

On behalf of **Masimo Corporation**

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MASIMO CORPORATION
Petitioner,

v.

APPLE INC.
Patent Owner.

Case No. IPR2023-00635
U.S. Patent No. 10,987,054

**PETITION FOR *INTER PARTES* REVIEW OF
U.S. PATENT NO. 10,987,054**

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EXHIBIT LIST

Exhibit No.	Description
1001	U.S. Patent No. 10,987,054 (“the ’054 patent”)
1002	File history of the ’054 patent
1003	Declaration of Alan Oslan
1004	<i>Curriculum Vitae</i> of Alan Oslan
1005	US2016/0058375 (“Rothkopf”)
1006	US20160228064 (“Jung”)
1007	WO2017/165532 (“Paulke”)
1008	US10231629 (“Pei”)
1009	ECG Monitoring Leads and Special Leads (“Francis”)
1010	US2016/0073914 (“Lapetina”)
1011	US6265789 (“Honda”)
1012	Principles of ECG (“Berbari”)
1013	Dry Electrodes for ECG (“Meziane”)
1014	Drying and Curing Inks and Coatings on Glass (“Canfield”)
1015	District of Delaware Time to Trial Statistics – Sept. 2022
1016	US9277880 (“Poeze”)

GROUND LISTING

GROUND 1	Claims 9 and 13-15 are unpatentable as anticipated by Rothkopf
GROUND 1A	Claim 10 is unpatentable as obvious over Rothkopf in view of Francis and Lapetina
GROUND 2	Claims 1-6, 9, 12-16, 17, 19 are unpatentable as obvious over Rothkopf in view of Jung
GROUND 2A	Claims 7 and 20 are unpatentable as obvious over Rothkopf in view of Jung and Pei
GROUND 2B	Claim 8 is unpatentable as obvious over Rothkopf in view of Jung and Honda
GROUND 2C	Claims 10-11 and 18 are unpatentable as obvious over Rothkopf in view of Jung, Francis and Lapetina
GROUND 3	Claims 1-5, 9, 13-16, 19 are unpatentable as obvious over Rothkopf in view of Paulke
GROUND 3A	Claims 7 and 20 are unpatentable as obvious over Rothkopf in view of Paulke and Pei
GROUND 3B	Claim 8 is unpatentable as obvious over Rothkopf in view of Paulke and Honda
GROUND 3C	Claims 10-11 and 18 are unpatentable as obvious over Rothkopf in view of Paulke, Francis and Lapetina

Masimo Corporation (“Petitioner”) requests *inter partes* review of claims 1-20 of U.S. Patent No. 10,987,054 (“the ’054 patent”).

I. MANDATORY NOTICES; FEES; STANDING

A. Mandatory Notices

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

Masimo Corporation is the real party-in-interest.

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

Apple has asserted the ’054 patent against Petitioner in *Apple Inc. v. Masimo Corporation and Sound United, LLC*, U.S. District Court for the District of Delaware, Case No. 1:22-cv-01378-MN (“the Delaware Litigation”).

3. Lead and Backup Counsel (37 C.F.R. § 42.8(b)(3))

Petitioner provides the following designation of counsel:

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Pursuant to 37 C.F.R. § 42.10(b), a Power of Attorney accompanies this petition. The above-identified lead and backup counsel are registered practitioners associated with Customer No. 64,735 listed in that Power of Attorney.

4. Service Information (37 C.F.R. § 42.8(b)(4))

Service information above. Petitioner consents to electronic service by email to MasimoIPR-054@knobbe.com.

B. Payment of Fees

The fee set forth in 37 C.F.R. § 42.15(a) has been paid. The undersigned further authorizes payment for any additional fees that may be due in connection with this petition to be charged to Deposit Account 11-1410.

C. Grounds for Standing

Petitioner certifies that the '054 patent is available for IPR and that Petitioner is not barred or estopped from requesting IPR.

II. BACKGROUND

A. Reliance on Expert Analysis and Testimony

The predominant issues in this Petition, as in most patentability challenges, are technical issues for which expert analysis is relevant, particularly with respect to what would have been known or understood by a person of ordinary skill in the art

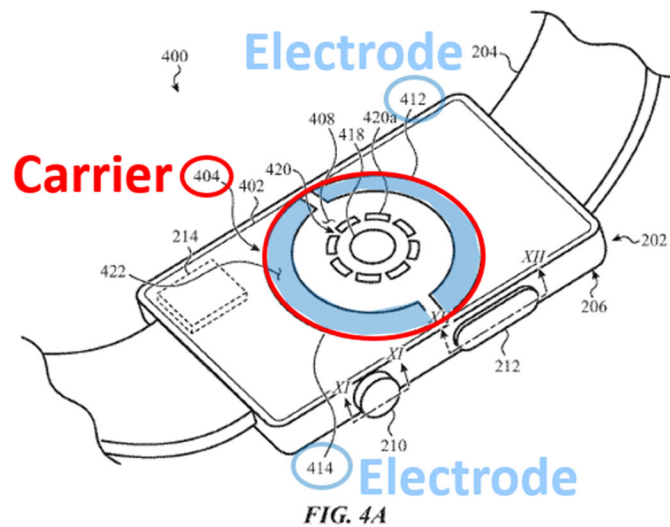
(“POSITA”). Accordingly, this Petition largely adopts the expert analysis and testimony of Mr. Alan L. Oslan EX1003 ¶¶ 1-183; EX1004.¹

B. Overview of the ’054 Patent

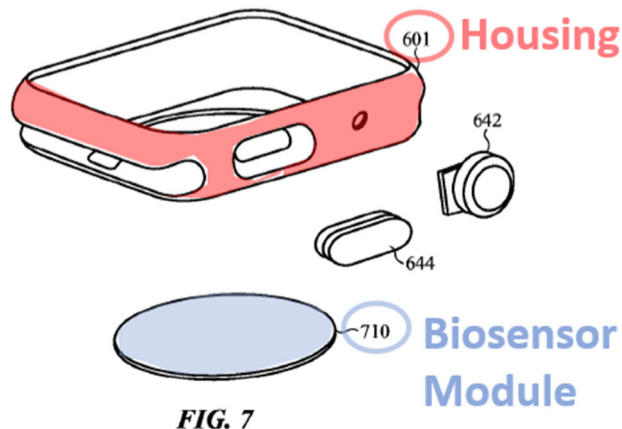
The ’054 patent is “directed to an electronic watch or other wearable electronic device having a set of electrodes that may be used to sense or determine biological parameters of a user that wears the wearable electronic device.” EX1001, 1:49-55. The ’054 patent describes a “carrier” that is a “structure that support the electrodes.” *Id.*, 6:12-14. Fig. 4A (reproduced below²) of the ’054 patent illustrates the disclosed watch with carrier 404 and electrodes 412, 414. EX1003, ¶ 33

¹ In general, herein, a single citation to Mr. Oslan expert declaration is provided at the end of each paragraph that is supported by Mr. Oslan’s testimony.

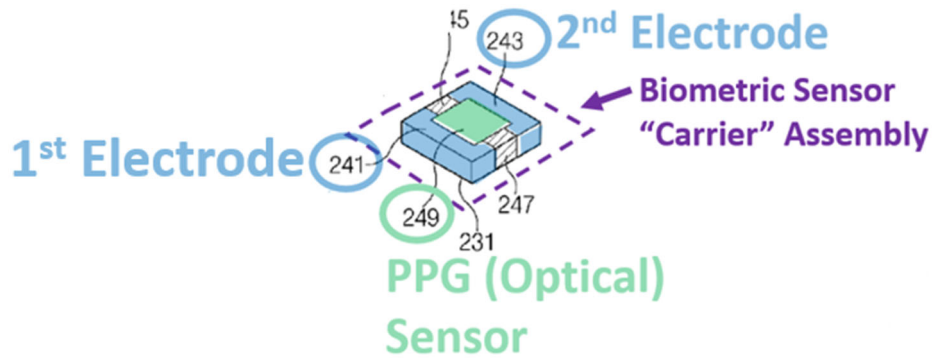
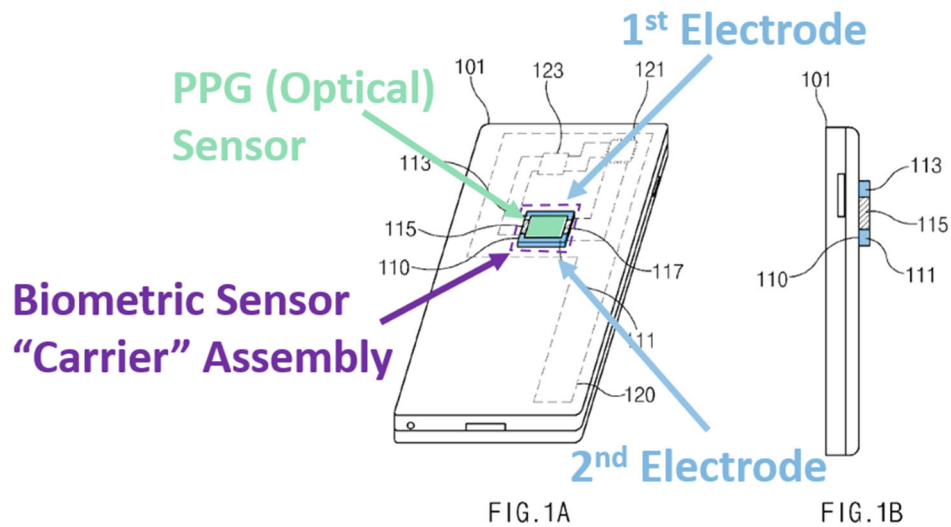
² All figures fully or partially reproduced herein are annotated unless otherwise noted.



Electrodes on a carrier structure of a watch, however, are not new. In fact, Apple itself disclosed a watch structure with a carrier assembly including electrodes years before the priority filing date of the '054 patent. For example, US2016/0058375 (“Rothkopf”) predates the '054 patent by years and teaches a carrier assembly. Apple called its carrier assembly a “biosensor module” and disclosed that it “may include one or more light sources, one or more photodetectors, and one or more electrodes.” EX1001, [0148]. Apple’s prior art biosensor module (710) fits into an opening in housing (601) as illustrated in Fig. 7 (reproduced in part below) of Rothkopf. EX1003, ¶ 41.

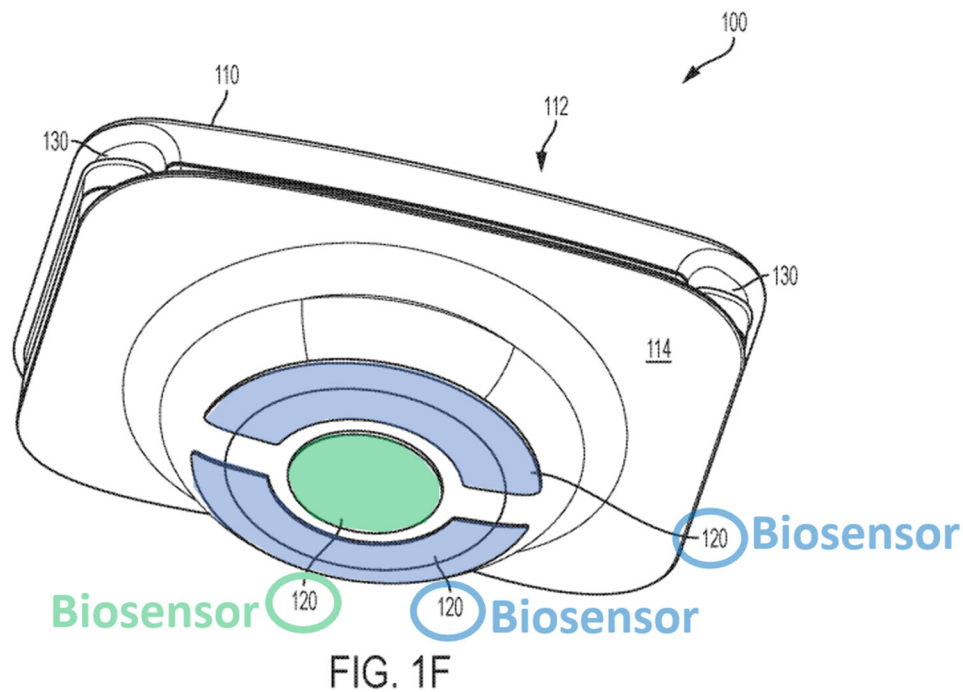


Apple's own prior art in this space is not alone. Prior art wearables incorporating carrier structures for electrodes and other biosensors are ubiquitous. For example, Jung teaches an electronic device, such as a watch, having a biosensor carrier structure that positions its electrodes as shown in Figs. 1A-2 below. EX1006, [0028], [0046], Figs. 1A-2. EX1003, ¶ 42.



Partially reproduced Fig. 2

As another example, Paulke teaches a watch that includes a biosensor module that positions various biosensors 120, including electrodes and optical sensors. EX1007, 6:16-17; 12:6-13, 15:12-13, Fig. 1F. EX1003, ¶ 43.



C. Prosecution History

During prosecution of the '054 patent, the Application was rejected over US2016/0338598 ("Kegasawa"). Patentee amended the claims to add new limitations of a "carrier assembly" comprising a "carrier member" positioning first and second electrodes. EX1002, 90-99. Citing Fig. 9A of the '054 patent (reproduced below with annotations), Patentee argued that the carrier member (904) has electrode (900) and is a "different structural component than the housing member 914 to which it is coupled." *Id.*, 97.

'054 Fig. 9A

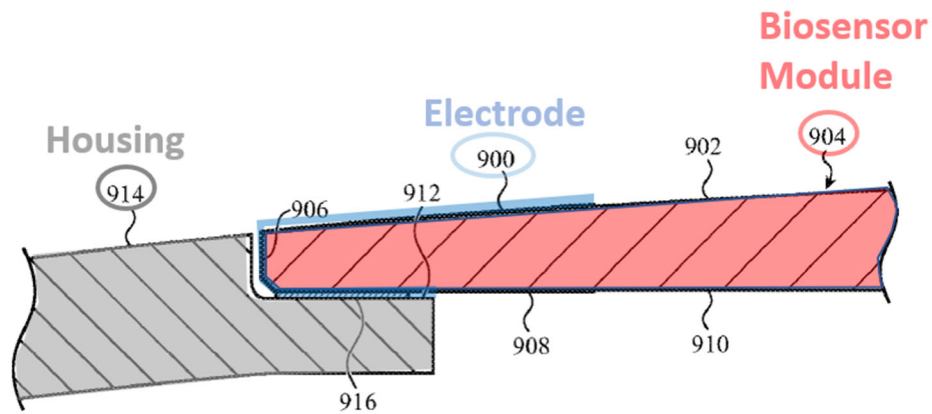
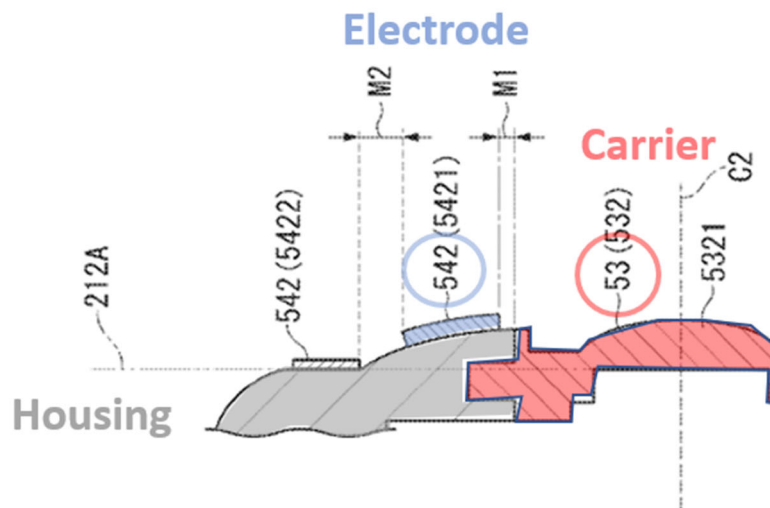


FIG. 9A

Patentee then argued the cited prior art, Kegasawa, did not disclose these limitations because as shown in Fig. 16, below, its ECG leads 542 were positioned on a main housing 212, not a separate carrier 53. *Id.*, 97-98.

Kegasawa Fig. 16 (Cited Prior Art)



Relying on these arguments, the examiner provided reasons for allowance stating the electrodes of Kegasawa (542 in Fig. 16, above) are on a separate component from the carrier assembly (53 in Fig. 16). *Id.* EX1002, 42, 46-47.

D. Priority

The '054 patent, filed April 6, 2020, is a continuation of U.S. Application No. 16/193,836, filed Nov. 16, 2018, which is a continuation of U.S. Application No. 16/118,282, filed August 30, 2018, which claims priority to provisional applications 62/644886, filed March 3, 2018 and 62/554,196, filed September 5, 2017—the earliest alleged priority date. EX1002, 309.

E. Level of Ordinary Skill in the Art

A POSITA of the '054 patent would have had at least a B.S. degree in electrical or biomedical engineering or a related field, with at least two years of experience designing patient monitoring or similar systems. A higher level of education may compensate for less work experience and vice versa. EX1003, ¶ 31-32.

F. Claim Construction

Numerous claim terms are construed based on their ordinary meanings or otherwise in the context of the invalidity analysis in this petition, consistent with *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005). Constructions of a few example terms and phrases are also discussed here for convenience.

1. Carrier Assembly and Carrier Member

Various claims recite a “carrier assembly” and a “carrier member” as a sub-element of the carrier assembly. Outside of the claims, the ’054 Specification does not use the claim terms “carrier assembly” or “carrier member.” Nor does it describe with any clarity what is meant by either term.

The Specification of the ’054 patent only describes a “carrier.” It is not clear whether the “carrier” described in the specification is the “carrier assembly” of the claims or the “carrier member” of the claims or neither. EX1003, ¶ 39. The Specification recites that a “carrier may be any appropriate structure that supports the electrodes, on which the electrodes are formed, or to which the electrodes are attached.” EX1001, 6:11-13. A carrier is illustrated using call out 404 in Fig. 4A (reproduced below with annotation). EX1001, 12:64-66.

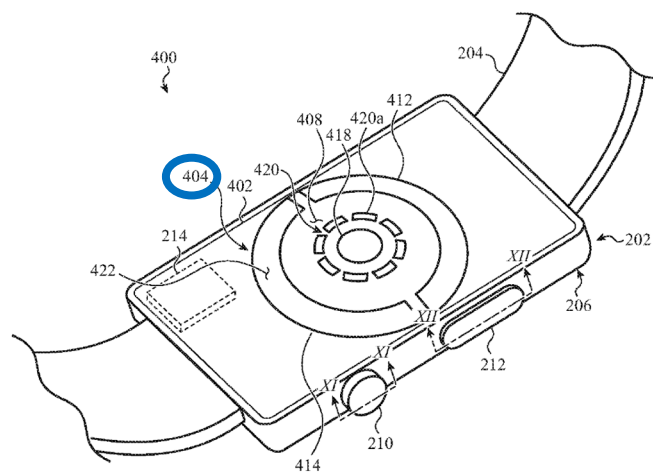
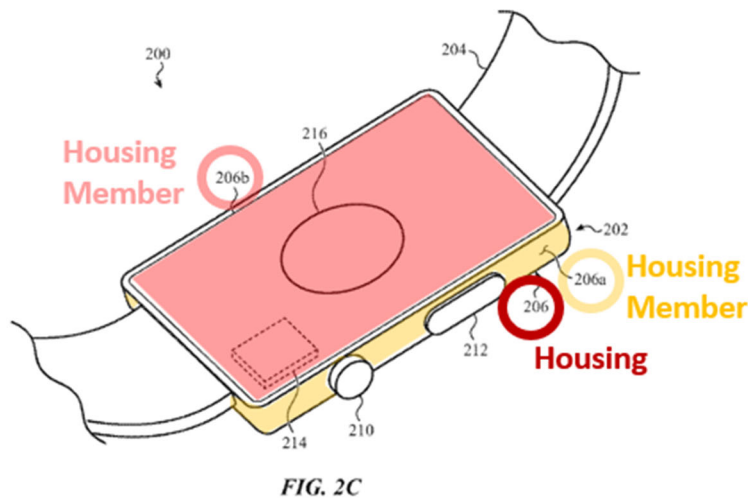


FIG. 4A

The carrier is taught to be an optically transparent material or opaque material that has a domed, flat, stepped, or parallelepiped shape. EX1001, 6:12-20. Additionally, the “components attached to the carrier 404 may include ... the optical subsystem 416.” Ex. 1001, 14:41-43.

For purposes of this Petition, Petitioner interprets the claim term “carrier assembly” according to mean any appropriate structure that supports the electrodes and, optionally, optical components. EX1003, ¶¶ 37-39.

With regard to “carrier member,” Courts have construed “member” style claim terms as nonstructural, and accordingly, courts require such terms to be construed according to 35 U.S.C. §112(f). *Williamson v. Citrix Online, LLC*, 792 F.3d 1339 (Fed. Cir. 2015) (*en banc* as to Part II.C.1); *Kyocera Senco Indus. Tools Inc. v. Int'l Trade Comm'n*, 22 F.4th 1369, 1380 (Fed. Cir. 2022) (interpreting “lifter member” as invoking 35 U.S.C. §112 ¶(6)). As noted above, the '054 Specification does not use the term “carrier member” nor does it provide any structure corresponding to a “carrier member.” The '054 specification does use the term “housing member,” which appears to mean a component of the housing. For example, Fig. 2C illustrates “housing member 206 may include a front side housing member 206a . . . and a back side housing member 206b.” EX1001, 7:28-30, Fig. 2C (below with annotations).



Consistent with the usage of “housing member” discussed above, and for purposes of this Petition, Petitioner interprets “carrier member” to mean “a component of a carrier assembly.” *Id.*

III. STATEMENT OF PRECISE RELIEF REQUESTED

A. Statutory Ground for Cancellation

Petitioner requests that the Board cancel claims 1-20 of the '054 patent under post-AIA 35 U.S.C. §§ 102, 103 because they would have been anticipated and/or obvious before their effective filing date to a POSITA.

B. Status of References as Prior Art

The following references are prior art for the following reasons:

Exhibit No.	Description	Prior Art Basis
1005	US20160058375 (Rothkopf)	Post-AIA 35 U.S.C. § 102(a)(1) – published March 3, 2016.
1006	US20160228064 (Jung)	Post-AIA 35 U.S.C. § 102(a)(1) – published January 15, 2016.
1007	WO2017165532 (Paulke)	Post-AIA 35 U.S.C. § 102(a)(2) – filed March 22, 2017 and published September 28, 2017 and filed by Neumitra Inc.
1008	US10231629 (Pei)	Post-AIA 35 U.S.C. § 102(a)(2) – filed July 15, 2015 and published March 19, 2019 and filed by Maxim Integrated Products, Inc.
1009	ECG Monitoring Leads and Special Leads (Francis)	Post-AIA 35 U.S.C. § 102(a)(1) – published July 17, 2016.
1010	US2016007391 (Lapetina)	Post-AIA 35 U.S.C. § 102(a)(1) – published March 17, 2016.
1011	US6265789 (Honda)	Post-AIA 35 U.S.C. § 102(a)(1) – published July 24, 2001.

These references constitute analogous art because they are from the same field of endeavor as the '054, *e.g.*, wearables or other electronic devices with ECG leads. *Unwired Planet, LLC v. Google Inc.*, 841 F.3d 995, 1000 (Fed. Cir. 2016). The references are also reasonably pertinent to a particular problem with which the inventor was involved, *e.g.*, how to incorporate and position electrodes with respect

to such wearable or electronic devices. As these references are analogous art, a POSITA is presumed to have been aware of them. *In re Nilssen*, 851 F.2d 1401, 1403 (Fed. Cir. 1988).

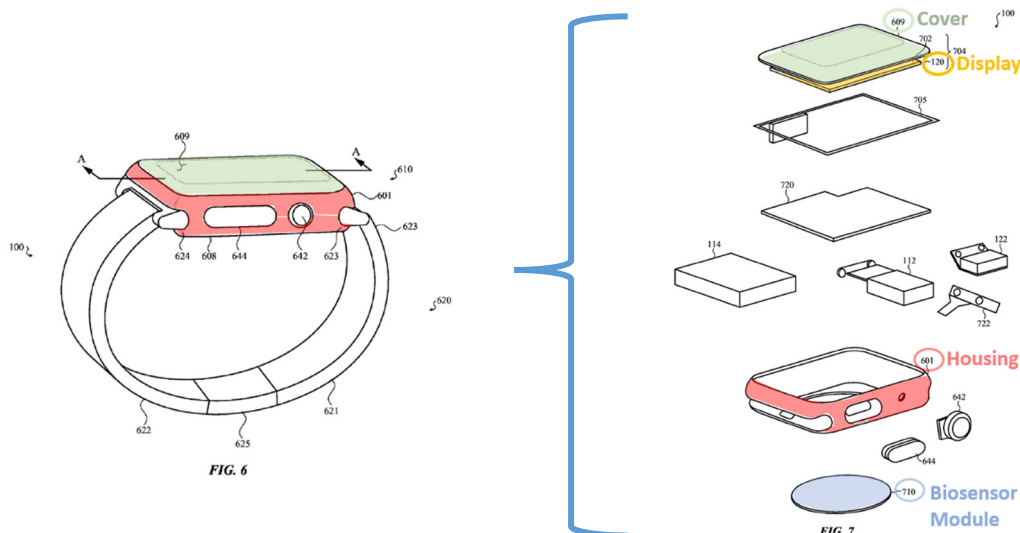
IV. SPECIFIC PROPOSED GROUNDS FOR UNPATENTABILITY

As explained below, claims 1-20 of the '054 patent are anticipated or would have been obvious in view of the prior art identified below.

A. Overview of Key Prior Art

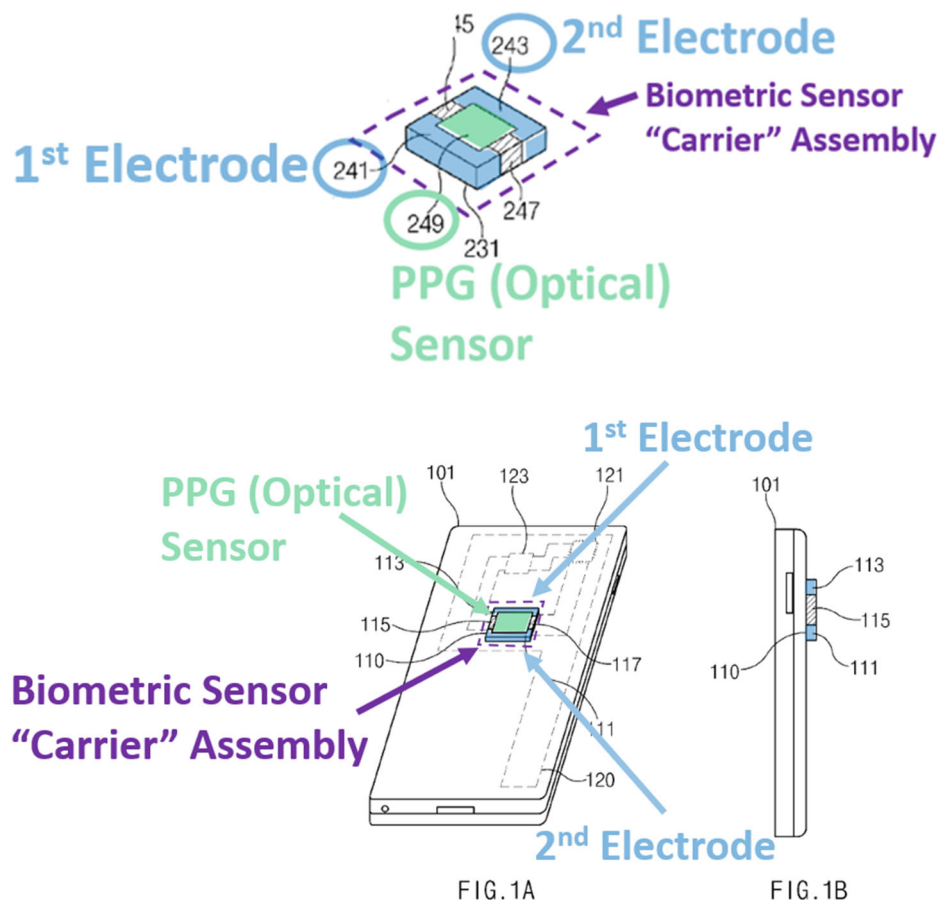
1. Rothkopf

Rothkopf, a publication of the Patentee, Apple, discloses a watch with a housing 601 that has an opening on the top and bottom. EX1005, [0148]. A display 120 with an optically transparent cover 609 covers a top opening of the housing 601. EX1005, [0121]. A biosensor module 710 that holds optical sensors and electrodes and includes a separate cover to which the electrodes can be attached covers a bottom opening of the housing 601. EX1005, Figs. 6 and 7 (below), [0148]; EX1003, ¶ 41.



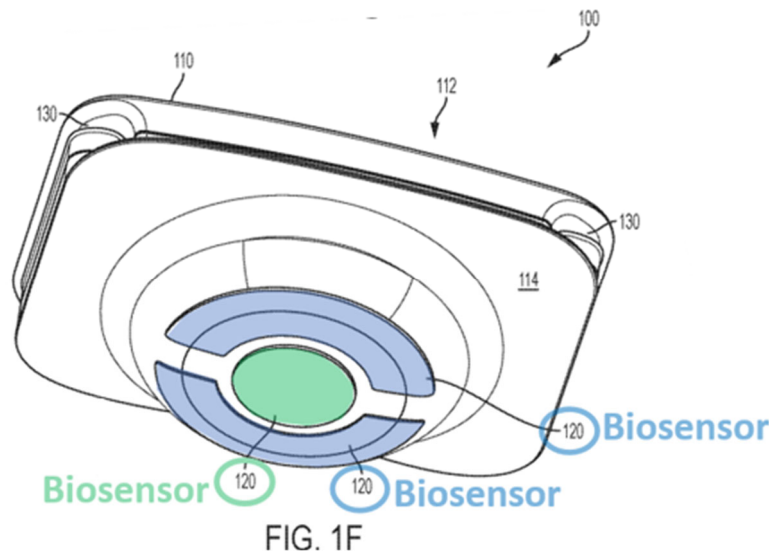
2. Jung

Jung discloses a mobile device with a carrier member, which Jung refers to as a biometric sensor (231). Biometric sensor (231) includes: first and second electrodes (241, 243, respectively); and a light emitter and receiver (249). The first and second electrodes (241, 243) may be disposed on and around the edges of the biometric sensor 231. The biometric sensor (231) is placed into an opening (271) on the back of a housing cover (270) and connects directly to a circuit board (230) and processor inside the housing. EX1006, [0045]-[0046], [0050], Figs. 1A-B and 2 (reproduced below in part with annotations); EX1003, ¶ 42.



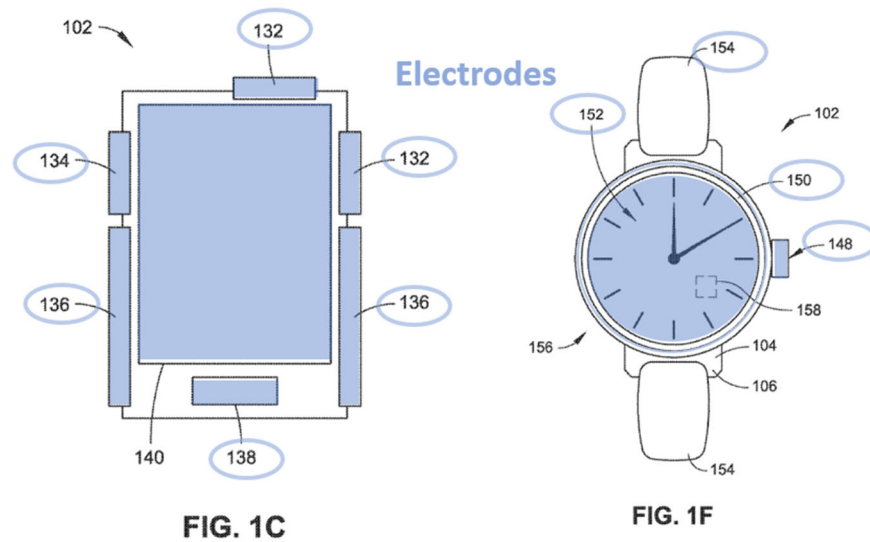
3. Paulke

Paulke discloses a watch with a biosensor module including biosensors (120) that can perform electrocardiography (ECG), pulse rate and/or blood oxygen saturation measurements. EX1007, Abstract, 6:16-17; 12:1-16; Fig. 1F (reproduced below with annotations). EX1003, ¶ 43.



4. Pei

Pei discloses a mobile phone or watch that can include electrodes in various forms and locations, including: as part of “a mechanical button 138 (e.g., home button, volume button or power button 132),” side trim 134, antenna 136, or screen 140; or on a frame 144, a band 154, a back plate 146, a watch face 152, a bezel 150, or a watch crown 148. EX1008, 7:64-8:32, Figs. 1C-1F (reproduced below with annotations); EX1003, ¶ 44.



5. Lapetina

Lapetina explains how a watch positions a well-known three lead ECG system on the wrist. Lapetina explains:

an ECG waveform could be extracted from voltage fluctuations between the outer portion 460 of the frame and one or more electrical contacts 430a, 430b [misabeled as 430d in Fig. 4B] when the central housing 410 is mounted to a first external body surface (e.g., skin of a wrist of a first arm of a wearer) and a second body surface (e.g., skin of a finger of an arm of the wearer opposite the arm to which the wearable device is mounted).

EX1010, [0070], see also [0041](describing lead I ECG recording), Figs. 1B and 4A-B (reproduced below with annotations); EX1003, ¶ 45.

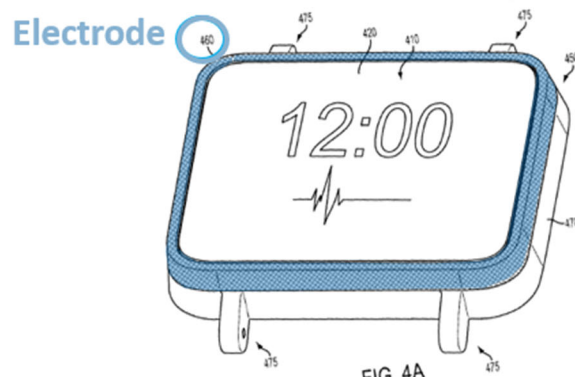


FIG. 4A

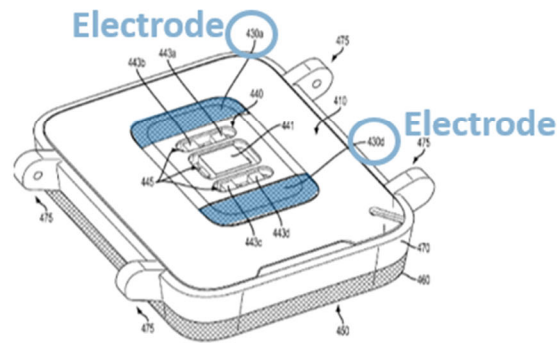


FIG. 4B

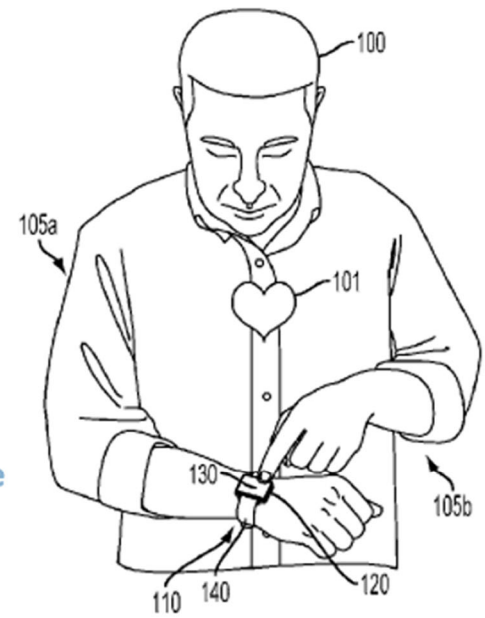


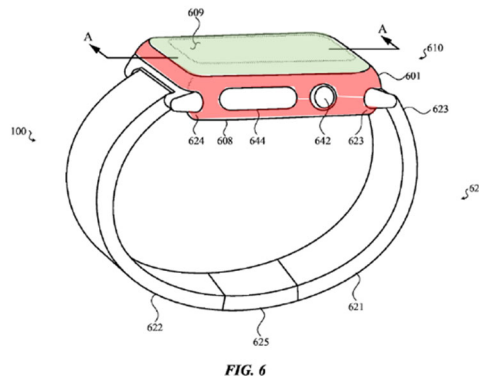
FIG. 1B

B. Ground 1: Claims 9 and 13-15 are unpatentable as anticipated by Rothkopf

1. Claim 9

a. Limitation 9a (preamble) “A wearable electronic device comprising”

The preamble of claim 9, recites a “wearable electronic device.” Rothkopf discloses a “wearable electronic device” and explains that the device can be a “wearable watch.” EX1005 Title, [0056], see also Fig. 6 (reproduced below); EX1003, ¶ 47.



b. Limitation 9b “a rectangular housing member defining a rectangular front opening and a circular rear opening”

Rothkopf discloses a rectangular housing member 601 including a rectangular front opening and a circular rear opening as shown in its Fig. 8. EX1005, [0119], Fig. 8; EX1003, ¶ 48.

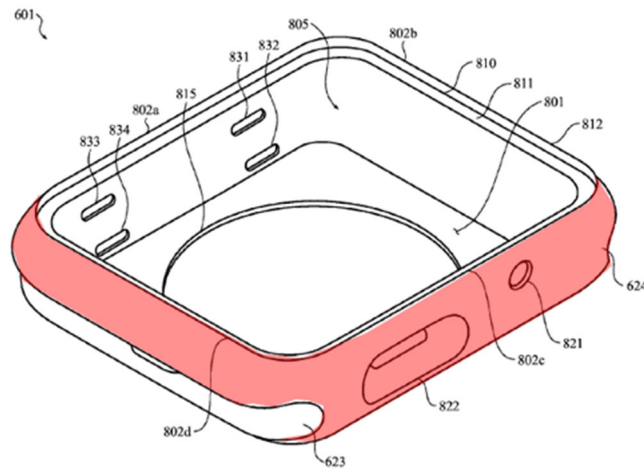
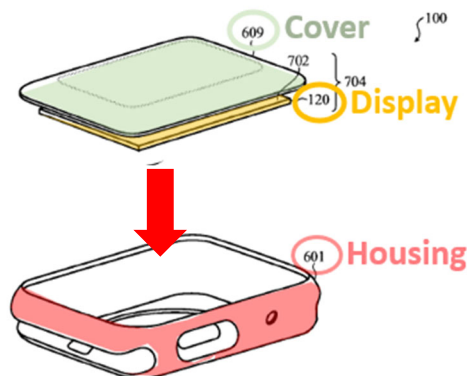


FIG. 8

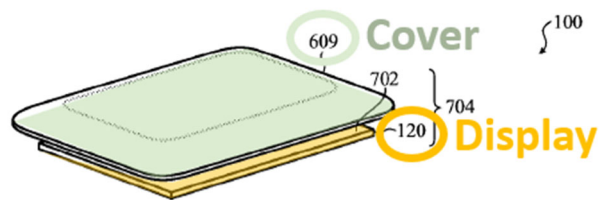
c. Limitation 9c “a cover having a rectangular cover profile and positioned over the rectangular front opening”

Rothkopf discloses “cover 609 is disposed above the display and encloses a cavity or opening formed in the top portion of the housing 601.” EX1005, [0122], Fig. 7. As shown below in an excerpt from Fig. 7 of Rothkopf, the cover has a rectangular profile and is positioned over the rectangular front opening of housing 601. EX1003, ¶ 49.



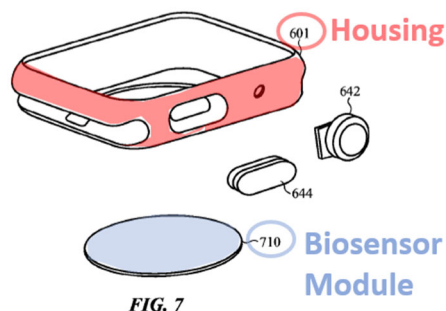
d. Limitation 9d “a display positioned below the cover”

Rothkopf discloses “cover 609 is disposed above the display” 120. EX1005, [0122], Fig. 7. The display 120 of Rothkopf is positioned below the cover 609, as shown in Fig. 7 partially reproduced below with annotations. EX1003, ¶ 50



e. Limitation 9e “a carrier assembly coupled to the rectangular housing member and comprising”

Rothkopf discloses a biosensor module 710 that forms a carrier assembly coupled to the rectangular housing 601. The “biosensor module 710 includes the rear cover 608.” EX1005, [0148]. “The biosensor module 710 is disposed in an opening formed in the rear surface of housing 601, a chassis or plate facilitates attachment of the biosensor module 710 to the housing.” *Id.*, [0148], Fig. 7 (below).

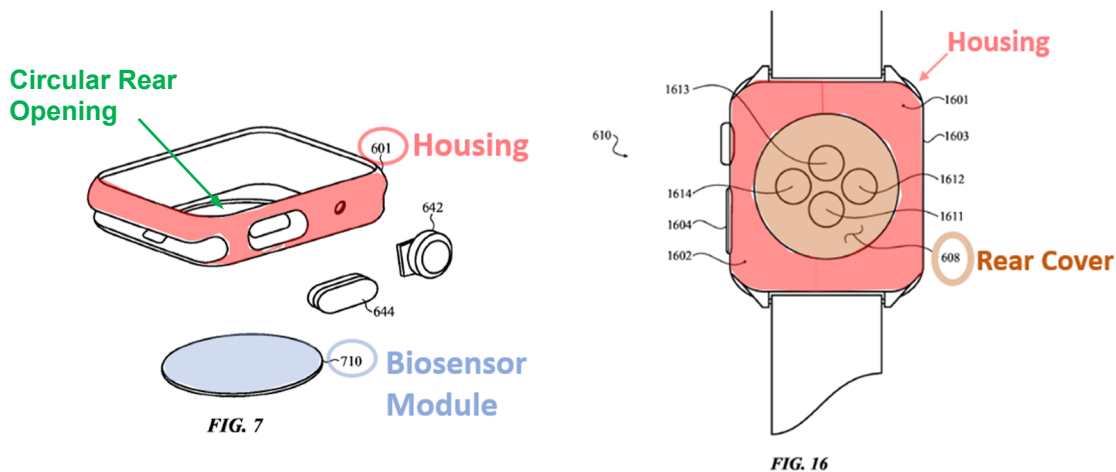


The rear cover 608 also facilitates attachment of the biosensor module 710 to the housing 601. *Id.* “[B]iosensors are disposed relative to **or attached to** a rear cover

608 that is formed from an optically transparent material.” *Id.*, [0201] (emphasis added). Accordingly, Rothkopf teaches a carrier assembly coupled to the rectangular housing member. EX1003, ¶ 51.

f. Limitation 9f “a carrier member having a circular carrier profile and positioned over the circular rear opening”

The carrier assembly (biosensor module 710) “includes the rear cover 608.” EX1005, [0148]. The rear cover 608 is therefore a component of the carrier assembly and forms a carrier member. As shown in Figs. 7 and 16 below, the housing 601 has a circular opening in its rear into which the biosensor module 710 is inserted. *Id.*, [0148].



The “rear cover 608 may include a shelf or flange that may be used to form a seal between the biosensor module 710 and the housing 601.” EX1005, [0148]. From this disclosure, a POSITA would have understood that the cover 608 has a circular profile matching the circular profile of the opening and is positioned over the circular rear opening in order to form a seal. EX1003 ¶¶ 52-53.

g. Limitation 9g “a rear electrode positioned on the carrier member and configured to receive a first voltage signal from a wrist of a user”

Rothkopf discloses its “biosensor module 710 may include ... one or more electrodes or conductive elements that are configured to detect and measure a physiological condition or property of the user.” EX1005, [0148]. As noted above, “biosensor module 710 includes the rear cover 608.” *Id.*, [0148]. Rothkopf further discloses that its “biosensors are disposed relative to *or attached to* a rear cover 608” *Id.*, [0201] (emphasis added). Rothkopf explains its “biosensors” can be an electrode configured to perform an ECG measurement. *Id.*, [0084]. Rothkopf further confirms that its “device may also include at least one pair of electrodes disposed on an exterior surface of the wearable electronic device.” *Id.*, [0024]. Rothkopf discloses the electrodes “make contact with the skin of the user’s wrist when the device is being worn.” *Id.*, [0196]; EX1003, ¶ 54.

Rothkopf further discloses the electrodes are coupled to a processor and configured to detect “electrical activity” produced by the heart of the user, which a POSITA would understand can include a first voltage from the measurement site where the electrodes are worn, including the wrist. *Id.*, [0198]; EX1003, ¶ 55.

Accordingly, Rothkopf discloses a rear electrode positioned on the carrier member (rear cover 608) and configured to receive a first voltage signal from a wrist of a user. EX1003, ¶ 54-56.

h. Limitation 9h-j “an optical sensor system comprising: an optical emitter positioned below a first region of the carrier member; and an optical receiver positioned below a second region of the carrier member”

Rothkopf’s “biosensor module 710 may include one or more light sources [and] one or more photodetectors” which a POSITA would understand to be optical emitters and optical receivers, respectively. EX1005, [0148]. Accordingly, Rothkopf discloses its biosensor module can include an optical sensor, such as a photo plethysmography (PPG) sensor. *Id.*, [0084]. Rothkopf’s rear cover 608 includes separate emitter and detector windows for each of emitters and detector 1614, 1612, 1613 and 1611. *Id.*, [0201], Fig. 16 (below).

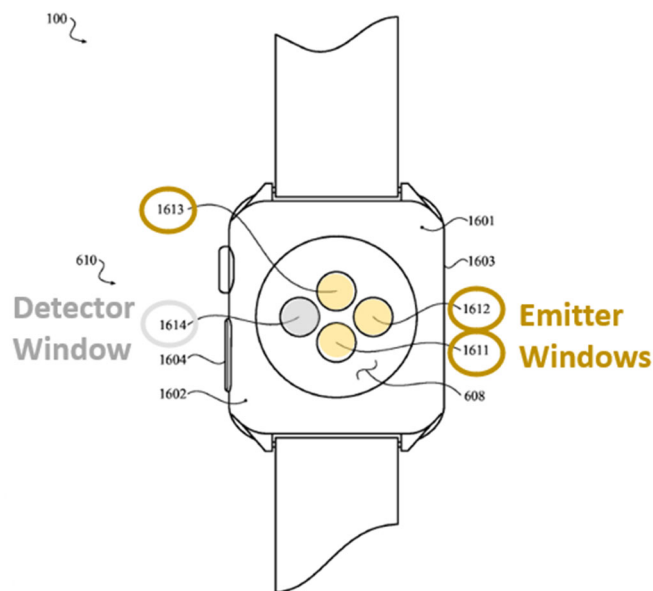


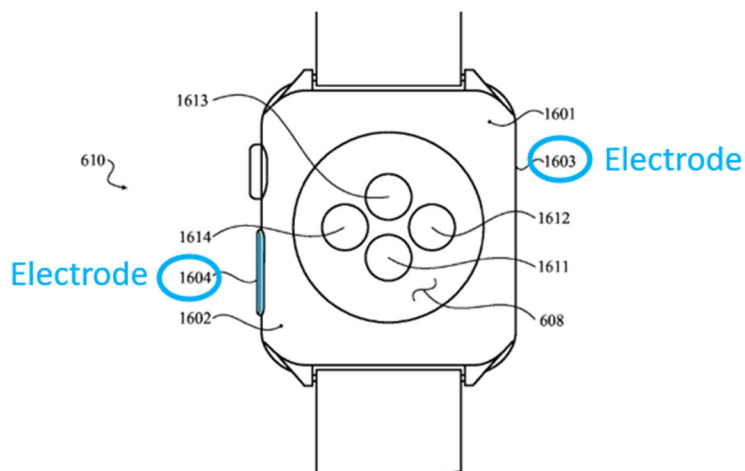
FIG. 16

Rothkopf discloses the “biosensor module may also include an optically transparent rear cover disposed over the array of windows and operative to pass light emitted from the array of light sources into the user.” *Id.* Because the emitters and detector

are under (covered by) the rear cover 608, Rothkopf discloses an optical emitter positioned below a first region of the carrier, windows 1611-1612, and an optical receiver positioned below a second region of the carrier member, window 1614. EX1003, ¶ 57.

i. Limitation 9k “a side electrode positioned along an exterior of the rectangular housing member and configured to receive a second voltage signal from a finger of the user”

Rothkopf discloses “a third electrode 1603 and fourth electrode 1604 may be disposed along a periphery of the device body 610.” EX1005, [0196], Fig. 16 (below). The “third 1603 and fourth 1604 electrodes are configured to come into contact with the skin of the user’s other hand...(e.g., a forefinger and thumb).” *Id.* Further, Rothkopf discloses the electrodes are configured to detect “electrical activity” produced by the heart to produce an ECG. *Id.* [0198]. A POSITA would understand the “electrical activity” described by Rothkopf is a voltage level. EX1003, ¶ 58. Accordingly, Rothkopf discloses this limitation. *Id.*



j. Limitation 91 “a processor positioned within the wearable electronic device and configured to determine a biological parameter using the first and second voltage signals”

Rothkopf discloses “processing units 102 may receive signals from the optical sensor(s) and/or electrodes and process the signals to correlate the signal values with a physiological parameter of the user.” EX1005, [0198], Fig. 2 (below showing processing units 102 as part of device 100). A POSITA would understand the “signals” described by Rothkopf are voltage signals. Based on the above, a POSITA would understand Rothkopf teaches a processor inside its wearable electronic device that determines a biological parameter using first and second voltage signals. EX1005, [0198], Fig. 2; EX1003, ¶ 59.

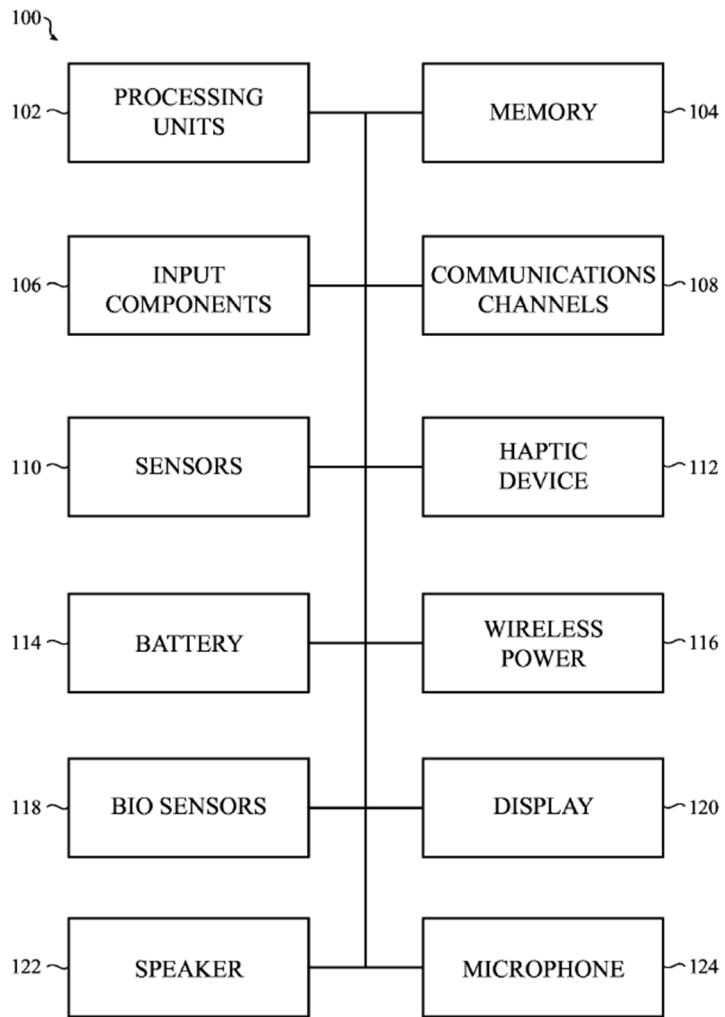


FIG. 2

k. Claim 9 Conclusion

As explained above Rothkopf discloses every limitation of Claim 9 of the '054 patent. EX1003, ¶ 46.

2. Claim 13 “The wearable electronic device of claim 9, wherein the optical sensor system is an optical heart rate sensor that is configured to measure a heart rate of the user”

Claim 13 depends from Claim 9 and adds the optical sensor is configured to measure a heart rate. Rothkopf discloses that “optical (e.g., PPG) sensor or sensors may be used to compute various health metrics, including, without limitation, a heart rate.” EX1005, [0193]. Accordingly, Rothkopf teaches the limitations of Claim 13. EX1003, ¶ 60.

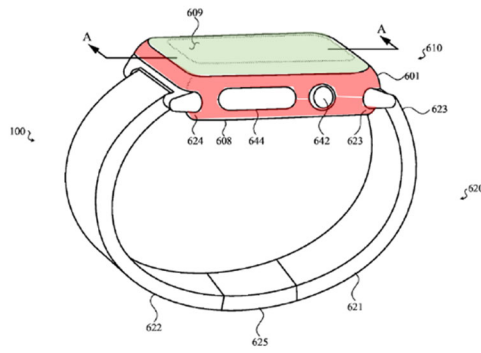
3. Claim 14 “The wearable electronic device of claim 9, wherein: the optical sensor system is configured to measure a heart rate of the user; and the biological parameter is an electrocardiogram (ECG) of the user”

Claim 14 depends from Claim 9 and adds that its optical sensor is configured to measure heart rate and its biological parameter measured by the processor is an electrocardiogram (ECG). Rothkopf discloses that “optical (e.g., PPG) sensor or sensors may be used to compute various health metrics, including, without limitation, a heart rate.” EX1005, [0193]. Rothkopf also teaches that its one or more biosensors may be configured to measure an ECG, which is a physiological (*i.e.*, biological) parameter. *Id.*, [0084], [0199]. Accordingly, Rothkopf teaches the limitations of Claim 14. EX1003, ¶ 61.

4. Claim 15

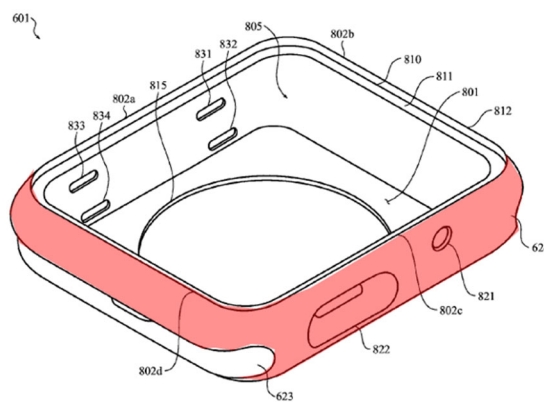
a. Limitation 15a (preamble) “A watch comprising”

The preamble of claim 15, recites a “watch.” Rothkopf discloses “wearable watch.” EX1005, [0056], see also Fig. 6 (reproduced below); EX1003, ¶ 62.



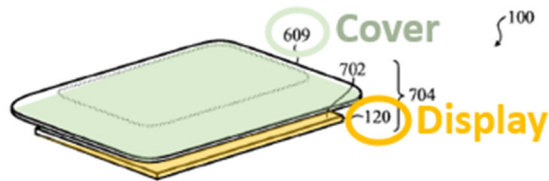
b. Limitation 15b “a housing member”

Rothkopf discloses a housing member 601. EX1005, [0119], [0130], Fig. 8 (below). EX1003, ¶ 63.



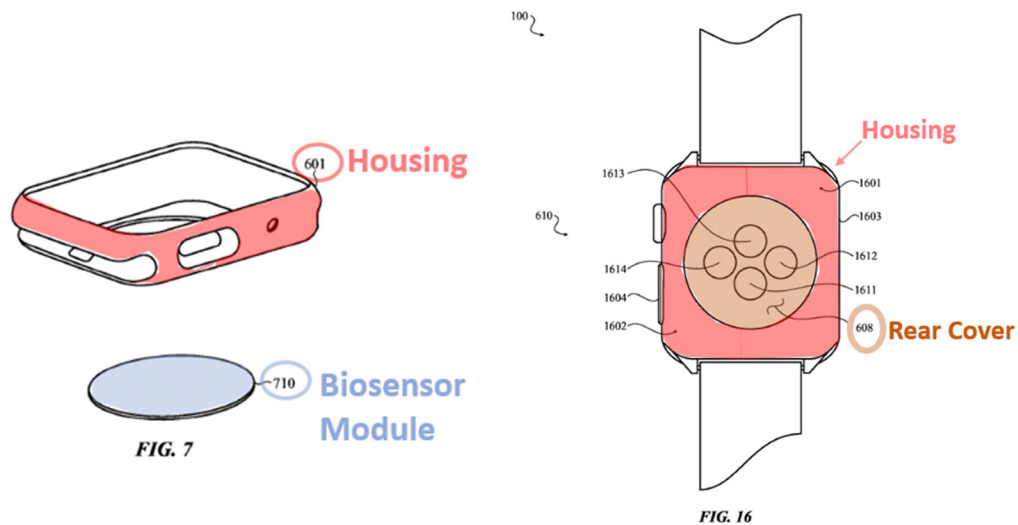
c. Limitation 15c “a display configured to display a graphical output”

Rothkopf discloses a display 120 which displays a graphical output. EX1005, [0120], Fig. 7 (below); EX1003, ¶ 64.



d. Limitation 15d “a carrier assembly coupled to the housing member and comprising: a carrier member protruding outward from an external surface of the housing member”

Rothkopf discloses a biosensor module 710 that forms a carrier assembly. Rothkopf discloses “biosensor module 710 is disposed in an opening formed in the rear surface of the housing 601 . . . biosensor module 710 includes the rear cover 608 and may also include a chassis or plate that facilitates attachment of the biosensor module 710 to the housing.” EX1005, [0148], Fig. 7 and 16 (below). Rothkopf further discloses the rear cover 608 can have a convex outer contour that protrudes outward from the back external surface of the housing member 601. *Id.*, [0123], [0201]. This cover 608 is the carrier member of Claim 15. EX1003 ¶ 65.



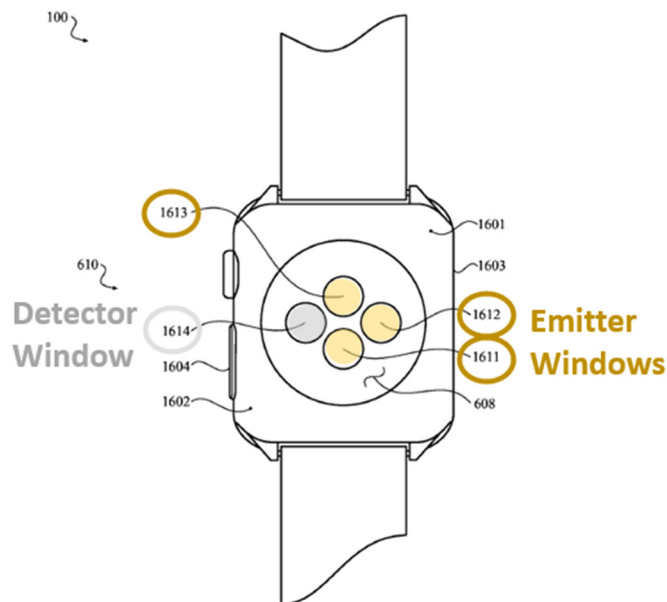
e. **Limitation 15e “a rear electrode positioned on the carrier member, the rear electrode operably coupled to a processor and configured to detect a first voltage”**

Rothkopf discloses its “biosensor module 710 may include ... one or more electrodes or conductive elements that are configured to detect and measure a physiological condition or property of the user.” EX1005, [0148]. As noted above, “biosensor module 710 includes the rear cover 608.” *Id.*, [0148]. Rothkopf further discloses that its “biosensors are disposed relative to *or attached to* a rear cover 608.” *Id.*, [0201] (emphasis added). Rothkopf explains its “biosensors” can be an electrode configured to perform an ECG measurement. *Id.*, [0084]. Rothkopf further confirms that its “device may also include at least one pair of electrodes disposed on an exterior surface of the wearable electronic device.” *Id.*, [0024]. Accordingly, Rothkopf discloses a first electrode positioned on the carrier member - rear cover 608. EX1003, ¶ 66.

Rothkopf further discloses the electrodes are coupled to a processor and configured to detect electrical activity produced by the heart of the user, which a POSITA in the art would understand can include a first voltage. EX1005, [0198]; EX1003, ¶ 67.

f. Limitation 15f “an optical sensor positioned below the carrier member and configured to transmit optical signals through the carrier member”

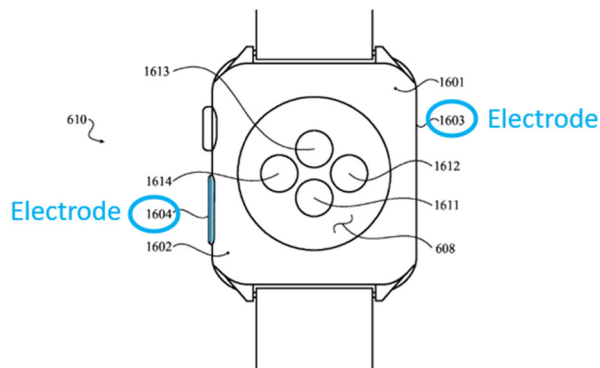
Rothkopf discloses its biosensor can include optical biometric sensors including a light source and a photodetector that form a photoplethysmography (PPG) sensor. EX1005, [0084]. Rothkopf’s rear cover 608 includes emitter and detector windows for each of emitters and detector 1614, 1612, 1613 and 1611. *Id.*, [0201], Fig. 16 (below).



Further, Rothkopf discloses the “biosensor module may also include an optically transparent rear cover disposed over the array of windows and operative to pass light emitted from the array of light sources into the user.” *Id.* Because the emitters and detector are below the cover 608, Rothkopf discloses an optical emitter positioned below a first region of the carrier, windows 1611-1612, and an optical receiver positioned below a second region of the carrier member, window 1614. EX1003, ¶ 68.

g. Limitation 15g “a side electrode positioned along an exterior of the watch, the side electrode operably coupled to the processor and configured to detect a second voltage”

Rothkopf discloses “a third electrode 1603 and fourth electrode 1604 may be disposed along a periphery of the device body 610.” EX1005, [0196], Fig. 16 (below).



The “third 1603 and fourth 1604 electrodes are configured to come into contact with the skin of the user’s other hand...(e.g., a forefinger and thumb).” *Id.* Further, Rothkopf discloses the electrodes are configured to detect electrical activity

produced by the heart to produce an ECG. *Id.*, [0198]. A POSITA would understand the “electrical activity” described by Rothkopf is a voltage level. EX1003, ¶ 69. Accordingly, Rothkopf discloses this limitation.

h. Limitation 15h “the processor positioned within the watch and configured to: determine a biological parameter”

Rothkopf discloses a processor inside its watch configured to determine an electrocardiograph and other biological parameters using voltages from the electrodes. EX1005, [0199]; EX1003, ¶ 70.

i. Limitation 15i “cause a change to the graphical output in response to determining the biological parameter”

Rothkopf discloses a display disposed within the housing and configured to display the health metric computed by its processor. EX1005, [0014], [0021], [0093]; EX1003, ¶ 71.

j. Claim 15 Conclusion

As discussed above, Rothkopf anticipates every limitation of Claim 15. EX1003, ¶ 46.

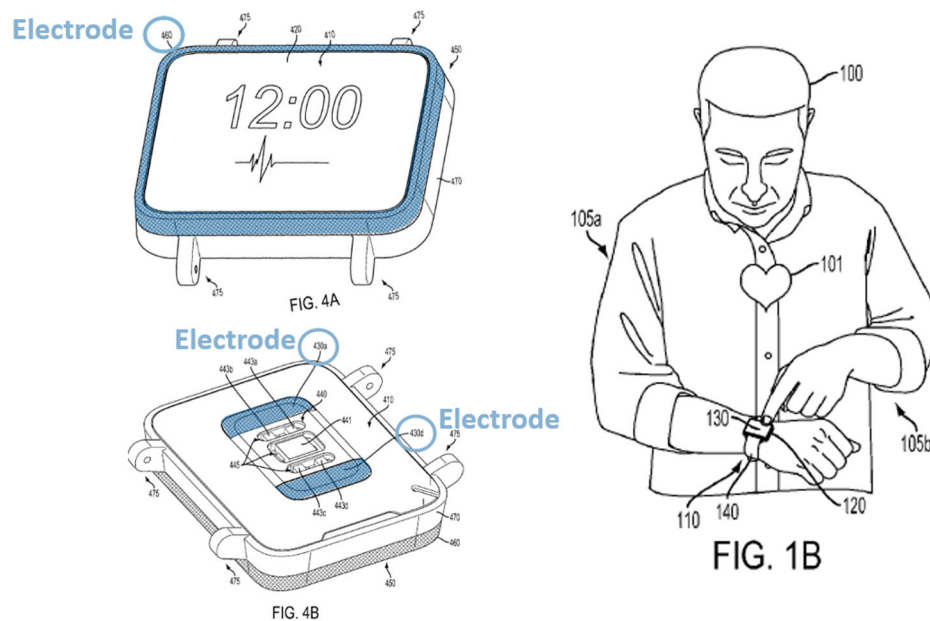
C. Ground 1A: Claim 10 is unpatentable as obvious in view of Rothkopf and Lapatina and Francis

- 1. Claim 10 “The wearable electronic device of claim 9, wherein: the rear electrode is a first rear electrode; and the wearable electronic device further comprises a second rear electrode positioned on the carrier member and configured to ground the wearable electronic device to the user”**

Rothkopf discloses its “biosensor module 710 may include ... one or more electrodes or conductive elements that are configured to detect and measure a physiological condition or property of the user.” EX1005, [0148]. As noted above, “biosensor module 710 includes the rear cover 608.” *Id.*, [0148]. Rothkopf further discloses that its “biosensors are disposed relative to *or attached to* a rear cover 608 that is formed from an optically transparent material” *Id.*, [0201] (emphasis added). Rothkopf explains its “biosensors” can be an electrode configured to perform an ECG measurement. *Id.*, [0084]. Rothkopf further confirms that its “device may also include at least one pair of electrodes disposed on an exterior surface of the wearable electronic device.” *Id.*, [0024]. Accordingly, Rothkopf discloses a first and second electrode positioned on the carrier member (rear cover 608). EX1003, ¶ 73. Rothkopf does not explicitly describe an electrode configured to ground the device.

Using a ground electrode is common basic knowledge of ECG operation and is well within the knowledge of a POSITA. EX1003, ¶ 74. For example, Francis explains well known “three electrode monitoring uses two electrodes at a time for active monitoring and third one as ground electrode.” EX1009, 93; EX1003, ¶ 74.

Further, Lapetina explains how this well-known three lead ECG system can be applied using a watch on the wrist. EX1003, ¶ 75. Lapetina explains “an ECG waveform could be extracted from voltage fluctuations between the outer portion 460 of the frame and one or more electrical contacts 430a, 430b [mislabeled as 430d in Fig. 4B] when the central housing 410 is mounted to a first external body surface (e.g., skin of a wrist of a first arm of a wearer) and a second body surface (e.g., skin of a finger of an arm of the wearer opposite the arm to which the wearable device is mounted.” EX1010, [0070], Figs. 1B and 4A-B (below), see also [0041] (describing lead I ECG recording); EX1003, ¶ 74.



A POSITA would understand that the two active electrodes are one of the two on the back of Rothkopf and the electrode touched by the opposite hand is the other active electrode, and that the second electrode on the rear of the device may be used

as a reference or ground to improve ECG fidelity as taught by Francis and Lapetina.

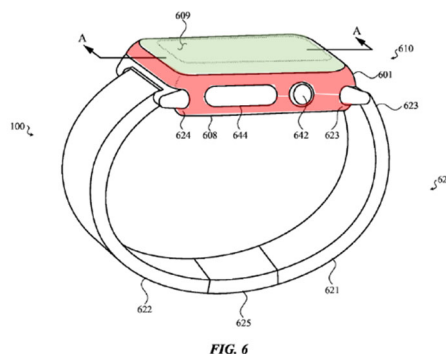
EX1003, ¶ 76. A POSITA would use the teachings of a ground electrode in Francis and Lapetina in order to implement an ECG system as taught by Rothkopf. *Id.*

D. Ground 2: Claims 1-6, 9, 12-16, 17, 19 are unpatentable as obvious over Rothkopf in view of Jung

1. Claim 1

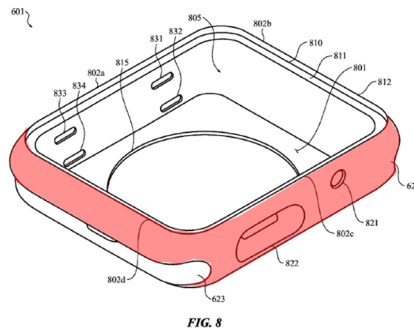
a. Limitation 1a (preamble) “An electronic watch comprising”

Rothkopf discloses a “wearable electronic device” and explains that the device can be a “wearable watch.” EX1005 Title, [0056], Fig. 6 (reproduced below); EX1003, ¶ 78.



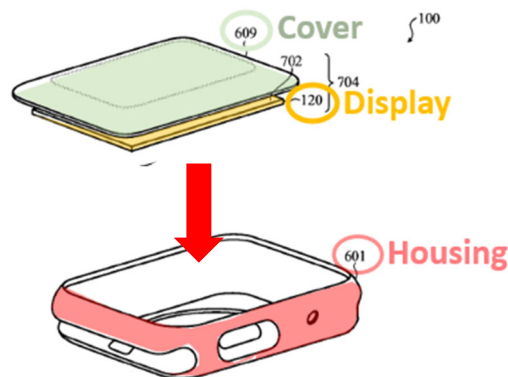
b. Limitation 1b “a housing member”

Rothkopf discloses a housing 601. EX1005, [0119]; [0130]; Fig. 8 (below); EX1003, ¶ 79.



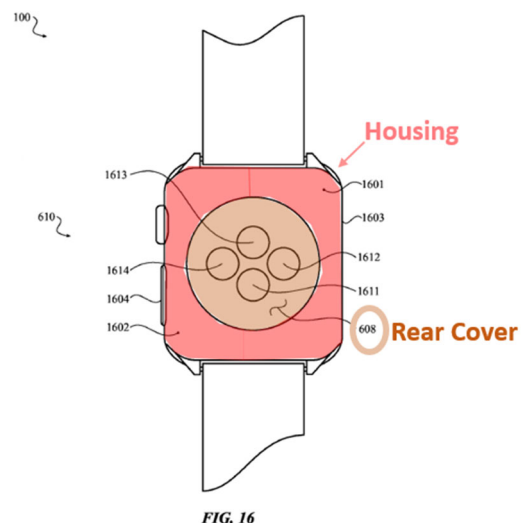
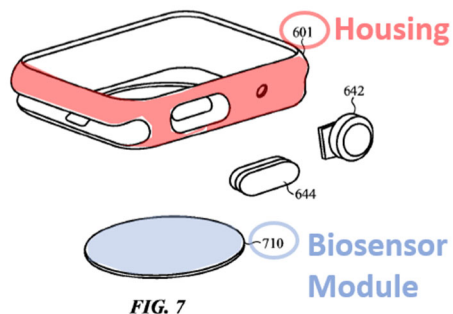
c. Limitation 1c “a display at least partially enclosed by the housing member”

Rothkopf discloses “a main cavity of the housing 601” and a “display 120 within the cavity.” EX1005, [0141]; [0120]. Accordingly, Rothkopf discloses that the display 120, by virtue of being in the cavity formed by housing 601, is *at least partially enclosed* within the housing 601. *Id.*, [0141], Fig. 7 and 16 (below); EX1003, ¶ 80.



d. Limitation 1d “a carrier assembly coupled to the housing member and comprising”

Rothkopf discloses a biosensor module 710 that forms a carrier assembly. Rothkopf discloses “biosensor module 710 is disposed in an opening formed in the rear surface of the housing 601 . . . biosensor module 710 includes the rear cover 608 and may also include a chassis or plate that facilitates attachment of the biosensor module 710 to the housing.” EX1005, [0148], Figs. 7 and 16 (below); EX1003, ¶ 81.



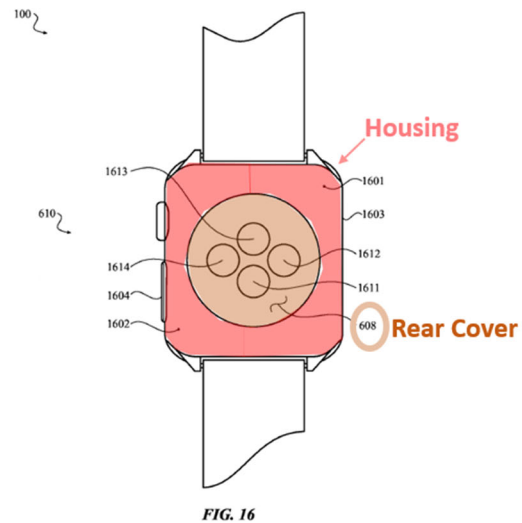
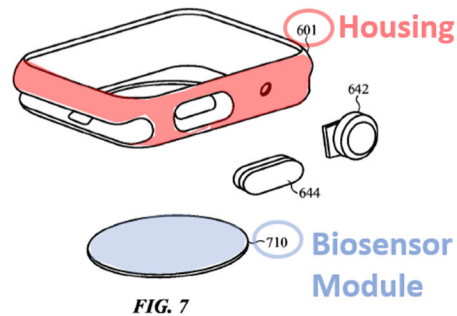
e. Limitation 1e “a carrier member formed from a transparent material”

Rothkopf discloses “biosensor module 710 includes the rear cover 608.” EX1005, [0148]. The rear cover 608 is the carrier member of this claim limitation. The “rear cover 608 is formed from an optically transparent material.” *Id.*, [0201].

“[B]iosensors are disposed relative to *or attached to* a rear cover 608.” EX1005, [0201]. Accordingly, Rothkopf discloses a carrier member which supports or positions electrodes and is formed from a transparent material. EX1003 ¶ 82.

f. Limitation 1f “a first electrode positioned on the carrier member, operably coupled to a processor and configured to detect a first voltage”

Rothkopf discloses its “biosensor module 710 may include ... one or more electrodes or conductive elements that are configured to detect and measure a physiological condition or property of the user.” EX1005, [0148]. As noted above, “biosensor module 710 includes the rear cover 608.” *Id.*, [0148], Fig. 7 and 16 (below). Rothkopf further discloses that its “biosensors are disposed relative to or attached to a rear cover 608 that is formed from an optically transparent material” *Id.*, [0201]. Rothkopf explains its “biosensors” can be an electrode configured to perform an ECG measurement. *Id.*, [0084]. Rothkopf further confirms that its “device may also include at least one pair of electrodes disposed on an exterior surface of the wearable electronic device.” *Id.*, [0024]. Accordingly, Rothkopf discloses a first electrode positioned on the carrier member (rear cover 608). EX1003, ¶ 83.



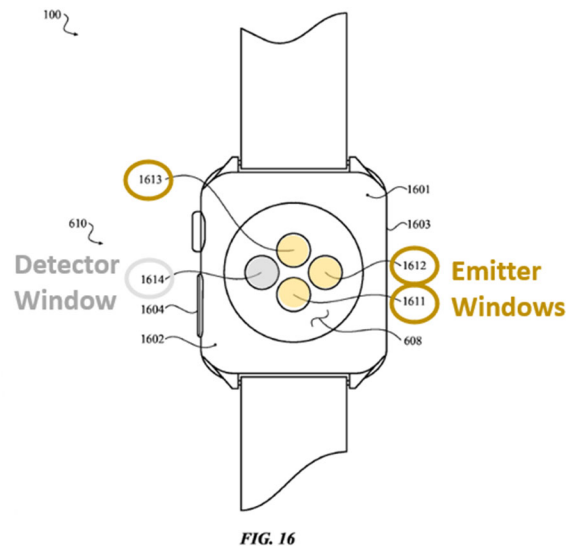
Rothkopf further discloses the electrodes are coupled to a processor and configured to detect electrical activity produced by the heart of the user, which a POSITA would understand can include a first voltage. EX1005, [0198]; EX1003, ¶ 84.

- g. Limitation 1g “a second electrode positioned on the carrier member, operably coupled to the processor and configured to detect a second voltage, the first and second electrodes at least partially surrounding a first region of the carrier member and a second region of the carrier member”**

As noted above in limitation 1f, Rothkopf discloses a second electrode (“pair of electrodes”) positioned on the carrier member (rear cover 608) and operably coupled to the processor to detect a second voltage.

Rothkopf, however, does not illustrate the exact configuration of the electrodes located on the biosensor module. Rothkopf does illustrate where emitters and detectors are located on the biosensor module in Fig. 16 (below). Rear cover

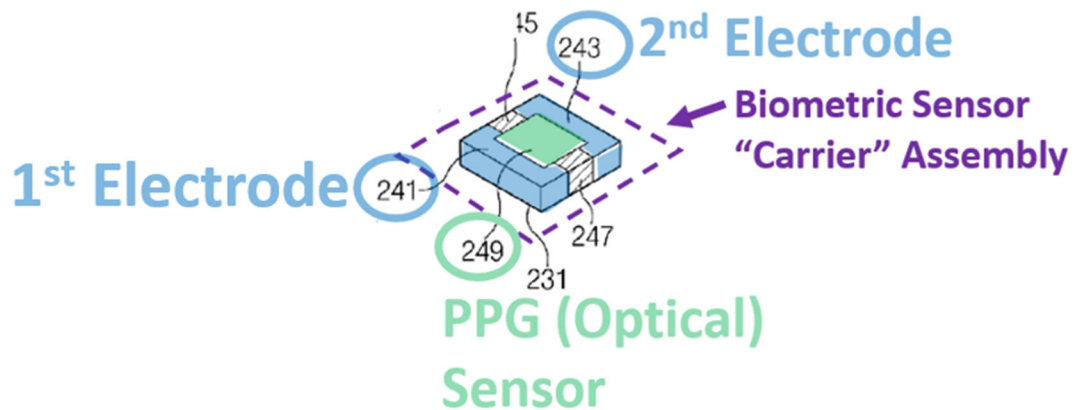
608 includes emitter and detector windows 1614, 1612, 1613 and 1611. In the embodiment of Fig. 16, electrodes 1601 and 1602 are not located on the biosensor module. But, as noted above, Rothkopf describes an embodiment where the electrodes are positioned on the cover 608. EX1005, [0201].



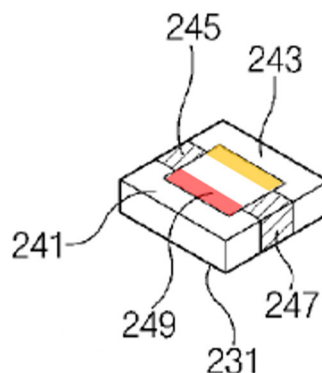
A POSITA seeking to implement the teaching of Rothkopf to locate the electrodes on the biosensor module would look to other mobile electronic device references that teach the use of electrodes on a biosensor carrier assembly similar to that of Rothkopf. EX1003, ¶¶ 85-86.

Jung discloses a biometric sensor carrier assembly with a biometric sensor carrier member (231) including a first electrode (241) (which detects a first voltage) and second electrode (243) (which detects a second voltage), the first and second electrodes are positioned on and wrapped around the edges of the carrier (231). EX1006, [0046]-[0047], Fig. 2 (partially reproduced below with annotations). The

biometric sensor carrier assembly also includes a first insulator (245), a second insulator (247), and a photoplethysmogram (PPG) sensor (249). *Id.*; EX1003, ¶ 87.

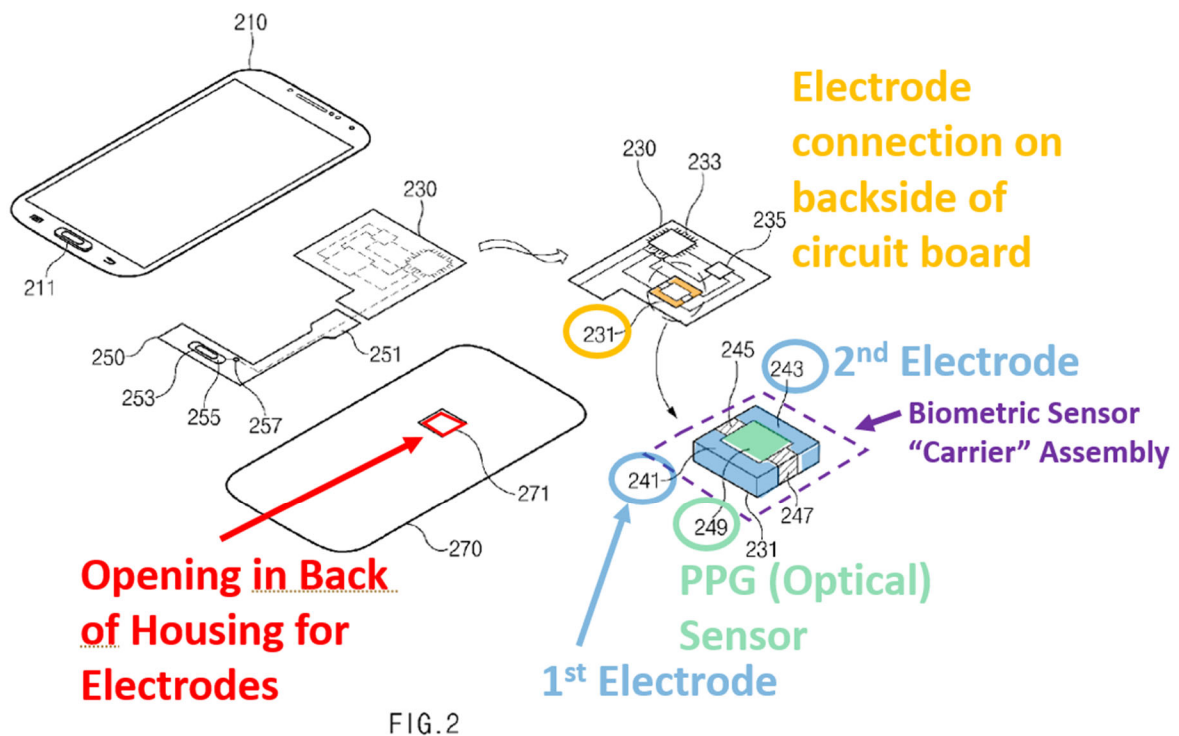
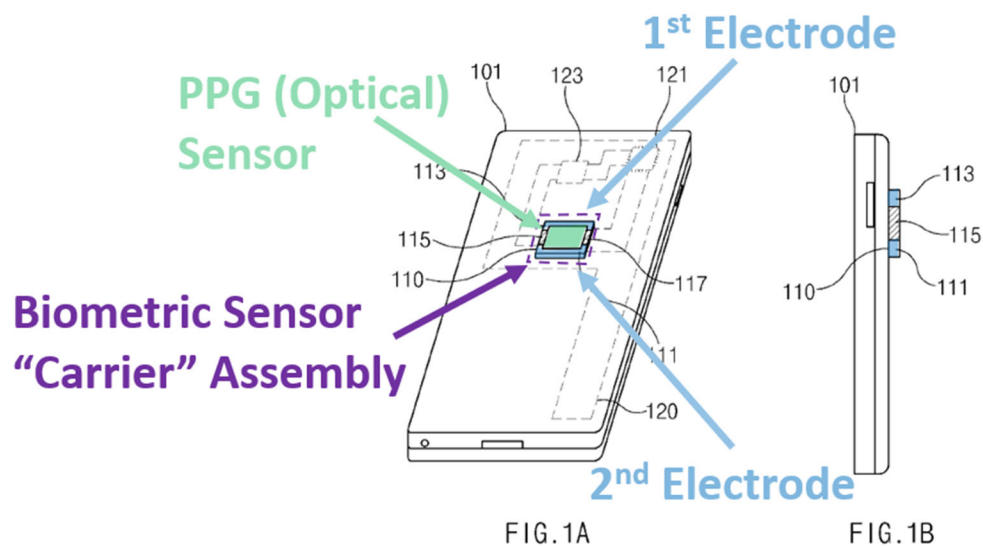


The biometric sensor of Jung is coupled to a processor. EX1006, [0045]-[0047], [0050], Fig. 2. In Fig. 2 partially reproduced below, first electrode 241 partially surrounds a first region (annotated in red) and second electrode 243 partially surrounds a second region (annotated in orange). EX1003, ¶ 87.

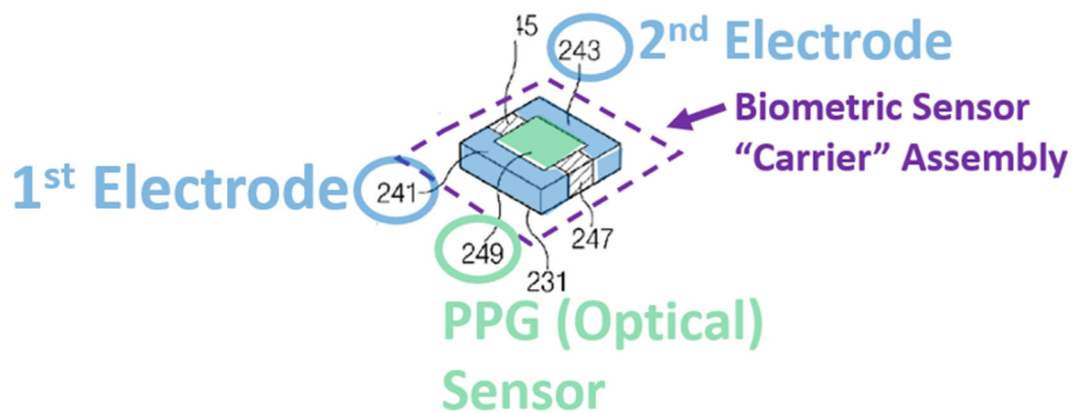


The biosensor carrier (231) is placed into an opening on the back of a housing (271) and connects directly to a circuit board (230) and processor inside the housing.

EX1006, [0047], [0050], Figs. 1A-2 (below). EX1003, ¶ 87.



A POSITA seeking to implement the teachings of Rothkopf would understand based on Jung's disclosure, that the electrodes can wrap around the edges of a carrier member that includes an optical PPG sensor in a central location of the carrier member. EX1003, ¶ 87.



A POSITA would be motivated to use the teachings of Jung to implement the carrier assembly taught by Rothkopf. A POSITA would position the electrodes and wrap the electrodes around the edges of Rothkopf's carrier member as taught by Jung in order to improve contact with the user's skin by covering as much of the carrier member as possible without obstructing the optical sensor. EX1003 ¶¶ 85-88. A POSITA would understand that it is advantageous to increase the contact area of the skin-to-electrode interface to maintain lower impedance and exhibit better behavior in reducing motion artifacts. EX1003 ¶¶ 85-88. A POSITA would end up with a

sensor arrangement shown below using the teachings of Jung in the system of Rothkopf:

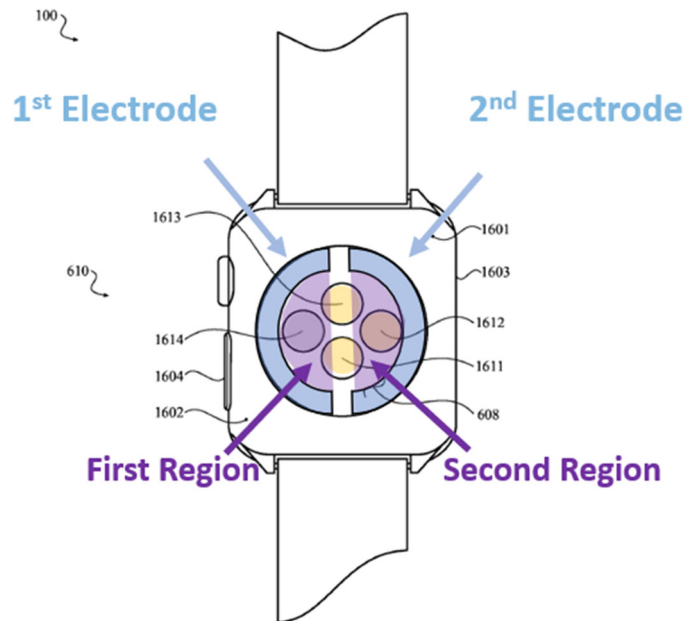


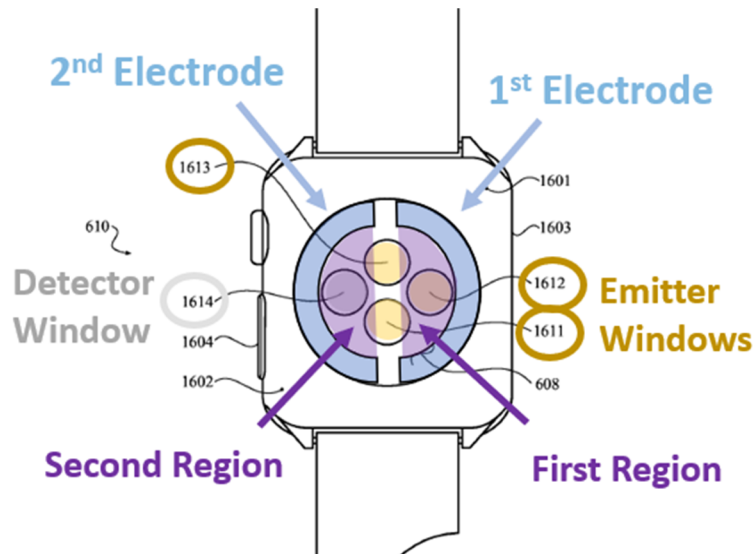
FIG. 16

EX1003, ¶ 88. A POSITA would have expected success in making this combination as it is a mere arrangement of known compatible components in a predictable way to obtain a predictable result. *Id.* For example, Jung’s carrier structure is similar in size and purpose to the carrier structure of Rothkopf and Jung teaches a POSITA how to incorporate electrodes on a carrier structures as expressly suggested by Rothkopf. *Id.*

h. Limitation 1h “a light emitter positioned below the first region of the carrier member”

Rothkopf discloses a light emitter positioned below the first region of the carrier member of Claims 1h. Rothkopf discloses its cover 608 includes windows

that allow its light emitters to emit light through apertures or openings in the cover 608 indicating the light emitters are below its cover 608. EX1005, [0201]. Thus, in the combined device of Rothkopf and Jung, the light emitters are located below the emitter windows 1611, 1612 and 1613 as illustrated below:

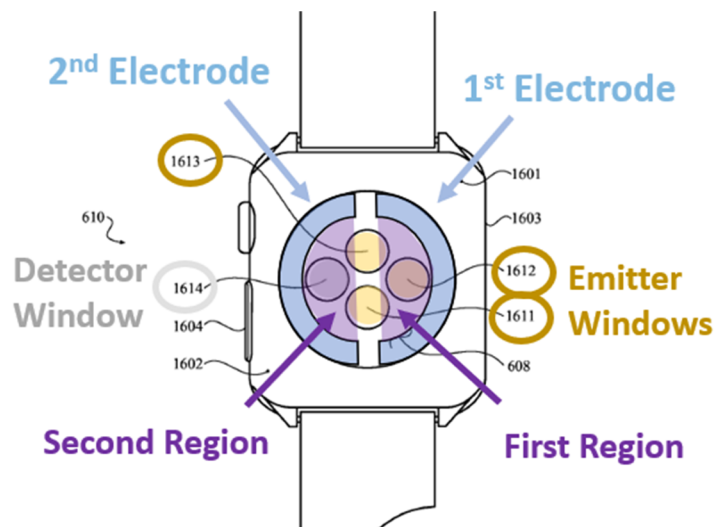


EX1003, ¶ 89.

Jung also discloses a biometric sensor carrier that includes a PPG sensor. The PPG sensor includes a light emitter and receiver and “may be disposed in a specific area in the *interior* of the biometric sensor 231.” Therefore, Jung also teaches a light emitter that may be *below* the first region of the carrier. EX1006, [0045]-[0046]; EX1003, ¶ 90. A POSITA would arrive at the above shown combination and would have a reasonable expectation of success as the combination is a basic rearrangement of components. EX1003, ¶ 90.

i. Limitation 1i “a light receiver positioned below the second region of the carrier member and configured to receive light reflected from a wrist”

Rothkopf discloses a light receiver (detector) positioned below the second region of the carrier member of Claims 1i as illustrated below. Rothkopf discloses its cover 608 includes a window that allows its light detector to receive light through an aperture or an opening in the cover 608 indicating the light detector is below its cover 608. EX1005, [0201]. Thus, in the combined device of Rothkopf and Jung, the light detector is located below the detector window 1614 as illustrated below:



EX1003, ¶ 90.

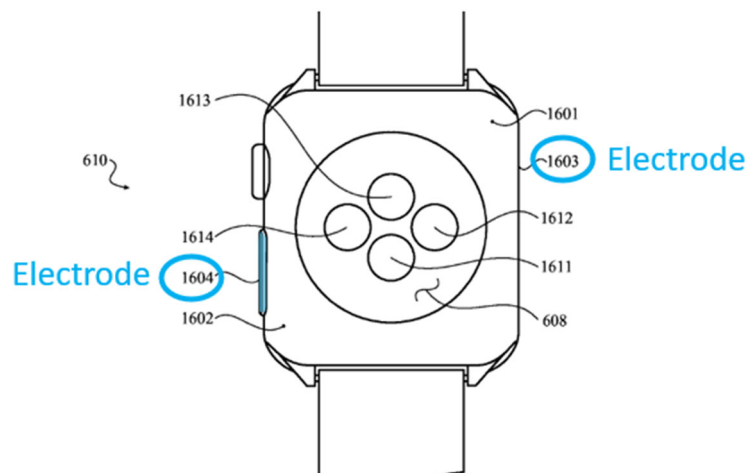
Jung also discloses a biometric sensor carrier that includes a PPG sensor. The PPG sensor includes a light emitter and receiver and “may be disposed in a specific area in the *interior* of the biometric sensor 231.” Therefore, Jung teaches a light emitter that may be *below* the first region of the carrier. EX1006, [0045]-[0046]. A POSITA would arrive at the above shown combination and would have a reasonable

expectation of success as the combination is a basic rearrangement of components.

EX1003, ¶ 91.

j. Limitation 1j “a third electrode coupled to the housing member, operably coupled to the processor, and configured to detect a third voltage”

Rothkopf discloses “a third electrode 1603 and fourth electrode 1604 may be disposed along a periphery of the device body 610.” EX1005, [0196], Fig. 16 (below). The “third 1603 and fourth 1604 electrodes are configured to come into contact with the skin of the user’s other hand...(e.g., a forefinger and thumb).” *Id.* The electrodes detect a voltage and are operatively coupled to sensing circuits and processing units. EX1005, [0196], [0199]; EX1003, ¶ 92.



k. Limitation 1k “the processor positioned within the electronic watch and configured to determine an electrocardiogram using the first voltage, the second voltage, and the third voltage”

Rothkopf discloses a processor inside its watch configured to determine an electrocardiograph using voltages from its electrodes. EX1005, [0198]-[0199]; EX1003, ¶ 93.

Jung also discloses that “biometric information may include biometric electric potential information obtained through electrodes associated with an electrocardiogram (ECG) sensor” and “the biometric information processing module 123 may be integrated into the processor 121.” EX1006, [0040]. The electrical potential (voltage) information is used to determine an ECG, which is a biological parameter. EX1003, ¶ 94.

l. Claim 1 Conclusion

Rothkopf combined with Jung obviate every limitation of Claim 1 of the '054 patent. Claim 1, therefore, would have been obvious to a POSITA before its effective filing date.

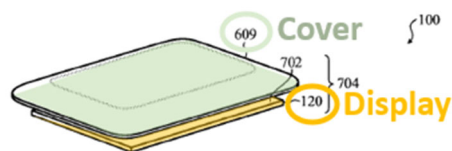
2. Claim 2 “The electronic watch of claim 1, wherein the light receiver is a first light receiver; the electronic watch further comprises a second light receiver; and the first and second light receivers are configured to measure a heart rate using the light reflected from the wrist”

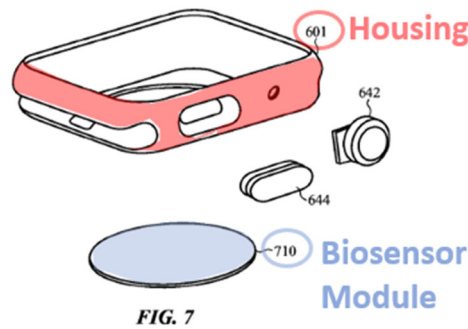
Rothkopf discloses more than one photodetector can be used. EX1005, [0148]; EX1003, ¶ 95. Rothkopf further discloses “optical (*e.g.*, PPG) sensor or

sensors may be used to compute various health metrics, including, without limitation, a heart rate” EX1005, [0193]. A POSITA would understand a Rothkopf/Jung combined watch could include a first and second light receiver where the first and second light receivers are configured to measure a heart rate using the light reflected from the wrist as explicitly taught by Rothkopf. A POSITA would have expected success as this is a simple mechanical addition that duplicates already included components as suggested by Rothkopf itself and for the beneficial reasons recognized in the prior art. EX1003, ¶ 95.

3. Claim 3 “The electronic watch of claim 1, wherein: the housing member defines a rectangular outer housing profile; the display is a rectangular display; and the carrier member defines a circular outer carrier profile”

Claim 3 depends from Claim 1 and adds a rectangular shape for the housing and display and a circular carrier profile. Rothkopf discloses a rectangular body for its housing 601, a rectangular display 120 and a circular carrier profile for its biosensor module 710 as illustrated in Fig. 7 partially reproduced below:



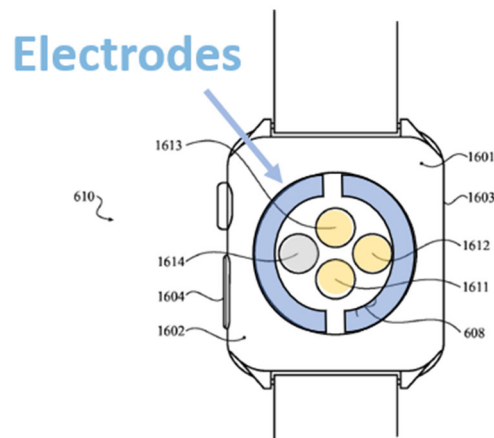


EX1005, [0007]; EX1003, ¶ 95.

4. **Claim 4 “The electronic watch of claim 1, wherein: the first electrode includes a first conductive coating deposited on the carrier member; and the second electrode includes a second conductive coating deposited on the carrier member”**

Claim 4 depends from Claim 1 and adds the electrodes include conductive coatings deposited on the carrier member. Rothkopf discloses “biosensor module 710 may include ... one or more electrodes or conductive elements that are configured to detect and measure a physiological condition or property of the user.” EX1005, [0130]. Rothkopf further discloses “the housing 601 may be formed from a variety of materials including ... glass, ceramics ... may include a surface treatment or coating, which may be formed from a variety of materials, including, without limitation aluminum, steel, gold, silver and other metals, metal alloys, ceramics, wood, plastic, glasses, and the like.” *Id.* A POSITA would understand that conductive coatings can be applied to various surfaces to form electrodes , such as a silver coating on ceramic. EX1003, ¶ 97. Accordingly, as taught by Rothkopf, it would have been obvious to use conductive coatings, such as silver or ceramic

surface coatings, on a glass or ceramic biosensor module housing to create the electrodes of Claim 4 in the combined Rothkopf/Jung device and a POSITA would have a reasonable expectation of success in the combination. *Id.*



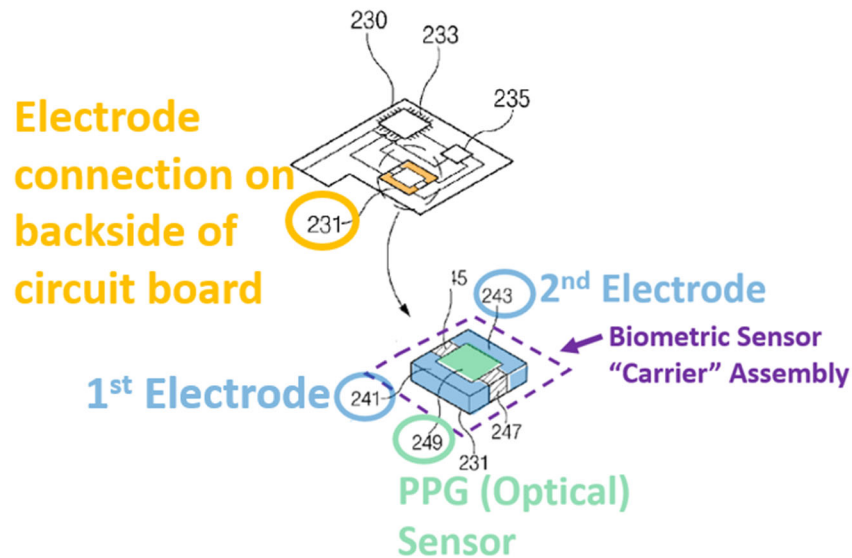
5. Claim 5 “The electronic watch of claim 4, wherein the first and second conductive coatings include one or more of an aluminum titanium nitride material, a chromium silicon carbon nitride material, or a diamond like carbon material”

Rothkopf discloses using surface treatments or coatings of aluminum, steel, gold, silver and other metals, metal alloys, ceramics, wood, plastic, glasses, and the like. EX1005, [0130]. It would have been obvious to use any conductive materials or alloys or ceramics for conductive coating materials to form the electrodes. EX1003, ¶ 98. For example, Lapetina discloses “electrical contacts could have a variety of surface compositions to allow ohmic (*i.e.*, related to conduction by ionic and/or redox reaction across the surface of the electrical contacts) and/or capacitive (*i.e.*, related to the accumulation of opposite charges on opposite sides of a surface of the electrical contacts) electrical coupling between the electrodes and skin

locations of a wearer. EX1010, [0043]. Such surface compositions could include stainless steel, gold, platinum, silver, silver/silver-chloride, polymers or rubbers containing conductive particles, or other conductive or partially conductive materials.” EX1010, [0053]; EX1003, ¶ 98. Accordingly, a POSITA would have looked to any conductive material for the conductive coatings of Claim 5.

6. Claim 6 “The electronic watch of claim 4, wherein: the first conductive coating is deposited along an exterior surface of the carrier member, an edge of the carrier member, and an interior surface of the carrier member; and the processor is operably coupled to the first electrode along a portion of the first conductive coating positioned along the interior surface of the carrier member”

Claim 6 depends from Claim 4 and further adds the first conductive coating is deposited along an exterior surface of the carrier member, an edge of the carrier member, and an interior surface of the carrier member. Jung, for example, discloses a biometric sensor (231) consisting of a first and second electrode (241, 243, respectively) that wrap around the edge of the carrier member (231); the carrier member (231) then passes through an opening on the back of a housing (271) and the electrodes connect directly to a circuit board (230) and processor inside the housing. EX1006, [0050]-[0050]. Jung discloses that “printed circuit board 230 may be connected to a biometric sensor 231” that “may include a first electrode 241 [and] a second electrode.” EX1006, [0045]-[0046], Fig. 2 (partially reproduced below); EX1003 ¶ 99.



It would have been obvious to use the electrode structure of the Jung to implement the teachings of Rothkopf because Jung teaches how to connect electrodes on the exterior of a bio-sensor carrier member to an internal circuit board with a processor providing an expectation of success. EX1003, ¶ 100.

7. Claim 9

a. Limitation 9a-f

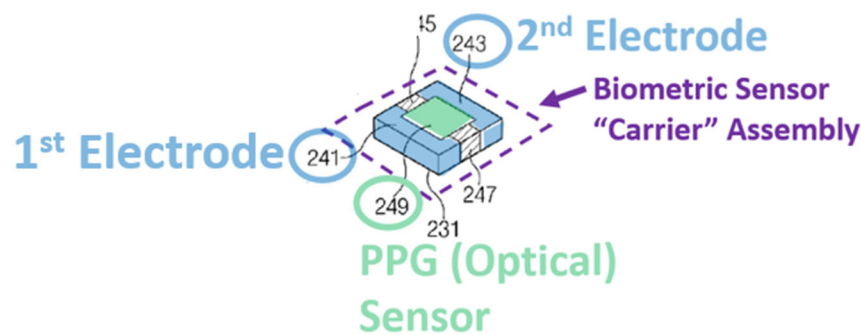
Rothkopf teaches this limitation as explained above with regard to limitation 9a-f respectively of Ground 1. EX1003, ¶¶ 101-106.

b. Limitation 9g “a rear electrode positioned on the carrier member and configured to receive a first voltage signal from a wrist of a user”

Rothkopf teaches this limitation as explained above with regard to limitation 9g of Ground 1. A POSITA seeking to implement the teaching of Rothkopf to locate

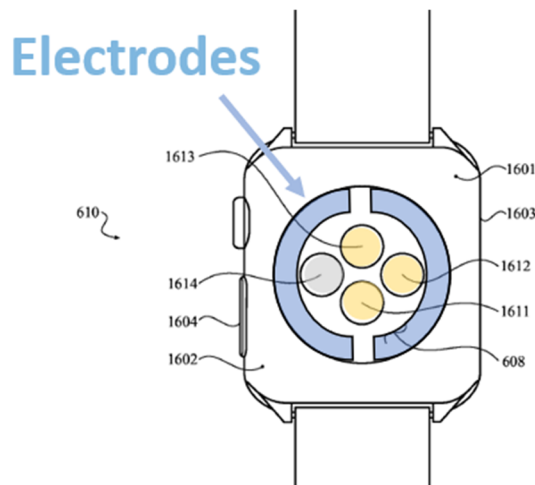
the electrodes on the biosensor module would look to other mobile electronic device references that teach the use of electrodes on a biosensor carrier assembly similar to that of Rothkopf. EX1003, ¶¶ 10-108.

Jung also discloses a biometric sensor carrier assembly with a biometric sensor carrier member (231) including a first electrode (241) (which detects a first voltage) and second electrode (243) (which detects a second voltage), the first and second electrodes are positioned on and wrapped around the edges of the carrier (231). EX1006, [0046]-[0047], Fig. 2 (partially reproduced below). The biometric sensor carrier assembly also includes a first insulator (245), a second insulator (247), and a photoplethysmogram (PPG) sensor (249). *Id.*



The biometric sensor is coupled to a processor. EX1006, [0045]-[0047], [0050]. The biosensor carrier (231) is placed into an opening on the back of a housing (271) and connects directly to a circuit board (230) and processor inside the housing. *Id.*, [0047], [0050]. Accordingly, Jung provides further details on the suggested embodiments of Rothkopf. EX1003 ¶ 109.

A POSITA would be motivated to use the teachings of Jung to implement the carrier assembly taught by Rothkopf. A POSITA would position the electrodes and wrap the electrodes around the edges of Rothkopf's carrier member as taught by Jung in order to improve contact with the patient's skin by covering as much of the carrier member as possible without obstructing the optical sensor. A POSITA would understand that it is advantageous to "increase the contact area of the skin-to-electrode interface to maintain lower impedance and exhibit better behavior in reducing motion artifacts." EX1003 ¶ 110. A POSITA would end up with a sensor arrangement shown below using the teachings of Jung in the system of Rothkopf:



EX1003, ¶ 110. A POSITA would have expected success in making this combination as it is a mere rearrangement of known compatible components in a predictable way to obtain a predictable result. Jung's carrier structure is similar in size and purpose to the carrier structure of Rothkopf and Jung teaches a POSITA how to incorporate electrodes on a carrier structure as expressly suggested by

Rothkopf. EX1003 ¶ 110. Accordingly, success in making the combination would have been expected. *Id.*

c. Limitation 9h-j “an optical sensor system comprising: an optical emitter positioned below a first region of the carrier member; and an optical receiver positioned below a second region of the carrier member”

Rothkopf teaches this limitation as explained above with regard to limitation 9h-j respectively of Ground 1. EX1003, ¶ 111.

Jung also discloses a biometric sensor carrier that includes a PPG sensor. The PPG sensor includes a light emitter and receiver and “may be disposed in a specific area in the *interior* of the biometric sensor 231.” Therefore, Jung also teaches a light emitter that may be *below* the first region of the carrier. EX1006, [0045]-[0046]; EX1003, ¶ 112.

d. Limitation 9k “a side electrode positioned along an exterior of the rectangular housing member and configured to receive a second voltage signal from a finger of the user”

Rothkopf teaches this limitation as explained above with regard to limitation 9k of Ground 1. EX1003, ¶ 113.

e. Limitation 9l “a processor positioned within the wearable electronic device and configured to determine a biological parameter using the first and second voltage signals”

Rothkopf discloses a processor inside its watch configured to determine an electrocardiograph, a biological parameter, using voltages from the electrodes. EX1005, [0198], Fig. 2; EX1003, ¶ 114.

Jung also discloses that “biometric information may include biometric electric potential information obtained through electrodes associated with an electrocardiogram (ECG) sensor” and “the biometric information processing module 123 may be integrated into the processor 121.” EX1006, [0040]. The electrical potential (voltage) information is used to determine an ECG, which is a biological parameter. EX1003, ¶¶ 115-116.

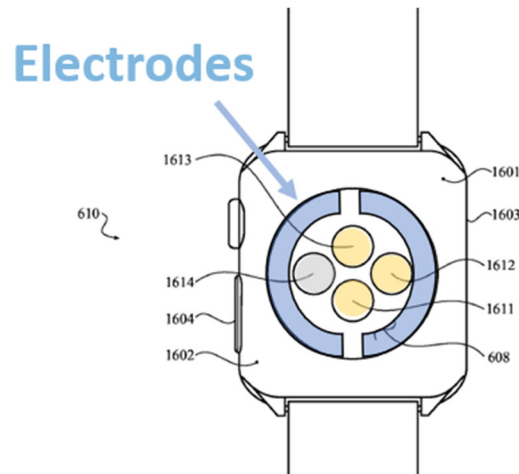
f. Claim 9 Conclusion

Accordingly, Rothkopf in combination with Jung obviates every limitation of Claim 9 of the '054 patent. Claim 9, therefore, would have been obvious to a POSITA before its effective filing date. EX1003, ¶ 77.

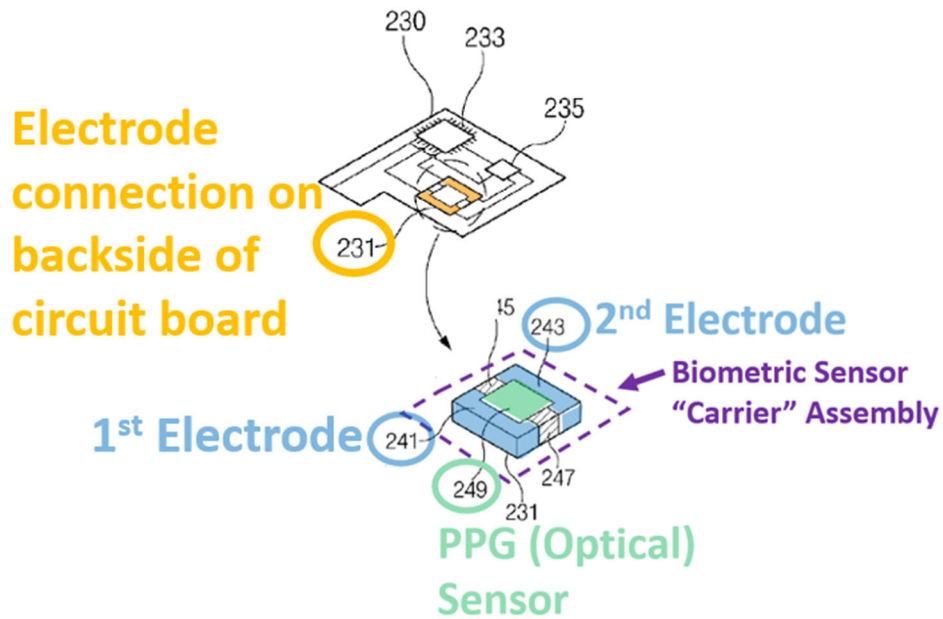
8. Claim 12 “The wearable electronic device of claim 9, wherein: the rear electrode is formed from a conductive coating deposited along an exterior surface of the carrier member; and the conductive coating extends around an edge of the carrier member and along an inner portion of the carrier member that is internal to the wearable electronic device”

Rothkopf discloses “biosensor module 710 may include ... one or more electrodes or conductive elements that are configured to detect and measure a physiological condition or property of the user.” EX1005, [0130]. Rothkopf further discloses “the housing 601 may be formed from a variety of materials including ... glass, ceramics ... may include a surface treatment or coating, which may be formed from a variety of materials, including, without limitation aluminum, steel, gold, silver and other metals, metal alloys, ceramics, wood, plastic, glasses, and the like.”

Id., [0130]. Accordingly, as taught by Rothkopf, it would have been obvious to use conductive coatings, such as silver or ceramic surface coatings, on a biosensor module housing to create the electrodes of Claim 12. EX1003, ¶ 117.



Jung also discloses a biometric sensor (231) (that is, in effect, a carrier member) consisting of a first and second electrode (241, 243, respectively) that may be disposed on the edge of the carrier member (231), including an inside edge; the carrier member (231) then passes through an opening on the back of a housing (271) and the electrodes connect directly to a circuit board (230) and processor inside the housing through the interior wrapped portion of the electrode. EX1006, [0045]-[0050]. Jung discloses that “printed circuit board 230 may be connected to a biometric sensor 231” that “may include a first electrode 241 [and] a second electrode” as shown in Jung’s Fig. 2 (below). EX1006, [0045]-[0046], Fig. 2.



As discussed above, a POSITA seeking to implement the teachings of Rothkopf would be motivated to use the teachings of Jung. A POSITA would have expected success in making this combination as it is a simple rearrangement of known compatible components in a predictable way to obtain a predictable result. Jung's carrier structure is similar in size and purpose to the carrier structure of Rothkopf and Jung teaches a POSITA how to incorporate electrodes on a carrier structure (as expressly suggested by Rothkopf) and connect the structure to an underlying circuit board (as explained by Jung). Rothkopf in combination with Jung obviates this claim. EX1003, ¶¶ 118-119.

9. Claim 13 “The wearable electronic device of claim 9, wherein the optical sensor system is an optical heart rate sensor that is configured to measure a heart rate of the user”

Rothkopf teaches this limitation as explained above with regard to Claim 13 of Ground 1. EX1003, ¶ 120.

10. Claim 14 “The wearable electronic device of claim 9, wherein: the optical sensor system is configured to measure a heart rate of the user; and the biological parameter is an electrocardiogram (ECG) of the user”

Rothkopf teaches this limitation as explained above with regard to Claim 14 of Ground 1. EX1003 ¶ 121.

11. Claim 15

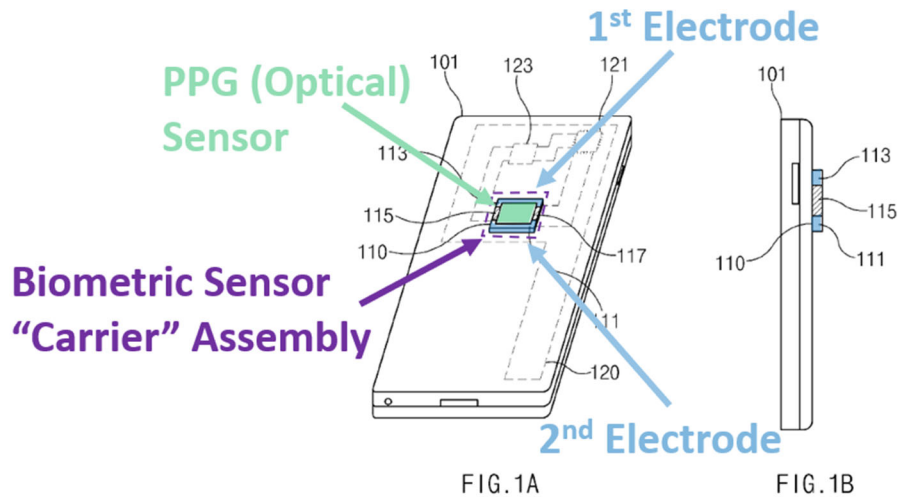
a. Limitations 15a-c

Rothkopf teaches these limitation as explained above with regard to limitation 15a-c of Claim 15 of Ground 1. EX1003 ¶¶ 122-124.

b. Limitation 15d “a carrier assembly coupled to the housing member and comprising: a carrier member protruding outward from an external surface of the housing member”

Rothkopf teaches this limitation as explained above with regard to Claim 15d of Ground 1. EX1003, ¶ 125.

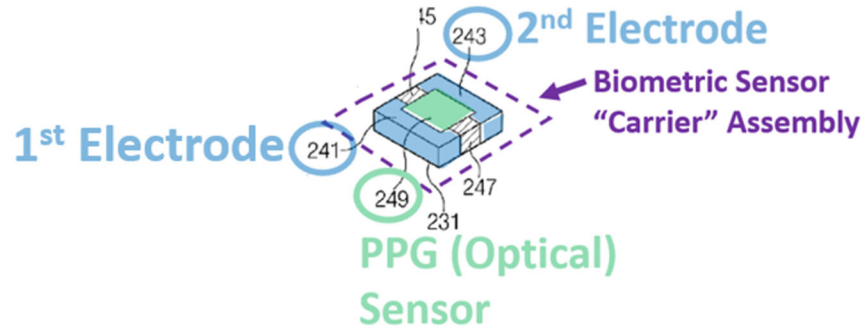
Jung also discloses a carrier assembly with a carrier member that protrudes outward from an external service of Jung’s housing as shown below in Jung’s Figs. 1A-1B. EX1006, Figs. 1A-1B (below); EX1003 ¶ 126.



- c. **Limitation 15e “a rear electrode positioned on the carrier member, the rear electrode operably coupled to a processor and configured to detect a first voltage”**

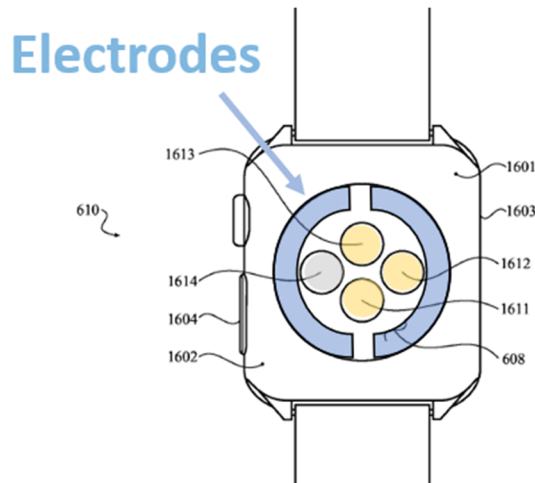
Rothkopf teaches this limitation as explained above with regard to Claim 15e of Ground 1. EX1003, ¶¶ 127-128.

Jung also discloses a biometric sensor carrier assembly with a biometric sensor carrier member (231) including a first electrode (241) (which detects a first voltage) and second electrode (243) (which detects a second voltage), the first and second electrodes are positioned on and wrapped around the edges of the carrier (231). EX1006, [0046]-[0047], Fig. 2 (below). The biometric sensor carrier assembly also includes a first insulator (245), a second insulator (247), and a photoplethysmogram (PPG) sensor (249). *Id.*; EX1003 ¶ 129.



The biometric sensor is coupled to a processor. EX1006, [0045]-[0047], [0050]. The biosensor carrier (231) is placed into an opening on the back of a housing (271) and connects directly to a circuit board (230) and processor inside the housing. *Id.*, [0047], [0050]. Accordingly, Jung provides further details on the suggested embodiments of Rothkopf. EX1003, ¶ 129.

A POSITA would be motivated to use the teachings of Jung to implement the carrier assembly taught by Rothkopf. A POSITA would position the electrodes and wrap the electrodes around the edges of Rothkopf's carrier member as taught by Jung in order to improve contact with the user's skin by covering as much of the carrier member as possible without obstructing the optical sensor. A POSITA would understand that it is advantageous to "increase the contact area of the skin-to-electrode interface to maintain lower impedance and exhibit better behavior in reducing motion artifacts." A POSITA would end up with a sensor arrangement shown below using the teachings of Jung in the system of Rothkopf:



A POSITA would have expected success in making this combination as it is a mere combination of compatible mechanical components in a predictable way to obtain a predictable result. Jung’s carrier structure is similar in size and purpose to the carrier structure of Rothkopf and Jung teaches a POSITA how to incorporate electrodes on a carrier structure as expressly suggested by Rothkopf. Accordingly, success in making the combination would have been expected. EX1003, ¶ 130.

d. Limitation 15f “an optical sensor positioned below the carrier member and configured to transmit optical signals through the carrier member”

Rothkopf discloses this limitation as explained above with regard to limitation 15f of Ground 1. EX1003, ¶ 131.

Jung also discloses a biometric sensor carrier that includes a PPG sensor. The PPG sensor includes a light emitter and receiver and “may be disposed in a specific area in the *interior* of the biometric sensor 231.” EX1006, [0043]. Therefore, Jung

teaches a light emitter that may be *below* the first region of the carrier. EX1006, [0045]-[0046]; EX1003, ¶ 132.

e. Limitation 15g “a side electrode positioned along an exterior of the watch, the side electrode operably coupled to the processor and configured to detect a second voltage”

Rothkopf discloses this limitation as explained above with regard to limitation 15g of Ground 1. EX1003, ¶ 133

f. Limitation 15h “the processor positioned within the watch and configured to: determine a biological parameter”

Rothkopf teaches this limitation as explained above with regard to limitation 15h of Ground 1. EX1003, ¶ 134.

Jung also discloses that “biometric information may include biometric electric potential information obtained through electrodes associated with an electrocardiogram (ECG) sensor” and “the biometric information processing module 123 may be integrated into the processor 121.” EX1006, [0040]. The electrical potential (voltage) information is used to determine an ECG, which is a biological parameter. EX1003, ¶ 135.

g. Limitation 15i “cause a change to the graphical output in response to determining the biological parameter”

Rothkopf teaches this limitation as explained above with regard to limitation 15i of Ground 1. EX1003, ¶ 136.

h. Claim 15 Conclusion

Accordingly, Rothkopf and Jung obviates every limitation of Claim 15. Claim 15, therefore, would have been obvious to a POSITA before its effective filing date. EX1003, ¶ 77.

- 12. Claim 16 “The watch of claim 15, wherein: the carrier member defines a circular outer profile; the optical sensor comprises a light emitter configured to emit light through a first region of the carrier member; the optical sensor comprises an optical receiver configured to receive reflected light through a second region of the carrier member; and the rear electrode is positioned along a peripheral region of the carrier member and at least partially surrounds the first and second regions of the carrier member”**

As explained above with regard to Claim 9 (limitations 9f; 9h-j), Rothkopf in combination with Jung obviate all of these limitations. EX1003, ¶¶ 106, 111-112, 137.

- 13. Claim 17 “The watch of claim 15, wherein: the rear electrode is a first rear electrode; the watch further comprises a second rear electrode positioned on the carrier member; and the first rear electrode and the second rear electrode are defined by a conductive coating deposited on a surface of the carrier member”**

As explained above with regard to Claims 9 and 12, Rothkopf in combination with Jung teach all of these limitations. EX1003, ¶¶ 107-110, 117-119, 138.

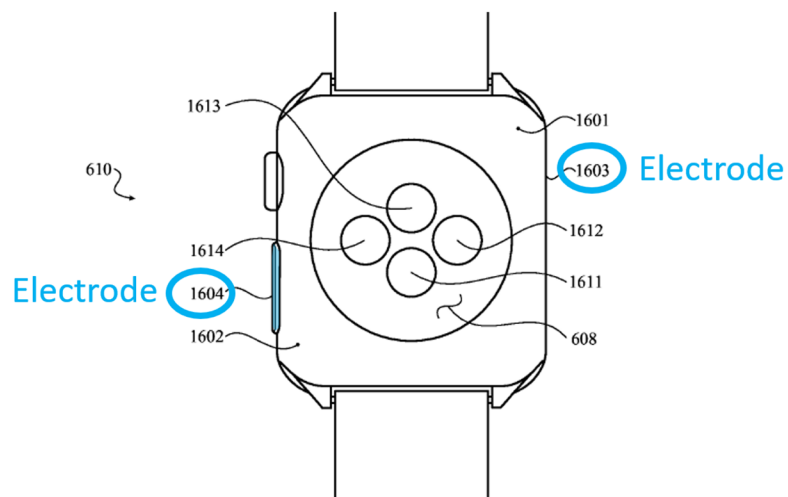
14. **Claim 19 “The watch of claim 15, wherein: the rear electrode includes a conductive coating that includes one or more of an aluminum titanium nitride or a chromium silicon carbon nitride material; and the conductive coating extends along an edge of the carrier member and along an interior surface of the carrier member”**

As explained above with regard to Claim 5, Rothkopf in combination with Jung and Lapetina teach all of these limitations. EX1003, ¶¶ 8, 139.

E. Ground 2A: Claims 7 and 20 are unpatentable as obvious over Rothkopf and Jung and further in view of Pei

1. **Claim 7 “The electronic watch of claim 1, wherein: the electronic watch further comprises a button having a conductive button cap; and the conductive button cap defines the third electrode”**

Rothkopf teaches a third electrode (1603) and fourth electrode (1604) along a side of a device as shown in Fig. 16 (below), but does not provide the details of the structure of these electrodes.



Pei discloses a mobile phone or watch that can include a “device input button ... which can also serve as an electrode.” EX1008, 3:44-66. Pei further discloses “the pressable input button includes a conductive layer (e.g., a thin layer of silicon) configured to receive and/or transmit an electrical signal (e.g., from a finger)” *Id.*, 4:42-44. The electrode button can be a mechanical button such as a home button, a volume button or a power button. *Id.*, 8:1-3. It would have been obvious to use the teachings of Pei to implement an additional electrode in the form of a button in the Rothkopf and Jung combination device. A POSITA seeking to implement the third and/or fourth electrode of Rothkopf as suggested by Rothkopf would have looked to Pei for implementation details and for the suggestion to use an existing button or crown as an electrode as a space saving technique because a watch is of limited size. A POSITA would have expected success in making this combination as it is a simple rearrangement of known compatible components in a predictable way to obtain a predictable result. Pei’s teaching of electrodes on a watch structure is similar in size and purpose to the watch structure and electrode teachings of Rothkopf and Pei teaches a POSITA how to incorporate electrodes on a watch structure as expressly suggested by Rothkopf. EX1003, ¶ 141.

2. **Claim 20 “The watch of claim 15, wherein: the watch further comprises a button; and the side electrode is positioned along a surface of the button”**

As explained above with regard to Claim 7, Rothkopf in combination with Jung and Pei teach the limitations of Claim 20. EX1003, ¶¶ 140-142.

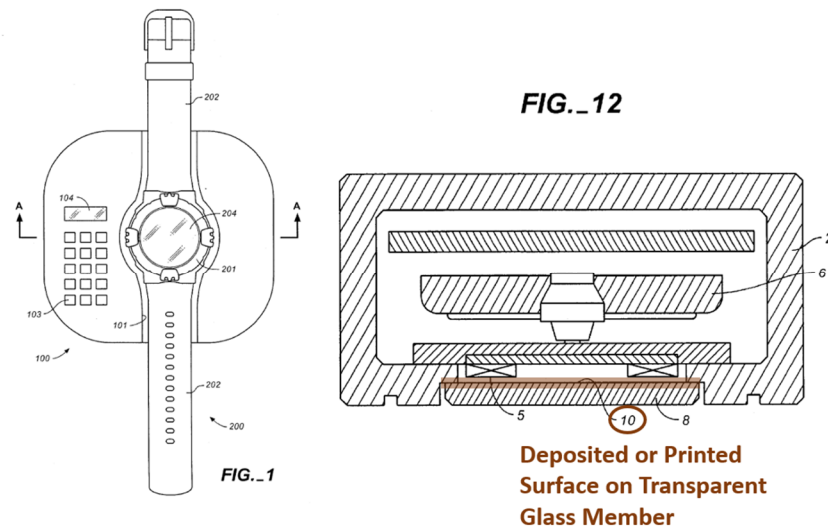
F. Ground 2B: Claim 8 is unpatentable as obvious over Rothkopf and Jung and further in view of Honda

1. **Claim 8 “The electronic watch of claim 1, wherein: the carrier member includes an opaque ink mask deposited along an inner surface of the carrier member surrounding the first and second regions; the first and second electrodes are positioned along an exterior surface of the carrier member that is over the opaque ink mask; and the exterior surface of the carrier member protrudes outward from an external surface of the housing member”**

Rothkopf discloses its “device may also include a transparent cover disposed over the cavity of the housing and may include a flat middle portion at a center of the transparent cover, a curved outer portion that emanates from and surrounds the flat middle portion and extends outwardly to an edge of the transparent cover, and a mask positioned relative to an internal surface of the transparent cover.” EX1005, [0015]. “The mask may have an outer boundary located proximate to the edge of the transparent cover and an inner boundary located within the curved outer portion of the transparent cover.” *Id.* Rothkopf further discloses that a mask can be opaque. *Id.*, [0122]. A POSITA would have understood that the mask disclosed in Rothkopf is over the display and that a mask could also be deposited on the inner surface of the rear cover 608 to form “an array of windows, each window including an aperture

or opening for a respective light source.” *Id.*, [202]. Although Rothkopf does not disclose its cover mask is an ink mask, a POSITA would have understood Rothkopf’s disclosure of an opaque mask would indicate use of an ink mask as one possible implementation. EX1003, ¶ 144.

The application of ink to a transparent material (such as glass) to make it opaque is a well-known process. EX1003, ¶ 145. For example, Honda teaches an “electronic watch” which can “detect biological information including the pulse rate or the heart rate of the body through an unshown sensor” and including a cover glass which has a plated, printed or painted colored interior surface (10). EX1011, 1:13-15, 4:50-58, 6:18-20, 13:59-62, Fig. 1 and Fig. 12 (below). Honda teaches that the glass surface may be deposited (e.g., vapor deposition) or coated with a printed surface (e.g., inked). *Id.*, 13:59-61. Honda explains, for example, a printed surface on an otherwise transparent cover over electronic devices is preferred from both an aesthetic point of view as well as to protect the electronic components from ultraviolet lights that can cause deterioration. *Id.*, 13:53-64. Honda teaches the glass can be opaque and a POSITA would understand from both this teaching as well as the context of the deposited or printed surface coating can also be opaque. *Id.*, 18:14-17, 18:37-39, claims 12 and 16; EX1003, ¶ 145.



Further, a POSITA would have been motivated by the express teachings of Honda to paint or print (e.g., using an ink mask) the inside of the glass cover for aesthetic purposes and to protect the electronic device. EX1011, 13:53-59; EX1003, ¶ 146.

As explained above Rothkopf teaches “at least one pair of electrodes disposed on an exterior surface of the housing.” EX1005, [0023]. Further as discussed above, Rothkopf in combination with Jung places those electrodes on the outside of a transparent cover of the biosensor module (carrier member). Given the teachings of Honda, a POSITA would have opacified (e.g., using an ink mask) the interior glass including under the electrodes in the combined Rothkopf and Jung device described in Ground 2. Further, a POSITA would have had a reasonable expectation of success as Honda, Rothkopf and Jung all teach compatible structures resulting in a predicable structure. EX1003, ¶ 147.

Rothkopf discloses that the rear cover, which is the carrier member, can have a convex outer contour that protrudes outward from the back external surface of the housing member 601. EX1005, [0123], [0201]. The convex outer contour of the rear cover would make it protrude from the main housing. EX1003, ¶ 148.

G. Ground 2C: Claims 10-11 and 18 are unpatentable as obvious over Rothkopf and Jung and further in view of Francis and Lapetina

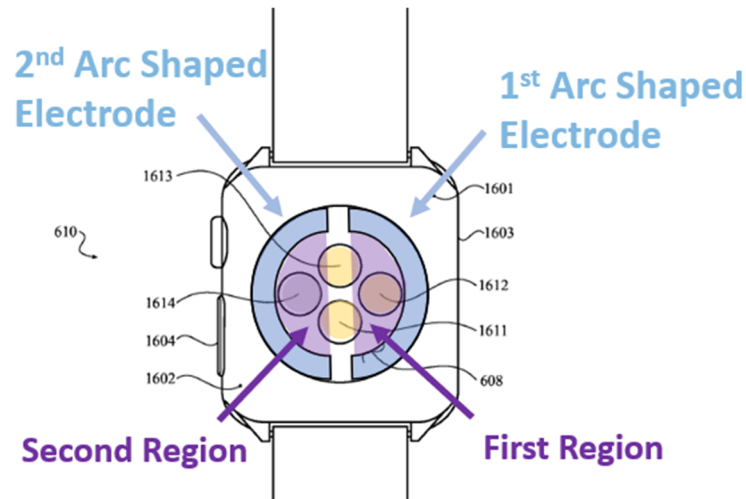
- 1. Claim 10 “The wearable electronic device of claim 9, wherein: the rear electrode is a first rear electrode; and the wearable electronic device further comprises a second rear electrode positioned on the carrier member and configured to ground the wearable electronic device to the user”**

As explained above with regard to Claim 10 in Grounds 1A and Claim 9 in Ground 1A and 2, Rothkopf in combination with Jung teach a first and second rear electrode positioned on the carrier member and Francis and Lapetina explain that one of those electrodes would be considered a ground electrode by a POSITA. Accordingly, the limitations of Claim 10 would have been obvious in view of the combination of Rothkopf, Jung, Francis and Lapetina. EX1003, ¶¶ 73-76, 107-110, 150.

- 2. Claim 11 “The wearable electronic device of claim 10, wherein: the first rear electrode defines a first arc that partially surrounds the optical sensor system; and the second rear electrode defines a second arc that partially surrounds the optical sensor system”**

As explained in limitation 9g of Ground 2, Rothkopf in combination with Jung teach a first rear electrode that defines a first arc that partially surrounds the optical

sensor system and a second rear electrode that defines a second arc that partially surrounds the optical sensor system. The combination device as explain above in Ground 2 would look like the following figure.



EX1003, ¶¶ 107-110.

3. Claim 18

Rothkopf and Jung in combination with Francis and Lapetina teach all of the limitations of this claim as explained above with regard to Claim 10. EX1003, ¶¶ 73-76, 107-110, 150, 152.

H. Ground 3: Claims 1-5, 9, 13-16, 19 are unpatentable as obvious in view of Rothkopf and Paulke

1. Claim 1

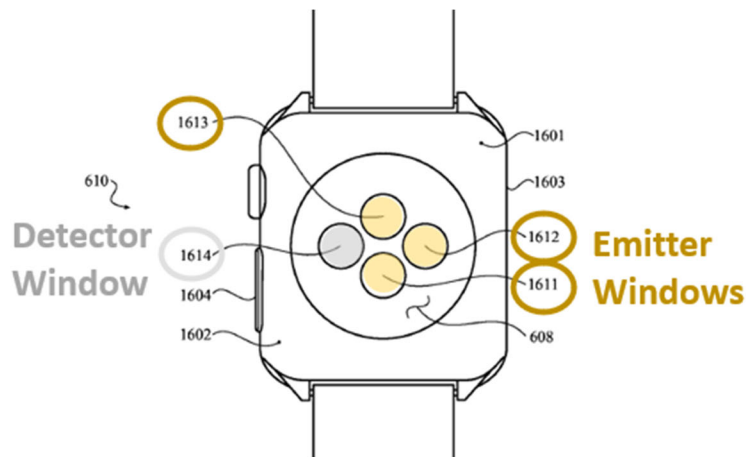
a. Limitation 1a-f

Rothkopf teaches this limitation as explained above with regard to limitation 1a-f respectively of Ground 2. EX1003, ¶¶ 78-84, 153.

- b. Limitation 1g “a second electrode positioned on the carrier member, operably coupled to the processor and configured to detect a second voltage, the first and second electrodes at least partially surrounding a first region of the carrier member and a second region of the carrier member”**

As explained above in limitation 1f of Ground 2, Rothkopf discloses a second electrode (“pair of electrodes”) positioned on the carrier member (rear cover 608) and operably coupled to the processor to detect a second voltage.

As further explained above in Ground 2, Rothkopf does not illustrate the exact configuration of the electrodes located on the biosensor module. Rothkopf does illustrate where emitters and detectors are located on the biosensor module in Fig. 16. Rear cover 608 includes emitter and detector windows 1614, 1612, 1613 and 1611. EX1005, [0190]. In the embodiment of Fig. 16 (below), electrodes 1601 and 1602 are not located on the biosensor module. *Id.*



But, as explained above, Rothkopf describes an embodiment where the electrodes are positioned on the cover 608. EX1005, [0201]. Additionally, Rothkopf teaches

that “one or more of the electrodes may be placed on a top surface or other surface of the device” and “to contact the user’s skin.” *Id.*, [0197], [0201], [0084], [0148]; EX1003, ¶¶ 86, 154.

A POSITA seeking to implement the teaching of Rothkopf to locate the electrodes on the biosensor module would look to other mobile electronic device references that teach the use of electrodes on a biosensor carrier assembly similar to that of Rothkopf. EX1003, ¶ 86, 155-156.

Paulke discloses a biosensor module carrier. Paulke states that any “suitable number and/or type(s) of biosensors may be included in the biosensor module, such as but not limited to ... electrocardiography, ... optical reflectance of blood vessels, oxygen saturation sensors, etc.” and the wearable device may include a processor that may process physiological measurements (such as ECG). EX1007, 12:6-13, 6:11-13. Fig. 1F of Paulke, reproduced with annotations below, shows an arrangement for three biosensors 120. Paulke suggests, for example, the two biosensors 120 (annotated in blue) may be first and second electrodes (such as for galvanic or ECG measurements) and biosensor 120 (annotated in green) may be for optical reflectance of blood vessels or oxygen saturation (PPG). EX1007, 14:26-15:18; EX1003, ¶ 157.

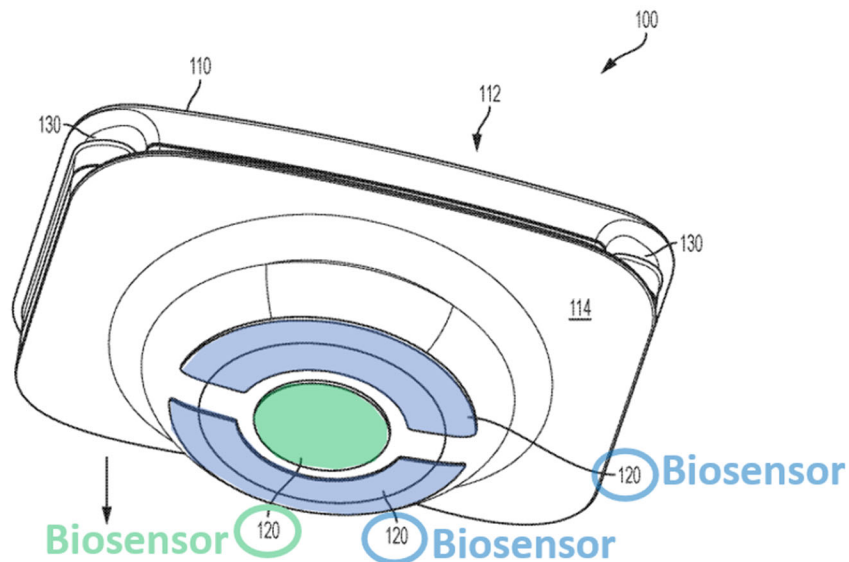
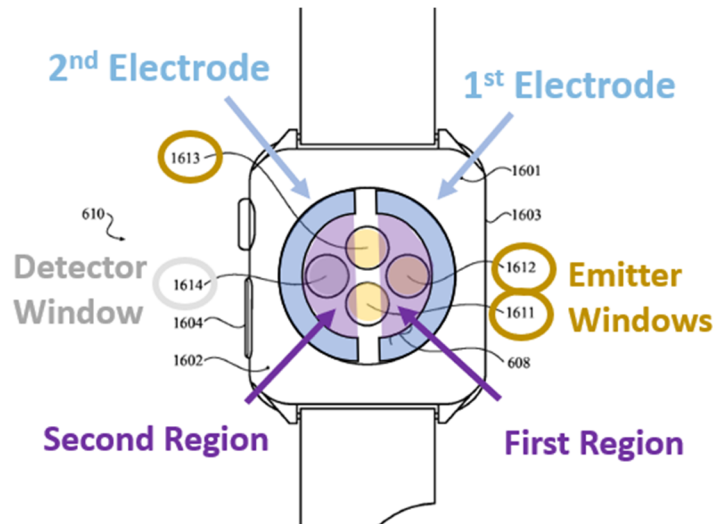


FIG. 1F

The illustrated embodiment above of Paulke is located on the strap of a wrist-worn wearable device. But, Paulke discloses that the “wearable article may be a wrist-worn watch.” EX1007, 6:16-17; EX1003, ¶ 158.

A POSITA would be motivated to use the teachings of Paulke to implement the carrier assembly taught by Rothkopf. A POSITA would position the electrodes as taught by Paulke in order to maintain contact with the user’s skin. EX1007, 6:5-7. A POSITA would end up with a sensor arrangement shown below using the teachings of Jung in the system of Rothkopf:



A POSITA would have expected success in making this combination as it is a mere rearrangement of compatible components in a predictable way to obtain a predictable result. Paulke's carrier structure is similar in size and purpose to the carrier structure of Rothkopf and Paulke teaches a POSITA how to incorporate electrodes on a carrier structure as expressly suggested by Rothkopf. EX1003, ¶ 159.

c. Limitation 1h-k

Rothkopf teaches limitation 1h-k as explained with regard to the limitations 1h-k of Ground 2. EX1003, ¶¶ 89-94, 160.

d. Claim 1 Conclusion

Rothkopf combined with Paulke disclose and make obvious every limitation of Claim 1 of the '054 patent. Claim 1, therefore, would have been obvious to a POSITA before its effective filing date. EX1003, ¶ 161

2. Claims 2-5

Rothkopf alone or in combination with Lapetina teach the limitations of Claims 2-5 for the same reasons discussed above in Ground 2 with regard to these same claims. EX1003 ¶¶ 95-98, 162.

3. Claim 9

a. Limitation 9a-f

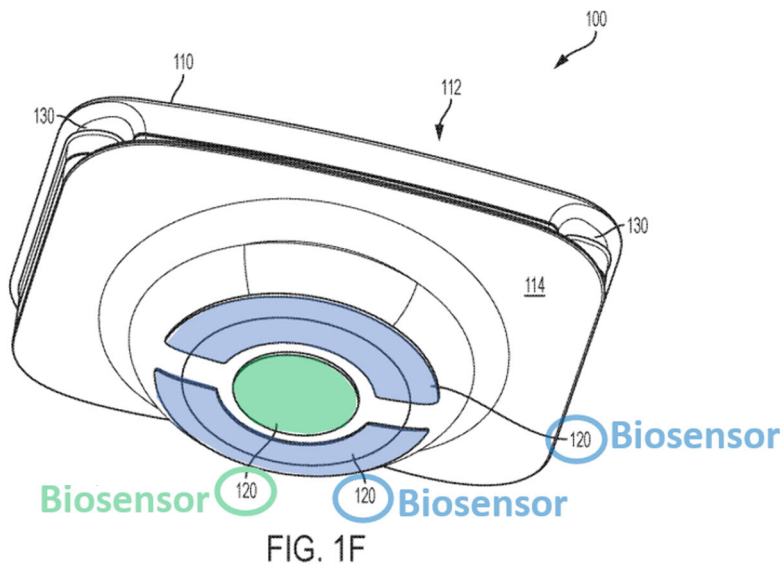
Rothkopf teaches this limitation as explained above with regard to limitation 9a-f respectively of Ground 1. EX1003, ¶¶ 101-106, 163.

b. Limitation 9g “a rear electrode positioned on the carrier member and configured to receive a first voltage signal from a wrist of a user”

Rothkopf teaches this limitation as explained above with regard to limitation 9g of Ground 1. A POSITA seeking to implement the teaching of Rothkopf to locate the electrodes on the biosensor module would look to other mobile electronic device references that teach the use of electrodes on a biosensor carrier assembly similar to that of Rothkopf. EX1003, ¶¶ 54-56, 164.

Paulke discloses a biosensor module carrier. Paulke states that any “suitable number and/or type(s) of biosensors may be included in the biosensor module, such as but not limited to ... electrocardiography, ... optical reflectance of blood vessels, oxygen saturation sensors, etc.” and the wearable device may include a processor that may process physiological measurements (such as ECG). EX1007, 12:6-13,

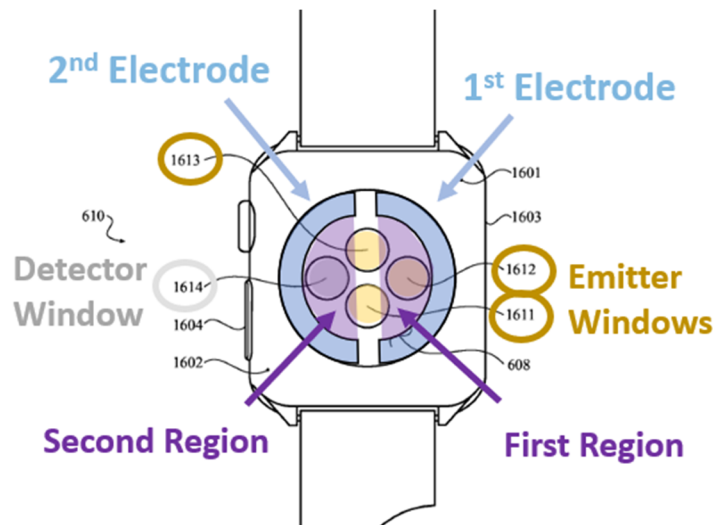
6:11-13. Fig. 1F of Paulke, reproduced with annotations below, shows an arrangement for three biosensors 120. Paulke suggests, for example, the two biosensors 120 (annotated in blue) may be first and second electrodes (such as for galvanic or ECG measurements) and biosensor 120 (annotated in green) may be for optical reflectance of blood vessels or oxygen saturation (PPG). *Id.* 14:26-15:18; EX1003, ¶ 165.



The biosensor module of Paulke illustrated above is located on the strap of a wrist-worn wearable device, and not housed in the wearable device, such as a watch. However, Paulke discloses that the “wearable article may be a wrist-worn watch.” EX1007, 6:16-17. A POSITA would have been motivated to incorporate the features of the Paulke design into the carrier of Rothkopf. Rothkopf itself, for example, teaches the desirability to provide a “wearable electronic device that is configured to provide an expansive feature set integrated or incorporated into a compact form factor.” EX1005, [0004]. Rothkopf further explains “a consumer product may

integrate or combine multiple subsystems into a single device to provide a wide range of functionality, including biometric sensing.” *Id.* EX1003, ¶ 166.

A POSITA would be motivated to use the teachings of Paulke to implement the carrier assembly taught by Rothkopf. A POSITA would position the electrodes as taught by Paulke in order to maintain contact with the user’s skin. EX1007, 6:5-7. A POSITA would end up with a sensor arrangement shown below using the teachings of Jung in the system of Rothkopf:



EX1003, ¶ 167.

A POSITA would have expected success in making this combination as it is a mere rearrangement of compatible components in a predictable way to obtain a predictable result. Paulke’s carrier structure is similar in size and purpose to the carrier structure of Rothkopf and Paulke teaches a POSITA how to incorporate electrodes on a carrier structure as expressly suggested by Rothkopf. *Id.*

c. Limitation 9h-j “an optical sensor system comprising: an optical emitter positioned below a first region of the carrier member; and an optical receiver positioned below a second region of the carrier member”

Rothkopf teaches this limitation as explained above with regard to limitation 9h-j of Ground 1. Paulke also discloses a biosensor module carrier. Paulke states that any “suitable number and/or type(s) of biosensors may be included in the biosensor module, such as but not limited to ... electrocardiography, ... optical reflectance of blood vessels, oxygen saturation sensors, etc.” and the wearable device may include a processor that may process physiological measurements (such as ECG). EX1007, 12:6-13, 6:11-13; EX1003, ¶¶ 57, 168.

d. Limitation 9k

Rothkopf teaches this limitation as explained above with regard to limitation 9k of Ground 1. EX1003, ¶¶ 58, 169.

e. Limitation 9l

Rothkopf teaches this limitation as explained above with regard to limitation 9l of Ground 1. Paulke also discloses a processor for processing the physiological measurements included in the wearable article. EX1007, 6:11-13; EX1003, ¶¶ 59, 170.

f. Claim 9 Conclusion

Accordingly, Rothkopf in combination with Paulke obviates every limitation of Claim 9 of the '054 patent. Claim 9, therefore, would have been obvious to a POSITA before its effective filing date.

4. Claims 13-14

Rothkopf teaches this limitation as explained above with regard to Claims 13 and 14 respectively of Ground 2. EX1003, ¶¶ 120-121, 172.

5. Claim 15

a. Limitation 15a-c

Rothkopf teaches this limitation as explained above with regard to Claim 15a-c of Ground 1. EX1003, ¶¶ 122-124, 173.

b. Limitation 15d “a carrier assembly coupled to the housing member and comprising: a carrier member protruding outward from an external surface of the housing member”

Rothkopf teaches this limitation as explained above with regard to Claim 15d of Ground 1. Paulke also teaches a carrier member protruding outward from an external surface of a housing member as shown in Fig. 1f below. EX1003, ¶¶ 174.

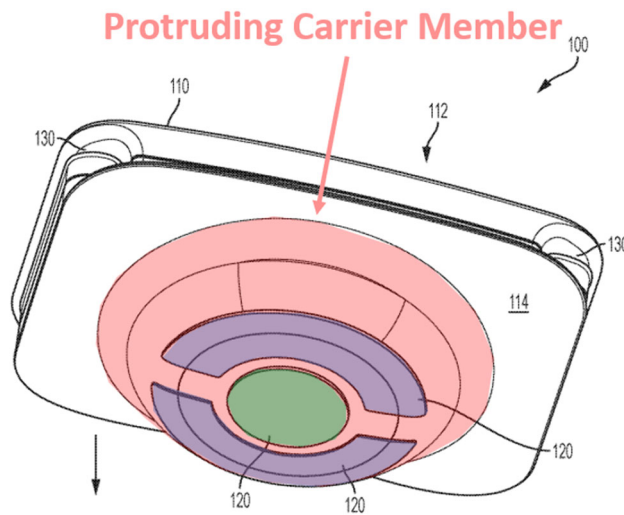


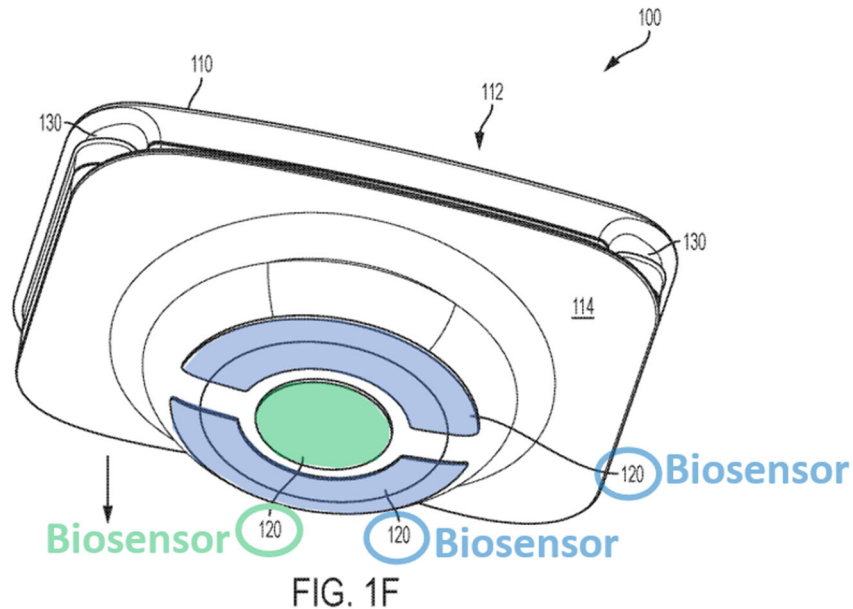
FIG. 1F

c. Limitation 15e “a rear electrode positioned on the carrier member, the rear electrode operably coupled to a processor and configured to detect a first voltage”

Rothkopf teaches this limitation as explained above with regard to Claim 15e of Ground 2. EX1003, ¶¶ 66-67, 175.

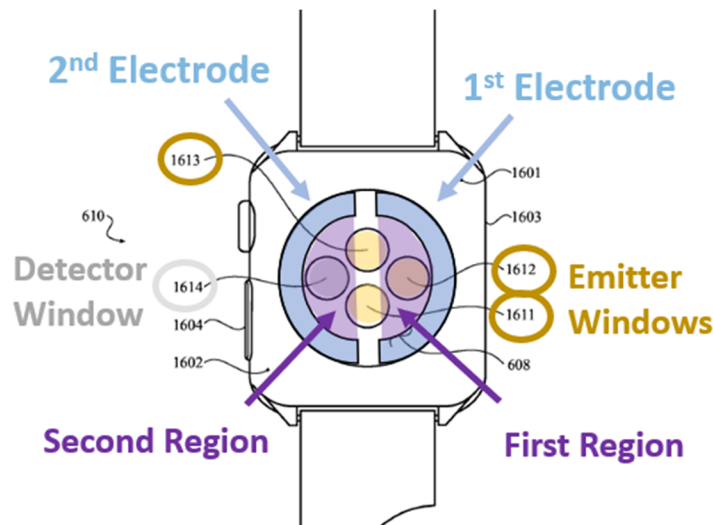
Paulke discloses a biosensor module carrier. Paulke states that any “suitable number and/or type(s) of biosensors may be included in the biosensor module, such as but not limited to ... electrocardiography, ... optical reflectance of blood vessels, oxygen saturation sensors, etc.” and the wearable device may include a processor that may process physiological measurements (such as ECG). EX1007, 12:6-13, 6:11-13. Fig. 1F of Paulke, reproduced with annotations below, shows an arrangement for three biosensors 120. Paulke suggests, for example, the two biosensors 120 (annotated in blue) may be first and second electrodes (such as for galvanic or ECG

measurements) and biosensor 120 (annotated in red) may be for optical reflectance of blood vessels or oxygen saturation (PPG). EX1007, 14:26-15:18; EX1003, ¶ 176.



The biosensor module of Paulke illustrated above is located on the strap of a wrist-worn wearable device, and not housed in the wearable device, such as a watch. However, Paulke discloses that the “wearable article may be a wrist-worn watch.” EX1007, 6:16-17. A POSITA would have been motivated to incorporate the features of the Paulke design into the carrier of Rothkopf. Rothkopf itself, for example, teaches the desirability to provide a “wearable electronic device that is configured to provide an expansive feature set integrated or incorporated into a compact form factor.” EX1005, [0004]. Rothkopf further explains “a consumer product may integrate or combine multiple subsystems into a single device to provide a wide range of functionality, including biometric sensing.” *Id.* EX1003, ¶ 177.

A POSITA would be motivated to use the teachings of Paulke to implement the carrier assembly taught by Rothkopf. A POSITA would position the electrodes as taught by Paulke in order to maintain contact with the user's skin. EX1007, 6:5-7. A POSITA would have a reasonable expectation of success as the combination is a basic rearrangement of compatible components. A POSITA would end up with a sensor arrangement shown below using the teachings of Paulke in the system of Rothkopf:



EX1003, ¶ 178,

A POSITA would have expected success in making this combination as it is a mere rearrangement of compatible components in a predictable way to obtain a predictable result. Paulke's carrier structure is similar in size and purpose to the carrier structure of Rothkopf and Paulke teaches a POSITA how to incorporate electrodes on a carrier structure as expressly suggested by Rothkopf. Accordingly, success in making the combination would have been expected. *Id.*

d. Limitation 15f-i

Rothkopf teaches these limitations as explained above with regard to limitations 15f-i of Ground 2. EX1003 ¶¶ 131-136, 179.

e. Claim 15 Conclusion

For the reasons discussed above, Rothkopf and Paulke obviates every limitation of Claim 15. Claim 15, therefore, would have been obvious to a POSITA before its effective filing date. EX1003, ¶ 181.

6. Claim 16

As explained above with regard to Claim 9 (limitations 9f; 9h-j) of Ground 3, Rothkopf in combination with Paulke obviate the limitations of Claim 16. EX1003, ¶¶ 106, 111-112, 182.

7. Claim 19

For the same reasons discussed above with regard to Claim 5 of Ground 2, Rothkopf in combination with Paulke and Lapetina teach the limitations of Claim 19. EX1003, ¶¶ 98, 183.

I. Ground 3A: Claims 7 and 20 are unpatentable as obvious over Rothkopf and Paulke and further in view of Pei

For same reasons discussed above with regard to Claim 7 in Ground 2A, Rothkopf and Paulke in combination with Pei teach all of the limitations of Claims 7 and 20. EX1003 ¶¶ 141-142, 184.

J. Ground 3B: Claim 8 is unpatentable as obvious over Rothkopf and Paulke and further in view of Honda

For same reasons discussed above with regard to Claim 8 in Ground 2B, Rothkopf and Paulke in combination with Honda teach all of the limitations of Claim 8. EX1003, ¶¶ 145-149, 185.

K. Ground 3C: Claims 10-11 and 18 are unpatentable as obvious over Rothkopf and Paulke and further in view of Francis and Lapetina

For same reasons discussed above with regard to Claims 10-11 and 18 in Ground 2C, Rothkopf and Paulke in combination with Francis and Lapetina teach all of the limitations of Claims 10-11 and 18. EX1003, ¶¶ 151-153, 186.

V. SECONDARY CONSIDERATIONS

Secondary considerations should be considered but do not control an obviousness conclusion, particularly where, as here, a strong *prima facie* showing of obviousness exists. *Leapfrog Enters., Inc. v. Fisher-Price, Inc.*, 485 F.3d 1157, 1162 (Fed. Cir. 2007). Petitioner is unaware of evidence of secondary considerations, and any such evidence could not outweigh the strong *prima facie* case of obviousness. Petitioner reserves the right to respond to any evidence of secondary considerations.

VI. DISCRETIONARY FACTORS FAVOR INSTITUTION

With respect to 35 U.S.C. § 314(a), *Fintiv* factors 2, 3, 4, and 6 strongly favor institution of this IPR, and factors 1 and 5 are neutral. Regarding factor 2, the final

written decision in this IPR is expected long before trial in the Delaware Litigation. Apple filed its complaint in the Delaware Litigation less than five months ago, on October 20, 2022, and the most recent published statistics indicate that the median time to trial for a civil action in the District of Delaware is almost three years. EX1015.

For factor 3, the parties and the court have made little investment in the Delaware Litigation. No discovery or infringement or invalidity contentions have been exchanged and claim construction briefing has not started.

For factor 4, Petitioner stipulates that, if the Board institutes this IPR, Petitioner will not pursue, in the Delaware Litigation, the specific invalidity grounds for the challenged claims raised in this Petition or that reasonably could have been raised in this Petition. This stipulation “mitigates any concerns of duplicative efforts between the district court and the Board,” and, thus, factor 4 “weighs strongly in favor of not exercising discretion to deny institution.” *Sotera Wireless, Inc. v. Masimo Corp.*, IPR2020-01019, Paper 12 at 19 (PTAB Dec. 1, 2020) (precedential as to § II.A).

For factor 6, this Petition presents a compelling case of unpatentability of the challenged claims. For factor 1, Petitioner has not moved for a stay of the Delaware Litigation but may do so upon institution of this IPR. For factor 5, Petitioner Masimo is a defendant in the Delaware Litigation. In view of all circumstances, the

judicial and administrative efficiency considerations underlying *Fintiv* are not implicated here. Therefore, the Board should institute this IPR.

With respect to 35 U.S.C. § 325(d), this Petition presents the first *inter partes* challenge to the '352 patent and none of the references the Petition relies on were considered during examination. Further, the references presented herein are materially better than the references considered during examination

VII. CONCLUSION

Petitioner respectfully requests that the Board institute an IPR and cancel claims 1-20 of the '054 patent.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: February 27, 2023

By: /Jarom Kesler/

Jarom D. Kesler (Reg. No. 57,046)
Customer No. 64,735
Attorneys for Petitioner
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(949) 760-0404

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), the undersigned certifies that foregoing **PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 10,987,054**, exclusive of the parts exempted as provided in 37 C.F.R. § 42.24(a), contains 13,499 words and therefore complies with the type-volume limitations of 37 C.F.R. § 42.24(a).

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: February 27, 2023

By: /Jarom Kesler/

Jarom D. Kesler (Reg. No. 57,046)
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CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing **PETITION FOR
INTER PARTES REVIEW OF U.S. PATENT NO. 10,987,054** and **EXHIBITS
1001-1016** are being served on February 27, 2023, via Federal Express overnight
delivery on counsel of record for U.S. Patent No. 10,987,054 as addressed below:

62579 - APPLE INC./BROWNSTEIN
c/o Brownstein Hyatt Farber Schreck, LLP
410 Seventeenth Street
Suite 2200
Denver, CO 80202

Dated: February 27, 2023

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