

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of: Bilal Muhsin, et al.
U.S. Patent No.: 10,736,507 Attorney Docket No. 50095-0135IP2
Issue Date: August 11, 2020
Appl. Serial No.: 15/880,071
Filing Date: January 25, 2018
Title: PHYSIOLOGICAL MONITOR WITH MOBILE COMPUTING
 DEVICE CONNECTIVITY

THIRD DECLARATION OF DR. THOMAS W. KENNY

I currently hold the opinions that are expressed in this declaration. But my analysis may continue, and I may acquire additional information and/or attain supplemental insights that may result in added observations. I hereby declare that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true. I further declare that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of the Title 18 of the United States Code.

Dated: April 2, 2025

By:  _____

Thomas W. Kenny, Ph.D.

TABLE OF CONTENTS

I.	QUALIFICATIONS AND BACKGROUND INFORMATION.....	3
II.	OVERVIEW OF CONCLUSIONS FORMED.....	7
III.	SUBSTITUTE CLAIMS 21-24 ARE OBVIOUS WITH RESPECT TO THE PRIOR ART OF RECORD	9
A.	[GROUND 1A] – CLAIMS 21 AND 23-24 ARE OBVIOUS OVER POEZE, KIANL, BABA, AND PAKULA.....	13
1.	Overview of Poeze.....	14
2.	Overview of Baba	20
3.	Overview of Pakula.....	24
4.	The Combination of Poeze, Kianl, Baba, and Pakula.....	27
5.	Application of Poeze, Kianl, Baba, and Pakula to the Claims	40
B.	[GROUND 1B] – CLAIM 22 IS OBVIOUS OVER POEZE, KIANL, BABA, PAKULA, AND MOON.....	101
1.	The Combination of Poeze, Kianl, Baba, Pakula, and Moon	101
2.	Application of Poeze, Kianl, Baba, Pakula, and Moon to Claim 22.....	105
C.	[GROUND 1C] – CLAIM 22 IS OBVIOUS OVER POEZE, KIANL, BABA, PAKULA, AND DIAB	107
1.	Overview of Diab.....	107
2.	The Combination of Poeze, Kianl, Baba, Pakula, and Diab... ..	108
3.	Application of Poeze, Kianl, Baba, Pakula, and Diab to Claim 22.....	110
D.	[GROUND 1D] – CLAIMS 23-24 ARE OBVIOUS OVER POEZE, KIANL, BABA, PAKULA, AND TELLER	111
1.	Overview of Teller.....	111
2.	The Combination of Poeze, Kianl, Baba, Pakula, and Teller	113
3.	Application of Poeze, Kianl, Baba, Pakula, and Teller to Claims 23-24	114
E.	[GROUND 2A-2D] – ADDITION OF LIN TO GROUNDS 1A-1D	121
F.	[GROUND 3A-4D] – REPLACEMENT OF PAKULA WITH SODEN IN GROUNDS 1A-2D.....	122
IV.	OTHER REFERENCES MATERIAL TO PATENTABILITY	129
V.	CONCLUSION.....	130

I. QUALIFICATIONS AND BACKGROUND INFORMATION

1. My education and experience are described in my previously filed First Declaration in this proceeding (APPLE-1003) as well as my curriculum vitae, attached as Appendix A to APPLE-1003.

2. In addition to the references and other documents that I identified in my First Declaration (APPLE-1003) and my Second Declaration (APPLE-1083) and any materials cited in the present declaration, I have also reviewed the following documents and references:

3. Paper 42: Masimo's Patent Owner's Revised Contingent Motion to Amend

- APPLE-1110: U.S. Patent Application Pub. No. 2011/0082711 to Poeze et al. ("Poeze")
- APPLE-1111: U.S. Patent Application Pub. No. 2010/0030040 to Poeze et al. ("Poeze-040") (incorporated by reference in APPLE-1084)
- APPLE-1112: U.S. Patent Application Pub. No. 2006/0211924 to Dalke et al. ("Dalke") (incorporated by reference in APPLE-1084)
- APPLE-1113: U.S. Patent Application Pub. No. 2011/0187245 to Pakula et al. ("Pakula")

- APPLE-1114: U.S. Patent Application Pub. No. 2003/0176815 to Baba et al. (“Baba”)
- APPLE-1115: U.S. Patent Application Pub. No. 2009/0149299 to Tchao et al. (“Tchao”)
- APPLE-1116: U.S. Patent Application Pub. No. 2011/0003665 to Burton et al. (“Burton”)
- APPLE-1117: U.S. Patent No. 6,443,614 to Read (“Read”)
- APPLE-1118: PCT Pub. No. WO2011/127446 to Soden et al. (“Soden”)
- APPLE-1119: U.S. Patent Application Pub. No. 2010/0113950 to Lin et al. (“Lin”)
- APPLE-1120: U.S. Patent No. 6,970,792 to Diab (“Diab”)
- APPLE-1121: U.S. Patent No. 7,712,970 to Lee (“Lee”)
- APPLE-1122: U.S. Patent No. 6,869,315 to Nakai et al. (“Nakai”)
- APPLE-1123: U.S. Patent Application Pub. No. 2005/0265668 to Martin (“Martin”)
- APPLE-1124: U.S. Patent Application Pub. No. 2004/0089570 to Chien et al. (“Chien”)
- APPLE-1125: U.S. Patent Application Pub. No. 2011/0194234 to Kim et al. (“Kim”)

- APPLE-1126: U.S. Patent Application Pub. No. 2011/0216482 to Moscovitch et al. (“Moscovitch”)
- APPLE-1127: U.S. Patent No. 7,649,741 to Liu (“Liu”)
- APPLE-1128: U.S. Patent Application Pub. No. 2008/0223892 to Hamilton (“Hamilton”)
- APPLE-1129: U.S. Patent Application Pub. No. 20120122519 to Jochheim (“Jochheim”)
- APPLE-1130: U.S. Patent Application Pub. No. 2010/0004522 to Varela (“Varela”)
- APPLE-1131: U.S. Patent Application Pub. No. 2009/0171170 to Li et al. (“Li”)
- APPLE-1132: Pomona Model 3231 Size B Aluminum Box With Cover BNC Male/Female specification (1999)
- APPLE-1133: Pomona Model 3301 Size F Extruded Aluminum Box With Cover specification (1999)

4. I have also reviewed various supporting references and other documentation as further noted in my opinions below.

5. Counsel has informed me that I should consider these materials through the lens of one of ordinary skill in the art related to the '507 Patent at the time of the earliest possible priority date of the '507 Patent, and I have done so during my review of these materials. The '507 Patent claims the benefit of priority

to a provisional application filed September 20, 2012. As discussed in my Second Declaration, I reviewed portions of the Muhsin Declaration (EX2038) and the prototype video (EX2039) that Mr. Muhsin discussed in his Declaration. It is my opinion that numerous elements recited in the amendments to Substitute Claim 21 of Masimo's Revised Motion to Amend are not present in or supported by the prototype video and the relevant description in Mr. Muhsin's Declaration, including (but not limited to) the specific physical configuration for the "protective assembly" recited in Substitute Claim 21, wireless communication between the processing board and the smartphone mobile computing device, and display of "a graphical representation of a heart." As such, I have applied the provisional application filing date of September 20, 2012 as the date of invention in my analysis in this Declaration (the "Critical Date"). However, my analysis would remain the same if the date of invention were anywhere in the early 2010's. I have not thoroughly reviewed the provisional application to which the '507 patent claims priority with respect to the claim amendments presented in Masimo's Revised Motion to Amend and therefore have no opinion on whether or not the Substitute Claims presented in the Revised Motion to Amend are entitled to the priority date of the provisional application.

6. I have no financial interest in the parties or in the outcome of this proceeding. I am being compensated for my work as an expert on an hourly basis.

My compensation is not dependent on the outcome of these proceedings or the content of my opinions.

7. In writing this declaration, I have considered the following: my own knowledge and experience, including my work experience in the fields of mechanical engineering, computer science, biomedical engineering, electrical engineering and physics; my experience in teaching those subjects; and my experience in working with others involved in those fields. In addition, I have analyzed various publications and materials, in addition to other materials I cite in both this declaration and my First and Second Declarations.

8. My opinions, as explained below, are based on my education, experience, and expertise in the fields relating to the '507 Patent. Unless otherwise stated, my testimony below refers to the knowledge of one of ordinary skill in the art as of the Critical Date, or before. Any figures that appear within this document have been prepared with the assistance of Counsel and reflect my understanding of the '507 Patent and the prior art discussed below.

II. OVERVIEW OF CONCLUSIONS FORMED

9. This declaration explains the conclusions that I have formed based on my analysis. To summarize those conclusions, based upon my knowledge and experience and my review of the substitute claims and the prior art publications listed above, I believe that:

- Substitute Claims 21, 23-24 are obvious over Poeze (APPLE-1110), Kianl (APPLE-1006), Baba (APPLE-1114), and Pakula (APPLE-1113);
- Substitute Claim 22 is obvious over Poeze, Kianl, Baba, Pakula, and Moon (APPLE-1010);
- Substitute Claim 22 is obvious over Poeze, Kianl, Baba, Pakula, and Diab (APPLE-1120);
- Substitute Claims 23-24 are obvious over Poeze, Kianl, Baba, Pakula, and Teller (APPLE-1104);
- Substitute Claims 21, 23-24 are obvious over Poeze, Kianl, Baba, Pakula, and Lin (APPLE-1119);
- Substitute Claim 22 is obvious over Poeze, Kianl, Baba, Pakula, Lin, and Moon;
- Substitute Claim 22 is obvious over Poeze, Kianl, Baba, Pakula, Lin, and Diab
- Substitute Claims 23-24 are obvious over Poeze, Kianl, Baba, Pakula, Lin, and Teller
- Substitute Claims 21, 23-24 are obvious over Poeze, Kianl, Baba, and Soden (APPLE-1118)

- Substitute Claim 22 is obvious over Poeze, Kianl, Baba, Soden, and Moon
- Substitute Claim 22 is obvious over Poeze, Kianl, Baba, Soden, and Diab
- Substitute Claims 23-24 are obvious over Poeze, Kianl, Baba, Soden, and Teller
- Substitute Claims 21, 23-24 are obvious over Poeze, Kianl, Baba, Soden, and Lin
- Substitute Claim 22 is obvious over Poeze, Kianl, Baba, Soden, Lin, and Moon
- Substitute Claim 22 is obvious over Poeze, Kianl, Baba, Soden, Lin, and Diab
- Substitute Claims 23-24 are obvious over Poeze, Kianl, Baba, Soden, Lin, and Teller

10. I address each of these conclusions in the following sections.

III. SUBSTITUTE CLAIMS 21-24 ARE OBVIOUS WITH RESPECT TO THE PRIOR ART OF RECORD

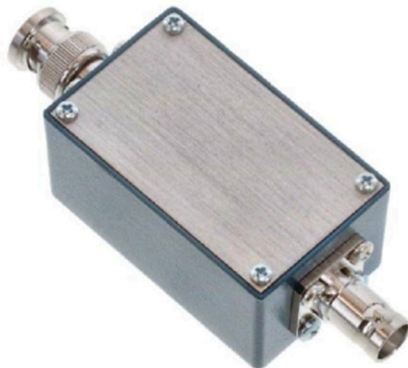
11. As I demonstrate below, the prior art rendered obvious all of substitute claims 21-24 as of the Critical Date. In my opinion, the substitute claim amendments recite routine features that had been known in similar prior art physiological sensors and related electronic devices. In addition to the prior art

combinations that I analyze in detail below, I have also included a brief overview of additional references that additionally demonstrate that the claim features recited in substitute claims 21-24 were known in the prior art.

12. For example, the amended claims recite features associated with the packaging (protective assembly) of the processing board (element [21n]):

“The processing board surrounded within a protective assembly comprising upper and lower shells and a rounded rectangular enclosure forming a cavity with upper and lower openings, the openings having an inner ledge and a perimeter lip sized and configured to receive the upper and lower shells to fill the openings such that the perimeter lip surrounds at least a portion of perimeter sides of the upper and lower shells;”

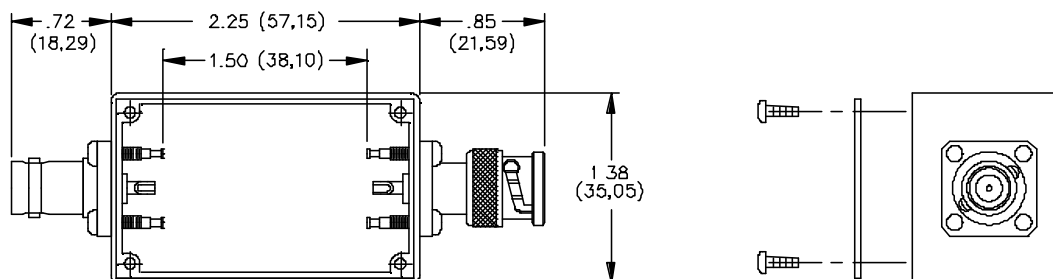
13. Electronics enclosures with these features have been widely used for many situations for many years. I specifically remember using a product called a “Pomona Box” for packaging of circuit elements during my PhD research at UC Berkeley in the mid-1980s, and these very old products included many of the claimed features recited by the amendment in claim element [21n]. For example,



the Pomona Box product Model 3231 (shown above and below, excerpted from a 1999 datasheet) has many features claimed in this amendment.

Pomona®

Model 3231
Size B Aluminum Box With Cover
BNC Male/Female



APPLE-1132.

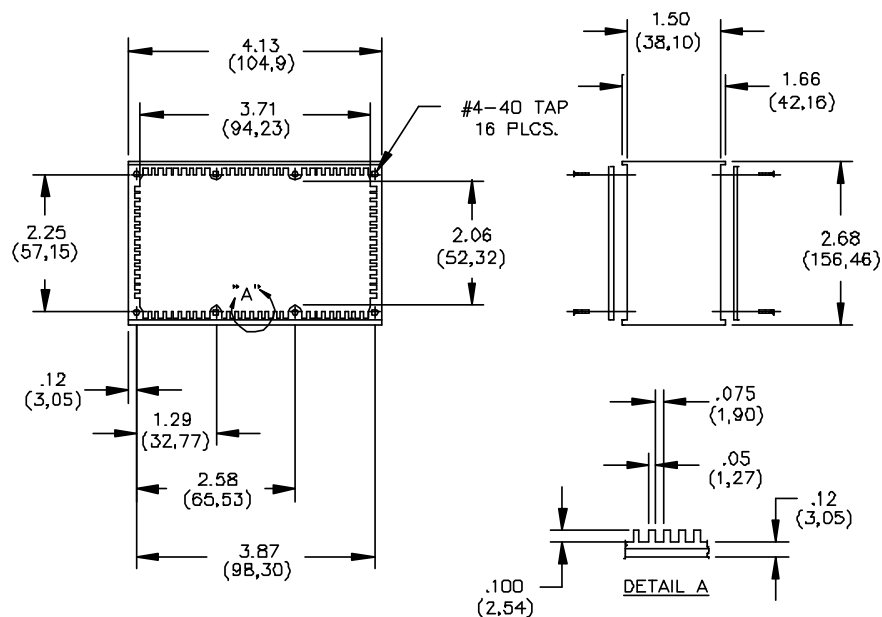
14. Here in this example Pomona Box product, we see a protective housing with an upper shell and a rounded rectangular enclosure forming a cavity with an upper opening, the opening having an inner ledge and a perimeter lip sized and configured to receive the upper shell to fill the opening such that the perimeter lip surrounds at least a portion of perimeter sides of the upper shell. This particular product does not have a lower shell with these features, but I distinctly remember a similar product with an upper and lower shell, with the lower opening and lower shell having the same configuration as I just described for the upper opening and upper shell. Such a configuration having both an upper and lower shell was useful to me in providing access for a soldering iron through the top and bottom during circuit assembly prior to attaching the covers. These Pomona Boxes were

extremely useful for providing passive and active electronic stages that could be completely shielded from RF and other electronic noise sources, and be positioned along a coaxial signal cable from a sensor to data acquisition.

15. Another example, from the datasheet for the 1999 Pomona product datasheet for Model 3301 shows an enclosure with top and bottom shells.

Pomona®

**Model 3301
Size F Extruded
Aluminum Box With Co**



APPLE-1133.

16. These very old products, which I used during my PhD research as early as the mid 1980s, include all the claimed features related to the protective

assembly claim term added to amended claim 21 (element [21n]), with a 2012 priority date, which is at least 25 years after my experiences with Pomona boxes.

17. Based on my own experience, Pomona boxes were well known and widely used for many years prior to the priority date associated with the claimed inventions of these proposed amendments. A POSITA would be familiar with these products, and specifically the offering of Pomona boxes with the “cavities”, “ledges”, “lips”, “shells” and a “rounded rectangular” enclosure. Further, a POSITA would appreciate that these claimed features were not novel, individually or all together in a single example, and that products like the Pomona boxes of the mid 1980s contained all of these features.

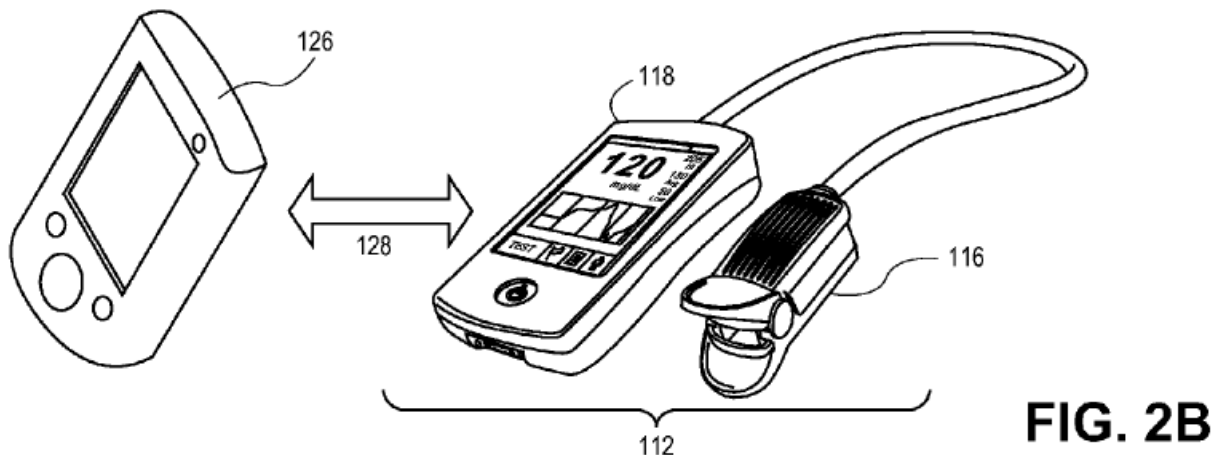
A. [GROUND 1A] – CLAIMS 21 AND 23-24 ARE OBVIOUS OVER POEZE, KIANL, BABA, AND PAKULA

18. The sections below provide a brief introduction to Poeze, Baba, and Pakula. I provided an overview of Kianl in my First Declaration (APPLE-1003, ¶¶100-102) and I largely rely on Kianl in the below combinations for the same physiological information display and user interface features that I previously discussed in my First Declaration. After the overview of the new references, I discuss the proposed modifications to Poeze based on Kianl, Baba, and Pakula and explain the application of this proposed combination to the claims. I note that the original disclosure of Poeze was filed by the '507 patent owner almost 3 years

before the priority date of the '507, and the original disclosure of Kianl was filed by the '507 patent owner almost 12 years before the priority date of the '507.

1. Overview of Poeze

19. Poeze describes various implementations of “a personal health organizer that enables patients and healthcare personnel to manage health data” that is part of a physiological parameter measurement system. APPLE-1110, Abstract. Poeze describes embodiments in which “the personal health organizer is a dedicated portable device that is adapted to retrieve reading data from a health data collection device”; embodiments in which “the personal health organizer is a software module/platform that is configured to be executed on a general purpose computing device such as a personal computer a laptop, a mobile phone, a mobile computer and a wristwatch computer”; and embodiments in which the “personal health organizer device...includes an integrated health data collection module that is configured to receive physiological data reading from a sensor.” *Id.*, [0009]-[0011]. In one of the embodiments in which the personal health organizer is implemented as software executing on a general purpose computing device, the general purpose computing device is a cell phone 126 that is in wired or wireless communication with a health data collection device 112 that includes a finger clip sensor 116 and a monitor 118, as shown, for example, in FIG. 2B. *Id.*, [0034]-[0035].

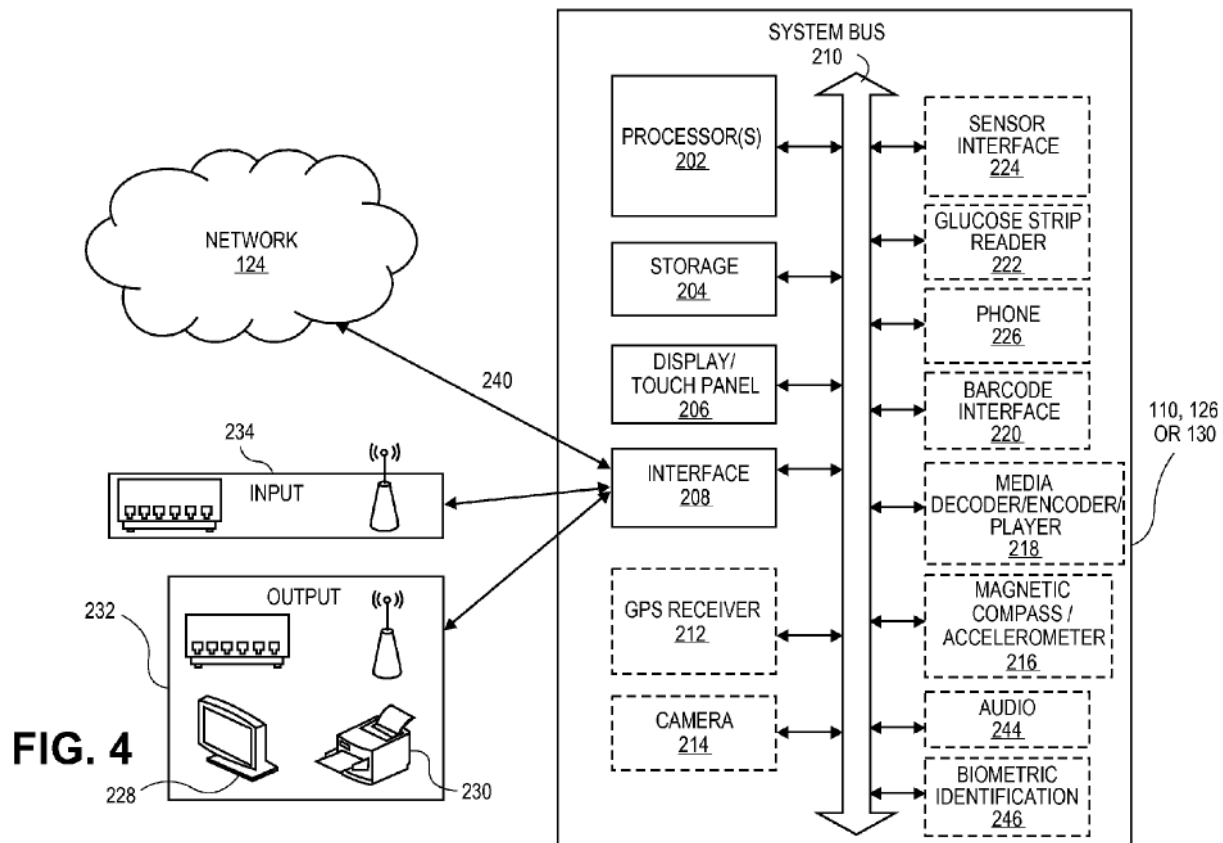


APPLE-1110, FIG. 2B.

20. In this configuration, the personal health organizer takes the form of a “software module 132 executed on a general purpose computing device 126” having “a wired or *wireless connection*” to the “health data collection device 112.” APPLE-1110, [0034]. The software module “can be an executable program on an operating system of a device such as a *mobile phone*.” *Id.* The health data collection device 112 (which includes the finger clip sensor 116 and monitor 118 connected through a wired communications link 114) “is configured to collect physiological data from a patient invasively or non-invasively. The health data collection device 112 can be a glucometer, *a pulse oximeter*, monitor devices that measure total hemoglobin, *SpO2*, methemoglobin, carboxyhemoglobin, and the like.” *Id.*, [0029]. Poeze describes that “the monitor 118 can advantageously includes electronic processing, signal processing, and data storage devices capable of receiving signal data from the sensor 116, [and] *processing the signal data to*

determine one or more output measurement values *indicative of one or more physiological parameters* of a monitored patient.” APPLE-1110, [0031]. As mentioned above, these physiological parameters include “oxygen saturation (SpO₂).” *Id.*, [0114].

21. As shown in FIG. 4, the personal health organizer (implemented on smartphone 126) includes various input and output interfaces, sensor interfaces, network interfaces, processors, memory, and a display/touchpanel 206. APPLE-1110, [0039]-[0049].



APPLE-1110, FIG. 4. The smartphone 126 also includes “a biometric identification module (such as a vein pattern or finger print scanner) 246 to distinguish one user from another or provide security for information stored.” *Id.*, [0040], [0066]. The smartphone 126 also displays “trended data (e.g. readings tracked over a period of time).” *Id.*, [0051]. For example “[t]he medical data analysis module 326, by way of example, can be used to receive medical or physiological data from the health data collection device 112” and then displays that information to a user. *Id.*, [0059], [0062].

22. As shown in FIG. 8, the sensor 116 includes one or more emitters 504 that “employ light wavelengths to measure various blood analytes or percentages (e.g., saturation) thereof” such as “oxygen saturation (SpO_2). APPLE-1110, [0111]

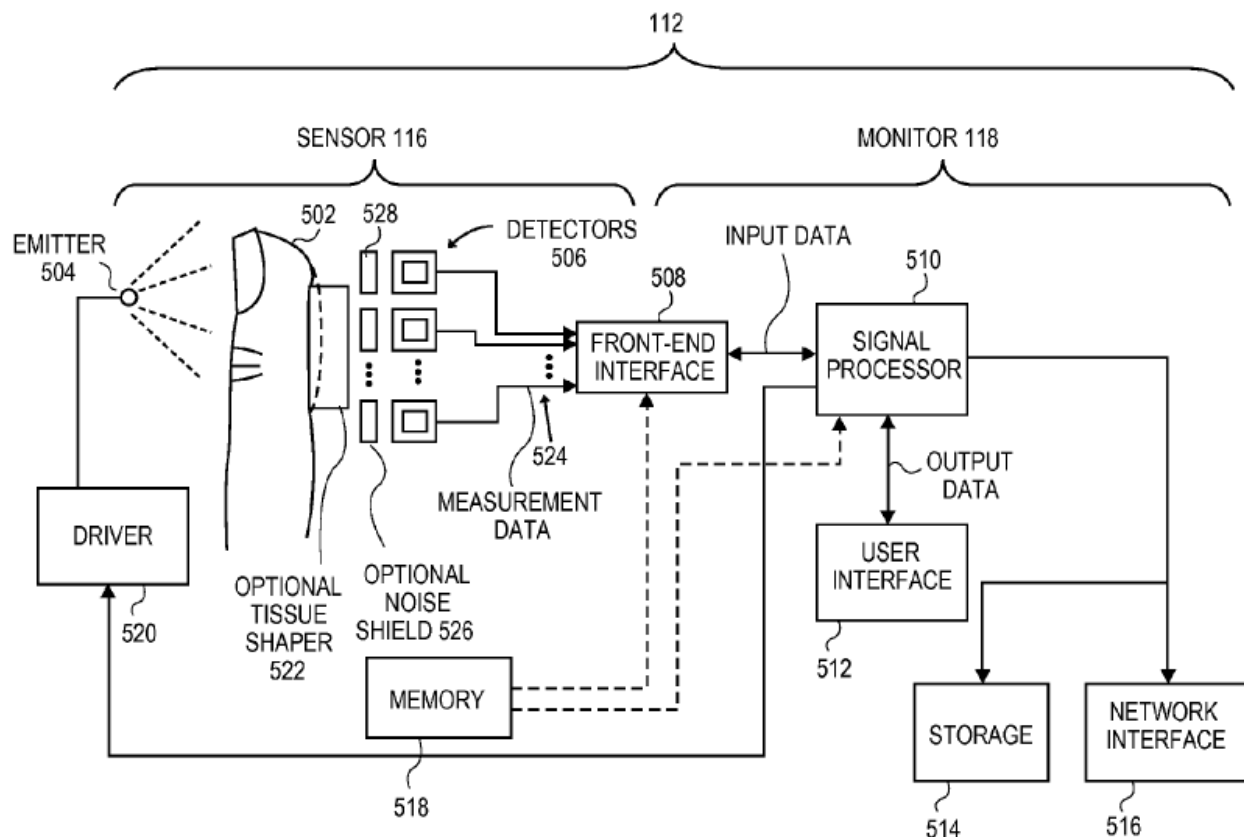


FIG. 8

APPLE-1110, FIG. 8. The light is attenuated through tissue of the patient (shown as a finger in FIG. 8) and “detectors 506 capture and measure light from the measurement site 502.” [0118]. The health data collection device 112 further includes a “front end interface 508 [that] can have its components assembled in the sensor 116, in the monitor 118, in connecting cabling (if used), combinations of the same, or the like.” *Id.*, [0120]. “The front-end interface 508 provides an interface that adapts the output of the detectors 506, which is responsive to desired physiological parameters. For example, the front-end interface 508 can adapt a signal 524 received from one or more of the detectors 506 into a form that can be

processed by the monitor 118, for example, by a signal processor 510 in the monitor 118.” *Id.* The front-end interface 508 is coupled to one or more analog to digital converters (ADCs) (which can be in the monitor 118), such as a sigma-delta ADC. *Id.* [0122]. As such, the signals received at Poeze’s monitor 118, which performs analog to digital conversion, must be analog signals. The monitor 118 of the health data collection device 112 further includes a “signal processor 510” having “processing logic that determines measurements for desired analytes, such as glucose, based on the signals received from the detectors 506. The signal processor 510 can be implemented using one or more microprocessors or subprocessors (e.g., cores), digital signal processors, application specific integrated circuits (ASICs), field programmable gate arrays (FPGAs), combinations of the same, and the like.” *Id.*, [0126].

23. In addition to these disclosures, Poeze also incorporates by reference Poeze-040 (APPLE-1111) and Dalke (APPLE-1112) to provide additional details on the health collection device 112, including implementations in which the health collection device 112 is a pulse oximeter that measures SpO₂, among other physiological parameters. APPLE-1110, [0029], [0107]. Both references are incorporated by reference in Poeze in their entirety. *Id.* Poeze-040 describes that the health collection device (that includes sensor 116 and monitor 118) can measure “a blood constituent or analyte, such as oxygen” and “many other

physiologically relevant patient characteristics” such as “pulse rate.” APPLE-1111, [0006]. Such physiological parameters can be measured using “LEDs 1102 for emitting red and/or infrared light.” *Id.*, [0168].

24. Dalke provides similar details regarding the health collection device in implementations in which the health collection device is a pulse oximeter. For example, Dalke describes applying spectroscopy techniques to implement “pulse oximetry, which utilizes a noninvasive sensor to measure oxygen saturation (SpO₂) and pulse rate” describing that in such systems “the sensor has light emitting diodes (LEDs) that transmit optical radiation of red and infrared wavelengths into a tissue site and a detector that responds to the intensity of the optical radiation after absorption (e.g., by transmission or transreflectance) by pulsatile arterial blood flowing within the tissue site. Based on this response, a processor determines measurements for SPO₂, pulse rate, and can output representative plethysmographic waveforms.” APPLE-1112, [0005].

2. Overview of Baba

25. Baba describes yet another prior art physiological monitoring device that “a movement detection means for detecting user movement; a physiological reaction detection means for detecting the user's physiological reaction; a physical activity data calculating means for calculating the user's physical activity data from detection results output by the physiological reaction detection means, an

evaluation means for determining if the user started exercising, and storage means for storing detection results from the movement detection means and physical activity data from when the evaluation result becomes positive.” APPLE-1114, [0010]. In a primary embodiment, Baba’s physiological monitoring device takes the form of “wristwatch type physical activity measurement apparatus” that “measures the heart rate as an indicator of physical activity, and measures the number of steps as an indicator of body movement.” *Id.*, [0052], [0054].

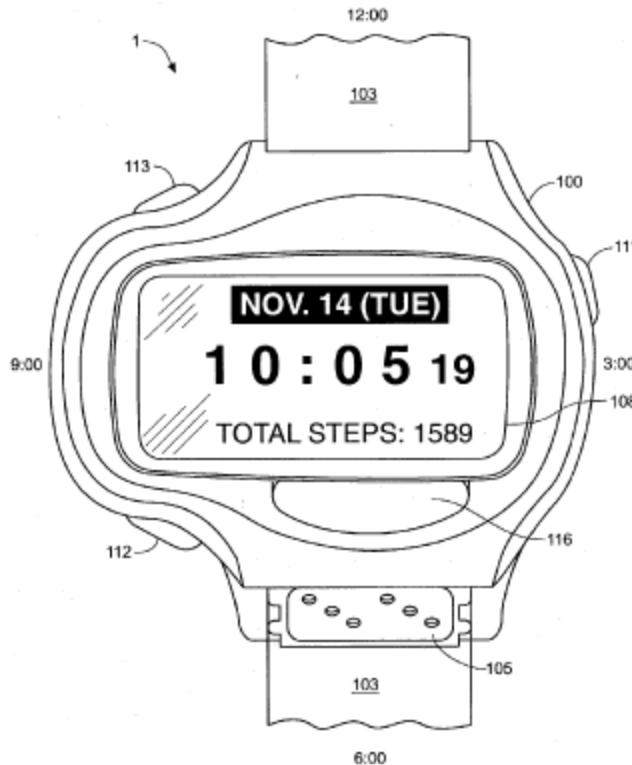


FIG. 2

APPLE-1114, FIG. 2. For example, Baba’s device includes a “pulse wave sensor unit 102” having LEDs that transmit light into the user’s skin that “is reflected from blood vessels below the skin of the user and detected by the phototransistor

1024. The reflected light is photoelectrically converted by the phototransistor 1024 to produce a pulse wave detection signal which is then output through cable 101 (FIG. 1A) connected to the circuit board 1026 (FIG. 4) to the pulse wave signal amplifier 120 (FIG. 3) inside the main unit 100 (FIG. 2).” *Id.*, [0060].

26. As shown in FIGs. 10A-10C, Baba’s device displays a user interface that shows a “heart image icon 400 [that] changes according to the heart rate.” APPLE-1114, [0096]. For example, “heart icon 400 displays a smile, as shown in FIG. 10A, when the heart rate is within the allowable heart rate range 300. When the user's heart rate exceeds the maximum heart rate 300 a, heart icon 400 displays a distressed expression, shown in FIG. 10B, and when the user's heart rate drops below the minimum heart rate 300 b, heart icon 400 displays an angry expression, shown in FIG. 10C.” *Id.*, [0097].

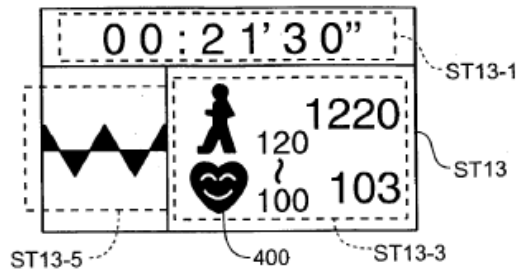


FIG. 10A

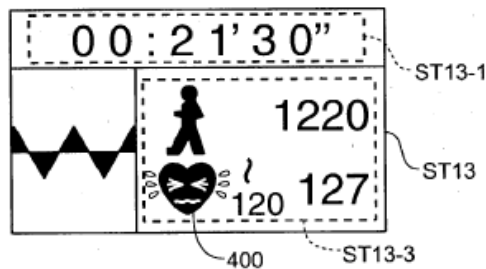


FIG. 10B

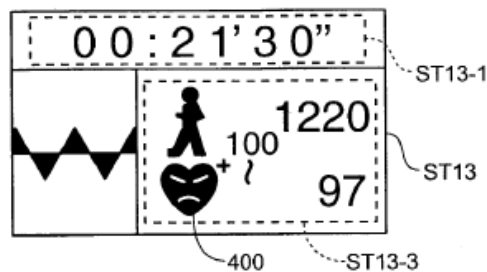
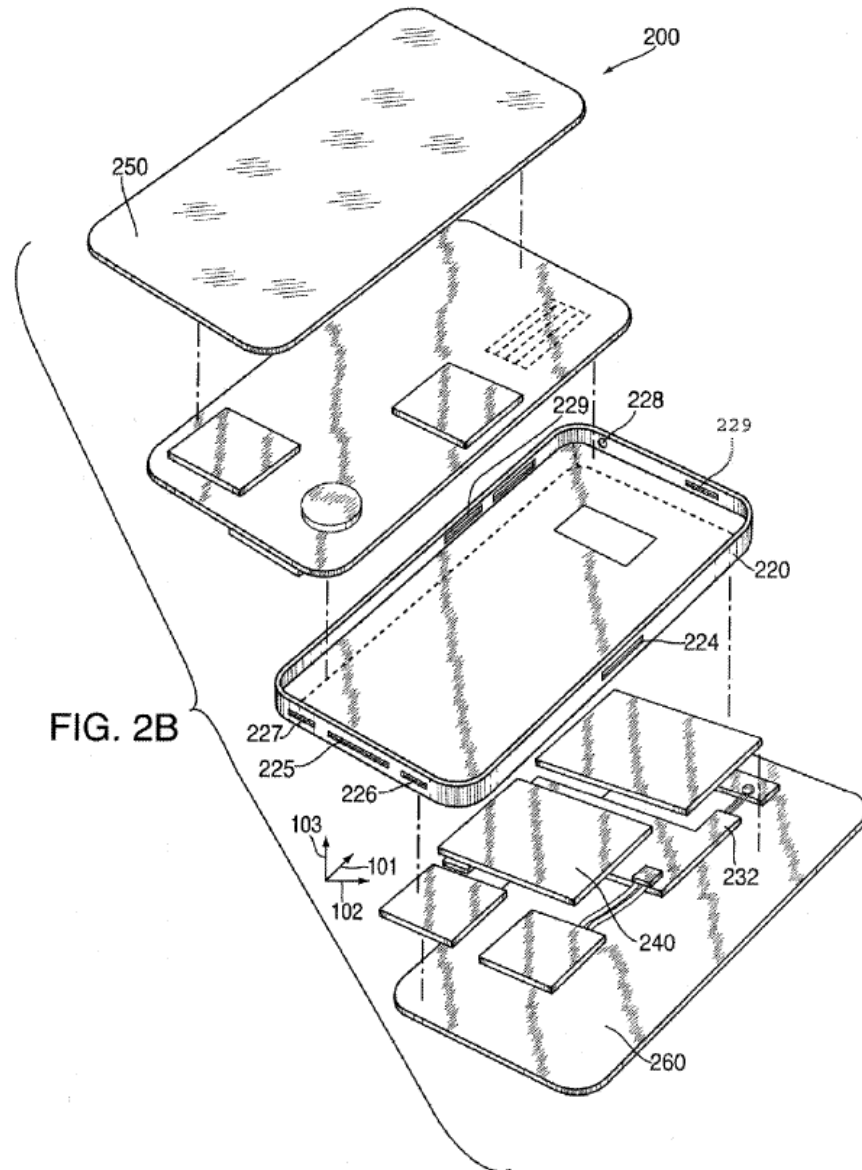


FIG. 10C

APPLE-1114, FIGs. 10A-10C. For example, “varying the heart icon 400 according to whether the user's heart rate is within, above, or below the allowable heart rate range 300, the user can determine the load on the heart by simply glancing at the heart icon 400 in LCD 108. This enables the user to adjust the intensity of the exercise according to the expression of the heart icon 400, and can thereby reliably exercise at the level prescribed by the physician.” *Id.*, [0097].

3. Overview of Pakula

27. Pakula describes “[i]mproved housings for electronic devices” that includes at least one outer member (e.g., cover) that can be aligned, protected and/or secured with respect to other portions of the housing for the electronic device. EX1113, Abst. Pakula’s housings also include “[p]rotective sides [that] can be provided in some embodiments to protect the edges of the one or more glass surfaces so as to dissipate impact forces and thus reduce damage to the electronic device housing.” *Id.* FIG. 2B shows an embodiment in which the electronic device housing has front and back covers 250 and 260 that are engaged and surrounded by an outer periphery member 220. *Id.*, [0048]-[0049], [0084]-[0085].



APPLE-1113, FIG. 2B. In some configurations, the front and back covers abut a protective side bumper such that the covers are “recessed within the outer periphery member.” *Id.*, [0114]-[0117], [0092]. For example, FIG. 8D shows an embodiment in which front and back covers 822 and 842 engage with internal ledges of the outer periphery member such that they are each surrounded by a perimeter lip of the outer periphery member. *Id.*, [0114]-[0117].

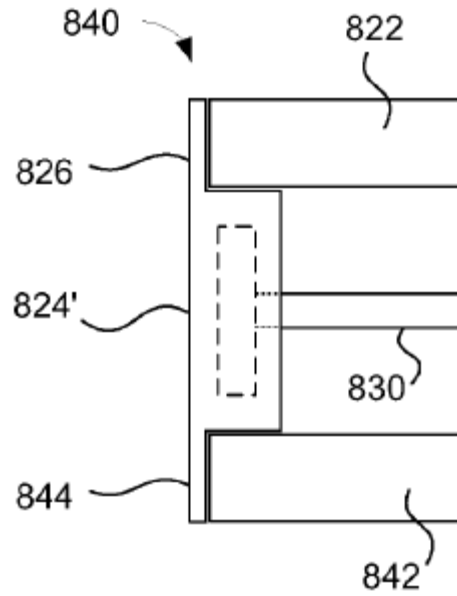


FIG. 8D

APPLE-1113, FIG. 8D. The various protective electronics housing embodiments described in Pakula act “to dissipate impact forces and thus reduce damage to the electronic device housing.” *Id.*, [0007]. Pakula’s housing allows for “robustly attaching” components to “support and protect” such components. *Id.*, [0048]-[0049]. For example, the electronic housing includes “one or more internal member or platform 140, which can serve as a mounting points or regions for helping secure, hold or pack one or more component layers (e.g., attaching component 130 to the back surface of internal platform 140, and component 132 to the front surface of internal platform 140).” *Id.*, [0067]. As such, various components, such as processing boards holding processors and other electronic components, can be mounted internally within the protective housing. *Id.*, [0069], [0085].

4. The Combination of Poeze, Kianl, Baba, and Pakula

28. In my opinion, a POSITA would have been motivated to modify the physiological monitoring system of Poeze to (1) include user interfaces that display historic physiological sensor information and user input icons as taught by Kianl; (2) include a heart icon in the user interface displayed by the smartphone that represents the current status of the user's heart rate (e.g., within the target zone, above the target zone, or below the target zone) as taught by Baba; and (3) implement the monitor 118 of Poeze's system to include the protective electronic device housing disclosed by Pakula.

29. Turning first to the application of Kianl to Poeze, Multiple reasons would have motivated a POSITA to apply the suggestions of Kianl to Poeze's physiological monitoring system to modify Poeze's mobile phone to display a user interface that includes graphs of histories of SpO2 and heart rate measurement values and control icons. The reasons for applying Kianl's teachings to Poeze are largely the same as the reasons I discussed for applying Kianl to Mendelson in my First Declaration. A POSITA would have recognized that application of Kianl to Poeze would have achieved at least the benefits that discussed in that Declaration. APPLE-1003, ¶¶100-109. My understanding is that these reasons for applying Kianl to Mendelson were never challenged by Masimo in any arguments presented since my original declaration. For example, Kianl's pulse oximetry 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. Kianl describes the various views for displaying the pulse oximetry information, describing that “[o]ne of the views is a pleth view that presents a pulse waveform. ***Another one of the views is a trend view that presents a trend graph.*** At least one of the icons can be selected so as to switch the display between the pleth view and the trend view.” *Id.* Kianl describes that “[e]ach of the views are adapted to present data responsive to a physiological signal. A plurality of icons are configured to occupy a portion of the views and adapted to designate the content of the views.” *Id.*, 2:18-23. Specifically, “[a]t least one of the icons can be selected so as to ***switch the display between the pleth view and the trend view.***” *Id.*, 2:29-31. For example, the user interface shown in FIG. 10 includes “a pulse rate trend graph 1050” along with blood oxygen trend information that show graphs depicting historic values for the pulse rate and blood oxygen saturation levels measured over time. APPLE-1006, 11:6-49, 12:18-26.

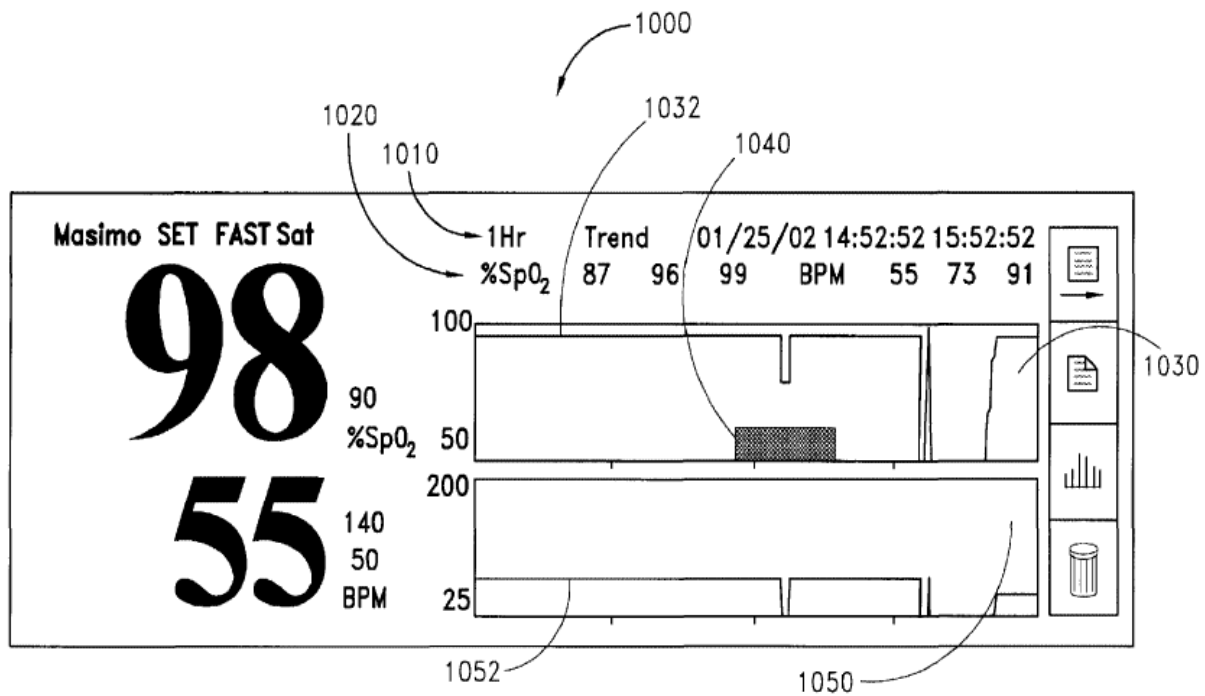


FIG. 10

APPLE-1006, FIG. 10. As shown in FIG. 10, the user interface also includes “soft key icons” that allow the user to select different menus to change the display and otherwise interact with the application displaying the user interface. *Id.*, 5:23-51.

30. As a first reason that would have prompted a POSITA to apply the teachings of Kianl to Poeze to include these user interface features in the user interface displayed by the smartphone 126 in Poeze’s system, a POSITA would have recognized that “calculating a data trend” of measured SpO2 data would have provided easier to digest information to healthcare providers to allow them to more

easily identify abnormal patterns, conditions, and other health concerns based on the analyzed physiological data, such as blood oxygen saturation data. APPLE-1006, 2:32-41. This would have beneficially led to easier identification of potentially dangerous health conditions thereby leading to quicker and/or better treatment in at least some scenarios, which would have led to improved health outcomes for patients.

31. As a second reason, a POSITA would have recognized that applying Kianl's teachings to Poeze's physiological monitoring system to allow users (including the user being monitored and affiliated healthcare providers) to easily switch between various views for the physiological measurements using input buttons displayed on the user interface display, such as trend analysis, real-time measurement values, and scrolling 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. Such functionality would have allowed each user to view the physiological information in a preferred format, thereby increasing the overall usability of the resulting system.

32. As a third reason, a POSITA would have recognized that applying Kianl's teachings to Poeze's physiological monitoring system to provide multiple different 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. Providing additional options for viewing physiological measurement information would have improved overall usability of the resulting system.

33. As a fourth reason, a POSITA would have recognized that applying Kianl’s teachings to Poeze’s physiological monitoring system to provide touchscreen user interface options for switching between the various views would have made the resulting system easy and intuitive to use. Displaying the onscreen control buttons described by Kianl on the touchscreen display of Poeze’s smartphone 126 would have allowed users to easily access various features of the resulting healthcare software by selecting such buttons using Poeze’s touchscreen.

34. As a fifth reason, Poeze describes that “medical data analysis module 326” executing on the smartphone 126 “provide[s] visualization of health data tracking or trending. In an embodiment, the medical data display module 344 displays trended data for a user in a variety of graphical formats, for example, when rotated in a horizontal position. The trended data can contain continuous or spot readings of measureable parameters or user input for activity flags, as discussed above.” APPLE-1110, [0066]. However, Poeze is lacking in specifics as to how such physiological information, including “trended data” is displayed on

the smartphone 126. The various example user interface displays described by Kianl fill in this missing information by describing known user interfaces for displaying physiological information of a user in a physiological parameter monitoring system. Similarly, Poeze describes receiving user input via the touchscreen and Kianl provides helpful details on input softkeys that can be displayed to elicit such input. APPLE-1110, [0062], [0065]-[0066], [0128].

35. Finally, a POSITA would have been prompted to implement Poeze's physiological parameter monitoring system to display historic measurement information for received and stored heart rate and SpO₂ data (and other physiological measurements) in a plurality of graphical representations including graphs (as suggested by Kianl) because doing so would be merely the application of a known technique to a known system (e.g., Poeze's physiological monitoring system) ready for improvement to yield predictable results. Here, Kianl provides straightforward examples of known techniques for displaying graphs of historic measured SpO₂ and heart rate data, and Poeze's teaching provides a known system that would have been improved by application of Kianl's suggested technique for at least the reasons described above.

36. Based upon my knowledge and experience in this field and my review of Poeze and Kianl, I am confident a POSITA would have recognized that such a modification would have yielded predictable results, and implementation of these

modifications would have been within the ordinary level of skill of a POSITA. Thus, a POSITA would have had a reasonable expectation of success in implementing such a combined system based on applying Kianl's teachings to Poeze's system.

37. Furthermore, multiple reasons would have motivated a POSITA to apply the teachings of Baba to Poeze's system (as modified by Kianl) to further include a display of a heart icon in the user interface of the smartphone of the resulting combination. As a first reason, applying Baba's teaching to display an "image of the heart icon 400 [that] changes according to the heart rate" would have allowed the user to easily and intuitively determine if the user's current heart rate is within an "allowable heart rate" or above or below the target heart rate by displaying a "smile," "a distressed expression," or "an angry expression" as shown, for example in FIGs. 10A-10B. APPLE-1114, [0096]-[0097]. This graphical and intuitive display allows the user to understand the current condition without having to remember the established heart rate values that comprise the "allowable heart rate" range, which could be especially important if the heart rate is out of range and the user needs information that is clear and easy to interpret.

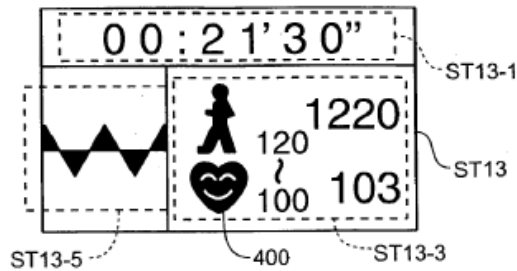


FIG. 10A

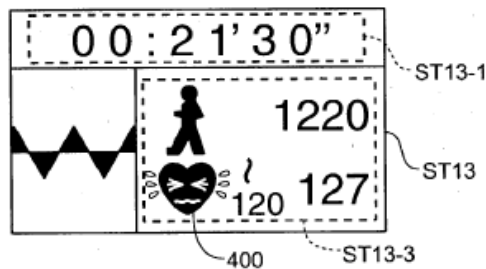


FIG. 10B

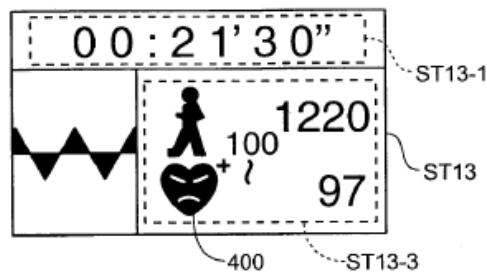


FIG. 10C

APPLE-1114, FIGs. 10A-10C. As I discussed above, “varying the heart icon 400 according to whether the user's heart rate is within, above, or below the allowable heart rate range 300 [allows] the user [to] determine the load on the heart by simply glancing at the heart icon 400 in LCD 108. This enables the user to adjust the intensity of the exercise according to the expression of the heart icon 400, and can thereby reliably exercise at the level prescribed by the physician.” *Id.*, [0097];

see also APPLE-1117, 2:49-53 (providing another example of a heart icon displayed in a user interface of a physiological sensor to intuitively “indicate i[f] the user is above (up arrow) or below (down arrow) the target heart rate zone.”). As such, application of this teaching to Poeze’s system (as modified by Kianl) would have improved the resulting system by improving the ability of the user to maintain a target heart rate by providing heart rate information in an intuitive manner.

38. As a second reason, such an application of Baba to Poeze (as modified by Kianl) would have indicated to users in an intuitive, easy to understand at a glance manner that the numeric values being displayed are heart rate values. For example, it was known in the prior art to include a “[h]eart rate icon (heart symbol)” in a display for a physiological monitoring system and to implement the heart icon to “flash[] to show hea[r]t rate signal from chest strap.” APPLE-1117, 2:27-30.

39. As a third reason, such an application of Baba to Poeze (as modified by Kianl) to display a heart icon in the user interface would have been beneficially used to indicate that the heart rate monitor functionality of the system is active and ready for use. For example, it was known in similar prior art physiological monitoring systems to implement the user interface to display a “ready screen once

the heart rate sensor is detected wherein the heart icon is solid and not blinking” to indicate to the user that the heart rate sensor is ready for use. APPLE-1116, [0131].

40. As a fourth reason, a POSITA would have been prompted to implement Poeze’s physiological parameter monitoring system, as modified by Kianl, to include a heart icon in the graphic user interface (as suggested by Baba) because doing so would be merely the application of a known technique to a known system (e.g., Poeze’s physiological monitoring system) ready for improvement to yield predictable results. Here, Baba provides straightforward examples of known techniques for displaying a graphic indication of a heart to provide information to the user in an intuitive and easy to understand manner, and Poeze’s teaching provides a known system that would have been improved by application of Baba’s suggested technique for at least the reasons described above.

41. Based upon my knowledge and experience in this field and my review of Poeze, Kianl, and Baba, I am confident a POSITA would have recognized that such a modification would have yielded predictable results, and implementation of these modifications would have been within the ordinary level of skill of a POSITA. Thus, a POSITA would have had a reasonable expectation of success in implementing such a combined system based on applying Baba’s teachings to Poeze’s system (as modified by Kianl).

42. As I discussed above, a POSITA also would have been motivated to apply the teachings of Pakula to the physiological monitoring system of Poeze to implement the monitor 118 to house the electronic components of Poeze's monitor 118 within the protective housing disclosed by Pakula for multiple reasons. As a first reason, such an application of Pakula's teachings to Poeze's system would have protected the display and internal electronic components of Poeze's monitor 118 from damage. Pakula describes providing "improved techniques and structures for providing housings for portable electronic devices" and Poeze's monitor 118 is just such an electronic device that would have benefited from the teachings of Pakula. APPLE-1113, [0005]. Specifically, Pakula describes that its improved housing is configured "to protect the edges of the one or more glass surfaces so as to *dissipate impact forces and thus reduce damage to the electronic device housing.*" *Id.*, [0007]. Due to this protective configuration, Pakula's electronic device housing "protect the components from damage during use or when dropped." *Id.*, [0071].

43. As a second reason, Pakula's improved electronic device housing allows for "robustly attaching" components to "support and protect" such components. APPLE-1113, [0048]-[0049]. For example, the electronic housing includes "one or more internal member or platform 140, which can serve as a mounting points or regions for helping secure, hold or pack one or more

component layers (e.g., attaching component 130 to the back surface of internal platform 140, and component 132 to the front surface of internal platform 140).” *Id.*, [0067]. Pakula’s improved electronic device housing thus “retain[s] components within the volume 232” in a secure manner. Pakula goes on to describe that its improved electronic device housing “provide[s] attachment points for the various layers placed within the electronic devices” to allow the electronic components described by Poeze to be securely mounted within the resulting monitor device. *Id.*, [0060], [0064], [0067]. As such, various components of Poeze’s monitor 118, including the signal processor 510 and the analog-to-digital converter(s) (and in some implementations, the front-end interface 508) can be conveniently and securely mounted internally within the protective housing. *Id.*, [0069], [0085].

44. As a third reason, Pakula discloses that its improved electronic device housing “can provide a variety of attributes to the electronic device including for example, structural, functional, cosmetic, or combinations of these.” *Id.*, [0054]. For example, “[i]f several elements are combined to form the outer periphery members, the elements can be connected in any suitable manner to form a single unit having adequate structural, functional, or cosmetic properties.” *Id.* A POSITA would have recognized that “enhancing the aesthetic appeal” of the resulting

device would have improved consumer demand, in at least some scenarios, thus increasing sales. [0058], [0084], [0097].

45. As a fourth reason, the flush edges and curves of Pakula's housing "prevent edges from engaging other surfaces" such as by snagging on clothing or causing scratches to the skin of the user. APPLE-1113., [0071].

46. As a fifth reason, implementing Poeze's monitor 118 to include the protective electronic device housing of Pakula would function to "reduce the overall weight, size or both of electronic device 200" while still providing adequate resistance to "bending, torsion, tension, compression, or other deformation." APPLE-1113, [0085].

47. As a sixth reason, using the front and back covers disclosed by Pakula as part of the housing for Poeze's monitor 118 would "retain components within" the device while "provid[ing] access to one or more internal components" to allow for easy "servicing or replacing electronic device components." *Id.*, [0090]-[0091], [0064].

48. As a seventh reason, Pakula makes clear that its suggestions for an improved electronic device housing are applicable to "any suitable type of electronic device having a display" and therefore are directly applicable for implementing Poeze's monitor 18. APPLE-1113, [0061]. As such, a POSITA would have recognized that the proposed modification would be merely the

application of a known technique to a known system (e.g., Poeze's physiological monitoring system) ready for improvement to yield predictable results. Here, Pakula provides straightforward examples of known techniques for configuring a protective housing for an electronic device, and Poeze's teaching provides a known system that would have been improved by application of Pakula's suggested technique for at least the reasons described above.

49. Based upon my knowledge and experience in this field and my review of Poeze, Kianl, Baba, and Pakula, I am confident a POSITA would have recognized that such a modification would have yielded predictable results, and implementation of these modifications would have been within the ordinary level of skill of a POSITA. Thus, a POSITA would have had a reasonable expectation of success in implementing such a combined system based on applying Pakula's teachings to Poeze's system (as modified by Kianl and Baba).

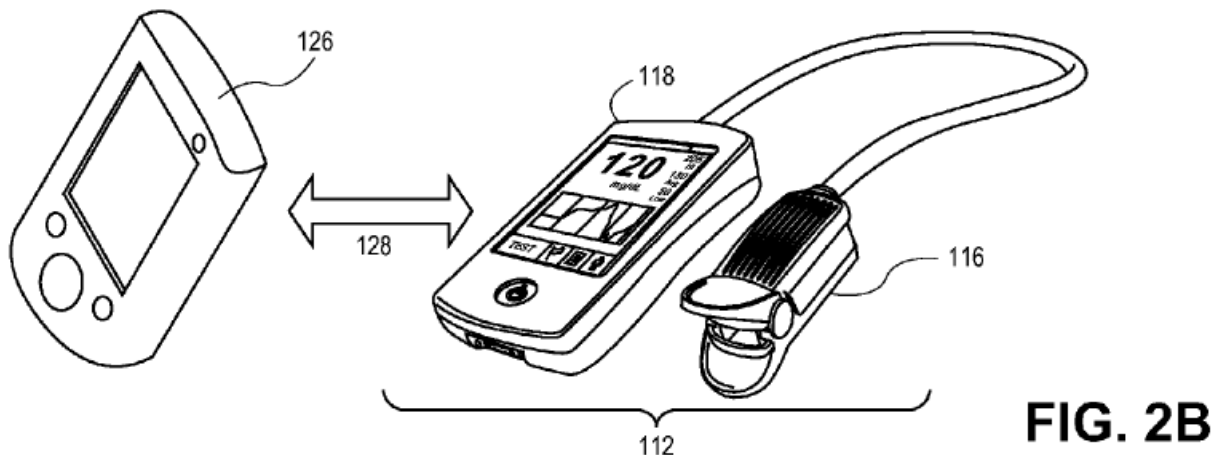
5. Application of Poeze, Kianl, Baba, and Pakula to the Claims

(i) Claim 21

50. The combination of Poeze with Kianl Baba, and Pakula (as I have described above) provides all elements of substitute claim 21.

[21pre] A computer-implemented method of informing a user of mobile measurement of oxygen saturation (“SpO2”), the computer-implemented method comprising:

51. Poeze describes that “[s]ystems, methods, and computer-readable media are disclosed for obtaining and analyzing medical data from a medical device or a data server. More specifically, systems, methods, and computer readable media are disclosed for enabling a portable device to obtain and analyze medical data from a health data collection device, such as a glucometer.” APPLE-1110, [0027]. While the primary examples in Poeze are directed toward systems that include a glucometer, Poeze is also clear that the “health data collection device 112” of its physiological monitoring system can be “a pulse oximeter” for measuring SpO₂ values. *Id.*, [0029]. FIG. 2B shows an example system in which an optical finger clip sensor 116 is connected to a monitor 118 to form a health data collection device 112, with the monitor 118 in wired or wireless communication with a general purpose computing device such as a smartphone 126. *Id.*, [0031], [0034]-[0035].



APPLE-1110, FIG. 2B. Poeze describes that the “mobile computing device”/“mobile phone” functions to “provide the patient with mobility and provide the caregiver the option of including the monitoring device when transporting patients” and can measure “movement of the user.” APPLE-1110, [0028], [0034], [0006], [0013], [0052], [0082].

52. Briefly, Poeze describes the method at a high level, stating that “the monitor 118 can advantageously include electronic processing, signal processing, and data storage devices capable of receiving signal data from the sensor 116, processing the signal data to determine one or more output measurement values indicative of one or more physiological parameters of a monitored patient, and displaying the measurement values, trends of the measurement values, combinations of measurement values, and the like.” APPLE-1110, [0031]. The physiological information, including trend data, is also displayed by the smartphone 126, which a POSITA would have understood as providing the recited

informing a user of mobile measurement of oxygen saturation (“SpO2”). *Id.*, [0051], [0066].

[21a] outputting, from an optical sensor of an SpO2 measurement system, one or more analog signals responsive to light from a light source attenuated by tissue of the user at a measurement site, said one or more analog signals responsive to an oxygen saturation of said tissue; and

53. Poeze is clear that the sensor 116 is an optical sensor that outputs signals responsive to light from a light source attenuated by tissue of the user at a measurement site indicative of oxygen saturation of the tissue and that the signals output by the sensor 116 are analog signals. As discussed above, Poeze describes that the monitor 118 “receiv[es] signal data from the sensor 116.” APPLE-1110, [0031]. As shown in FIG. 8, “the sensor 116 includes an emitter 504, a tissue shaper 522, [and] a set of detectors 506.” *Id.*, [0106]. Poeze describes that “the emitter 504 can include one or more sources of optical radiation, such as LEDs, laser diodes, incandescent bulbs with appropriate frequency-selective filters, combinations of the same, or the like. In an embodiment, the emitter 504 includes sets of optical sources that are capable of emitting visible and near-infrared optical radiation.” *Id.*

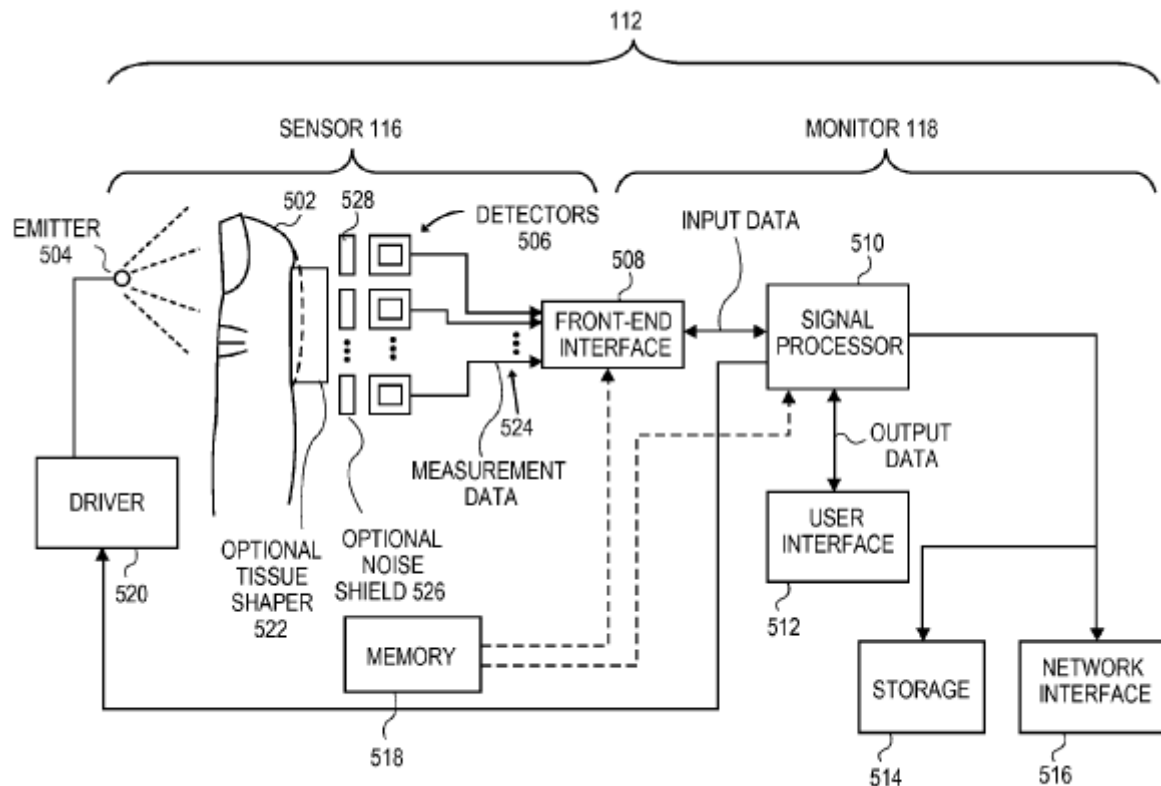


FIG. 8

APPLE-1110, FIG. 8.

54. “The detectors 506 capture and measure light from the measurement site 502. For example, the detectors 506 can capture and measure light transmitted from the emitter 504 that has been attenuated or reflected from the tissue in the measurement site 502.” APPLE-1110, [0118]. Furthermore, “[t]he detectors 506 can *output a detector signal 524 responsive to the light captured or measured.* The detectors 506 can be implemented using one or more photodiodes, phototransistors, or the like.” *Id.*

55. The data collection device 112 further includes a “front-end interface 508 [which] can have its components assembled in the sensor 116, in the monitor

118, in connecting cabling (if used), combinations of the same, or the like.”

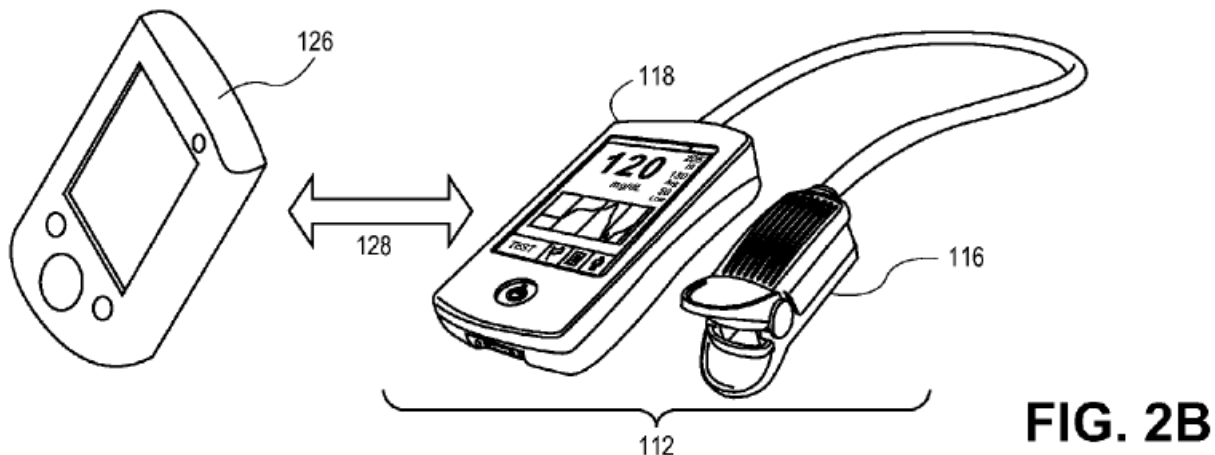
APPLE-1110, [0120]. This front-end interface 508 acts to “adapt a signal 524 received from one or more of the detectors 506 into a form that can be processed by the monitor 118, for example, by a signal processor 510 in the monitor 118.” A POSITA would have recognized that both the finger clip sensor 116 (including the emitter 504 and detectors 506) alone and a combination of the finger clip sensor 116 and the front-end interface 508 provides the claimed optical sensor. As I discussed above, “some embodiments may be configured to measure analytes, such as total hemoglobin (tHb), *oxygen saturation (SpO2)*, carboxyhemoglobin, methemoglobin, etc.” *Id.*, [0114]. Therefore the light attenuated by tissue of the user at the measurement site is responsive to an oxygen saturation of the tissue in implementations in which the data collection device 112 is (or includes) a pulse oximeter.

56. Poeze also makes clear that the signal from the optical sensor is an analog signal. Specifically, Poeze describes that the front-end interface 508 can be “coupled to one or more analog to digital converters (ADCs) (which can be in the monitor 118), such as a sigma-delta ADC.” APPLE-1110, [0122]. A POSITA would have recognized that because the ADCs are located in the monitor 118, the signal received at the monitor 118 is an analog signal. In an additional example, Poeze describes that “[t]he ADC or ADCs can provide one or more outputs into

multiple channels of digital information for processing by the signal processor 510 of the monitor 118. Each channel can correspond to a signal output from a detector 506.” *Id.*, [0123].

[21b] via a processing board of the SpO2 measurement system, the processing board in data communication with the optical sensor and a smartphone mobile computing device including a touch-sensitive smartphone display:

57. Poeze discloses the claimed processing board in the form of the internal circuitry of the monitor 118. As shown in FIG. 8, “the monitor 118 can advantageously includes *electronic processing, signal processing*, and data storage devices capable of receiving signal data from the sensor 116, *processing the signal data to determine one or more output measurement values* indicative of one or more physiological parameters of a monitored patient, and displaying the measurement values, trends of the measurement values, combinations of measurement values, and the like.” APPLE-1110, [0031]. These “output measurement values” include oxygen saturation (SpO₂). APPLE-1110, [0029], [0086], [0114].



APPLE-1110, FIG. 2B.

58. In addition to the signal processor 510, the system includes “an ADC in the monitor 118” for converting the analog signal from the front-end interface 508 to a digital signal that can be processed by the signal processor 510. APPLE-1110, [0122]-[0124]. As previously discussed, in some implementations the front-end interface 508 is one of the computing components included in the monitor while the in other implementations the front-end interface 508 is outside of the monitor such as by being included in the sensor 116 or “in connecting cabling (if used), combinations of the same, or the like.” *Id.*, [0120].

59. To the extent that Poeze does not expressly use the term “processing board” or describe the ADC(s) and processor 510 as being mounted to a “board,” such an implementation for the internal circuitry of Poeze would have been obvious based on the disclosures of Pakula. For example, Pakula describes that its improved electronic housing includes “one or more internal member or platform

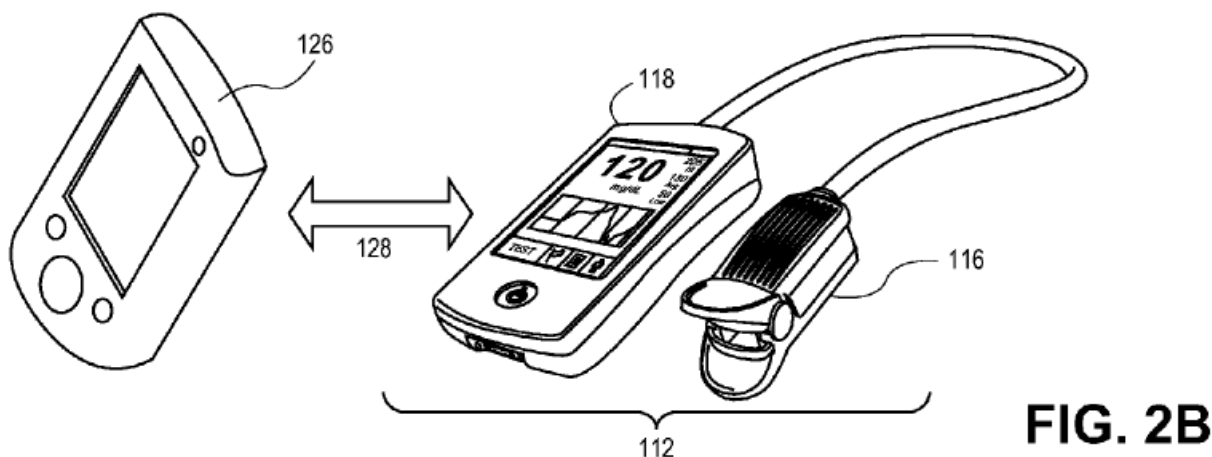
140, which can serve as a mounting points or regions for helping secure, hold or pack one or more component layers (e.g., attaching component 130 to the back surface of internal platform 140, and component 132 to the front surface of internal platform 140).” APPLE-1113, [0067]. A POSITA would understand that these “component layers” would have included a printed circuit board (“PCB”) to provide support and connections for each “component.” Such PCBs are planar structures that could be described as “layers” for providing processing of signals. As such, various processing boards holding components such as processors and other electronic components, can be mounted internally within the protective housing. *Id.*, [0069], [0085]. For example, Pakula describes that various internal computing components of the resulting device “can be electrically coupled using one or more of a **PCB**...” APPLE-1113, [0066]. In another example, Pakula describes that “the internal platform can be formed by a printed circuit board.” *Id.*, [0069]-[0070] In yet another example, “internal components of the electronic device” can be implemented using “a circuit board” that includes various “chips.” *Id.*, [0085]-[0086]. A POSITA would have recognized that implementing at least the ADC and signal processor 510 of Poeze as components of a circuit board (along with front-end interface 508 in some embodiments) based on Pakula’s suggestions would be straightforward and within their capabilities. Further, a POSITA would have appreciated that this arrangement would allow the

components to be in electrical communication in a reliable, well-known manner while securing the components within the assembly to provide the protection from damage and other benefits that I discussed in paragraphs 42-49, above. Indeed, it was well known in the art to mount such processors and analog-to-digital converters on a single board within a housing in prior art physiological monitoring systems/devices, As such this implementation would have been straight forward to implement and provide predictable benefits. APPLE-1092 11:6-20. It was also well known to mount such processing components on a processing board within a protective housing of an electronic device/system. APPLE-1118, [81].

60. Returning to the disclosures of Poeze, these disclosures also make clear that the monitor 118 is in data communication with a smartphone mobile computing device including a touch-sensitive smartphone display. Specifically, the “general purpose computing device 126” can be implemented as a mobile phone (as depicted in FIG. 2B, above) “such as the iPhone manufactured by Apple, Inc., a Blackberry device manufactured by Research In Motion, Inc., the Pre manufactured by Palm, Inc, or a mobile device manufactured by HTC, Nokia, or Motorola, etc.” APPLE-1110, [0034]. Poeze also discloses that the smartphone 126 has “a touch screen.” *Id.*, [0040]-[0043], [0047], [0062]. It was well-known that iPhones use a touchscreen interface, for example.

[21c] receiving through a wired connection said one or more analog signals from the optical sensor;

61. As I discussed with respect to element [21a], above, the signals provided to the monitor 118 by the sensor 116 are analog signals because they are converted from analog to digital by ADCs located within the monitor 118. APPLE-1110, [0122]-[0124]. As shown in FIG. 1B, the monitor 118 (the claimed processing board) has a wired connection to the optical sensor 116.



APPLE-1110, FIG. 2B. Poeze describes “the health data collection device 112 includes a finger clip sensor 116 connected to a monitor 118 via a cable” and the monitor 118 “receiv[es] signal data from the sensor 116.” *Id.*, [0031]. In more detail, with respect to FIG. 8, Poeze describes that “[t]he front-end interface 508 can be coupled to the detectors 506 and to the signal processor 510 using a bus, wire, electrical or optical cable, flex circuit, or some other form of signal connection.” *Id.*, [0121]. As previously discussed, “[t]he front-end interface 508

can have its components assembled in the sensor 116, in the monitor 118, in connecting cabling (if used), combinations of the same, or the like.” *Id.*, [0120].

[21d] processing said one or more analog signals to generate the SpO2 measurement values and heart rate; and

62. Poeze describes that “the monitor 118 can advantageously includes electronic processing, signal processing, and data storage devices capable of receiving signal data from the sensor 116, [and] *processing the signal data to determine* one or more output measurement values *indicative of one or more physiological parameters* of a monitored patient.” APPLE-1110, [0031]. As I previously discussed, these physiological parameters include “oxygen saturation (SpO₂).” *Id.*, [0114], [0029]. In more detail “the signal processor 510 includes processing logic that determines measurements for desired analytes, such as glucose, based on the signals received from the detectors 506. The signal processor 510 can be implemented using one or more microprocessors or subprocessors (e.g., cores), digital signal processors, application specific integrated circuits (ASICs), field programmable gate arrays (FPGAs), combinations of the same, and the like.” *Id.*, [0126].

63. Poeze further describes tracking “the user’s pulse rate.” *Id.*, [0052]. For example, Poeze describes the “medical data analysis module 326” as performing “pulse rate tracking.” To the extent that Poeze does not expressly describe that the monitor 118 processes the analog signals received from the sensor

116 to generate the heart rate/pulse rate values, these additional details are provided by both Poeze-040 and Dalke. As I previously mentioned, Poeze also incorporates by reference Poeze-040 (APPLE-1111) and Dalke (APPLE-1112) to provide additional details on the health collection device 112, including implementations in which the health collection device 112 is a pulse oximeter that measures SpO₂ and heart rate values, among other physiological parameters.

APPLE-1110, [0029], [0107]. Both references are incorporated by reference in Poeze in their entirety. *Id.* Poeze-040 describes that the health collection device (that includes sensor 116 and monitor 118) can measure “a blood constituent or analyte, such as oxygen” and “many other physiologically relevant patient characteristics” such as “pulse rate.” APPLE-1111, [0006]. These blood oxygen saturation and pulse rate physiological parameters can be measured using “LEDs 1102 for emitting red and/or infrared light.” *Id.*, [0168].

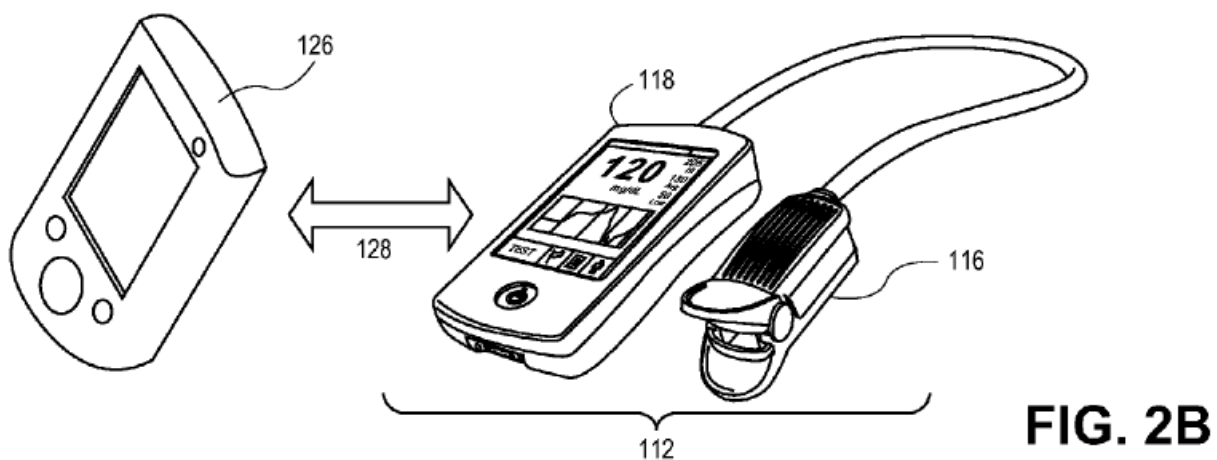
64. Dalke provides similar details regarding the health collection device 112 in implementations in which the health collection device 112 is a pulse oximeter. For example, Dalke describes applying spectroscopy techniques to implement “pulse oximetry, which utilizes a noninvasive sensor to measure oxygen saturation (SpO₂) and pulse rate” describing that in such systems “the sensor has light emitting diodes (LEDs) that transmit optical radiation of red and infrared wavelengths into a tissue site and a detector that responds to the intensity of the

optical radiation after absorption (e.g., by transmission or transreflectance) by pulsatile arterial blood flowing within the tissue site. Based on this response, *a processor determines measurements for SPO2, pulse rate*, and can output representative plethysmographic waveforms.” APPLE-1112, [0005]. As I previously discussed the monitor 118 “process[es] the signal data to determine one or more output measurement values indicative of one or more physiological parameters of a monitored patient” and as such, the determination of the blood oxygen saturation and pulse rate is determined by the monitor 118 of Poeze. APPLE-1110, [0031].

65. Additionally, although Poeze expressly incorporates by reference both Poeze-040 and Dalke and those references demonstrate that one of the physiological parameters of the monitored patient that is determined by Poeze’s monitor 118 is pulse rate, it also would have been obvious to modify Poeze based on Dalke and/or Poeze-040 to determine heart rate . Such a modification would beneficially provide additional physiological parameter information for use in determining overall health/fitness, especially in light of Poeze’s discussion of tracking pulse rate for the user.

[21e] wirelessly outputting the SPO2 measurement values and heart rate to the smartphone mobile computing device; and

66. As shown in FIG. 2B, the monitor 118 communicates with the smartphone 126 over a “communications link 128 [which] can be a wired or wireless connection adapted.” APPLE-1110, [0034].



APPLE-1110, FIG. 2B. The smartphone includes “a personal health organizer software module” having “medical data analysis module 326” that “receive[s] medical or physiological data from the health data collection device 112.” *Id.*, [0034]. For example, the smartphone 126 “receive[s] the measurement outputs from the monitor 118.” *Id.*, [0058]-[0059]. As I previously discussed with respect to element [21d], above, the physiological parameters determined by the monitor 118 and transmitted to the smartphone 126 include SpO₂ (blood oxygen saturation) and heart rate. *Id.*, [0114], [0029]; APPLE-1111, [0006]; APPLE-1112, [0005].

[21f] via an application configured to execute commands on the smartphone mobile computing device:

67. Poeze describes embodiments in which “the personal health organizer is *a software module/platform* that is configured to be executed on a general purpose computing device such as a personal computer, a laptop, *a mobile phone*, a mobile computer, and a wristwatch computer.” APPLE-1110, [0010]. A POSITA would have recognized that a “software module/platform” as described by Poeze is an application configured to execute commands on the smartphone (iPhone, Blackberry, etc.) to perform the processes described therein. For example, Poeze describes that “[t]he general purpose computing device can be a mobile computing device with its own operating system and software, and has installed upon it the personal health organizer software module configured to perform tasks that are substantially similar to those performed by the dedicated personal health organizer depicted in FIGS. 1A and 1B.” *Id.*, [0028]. More specifically, “the personal health organizer module 132 *can be an application that is executed on the operating system of a mobile phone* such as the iPhone manufactured by Apple, Inc., a Blackberry device manufactured by Research In Motion, Inc., the Pre manufactured by Palm, Inc, or a mobile device manufactured by HTC, Nokia, or Motorola, etc.” *Id.*, [0034].

[21g] generating a graphical user interface having a plurality of display portions on the touch-sensitive smartphone display;

68. As I discussed in paragraphs 29-36, above, a POSITA would have predictably and beneficially applied Kinal to Poeze to display a graphical user interface having a plurality of display portions on the touch-sensitive smartphone display. As I discussed above, the smartphone 126 of Poeze has a touch screen. Specifically, the “general purpose computing device 126” can be implemented as a mobile phone (as depicted in FIG. 2B, above) “such as the iPhone manufactured by Apple, Inc., a Blackberry device manufactured by Research In Motion, Inc., the Pre manufactured by Palm, Inc, or a mobile device manufactured by HTC, Nokia, or Motorola, etc.” APPLE-1110, [0034]. Thee smartphone 126 has “a touch screen.” *Id.*, [0040]-[0043], [0047], [0062]. For example, it was well-known that iPhones use a touchscreen interface. Poeze also describes that the smartphone 126 displays “trended data (e.g. readings tracked over a period of time).” *Id.*, [0051]. For example “[t]he medical data analysis module 326, by way of example, can be used to receive medical or physiological data from the health data collection device 112” and then displays that information to a user. *Id.*, [0059], [0062].

69. Poeze also describes that “medical data analysis module 326” executing on the smartphone 126 “provide[s] visualization of health data tracking or trending. In an embodiment, the medical data display module 344 displays trended data for a user in a variety of graphical formats, for example, when rotated

in a horizontal position. The trended data can contain continuous or spot readings of measureable parameters or user input for activity flags, as discussed above.”

APPLE-1110, [0066]. However, Poeze provides limited specifics as to how such physiological information, including “trended data” is displayed on the smartphone 126. Kianl provides a more complete and detailed disclosure of these details in a known prior art physiological monitoring system to demonstrate that the smartphone in the predictable combination of Poeze, Kinal, Baba, and Pakula displays a graphical user interface having a plurality of display portions on the touch-sensitive smartphone display.

70. For example, Kianl provides many examples of display configurations that include a variety of arrangements of different combinations of numerical and graphical displays, which can be applied to other instruments. For example, FIG. 4 shows a user interface that includes a graph of SpO₂ readings, a numeric value for SpO₂, and input keys for switching between the views.

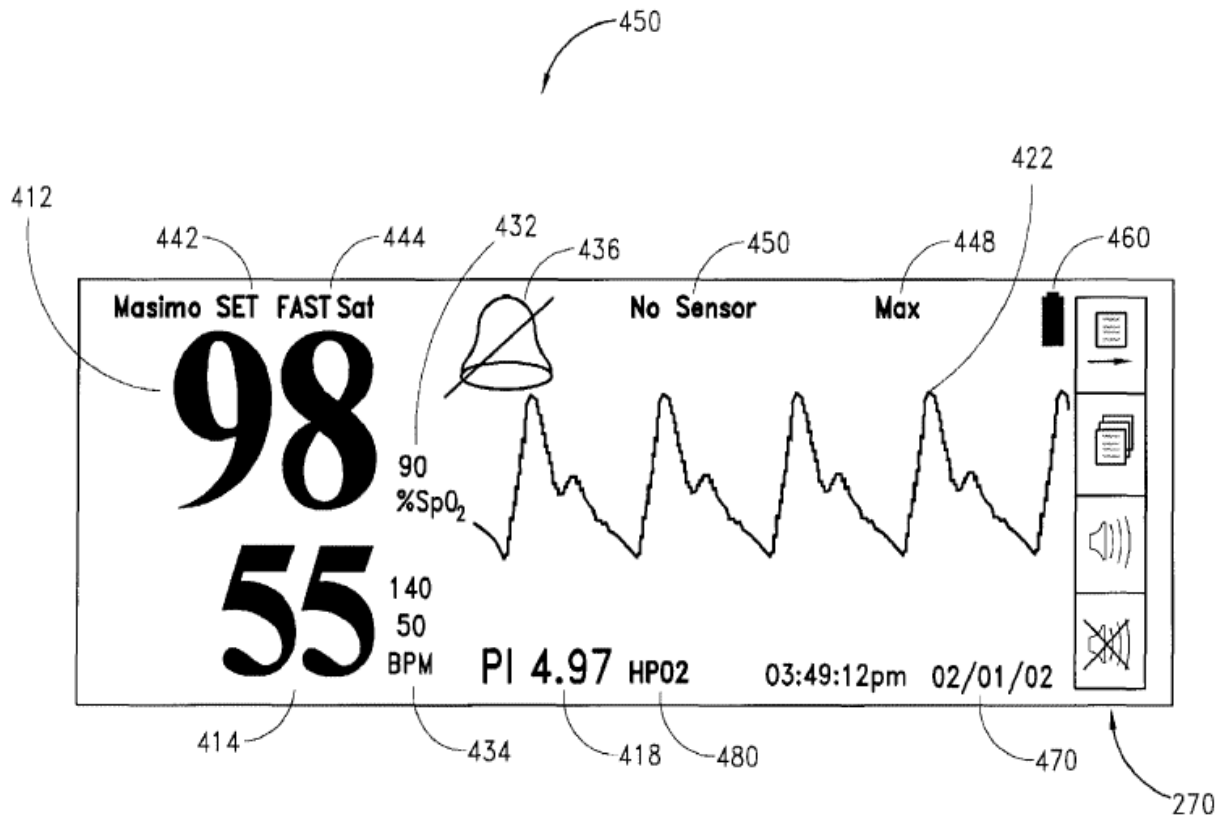


FIG. 4

APPLE-1006, FIG. 4.

71. With respect to FIG. 4, Kianl describes that “[t]he oxygen saturation 412 displays a functional arterial hemoglobin oxygen saturation measurement in units of percentage SpO₂.” APPLE-1006, 6:1-3. Kianl’s user interface also includes a “pulse waveform 422” of blood oxygen level. *Id.*, 6:10-15. FIG. 10 of Kianl shows another example display that includes “*a pulse rate trend graph 1050*” along with blood oxygen trend information shown for a particular time

period, including a start time and date and an end time and date for this historical data. APPLE-1006, 11:6-49, 12:18-26.

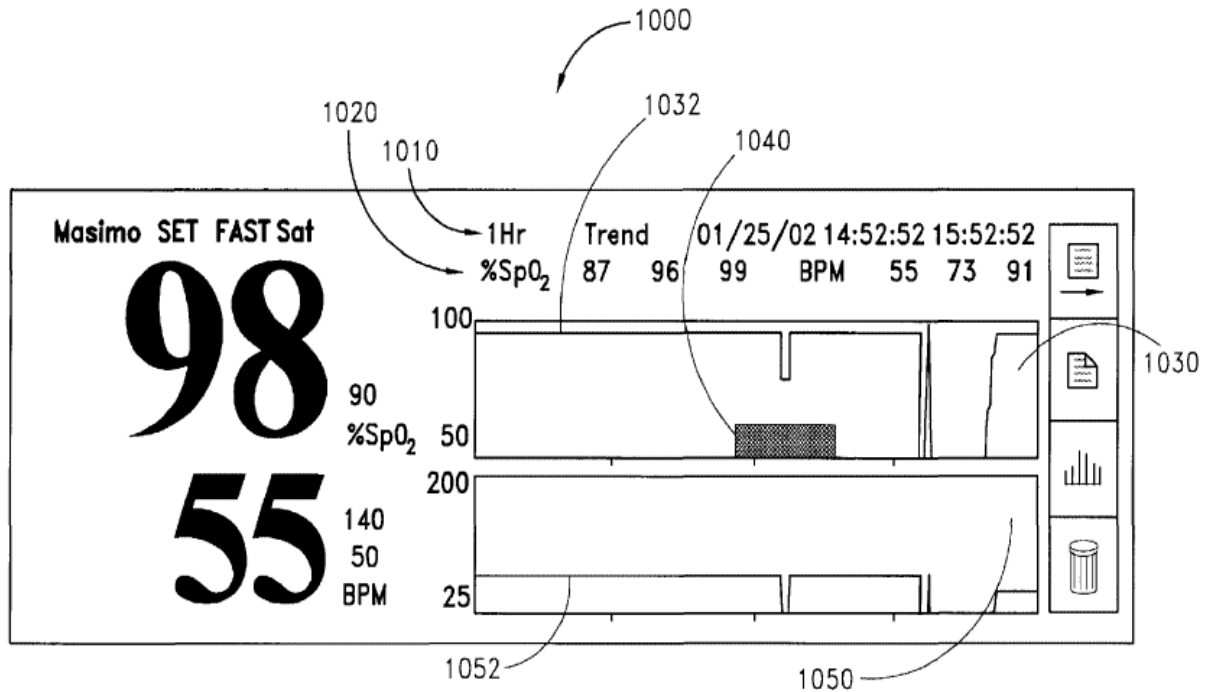
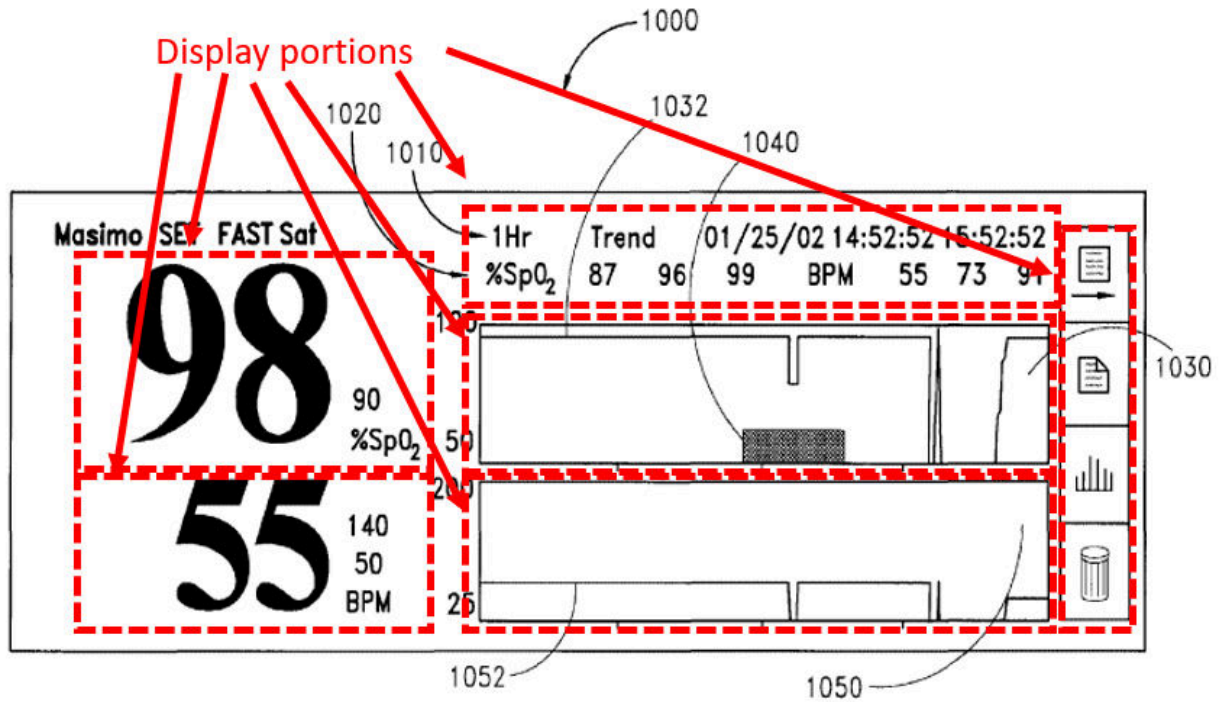


FIG. 10

APPLE-1006, FIG. 10.

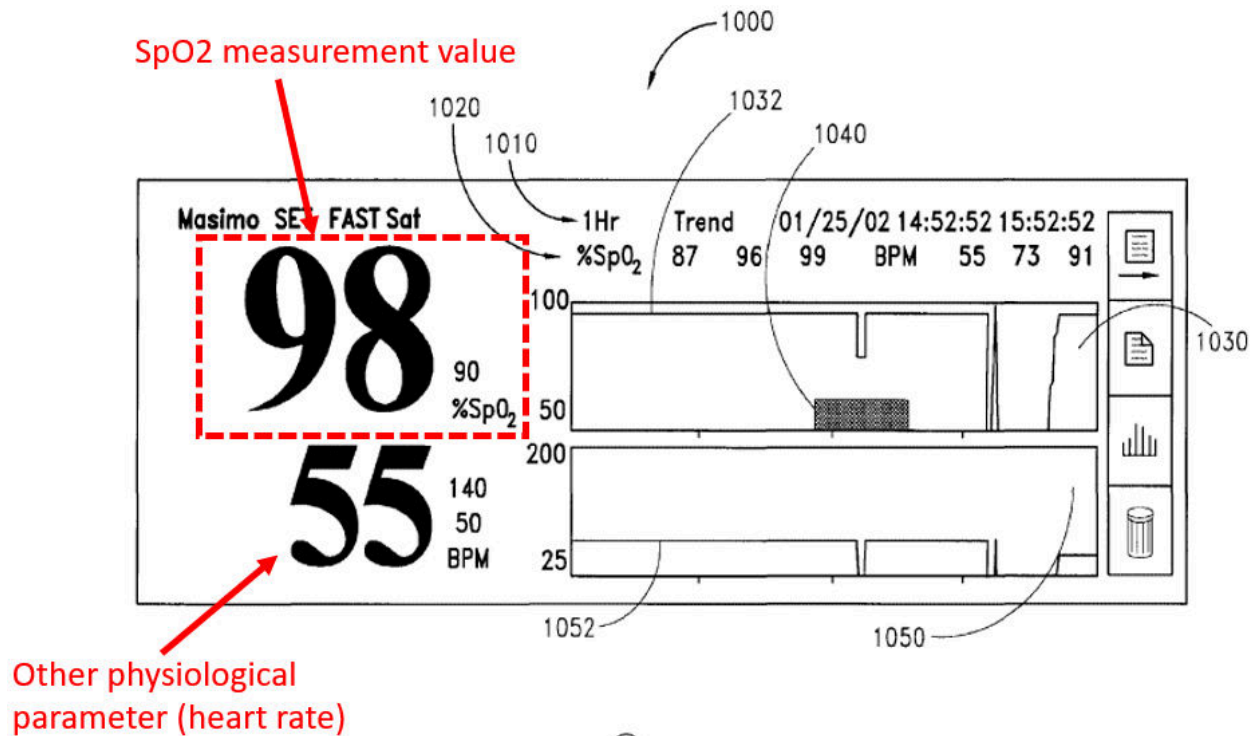
72. Furthermore, it would be clear to a POSITA that the user interface examples in Kianl have a plurality of display portions, as demonstrated, for example, in FIG. 10. APPLE-1006, 11:6-31.



APPLE-1006, FIG. 10.

[21h] displaying, in at least one portion of the plurality of display portions at one or more times, a representation of a physiological parameter of a plurality of physiological parameters comprising the SpO2 measurement values;

73. The user interface display screens of the predictable combination display multiple physiological parameters. For example, as shown in FIG. 10 of Kianl, the user interface displays “minimum, average, and maximum SpO2 and pulse rate measurements.” APPLE-1006, 11:6-31, FIG. 10.



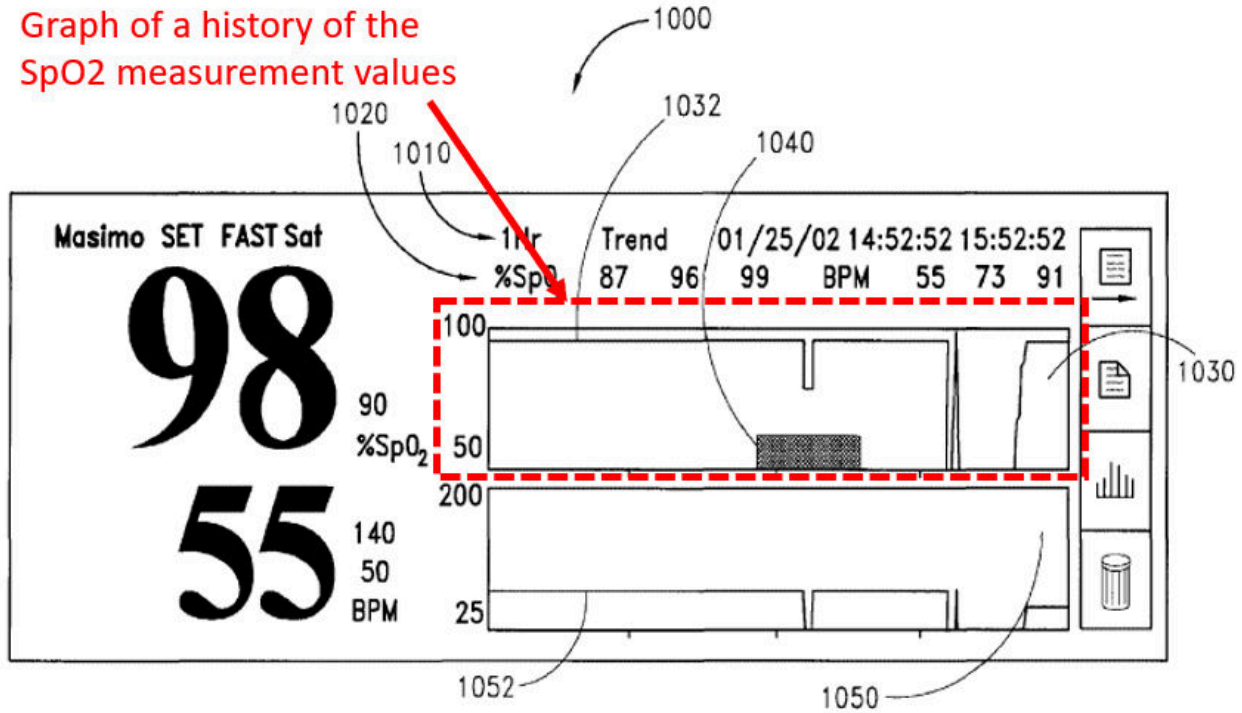
APPLE-1006, FIG. 10.

[21i] displaying, in at least one portion of the plurality of display portions at one or more times, a graph of a history of the SpO2 measurement values;

74. FIG. 10 of Kianl displays “oxygen saturation trend graph 1030 show[ing] the SpO2 measurements displayed versus time” and “pulse rate trend graph 1050 show[ing] the pulse rate measurements displayed versus time.”

APPLE-1006, 11:6-23; APPLE-1110, [0051] (“...view full screen trended data (e.g. readings tracked over a period of time)”), [0062].

Graph of a history of the
SpO2 measurement values



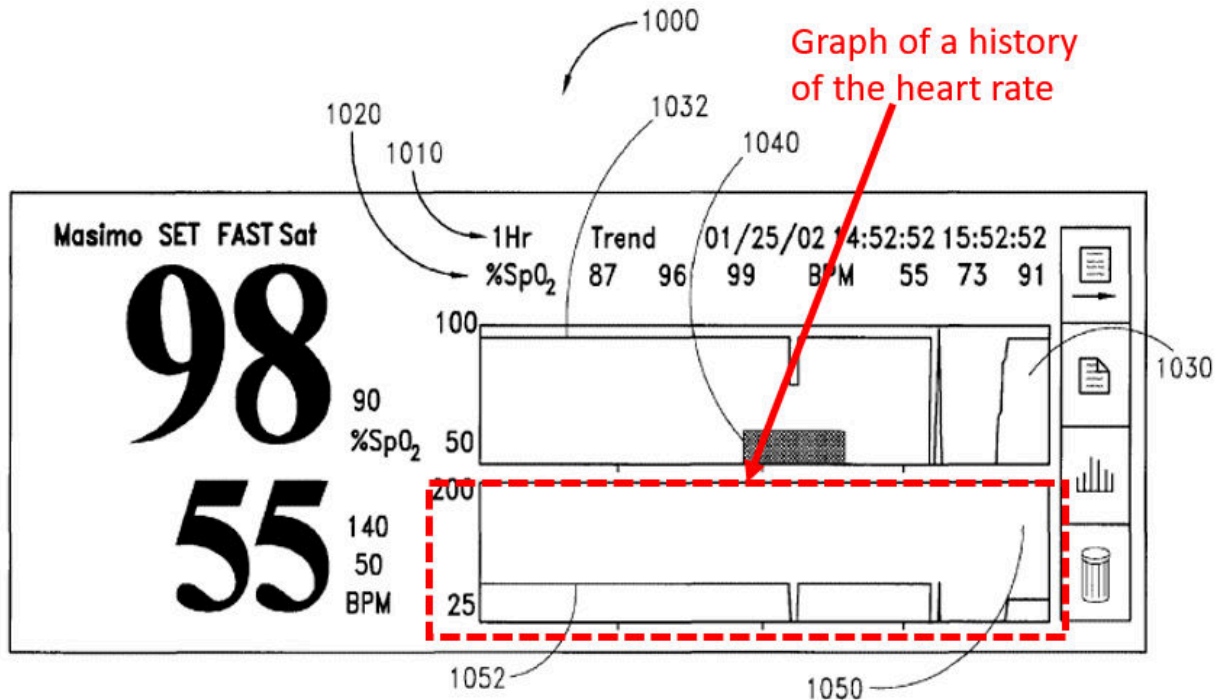
APPLE-1006, 11:6-31, FIG. 10.

75. A POSITA would have recognized that the displayed trend graphs are a “history” of SpO2 and heart rate, respectively, because the GUI shows “the starting date, starting time and end time of the data set that is displayed on the screen.” *Id.*, 11:6-23, 12:18-26 (“histogram”); APPLE-1110, [0054] (“device history log”), [0072]. As such, the displayed graphs are graphs of the histories of these physiological measurements.

[21j] displaying, in at least one portion of the plurality of display portions at one or more times, a graph of a history of the heart rate;

76. FIG. 10 of Kianl displays “oxygen saturation trend graph 1030 show[ing] the SpO2 measurements displayed versus time” and “pulse rate trend graph 1050 show[ing] the pulse rate measurements displayed versus time.”

APPLE-1006, 11:6-23; APPLE-1110, [0051] (“...view full screen trended data (e.g. readings tracked over a period of time)”), [0062].



APPLE-1006, 11:6-31, FIG. 10.

[21k] displaying, in at least one portion of the plurality of display portions at one or more times, a graphical representation of a heart; and

77. As I discussed in paragraphs 37-41, above, a POSITA would have found it beneficial and obvious to modify Poeze (as modified by Kianl) to additionally include a “heart image icon 400 [that] changes according to the heart rate” in the user interface displayed by the smartphone 126 in the resulting system. APPLE-1114, [0096]. Baba is one of many prior art examples of displaying a heart icon on the display screen for a physiological monitoring system. As Baba describes, the heart icon can be used to indicate whether or not the user’s heart rate

is within the target zone. For example, “heart icon 400 displays a smile, as shown in FIG. 10A, when the heart rate is within the allowable heart rate range 300.

When the user's heart rate exceeds the maximum heart rate 300 a, heart icon 400 displays a distressed expression, shown in FIG. 10B, and when the user's heart rate drops below the minimum heart rate 300 b, heart icon 400 displays an angry expression, shown in FIG. 10C.” *Id.*, [0097].

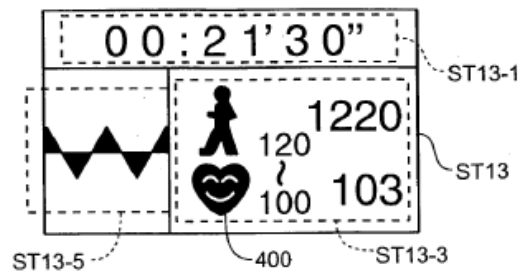


FIG. 10A

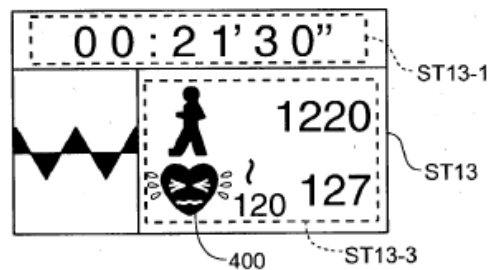


FIG. 10B

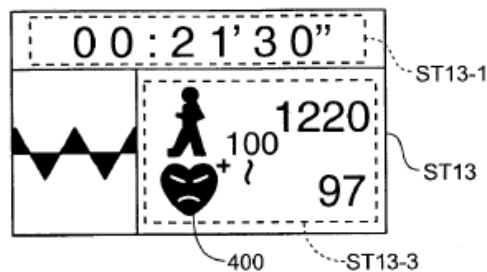


FIG. 10C

APPLE-1114, FIGs. 10A-10C. For example, “varying the heart icon 400 according to whether the user's heart rate is within, above, or below the allowable heart rate range 300, the user can determine the load on the heart by simply glancing at the heart icon 400 in LCD 108. This enables the user to adjust the intensity of the exercise according to the expression of the heart icon 400, and can thereby reliably exercise at the level prescribed by the physician.” *Id.*, [0097]. In additional examples, it was known in the prior art to include a “[h]eart rate icon (heart symbol)” in a display for a physiological monitoring system and to implement the heart icon to “flash[] to show hea[r]t rate signal from chest strap.” APPLE-1117, 2:27-30. As yet another example, it was known in similar prior art physiological monitoring systems to implement the user interface to display a “ready screen once the heart rate sensor is detected wherein the heart icon is solid and not blinking” to indicate to the user that the heart rate sensor is ready for use. APPLE-1116, [0131].

78. For example, a POSITA would have been motivated to implement the user interface for the smartphone 126 in the resulting system to include a heart icon based on Baba’s disclosures in the following manner:

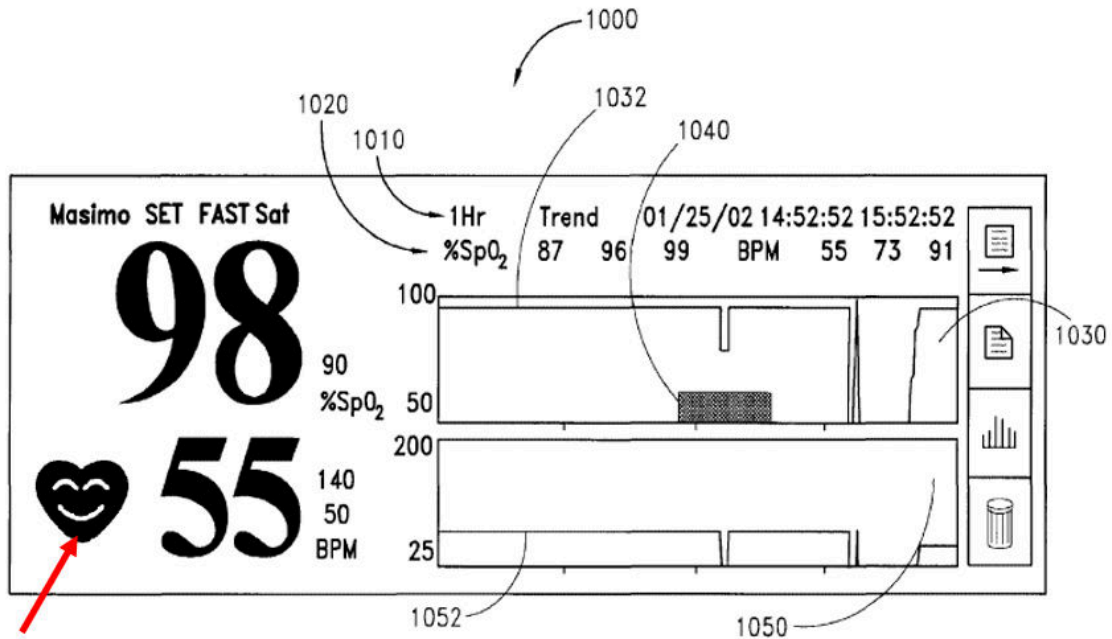


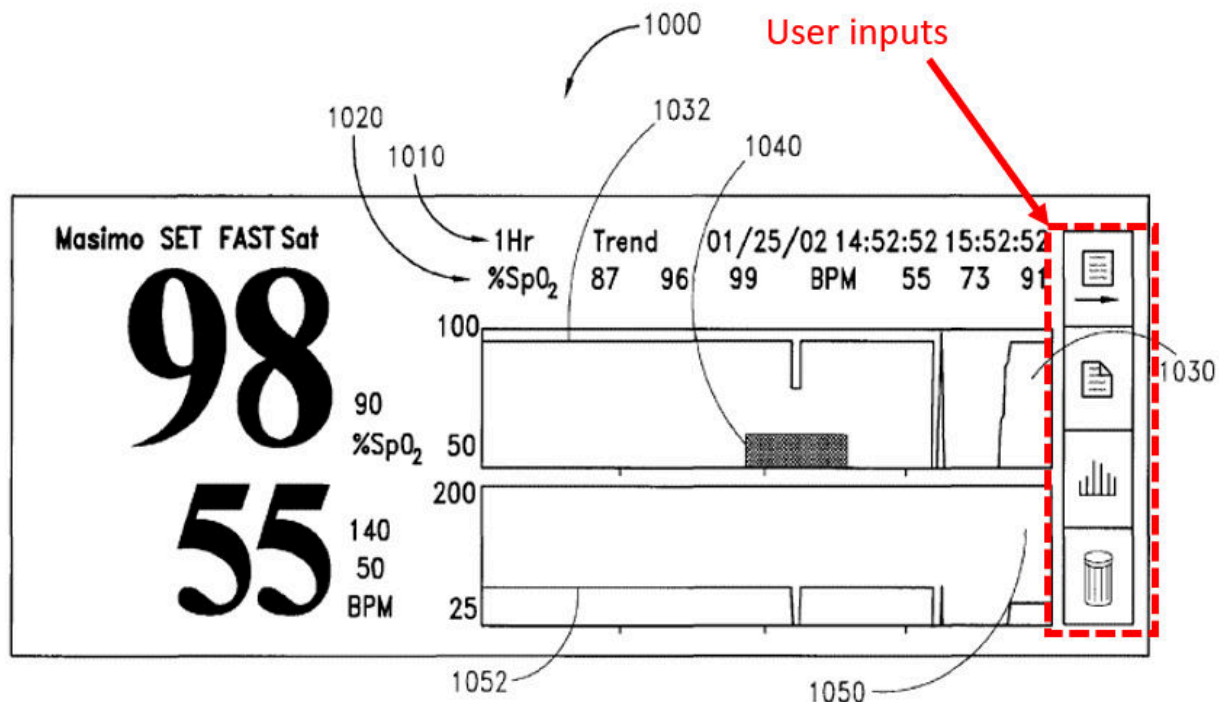
FIG. 10 of Kianl modified to include Baba's heart icon 400

APPLE-1006, FIG. 10 (modified to include the heart icon of APPLE-1114, FIG. 10A).

[211] displaying, in a different portion of the plurality of portions, a plurality of user inputs configured to allow the user to use the touch-sensitive smartphone display to interact with at least one of the plurality of display portions or the application;

79. Kianl demonstrates that the user interface of the smartphone 126 in the resulting system includes a plurality of user inputs configured to allow the user to use the touch-sensitive smartphone display to interact with at least one of the plurality of display portions or the application displayed in a different portion of the plurality of portions. For example, the user interface shown in FIG. 10 of Kianl includes “soft key icons” that allow the user to select different menus to

change the display and otherwise interact with the application displaying the user interface. *Id.*, 5:23-51.



APPLE-1006, FIG. 10. The soft key icons include “display view icons 810, menu icons 820, category icons 830, [] parameter icons 840,” and “trend-related icons 870-890.” APPLE-1006, 9:44-10:27, FIGs. 8A-10. Additionally, as I previously discussed, the smartphone of the resulting combination receives user input using Poeze’s touchscreen. APPLE-1110, [0040], [0043], [0047].

[21m] wherein the computer-implemented method is configurable to authenticate user data access by using at least one of fingerprint, facial, and voice recognition technologies;

80. Poeze discloses that its smartphone 126 authenticates access to user data using fingerprint, facial, or voice recognition analysis. For example, Poeze discloses that the smartphone 126 “store[s] patient information’ and “include[s] a

biometric identification module (such as a vein pattern or finger print scanner) 246 to distinguish one user from another or provide security for information stored.” APPLE-1110, [0040], [0048]. Poeze’s smartphone 126 can also perform voice recognition “*including speech and command recognition.*” *Id.*, [0055]. In another example, Poeze describes that user’s “can login via a password or a *biometric identification system*” which, as described in other portions of Poeze, includes fingerprint, facial, and voice recognition. *Id.* [0071]. For example, “[t]he device can then prompt the new user to enter a password. The device security module 342 can also utilize biometric identification, for example, through the built-in camera 214” to “*recognize the face and expressions* of the user from the camera.” *Id.*, [0092]. Additionally, “a special near infrared emitter detector can absorb the unique vein pattern of the finger. The device security module 342 can also utilize the CCD or CMOS camera to distinguish among patients when the device is shared among multiple patients (e.g. in a hospital setting for where a healthcare personnel is using the device for multiple patients). Once a patient's finger print is recognized, the device automatically brings up the patient's file.” *Id.*

[21n] the processing board surrounded within a protective assembly comprising upper and lower shells and a rounded rectangular enclosure forming a cavity with upper and lower openings, the openings having an inner ledge and a perimeter lip sized and configured to receive the upper and lower shells to fill the openings such that the perimeter lip surrounds at least a portion of perimeter sides of the upper and lower shells;

81. As an initial matter, I do not believe that the original disclosure of the '507 patent provides full written description support for this claim amendment. I have reviewed Masimo's Revised Contingent Motion to Amend and noticed that Masimo has pointed to several portions of Exhibit EX2045 (the "Original Disclosure of '507 Patent") as supposedly providing support for the amendments to claim 1. RMTA, 12. However, there is no discussion in the Original Disclosure of "an inner ledge," "a perimeter lip" as recited in this claim element or any of the details and benefits of these features for the intended use of these invented items. EX2045. In fact, the words "ledge" and "lip" do not appear anywhere in the Original Disclosure at all and there is no discussion of any synonyms for these terms with reference to the enclosure 132 described in the Original Disclosure.

82. While the Revised Motion to Amend provided by the Patent Owner provides very limited description as to what portions of the Original Disclosure support this specific claim element, the only possible support for this claimed "protective assembly" appears to be FIG. 1C, which shows an upper shell 135, a lower shell 131, and an enclosure 132 having a rounded rectangular shape. FIG. 1C shows some internal features for the enclosure 132 which might arguably be identified as including support for "an inner ledge" or "a perimeter lip" for the upper opening as recited by element [21n]. However, in this illustration, there is no depiction of any kind or written description of the lower opening including "an

inner ledge” or “a perimeter lip” as recited by element [21n]. Rather, FIG. 1C shows provides only various indeterminate lines that suggest internal structures, but clearly do not depict the “inner ledge” and “perimeter lip” for the lower opening recited by [21n].

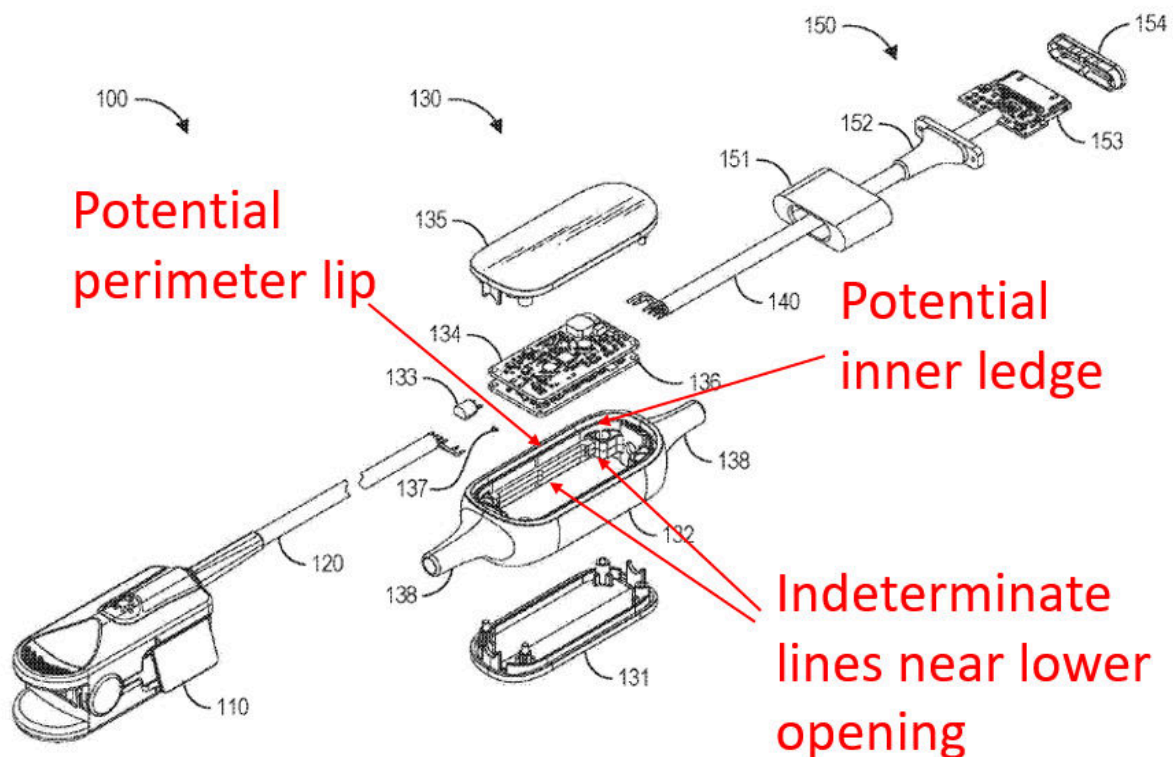
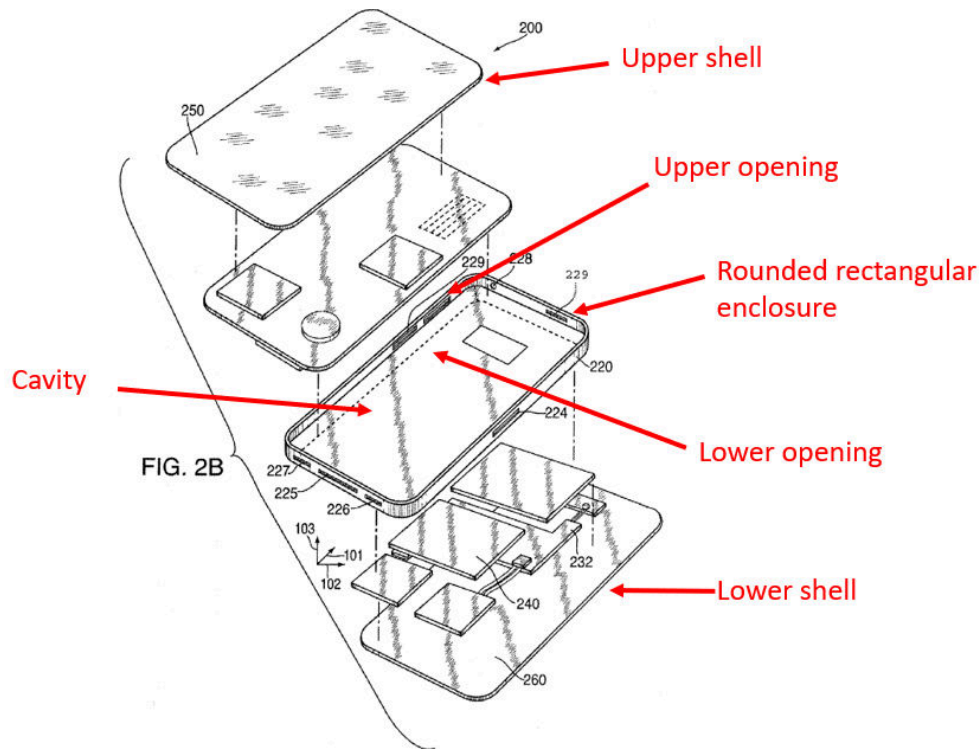


FIG. 1C

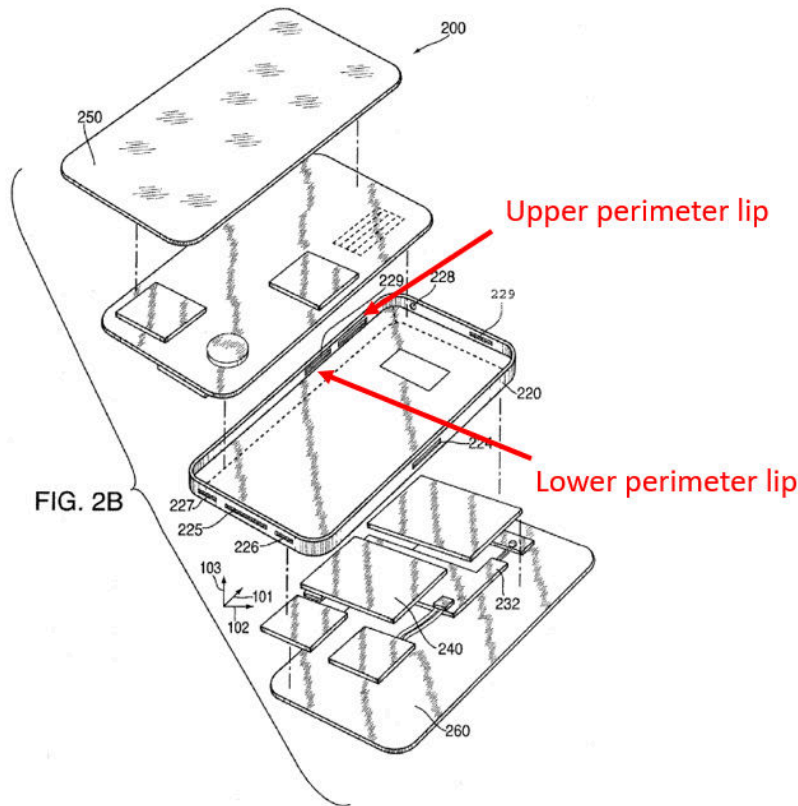
EX2045, FIG. 1C. Even if these indeterminate lines were considered to show an inner ledge and perimeter lip for the lower opening, I do not see any description or depiction at all of any alleged **lower** inner ledge or perimeter lip being “sized and configured to receive the...lower shell[]” as required in the Original Disclosure.

83. By contrast, Pakula discloses all of the features recited in this claim element in great detail, with several different examples that all provide the features of the claimed protective assembly. For example, Pakula describes that its improved housing is configured “to protect the edges of the one or more glass surfaces so as to dissipate impact forces and thus reduce damage to the electronic device housing.”APPLE-1113, [0007]. This protective assembly functions “[t]o protect the components from damage during use or when dropped.” *Id.*, [0071]. As shown in FIG. 2B, for example, Pakula’s protective assembly includes “front cover assembly 250” (upper shell), “back cover assembly 260” (lower shell),” and “[o]uter periphery member 220 [that] surround[s] the periphery of electronic device 200” (rounded rectangular enclosure) that define a “volume 222” (cavity) for retaining internal electrical components, such as the processor and analog-to-digital-converter(s) of Poeze’s monitor 118. APPLE-1113, [0089]-[0090], [0077]-[0078], [0053]-[0057] (“front and back open area”).



APPLE-1113, FIG. 2B. Pakula expressly describes that the periphery member 220 (equivalent to the claimed “rounded rectangular enclosure”) has a “substantially rectangular shape” with “rounded edges or corners” and the volume has upper and lower openings. *Id.*, [0077]. As I previously discussed with respect to element [21b], Pakula discloses that the processing board (PCB) is positioned within the cavity. *Id.*, [0066], [0069]-[0070], [0085]-[0086]. As I discussed with respect to element [21b], in the resulting combination, a POSITA would have implemented at least the ADC and signal processor 510 of Poeze as components mounted on a circuit board (along with front-end interface 508 in some embodiments) within the internal cavity of the enclosure taught by Pakula. *Id.*

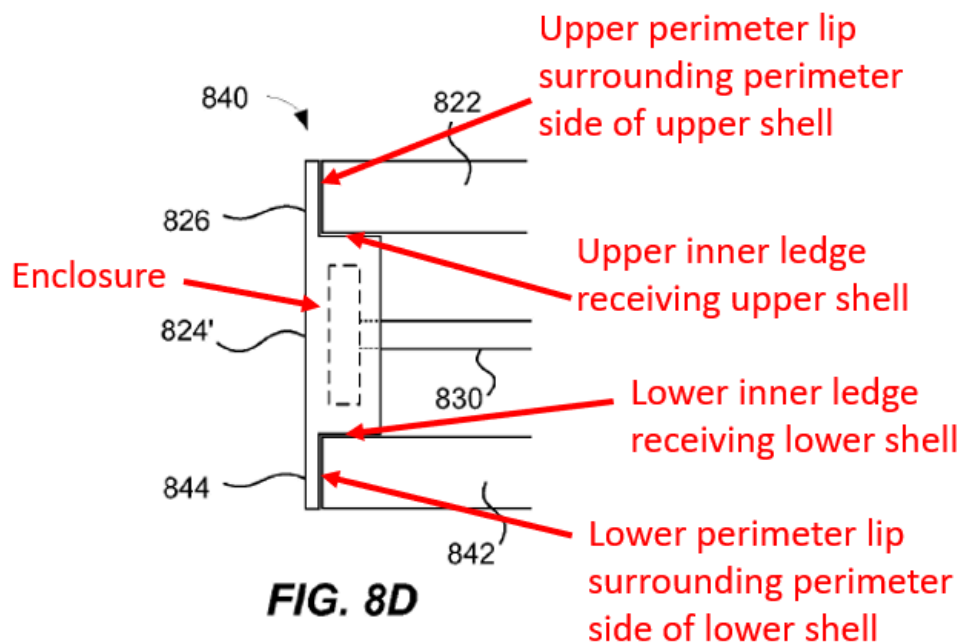
84. FIG. 2B also shows that the upper and lower openings of periphery member 220 include respective perimeter lips sized and configured to receive the upper and lower shells.



APPLE-1113, FIG. 2B. Furthermore, unlike the Original Disclosure of the '507 Patent, Pakula also provides written description, describing that that “outer periphery member can include one or more depressions, *recesses*, *channels*, *protrusions*, or openings for supporting components.” *Id.*, [0064], [0069]. For example, “[t]he internal platform, inner surfaces of the outer periphery members, or both can include one or more protrusions, depressions, *shelves*, recesses,

channels, or other features for receiving or retaining electronic device components.” *Id.*

85. Additional figures of Pakula also show that the protective assembly includes upper and lower perimeter lips surrounding respective upper and lower shells (front and back covers) and upper and lower inner ledges for receiving the upper and lower shells. For example, FIG. 8D shows additional details of a specific embodiment in which perimeter sides of the front and back covers (822, 842) are surrounded by the upper and lower perimeter lips, respectively, and the upper and lower openings include respective inner ledges with the respective inner ledges and perimeter lips sized and configured to receive the front and back covers. APPLE-1113, [0114]-[0117].



APPLE-1113, FIG. 8D. As Pakula describes with respect to FIG. 8D, “the outer housing member 822 can correspond to a top cover for the electronic device housing, and the outer housing member 842 can correspond to a bottom cover for the electronic device housing. The side member 824’ includes not only the protective side bumper 826 but also a protective side bumper 844.” *Id.*, [0117].

86. In another example from Pakula, FIG. 2A shows the claimed upper opening receiving an upper shell (front cover 250) with the upper opening having an inner ledge and perimeter lip sized and configured to receive the upper shell and that surrounds the upper shell. Specifically, FIG. 2A shows that the rounded rectangular enclosure (periphery member 220) includes an upper perimeter lip that surrounds perimeter sides of front cover 250 and an upper ledge (support structure 252) such that front cover 250 fills the opening. APPLE-1113, [0090]-[0091], [0094].

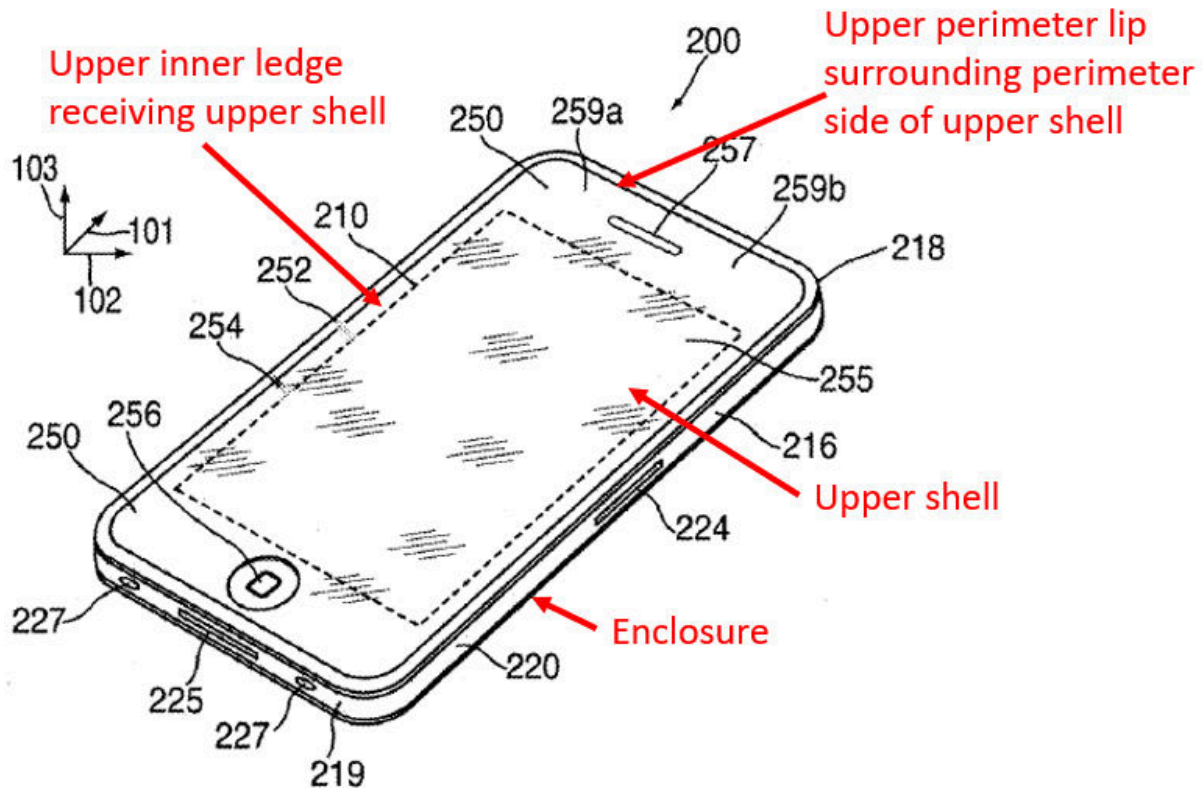
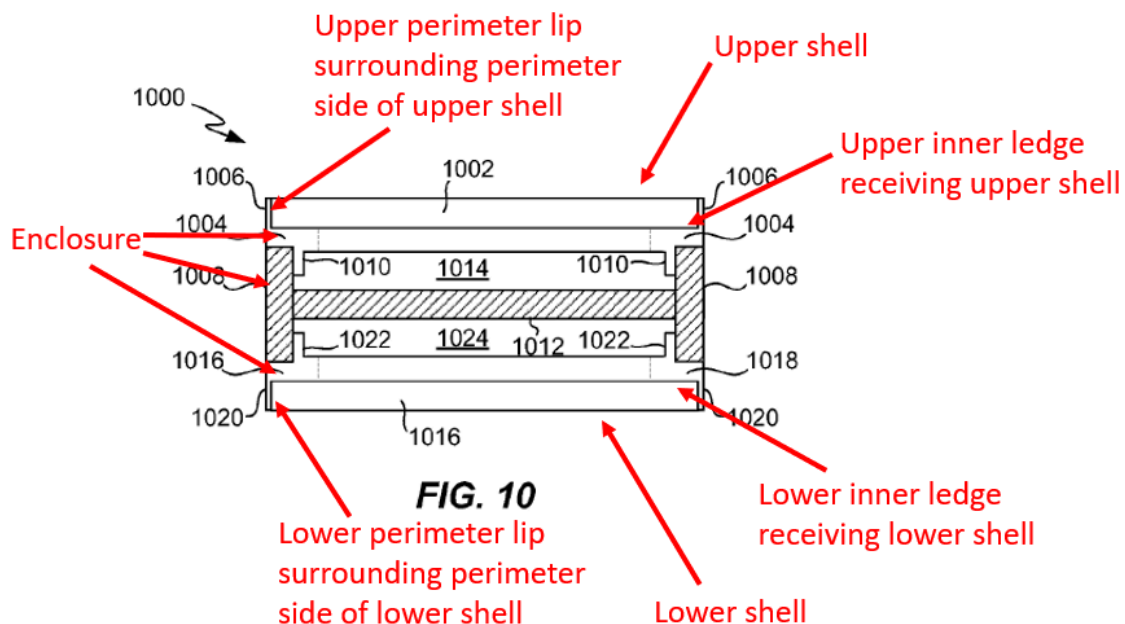


FIG. 2A

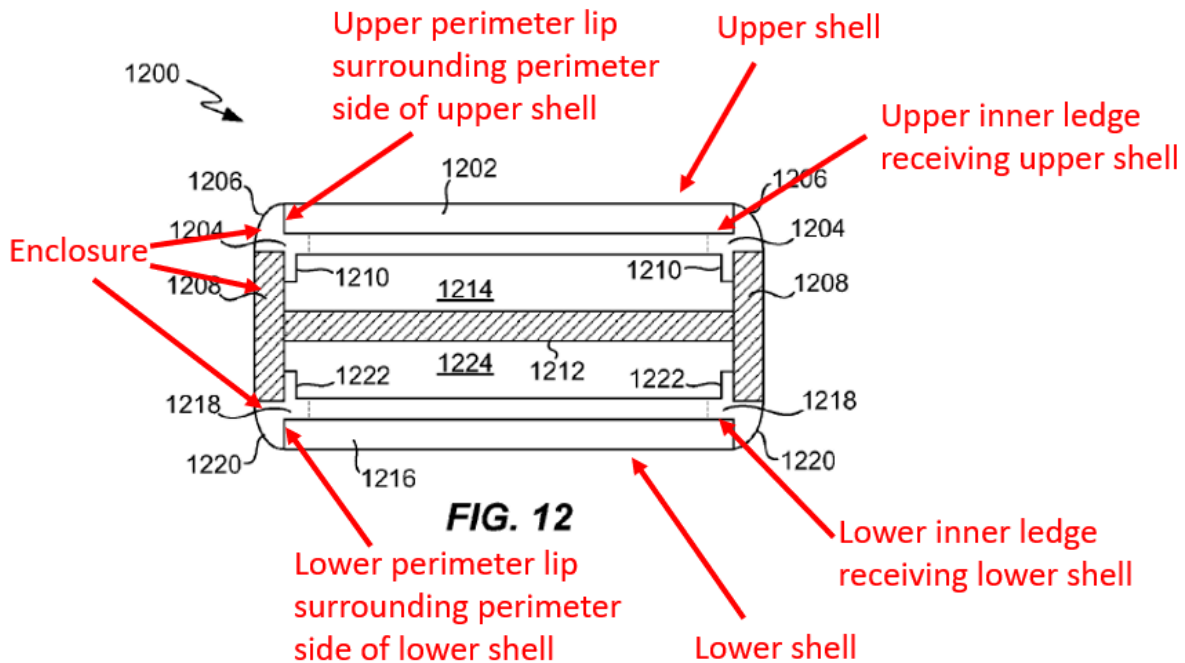
APPLE-1113, FIG. 2A. With respect to the back cover (not shown in FIG. 2A), Pakula also makes clear that it is received within the lower opening of the periphery member 220 in the same manner, stating “back cover assembly and front cover assembly can be connected relative to outer periphery member *in the same...manners*” thus indicating that the disclosure of FIG. 2A applies equally to the back cover/lower opening. *Id.*, [0092]. Therefore, FIG. 2A provides another example of a protective assembly having all of the features recited in element [21n].

87. There are numerous other examples in Pakula that further demonstrate that the protective assembly of Pacula includes all features recited in element [21n], far beyond the limited disclosure of the ‘507. For example, FIG. 10 shows that the rounded rectangular enclosure has upper and lower openings with respective perimeter lips and inner ledges for receiving respective upper and lower shells (covers). APPLE-1113, [0121]-[0127]. I’ll note that the example in FIG. 10 shows the outer periphery member (the claimed rounded rectangular enclosure) is made up of several components but that Pakula states that in such embodiments the multiple “elements can be connected in any suitable manner to form a single unit” for the enclosure that receives the upper and lower shells (covers). APPLE-1113, [0054].



APPLE-1113, FIG. 10.

88. FIG. 12 shows yet another example demonstrating that the rounded rectangular enclosure has upper and lower openings with respective perimeter lips and inner ledges for receiving respective upper and lower shells (covers). APPLE-1113, [0128]-[0136].



APPLE-1113, FIG. 12.

89. To the extent the Board might agree that the ‘507 provides disclosure of these claimed features (which I do not find), Pacula provides far more complete disclosure of these features well in advance of the disclosure of the ‘507. Finally, as I previously discussed in paragraphs 12-17, Pakula is far from the only prior art disclosure of such a configuration. The Pomona Box is one such example that had been used for decades to house electrical components in various electronic devices and systems that discloses the recited features of element [21n].

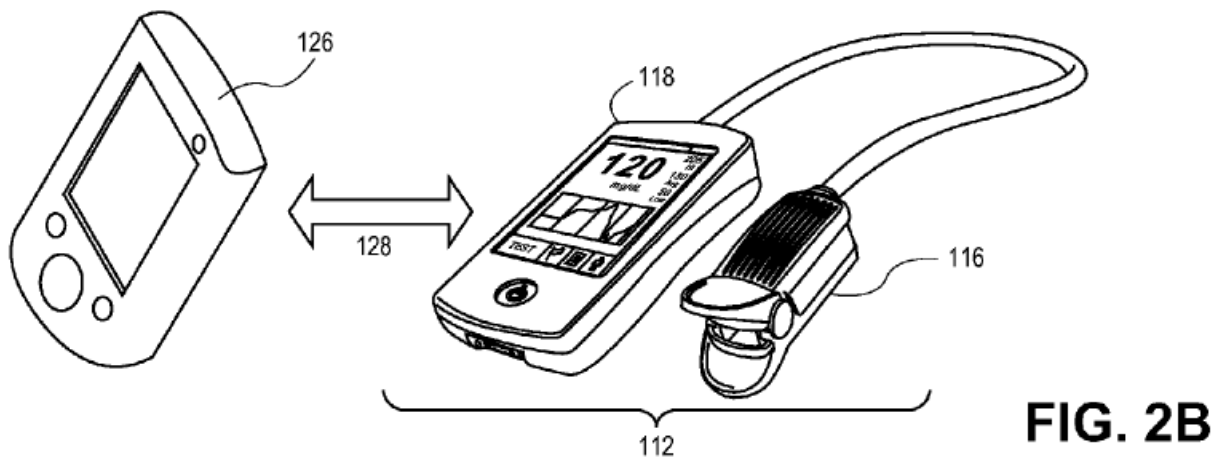
[21o] the light from the light source comprises at least red and infrared light; and

90. Poeze describes that the emitters in the finger clip sensor emit “light wavelengths to measure various blood analytes or percentages (e.g., saturation) thereof” and that these various wavelengths include “visible and infrared light.” APPLE-1110, [0111]-[0114] (“oxygen saturation (SpO₂)”). As I previously discussed, Poeze’s primary implementation involves a glucose monitor but Poeze also incorporates by reference both Poeze-040 and Dalke to provide additional details on the health collection device 112, including implementations in which the health collection device 112 is a pulse oximeter that measures SpO₂, among other physiological parameters. APPLE-1110, [0029], [0107]. Turning to these additional references that are incorporated by reference in Poeze, Dalke discloses that in the pulse oximeter implementations, the sensor includes “light emitting diodes (LEDs) that transmit optical radiation of *red and infrared wavelengths*” for measuring SpO₂ and pulse rate. APPLE-1112, [0005]. Poeze-040 similarly discloses using “LEDs 1102 for emitting red and/or infrared light.” APPLE-1111, [0168]. In addition to these disclosures that are expressly incorporated by reference in Poeze, a POSITA would have been well aware that red and infrared wavelengths were traditionally used in pulse oximetry to determine SpO₂ and heart rate and therefore would have been prompted to implement Poeze to utilize such wavelengths to determine these physiological parameters using well-known and widely

tested SpO2 measurement techniques. *See e.g.* APPLE-1010, [0006]-[0010], [0025], [0062]-[0064], [0068]-[0070], [0120]; APPLE-1091, [0007], [0009], [0052]-[0054]; APPLE-1005, [0288]; APPLE-1092, 16:9-14; APPLE-1106, 23-24.

[21p] the SpO2 measurement system is configured to be portable by including the sensor and processing board together, wirelessly connectable to the smartphone mobile computing device for display of physiological data.

91. As I discussed above, Poeze describes “the health data collection device 112 includes a finger clip sensor 116 connected to a monitor 118 via a cable” and the monitor 118 “receiv[es] signal data from the sensor 116.” *Id.*, [0031]. This configuration is shown in FIG. 2B, which shows that the sensor 116 and processing board (internal circuit board of monitor 118 in the resulting combination) are included together.



APPLE-1110, FIG. 2B.

92. Poeze also describes that its system is “portable” and emphasizes the importance of the “[p]ortability of these monitoring systems” as being

“advantageous.” APPLE-1110, [0009], [0006], [0034]. Poeze is also clear that the “health data collection device 112” that includes monitor 118 and sensor 116 wirelessly connects to smartphone 126. *Id.*, [0031], [0034]-[0035]. As I discussed above with respect to elements [21g]-[21i], the smartphone 126 of the resulting system displays the physiological data. APPLE-1110, [0062]. For example, Poeze describes that “medical data analysis module 326” executing on the smartphone 126 “provide[s] visualization of health data tracking or trending. In an embodiment, the medical data display module 344 displays trended data for a user in a variety of graphical formats, for example, when rotated in a horizontal position. The trended data can contain continuous or spot readings of measureable parameters or user input for activity flags, as discussed above.” APPLE-1110, [0066].

93. Kianl provides additional details on the displayed physiological data in the resulting system, describing that “[t]he oxygen saturation 412 displays a functional arterial hemoglobin oxygen saturation measurement in units of percentage SpO₂.” APPLE-1006, 6:1-3. Kianl’s user interface also includes a “pulse waveform 422” of blood oxygen level. *Id.*, 6:10-15. FIG. 10 of Kianl shows another example display that includes “*a pulse rate trend graph* 1050” along with blood oxygen trend information shown for a particular time period, including a

start time and date and an end time and date for this historical data. APPLE-1006, 11:6-49, 12:18-26.

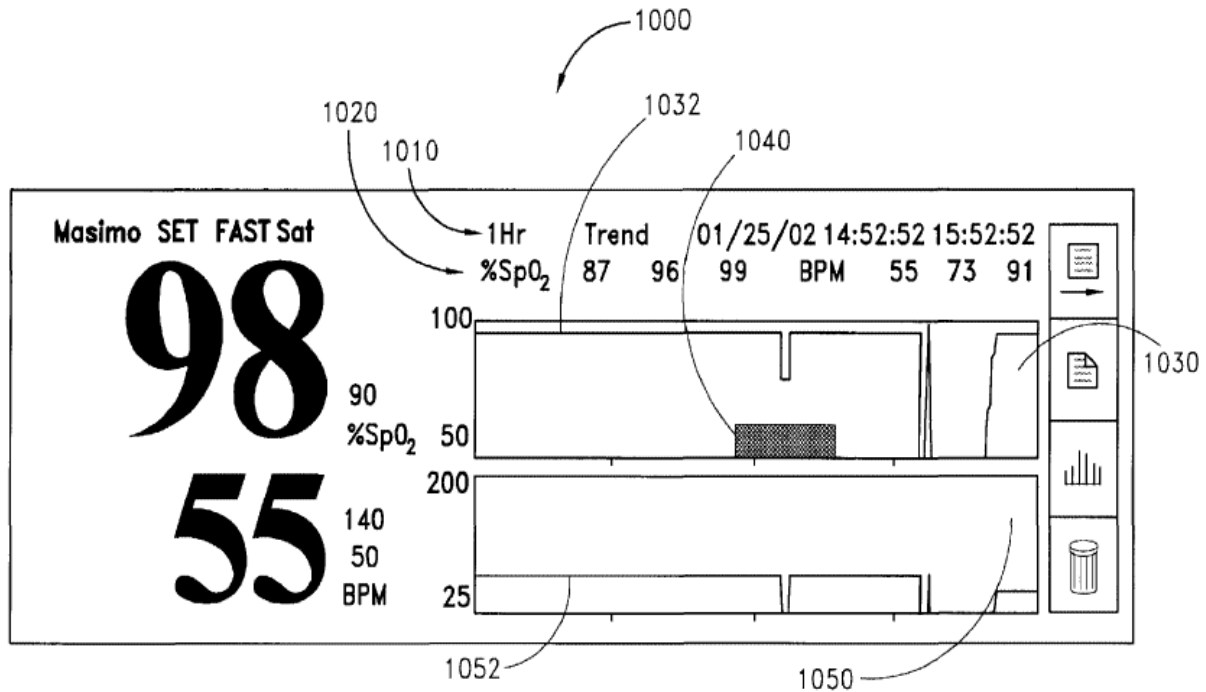


FIG. 10

APPLE-1006, FIG. 10.

(i) Claim 23

94. The combination of Poeze with Kianl Baba, and Pakula (as I have described above) provides all elements of substitute claim 23.

[23a] The computer-implemented method of claim ~~[[13]]~~21, 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;

95. Kianl provides element [23a] in the Poeze-Kianl-Baba-Pakula system for the reasons that I discussed with respect to claim 17 in my First Declaration.

APPLE-1003, ¶¶100-112; APPLE-1006, 2:18-31, 1:33-37, 5:65-6:15, 11:6-49, 14:18-30, 15:11-40, FIGs. 4, 1010.

96. For example, FIG. 4 from Kianl shows that a display that includes at least two graphical representations of the SpO₂ measurement value: a scrolling waveform showing the SpO₂ trend over time and a numerical value of the current SpO₂ value.

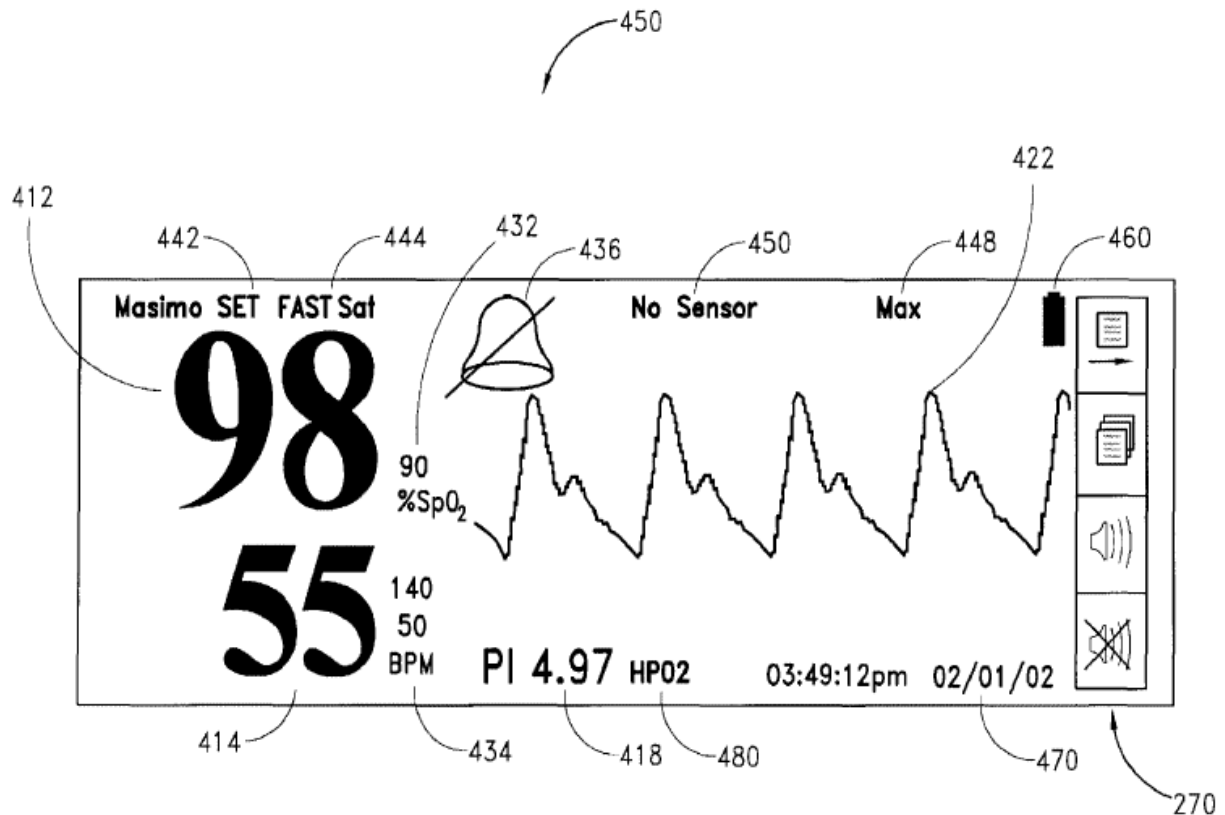


FIG. 4

APPLE-1006, FIG. 4. Kianl describes that GUI 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. FIG. 10 shows the “trend view 1000” including “oxygen saturation trend graph 1030.” APPLE-1006, 11:6-49.

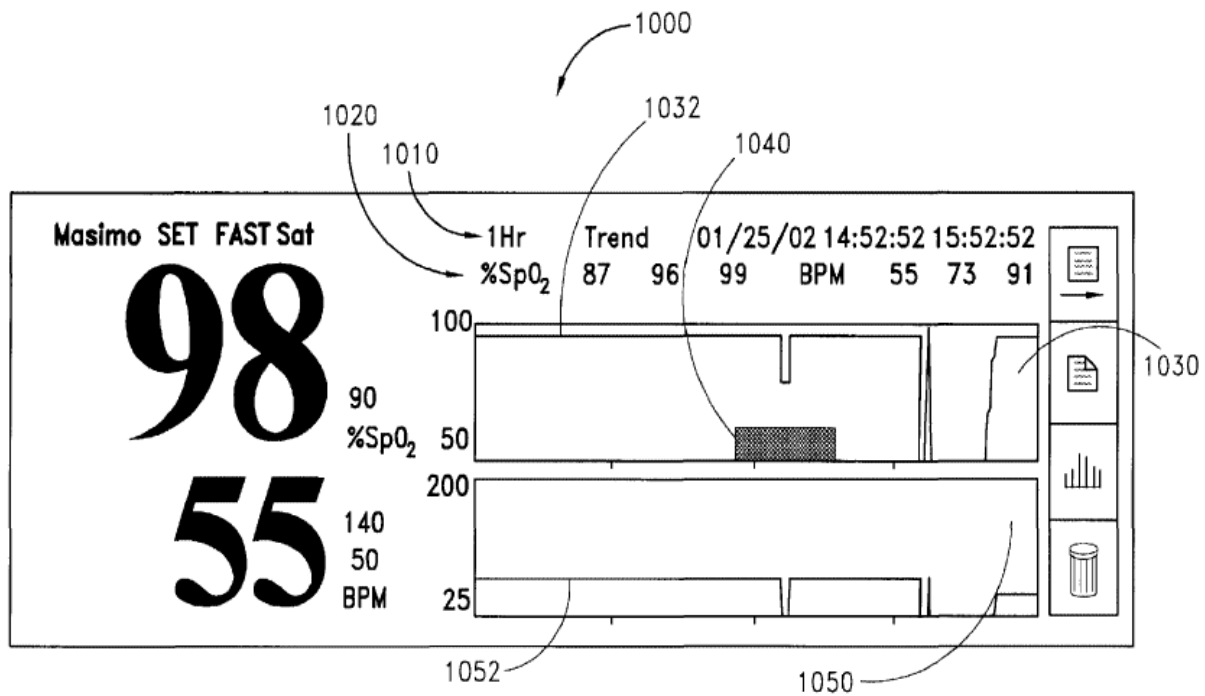


FIG. 10

APPLE-1006, FIG. 10. Kianl describes that “[t]he 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. FIG. 10 includes “a pulse rate trend graph 1050” along with blood oxygen trend information over time. APPLE-1006, 11:6-49, 12:18-26.

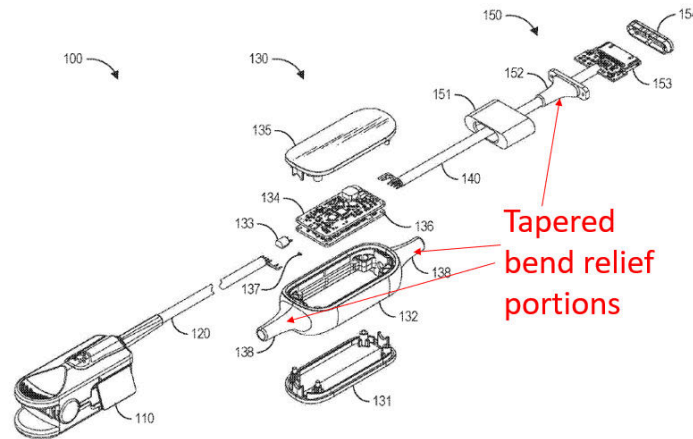
97. Kianl describes that these trends are plotted over time and therefore a POSTIA would have recognized that the display of these different representations

of SpO₂ measurement data are updated with each new measurement. APPLE-1006, 11:6-49, 14:18-30. 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. *Id.*, 15:10-56. As Kianl describes “FIG. 19 illustrates a trend setup menu 1900 having %SpO₂ max and min 1910, BPM max and min 1920, default view 1930, trend action 1940 and trend period 1950 items.” *Id.* The setup menus described with respect to FIG. 19 include an option to output the measured SpO₂ data as an “analog dump” including “an analog chart” of the data. *Id.* While Kianl describes these charts as being “print[ed],” a POSITA would have recognized that it would have been beneficial to include this chart as displayed data on the GUI of the resulting PDA device in addition to or in place of printing such information to more readily provide the information to the user or healthcare provider. Displaying such information on the interface rather than in print would have negated the need for a printer which would have beneficially increased the portability of the system, one of the goals of Poeze. APPLE-1110, [0009], [0006], [0034].

[23b] the rounded rectangular enclosure comprising, on a first side, a first transition from the enclosure to a tapered flexible support member, and on a second side opposite the first side, a second transition from the enclosure to a tapered flexible support member;

98. The only support in the ‘507 Original Disclosure for the claimed first and second transition from the enclosure to a tapered flexible support member

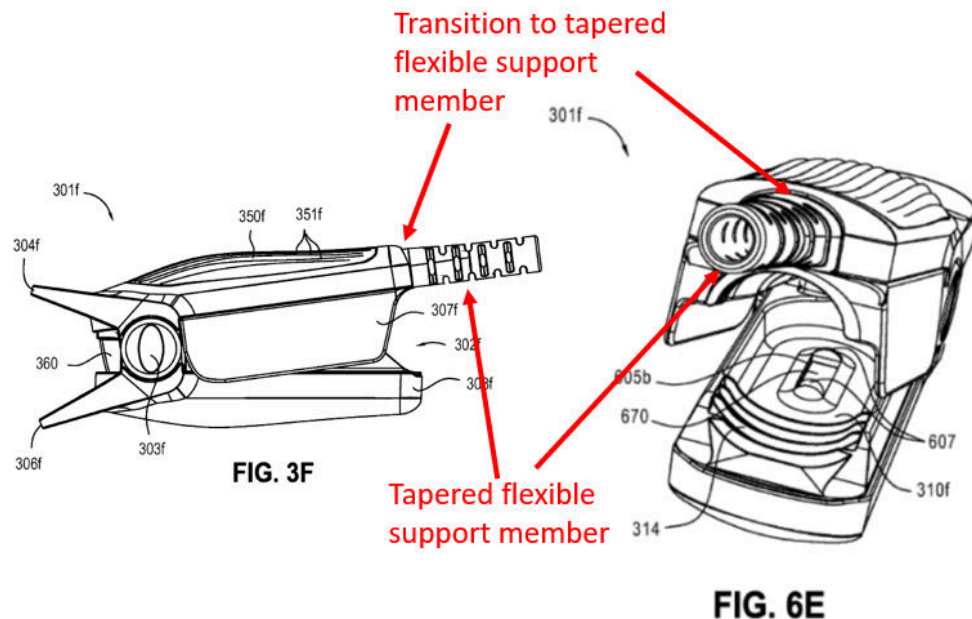
appears to be the description of the bend relief portions 138 and 152 shown in FIG. 1C as they are the only tapered components of the system shown in the Original Disclosure.



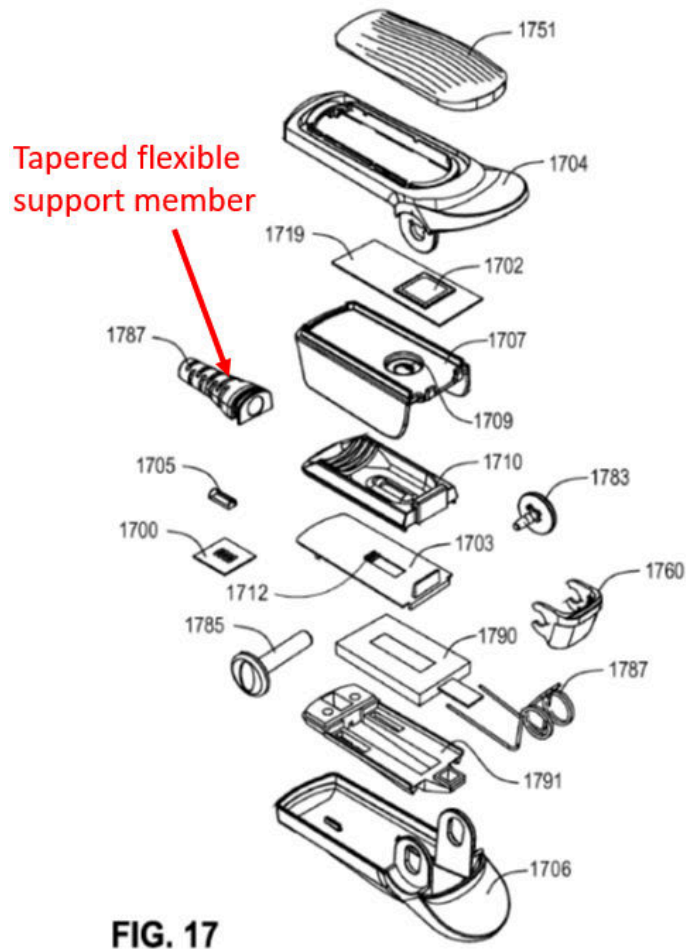
EX2045, FIG. 1C

99. Notably, there is no description of the bend relief portions 138 being flexible; rather they are described as “*prevent[ing] mechanical force, such as an axial load or flexing.*” EX2045, [0041]. Only the cables 120 and 140 are described as being flexible. *Id.* Assuming (as I only can, in the absence of explicit disclosure of “tapered flexible support members”) that Masimo might be pointing to as the bend relief portions 138 in FIG. 1C as support for this claim amendment, the Poeze-040 reference, which is incorporated by reference in Poeze, provides a highly similar disclosure that renders this claim element obvious. APPLE-1110, [0029]. Poeze cites to Poeze-040 as providing “[e]xample portable non-invasive monitoring devices” for use as the health data collection device 112 (which includes the monitor 118 and sensor 116) in Poeze’s system. *Id.*

100. Turning to Poeze-040, FIGs. 3f, 6E, and 17 show that the finger clip sensor includes a transition to a tapered flexible support member. APPLE-1111, [0281]-[0282], [0129], [0145]. A POSITA would have recognized from the interdigitated grooves that this cable support member is flexible to allow bending without cracking. In this case, it allows a modest curvature for the cable connection to the finger clip, instead of a sharp bend at the end of the taper. Indeed, use of such flexible cable support members having similar designs was well-known in the prior art and therefore a POSITA would have recognized the design as shown in Poeze-040 as being flexible. *See* APPLE-1118, [89], [45], FIGs. 9, 19-21; APPLE-1123, [0002]-[0004], [0032]-[0039]; FIGs. 1-3; APPLE-1121, FIGs. 1-7



APPLE-1111, FIGs. 3F, 6E.

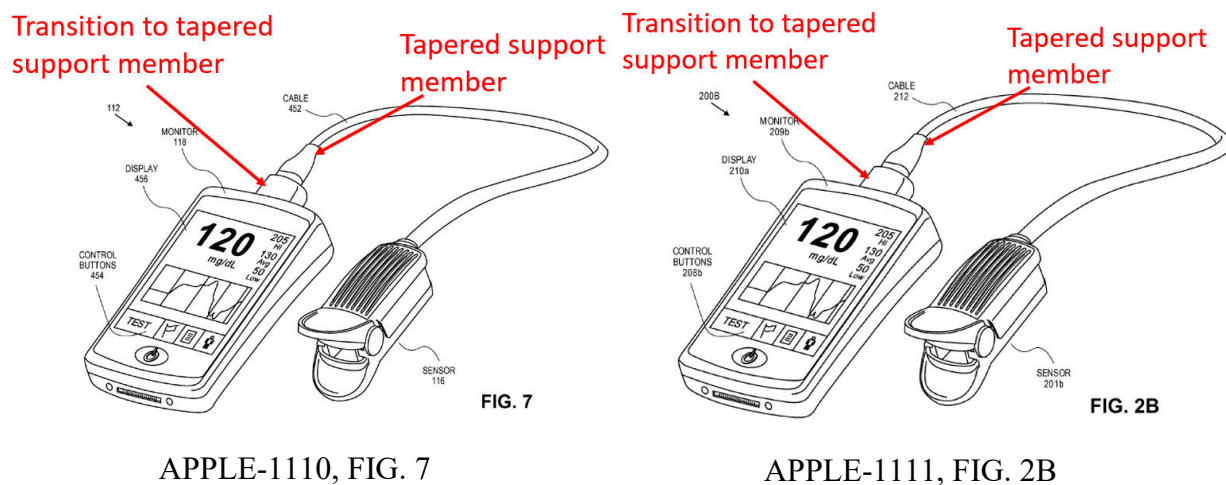


APPLE-1111, FIG. 17. A POSITA would have recognized, as depicted in the above Figures from Poeze-040, that the cable support member is tapered and that the interdigitated grooves on the exterior make it flexible to allow bending without cracking and therefore that this cable support member is a tapered flexible support member for supporting the cable that connects to the finger sensor.

101. Poeze-040 depicts the tapered flexible support member and its associated transition as attaching to the finger clip sensor but a POSITA would have found it obvious and beneficial to include such a flexible support member on

the other end of the cable that attaches where the cable attaches to the monitor enclosure (as modified based on Pakula) to provide extra support and “provide[] relief from lateral bending of the cable” at the point where it connects with the monitor to allow for a degree of motion at the junction of the cable and monitor enclosure while also preventing breakage or wear on the cable at the junction.

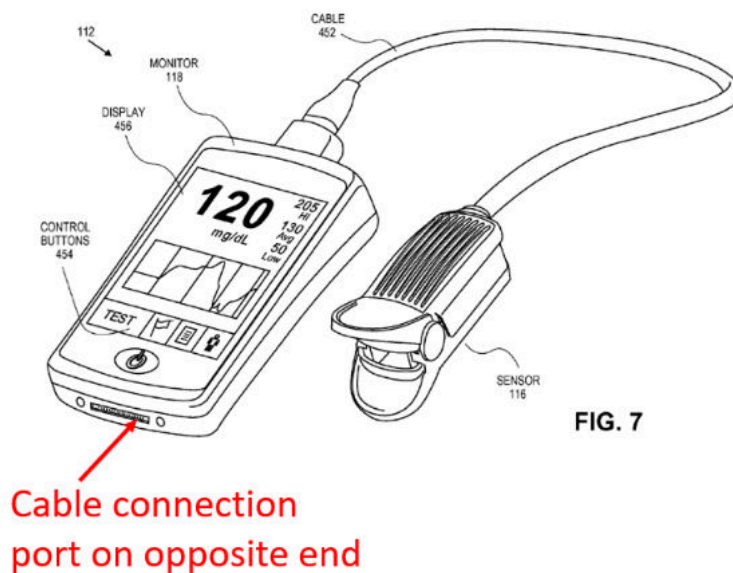
APPLE-1118, [89]. This is demonstrated, for example, by both Poeze and Poeze-040, which show embodiments in which the monitor enclosure includes a transition to a tapered support member:



103. It would have obvious to make the tapered support member at the junction of the cable the monitor flexible (based on the suggestion in Poeze-040 of using the tapered flexible support member at the junction of the cable and the finger clip) to add extra flexibility to the junction while preventing breakage and wear of the cable at the junction. Indeed, a POSITA would have known that use of such tapered flexible support members and respective transitions at the junction of

a cable and a more ridged enclosure for the electrical assembly housing was well-known in the prior art for “provid[ing] relief from lateral bending of the cable” to prevent “sharp bends” and “breakage.” APPLE-1118, [89], [45], FIGs. 9, 19-21; APPLE-1123, [0002]-[0004], [0032]-[0039]; FIGs. 1-3; APPLE-1121, FIGs. 1-7.

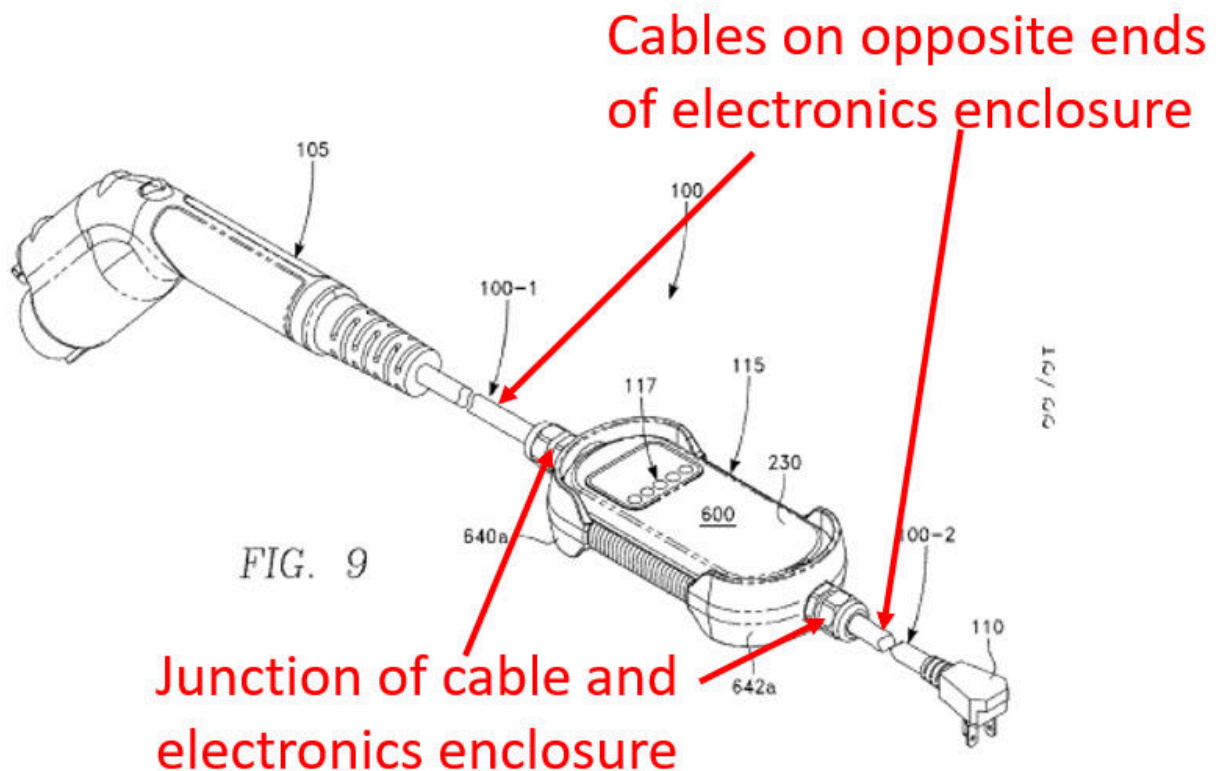
104. A POSITA also would have found it obvious and beneficial to include a second transition from the enclosure to a second tapered flexible support member on the opposite side of the monitor enclosure in the resulting system to provide the same bend relief benefits described above for a second cable connectable to additional devices. For example, FIG. 7 of Poeze shows that the monitor includes a port for connection to a peripheral device on the opposite end of the cable 452 and it would have been obvious and beneficial to use a similar flexible tapered support and transition at this opposite end to provide bend relief and prevent breakage of the attachment cable. *Id.*; APPLE-1110, [0096].



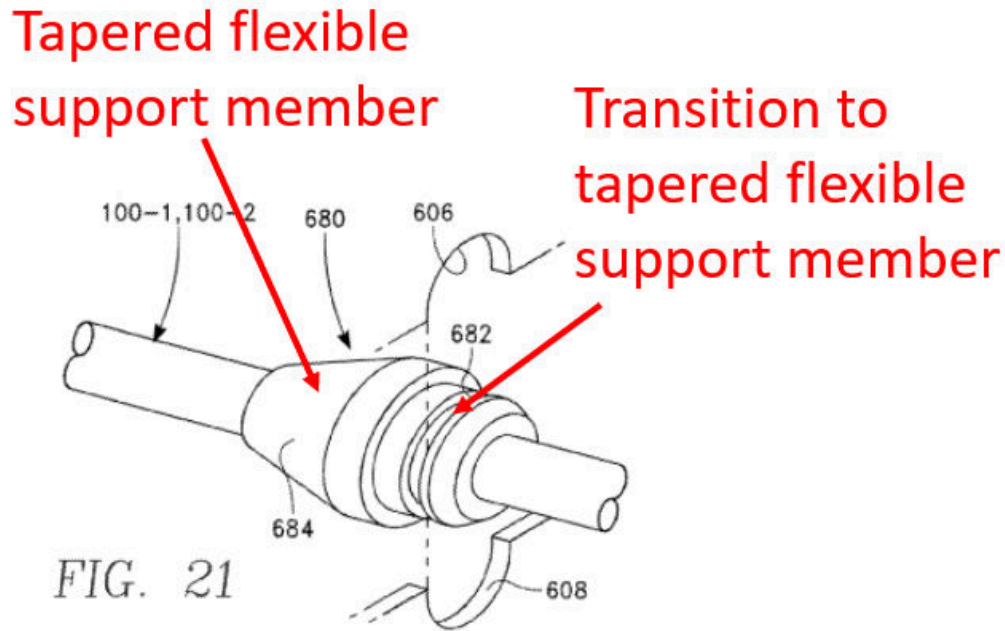
APPLE-1110, FIG. 7.

105. A POSITA would have recognized that including an additional transition, flexible support member, and cable would, for example, allow for connection to additional sensors such as blood pressure, body temperature, or glucose sensor or accelerometer. These types of additional sensors are expressly contemplated by Poeze. APPLE-1110, [0086], [0082]. As another example, Poeze explains that the monitor can communicate with the computing device 126 using “a wired or wireless connection.” *Id.*, [0034]. In this example, a POSITA would have recognized that inclusion of a second cable with a corresponding flexible tapered support and transition would allow users to have the option to use a wired connection between the devices as a backup or alternative to the wireless connection. As another example, the bottom port of the monitor can serve as “an AC or DC power port” as expressly contemplated by Poeze. *Id.*, [0096]. A POSITA would have recognized that inclusion of a flexible tapered support and transition for the cable connecting to that power port would provide the same additional benefits described above. Other known prior art references make clear that such a configuration with two tapered flexible support members and their respective transitions from an enclosure was known prior to the ’507 Patent. APPLE-1118, [89], FIGs. 10, 19-21; APPLE-1122, FIG. 1.

106. Additionally, a POSITA would have been aware that numerous other prior art references disclose bend relief members at the junction of a cable and a more ridged enclosure and that any such references would have been beneficially applied to the Poeze-Kianl-Baba-Pakula system to provide bend relief for the cables connecting to Poeze's monitor 118 (as modified based on Pakula) to prevent breakage and wear on the cables at such junctions. For example, Soden discloses an electronic enclosure having a "cable 100" positioned at either side of a protective electronics enclosure 115, with each cable "formed by a cylindrical flexible sleeve of an insulating material such as rubber or flexible plastic." APPLE-1118, [45].



APPLE-1118, FIG. 9. Soden goes on to describe that the junction of each cable at the electronic enclosure “may include a flexible conical section 684 that provides relief from lateral bending of the cable” as shown in FIG. 21. *Id.*, [89]



107. In another example, Martin discloses a bend relief member to make “cables resistant to impact, crush, and tensile forces” and reduce sensitivity “to sharp bends” and “breakages.” APPLE-1123, [0003]. Specifically, as shown in FIG. 1, Martin discloses a tapered, flexible “bend/stress relief sleeve” (and respective transition) for cables that can “maintain flexibility in low temperatures” and provide abrasive-resistance. APPLE-1123, [0032]-[0039].

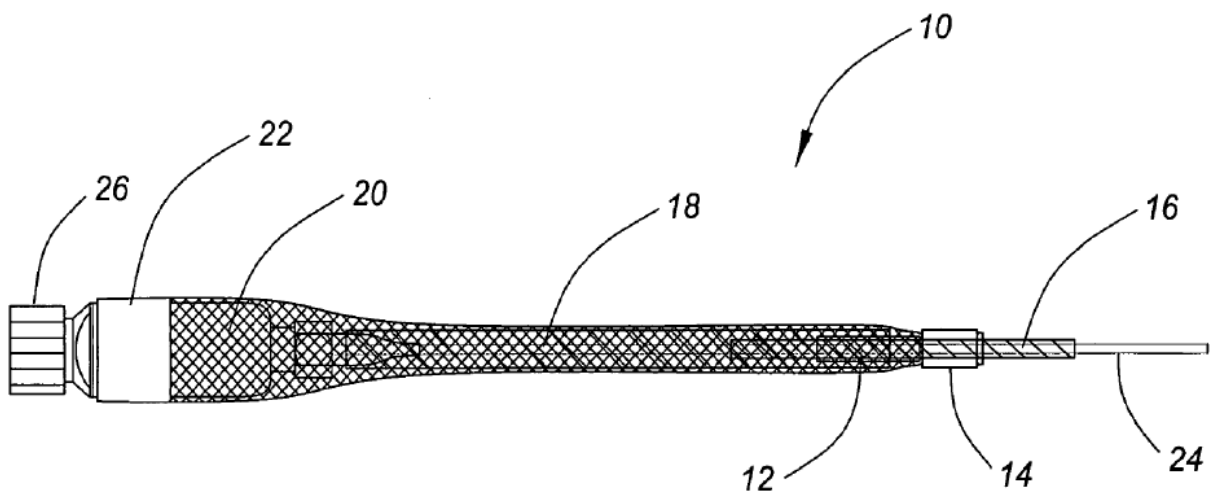


FIG. 1

APPLE-1123, FIG. 1.

108. In yet another example, Lee shows a tapered flexible support member for a cable having a transition to an enclosure that would have been beneficially applied to Poeze's monitor 118:

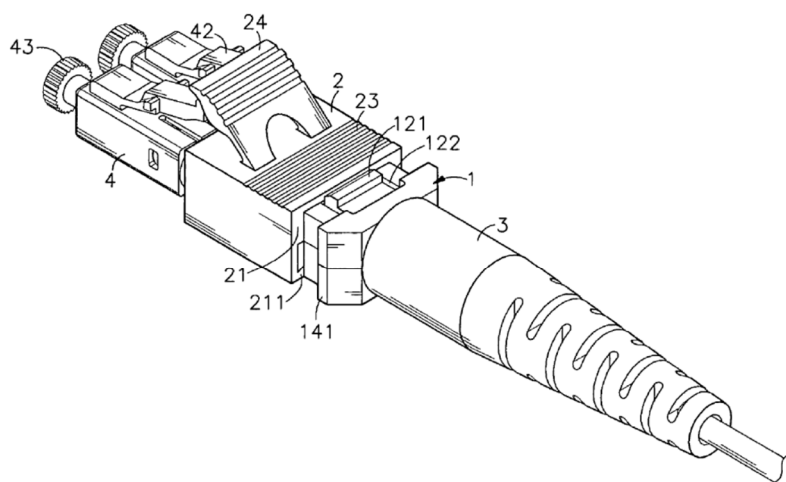


FIG. 1

APPLE-1121, FIG. 1.

109. The above demonstrate just a few examples of this known configuration for the junction of a cable and an electronics enclosure. A POSITA would have been aware the numerous other examples existed in the prior art.

[23c] wherein the sensor and processing board are provided together with a wrist-mounted device.

110. As I discussed in my Second Declaration, the '507 Patent mentions a “wristwatch” only a single time (APPLE-1001, 2:2), and only as an example of a mobile computing device 160 that could be used alternatively to a smartphone. APPLE-1083, ¶69. Claim 21, from which claim 23 depends, requires the claimed mobile computing device to be a smartphone. There is no disclosure in the '507 patent of an embodiment that includes both a wristwatch and a smartphone and no discussion of a system having multiple mobile computing devices of different types.

111. To the extent that this brief mention in the '507 Patent of a “wristwatch” that is an alternative to a smartphone mobile computing device is considered to provide support for this claim element (which I do not believe that it does), Poeze provides a nearly identical prior disclosure of this element, stating that the “general purpose computing device” executing “the personal health organizer” software (equivalent to the claimed MCD) could be implemented as “a wristwatch computer” as an alternative to “a mobile phone.” APPLE-1110, [0010].

112. It would have been obvious to a POSITA to implement Poeze's monitor 118 as a wrist-mounted device. For example, Poeze discloses that the monitor 118 can include "straps that facilitate attachment to a patient's...arm." APPLE-1110, [0095]; APPLE-1111, [0096], FIG. 2C. While Poeze is silent as to the specific location on the arm for attaching the monitor 118 using the straps, Baba discloses to a POSITA the conventional location of a patient's wrist for such physiological monitors. APPLE-1114, [0051]-[0052]. A POSITA would have recognized that implementing Baba's suggestion to position Poeze's arm mounted monitor 118 at the wrist would have allowed the resulting monitor 118 to be easily "worn on the user's wrist and removed as desired." *Id.* Positioning at the wrist would also allow the user to easily interact with the monitor, including to view display information of the monitor, to attach peripheral devices to the monitor (e.g., additional sensors), to provide input directly to the monitor using inputs of the monitor (rather than or in addition to providing input via the smartphone), and to easily carry the monitor in an attached manner without getting in the way of the user's clothing.

113. Such a configuration at the wrist would have also beneficially improved the ability of the resulting system to track the user's steps. Poeze expressly contemplates tracking activity and "physical movement of the user." APPLE-1110, [0052], [0062]. Baba provides additional complimentary teachings

that positioning the monitor and a related accelerometer at the wrist allows for “detect[ing] steps taken by the user as an indicator of the user's body movement” by “detect[ing] the acceleration of the arm swing in conjunction with the user's walking motion.” APPLE-1114, [0063], [0068]-[0069].

114. In addition the example in Baba, numerous other examples of wrist mounted components for physiological monitoring systems were known in the prior art, including several that I discussed in my Second Declaration, and that each would have been combinable with the Poeze-Kianl-Baba-Pakula combination to provide the above described benefits. *See e.g.*, APPLE-1091, ¶¶[0046]-[0058], [0062], FIG. 1; APPLE-1009, ¶¶[0082]-[0085], [0095], [0098], [0104], [0010], claim 6, FIGS. 9A, 9B; APPLE-1092, 3:25-52, 4:34-42, 2:63-65, FIGs. 2, 5; APPLE-1010, ¶¶[0023], [0125], [0136]; APPLE-1130, FIGs. 2, 5-8, [0014], [0021]; APPLE-1083, ¶¶73-78, 90-91, 124-125.

(ii) Claim 24

115. The combination of Poeze with Kianl, Baba, and Pakula (as I have described above) provides all elements of substitute claim 24.

[24] The computer-implemented method of claim [[13]]21, wherein the protective assembly is configured to protect sensitive circuitry of the processing board from water damage further comprising wirelessly transmitting the SpO2 measurement values from the SpO2 measurement system to the mobile computing device.

116. Poeze provides a general teaching, of which a POSITA would have been aware, that it was beneficial to make an enclosure for an electronic device water-resistant to protect the internal electrical components. Specifically, Poeze describes implementing “the personal health organizer” using “a water-proof case.” APPLE-1110, [0037]. Based on this suggestion within Poeze itself, a POSITA would have found it obvious and beneficial to also implement the case for the monitor 118 (as implemented based on Pakula’s suggestions) in the resulting system to also be water-proof. For example, such a configuration would have beneficially allowed the device to “withstand water pressure up to 300M in depth” to allow “divers to use the personal health organizer under water.” *Id.*; APPLE-1114, [0127] (describing a water-proof as being beneficial for use when “water diving”). In addition to making the resulting system useful for underwater diving, a POSITA also would have recognized that such a water-proof implementation for the case for the monitor 118 would have protected the internal circuitry from water damage during rain or other circumstances when water is present, such as when washing hands.

117. In addition to this discussion in Poeze, Pakula describes attaching the covers using a “liquid adhesive” which a POSITA would have recognized as providing at least some degree of protection against water damage to the internal processing board contained within the enclosure. APPLE-1113, [0106], [0110]-[0111]. This disclosure of a liquid adhesive in Pakula is consistent with the mention of an epoxy in the ‘507 (“...In an embodiment, the upper and lower shells 135, 131, can be sealed to the enclosure using epoxy...”). APPLE-1001, 8:42-44.

B. [GROUND 1B] – CLAIM 22 IS OBVIOUS OVER POEZE, KIANL, BABA, PAKULA, AND MOON

118. In this section, I largely rely on Moon in the proposed combination for the same physiological information display and user interface features that I previously discussed in my First Declaration. APPLE-1003, ¶¶212-235.

1. The Combination of Poeze, Kianl, Baba, Pakula, and Moon

119. A POSITA would have been prompted to apply the teachings of Moon to the physiological monitoring system of Poeze (as modified by Kianl, Baba, and Pakula) to correct for the effects of motion on vital sign readings, including SpO₂, and to filter out noise caused by user motion from such readings for the same reasons that I discussed with respect to the Mendelson-Moon combination in my First Declaration. APPLE-1003, ¶¶218-225.

120. As a first reason, a POSITA would have recognized that in user worn and other mobile 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]. Moon explains that this motion of the patient can cause motion artifacts in sensed signals which “can cause the pulse oximeter to generate inaccurate values and false alarms.” *Id.*, [0011], [0078]. As I’ve previously discussed, Poeze describes that its system is “portable” and emphasizes the importance of the “[p]ortability of these monitoring systems” as being “advantageous.” APPLE-1110, [0009], [0006], [0034]. A POSITA therefore would have recognized that the teachings of Moon would have been beneficially applied to Poeze’s system 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]. A POSITA would have therefore recognized that 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].

121. As a second reason, a POSITA would have recognized that pulse oximetry systems that only function accurately “when a patient is sedentary...are

impractical for ambulatory patients...making it difficult to provide true continuous monitoring.” APPLE-1010, [0012]. A POSITA therefore would have recognized that applying Moon’s teachings to Poeze to account for noise caused by user motion would have allowed for “true continuous monitoring” of such users in motion. APPLE-1010, [0025], [0073]-[0074], [0082], [0089]-[0092], [0102]-[0103].

122. As a third reason, a POSITA would have recognized that applying Moon’s teachings to Poeze to reduce motion artifacts and account for signal noise caused by motion of the user would “minimize the occurrence of false alarms and, additionally, make accurate readings in the presence of motion.” APPLE-1010, [0082]. As Moon describes, such techniques can “greatly enhance the accuracy of alarms/alerts.” *Id.* [0015], [0076].

123. As a fourth reason, a POSITA would have been prompted to implement Poeze’s physiological parameter monitoring system would have also beneficially reduced noise due to factors other than motion to “increase[] the accuracy to which data points corresponding to IR/RED(peak) and IR/RED(foot) can be determined.” APPLE-1010, [0072]. This includes “digitally filtering the waveforms to remove any high-frequency noise, and then determining IR/PPG(peak) values from the first derivative of each waveform, and IR/PPG(foot) values from the second derivative of each waveform (step 42).” *Id.*, [0073].

124. As a fifth reason, a POSITA would have been prompted to implement Poeze's physiological parameter monitoring system to correct for motion induced artifacts and signal noise (as described by Moon) because doing so would be merely the application of a known technique to a known system (e.g., Mendelson's physiological monitoring system) ready for improvement to yield predictable results. Here, Moon provides straightforward evidence of known techniques for correcting for motion induced artifacts and noise in a body-worn pulse oximetry system and Poeze's teaching provides a known system that would have been improved by application of Moon's suggested techniques for at least the reasons described above.

125. As a sixth reason, at the time of the '507 patent, a POSITA would have been aware of the availability of miniature, low-power and low-cost accelerometers being widely used in consumer electronic devices for monitoring motion. Additionally, a POSITA would have appreciated that addition of such an accelerometer to the system of Poeze would have been straightforward, and provided the benefits described by Moon without compromising the features described by Poeze.

126. Based upon my knowledge and experience in this field and my review of Poeze, Kianl, Baba, Pakula, and Moon, I am confident a POSITA would have recognized that such a modification would have yielded predictable results, and

these modifications would have been within the predictable and ordinary level of skill of a POSITA. Thus, a POSITA would have had a reasonable expectation of success in implementing such a combined system based on applying Moon's teachings to Poeze's system.

2. Application of Poeze, Kianl, Baba, Pakula, and Moon to Claim 22

127. The combination of Poeze with Kianl Baba, Pakula, and Moon (as I have described above) provides all elements of substitute claim 22.

[22pre] The mobile pulse oximetry system of claim [[13]]21, further comprising, via the application:

[22a] performing a trend analysis on received SpO₂ measurement values; and

[22b] displaying results of the trend analysis in at least one portion of the plurality of display portions;

128. Kianl provides elements [22pre]-[22b] in the Poeze-Kianl-Baba-Pakula-Moon system for the reasons that I discussed with respect to claim 14 in my First Declaration. APPLE-1003, ¶¶100-110; APPLE-1006, 11:6-31, 15:11-40, FIG. 10.

[22c] wherein the processing said one or more analog signals comprises applying an advanced signal processing algorithm with data filtering.

129. Moon describes applying advanced signal processing algorithms, including data filtering, to the signals acquired by physiological sensor that measures light attenuated through a patient's tissue. For example, Moon describes that, similar to Poeze, "[t]he probe 1 makes a transmission-mode optical

measurement along an inner portion of the thumb 3 with a pair of embedded LEDs 9, 10 operating at, respectively, 660 and 905 nm, and a single photodetector 12 that detects these wavelengths after they pass through vasculature and other tissue lying beneath the LEDs 9,10.” APPLE-1010, [0059], [0120]-[0121]. Specifically, “the oximeter processes PPG waveforms measured with red (RED(PPG)) and infrared (IR(PPG)) wavelengths to determine time-dependent AC signals and time-independent DC signals.” *Id.*, [0007], [0013]. This processing includes filtering the PPG and PTT waveforms (data) using detected motion of the patient to more accurately determine SpO₂. *Id.*, [0025], [0073]-[0074], [0089]-[0094]; APPLE-1003, ¶¶215-216, 228-229. For example, if “a pulse is corrupted by noise” due to movement, the system “deploys a ‘matched filter’ to process both the RED/IR(PPG) waveforms to maximize signal-to-noise ratios of the pulses therein” to “determine accurate SpO₂ and cNIBP values even when motion-related noise is present.” APPLE-1010, [0088]-[0089], [0025]. In addition to filtering the signal to reduce or remove motion artifacts, Moon also describes filtering out “unwanted and relatively high-frequency electrical and mechanical noise” to “increase[] the accuracy” of measurements as part of its advanced signal processing. *Id.*, [0072]-[0073]. A POSITA would appreciate that the sophisticated filtering disclosed by Moon represents an example of advanced signal processing.

**C. [GROUND 1C] – CLAIM 22 IS OBVIOUS OVER POEZE,
KIANL, BABA, PAKULA, AND DIAB**

130. In reviewing the specification of the '507, I noticed that the '507 Patent gives examples of types of signal processing that would fall into the category of “advanced signal processing techniques.” APPLE-1001, 6:7-12. These examples include “parallel engines and adaptive filters.” *Id.* While I do not believe that the “advanced signal processing algorithm” recited by claim 22 requires either of these forms of signal processing, I have been asked to review the Diab reference and I find that Diab discloses use of parallel engines and adaptive filters in physiological sensor signal processing and therefore, when combined with Poeze, Kianl, Baba, and Pakula, renders claim 22 obvious even if the term “advanced signal processing algorithm” is interpreted narrowly.

1. Overview of Diab

131. Diab discloses “pulse oximetry systems and methods” that “filter motion artifacts and other noise using a variety of techniques.” APPLE-1120, Abst., 3:13-27, 1:47-54, 2:1-8, Cl. 11. For example, “linear, nonlinear and statistical filtering techniques may be applied to reliably estimate the blood saturation values.” *Id.*, 8:38-9:10. Diab also describes using adaptive filtering and parallel engines to correct for motion artifacts. In a section titled “Managing Motion Artifacts,” Diab describes:

More importantly, the impact of motion artifacts on the calculated saturation values can also be very large, thus causing drawbacks in many older generations of pulse oximeters. For example, when motion is repetitive and affects the photopleth over its entirety, then a combination of adaptive filtering and frequency-domain techniques can provide the best estimates of the saturation values. On the other hand, when motion is intermittent or non-repetitive, e.g. pseudo random, then a combination of a time-domain analysis and adaptive filtering techniques with fast adaptation rates works better. While each of the foregoing techniques has its strength and weaknesses, use of multiple parallel engines executing two or more of the foregoing techniques in parallel, and then fusing their results together, often provides best overall performance. Toward that end, the present technique of complex analysis can be a valuable addition to a set of parallel engines that advantageously improves the accuracy of pulse oximeters by correcting for a subset of conditions where the previous algorithms have failed. For example, the ability of the present algorithm to explicitly encode the phase of the signal on a point by point basis renders it very valuable in case of sensor decoupling from the skin where phase decorrelation between Red and Infrared photopleths is prevalent.

APPLE-1120, 9:49-10:14.

2. The Combination of Poeze, Kianl, Baba, Pakula, and Diab

132. A POSITA would have been prompted to apply the teachings of Diab to the physiological monitoring system of Poeze (as modified by Kianl, Baba, and

Pakula) to correct for the effects of motion on vital sign readings, including SpO₂, and to filter out noise caused by user motion from such readings for the same reasons that I discussed with respect to the applying Moon to Mendelson's physiological monitoring system in my First Declaration. APPLE-1003, ¶¶218-225. As I discussed in my First Declaration, correction for motion artifacts would have increased the accuracy of such measurements and would have beneficially allowed for the system to be used during motion of the user. As I've previously discussed, Poeze describes that its system is "portable" and emphasizes the importance of the "[p]ortability of these monitoring systems" as being "advantageous." APPLE-1110, [0009], [0006], [0034]. A POSITA therefore would have recognized that the teachings of Diab would have been beneficially applied to Poeze's system to both reduce the effects of motion on the measured signals and to filter noise caused by such motion. This would have increased the uses for the resulting system by allowing the system to be used during motion of the user, such as during physical therapy or exercise. As described by Diab, application of such advanced signal processing to Poeze's system (as modified by Kianl, Baba, and Pakula) would correct for the "dramatic" effects and "drawbacks" of motion artifacts and any other "extraneous disturbing source that affects the shape or quality of the optically detected photopleth signal" to "provide the best

estimates of the saturation values” and “best overall performance” for the system.

APPLE-1120, 9:42-10:14.

3. Application of Poeze, Kianl, Baba, Pakula, and Diab to Claim 22

133. The combination of Poeze with Kianl Baba, Pakula, and Diab (as I have described above) provides all elements of substitute claim 22.

[22pre] The mobile pulse oximetry system of claim [[13]]21, further comprising, via the application:

[22a] performing a trend analysis on received SpO₂ measurement values; and

[22b] displaying results of the trend analysis in at least one portion of the plurality of display portions;

134. Kianl provides elements [22pre]-[22b] in the Poeze-Kianl-Baba-Pakula-Diab system for the reasons that I discussed with respect to claim 14 in my First Declaration. APPLE-1003, ¶¶100-110; APPLE-1006, 11:6-31, 15:11-40, FIG. 10.

[22c] wherein the processing said one or more analog signals comprises applying an advanced signal processing algorithm with data filtering.

135. Diab describes applying “*adaptive filtering* and frequency-domain techniques [to] provide the best estimates of the saturation values.” APPLE-1120, 9:49-10:14. Diab goes on to describe that “when motion is intermittent or non-repetitive, e.g. pseudo random, then a combination of a time-domain analysis and *adaptive filtering* techniques with fast adaptation rates works better.” *Id.* Diab further describes that “While each of the foregoing techniques has its strength and

weaknesses, *use of multiple parallel engines* executing two or more of the foregoing techniques in parallel, and then fusing their results together, often provides best overall performance.” *Id.* A POSITA would appreciate that the sophisticated filtering and processing disclosed by Diab represents an example of advanced signal processing.

**D. [GROUND 1D] – CLAIMS 23-24 ARE OBVIOUS OVER
POEZE, KIANL, BABA, PAKULA, AND TELLER**

136. The recitations of a first and second “transition from the enclosure to a tapered flexible support member” appear to be rather broad and could potentially refer to structures other than those that are highly similar to the tapered bend relief portions 138 of FIG. 1C of the ’507 Patent. Teller discloses tapered support straps for a wrist mounted physiological monitoring device that also provide the recitations of element [23b]. Furthermore, Teller provides additional evidence of the known prior art technique of making electronic device enclosures water resistant.

1. Overview of Teller

137. Teller is directed toward “a system for monitoring and reporting the activity level and caloric expenditure of an individual.” APPLE-1104, Abst. Teller’s “system has sensors in electronic communication with a wearable device. A processor is programmed to communicate with the sensor and a computing device to activity data from movement-related data.” *Id.* Teller describes

embodiments for a sensor assembly “in the form of an armband adapted to be worn by an individual on his or her upper arm, between the shoulder and the elbow” having “computer housing 405, flexible wing body 410, and, as shown in FIG. 17, elastic strap 415.” *Id.*, [0093].

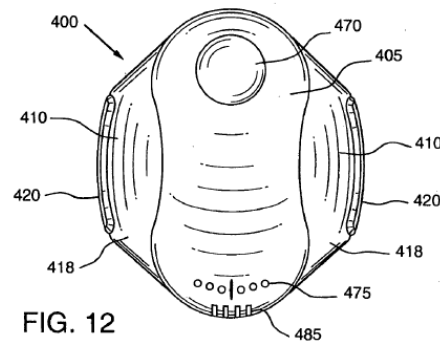


FIG. 12

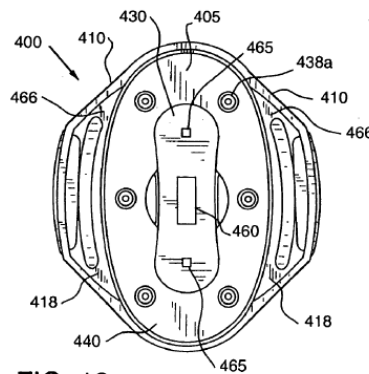


FIG. 13

APPLE-1104, FIGs. 12-13. Teller describes that “[e]lastic strap 415 is used to removably affix armband sensor device 400 to the individual's upper arm. As seen in FIG. 17, bottom surface 426 of elastic strap 415 is provided with velcro loops 416 along a portion thereof Each end 427 of elastic strap 415 is provided with velcro hook patch 428 on bottom surface 426 and pull tab 429 on top surface 430.”

Id., [0094]. Teller also describes that “the assembled computer housing 405 is sufficiently water resistant to permit armband sensor device 400 to be worn while swimming without adversely affecting the performance thereof.” *Id.*, [0098].

2. The Combination of Poeze, Kianl, Baba, Pakula, and Teller

138. Multiple reasons would have prompted a POSTIA to apply the teachings of Teller to the Poeze-Kianl-Baba-Pakula system to include a tapered arm support strap for Poeze’s monitor 118 and to make the resulting electronics enclosure for the monitor 118 water resistant. Poeze discloses that the monitor 118 can include “straps that facilitate attachment to a patient’s...arm” and Teller provides details on tapered support straps that “can be adjusted to fit arms of various sizes” and uses “soft foam fabric” to “fit comfortably” during exercise and allow for easy attachment and removal using simple pull tabs and velcro loops. APPLE-1110, [0095]; APPLE-1104, [0095], [0099], [0077]-[0078]. As such, Teller provides additional detail for an arm strap that is both comfortable and easy to attach and detach from the user’s arm, thus improving the overall user experience for the resulting system. Additionally, applying Teller’s teaching to have a water tight seal for the protective housing for Poeze’s monitor 118 would have beneficially allowed the monitor 118 “to be worn while swimming without adversely affecting the performance thereof” while “maintain[ing] the integrity of [the] housing” to protect sensitive internal components from water damage.

APPLE-1104, [0098]-[0101]. Such water resistance also would have protected the internal components from water damage due to rain or other situations in which the monitor 118 may be exposed to water.

3. Application of Poeze, Kianl, Baba, Pakula, and Teller to Claims 23-24

[23a] The computer-implemented method of claim [[13]]21, 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;

139. Kianl provides element [23a] in the Poeze-Kianl-Baba-Pakula system for the reasons that I discussed with respect to claim 17 in my First Declaration.

APPLE-1003, ¶¶100-112; APPLE-1006, 2:18-31, 1:33-37, 5:65-6:15, 11:6-49, 14:18-30, 15:11-40, FIGs. 4, 1010.

140. For example, FIG. 4 from Kianl shows that a display that includes at least two graphical representations of the SpO₂ measurement value: a scrolling waveform showing the SpO₂ trend over time and a numerical value of the current SpO₂ value.

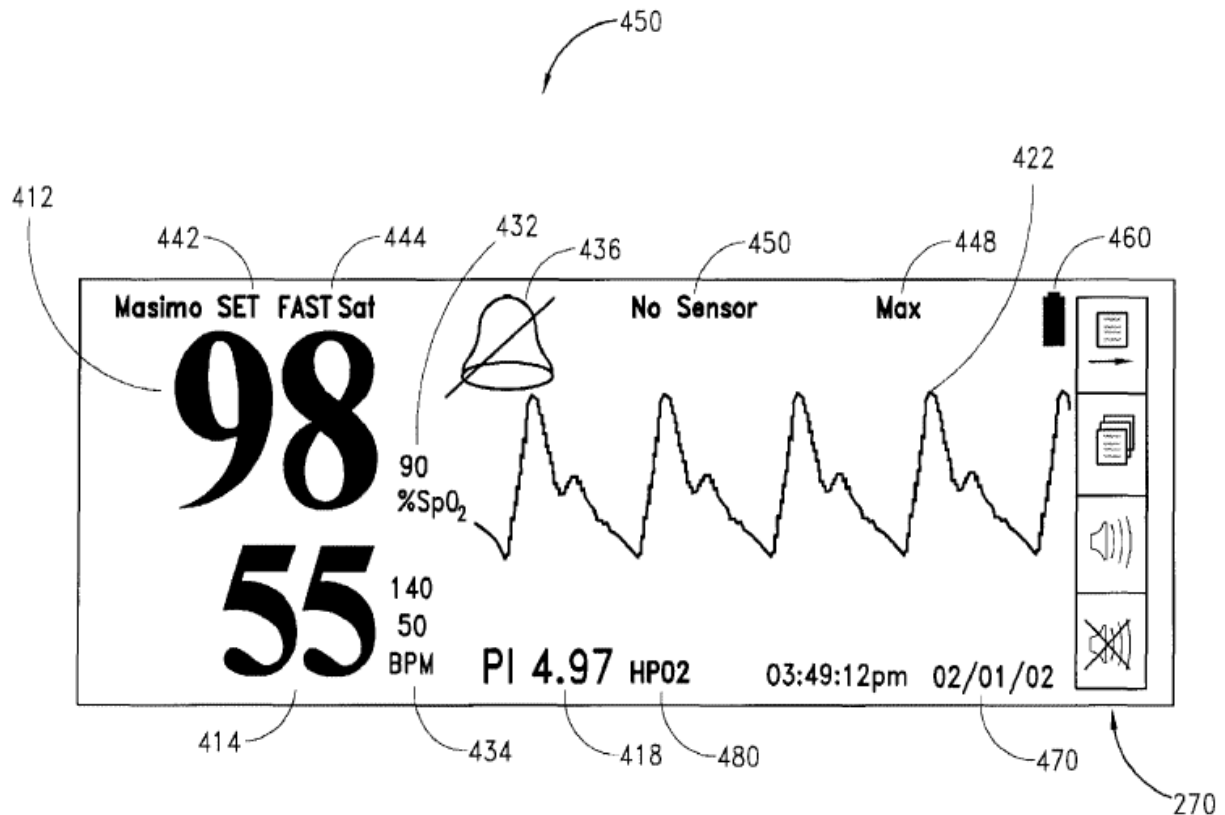


FIG. 4

APPLE-1006, FIG. 4. Kianl describes that GUI 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. FIG. 10 shows the “trend view 1000” including “oxygen saturation trend graph 1030.” APPLE-1006, 11:6-49.

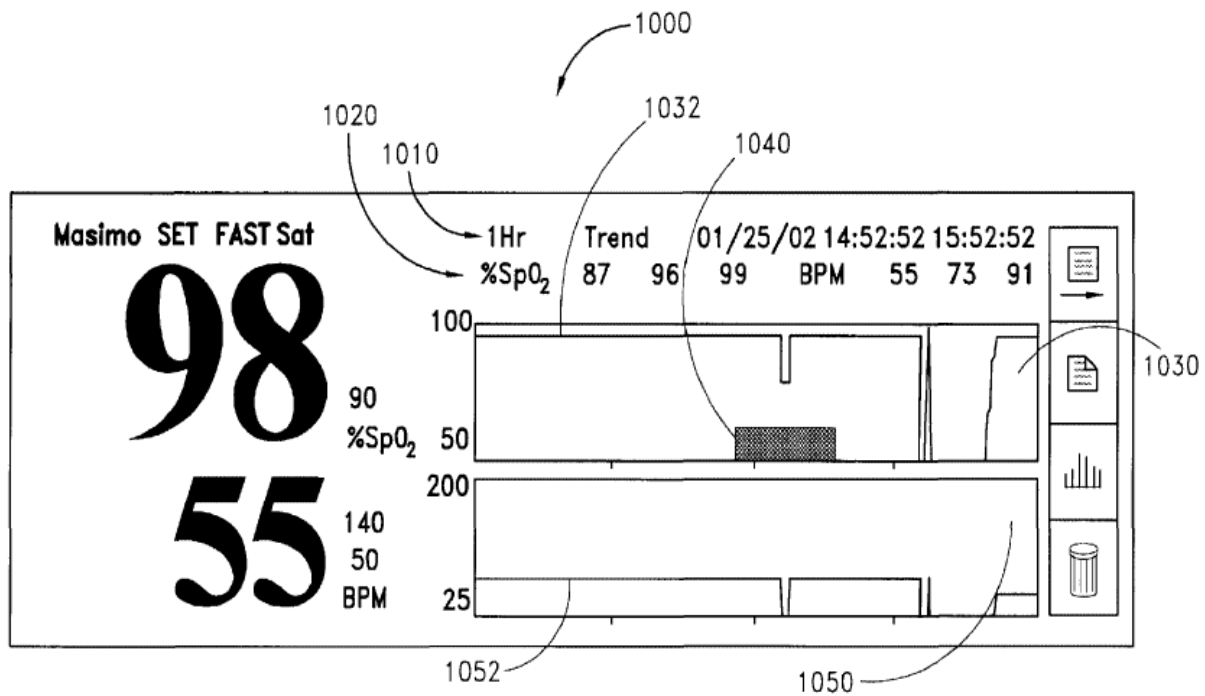


FIG. 10

APPLE-1006, FIG. 10. Kianl describes that “[t]he 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. FIG. 10 includes “a pulse rate trend graph 1050” along with blood oxygen trend information over time. APPLE-1006, 11:6-49, 12:18-26.

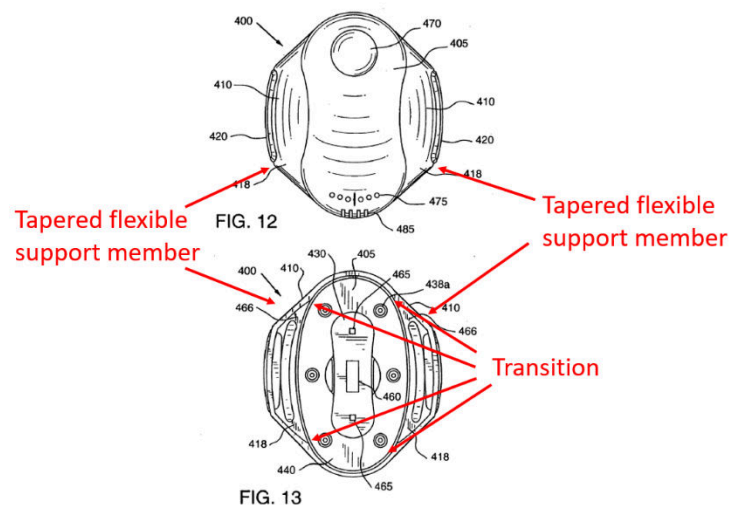
141. Kianl describes that these trends are plotted over time and therefore a POSTIA would have recognized that the display of these different representations

of SpO₂ measurement data are updated with each new measurement. APPLE-1006, 11:6-49, 14:18-30. 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. *Id.*, 15:10-56. As Kianl describes “FIG. 19 illustrates a trend setup menu 1900 having %SpO₂ max and min 1910, BPM max and min 1920, default view 1930, trend action 1940 and trend period 1950 items.” *Id.* The setup menus described with respect to FIG. 19 include an option to output the measured SpO₂ data as an “analog dump” including “an analog chart” of the data. *Id.* While Kianl describes these charts as being “print[ed],” a POSITA would have recognized that it would have been beneficial to include this chart as displayed data on the GUI of the resulting PDA device in addition to or in place of printing such information to more readily provide the information to the user or healthcare provider. Displaying such information on the interface rather than in print would have negated the need for a printer which would have beneficially increased the portability of the system, one of the goals of Poeze. APPLE-1110, [0009], [0006], [0034].

[23b] the rounded rectangular enclosure comprising, on a first side, a first transition from the enclosure to a tapered flexible support member, and on a second side opposite the first side, a second transition from the enclosure to a tapered flexible support member;

142. Teller demonstrates that the resulting arm band monitor enclosure includes first and second transitions to tapered flexible support members. APPLE-

1104, FIGs. 12-19; [0093]-[0101]. For example, as shown in FIGs. 12-13, Teller's assembly includes "***flexible*** wing body 410" that is "preferably made of a flexible urethane material or an elastomeric material such as rubber or a rubber-silicone blend by a molding process." APPLE-1104, [0093]. Teller further describes that "[f]lexible wing body 410 includes first and second wings 418 each having a thru-hole 420 located near the ends 425 thereof. First and second wings 418 are adapted to wrap around a portion of the wearer's upper arm." *Id.*



APPLE-1104, FIGs. 12-13. As shown in FIGs. 12-13, the wings of the flexible wing body 410 are tapered and act as support members on opposite sides of housing 405 that support the housing on the user's arm. *Id.* The flexible wing body 410 further includes a flexible ring that provides first and second transitions to the tapered flexible support members. *Id.*, [0116]. As Teller describes, the "housing 405, may be affixed to flexible wing body 410 by one of several known methods, such as by an adhesive, by snap-fitting, or by screwing the two pieces together. *Id.*

[23c] wherein the sensor and processing board are provided together with a wrist-mounted device.

143. Teller describes that the intended location for its armband is on the “upper arm.” APPLE-1104, [0093]. However, a POSITA would have recognized that it would have been beneficial and obvious to position the armband on the user’s wrist based on Baba’s suggestion for the same reasons that I discussed in paragraphs 112-114, above. For example, a POSITA would have recognized that implementing Baba’s suggestion to position the arm mounted monitor 118 at the wrist would have allowed the resulting monitor 118 to be easily “worn on the user’s wrist and removed as desired.” APPLE-1114, [0051]-[0052]. Positioning the resulting monitor 118 at the wrist would also allow the user to easily interact with the monitor, including to view display information of the monitor, to attach peripheral devices to the monitor (e.g., additional sensors), to provide input directly to the monitor using inputs of the monitor (rather than or in addition to providing input via the smartphone), and to easily carry the monitor in an attached manner without getting in the way of the user’s clothing.

144. Such a configuration at the wrist would have also beneficially improved the ability of the resulting system to track the user’s steps. Poeze expressly contemplates tracking activity and “physical movement of the user.” APPLE-1110, [0052], [0062]. Baba provides additional complimentary teachings that positioning the monitor and a related accelerometer at the wrist allows for

“detect[ing] steps taken by the user as an indicator of the user's body movement” by “detect[ing] the acceleration of the arm swing in conjunction with the user's walking motion.” APPLE-1114, [0063], [0068]-[0069].

145. Alternatively or additionally, Teller also describes “a remote control device incorporated into a wristwatch” to beneficially provide a convenient and easy to use input device for the physiological sensor, which satisfies the claimed “wrist-mounted device” that is “provided together with” the sensor and processing board. APPLE-1104, [0118]. A POSTIA would have found it obvious and beneficial to include this additional wrist mounted control device in the resulting system to provide easy access to controls for the resulting system at the user’s wrist.

[24] The computer-implemented method of claim [[13]]21, wherein the protective assembly is configured to protect sensitive circuitry of the processing board from water damage further comprising wirelessly transmitting the SpO2 measurement values from the SpO2 measurement system to the mobile computing device.

146. Teller demonstrates that the protective assembly for Poeze’s monitor 118 is configured to protect the internal sensitive circuitry of the processing board from water damage in the resulting combination. For example, Teller discloses that “the assembled computer housing 405 is sufficiently water resistant to permit armband sensor device 400 to be worn while swimming without adversely affecting the performance thereof.” APPLE-1104, [0098]. This water protection

can be achieved, for example, through use of sealingly mating the front and back covers of Pakula with the periphery member such as through use of one or more O-rings. *Id.*

E. [GROUNDS 2A-2D] – ADDITION OF LIN TO GROUNDS 1A-1D

147. While I believe that Grounds 1A-1D demonstrate obviousness of claims 21-24, including the disclosures of Poeze relevant to element [21m], I have been asked to address the Lin reference (APLE-1119) in combination with each of the prior art combinations from Grounds 1A-1D. Based on my analysis of the claims and the prior art references, I believe that Lin provides all recitations of element [21m] in a physiological monitoring system and, in combination with the prior art references discussed in Grounds 1A-1D, above, renders obvious claims 21-24.

148. Lin is directed toward “an electronic device having a seamlessly integrated cardiac sensor. The cardiac sensor can be integrated in any suitable portion of the electronic device, including for example a portion with which the user is typically in contact (e.g., an input mechanism or a housing held by the user), or metallic or conductive portions of the device.” APPLE-1119, [0006]. Lin describes that “electronic device[s] can use several approaches to identify the user of the electronic device and provide access to the user's private and personal information, or to load the user's personal profile.” *Id.*, [0004]. This includes

authenticating user data access using “sensors operative to detect a fingerprint, voice print, [or] facial features.” APPLE-1119, [0004]. A POSTIA would have been prompted to apply such security features to the smartphone 126 of Poeze to authenticate a user’s identity to allow access to sensitive user data to increase the number of options available to the user for accessing the user’s private information, thus making it more user friendly for the user to review collected physiological data by using the authentication method preferred by the user.

F. [GROUNDS 3A-4D] – REPLACEMENT OF PAKULA WITH SODEN IN GROUNDS 1A-2D

149. As I discussed above, numerous prior art references describe electronic enclosures having the configuration recited in element [21n], including both the Pomona Box and Pakula. Soden (APPLE-1118) provides another example of such an electronic device enclosure that includes all features recited by element [21n], provides that internal electronic components can be mounted to a circuit board within the enclosure, and provides a water-proof seal, and provides first and second transitions to tapered flexible support members that are highly similar to the bend relief portions 138 shown in FIG. 1C of the ’507 patent. As such, a POSITA would have found that Pakula could have and would have been replaced by Soden in each of the combinations of Grounds 1A-2D to further render obvious claims 21-24.

150. Soden describes an “in-line controller 115 [that] includes circuit elements and programmable controller elements” having “[a] housing or enclosure 230 [that] provides a permanent water-proof seal around” the internal electronic components. APPLE-1118, [45], [58]. With respect to FIGs. 9-16, Soden describes:

[T]he housing 230 includes a shell 600 as indicated in FIG. 9. As shown in FIG. 11, *the shell 600 is formed as two matching halves, namely a top half shell 602 and a bottom half shell 604*, both preferably formed of a hard high- impact material, which may be plastic, metal, alloy, carbon fiber or other synthetic material. The top half shell 602 has a ceiling 602a and a side wall 602b, while the bottom half shell 604 has a floor 604a and a side wall 604b. There are exposed edges 602c, 604c of the side walls 602b and 604b that are generally congruent with one another. The ceiling 602a and floor 604a are generally flat while the side walls 602b and 604b follow a "racetrack shape" defined by long straight edges 602c- 1, 604c-1, respectively, and short curved edges 602c-2, 604c-2, respectively. The top half shell 602 has half- circle openings 606a, 606b at respective ends of the side wall 602b. Similarly, the bottom half shell 604 has half-circle openings 608a, 608b at respective ends of the side wall 604b. . The half circle openings form circular openings 607, 609 (shown in FIG. 16) at the respective ends of the shell 600 when the two half shells 602, 604 are mated. The top and bottom half shells 602, 604 have structurally reinforcing interior ribs 610, 611, respectively, extending in transverse direction to opposite sides. The

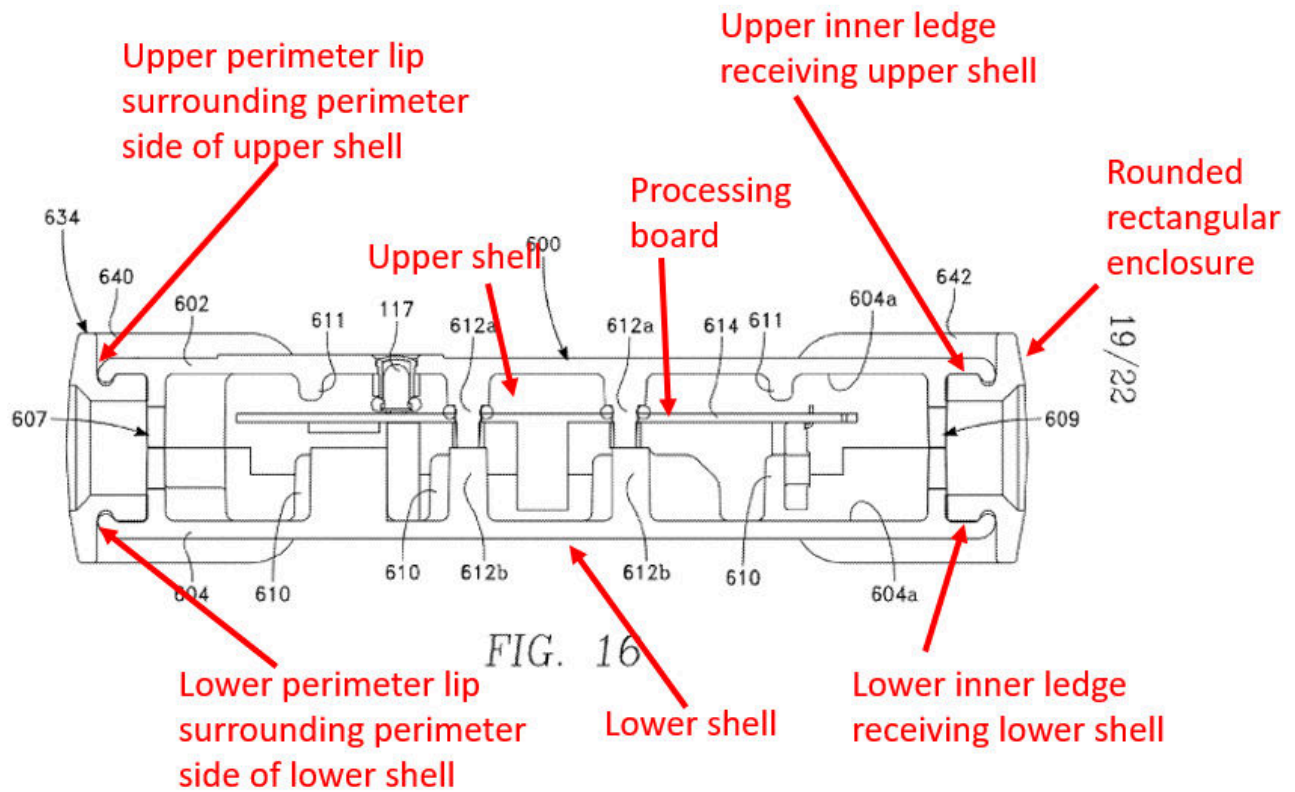
ribs 610 of the bottom half shell 604 are visible in the view of FIG. 11, and there are corresponding ribs 611 in the top half shell 602 visible in FIG. 16. Interior reinforcing posts 612 extend from the floor 604a to the ceiling 602a are each divided into separate half posts, of which the bottom half posts 612b extending from the floor 604a are visible in the view of FIG. 11, while the top half posts 612a are shown in FIG. 16 and in hidden line in FIG. 11.

APPLE-1118, [80]

151. Soden further describes a “circuit board 614” supporting “electronic components” that is “sealed within the housing 230 from any external moisture.”

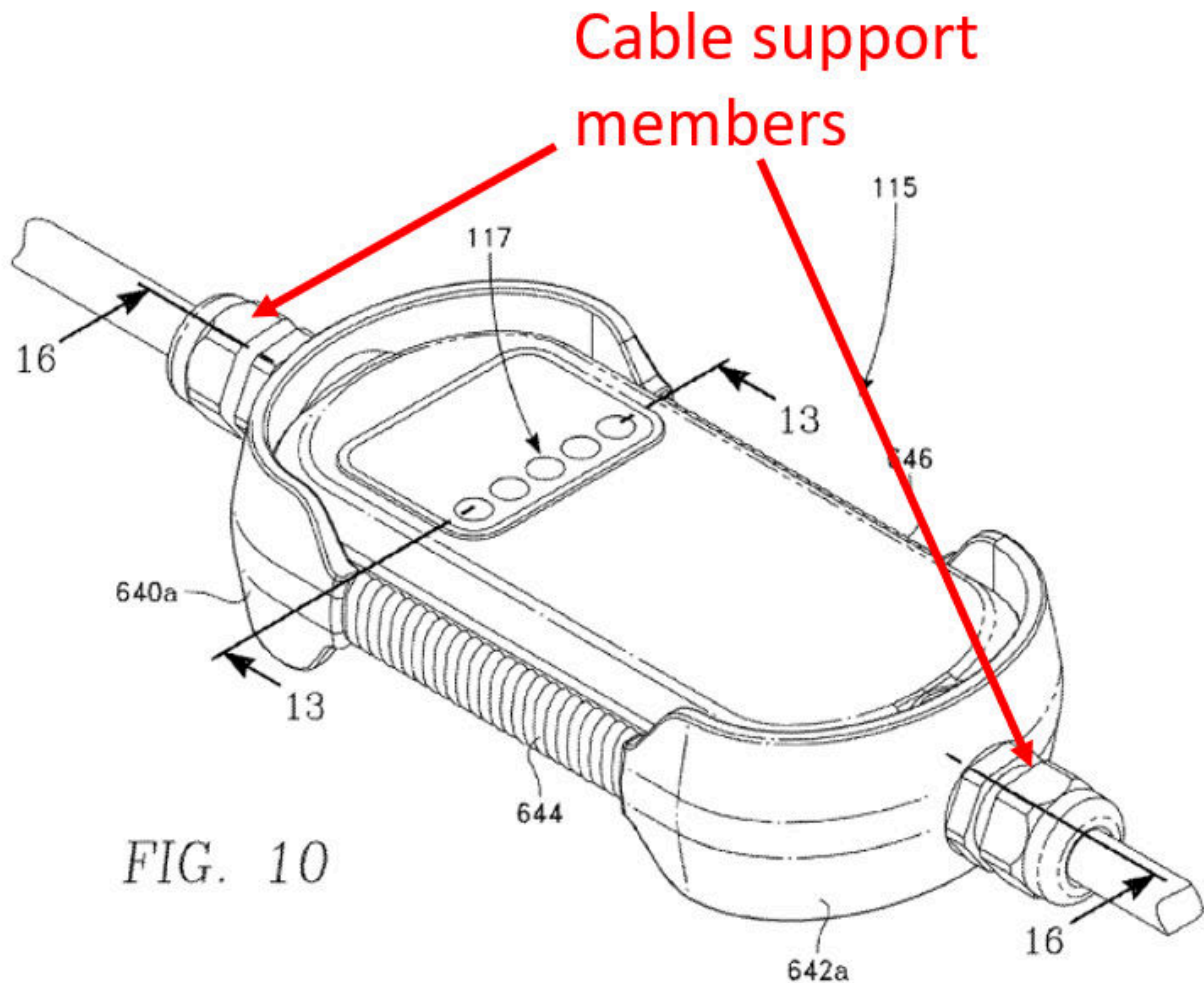
APPLE-1118, [78]-[81]. A POSTIA would have recognized that in the predictable combinations, the electronic components of Poeze’s monitor 118 (including the 510 and analog-to-digital converters) would have been beneficially mounted on the circuit board disclosed by Soden such that the electronic components are protected within Soden’s protective housing 230. Soden goes on to describe that the “top half shell 602 and a bottom half shell 60” are surrounded by bumper 634 (outer case 634a) having upper and lower inner ledges and perimeter lips for receiving the top and bottom shells as shown in FIGs. 9-16. *Id.*, [80]-[83]. As demonstrated in FIGs. 9-16, the housing 230 includes upper and lower shells (top half shell 602 and bottom half shell 60) and a rounded rectangular enclosure (bumper 634 having outer case 634a) forming a cavity with upper and lower openings, the openings having an inner ledge and a perimeter lip sized and configured to receive the upper

and lower shells to fill the openings such that the perimeter lip surrounds at least a portion of perimeter sides of the upper and lower shells.



APPLE-1118, FIG. 16.

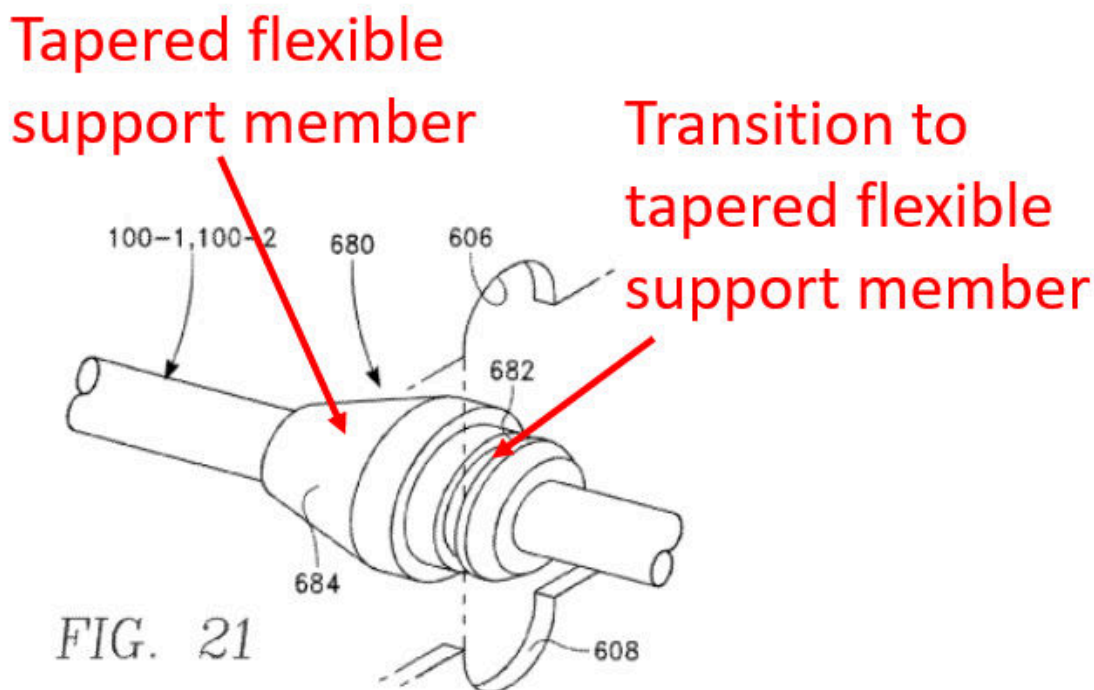
to a tapered flexible support member in more detail than the specification of the '507 Patent. For example, as shown in FIG. 10, Soden's enclosure includes cable support members at opposite sides of the enclosure:



APPLE-1118, FIG. 10.

153. Soden goes on to disclose that each of these cable support members can be implemented as a tapered flexible support member with a corresponding transition from the enclosure. For example, with respect to FIG. 21, Soden discloses an embodiment in which “an elastic or plastic hollow fitting 680 fits

around the exterior of the cable 100-1 (100-2). The fitting 680 has a circular groove 682 that receives the edges of the two half circular openings 606, 608. *The fitting 680 may include a flexible conical section 684 that provides relief from lateral bending of the cable.*” APPLE-1118, [89].



APPLE-1118, FIG. 21. FIGs. 19-20 demonstrate other alternative configurations that provide tapered flexible support members for supporting the cables on opposite sides of housing 230. APPLE-1118, [86]-[88], FIGs. 19-20.

154. With respect to claim 24, Soden discloses that the housing is “water-proof.” APPLE-1118, [58], [60] (“One advantage of permanently sealing the components of the in-line controller components within the housing 230 is that the in-line controller 115 is protected from moisture.”), [78].

155. A POSITA would have found it obvious and beneficial to apply Soden to the various combinations of Grounds 1A-2D to support the electronic components of Poeze's monitor 118 on a processing board in a housing to "protect[]" the components "from moisture, mechanical shock, electrical shock and tampering" and "provide[] relief from lateral bending" of input cables for the monitor 118. APPLE-1118, [60], [78]-[80], [89].

IV. Other References Material to Patentability

156. Additional features of Masimo's amended claims are further disclosed by a host of additional references, as I have indicated below:

- Wired connection between an optical sensor and a processing board, wireless connection from processing board to MCD: APPLE-1010, ¶¶[0010], [0013], [0060], [0120], [0139]; APPLE-1097, 2-3, FIG. 1; APPLE-1101, 8:51-55, 14:40-50, 15:48-52; APPLE-1091, ¶¶[0046]-[0065], [0072]-[0079]; APPLE-1131, [0021]-[0024], [0026]-[0032], [0034]-[0035].
- Receiving analog signals from the optical sensor: APPLE-1010, ¶¶[0013],[0060]; APPLE-1102, 12:30-64; FIG. 7, FIGS. 10-11; APPLE-1091, ¶¶[0054]-[0056].
- Protective assembly with rounded rectangular enclosure having inner ledges receiving upper/lower shells: APPLE-1124, FIGs. 1-4;

APPLE-1125, FIGs. 1-5; APPLE-1126, FIGs. 1-4, 5B; APPLE-1127, FIGs. 1-8; APPLE-1116, FIGs. 4-7, 25-33.

- Tapered flexible wrist band support members for electronics assembly: APPLE-1128, FIGs 1, 3-4, [0016]-[0017], Cl. 12; APPLE-1129, FIGs. 2-7, 9-10; APPLE-1102, FIGs. 3-3B; APPLE-1116, FIGs. 2-7, 23; APPLE-1101, FIG. 15C; APPLE-1115, FIGs. 6, 9.
- Water resistant enclosure: APPLE-1095, 15; APPLE-1105, ¶¶ [0065], [0134]-[0135]; APPLE-1130, [0133]-[0135].

V. CONCLUSION

157. I reserve the right to supplement my opinions to address any information obtained, or positions taken, based on any new information introduced throughout this proceeding.

158. I declare under penalty of perjury that the foregoing is true and accurate to the best of my ability.