UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MASIMO CORPORATION,
Petitioner,

v.

APPLE INC.,
Patent Owner

Case IPR2023-00807
U.S. Patent No. 11,474,483

PATENT OWNER'S PRELIMINARY RESPONSE

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LIST OF EXHIBITS

Ex. 2001	U.S. Patent Pub. No. 2014/0275852 to Hong et al. ("Hong")
Ex. 2002	U.S. Patent No. 4,448,199 to Schmid ("Schmid II")
Ex. 2003	U.S. Patent Pub. No. 2015/0085429 to Memering et al. ("Memering")
Ex. 2004	US Patent No. 5,738,104 to Lo ("Lo")
Ex. 2005	Prosecution History of U.S. Patent No. 10,942,491 (the "'491 Patent")
Ex. 2006	RESERVED
Ex. 2007	U.S. Patent No. 9,436,645 to Al-Ali et al ("Al-Ali")

I. INTRODUCTION

The Petition for U.S. Patent No. 11,474,483 (the "'483 Patent") should be denied for two reasons: (1) none of the Petition's presented grounds disclose or suggest a device that is configured to a measure a physiological parameter using two electrodes positioned on a rear device surface and a third electrode positioned along a side of the device, as required by the Challenged Claims, and (2) the grounds based on Kotanagi and Schmid (Grounds 2, 5-7) are substantially the same as the art considered during prosecution and Petitioner has failed to demonstrate any material error during prosecution, thus warranting discretionary denial of these grounds under §325(d).

In more detail, the '483 Patent sought to improve on portable devices, particularly wearable devices (e.g., wristwatches), that had traditionally included "relatively limited functionality" or "were only able to perform a specialized set of functions or tasks." Ex. 1001, 2:61-3:1. To that end, the '483 Patent provides "an expansive feature set" that is "integrated into" the "relatively compact space of a wrist-worn device." *Id.*, 8:37-58, 3:11-21. In some embodiments, the '483 Patent provides a wrist-worn device that "integrate[s] or combine[s] multiple subsystems"—including one or more biosensors such as optical sensors and electrical sensors—"into a single device" to provide a wrist-worn device with a wide range of health monitoring capabilities. *Id.*, 3:11-21, 4:11-22, 9:60-10:5.

The optical sensors, which are disposed in the rear portion of the device (e.g., behind the device's rear cover) facilitate measurements of a first physiological parameter (e.g., heart rate), and electrode assemblies, including two electrodes positioned on the rear device surface and one or more electrodes positioned along a side of the device facilitate measurement of a second physiological parameter (e.g., ECG, galvanic skin resistance). *Id.*, 39:30-41:35. Indeed, during prosecution, the Examiner allowed the claims upon finding that the prior art of record did not disclose the above-described "configuration of electrodes as presently recited with respect to the locations on the housing." Ex. 1002, 40, 138-145.

This deficiency in the art of record also permeates the grounds presented in the Petition—including the grounds based on Kotanagi and Coppola (Grounds 1, 3-7) and those based on Kotanagi and Schmid (Grounds 2, 5-7). Specifically, none of the presented grounds disclose or render obvious measurement of a physiological parameter (which Petitioner alleges is an ECG measurement) using this specific configuration of electrodes—namely, a first and a second electrode positioned on a rear device surface and a third electrode positioned along a side of the device. As explained below in Section VII, Kotanagi does not disclose any ECG capability in its wrist-worn device, and its disclosed electrodes, which are only provided on the rear surface of its wrist-worn device, are used to detect skin contact—and not to measure ECG. Coppola contemplates ECG measurements, but

does not disclose measuring ECG using two rear surface electrodes and an electrode positioned along a side of the device. Similarly, Schmid also contemplates using electrodes for ECG measurements, but the totality of its disclosures confirm that its ECG measurements are performed using electrodes disposed on a single surface of the wrist-worn device (such as the rear device surface). Beyond these deficiencies in the ground references, the Petition also fails to explain how Kotanagi's device, which has electrodes that only facilitate skin contact detection, would be configured to additionally enable ECG measurements, particularly using the particular configuration recited in the claims. Thus, on the current record, the Petition has failed to demonstrate a device or watch that is configured to measure ECG using the specific configuration of electrodes, as required by the claims.

Additionally, the Petition's reliance on Kotanagi and Schmid warrants discretionary denial under §325(d) of at least grounds based on those references (i.e., Grounds 2 and 5-7). Kotanagi is substantially the same as the Hong reference that was applied in a rejection during prosecution because, like Petitioner's allegations in view of Kotanagi, the Examiner determined that Hong discloses wrist-worn devices with a housing, a biosensor module, a front cover, a display, and electrodes. Ex. 1002, 703-709. Additionally, Schmid is substantially the same as the Schmid II reference that was cited in an information disclosure statement

during prosecution, and which (1) has the same inventor as the Schmid reference, (2) is a continuation-in-part of Schmid, (3) was applied in a rejection in the related and earlier application for the '491 Patent (which Petitioner is separately challenging via IPR), and (4) has all the same disclosures that Petitioner relies upon in Schmid. Moreover, Kotanagi and Schmid suffer from the same deficiencies that the Examiner observed in the art of record—i.e., they fail to disclose or suggest measurement of a physiological parameter using this specific configuration of electrodes. *See* Ex. 1002, 40, 138-145.

Given that Kotanagi and Schmid are substantially the same as the art of record, Petitioner bears the burden to demonstrate material error during prosecution. The Petition provides only a one-paragraph long assessment of 325(d) (Petition, 82), which fails to demonstrate any material error during prosecution. In this single paragraph, the Petition states that the references in the Petition disclose features of the independent claims, such as "ECG electrodes on various surfaces of a biosensing watch, a touchscreen display, a rear sapphire cover, wireless charging," which were allegedly not disclosed in the references of

record. Petition, 82[1]. However, contrary to Petitioner's assertions, these identified features are in fact disclosed by multiple references cited during prosecution. *See* §VIII *infra*. Indeed, many of these references—including Hong (which discloses touch screen display, electrodes, wireless charging), Memering (which discloses a rear sapphire cover), and Lo (which discloses electrodes on various surfaces)—were identified by the Examiner and applied in claim rejections during prosecution. Thus, on this record, Petitioner has failed to show any material error during prosecution, thus warranting discretionary denial of the Kotanagi-Schmid based grounds under 325(d).

For these reasons, and as further explained below, the Petition respectfully requests denial of the Petition.

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[1] Although the Petition states that "the references relied on herein … disclose every limitation of the ***independent claims***, including ECG electrodes on various surfaces of a biosensing watch, a touchscreen display, a rear sapphire cover, wireless charging, ***and other features***" (Petition, 82 (emphasis added)), the Petition does not specify or discuss the "other features" that are alleged to be disclosed by the Petition's references and not the art of record. Note also that the Petition confined its 325(d) analysis to the independent claims.

II. THE INVENTION OF THE '483 PATENT

The '483 Patent relates to "a wearable electronic device" that provides a "wide range" of features, including among others, "health monitoring functionality." Ex. 1001, 3:4-22.

The '483 Patent explains that traditional wearable electronic devices had "relatively limited functionality or [were] only able to perform a specialized set of functions or tasks." Ex. 1001, 2:61-3:1. "For example, some traditional electronic wristwatches" were "configured to perform a relatively limited set of functions, including displaying time, date, and performing basic timing functions." *Id.*

In contrast, and "compared to some traditional wearable electronic devices," the '483 patent provides "an expansive feature set" that is "integrated into" the "relatively compact space of a wrist-worn device." *Id.*, 8:37-58, 3:11-21. In some embodiments, the '483 Patent provides a wrist-worn device that "integrate[s] or combine[s] multiple subsystems"—including one or more biosensors such as optical sensors and electrical sensors that are used to measure health metrics/physiological parameters of a wearer—"into a single device" to provide a wrist-worn device with a wide range of health monitoring capabilities. *Id.*, 3:11-21, 4:11-22, 9:60-10:5.

In some embodiments, the '483 Patent discloses a device 100 that enables biometric sensing using a "biosensor module" made up of "one or more sensors"

that are "used to calculate a health metric," such as "a heart rate, a respiration rate, blood oxygenation level, a blood volume estimate, blood pressure, or a combination thereof." *Id.*, 39:30-41:35. As depicted in further detail with reference to FIG. 16 (reproduced below), the "biosensor module" includes "one or more light sources, one or more photodetectors, and one or more electrodes or conductive elements that are configured to detect and measure a physiological condition or property of the user." *Id.*, Fig. 16 (annotated), 29:54, 60.

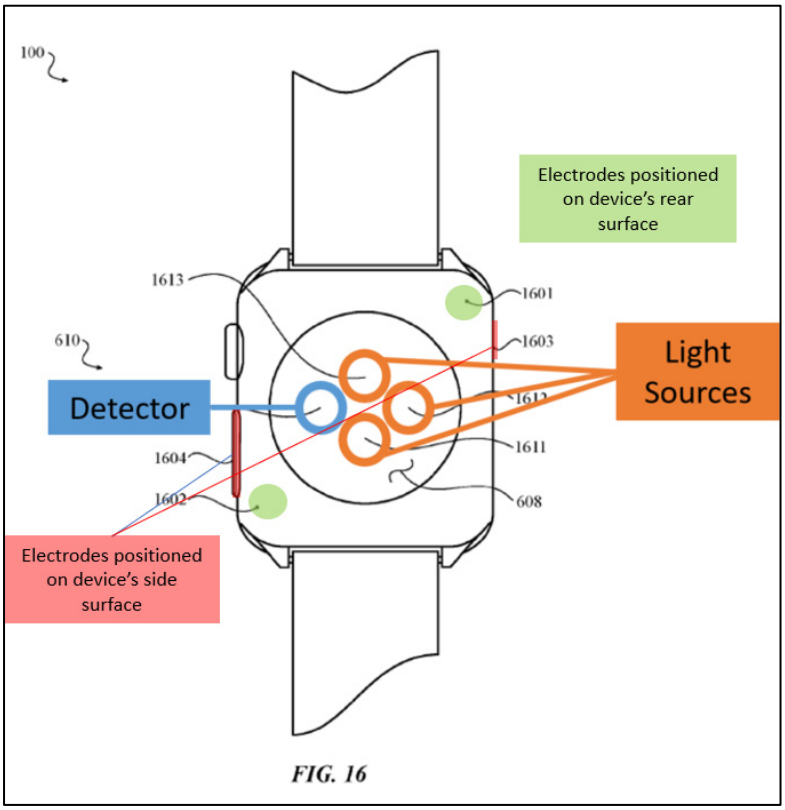


FIG. 16

The light sources 1611-1613 and the detector 1614 on the rear portion of the device "are configured to function as an optical sensor or sensors," such as "a photoplethysmography (PPG) sensor or sensors." *Id.*, 40:1-41:20.

Additionally, the device can include "one or more electrodes" that are used to "measure electrical properties of the user's body." *Id.*, 41:21-60. As shown above, "a first electrode 1601 and second electrode 1602 are disposed on the rear face of the device 100" that "make[s] contact with the skin of the user's wrist when the device is being worn" and "a third electrode 1603 and fourth electrode 1604 may be disposed along" sides "of the device body 610" that "come into contact with the skin of the user's other hand (that is not wearing the device 100)." *Id.* "For example, the third 1603 and fourth 1604 electrodes may be contacted when the user pinches the device 100 between two digits (e.g., a forefinger and thumb)." *Id.*

"Using the electrodes of the device, various electrical measurements may be taken, which may be used to compute a health metric or other health-related information. By way of example, the electrodes may be used to detect electrical activity of the user's body. In some cases, the electrodes may be configured to detect electrical activity produced by the heart of the user to measure heart function or produce an electrocardiograph (ECG). As another example, the electrodes of the device may be used to detect and measure conductance of the body. In some cases, the measured conductance may be used to compute a galvanic skin response (GSR), which may be indicative of the user's emotional state or other physiological condition." *Id.*, 41:44-60.

In this manner, the ’483 Patent provides a wearable device with different types of biometric sensing capabilities, and recites a specific configuration in which (1) optical sensors are positioned in the rear portion of the wearable device and facilitate measurement of a first physiological parameter (e.g., heart rate) and (2) multiple electrodes are positioned on each of the rear and side surfaces of the device and facilitate measurement of a second physiological parameter (e.g., ECG, galvanic skin response).

III. PROSECUTION HISTORY SUMMARY

A. Prosecution History of the ’483 Patent

The application for the ’483 Patent (App. No. 17/672,653) was filed on February 15, 2022. Ex. 1001, p. 1. This application claims priority, via a series of intermediate applications, to a non-provisional application (U.S. Patent App. No. 14/842,617; now US Patent No. 10,599,101) filed on September 1, 2015. Ex. 1001, pp. 1-2. The application for the ’483 Patent further claims priority to a provisional application (App. No. 62/044,974) filed on September 2, 2014. Ex. 1001, p. 1.

During prosecution, the Examiner issued an office action, rejecting the then-pending claims (pending claims 21-40) on multiple prior art-based grounds. Ex. 1002, 703-709. Specifically, the Examiner rejected the pending claims in view of multiple references, including (among others), Hong (Ex. 2001), Schmid II (Ex.

2002), Memering (Ex. 2003), and Lo (Ex. 2004). *See id.* In support of these rejections, the Examiner made the following pertinent findings and rationale:

- "***Hong et al. describe a wearable device in the embodiment of a wearable watch for biometric monitoring***. Figures 2a and 2b show a housing of the wearable device, wherein figure 2a shows the front surface and figure 2b depicts the rear surface. The … illustration in figure 2a is considered to describe a front surface opening of the housing with an electronics package and display, wherein the screen of the display is considered to comprise a front cover and front exterior surface. The display may include capacitive touch detection to make the display touch sensitive (para 239, 272, and 280). ***Figure 2b depicts the rear portion of the wearable device with a second opening in which an optical sensor is located.*** The optical sensor has a rear cover that is optically transparent (para 145, 146, and 155) and defines a protruding convex exterior surface at the sensor (para 153 and 154). ***The optical sensor is configured as a PPG biosensor which measures a heart rate*** (para 36, 37, 39, and 136-156). This input from this sensor would comprise a first physiological signal. ***Hong et al. also contemplates that other types of sensors may be incorporated with the wearable device. Such sensors are found in Table 1 (para 110), wherein such additional sensors include ECG and***

galvanic skin conductance electrodes (para 110 and 186). … It is also considered that one of ordinary skill in the art would readily recognize that the skin conductance and ECG sensors necessarily require electrodes for proper functioning and signal measurement…. Hong et al. teaches that skin conductance electrodes may be mounted on the strap.… ***Therefore it is considered to have been obvious to … to modify Hong et al. to include electrode sensors for either galvanic skin conductance or ECG because the reference explicitly suggests the addition***." Ex. 1002, 703-705[2].

- "Hong et al. suggests incorporation of additional sensors which may be used to measure ECG signals ((para 110 and Table 1). ***The ECG sensor proposed by Hong et al. would comprise a second physiological signal.*** Additionally, one of ordinary skill in the art is considered to readily recognize that ***such sensor requires at least one electrode for proper operation and measurement***." Ex. 1002, 706.
- "Hong et al. is considered to substantially suggest the invention as claimed, including a convex cover portion comprising an optically transparent window, such as a lens, for light transmission (para 153-154).

[2] Emphasis added throughout unless otherwise noted.

However, Hong et al. does not teach that the lens material is sapphire. ***Memering et al. teaches that sapphire is a suitable transparent material for manufacturing as a cover and as improved resistance to scratches and damage*** (abstract and para 5, 20 ,26). In view of these properties, sapphire is considered a suitable material for the claimed intended use. ***Therefore, modification of Hong et al. to use sapphire for the convex covering of the optical sensor is considered to have been obvious to one of ordinary skill in the art*** since Memering et al. teaches the suitability of the material for the intended use …." Ex. 1002, 706-707.

- "Hong et al. is considered to substantially suggest a wrist wearable sensor that may include electrodes for sensing ECG or galvanic skin conductance signals. ***However, Hong et al. does not teach that the ECG is signal measuring portion includes a first, second, and third electrode. Lo et al. show a wrist based monitor for ECG and heart rate that utilizes a three contact approach for measuring ECG.…*** Therefore modification of the suggested ECG and/or galvanic skin response electrodes in Hong et al. to include at least three electrodes is considered to have been obvious … since the modification would pertain to the application of a conventional technique for acquiring ECG signals to a known device to yield predictable results." Ex. 1002, 707-708.

In a subsequently-filed response to this office action, Applicant amended the independent claims to recite that each of the first and second electrodes is "positioned along a rear surface of the" wearable electronic device/watch and a third electrode is "positioned along a side" of the device/watch, with the device/watch being "configured to measure a second physiological parameter using the first electrode, second electrode, and the third electrode." Ex. 1002, 138-141.

In the corresponding remarks, Applicant explained that Hong does not describe electrodes "located on the rear portion of the housing" nor does it describe "a third electrode positioned along a side of" the device, as recited in the amended claims. Ex. 1002, 143-144. Thus, Applicant reasoned that "Hong fails to describe the particular configuration of electrodes" as recited in the claims. Ex. 1002, 144. Applicant further explained that "it would not be obvious to a person of ordinary skill in the art to modify Hong to move the electrodes from being 'hidden in the band' to the locations recited in" the amended claims because:

> *"[I]n the context of wearable electronic devices, such as watches, health monitoring devices, and the like, the integration of sophisticated electronic systems, such as those that interact with the human body for physiological measurements, is a complex engineering task. Components of such systems, such as skin-contacting electrodes, cannot simply be moved to another location without incurring significant engineering challenges. For example, in the case of Hong, moving electrodes from a band to a rear and a side of the device would*

> *require significant reengineering of the 'portable monitoring device,' including its existing optical sensor. Nor would one of ordinary skill in the art have a reasonable expectation that the modification could be performed successfully without impacting the operation of the device (e.g., negatively affecting the operation of the electrodes and associated sensors, the optical sensing system, etc.). Accordingly, such modification is not obvious to one of ordinary skill in the art.*

Ex. 1002, 144-145.

With respect to the Lo reference applied in the rejection, Applicant explained in its response that Lo describes a digital watch in which "[t]wo electrical contacts 14 and 16 are placed on the front of the watch for the user to place his or her fingers on when the pulse mode is entered and a third electrical contact is located on the back side of the watch." Ex. 1002, 145. As such, Applicant explained that Lo does not describe any electrical contacts "positioned along a side of the wearable electronic device," nor does it describe two electrodes "positioned along the rear surface of the wearable electronic device," as recited by the claims. *See* Ex. 1002, 145. Thus, even if Lo and Hong's teachings could be combined, Applicant explained that the "combination would still fail to teach or suggest the" claimed device because (1) "the electrodes would have a completely different physical arrangement than claim 21" and (2) it would not be "obvious to rearrange Lo's electrodes to meet the arrangement recited in claim 21, as there is no teaching or suggestion in any of the references of the claimed arrangement, let

alone any suggestion that the rearrangement could be undertaken without encountering significant engineering challenges or without impacting the functioning of the device." Ex. 1002, 145.

In view of these arguments and amendments, the Examiner issued a Notice of Allowance in the next action. Ex. 1002, 34-41. In the corresponding reasons for allowance, the Examiner stated that "the prior art fails to describe the configuration of electrodes as presently recited with respect to the locations on the housing." Ex. 1002, 40. The application subsequent issued as the '483 Patent on October 18, 2022. Ex. 1002, 3.

B. Prosecution History of the '491 Patent

App. No. 16/826,130, which issued as U.S. Patent No. 10,942,491, is one of the applications to which the application for the '483 Patent claims priority. Ex. 1001, pp. 2. During prosecution of the application for the '491 Patent, the Examiner issued an office action, rejecting the then-pending claims (pending claims 21-40) on multiple prior art-based grounds. Ex. 2005, 1119-1131. Specifically, the Examiner rejected the pending claims in view of multiple references, including Hong (Ex. 2001), Schmid II (Ex. 2002), and Mistry (Ex. 2006). *See id.* Notably, Schmid II is a continuation-in-part of the Schmid reference relied upon in the Petition and includes the same disclosures that are relied upon in the Petition in view of Schmid. *See* §VIII.A *infra*.

In support of these rejections, the Examiner provided the following pertinent findings and rationale:

1. ***Schmid II "describes a wrist worn device similar to a wrist watch that includes a first electrode and second electrode (electrodes 21) located on the rear side of housing 2 configured to contact a user's skin when worn on the wrist provide a measure of the user's electrocardiogram (col 5 lines 24-37). Thus, Schmid [II] demonstrates that wrist worn electrocardiogram measurement devices were known in the art.*** As electrocardiograms are known biometric signals for accessing a patient's health, modification of the health monitor of Hong et al. to include electrodes for measuring an electrocardiogram is considered to have been obvious to one of ordinary skill in the art at the time of the invention since the modification is considered to comprise combining prior art elements according to known methods to yield predictable results…." Ex. 2005, 1124.
2. "***Hong et al. also teaches*** that the wearable electronic device includes an ***internal rechargeable battery wherein the device may engage a charger such as a docking station*** using magnetic properties between magnets located in the charger and wearable device to facilitate battery recharge (para 305 and 306). ***The transmission of recharge energy from the***

> ***charger may be wireless (para 306).*** However, Hong et al. is not clear if there is a recharging receive coil located within the device to receive charging energy. ***Mistry et al., similar to Hong et al., describes a wearable sensing device with similar charging features (para 125-129). To facilitate charging of the device, the wearable device or band may include an antenna or coil located therein to receive recharging energy from the charger and is positioned to properly align with the charger coil to optimize power transfer (para 128). The antenna of Mistry et al. is considered similar to the coil as claimed. Both Hong et al. and Mistry*** et al. are considered to teach the necessary elements, or suitable equivalents, for ***functionally providing wireless energy transfer for recharging the battery***." Ex. 2005, 1125-1127.

Claims of this application were subsequently allowed upon the recitation of specific configuration (added via amendment) of the rear cover—which can be optically transparent or formed of a dielectric or non-conductive material—being configured to transmit/receive both optical signals and wireless power signals. *See* Ex. 2005, 595-599, 600, 468-473, 10-12.

IV. PERSON OF ORDINARY SKILL IN THE ART

Patent Owner contends that a person of ordinary skill in the art on or about the claimed priority date of the '483 Patent would have had at least a bachelor's

degree in electrical engineering, mechanical engineering, biomedical engineering, computer engineering, physics, or a related field, and would have had at least two years of relevant work experience with capture and processing of data or information, including but not limited to physiological information, or equivalents thereof. Less work experience may be compensated by a higher level of education and vice versa.

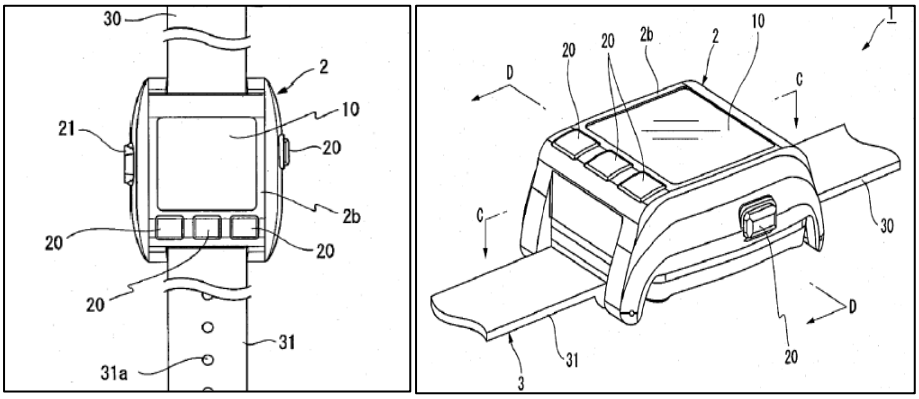
V. CLAIM CONSTRUCTION

While not agreeing with Petitioner's proposed constructions (or lack thereof) for certain claim terms (*see* Petition, 8-10), ***solely*** for purposes of this Preliminary Response, Patent Owner does not object to the constructions proposed by Petitioner at this time. Patent Owner reserves the right to assert alternative constructions for relevant claim terms in this or another proceeding involving the '483 Patent (or another patent related thereto), where appropriate.

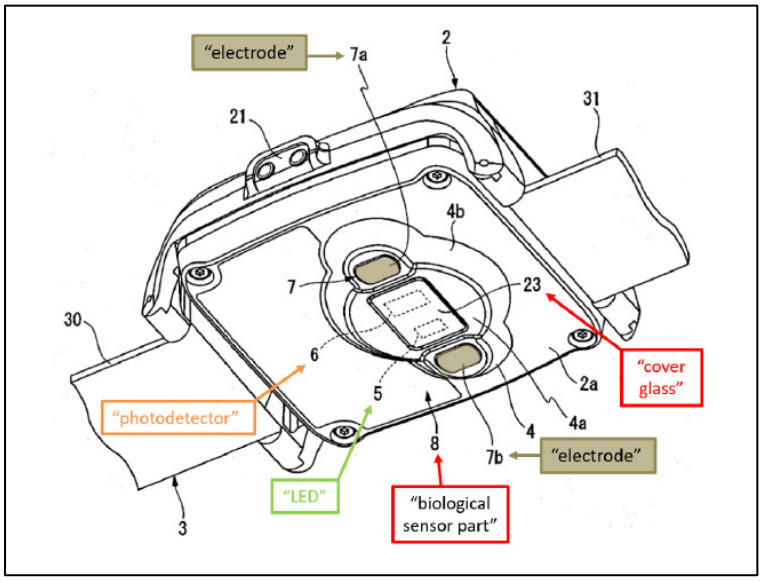
VI. THE ASSERTED PRIOR ART

A. Kotanagi (Ex. 1005)

Kotanagi discloses a "biological information measuring device 1," which as shown in FIGS. 1 and 2 below, includes a "wristwatch-type device" that "detects pulse rate as a type of biological information while mounted to [a] wrist (arm) …." Ex. 1005, ¶44.



The rear surface of Kotanagi's wristwatch device, which is reproduced below, includes "a protruding part 4 … [that] is formed on the lower surface 2a of the housing 2." *Id.*, ¶45. A biological sensor part 8, which includes a LED 5 and a photodetector (PD) 6, is disposed on the lower surface 4a of the protruding part 4. Ex. 1005, ¶46. As shown on the right, the biological sensor part 8 is "formed in the center of the lower surface 4a of the protruding part 4," with the "LED 5 and the PD 6" being positioned in "the protruding part 4." *Id.*, ¶¶55-56, Fig. 7 (annotated by Petitioner). A cover glass 23 covers the through-hole 22 and the biological sensor part 8. Ex. 1005, ¶55, Fig. 7.



When Kotanagi's wristwatch is mounted on a user's wrist, the LED 5 "emit[s] light toward the … body" and the PD 6 receives reflected light from the "body out of the light emitted by the LED 5," and generates "a pulse signal … corresponding to the amount of received light." *Id.*, ¶46.

Additionally, Kotanagi discloses that its device has a "contact detection part," which "includes at least a pair of electrodes" that are used to "detect[] whether the light-emitting part and the light-receiving part are in contact with the living body surface based on a potential difference between the pair of electrodes." Ex. 1005, ¶13. Kotanagi explains that "the electrodes need not be a pair, and a plurality of electrodes, for example, may be provided so that contact can be detected based on the potential difference between each of the electrodes." Ex. 1005, ¶14. Kotanagi discloses and depicts (as shown above) that the electrodes (e.g., electrodes 7a and 7b shown above in FIG. 5) are provided on the rear surface of its wrist-worn device. *See id.*, FIG. 5. As such, "when the main body" of the device "is mounted to the arm," these rear surface "electrodes come into contact with the living body surface so that a discharge occurs through the living body surface," which results in "the potential between the electrodes decreas[ing]." Ex. 1005, ¶14. "By detecting the potential difference between" "each of electrodes," it can be "easily and reliably detected whether the light-emitting part and the light-receiving part are indeed in contact with the living body surface." Ex. 1005, ¶14.

Kotanagi does not disclose any electrocardiography capability in its wrist-worn device, nor does it disclose that its electrodes have any function other than skin contact detection. *See generally* Ex. 1005.

B. Coppola (Ex. 1009)[3]

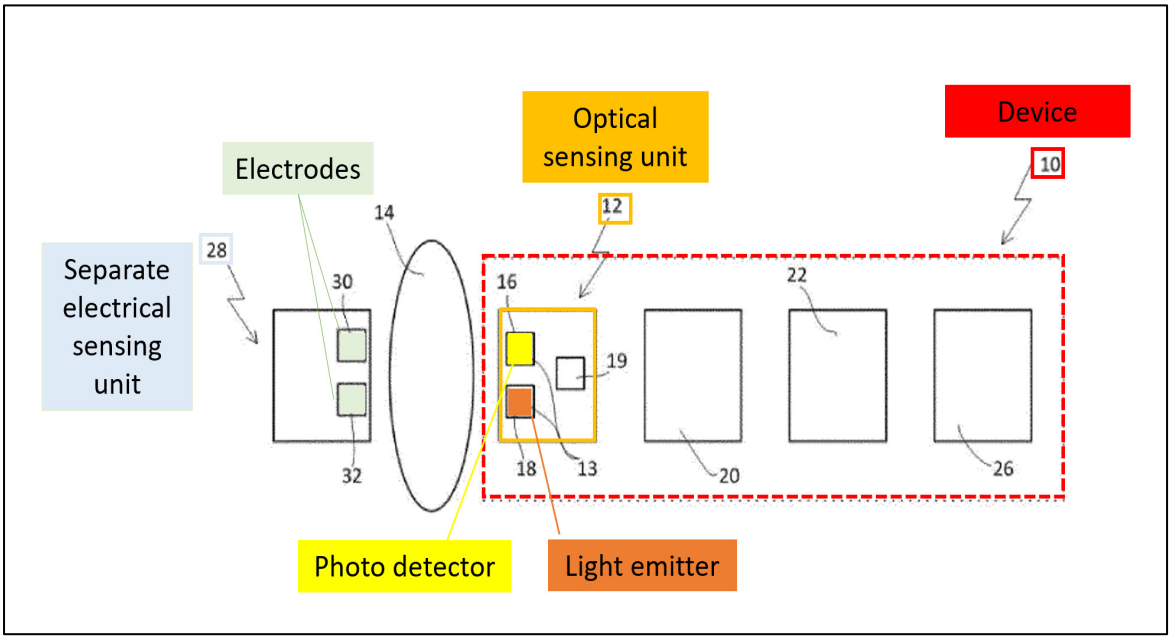
Coppola's invention relates to "a system and method for detecting variation of heart rate of a user" that "finds applications in diagnostic investigation of arrhythmias" and in particular, "in the detection of atrial fibrillation." Ex. 1009, 1:3-6.

Coppola discloses different device embodiments that are configured to detect heart rate variation (HR variation) based on an optical measurement that uses an optical sensing unit and an electrical measurement that uses an ECG unit. Ex. 1009, 3:1-16, 3:26-4:2, 6:1-7:12. The optical sensing unit can include "one or more photoplethysmography sensing unit[s]" that can "either be optimized to measure heart rate" or "SpO2 (pulse oximeter oxygen saturation)." Ex. 1009, 4:26-32. The optical sensing unit can include one or more photo detectors and one or more light sources, with the "one or more photo detectors catch[ing] the light

[3] For ease of reference, Patent Owner only cites to Ex. 1009 and not Ex. 1020, which Petitioner alleges is the PCT application that claims priority to the EP application shown in Ex. 1009. *See* Petition, 13.

that has travelled from the one or more light sources (advantageously LEDs) through the skin towards the photo detector(s) and in that way produce a signal that has a relation to the heart rate." *Id.* The electrocardiography ECG unit can include a first electrode and a second electrode that are used to measure an ECG signal. Ex. 1009, 5:23-33.

In a first embodiment (see FIG. 1, reproduced and annotated below), Coppola discloses a device 10 (1) that includes an optical sensing unit 12 for measuring optical signals and (2) that coordinates with an electrical sensing unit 28 to measure electrical signals.

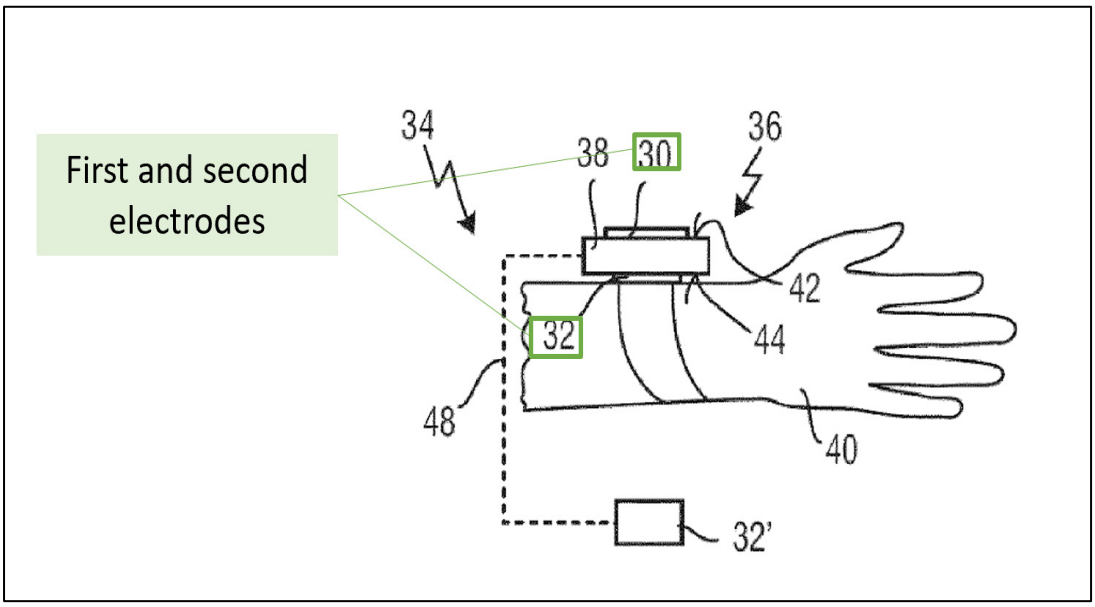


As shown, the optical sensing unit 12 includes an LED emitter 16 for emitting light and a photodetector 18 to detect the emitted light "that has travelled from the emitter 16 through the living body 14 to the photodetector 18." Ex. 1009,

8:13-21. An electrical sensing unit 28, which is separate from the device 10, can "measure a heartbeat-related electrical signal of the living being 14," such as an ECG signal. Ex. 1009, 9:23-33. In this embodiment, the electrical sensing unit 28 includes "only two electrodes 30, 32." Ex. 1009, 10:6-7. Coppola states that "the electrical sensing unit 28 may comprise further electrodes and that all the electrodes of the electrical sensing unit 28 may be arranged at least partially at different positions with respect to the living being 14 that are appropriate for performing an electrical measurements of the living being 14." Ex. 1009, 10:7-10.

The device 10's additional components shown above include (1) a processing unit 20 that derives the interbeat intervals from the sensor signals of the optical sensor 13, (2) an analyzing unit 22 that compares the HR-variation signal derived by the processing unit 20 to a reference HR range, and (3) an initiating unit 26 for initiating an electrical sensing unit 28 to measure a heartbeat-related electrical signal of the living being 14. Ex. 1009, 8:33-9:30.

In a second embodiment shown in FIG. 3 (reproduced below), a system 34 is shown that includes wearable device 10 with a housing 36 that can be worn by the living being 14.

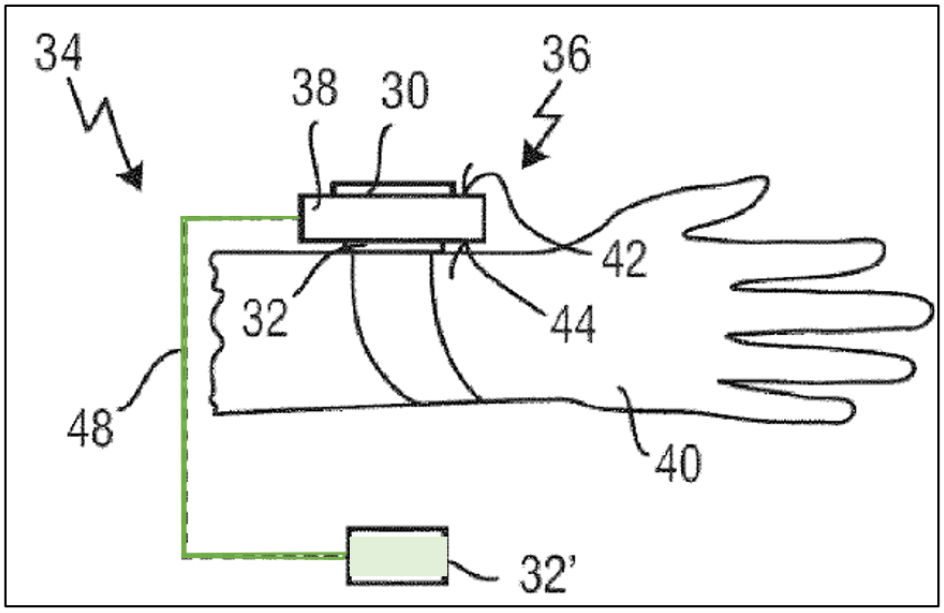


As shown, the system 34 includes a wristwatch-like device 36 with a housing 38 wearable on one wrist or arm of the living being 14. Ex. 1009, 12:22-31. "The first electrode 30 of the electrical sensing unit 28 is arranged on a first surface 42 of the housing 38, whereas the first surface 42 is not in contact with the wrist or arm 40 of the living being 14." *Id.*; *see id.*, FIG. 4A (showing electrode 30 adjacent to the GUI element 46 on the front/top surface). "The second electrode 32 of the electrical sensing unit 28 is arranged on a second surface 44 of the housing 38" that is "opposite to the first surface 42 with respect to the housing 38, so that the second electrode 32 may be configured to be in permanent contact with the skin of the wrist or arm 40." *Id.*; *see id.*, FIG. 4B (showing electrode 32 adjacent to optical sensing unit 12 on the back/rear surface of the wearable device).

In the context of this embodiment, Coppola additionally contemplates that "[b]y placing first electrode 30 not on the front side 42, but on the side of the

watch or on the strap instead, the GUI element 46 can cover the whole front side 42 of the watch." Ex. 1009, 13:17-23. Additionally, in this embodiment, "one or more optical sensors 13, in particular PPG sensors, may be arranged on the second surface 44"—i.e., the rear/back surface that is in contact with the wrist or arm of the living being 14—so that they may measure a heartbeat-related optical signal" from "the wrist or arm of the living being 14." Ex. 1009, 12:32-13:2, FIGS. 4A-4B.

"Alternatively," for the wearable device embodiment, Coppola discloses that "the electrical sensing 28 of the system 34 may comprise a second electrode 32' which is connected to the housing 38 of the wristwatch-like device 36 via connection means 48" such as a cable 48. Ex. 1009, 14:14-16, FIG. 3 (reproduced and annotated below).



The "wired second electrode 32' may be brought into contact with a different body part of the living being 14 such as the chest, the neck, the forehead, the face, the arm, the wrist, the back, the leg, the feet, etc. By bringing the wired second electrode 32' to the hand or the arm 20 or the wrist not wearing the wristwatch-like device 36, an electrical measurement of the HR-variation signal may be performed with two body parts on [sides] lying opposite one another with respect to the heart of the living being 14." Ex. 1009, 14:16-22. Coppola further states that "[a]s an ECG with even more than two electrodes could be valuable, there is also the possibility to have even more electrodes" and in such cases, "it is easy to attach and detach the one or more cables 48 of the one or more electrodes 32' to/from the device to keep the device 36 unobtrusive." Ex. 1009, 14:22-25. "In this embodiment," Coppola states that "the electrode 30 on top of the device and/or electrode 32 on the bottom of the device may be absent." Ex. 1009, 14:25-29.

In a third embodiment, Coppola discloses a device 10 that includes a mobile communication device 50 such as a "smartphone," "a tablet, a calculator, a portable media player, a video camera or a navigation." Ex. 1009, 14:33-15:2.

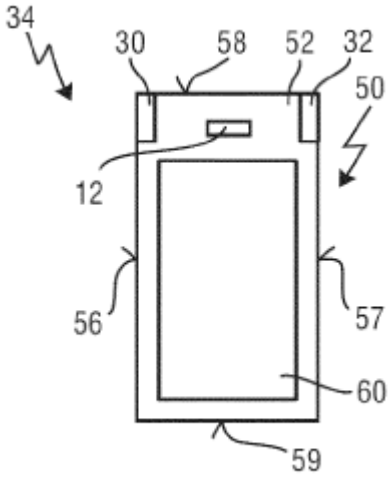


FIG. 5A

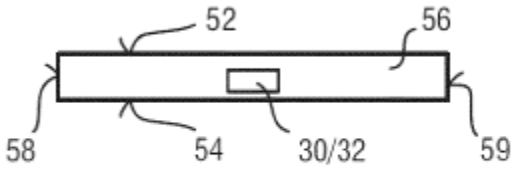


FIG. 5B

In this embodiment, the "first and second electrodes 30, 32 of the electrical sensing unit 28 … are … arranged on a front surface 52 of the mobile communication device 50. Alternatively, the electrical sensing unit 28 may comprise further electrodes, wherein at least two of all electrodes of the electrical sensing unit 28 are arranged on two different surfaces of the mobile communication device 50. In particular, at least one electrode 30, 32 may be arranged on a back surface 54 or a side surface 56, 57, 58, 59," as shown in Fig. 5B (reproduced above; showing electrode on side surface 56). Ex. 1009, 15:2-8.

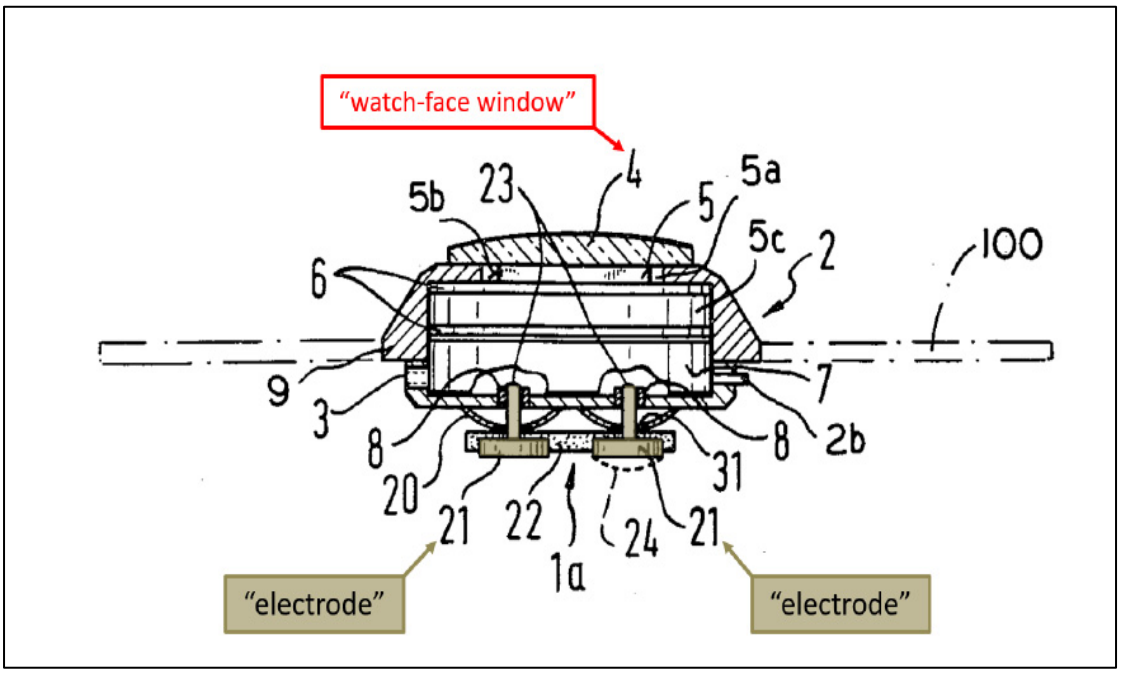
Additionally, the optical sensing unit 12 is shown in FIG. 5A "on the front surface 52"; however, Coppola states that "it can be alternatively arranged on the back surface 54 or one of the side surfaces 56, 57, 58, 59." Ex. 1009, 15:9-15. In one embodiment, "the optical sensing unit 12 includes "a plurality of optical sensors 13 which are arranged at least partially on different surfaces 52, 54, 56, 57,

58, 59." Ex. 1009, 15:11-13. Coppola further discloses that a computer program such as an app may be used to control optical and electrical signal measurements from the optical and electrical sensing units. Ex. 1009, 15:16-16:12.

C. Schmid (Ex. 1029)

Schmid relates to electrodes or electrode assemblies for determining bioelectrical conditions that operate in "association with an apparatus for evaluating and/or plotting such signals as, for example, in EKG evaluations." Ex. 1029, 1:6-11.

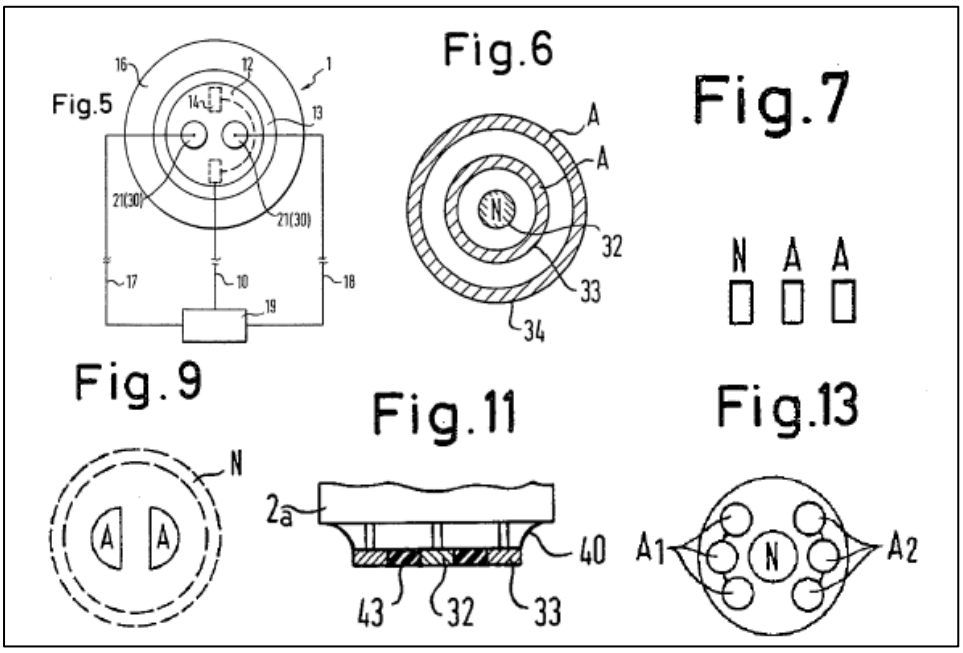
As shown in FIG. 1 below, Schmid provides a heart-frequency measuring assembly that includes "a housing 2 which can be similar to a wristwatch housing or case and which contains the electrodes in an electrode set or a plurality of such electrode sets, which can be connected by cables, contact pins or the like to a conventional recording, evaluation or registration circuit e.g. the electronics of a conventional EKG machine." Ex. 1005, 5:2-10.



Ex. 1029, FIG. 1 (annotated by Petitioner; *see* Petition, 57).

As shown in FIG. 1, the "electrode set 1a comprises two electrodes 21" that "are disposed with a minimum spacing from one another." Ex. 1029, 5:48-51. "These electrodes are held in place … by an insulating material or body 22 which can be a disk, plate or of another configuration or contour." Ex. 1029, 5:52-55. And, a neutral or reference electrode can be embedded in the insulating body. Ex. 1029, 3:16-24.

Schmid describes various configurations of electrode assemblies, which are depicted below:



Ex. 1029, FIGS. 5-7, 9, 11, 13. One such configuration shown in FIG. 5 includes "two measuring or input electrodes 21 or 30" that "are connected by conductors represented at 17 and 18 to an input amplifier 19," and further include the "neutral or reference electrode ring 13" that is "connected by the conductor 10 to the amplifier as well." Ex. 1029, 8:11-23. Schmid further discloses that the neutral or reference electrode "ring 13 can be fitted onto the assembly shown in FIG. 1 or dispensed with entirely when the band 100 or the housing 2 form the neutral electrode." Ex. 1029, 8:24-26.

Schmid's other electrode configurations include: (1) a configuration where the neutral electrode is disposed at the center of a pair of concentric circles formed by active electrodes (as shown in FIG. 6); (2) a configuration with a linear array of electrodes (as shown in FIG. 7); (3) a configuration where active electrodes are

provided in a semicircular configuration (or another configuration, such as square or rectangle) with the neutral electrode N forming a ring around the active electrodes (as shown in FIG. 9); (4) a configuration with an outer electrode ring 33 to which an elastic sleeve 40 is secured, with the sleeve 40 bridging the gap between the ring and the housing 2a to enable relatively flexible movement of the electrode (as shown in FIG. 11), and (5) an electrode configuration that includes six electrode pins forming the active electrodes Al and A2, with the neutral electrode N disposed therebetween (as shown in FIG. 13). Ex. 1029, 8:50-59, 9:3-17, 9:18-27, 9:28-37, 9:57-62. As shown, in each of these depicted configurations, the reference and active electrodes are disposed on the same surface.

VII. THE GROUNDS PRESENTED IN THE PETITION DO NOT RENDER THE CHALLENGED CLAIMS OBVIOUS

A. The Proposed Kotanagi-Coppola Combination Does Not Render Obvious the Challenged Claims

The Challenged Claims include claims 1-20 of the ’483 Patent, of which claims 1, 10, and 16 are independent claims. Each of these independent claims recites that “the wearable electronic device” or “electronic watch” is “configured to measure a second physiological parameter using the first electrode, the second electrode, and the third electrode,” where the first and second electrodes are “positioned along a rear [exterior] surface of the” device/watch and the “third electrode” is “positioned along a side of the” device/watch.

Petitioner contends that these limitations are rendered obvious by the Kotanagi-Coppola combination under two alternative theories. As further described below, both theories fail to demonstrate obviousness of these limitations because Kotanagi and Coppola, alone or in combination, fail to disclose or suggest measuring a second physiological parameter using the claimed arrangement of electrodes (namely, a first and a second electrode positioned on a rear device surface and a third electrode positioned along a side of the device).

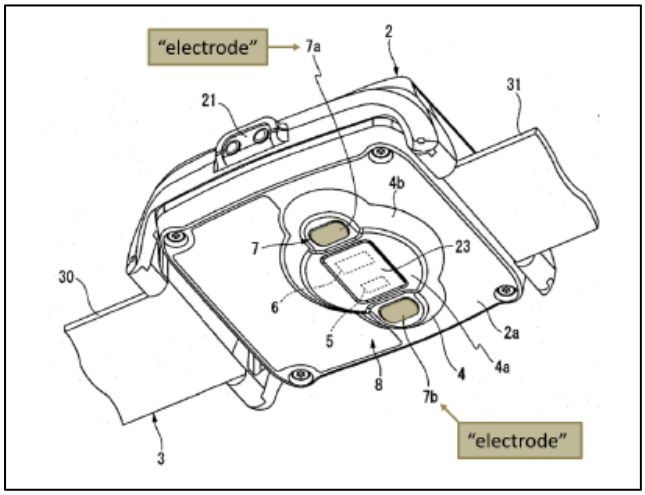
1. Petitioner's First Theory Based on the Kotanagi-Coppola Combination Does Not Render Obvious the Independent Claims

Under Petitioner's first theory, the Kotanagi-Coppola combination renders obvious the above-recited limitations because, per Petitioner, the combination's device would purportedly measure electrocardiography (ECG) (the alleged second physiological parameter) using two electrodes positioned along a rear surface of a wrist-worn device and a third electrode positioned along a side of the device. *See* Petition, 23-32, 36-44, 48-54. As described below, this theory lacks merit because, even if the teachings of Kotanagi and Coppola could be combined, they do not disclose or suggest measuring ECG using the specific configuration of electrodes recited in the claims.

As a starting point, Kotanagi's wrist-worn device does not include the specific configuration of electrodes arranged on the device's rear and side surfaces

(as required by the claims), nor does it teach using electrodes to measure ECG (the alleged second physiological parameter). Instead, and as explained below, Kotanagi's wrist-worn device includes electrodes only on the device's rear surface and those electrodes are used for detecting skin contact (and not for measuring ECG).

In more detail, Kotanagi's device has a "contact detection part" that "includes at least a pair of electrodes," which are depicted on the rear surface of Kotanagi's device as shown in Figure 5 below. Ex. 1005, ¶13, Fig. 5 (reproduced below; annotated by Petitioner at Petition, 23).



Kotanagi's contact detection part, through its electrodes, "detects whether the light-emitting part and the light-receiving part" (which are labeled as 5 and 6 in above image) "are in contact with the living body surface based on a potential difference between the pair of electrodes." Ex. 1005, ¶13. Specifically, Kotanagi

explains that when the device's main body "is mounted to the arm, the pair of electrodes come into contact with the living body surface so that a discharge occurs through the living body surface. As a result, the potential between the electrodes decreases. By detecting the potential difference between the pair of electrodes, it can be easily and reliably detected whether the light-emitting part and the light-receiving part are indeed in contact with the living body surface." *Id.*, ¶14. Thus, the electrodes positioned on the rear surface of Kotanagi's device are used to detect skin contact between the light emitting part and the light receiving part in Kotanagi (which are also positioned on the rear surface of Kotanagi's device) and the wrist/arm of the wearer. *See id.*

Kotanagi further explains that the "electrodes need not be a pair, and a plurality of electrodes, for example, may be provided so that contact can be detected on the potential difference between each of the electrodes." Ex. 1005, ¶14. Even if this disclosure in Kotanagi is interpreted as teaching or suggesting three (or more) electrodes, given the skin contact detection function of the electrodes, Kotanagi's electrodes would be positioned on the rear surface of the device—i.e., the surface that is in contact with the arm/wrist/body of the device wearer. *See id.* Indeed, positioning any of Kotanagi's electrode on a device surface other than the surface that contacts the wrist of the wearer would frustrate the above-described skin contact detection function of Kotanagi's electrodes.

Therefore, Kotanagi does not disclose or suggest any electrodes "positioned along a side" of its wrist-worn device, nor are its electrodes used for ECG measurements.

Petitioner nevertheless contends that, in view of Coppola's teachings, it would have been obvious to modify Kotanagi's device to include an electrode on a side of Kotanagi's device and to use the different electrodes in the device for ECG measurement (which Petitioner contends is the claimed second physiological parameter). *See, e.g.*, Petition, 23-32. This argument is flawed for two reasons.

First, and as explained above, Kotanagi does not disclose or contemplate any ECG capability, nor does it disclose or suggest electrode positioning on any surface other than the device's rear surface. As such, even if there are health benefits stemming from measuring electrocardiography, as Petitioner asserts (Petition, 27-28), the Petition fails to demonstrate how such functionality would be implemented in Kotanagi's device. In particular, even if additional electrodes could be added to Kotanagi's device in view of Coppola (as Petitioner alleges), the Petition and the associated expert testimony does not explain how the device would be configured to leverage the existing electrodes and any additional electrodes—which are only used for skin contact detection in Kotanagi—to now also enable ECG measurements. *See* Petition, 23-32.

***Second*,** notwithstanding the above deficiency and even assuming *arguendo* that Coppola's teachings would have resulted in (1) implementing ECG capability in Kotanagi's device and (2) adding a third electrode to the device's side surface, Kotanagi and Coppola (alone or in combination) do not contemplate ECG measurements using two electrodes on the rear surface of the device and a third electrode positioned along a side of the device, as required by the claims.

As explained above, Kotanagi does not disclose any ECG functionality and thus, it follows that Kotanagi also does not disclose any ECG measurements that are performed using the rear electrodes of its device (which are only used for skin contact detection). And, while Coppola contemplates measuring ECG using electrodes and even assuming *arguendo* that Coppola teaches positioning an electrode on the device's side surface, Coppola does not disclose any embodiments in which ***two electrodes on a rear surface of the device*** and a side electrode are used to measure ECG. At best, Coppola only discloses a wrist-worn device where ***a single rear surface electrode and a side surface electrode*** are used for measuring ECG. This is confirmed by the various disclosures in Coppola, which are summarized and discussed below.

Beginning first with Coppola's wrist-worn device embodiments (shown in Figs. 3, 4A-4B), Coppola discloses a single rear surface electrode and a single front surface electrode for ECG measurements. For example, when describing an

embodiment of the wrist-worn device, Coppola discloses: "The ***first electrode 30*** of the electrical sensing unit 28 ***is arranged on a first surface 42 of the housing 38***, whereas the first surface 42 ***is not in contact with the wrist or arm 40*** of the living being 14. The second electrode 32 of the electrical sensing unit 28 is arranged on a second surface 44 of the housing 38. ***The second surface 44 may be opposite to 30 the first surface 42 with respect to the housing 38, so that the second electrode 32 may be configured to be in permanent contact with the skin of the wrist or arm 40***." Ex. 1009, 12:22-31.

Using this configuration of an electrode on the front surface of the device and another electrode on the rear surface, Coppola discloses ECG measurement based on contact of the rear surface electrode with the wrist on one hand and contact of the front surface electrode with the finger of the other hand. *See* Ex. 1009, 14:3-5, 6:16-25 (taking ECG measurements using measurements from one rear surface electrode contacting the wrist of one hand and another electrode touched by a finger on the other hand of the wearer), 5:30-32 ("to measure ECG, the first and second electrodes are separately contacted or contactable to two body parts on sides lying opposite one another with respect to the heart of the user").

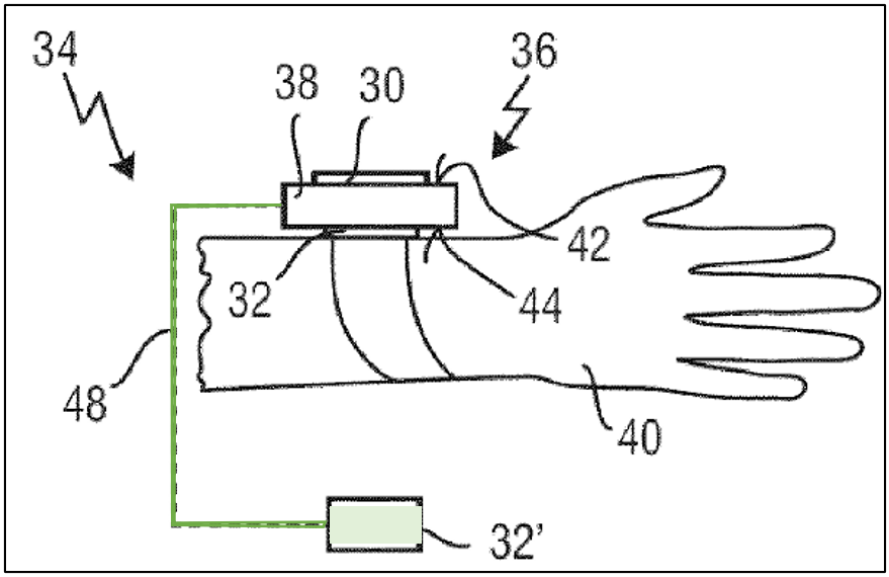
Moreover, as part of its description for this wrist-worn device embodiment, Coppola also contemplates replacing the first electrode on the first/front surface (that is not in contract with the wrist or arm) with an electrode on the side surface

of the device. Ex. 1009, 13:21-24 ("***By placing first electrode 30 not on the front side 42, but on the side of the watch*** or on the strap instead, the GUI element 46 can cover the whole front side 42 of the watch."). This disclosure would thus result in the front surface electrode being replaced with an electrode on the side, while retaining the single electrode on the rear surface. *See id.* Thus, even with this modification, an ECG measurement is performed using only ***a single rear*** surface electrode and a single side surface electrode. Ex. 1009, 14:3-5, 6:16-32

Coppola further contemplates an alternative embodiment for the above-described wrist-worn device, where electrodes are connected to the device via a cable connection to the side of the watch:

> *Alternatively, the electrical sensing 28 of the system 34 may comprise a second electrode 32' which is connected to the housing 38 of the wristwatch-like device 36 via connection means 48. In particular, the connection means 48 may comprise a cable 48. The wired second electrode 32' may be brought into contact with a different body part of the living being 14 such as the chest, the neck, the forehead, the face, the arm, the wrist, the back, the leg, the feet, etc. By bringing the wired second electrode 32' to the hand or the arm 20 or the wrist not wearing the wristwatch-like device 36, an electrical measurement of the HR variation signal may be performed with two body parts on size lying opposite one another with respect to the heart of the living being 14…. In this embodiment, the electrode 30 on top of the device and/or the electrode 32 on the bottom of the device may be absent.*

Ex. 1009, 14:14-29; Fig. 3 (reproduced below; annotated to show second electrode 32' connected via cable to side of device)



However, in this alternative embodiment and as shown above, the second electrode 32' is not positioned on the side of the device and is instead connected via a cable to the side of the device (as shown in FIG. 3 above). Nevertheless, even assuming *arguendo* that the cable-based connection of the electrode to a side surface is considered an electrode positioned on the device (which it is not), the ECG measurements in this embodiment would still be performed ***using the single rear surface electrode and the electrode connected by a cable to the side***—instead of using two electrodes positioned on a rear surface of the device and a third electrode position on a side of the device, as required by the claims. Ex. 1009, 14:3-5, 6:16-32, 5:30-32.

Going further, for this alternative embodiment involving cable-connected electrodes, Coppola additionally discloses that "[a]s an ECG with even more than two electrodes could be valuable, there is also a possibility to have even more electrodes." Ex. 1009, 14:22-23. Again, however, this disclosure is provided in the context of cable-connected electrodes rather than electrodes positioned on the housing of the watch. Also, because such cable-connected electrodes would need to be connected to the watch via an accessible surface while the device is worn by the user, the connection(s) would be made to the accessible side or top surfaces, but not the inaccessible rear surface that is in contact with the wrist or arm of the wearer. *See id.* This is confirmed by Fig. 3 of Coppola (reproduced above), which only illustrates an electrode connected via a cable to a side of the device. Thus, even in this alternative embodiment, a single electrode is positioned on the rear surface, further confirming that Coppola does not disclose ECG measurements that use ***two*** rear surface electrodes (in addition to an electrode positioned on a side of the device).

Petitioner also cites to Coppola's teachings with respect to its FIG. 5 embodiment relating to "mobile communication devices" and ECG measurements in the context of such devices. *See* Petition, 26. As an initial matter, Coppola explains that these devices are different from the wearable device described with reference to FIG. 3, and instead include a "smartphone," "a tablet, a calculator, a

portable media player, a video camera or a navigation device." *See* Ex. 1009, 14:31-16:12. Indeed, Coppola itself appears to acknowledge these differences by providing descriptions of electrode positioning in the context of mobile communication devices that are separate and different from descriptions related to wrist-worn devices. *Compare* Ex. 1009, 12:22-14:30, *with id.*, 14:31-16:12. Therefore, in the context of Coppola, its teachings of electrode positioning on different surfaces of such devices has limited applicability to its separately disclosed wearable wrist-worn devices shown in Coppola's FIG. 3 (and of similar such devices disclosed in Kotanagi). Nevertheless, even if the teachings with respect to mobile communication devices are considered as applicable in the context of wrist-worn devices at issue in the presented combination, Coppola's disclosures confirm that these devices have an "ECG unit" with only a single rear surface electrode (and an electrode on another surface). For example, Coppola discloses that the ECG unit of such device has "first and second electrodes 30, 32" "arranged on a front surface 52" or alternatively, these devices can include "at least two of all electrodes of the electrical sensing unit 28" arranged "on two different surfaces of the mobile communication device 50" where at least one electrode 30, 32 may be arranged on a back surface 54 or a side surface 56, 57, 58, 59, as shown in Fig. 5B." Ex. 1009, 15:2-8.

Thus, even if the totality of Coppola's disclosures are understood to teach ECG measurements via electrodes that are positioned on different surfaces of the device, none of Coppola's disclosures contemplate ECG measurements using a side surface electrode ***and two electrodes on the rear surface*** of the device, as required by the claims.

Indeed, Coppola discloses that each of its electrodes is intended to be contacted by a different body part. *See* Ex. 1009, 14:3-5, 6:16-32 (taking ECG measurements using measurements from one rear surface electrode contacting the wrist of the first hand and another electrode touched by one or more fingers on the second hand), 5:30-32 ("to measure ECG, the first and second electrodes are separately contacted or contactable to two body parts on sides lying opposite one another with respect to the heart of the user"). As such, there would be no need to provide two electrodes on a rear surface that contact the same body part (e.g., the wrist or the arm to which the device is attached)—further confirming why Coppola's disclosures only contemplates wrist-worn devices that include a single electrode on the rear surface of the device.

In view of the above teachings in Coppola, even if Kotanagi's wrist-worn device would have been modified to include a third electrode on the side of Kotanagi's device (which Patent Owner disputes), there is no teaching or suggestion in Coppola or Kotanagi for measuring ECG (i.e., the alleged second

physiological parameters) using an electrode positioned along a side surface of the device ***and two electrodes*** positioned along the rear surface of the device.

On this record, Petitioner has failed to make a *prima facie* showing of obviousness with respect to the claim limitation requiring measurement of the alleged second physiological parameter (ECG) ***using first and second electrodes positioned on a rear surface of the device and a third electrode positioned along a side of the device***.

2. *Petitioner's Second Theory Based on the Kotanagi-Coppola Combination Does Not Render Obvious the Independent Claims*

Petitioner additionally appears to argue that the Kotanagi-Coppola combination renders obvious the above-recited limitations because, per Petitioner, Kotanagi's wrist-worn device measures a potential difference between electrodes disposed on the device's rear surface and this potential difference is allegedly the claimed "second physiological parameter." *See* Petition, 27-28. This argument also fails to render the limitations at issue obvious for the below-described reasons.

As an initial matter, a potential difference between electrodes is not a physiological parameter. The '483 Patent confirms that signals received from electrodes (such as, e.g., a potential difference) are different from the physiological parameters. *See, e.g.*, '483 Patent, 41:67-42:3 ("The 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."); Ex. 2007, 4:51-67 (Masimo patent explaining that "physiological parameters" can be "***derived from signals output*** from optical and/or acoustic sensors, ***electrodes***, or the like"). A potential difference between electrodes is thus not a "physiological parameter" under the plain meaning of this claim phrase in the context of the '483 Patent.

Even assuming *arguendo* that a potential difference is considered a physiologic parameter (which it is not), Kotanagi only contemplates measuring a potential difference between electrodes positioned on its device's rear surface—as opposed to electrodes positioned on a rear surface and an electrode positioned on a side of the wearable device/watch. Ex. 1005, ¶¶13-14, FIG. 5; *see* §VII.A.1 *supra*. Indeed, Kotanagi uses potential difference to detect whether the device's optical elements, which are positioned on the rear surface, are in contact with the body. *See id.* Thus, Kotanagi's teachings confirm that its device would not use an electrode on a side surface (even if such an electrode could be added to the device) for any potential difference measurements given that such measurements are intended to inform whether there is contact between the rear surface optical elements and the wearer's body (e.g., the arm or wrist). *See id.*

For at least the above reasons, Petitioner has failed to demonstrate that the Kotanagi and Coppola-based grounds render obvious a device/watch that is

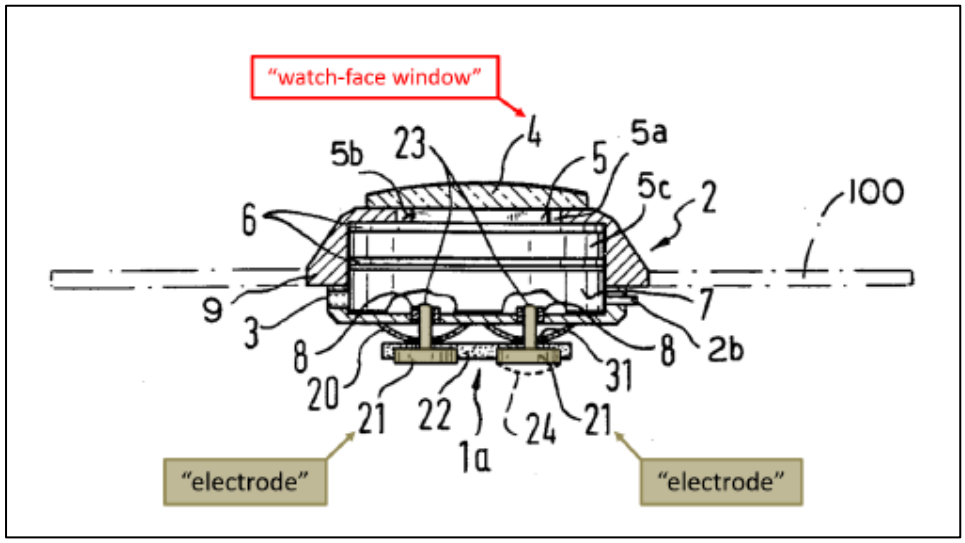
configured to measure a second physiological parameter using the particular arrangement of electrodes recited in the claims. Therefore, Petitioner has failed to make a *prima facie* showing of obviousness that the of the independent claims (and any claims depending therefrom) in view of the Kotanagi and Coppola-based grounds.

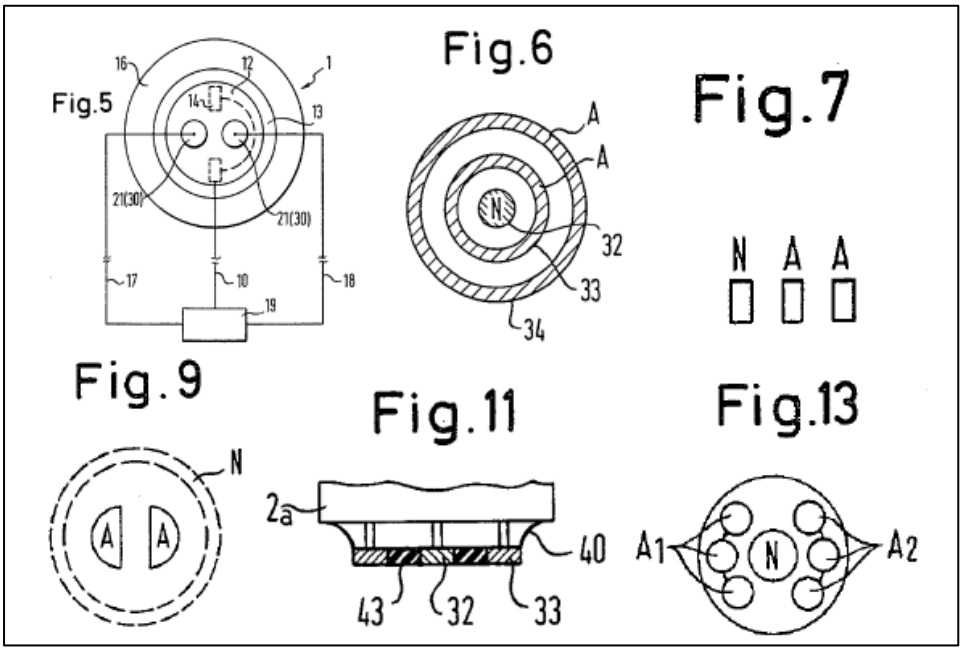
B. The Proposed Kotanagi-Schmid Combination Does Not Render Obvious the Challenged Claims

The proposed Kotanagi-Schmid combination also does not render obvious a "wearable electronic device" or "electronic watch" that is "configured to measure a second physiological parameter" using the particular arrangement of electrodes recited in the claims, i.e., using a first and a second electrode positioned on a rear device/watch surface and a third electrode positioned along a side of the device/watch.

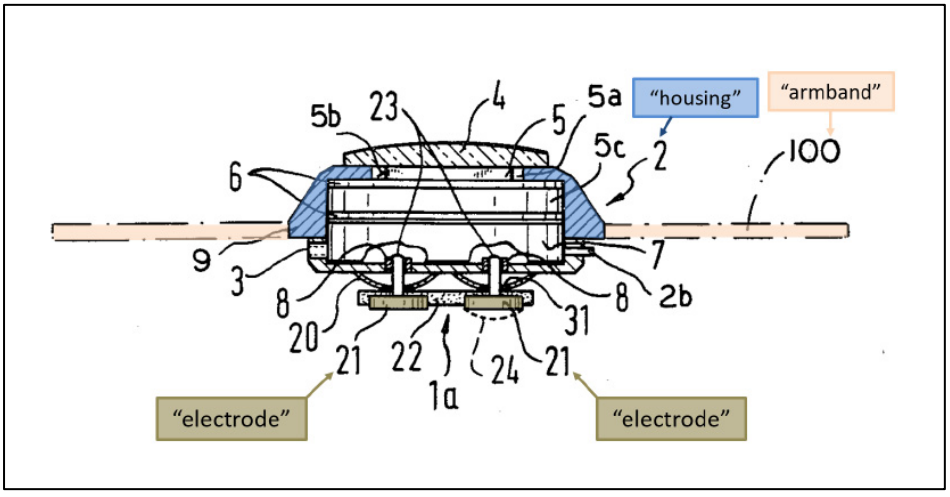
First, as described above in §VII.A, Kotanagi's wrist-worn device does not include the particular configuration of electrodes arranged on the device's rear and side surfaces (as recited in the claims), nor does it teach using electrodes to measure ECG. *See* Ex. 1005, ¶¶13-14, FIG. 5. Instead, and as explained above, Kotanagi's wrist worn device includes electrodes only on its rear surface and those electrodes are used for detecting skin contact (and not for measuring ECG). *See id.*

Second, contrary to Petitioner's assertions, Schmid does not disclose electrodes on a side surface of its wrist-worn device. Schmid describes multiple embodiments, each of which provide the measurement/active electrodes and the reference/neutral electrode on the same surface (i.e., the rear surface)—instead of being positioned on a rear surface ***and along a side of the device***. *See, e.g.*, Ex. 1029, FIGS. 1, 5-7, 9, 11, 13 (reproduced below; FIG. 1 annotations added by Petitioner).





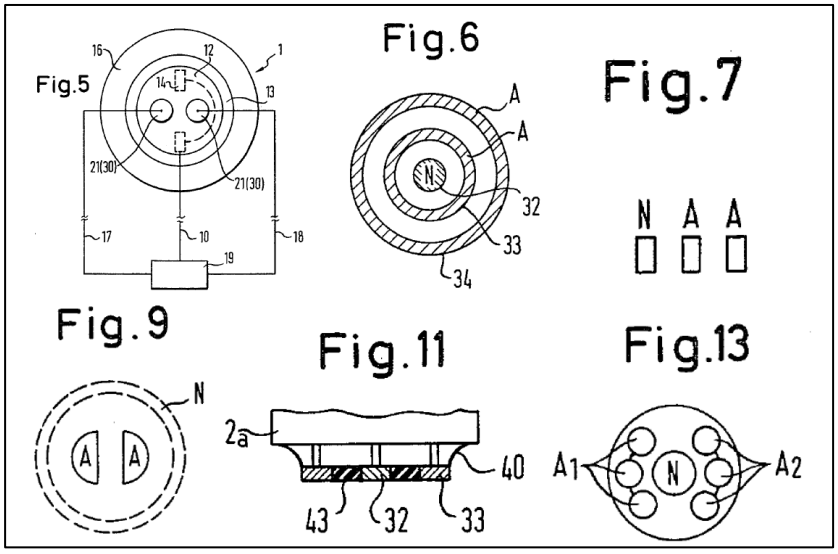
Petitioner nevertheless contends that Schmid contemplates positioning an electrode on a side surface based on its disclosure that (1) the reference electrode can be formed in the armband and/or the housing 2, and (2) in doing so, the reference electrode formed by ring 13 (as shown in FIG. 5 above) can be dispensed with entirely. Petition, 59 (citing Ex. 1029, 8:24-26; Petitioner providing below annotated FIG. 1 of Schmid in association with the above assertion).



Contrary to Petitioner's above assertion, and for reasons explained below, Schmid's disclosures of the reference electrode being formed in the band or the housing do not teach or suggest an electrode "positioned along a side of the" device/watch, as required by the claims.

Schmid's teaching of the reference/neutral electrode 13 being formed by the wristband of the device does not teach or suggest an electrode "positioned along a side of the" device/watch, as required by the claims. During prosecution, Applicant distinguished electrodes formed in a band of a wrist-worn device from an electrode "positioned along a side of the" device/watch, as recited in the claims. *See, e.g.*, Ex. 1002, 144-145 (in the case of the Hong reference applied during prosecution, Applicant argued that "moving electrodes from a band to a rear and a side of the device would require significant reengineering of the 'portable monitoring device,' including its existing optical sensor"), 38-41 (crediting this argument in the Notice of Allowance, in finding that the "prior art fails to describe the configuration of electrodes as presently recited with respect to the locations on the housing"); *see* §III.A *supra*. Thus, the prosecution history confirms that an electrode provided in a band of a wearable device/watch is not an electrode "positioned along a side of" the device/watch, as required by the claims.

Additionally, Schmid's teaching of the reference/neutral electrode 13 being "dispensed with entirely" when the "housing 2 form[s] the neutral electrode" (Ex. 1029, 8:24-26, 5:20-22) does not teach or suggest that that electrode is "positioned along a side of the" device/watch, as required by the claims. As described above, each of Schmid's described embodiments contemplates the reference electrode being provided on the same surface as the active electrodes.



Indeed, each reference electrode (identified by N) in the above-depicted embodiments) is on a surface that contacts the same body part as the active/measurement electrodes. Ex. 1029, 8:50-59, 9:3-17, 9:18-27, 9:28-37, 9:57-62, 5:45-51. This is also the case for the ring-shaped reference electrode 13 (as shown in the FIG. 5 embodiment above), which is on the same surface as the active electrodes. Ex. 1029, 8:11-26. Thus, the totality of Schmid's disclosures teach that the reference electrode is provided on a surface that is in contact with the same

body part as the other active electrodes. Given these disclosures then, Schmid's reference electrode formed by the housing would not be an electrode positioned along a side surface of the device that does not even contact the body—and instead, would be formed on a surface that is in contact with the body such as the same rear surface of the housing on which the electrode in the form of ring 13 is already provided. *See id.*

Thus, even assuming *arguendo* that Schmid's reference electrode is an electrode that is used to measure ECG, Schmid does not disclose or suggest a device that measures ECG using two electrodes on a rear surface of the device ***and a third electrode positioned on a side of the device***, as required by the claims. Therefore, even if Kotanagi's device would be modified to include a third electrode, neither Kotanagi nor Schmid's teachings (alone or in combination) motivate or suggest positioning that electrode along a side of Kotanagi's device. Instead, and at best, Schmid's teachings would suggest positioning such an electrode on the same rear surface on which the other two electrodes are positioned.

Third, even assuming *arguendo* that a third electrode would be positioned on the side of Kotanagi's device in view of Schmid's disclosures (which is refuted by the above analysis), the resulting combination would still not disclose or suggest a "***wearable electronic device [that] is configured to measure***" ECG (i.e.,

the alleged second physiological parameter). As described above, Kotanagi's wrist-worn device does not include ECG functionality, so it follows that its device is not configured to measure ECG. And, while Schmid's electrodes are used to measure ECG, Schmid's wrist-worn device is not configured to measure ECG. In particular, Schmid's electrodes on its wrist-worn device are coupled to a separate apparatus that is configured to measure ECG and thus, its wrist-worn device itself is not "configured to measure" ECG signals. *See, e.g.*, Ex. 1029, 1:6-11 (the "invention relates to … electrode assemblies adapted to determine bioelectrical conditions, ***especially in association with an apparatus for evaluating and/or plotting such signals as, for example, in EKG evaluations***"), 5:3-10 ("The heart-frequency measuring assembly shown in FIG. 1 comprises a housing 2 which can be similar to a ***wristwatch housing or case and which contains the electrodes*** in an electrode set or a plurality of such electrode sets, ***which can be connected by cables, contact pins or the like to a conventional recording, evaluation or registration circuit e.g. the electronics of a conventional EKG machine***."), 6:29-35 ("The housing 2 is also provided with contact sleeves 3 ***enabling the cable connection between the electrodes and a remote circuit, e.g. an EKG machine,*** for use especially when the electrodes are applied to other body portions.").

As such, neither Kotanagi nor Schmid teaches or suggestes a device that is configured to measure ECG, and the Petition has failed to demonstrate how such

functionality would nevertheless be implemented in Kotanagi's device. *See* Petition, 56-62; *see, e.g.*, Ex. 1001, claim, 1, 16 (reciting that "the wearable ***electronic device is configured to measure a second physiological parameter*** using the first electrode, the second electrode, and the third electrode"), claim 10 ("***the electronic watch is configured to measure a second physiological parameter*** using the first electrode, the second electrode, and the third electrode"). Thus, even if additional electrodes could be added to Kotanagi's device in view of Schmid (as Petitioner alleges), the Petition and the associated expert testimony does not explain how the device would be configured to leverage the existing electrodes and any additional electrodes to perform ECG measurements. *See id.*

For at least the above reasons, Petitioner has failed to demonstrate that the Kotanagi and Schmid-based grounds render obvious a device/watch that is configured to measure a second physiological parameter using the particular arrangement of electrodes recited in the claims. Therefore, Petitioner has failed to make a *prima facie* showing of obviousness that the of the independent claims (and any claims depending therefrom) in view of the Kotanagi and Schmid-based grounds.

VIII. THE KOTANAGI AND SCHMID-BASED GROUNDS (GROUNDS 2 AND 5-7) SHOULD BE DISCRETIONARILY DENIED UNDER § 325(D)

The PTAB uses the following two-part framework to determine whether to exercise its discretion to deny institution of an *inter partes* review under § 325(d): (1) whether the same or substantially the same art previously was presented to the Office ***or*** whether the same or substantially the same arguments previously were presented to the Office; and (2) if ***either condition*** of first part of the framework is satisfied, whether the petitioner has demonstrated that the Office erred in a manner material to the patentability of challenged claims. *Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6 at 7-9 (PTAB Feb. 13, 2020).

As explained below, Petitioner has failed to meet its burden under both parts of the *Advanced Bionics* framework because (1) the Petition advances references like Kotanagi and Schmid, which are substantially the same as the art previously presented to and considered by the Examiner during prosecution and (2) Petitioner has not demonstrated that the Office erred in a manner material to the patentability of challenged claims. Therefore, the Kotanagi and Schmid based grounds—which include Grounds 2 and Grounds 5-7 as they relate to the Kotanagi and Schmid combination—should be discretionarily denied under §325(d). *See Google LLC v. Valtrus Innovations Ltd.*, IPR2022-01197, Paper 18, 11-28 (PTAB June 13, 2023)

(exercising discretion under §325(d) to deny institution with respect to three of the eight grounds presented in the Petition, where the three grounds were based on substantially the same art that was previously presented during prosecution and Petitioner failed to demonstrate material error during prosecution).

A. Substantially the Same Prior Art as Kotanagi and Schmid Were Previously Presented to the Patent Office During the '483 Patent's Prosecution

Petitioner argued that the Petition should not be discretionarily denied under Section 325(d) because the Petition "presents ***new prior art*** and new patentability arguments that have never previously been before the Office." Petition, 82. Petitioner's arguments fail the first part of the *Advanced Bionics* framework, under which the critical inquiry is not whether "***new*** prior art" and "new" arguments are being presented in the petition. Rather, the first part of the *Advanced Bionics* framework is satisfied when the Petition raises the "***same or substantially the same***" art or arguments as previously presented to the Office, as is the case here.

As explained below, the first part of the *Advanced Bionics* framework is satisfied here because the Kotanagi and Schmid references relied upon in Ground 2 and Grounds 5-7 are substantially the same as those previously presented to the Office.

Specifically, references applied in a rejection during prosecution are cumulative of the Kotanagi reference applied in the Petition. Per Petitioner,

Kotanagi allegedly teaches a wrist-mounted device that includes optical elements (e.g., LEDs and photodetector) positioned below a cover over a rear opening in the device housing. *See* Petition, 15-21. Per Petitioner, Kotanagi also discloses electrodes in its device. *See id.* Similarly, during prosecution, Hong was applied in a rejection, with the examiner finding that Hong also discloses a wrist-mounted device that includes a housing, a display, a rear cover, optical elements (e.g., LEDs and photodetector) positioned below a cover over a rear opening in the device housing. Ex. 1002, 703-709; *see* §III.A *supra*; *see also* §III.B *supra* (Hong was also applied during the related '491 Patent's prosecution). Hong also discloses electrodes in its device and is stronger than Kotanagi in that, unlike Kotanagi, Hong was found to teach or suggest ECG measurements. *See id.*

Schmid is applied in the Petition for the teaching of a device that allegedly measures ECG and that allegedly includes electrodes on side and rear surfaces of the device to facilitate such measurements. Petition, 56-59. While appearing to contend that Schmid is new (*see* Petition, 82), Petitioner omits that U.S. Patent No. 4,448,199 to Schmid (Schmid II; Ex. 2002)—which is a continuation-in-part of the Schmid reference applied in the Petition and has the same named inventor—was identified and considered during prosecution. *See* Ex. 1001, p. 2; Ex. 1002, 867, 795-818 (showing Schmid listed on page 796 without any additional markings, with comment at the bottom of the page stating "ALL REFERENCES

CONSIDERED EXCEPT WHERE LINED THROUGH"); *Peloton Interactive, Inc. v. iFIT, Inc.*, IPR2022-00029, Paper 13 (PTAB Apr. 22, 2022) (references cited on an IDS that are expressly considered by the examiner constitute as previously presented art under the *Advanced Bionics* framework).

Petitioner also omits that Schmid II was applied in a rejection during the prosecution of the earlier and related patent, the '491 Patent. *See Becton, Dickinson & Co. v. B. Braun Melsungen AG*, IPR2017-01586, Paper 8, at 22-24 (PTAB Dec. 15, 2017) (designated Informative on March 21, 2018) (denying institution under §325(d) at least in part based on substantive consideration of the Petition's references in a parent of the patent at issue). Indeed, Petitioner addressed the '491 Patent's prosecution in the IPR2023-00734 proceeding, and that prosecution history revealed the Examiner's reliance on Schmid II's similar ECG and electrode teachings. Ex. 2005, 1124; *see* §III.B *supra*.

Thus, Petitioner was on notice of Schmid II and its substantial similarity given that Schmid II (1) lists the same inventor as and is related to the Schmid reference relied upon in the Petition, (2) was considered during prosecution of the present case as well as the prosecution of the related '491 Patent, and (3) includes substantially the same disclosures that the Petition now relies upon in view of Schmid. Indeed, the cumulativeness of Schmid and Schmid II is further confirmed

by the below table, which includes a listing of Schmid's teachings that are relied upon in the Petition and the corresponding teachings provided in Schmid II:

SCHMID (APPLIED IN PETITION)	SCHMID II (CONSIDERED DURING PROSECUTION)
Ex. 1029, Figs. 1, 5-13	Ex. 2002, Figs. 1, 5-14
Ex. 1029, 5:3-10	Ex. 2002, 5:24-31
Ex. 1029, 1:14-16, 2:5–9.	Ex. 2002, 1:19-21, 2:20-25
Ex. 1029, 4:15-22	Ex. 2002, 4:36-43
Ex. 1029, 6:36	Ex. 2002, 6:56
Ex. 1029, 5:20-22	Ex. 2002, 5:41-43
Ex. 1029, 8:24-26	Ex. 2002, 8:39-41

The cumulativeness of the Schmid and Kotanagi references to the art of record is further confirmed by the fact that these references not only have substantially the same disclosures as the art of record, but also have the same deficiencies as the art of record given their failure to disclose the particular configuration of electrodes that led to allowance of the claims—namely, first and second electrodes positioned along a rear surface of the device and a third electrode positioned along a side of the device. *See* §VII.B *supra*.

For at least the above reasons, the references considered during prosecution are substantially the same as and cumulative of the Kotanagi and Schmid references that are applied in the Grounds 2 and 5-7 of the Petition.

B. Petitioner Has Not Demonstrated Any Error Material to Patentability

Because the first prong of the *Advanced Bionic* framework is satisfied, Petitioner bears the burden to demonstrate the second prong of this framework,

namely "that the Office erred in a manner material to the patentability of challenged claims" of the '483 Patent. As explained below, Petitioner has not demonstrated an error material to patentability.

As described above, the Petition's references are cumulative of the art of record and they suffer from the same deficiencies because they fail to disclose or suggest the features that led to allowance. Specifically, the art of record—including Hong, Lo, and Schmid II—was found to not disclose the particular configuration of electrodes recited in the claims—namely, first and second electrodes positioned along a rear surface of the device and a third electrode positioned along a side of the device. *See* §§III.A-III.B *supra*. Similarly, and as explained above in §VII.B, Kotanagi and Schmid—alone or in combination—also do not disclose this claimed configuration and the underlying limitations discussed therein.

Against this backdrop, Petitioner bears the burden to demonstrate why, given the substantial similarity of the disclosures between the Petition's references and the art of record and the similar deficiencies in both, the Examiner nevertheless erred in allowing the claims. Petitioner only argues that the references presented in the Petition are "materially better than the references considered during examination because … they disclose every limitation of the independent claims, including ECG electrodes on various surfaces of a biosensing

watch, a touchscreen display, a rear sapphire cover, wireless charging, and other features." Petition, 82. Patent Owner respectfully disagrees with Petitioner's assertions of error during prosecution, for the reasons explained below.

First, Petitioner asserts error because, unlike the art of record, Kotanagi and Schmid allegedly disclose ECG electrodes on "various surfaces of a biosensing watch." This is incorrect. As described above in §VII.B *supra*, neither Kotanagi nor Schmid discloses a biosensing watch that includes electrodes on "various surfaces"—namely first and second electrodes positioned on a rear surface of the device and a third electrode positioned along a side of the device, as recited in the claims.

Indeed, as explained above, Kotanagi's electrodes are not even used to measure ECG and instead are used to detect contact between electrodes (and optical sensors) and the wrist/body of the wearer. Ex. 1005, ¶¶13-14, FIG. 5. Further still, Kotanagi's electrodes are only provided on the rear surface of the device—rather than on "various surfaces." *See id.* And while Schmid's electrodes are used for measuring ECG, Schmid—like Kotanagi—contemplates electrode positioning on a single surface (i.e., a rear device surface) or a surface that contacts the wearer (i.e., a surface other than a side surface that does not contact the body). Thus, even if Kotanagi and Schmid's teachings were combined, they do not disclose or suggest ECG measurements using first and second electrodes on a rear

device surface and a third electrode positioned along a side of the device. Nor do they disclose that the combination's alleged device/watch is configured to measure ECG (i.e., the alleged second physiological parameter). In this regard, and contrary to Petitioner's assertion, the teachings of Kotanagi and Schmid are deficient in the same manner as the art of record.

Second, Petitioner's next assertion of error is that, unlike the art of record, the petition's references disclose a "touchscreen display." This assertion also fails. The relevant claim limitation of "touch-sensitive display" is only recited in claim 16, which has not been challenged in view of the Kotanagi and Schmid-based grounds. As such, this alleged identification of material error is inapplicable in the context of the grounds based on the Kotanagi-Schmid combination. Nevertheless, even if this assertion is considered, there was no error during prosecution with respect to the "touch-sensitive display" limitation. That's because, during prosecution, the Examiner determined that this limitation was disclosed by the Hong reference. Ex. 1002, 703-704 (finding that Hong discloses "a wearable watch for biometric monitoring" with "a housing" having a "front surface" where a "display" is provided, with the display "include[ing] [a] capacitive touch detection to make the display touch sensitive.") (internal citations omitted). To the extent that Petitioner asserts that there was error during prosecution in the examiner's

finding of a "touch-sensitive display" in the art of record, Petitioner had the burden to articulate what that error was. Petitioner failed to do so here.

Third, Petitioner's next assertion of error is that, unlike the art of record, the petition's references disclose a "rear sapphire cover." This assertion also fails. The claim limitation of "rear cover comprises sapphire" is only recited in claim 15, which is challenged in Ground 3 of the Petition. However, Ground 3 does not implicate the Kotanagi and Schmid combination. As such, this alleged identification of material error is inapplicable in the context of the grounds based on the Kotanagi-Schmid combination (i.e., Grounds 2, 5-7). Nevertheless, even if this assertion is considered, there was no error during prosecution with respect to this limitation. That's because, during prosecution, the Examiner determined that this limitation was disclosed by the combination of Hong and Memering. Ex. 1002, 706-707. Specifically, the Examiner determined that:

> *Hong et al. is considered to substantially suggest the invention as claimed, including a convex cover portion comprising an optically transparent window, such as a lens, for light transmission (para 153-154). However, Hong et al. does not teach that the lens material is sapphire.* ***Memering et al. teaches that sapphire is a suitable transparent material for manufacturing as a cover and as improved resistance to scratches and damage*** *(abstract and para 5, 20 ,26). In view of these properties, sapphire is considered a suitable material for the claimed intended use. Therefore,* ***modification of Hong et al. to use***

> ***sapphire for the convex covering of the optical sensor is considered to have been obvious to one of ordinary skill in the art since Memering et al. teaches the suitability of the material for the intended use****, and it has been held by the reviewing courts that where the selection of a preferred material for an intended use only requires routine skill in the art.*

Ex. 1002, 706-707. To the extent Petitioner asserts that there was error during prosecution in the examiner's finding that the art of record renders obvious a rear sapphire cover, Petitioner had the burden to articulate what that error was. Petitioner failed to do so here.

Fourth, Petitioner's last assertion of error is that, unlike the art of record, the petition's references disclose "wireless charging." This assertion also fails. Hong, which was applied during prosecution, discloses wireless charging. Specifically, Hong discloses (Hong, ¶306):

> ***In another embodiment, the biometric monitoring device may contain one or more electromagnets in the biometric monitoring device body. The charger or dock for charging and data transmission may also contain an electromagnet and/or a permanent magnet. … In some embodiments, the charger or dock may include the electromagnet and may be configured (e.g., a processor in the charger or dock may be configured via program instructions) to turn the electromagnet on when a biometric monitoring device is connected for charging (the electromagnet may normally be left on such that a biometric monitoring device that is placed on the charger is drawn against the***

> ***charger by the electromagnet, or the electromagnet may be left off until the charger determines that a biometric monitoring device has been placed on the charger****, ... Upon completion of charging (or of data transfer, if the charger is actually a data transfer cradle or a combined charger/data transfer cradle), the electromagnet may be turned off (either temporarily or until the biometric monitoring device is again detected as being placed on the charger) and the biometric monitoring device may stop being drawn against the charger….*

Moreover, during prosecution of the earlier and related '491 Patent (the application for which was examined by the same examiner that examined the application for the '483 patent), the examiner found Hong to disclose wireless charging. Specifically, there, the Examiner determined that:

> ***Hong et al. also teaches that the wearable electronic device includes an internal rechargeable battery wherein the device may engage a charger such as a docking station using magnetic properties*** *between magnets located in the charger and wearable device to facilitate battery recharge (para 305 and 306). The transmission of recharge energy from the charger may be wireless (para 306). However, Hong et al. is not clear if there is a recharging receive coil located within the device to receive charging energy.* ***Mistry et al., similar to Hong et al., describes a wearable sensing device with similar charging features (para 125-129). To facilitate charging of the device, the wearable device or band may include an antenna or coil located therein to receive recharging energy from the charger and is positioned to properly align with the charger coil to optimize power transfer (para***

> ***128). The antenna of Mistry et al. is considered similar to the coil as claimed. Both Hong et al. and Mistry et al. are considered to teach the necessary elements, or suitable equivalents, for functionally providing wireless energy transfer for recharging the battery****.*

Ex. 2005, 1125-1126. Because Petitioner has previously scrutinized the prosecution history of the related '491 Patent in challenging the claims of that patent in IPR2023-00734, Petitioner was on notice of Hong's wireless charging teachings and the examiner's findings of the same. *See* §III.B *supra.* As such, Petitioner cannot now argue lack of notice of such teaching when confronted with a prosecution record for the '483 Patent where the same examiner applied the same Hong reference, which was previously found to disclose wireless charging.

Indeed, that the art of record teaches wireless charging is confirmed by the fact that the Examiner did not deem this feature as the feature absent from the art of record and instead, noted that the claims were allowable because the art of record failed to disclose the specific configuration of electrodes that facilitates measurement of the second physiological parameter. Ex. 1002, 137-146, 38-41 ("The following is an examiner's statement of reasons for allowance: ***the prior art fails to describe the configuration of electrodes as presently recited with respect to the locations on the housing***.").

On this record, to the extent Petitioner asserts that there was error during prosecution with respect to the art's teaching of wireless charging, Petitioner had the burden to articulate what that error was. Petitioner failed to do so here.

For at least the above reasons, Petitioner has not demonstrated any material error warranting a renewed review of the claims in view of the Kotanagi and Schmid-based grounds, which are substantially the same as the references already considered during prosecution and which suffer from the same deficiencies that are also present in the art of record (namely, a device with a specific configuration of electrodes provided on the device's housing that together facilitate measurement of a second physiological parameter by the device). Therefore, Patent Owner submits that the Kotanagi and Schmid-based grounds (Ground 2, 5-7) should be discretionarily denied under §325(d).

IX. CONCLUSION

For the foregoing reasons, Petitioner respectfully requests that the Board deny institution of the Petition.

Respectfully submitted,

Date: August 24, 2023

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CERTIFICATION UNDER 37 CFR § 42.24(d)

Under the provisions of 37 CFR § 42.24(d), the undersigned hereby certifies that the word count for the foregoing Patent Owner's Preliminary Response totals 13,479, which is less than the 14,000 allowed under 37 CFR § 42.24(b)(1).

Respectfully submitted,

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e)(4), the undersigned certifies that on August 24, 2023, a complete and entire copy of this Patent Owner's Preliminary Response and its supporting exhibits were provided via email, to the Petitioner by serving the email correspondence addresses of record as follows:

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