters including numerical values for each variable along with “upper and lower limits” for the variables, a “graph view” which shows multiple rows associated with various variables, and an “options view” that allows the user to set upper and lower limits for each variable using a picker wheel. APPLE-1007, 1530-31.

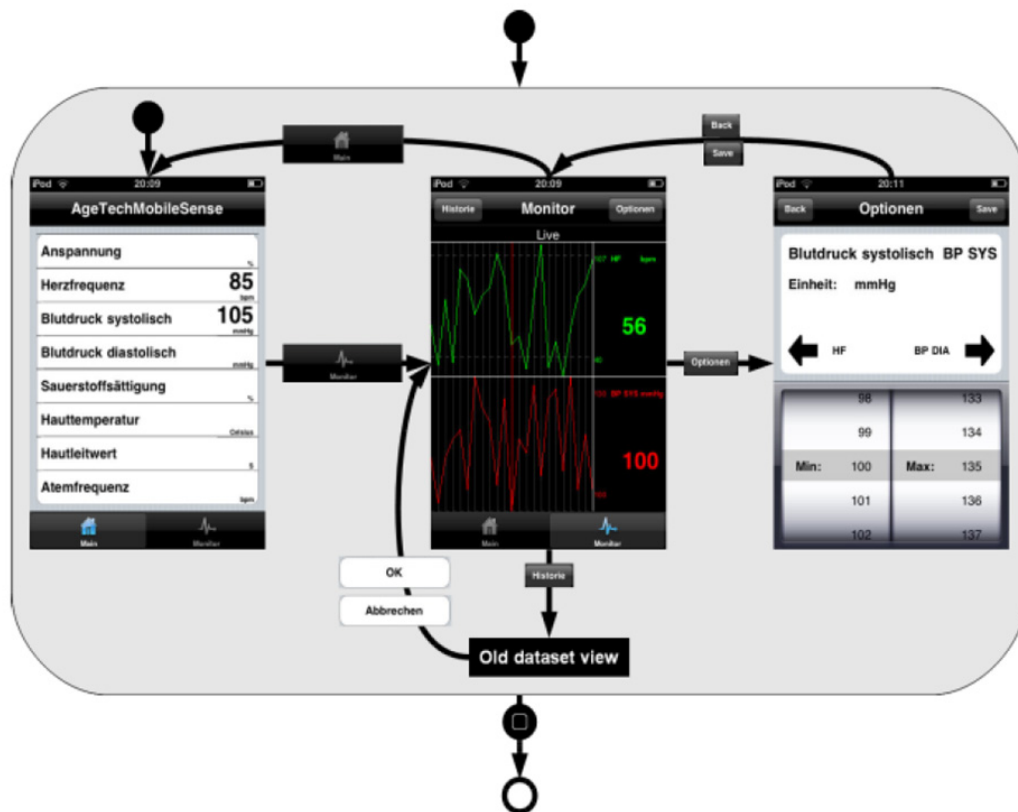


Fig. 5 Screenshots of the iPhone application visualizing acquired vital parameters live and previously recorded datasets.

APPLE-1007, Figure 5

The graph view allows users to view minimum and maximum recorded values and “scroll through current and older values.” APPLE-1007, 1530-31. The measured values include SpO₂. *Id.*, 1529.

2. Bailey-D’Angelo

Multiple reasons would have prompted a POSITA to apply D’Angelo’s teachings to Bailey’s pulse oximeter system to configure Bailey’s pulse oximeter (e.g., its “digital signal processing system” or “main circuitry housing”) to draw power from Bailey’s smartphone, and to include various physiological user

interface displays described by D'Angelo in addition to or in place of the user interface screens described by Bailey. APPLE-1003, [128].

First, a POSITA would have recognized that applying D'Angelo's teachings to Bailey's oximeter system would implement Bailey's smartphone to provide an improved user interface that expands the features and customizes operations of the Bailey system as taught by D'Angelo. APPLE-1003, [129]. The addition of the features disclosed by D'Angelo to Bailey's system would have required only straightforward modifications to software for interfacing with facilities and other users through the Internet, via the cellular connection of the smartphone, and that the result of these modifications would provide the simple and clear additive benefit of these features from D'Angelo to Bailey's system to facilitate Bailey's remote monitoring functionality. *Id.*

Second, modifying Bailey's oximeter system to be able to draw power from the smartphone would have provided the additional and beneficial functionality for the measured SpO₂ and physiological data to be read from the main circuitry housing "even when its battery is empty." APPLE-1007, 1530; APPLE-1004, 24 ("The main housing contained ... battery"). Such a modification to Bailey's system based on the straightforward teachings of D'Angelo would have provided crucial backup functionality for collecting important physiological data, including SpO₂ readings, even in scenarios in which Bailey's main circuitry housing has lost

power, which could facilitate potentially lifesaving interventions based on the physiological data read from the main circuitry housing. APPLE-1003, [130].

Third, including the multiple measured physiological data views disclosed by D'Angelo in Bailey's system would have improved the overall functionality and user experience of the resulting system. APPLE-1003, [131]. D'Angelo discloses additional graphical views for collected physiological information, including SpO₂ readings, that would have helped users to more readily understand the recorded information, including by "scroll[ing] through current and older values." APPLE-1007, 1529-31; APPLE-1003, [131].

Fourth, providing the user interface controls described by D'Angelo in Bailey's system would have allowed the user to easily set alarm limits for physiological parameters, including SpO₂. APPLE-1007, 1531; APPLE-1003, [132]. Bailey recognizes the importance of alerting the user or a caregiver when SpO₂ values are outside of threshold values and D'Angelo allows those values to be easily and intuitively set for each specific user according to their specific situation. APPLE-1004, 14, 47, 52, 62; APPLE-1007, 1531; APPLE-1003, [132].

Fifth, A POSITA would have recognized that D'Angelo's user input controls for displaying various different controls and data views would have increased the utility of the resulting system. APPLE-1003, [133]. Bailey describes the application executing on the smartphone that provides a user interface to "display

the recorded data from the microcontroller via wireless interface” and “sound an alarm when a low oxygen level was reached.” APPLE-1004, 47-50. D’Angelo provides additional details for changing between different user interface views to control aspects of the system including by setting alarm limits and viewing the recorded physiological information in different formats including graphically, numerically (in charts), and as scrollable waveforms. APPLE-1007, 1530-1531; APPLE-1003, [133]. A POSITA would have recognized that such additional functionality and flexibility in the GUI would have increased the overall utility of the system. *Id.*

Finally, such a modification also would have been merely the application of a known technique to a known system ready for improvement to yield predictable results and therefore a POSITA would have had a reasonable expectation of success in such a modification. APPLE-1003, [134]-[135]; *KSR*, 550 U.S. at 417.

3. Analysis

(a) Claim 1

[1pre]

Supra [13pre]; APPLE-1003, [136]-[139].

In particular, Bailey describes a “remotely monitored pulse oximeter, a device that measures blood oxygen saturation.” APPLE-1004, 8. Bailey’s pulse oximeter is in data communication with a mobile device (e.g., iPhone), which runs

an application and includes a display, thereby implementing a mobile pulse oximetry *system*. APPLE-1004, 23, 47-48, Figure 32. Bailey's mobile device is designed to "warn of dangerously low oxygen conditions," thereby teaching *a mobile pulse oximetry system for informing a user of mobile measurement of SpO₂*. APPLE-1004, 47; APPLE-1003, [137]-[138]. Bailey's pulse oximeter is "intended to be worn by a person" and thus made "smaller by not needing to incorporate a display and user interface on the oximeter itself." APPLE-1004, 8, 14. Therefore, it would have been apparent and obvious that Bailey's pulse oximeter is adapted for *mobile measurement of oxygen saturation*. APPLE-1003, [137]-[138]. Additionally, D'Angelo similarly describes a mobile pulse oximetry system for informing a user of mobile measurement of SpO₂. *Id.*, [139].

[1a]

Supra [13a]-[13d]. Bailey discloses an SpO₂ measurement system including "the LED driver control, analog signal processing, and digital signal processing systems." APPLE-1004, 9-11, 22-24, 27-28, Figures 1, 7, 11, and 32; APPLE-1003, [140].

[1b]

Supra, [13a]; APPLE-1003, [141].

[1c]

Supra, [13b]; APPLE-1003, [142].

Further, Bailey's mobile phone (e.g., iPhone) was well-known for **cellular communication** before the Critical Date. APPLE-1003, [143]; APPLE-1005, [0010], [0018], [0108]; APPLE-1009, [0016]-[0018], [0047]; APPLE-1010, [0136].

[1d]

Supra, [13c]; APPLE-1003, [144].

[1e]

Supra, [13d]; APPLE-1003, [145].

[1f]

Supra, [13e]; APPLE-1003, [146].

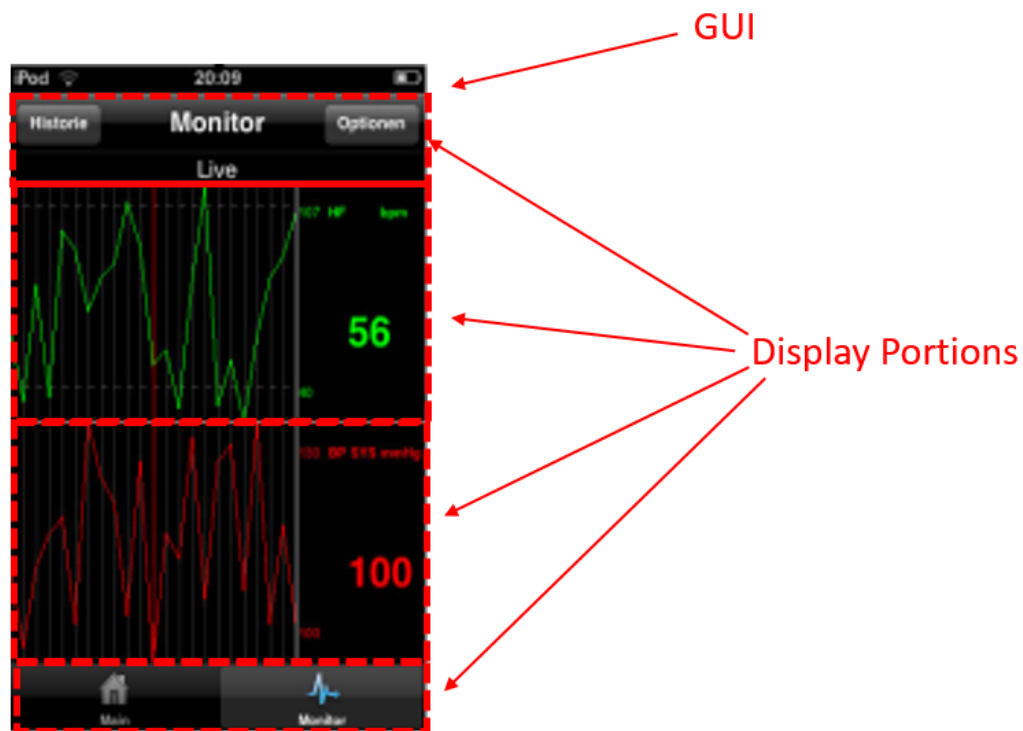
[1g]

Supra, [13f]; APPLE-1003, [147].

Further, it would have been obvious that Bailey's mobile device (e.g., iPhone) includes **one or more hardware processors**, which executes an application. APPLE-1003, [148]; APPLE-1007, 1528-29 (describing "processing" by the mobile phone). In the predictable combination, the hardware processors of Bailey's smartphone execute the application disclosed by Bailey (as modified based on D'Angelo), which executes commands to perform the described functions. APPLE-1004, 23, 49, Figure 33; APPLE-1003, [148].

[1h]

Bailey's GUI includes a plurality of display portions. *Supra* [13g]; APPLE-1003, [149]. Alternatively, D'Angelo shows a graphical user interface having a plurality of display portions that would have been beneficially implemented as one of the display screens in the resulting combination for the reasons discussed in Section IV.D.2. APPLE-1003, [150].



APPLE-1007, Figure 5

[1i]

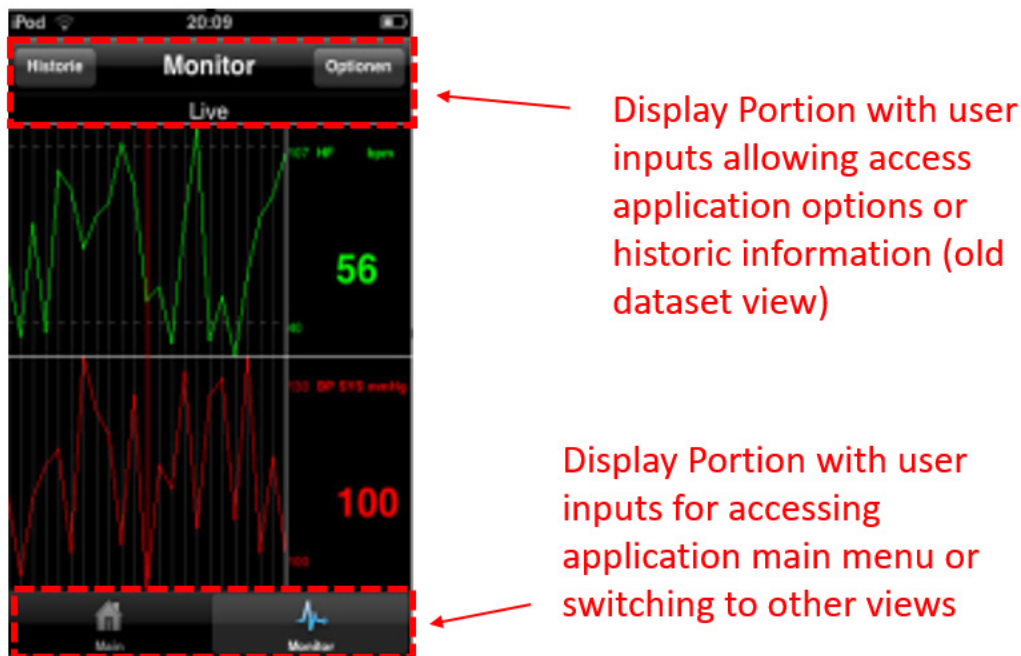
Bailey provides this element. *Supra*, [13h]. APPLE-1003, [151].
Alternatively, D'Angelo discloses that its “Graph view” (reproduced above) includes graphs of “variables for which values are available” as received from the physiological sensors. APPLE-1007, 1530. As shown in Figure 5 (above),

multiple scrolling graphs along the left of the GUI show multiple measured physiological parameters while for each “the value is shown as a number along with the corresponding unit and current maximum and minimal value measured” for the parameter. APPLE-1007, 1530-31; APPLE-1003, [152]-[153]. Bailey discloses that this plurality of physiological parameters comprises SpO₂ values. APPLE-1004, Figure 32; APPLE-1007, 1529.

[1j]

Bailey provides this element. *Supra*, [13i]. APPLE-1003, [154].

Alternatively, D’Angelo’s “Graph view” includes several display portions that allow the user to interact with the display portions and the application. APPLE-1007, 1530-31; APPLE-1003, [155].



APPLE-1007, Figure 5

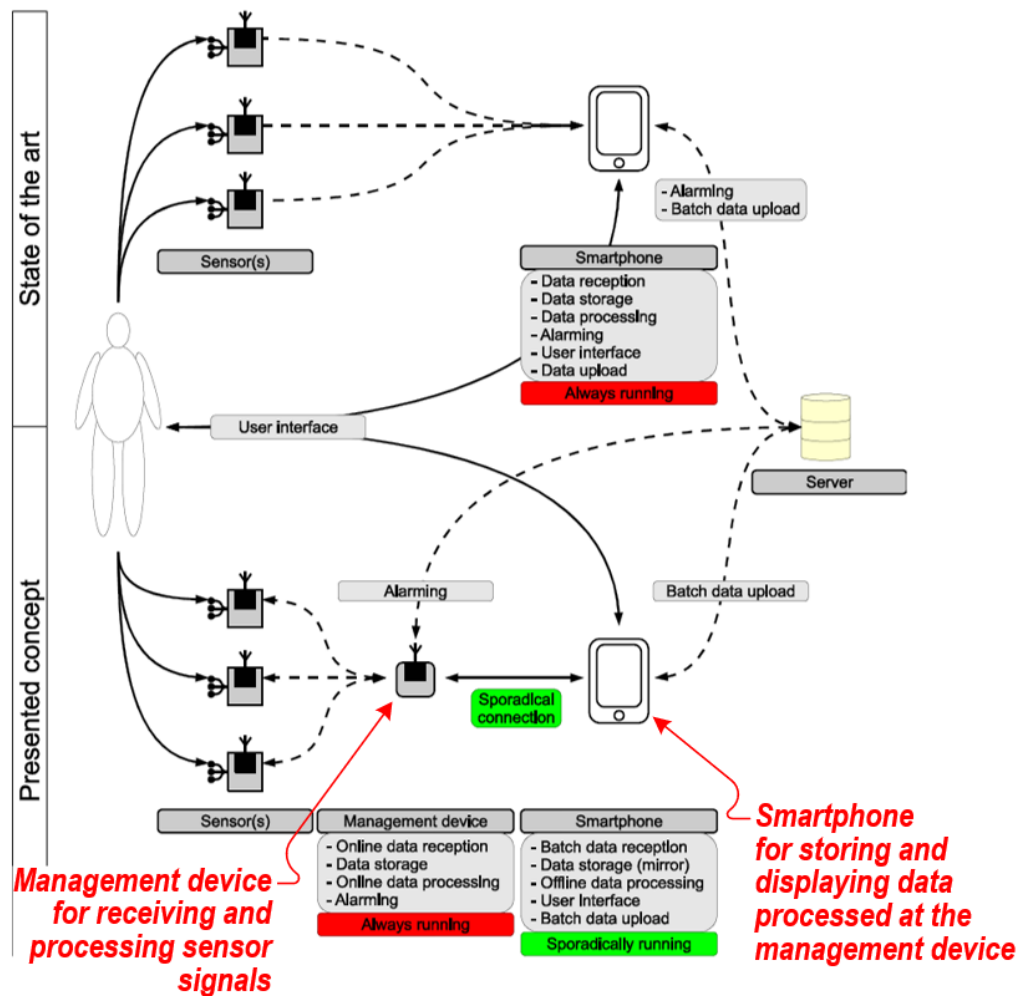
For example, the GUI includes a first portion with user inputs allowing access to application options or historic information and a second portion with user inputs for accessing a “Main view” or other views. APPLE-1007, 1530-31; APPLE-1003, [156]. D’Angelo also describes receiving user input on the touchscreen so that “the user can scroll through current and older values.” APPLE-1007, 1531. A POSITA would have recognized that these are all interactions with the application. APPLE-1003, [156].

[1k]

Bailey’s “digital signal processing system” (corresponding to ***processing board***) processes the signals from the “analog signal processing system” (corresponding to ***optical sensor***) to generate SpO2 measurement values. APPLE-1003, [157]; *supra*, [13d]. Bailey’s “digital signal processing system” then transmits the processed signals to the mobile device (e.g., iPhone) for displaying on the user interface. APPLE-1004, 22-23; *supra*, [13e]. Therefore, a POSITA would have understood that Bailey’s system processes the signals from the optical sensor only on the digital signal processing system (***processing board***), which would naturally unload memory included in the mobile device (***thereby freeing up memory available to the mobile computing device***). APPLE-1003, [158] (discussing APPLE-1020 as evidence of the knowledge of a POSITA).

D’Angelo clearly describes that, in the predictable combination of Bailey

with D'Angelo, the resulting application executes commands to process one or more signals to generate SpO2 measurement values only on the processing board, thereby freeing up memory available to the mobile computing device. APPLE-1003, [159]. Similar to Bailey, D'Angelo provides the same three-component architecture in which “a dedicated device, called management device,” “receive[s] data from a variety of sensors” (e.g., SpO2 and ECG sensors) and is “connected to a mobile phone or smartphone” to exchange data therebetween. APPLE-1007, 1529. D'Angelo's management device is configured for “continuous critical processes” (“time-critical or safety-critical processes”) by running “[t]he continuous processes, e.g. data acquisition, processing and time-stamped storage” on behalf of the mobile phone. *Id.*, 1529, 1531, Figure 1 (below). D'Angelo's mobile phone only performs “sporadic processes like user interaction or data visualization.” *Id.*, 1529, 1531.



APPLE-1007, Figure 1

Several reasons would have prompted a POSITA to modify Bailey's system to implement D'Angelo's teaching of "separating continuous critical processes and sporadic processes" between Bailey's digital signal processing system (*processing board*) and its mobile device. APPLE-1007, 1531; APPLE-1003, [160].

[11]

D'Angelo's management device is designed to be able to *draw power for operation from* the connected mobile device. APPLE-1007, 1530; APPLE-1003,

[161]-[162]. For example, D'Angelo's management device provides a "charging pin" to connect to "the smartphone's power output pin" to "read out the management device with the smartphone even when its battery is empty." *Id.*, 1530, Figure 3 (below).

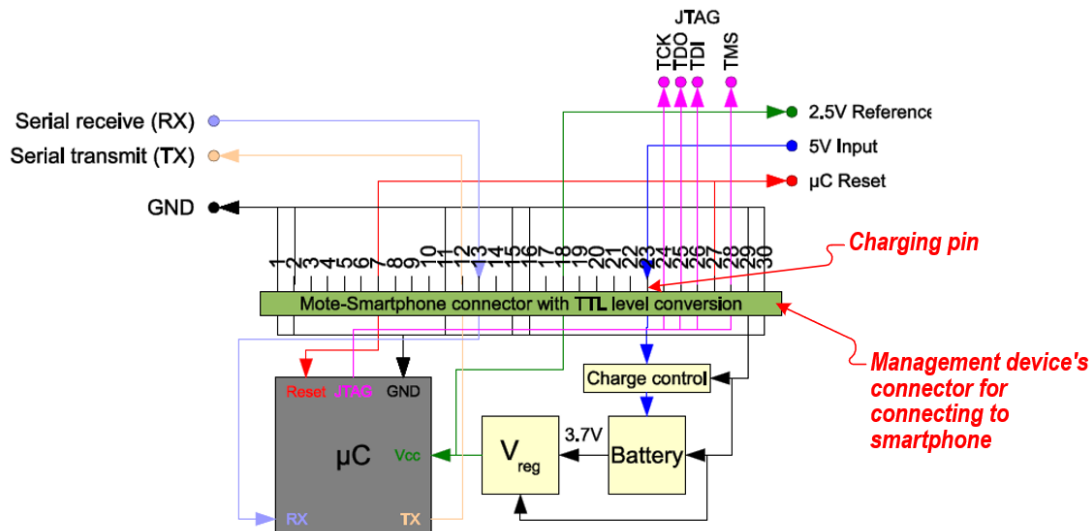


Fig. 3 Pin assignment of the mote-smartphone connector.

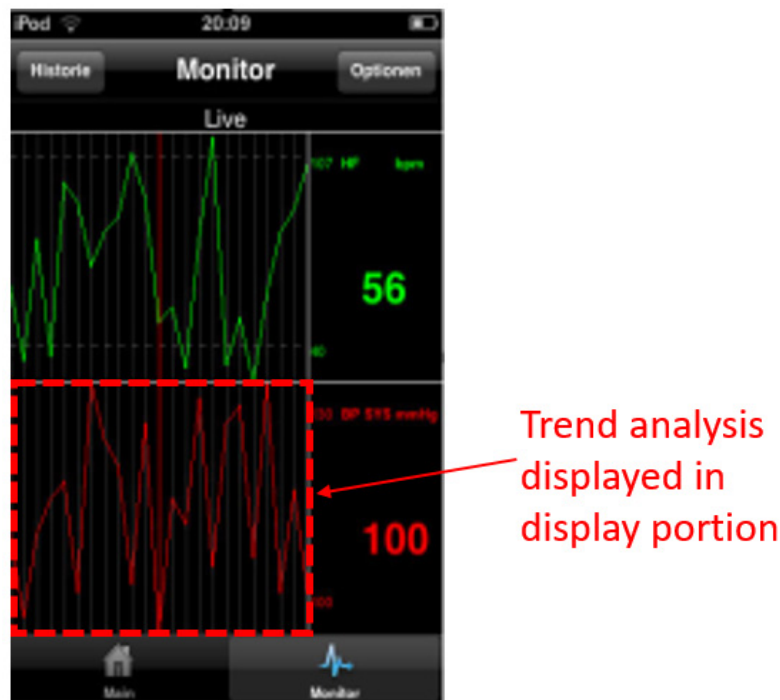
APPLE-1007, Figure 3

Similarly to Bailey's digital signal processing system, D'Angelo's management device is in communication with both physiological sensors and the smartphone. APPLE-1007, 1529-1530; APPLE-1004, 22-24; APPLE-1003, [163]. Therefore, when applying this teaching of D'Angelo to Bailey (for the reasons discussed in §IV.D.2 and *infra*), a POSITA would have implemented Bailey's digital signal processing system to be configured to draw power for operation from the mobile computing device. APPLE-1003, [164] (discussing APPLE-1016).

(b) Claim 2

Bailey describes these elements. *Supra*, Ground 1A, [14pre]-[14b]; APPLE-1003, [165]-[166].

Again, the '507 patent provides a limited disclosure of “trend analysis.” APPLE-1001, 5:25-35, 5:50-52, 13:44-63, Figure 4C. D’Angelo’s teachings align with the '507’s disclosure and therefore the combination of Bailey with D’Angelo renders this claim obvious. Specifically, D’Angelo describes that the “Graph view” is one of the display screens of D’Angelo’s GUI and displays determined physiological parameters in an automatically scrolling graph that depicts changes in the measured value over time. APPLE-1007, 1530-31.



APPLE-1007, Fig. 5.

Similarly to Bailey, SpO₂ values in D’Angelo are one of the values

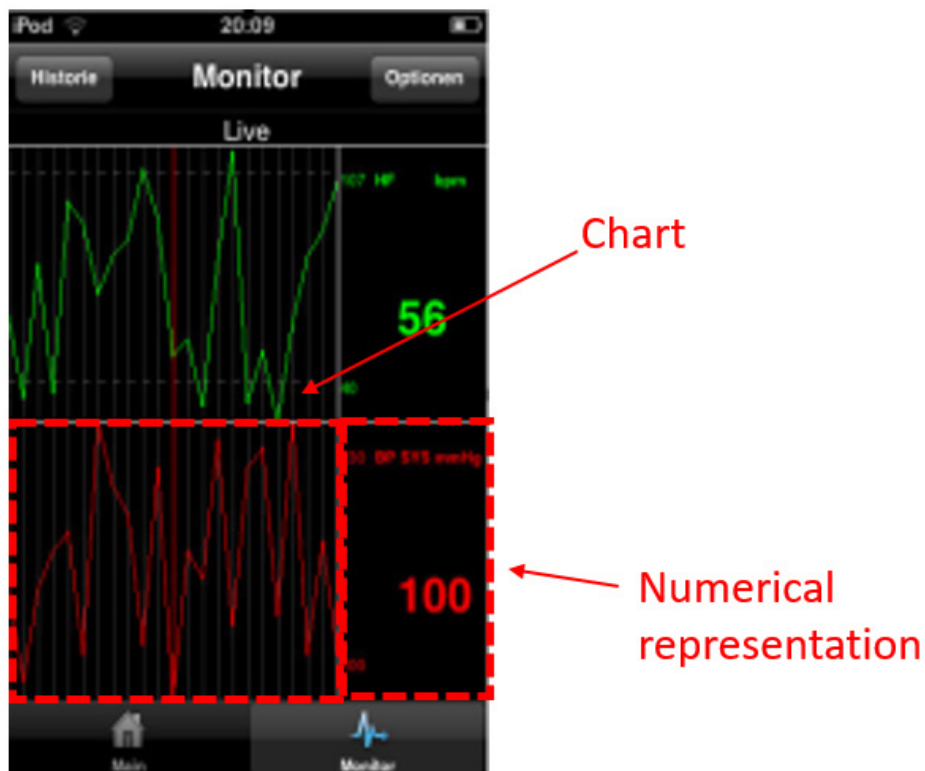
displayed as part of the graph view in the resulting combination. APPLE-1004, 50, 52, Figures 31-32; APPLE-1007, 1529; APPLE-1003, [166].

(c) Claim 5

Supra, Ground 1A, Claim [15]; APPLE-1003, [167].

(d) Claim 7

As shown in Figure 5 of D'Angelo, the measured physiological parameters, including SpO₂, are displayed in a plurality of graphical representations including a chart showing values plotted over time that updates over time such that “[n]ew values are added scrolling the graph automatically” and also as a numerical value in a second graphical representation. APPLE-1007, 1530-31; APPLE-1003, [168].



APPLE-1007, Figure 5

Similarly to Bailey, SpO₂ values in D'Angelo are one of the displayed parameters. APPLE-1004, 50, 52, Figures 31-32; APPLE-1007, 1529. This would have been performed by executing commands of the application or program in the resulting combination. APPLE-1003, [169]; APPLE-1004, 49, Figure 33.

(e) Claim 9

Bailey describes a smartphone like iPhone. APPLE-1004, 14, 20-23, 47, 62-63. Further, D'Angelo discloses that in the predictable combination, the mobile device is a smartphone such as an iPhone. APPLE-1007, 1-2; APPLE-1003, [170].

(f) Claim 12

Supra, Ground 1A, Claim [19]; APPLE-1003, [171].

(g) Claim 13

As discussed in Ground 1A, Bailey describes all elements of claim 13. Alternatively, a POSITA would have predictably modified Bailey's system to include the additional physiological data user interface displays, including the "Graph view" described by D'Angelo for the reasons discussed in Section IV.D.2, *supra*. In this alternative, Bailey-D'Angelo provides [13g]-[13i] for the reasons discussed at Ground 1D, [1h]-[1j] while all other elements of claim 13 are provided for the reasons discussed in Ground 1A. APPLE-1003, [172]-[177].

(h) Claim 14

Supra, Ground 1D, Claim [2]; APPLE-1003, [178].

(i) Claim 15

Supra, Ground 1A, Claim [15]; APPLE-1003, [179].

(j) Claim 17

Supra, Ground 1D, Claim [7]; APPLE-1003, [180].

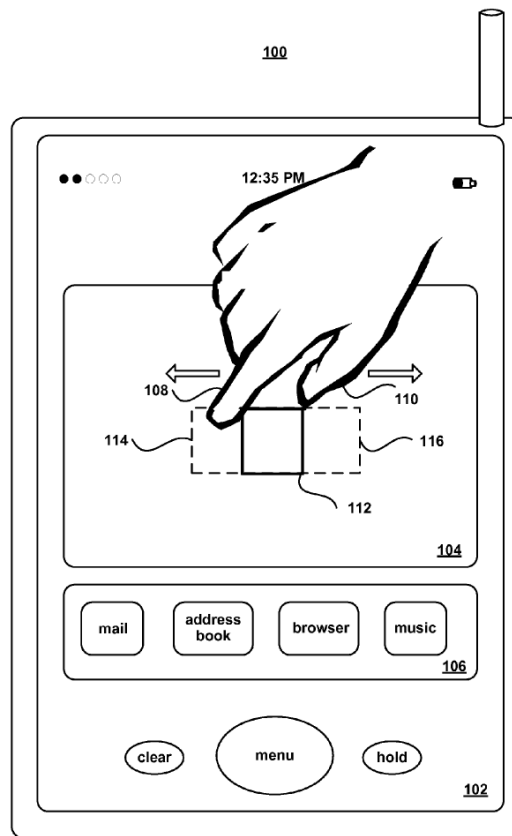
(k) Claim 19

Supra, Ground 1A, Claim [19]; APPLE-1003, [181].

E. GROUND 1E: Bailey-D’Angelo-Ording Over Claim 3

1. Ording

Ording describes a portable electronic communication device 100 that can “perform one or more operations on a graphical object based on one or more user contacts and/or motions.” APPLE-1008, 1:44-45; APPLE-1003, [182]-[183]. The user’s index finger 108 and thumb 110 can be used to pinch/de-pinch an object 112, resulting in a change in the dimension of the object 112. APPLE-1008, 4:40-47. A user can also zoom out using a pinching gesture. *Id.*, 7:63-64, 8:2-3.



APPLE-1008, Figure 1

2. Bailey-D'Angelo-Ording

A POSITA would have been prompted to modify the Bailey-D'Angelo system based on Ording to allow users to manipulate and navigate the display of physiological parameter information through use of touchscreen gestures including a pinch gesture to narrow or expand displayed results. APPLE-1003, [184]-[190]. A POSITA would have recognized that the iPhone of the Bailey-D'Angelo system includes a touchscreen interface and Ording provides additional details on how to use a touchscreen interface to manipulate displayed information and navigate GUIs. APPLE-1004, 14, 20, 22, 23, 47, 62-63; APPLE-1007, 1530; APPLE-1008,

1:56-60, 4:14-47, 7:61-67, 8:2-3; APPLE-1003, [186]. A POSITA would have recognized that allowing users to zoom in/out using the de-pinching and pinching motions described by Ording would have provided a quick and easy way for users to view the displayed physiological parameter information in a desired way (e.g., by looking at a zoomed in detailed portion of Bailey's graph, or zooming out to see a trend over a larger time period). APPLE-1003, [187]. By the 2012 priority date of the '507 patent, touchscreen smart phones were in common use and therefore such UI functionality would have been straight forward and familiar to users. APPLE-1003, [188]. De-pinching and pinching to perform zoom in/out functions would have been an intuitive action for many users, thereby increasing ease of use of the resulting system. APPLE-1003, [189]. Such a modification would have been merely the application of a known technique to a known system ready for improvement to yield predictable results and therefore a POSITA would have had a reasonable expectation of success in such a modification. APPLE-1003, [190]; *KSR*, 550 U.S. at 417.

3. Analysis

(a) Claim 3

Bailey describes iPhone or iPod Touch as example mobile devices, which were known to include a touch-sensitive display. APPLE-1003, [191]. Further, D'Angelo discloses that the smartphone includes "a touch display" and further

describes receiving touch input (“[t]aping and wiping”) that allows users to interact with the displayed physiological parameter information, including the graph of SpO₂ values over time. APPLE-1007, 1530-31; APPLE-1003, [191]. As discussed above, a POSITA would have applied Ording to the Bailey-D’Angelo combination to allow zooming in and out using de-pinching and pinching touch inputs. APPLE-1008, 4:14-47, 7:61-67, 8:2-3, 9:24-29. A POSITA would have applied Ording to Bailey-D’Angelo for the reasons described above to allow for zooming in and out (narrow and expand) the displayed graph of SpO₂ values at Bailey’s mobile device using a pinch gesture in the resulting combination. APPLE-1003, [192].

F. GROUND 1F: Bailey-D’Angelo-Tran Over Claims 4-6, 8, 16, 18, and 20

A POSITA would have applied Tran to the Bailey-D’Angelo combination for the reasons discussed in Ground 1B. APPLE-1003, [193].

1. Analysis

(a) Claim 4

Supra, Ground 1B, Claims [16], [20]; APPLE-1003, [194].

(b) Claim 5

Supra, Ground 1B, Claim [18]; APPLE-1003, [195].

(c) Claim 6

Supra, Ground 1B, Claim [16]; APPLE-1003, [196].

(d) Claim 8

Supra, Ground 1B, Claim [18]; APPLE-1003, [197].

(e) Claim 16

Supra, Ground 1B, Claim [16]; APPLE-1003, [198].

(f) Claim 18

Supra, Ground 1B, Claim [18]; APPLE-1003, [199].

(g) Claim 20

Supra, Ground 1B, Claim [20]; APPLE-1003, [200].

G. GROUND 1G: Bailey-D’Angelo-Kianl Over Claims 2, 7, 14, and 17

A POSITA would have applied Kianl to the Bailey-D’Angelo combination for the reasons discussed in Ground 1C. APPLE-1003, [201]. While Bailey and Bailey-D’Angelo render claims 14 and 2 obvious respectively (Grounds 1A and 1D), Kianl supplements Bailey’s and Bailey-D’Angelo’s teachings of performing and displaying a trend analysis on SpO2 data (claims 14 and 2), and further discloses graphical representations (e.g., charts) of SpO2 measurement values (claims 17 and 7).

1. Analysis

(a) Claim 2

Supra, Ground 1C, Claim [14]; APPLE-1003, [202].

(b) Claim 7

Supra, Ground 1C, Claim [17]; APPLE-1003, [203].

(c) Claim 14

Supra, Ground 1C, Claim [14]; APPLE-1003, [204].

(d) Claim 17

Supra, Ground 1C, Claim [17]; APPLE-1003, [205].

H. GROUND 1H: Bailey-D’Angelo-Kianl-Ording Over Claim 3

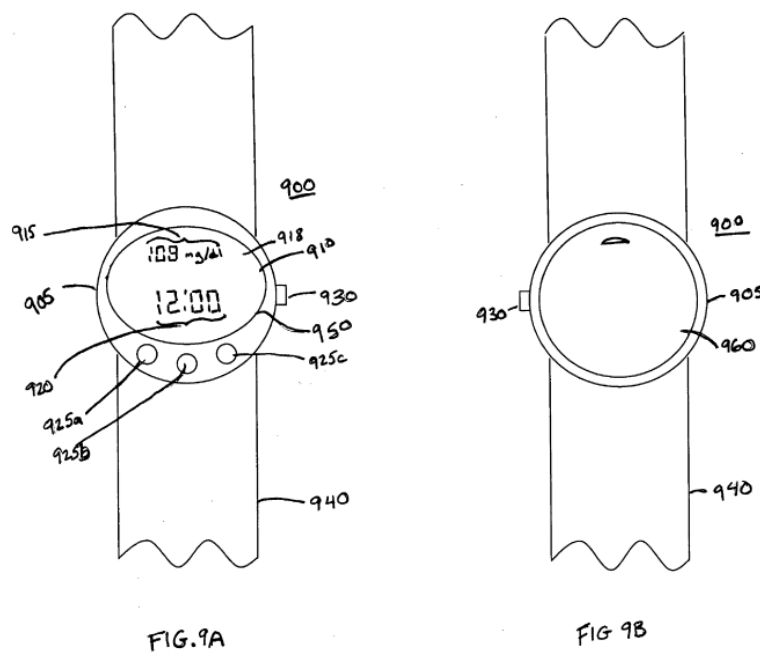
A POSITA would have applied Ording to the Bailey-D’Angelo-Kianl combination for the reasons discussed in Ground 1E. Specifically, a POSITA would have applied Ording to the Bailey-D’Angelo-Kianl combination to allow zooming in and out of Kianl’s trend analysis views displaying various views of SpO₂ information (as discussed in Ground 1C) using a pinch gesture (as disclosed by Ording) to achieve the same benefits as discussed in Ground 1E with respect to Bailey’s user interface (including the graph) and D’Angelo’s Graph view. APPLE-1003, [206]-[207]. The Bailey-D’Angelo-Kianl-Ording combination renders claim 3 obvious. *Id.*

I. GROUND 1I: Bailey-D’Angelo-Goldsmith Over Claims 10-11

1. Goldsmith

Goldsmith discloses a medical watch controller device 900. APPLE-1009, [0085], [0095], [0098], [0104], [0010], cl. 6, Figures 9A-9B; APPLE-1003, [208]-

[211]. As shown in Figures 9A-9B, Goldsmith's device 900 can be "used with any number of...diagnostic devices" and sensors to obtain physiological measurements, such as user oxygen level. APPLE-1009, [0037]-[0038]. The controller device 900 includes a wrist band 940 to be worn "like a watch." *Id.*, [0082]-[0085], [0095], cls. 25-27.



APPLE-1009, Figure 9A-9B

Goldsmith's device 900 includes display 910 for displaying data "received from a sensor transmitter on the patient's skin," from "any number of therapy/diagnostic devices," and/or from user input. APPLE-1009, [0082], [0087], [0095], [0102]. Goldsmith's device can monitor and display "concentration, levels, or quantities of . . . oxygen." *Id.*, [0014], [0037]-[0038].

2. Bailey-D'Angelo-Goldsmith

A POSITA would have applied Goldsmith to the Bailey-D'Angelo combination to implement Bailey-D'Angelo's cellular capable mobile device as a watch, such as a wristwatch. APPLE-1009, [0010], [0082]-[0085], [0095], [0098], [0104]; APPLE-1003, [212]. Implementing the mobile device as "a wrist-worn device, such as a watch" or "a watch that can be carried on other parts of the body or clothing, such as the ankle, neck (e.g., on a chain), pocket, or ankle" would have increased the portability of the device. APPLE-1009, [0010]; APPLE-1003, [213]. Such a configuration would have freed up the user's hands for other tasks as they would no longer need to hold the display device in one hand. APPLE-1003, [214]. Such a configuration would also increase ease of use as the user would not need to retrieve the display device from a pocket, backpack, or bag to view the display physiological parameters. APPLE-1003, [215]; APPLE-1009, [0085]. Additionally, smart watches were becoming in wide-spread use by 2012 and therefore such functionality would have provided additional functionality to devices already owned by users. APPLE-1003, [216]; APPLE-1009, [0085].

A POSITA would have had a reasonable expectation of success in such a modification. APPLE-1003, [217]-[218]. Goldsmith's controller device (which can be implemented as a wristwatch) displays data "received from a sensor transmitter on the patient's skin," and "any number of therapy/diagnostic devices," and/or from user input. APPLE-1009, [0082]-[0087], [0095], [0102]. This

includes monitoring and displaying “concentration, levels, or quantities of...oxygen.” *Id.*, [0014], [0037], [0038]. Goldsmith’s controller further includes “a touchscreen display.” *Id.*, [0086]. Goldsmith also describes “giving the controller device cellular telephone or pager capabilities.” *Id.*, [0016], [0068]. A POSITA would have therefore recognized that Goldsmith is fully compatible with the Bailey-D’Angelo combination and would have had a reasonable expectation of success in applying Goldsmith to Bailey-D’Angelo. APPLE-1003, [218].

Furthermore, a POSITA would have recognized that implementing the wristwatch display device described by Goldsmith to provide a power output pin for Bailey’s digital signal processing system or D’Angelo’s management device would have achieved the same benefits of allowing read out even when the battery in Bailey’s system or D’Angelo’s management device is empty as described in Ground 1D. APPLE-1003, [218]; APPLE-1007, 1530. Applying Goldsmith to Bailey-D’Angelo would have been merely the application of a known technique to a known system ready for improvement to yield predictable results and therefore a POSITA would have had a reasonable expectation of success in such a modification. APPLE-1003, [218]; *KSR*, 550 U.S. at 417.

3. Analysis

(a) Claim 10

Goldsmith discloses that the mobile computing device in the Bailey-

D'Angelo-Goldsmith combination is a wearable wristwatch computing device, such as a wearable wristwatch. APPLE-1009, [0010], [0082]-[0085], [0095], [0098], [0104], Figures. 9A-9B; APPLE-1003, [219].

(b) Claim 11

Supra, Claim [10]; APPLE-1003, [220].

J. GROUND 2A: Bailey-Moon Over Claims 13-15 and 19

Grounds 2A-2I closely track respective Grounds 1A-1I. However, to the extent that the preambles of claims 1 and 13 are interpreted such that the term “mobile measurement of oxygen saturation (‘SpO₂’)” is interpreted to require active reduction and/or correction of motion artifacts caused by user motion, Moon has been added to each of the combinations of Grounds 1A-1I to provide this additional disclosure and form Grounds 2A-2I. APPLE-1003, [221]-[222]. Other than the addition of Moon to the respective combinations to demonstrate how the combinations disclose the preambles to independent claims 1 and 13, all other analysis of the respective combinations remains the same as Grounds 1A-1I.

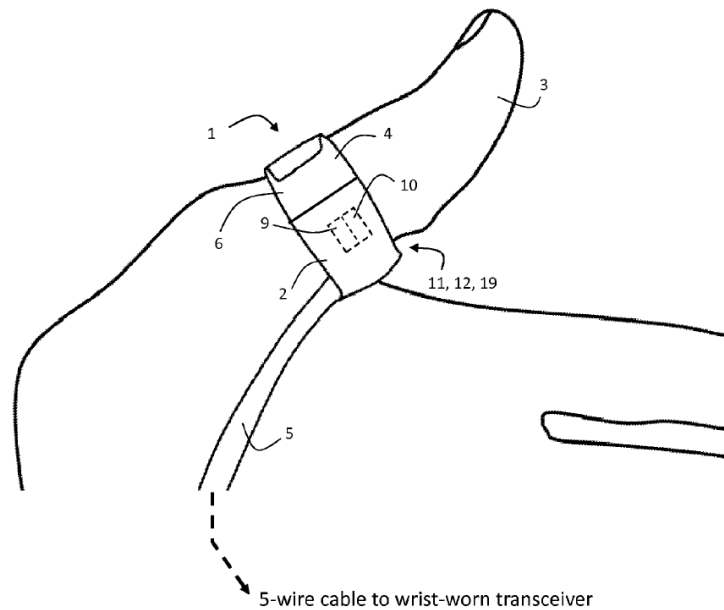
1. Moon

Similar to Bailey, Moon describes “a body-worn monitor that continuously measures pulse oximetry and other vital signs, along with motion, posture, and activity level.” APPLE-1010, [0013]; APPLE-1003, [223]-[226]. While the primary embodiments of Moon describe a finger-worn sensor, Moon describes that

the body-worn sensor can be worn at other locations “such as the ear, forehead, and bridge of the nose.” APPLE-1010, [0138]. The “body-worn monitoring system” includes “motion-detecting sensors” to track various aspects of the patient’s motion. *Id.*, [0015]. This detected motion can “be processed and used to exclude certain noise-corrupted artifacts from the SpO₂ calculation.” *Id.* This “can greatly enhance the accuracy” of measurements taken by the system. *Id.* Moon’s SpO₂ sensor system “features a first sensor with two radiation sources that emit optical radiation at first and second wavelengths, and a photodetector configured to detect the radiation after it passes through a portion of the patient.” *Id.*, [0018]. The system uses both the signals from the photodetector and signals from a motion sensor to determine SpO₂ and other “physiological propert[ies] of the patient’s blood.” *Id.* In further examples, Moon describes filtering the PPG and PTT waveforms using detected motion of the patient to more accurately determine SpO₂. *Id.*, [0025], [0073]-[0074], [0089]-[0092]. These techniques allow for “motion [to] be detected and accounted for during pulse oximetry measurements to minimize the occurrence of false alarms and, additionally, make accurate readings in the presence of motion.” *Id.*, [0082], [0089] (“...determine accurate SpO₂ and cNIBP values even when motion-related noise is present.”), [0102]-[0103].

Moon’s sensor includes secure straps 2, 4 and a flexible cable 5 to

“minimize[] motion relative to the measurement site.” APPLE-1010, [0060].



APPLE-1010, Figure 1

Moon further discusses using digital communication between the system components to further reduce signal noise caused by motion. APPLE-1010, [0130].

2. Combination of Bailey and Moon

Multiple reasons would have prompted a POSITA to apply Moon to Bailey (or its modification herein) to reduce the effects of motion on vital sign readings, including SpO₂ and to filter out noise caused by user motion from such readings. APPLE-1003, [227]-[234]. First, as Moon teaches, in user worn pulse oximetry systems, “[a]ctivities such as walking, finger tapping, falling, and convulsing can result in a number of artifacts that distort both the AC and DC components of

waveforms measured with the oximeter's optical system." APPLE-1010, [0011].

Such motion can generate motion artifacts in sensed signals which "can cause the pulse oximeter to generate inaccurate values and false alarms." *Id.*, [0011], [0078].

Bailey's pulse oximetry system is intended for use by users in motion and contemplates ways to "reduce motion artifact within the signal, which would increase the accuracy of the oxygen saturation read out from the pulse oximeter."

APPLE-1004, 18, 22. Bailey's design "allow[s] for the oximeter to be placed in an unobtrusive location, conveniently allowing the wearer to use his or her hands and conduct him or herself normally," while measuring user's SpO₂. *Id.*, 22. A POSITA therefore would have recognized the benefit of applying Moon to Bailey to both reduce the effects of motion on the measured signals and to filter noise caused by such motion to "greatly enhance the accuracy" of the detected vital signs. APPLE-1010, [0015], [0065]-[0066] ("...maximizes accuracy of the SpO₂ calculation"), [0070], [0072], [0083], [0088]-[0089]; APPLE-1003, [228]. Thus in the resulting system "the body-worn monitor can determine accurate SpO₂ and cNIBP values even when motion-related noise is present." APPLE-1010, [0089].

Second, as described by Moon, pulse oximeters that only function "when a patient is sedentary...are impractical for ambulatory patients...making it difficult to provide true continuous monitoring." APPLE-1010, [0012]. A POSITA would have recognized that, because Bailey's system is intended for users in motion,

applying Moon's teachings to Bailey to account for noise caused by user motion would have allowed for "true continuous monitoring." APPLE-1003, [229], APPLE-1004, 14, 8; APPLE-1010, [0025], [0073]-[0074], [0082], [0089]-[0092], [0102]-[0103].

Third, applying Moon's techniques for reducing motion artifacts and accounting for signal noise due to motion would "minimize the occurrence of false alarms and, additionally, make accurate readings in the presence of motion." APPLE-1010, [0082], [0015] ("...greatly enhance the accuracy of alarms/alerts"), [0076]; APPLE-1003, [230]. Bailey discloses "implementation of an alarm in the event that the blood oxygen level of the user fell below a safe level" and therefore increasing the accuracy of alerts would have improved the resulting system. APPLE-1004, 14, 47.

Fourth, Bailey expressly contemplates using "filters" for the measured sensor signals "[t]o limit the noise in the system." APPLE-1004, 40, 18, 20, 22, 34-44. Therefore a POSITA would have looked to other references that disclose techniques for improving the accuracy of the sensor signals by filtering noise. APPLE-1003, [231]. Moon provides just such a teaching for filtering noise from the signals caused by motion of the user. APPLE-1010, [0102]. A POSITA therefore would have beneficially applied Moon to Bailey because Moon provides additional details on how to filter noise as contemplated by Bailey. APPLE-1003,

[231].

Finally, such a modification would have been merely the application of a known technique to a known system ready for improvement to yield predictable results and therefore a POSITA would have had a reasonable expectation of success in such a modification. APPLE-1003, [232]-[234]; *KSR*, 550 U.S. at 417.

1. Analysis

(a) Claim 13

As discussed in Ground 1A, Bailey provides all elements of claim 13. To the extent that the term “mobile measurement of oxygen saturation (‘SpO₂’)” in the preamble of claim 13 is interpreted to require active reduction and/or correction of motion artifacts caused by user motion, the Bailey-Moon combination provides [13pre]. APPLE-1003, [235]. For example, in the predictable combination, Moon’s pulse oximetry system includes “motion-detecting sensors” to track various aspects of the user’s motion. *Id.*, [0015]. This detected motion can “be processed and used to exclude certain noise-corrupted artifacts from the SpO₂ calculation” to “greatly enhance the accuracy” of vital sign measurements. *Id.*; APPLE-1003, [236].

Both Moon and Bailey utilize an SpO₂ sensor that includes a photodetector to detect emitted light after it passes through a portion of the patient. APPLE-1004, 10-12, 27-18; APPLE-1010, [0018]. Moon teaches that in the resulting

combination, Bailey's digital signal processing system, which processes the signals to generate the SpO₂ values, is configured to use both the signals from the photodetector and signals from a motion sensor to determine SpO₂ and other "physiological propert[ies] of the patient's blood." APPLE-1010, [0018]; APPLE-1003, [237]. Moon further describes filtering the PPG and PTT waveforms using detected motion of the patient to more accurately determine SpO₂. APPLE-1010, [0025], [0073]-[0074], [0089]-[0092]. These techniques allow for "motion [to] be detected and accounted for during pulse oximetry measurements to minimize the occurrence of false alarms and, additionally, make accurate readings in the presence of motion." *Id.*, [0082]; APPLE-1003, [238]. In one example, Moon discloses using "a 'matched filter' to process both the RED/IR(PPG) waveforms to maximize signal-to-noise ratios of the pulses therein" to allow the system to "determine accurate SpO₂ and cNIBP values even when motion-related noise is present." *Id.*, [0088]-[0089] (describing a weighted average signal processing technique when "profound motion is present" that "would likely yield a SpO₂ value with suitable accuracy"), [0075].

In another example, a "wrist-worn accelerometer" measures user motion and collected data is "analyzed to estimate the effects of specific motions and activities on the ECG and PPG waveforms, and then deconvolute these factors using known mathematical techniques to effectively remove any motion-related artifacts."

APPLE-1010, [0102]. These “deconvoluted ECG and PPG waveforms can then be used to calculate vital signs.” *Id.* For example, PPG waveforms are “used to determine SpO₂.” *Id.*, [0121]; APPLE-1004, 10, 15-19, 22, 27-28, 31, 34, 45, 58, 59; APPLE-1003, [239].

As previously discussed at Ground 1A, [13pre], Bailey describes that the resulting system is “intended primarily for consumer user” and designed for *mobile measurement of oxygen saturation* by providing “the ability to communicate data to a smartphone or other portable device” so that the device can be made “smaller by not needing to incorporate a display and user interface on the oximeter itself.” APPLE-1004, 8. The device is also designed to “warn of dangerously low oxygen conditions.” *Id.*; APPLE-1003, [240]-[241].

Bailey demonstrates that the Bailey-Moon combination renders obvious all other elements of claims 13-15, and 19 for the reasons discussed in Ground 1A. APPLE-1003, [242]-[243].

K. GROUND 2B-I: The Modifications to the Bailey-Moon Combination Over the Remaining Claims

A POSITA would have been prompted to apply the teachings of Tran, Kianl, D’Angelo, Ording, and Goldsmith to the Bailey-Moon combination in the same manner and for the same reasons as discussed in Grounds 1B-1I to achieve the combinations identified for Grounds 2B-2I, and would have had a reasonable

expectation of success in doing so. APPLE-1003, [244]-[251]. With respect to Ground 2D, the Bailey-Moon-D'Angelo combination provides [1pre] for the same reasons discussed in Ground 2A with respect to [13pre]. All other elements of the claims identified with respect to Grounds 2B-2I are disclosed by the respective combinations for the reasons discussed in respective grounds 1B-1I.

V. DISCRETIONARY CONSIDERATIONS

A. 314(a)

1. Factor 1

Factor 1 does not favor denial. Neither party has indicated a lack of intent to request a stay of the related litigation, and the Board has indicated that it “will not attempt to predict” how a district court might adjudicate a future motion to stay, if/when filed. IPR2020-00019, Pap. 11 (“*Fintiv*”), 12; IPR2019-01393, Pap. 24 (“*Sand Revolution*”), 7; IPR2020-01019, Pap. 12 (“*Sotera*”), 14.

2. Factor 2

The Delaware District Court recently granted a joint motion to amend the case schedule that moved the case management conference back by approximately two months, but has not yet set an estimated trial date. APPLE-1065, 3.

Based on the October 20, 2022 filing date of Apple’s original complaint, an average time-to-trial of 37.8 months, and the 18-month IPR schedule, the Board is

expected to issue its FWD in June or July, 2025, nearly six months ahead of the statistically indicated December, 2025 district court trial date. APPLE-1060, 14.

Therefore, Factor 2 disfavors denial. APPLE-1061 (“*Director’s Guidance*”), 9; *Masimo Corp. v. Apple Inc.*, IPR2023-00634, Pap. 1 (Petition), 108 (Masimo argues against denial based “published statistics indicat[ing] that the median time to trial for a civil action in the District of Delaware is almost three years”).

In fact, several factors contribute to uncertainty with respect to the yet-scheduled trial date, including whether a single trial will be conducted to address all of Apple’s asserted utility and design patents and all of Masimo’s counter-asserted utility patents. *See, generally*, APPLE-1062-1065, APPLE-1069.

3. Factor 3

Factor 3 disfavors denial. Apple’s substantial investment in petitions addressing the 10 patents asserted by Patent Owner in District Court Litigation (including the 5 patents reasserted from ITC litigation) should counterbalance—and frankly outweigh—the resources invested in the co-pending District Court Litigation. It would be unjust to consider resources expended in District Court (equally by both parties), without considering Apple resources expended to prepare petitions that would be irretrievably lost without consideration on the merits.

Further, Apple stipulates that, if the Board institutes this IPR, Apple will not, for the instituted claims, seek resolution in the co-pending Delaware District Court

proceeding of any ground of invalidity that utilizes any of the prior art asserted in this petition, i.e., Bailey, Tran, Kianl, D'Angelo, Ording, Moon, or Goldsmith. APPLE-1066.

In fact, Apple's stipulation is broader in several dimensions than a *Sotera* stipulation, at least according to Masimo. For instance, despite offering a *Sotera* stipulation in support of its petitions, after institution, Masimo advances in district court invalidity grounds the same references that it applied within its instituted IPR petitions.⁴

⁴ For example, the Board instituted Masimo's *Sotera*-backed petition challenging Apple's D. Del.-asserted '257 patent, and Masimo has since revealed that it relies for its district court invalidity grounds on the same Markel and Mills references applied in that petition, further combined with product art. IPR2023-00745, Pap. 1, 12-13, 85; APPLE-1067, 1. Similarly, Masimo relies in district court on the same Chae reference applied in its now-instituted and *Sotera*-backed '352 patent petition, further combined with product art. IPR2023-00664, Pap. 1, 33, 94; APPLE-1067, 1. Finally, Masimo relies in district court on the same Kotanagi reference applied in its now-instituted and *Sotera*-backed '783 patent petition, further combined with product art. IPR2023-00634, Pap. 1, 6, 109; APPLE-1067,

Therefore, *Fintiv* factor 3 disfavors denial. *Seven Networks*, 11-12; *Sotera*, 16-17; IPR2020-00820, Pap. 15 (“*Snap*”), 11-13.

4. Factor 4

Factor 4 strongly disfavors denial. First, Patent Owner asserts only ’507 Patent claims 13, 14, 16, 17, 19, and 20; this Petition challenges all 20 ’507 Patent claims. A vast majority of the Challenged Claims will be left unaddressed in District Court Litigation. *Seven Networks*, 21.

Second, to eliminate any doubt as to the absence of meaningful overlap between the District Court Litigation and IPR, Apple stipulates that, if the Board institutes this IPR, Apple will not, for the instituted claims, seek resolution in the co-pending District Court proceeding of any ground of invalidity that utilizes any of Bailey, Tran, Kianl, D’Angelo, Ording, Moon, or Goldsmith. APPLE-1066.

By this stipulation, Factor 4 strongly disfavors denial. IPR2021-00972, Pap. 10 (“*AliveCor*”), 13-16; APPLE-1068 (demonstrating that Apple’s district court expert invalidity report does not leverage Bailey, Tran, Kianl, D’Angelo, Ording, Moon, or Goldsmith).

Notably, Apple’s stipulation is substantially more robust than a *Sand*

1.

Revolution stipulation, by which a petitioner pledges not to pursue the same grounds of invalidity in district court litigation, while leaving open the possibility of the same references applied within a petition being reasserted by the same petitioner in different district court invalidity grounds. *Sand Revolution*, 11-12. Therefore, Apple submits that ***Apple's stipulation***, which ***guarantees that there will be no overlap*** between the IPR prior art and the District Court prior art, should be accorded substantially more weight than a *Sand Revolution* stipulation. *Cf. Sand Revolution* at 12.

As noted in Factor 3, Apple's stipulation is also broader than a *Sotera* stipulation, at least insofar as it is apparently Masimo's position that a *Sotera* stipulation leaves open the possibility of the same references applied within an instituted IPR petition being reasserted by the same petitioner in district court invalidity grounds that could not reasonably have been raised in that petition. *Sotera*, 13-14, 19; 35 U.S.C §315(e)(2).

Whether the District of Delaware will allow Masimo to proceed in this manner remains to be seen, but recent decisions treating language of the §315(e)(2) estoppel provision that is co-extensive with *Sotera* suggest that it might. *Sotera*, 19; 35 U.S.C § 315(e)(2). For example, a recent D. Del. decision held that so long as printed publications are used in combination with product or system art such that the "combination is substantively different from the grounds that were raised

or reasonably could have been raised” in the IPR, IPR estoppel does not apply.

Ioengine, LLC v. PayPal Holdings, Inc. 607 F. Supp. 3d 464, 513 (D. Del. Jun. 15, 2022); *Chemours Co. FC, LLC v. Daikin Indus. Ltd.*, No. 1:17-cv-01612, 2022 WL 2643517, at *1 (D. Del. Jul. 8, 2022).

In stark contrast with Masimo’s *Sotera* stipulations and Masimo’s reliance on overlapping references in its IPR and District Court proceedings, Apple’s stipulation extinguishes the possibility of *any overlap* in the prior art, thereby ensuring that IPR is a true alternative to the District Court Litigation with respect to that art.

Moreover, Masimo asserts only a small subset of the claims challenged in this IPR (5 of 25). Further, official statistics indicate that the Board will issue its FWD months in advance of the District Court trial. APPLE-1060, 14.

Therefore, Factor 4 strongly disfavors denial. *AliveCor*, 16; *Seven Networks*, 21.

5. Factor 5

Factor 5 should, at worst, be neutral. The Litigation involves the same parties.

6. Factor 6

Factor 6 strongly disfavors denial. Here, the strength of the merits alone outweighs any potential inefficiencies. *Fintiv*, 14-15. As the instant Petition

demonstrates, evidence including the applied references and Dr. Kenny's robustly corroborated testimony, if unrebutted in trial, would plainly lead to a conclusion that one or more claims are unpatentable by a preponderance of the evidence.

With Factors 2, 3, 4, and 6 disfavoring denial, and with remaining Factors 1 and 5 otherwise neutral, discretion should not be exercised to deny institution.

Fintiv, 19; *Director's Guidance*, 4-5; IPR2022-01242, Pap. 23 ("*Commscope*"), 3.

B. 325(d)

This Petition presents new prior art and arguments for which there is no indication in the file history that the Office ever previously considered in connection with the '507 patent. While Kianl (APPLE-1006) appears on the face of the '507 patent, it was never substantively addressed by the examiner during prosecution. APPLE-1002, 107-120, 30-41. Furthermore, Kianl is relied upon in this petition only for certain dependent claims and was never considered in combination with primary reference Bailey, which was not before the Examiner during prosecution.

Because the '507 patent's prosecution did not involve negotiation between the applicant and the Examiner regarding the teachings of the prior art applied in the instant Petition, Petitioner submits that exercise of the Board's discretion under § 325(d) is unwarranted. IPR2019-01469, Pap. 6 (citing IPR2017-01586, Pap. 8).

VI. PAYMENT OF FEES – 37 C.F.R. § 42.103

Petitioner authorizes the Patent and Trademark Office to charge any fees to Deposit Account No. 06-1050.

VII. CONCLUSION

Petitioner requests IPR and cancellation of the Challenged Claims.

VIII. MANDATORY NOTICES UNDER 37 C.F.R § 42.8(a)(1)

A. Real Party-In-Interest Under 37 C.F.R. § 42.8(b)(1)

Apple Inc. is the petitioner and real party-in-interest.

B. Related Matters Under 37 C.F.R. § 42.8(b)(2)

Petitioner is not aware of any disclaimers, reexamination certificates or petitions for inter partes review for the '507 Patent. The '507 patent is the subject of civil action, *Apple Inc. v. Masimo Corporation et al.*, Case No. 1-22-cv-01378, District of Delaware (DDE), filed October 20, 2022, in which Patent Owner filed a counterclaim of infringement of the '507 patent on December 12, 2022.

C. Lead And Back-Up Counsel Under 37 C.F.R. § 42.8(b)(3)

Petitioner provides the following designation of counsel.

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D. Service Information

Please address all correspondence and service to the address listed above.

Petitioner consents to electronic service by email at IPR50095-0135IP1@fr.com.

Respectfully submitted,

Dated: December 12, 2023

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CERTIFICATION UNDER 37 CFR § 42.24

Under the provisions of 37 CFR § 42.24(d), the undersigned hereby certifies that the word count for the foregoing Petition for *Inter Partes* Review totals 13,917 words, which is less than the 14,000 allowed under 37 CFR § 42.24.

Dated: December 12, 2023

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CERTIFICATE OF SERVICE

Pursuant to 37 CFR §§ 42.6(e)(4)(i) *et seq.* and 42.105(b), the undersigned certifies that on December 12, 2023, a complete and entire copy of this Petition for *Inter Partes* Review and all supporting exhibits were provided via Federal Express, to the Patent Owner by serving the correspondence address of record as follows:

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