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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner,

v.

MASIMO CORPORATION,
Patent Owner.

Case IPR2022-01272
U.S. Patent 10,912,501

PATENT OWNER PRELIMINARY RESPONSE

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35 U.S.C. § 314	10
37 C.F.R. § 42.11	13
37 C.F.R. § 42.100	9

EXHIBIT LIST

Exhibit No.	Description
2001	Declaration of Jeremiah S. Helm in Support of <i>Pro Hac Vice</i> Motion
2002	Declaration of Professor R. James Duckworth, Ph.D
2003	<i>Curriculum Vitae</i> of Professor R. James Duckworth, Ph.D
2004	Y. Mendelson et al., “A wearable reflectance pulse oximeter for remote physiological monitoring,” Proceedings of the 28th IEEE EMBS Annual International Conference, pp. 912-915, 2006 (Exhibit 1014 to IPR2022-01271)
2005	R.J. Duckworth et al., “Field Testing of a Wireless Wearable Reflectance Pulse Oximeter,” American Telemedicine Association Annual Conference, 2006
2006	Y. Mendelson, “Wearable Wireless Pulse Oximetry for Physiological Monitoring,” Worcester Polytechnic Institute Precise Personnel Location Workshop, 2008
2007	Y. Mendelson et al., “Multi-channel pulse oximetry for wearable physiological monitoring,” 2013 IEEE International Conference on Body Sensor Networks, pp. 1-6, 2013
2008	<i>Masimo Corp. et al. v. Apple Inc.</i> , June 6-10, 2022 Public Hearing Transcript, ITC Inv. No 337-TA-1276
2009	U.S. Patent No. 5,638,818
2010	U.S. Patent No. 5,916,155
2011	<i>Masimo Corp. et al. v. Apple Inc.</i> , Masimo’s June 27, 2022 Public Initial Post-Hearing Brief, ITC Inv. No 337-TA-1276
2012	<i>Masimo Corp. et al. v. Apple Inc.</i> , Masimo’s August 18, 2022 Motion to Modify Protective Order, ITC Inv. No 337-TA-1276

Exhibit No.	Description
2013	<i>Masimo Corp. et al. v. Apple Inc.</i> , Apple’s August 29, 2022 Opposition to Masimo’s Motion to Modify Protective Order, ITC Inv. No 337-TA-1276
2014	Masimo’s September 20, 2022 Email to Board Requesting Authorization to File Motions for Additional Discovery
2015	Apple’s September 19, 2022 Email to Masimo Opposing Masimo’s Request for Additional Discovery
2016	Public February 22, 2022 Deposition Transcript of Robert Rowe
2017	June 6, 2022 Email from Counsel for Robert Rowe
2018	U.S. Patent No. 10,702,211
2019	U.S. Patent Pub. No. 2017/0325744
2020	January 3, 2013 Masimo Press Release Regarding iSpO2
2021	October, 2013 Marcelo Lamego Email to Apple CEO Tim Cook
2022	U.S. Patent No. 10,524,671
2023	U.S. Patent No. 10,247,670
2024	U.S. Patent No. 11,009,390
2025	U.S. Patent No. 10,219,754
2026	September 15, 2020 Apple Press Release Regarding Apple Watch Series 6
2027	<i>Masimo Corp. et al. v. Apple Inc.</i> , Public Order Regarding Masimo’s Motion for Preliminary Injunction, Case No. 8:20-cv-00048 (C.D. Cal.)
2028	Apple Webpage Titled “Apple Watch Series 6”

Exhibit No.	Description
2029	Apple Watch Series 6 Video
2030	Apple Watch Series 6 “It Already Does That” Commercial
2031	<i>Masimo Corp. et al. v. Apple Inc.</i> , Apple’s May 10, 2022 Trial Subpoena <i>Ad Testificandum</i> to Robert Rowe, ITC Inv. No 337-TA-1276
2032	R. P. Dresher and Y. Mendelson, “A New Reflectance Pulse Oximeter Housing to Reduce Contact Pressure Effects,” Proceedings of the IEEE 32nd Annual Northeast Bioengineering Conference, pp. 49-50, 2006

Pursuant to 35 U.S.C. § 313, 37 C.F.R. § 42.107, and the July 26, 2022 Notice of Filing Date Accorded to Petition (Paper 4), Masimo Corporation (“Masimo”) hereby timely submits its Preliminary Response to the Petition for *Inter Partes* Review of U.S. Patent No. 10,912,501 (“’501 Patent”) filed by Apple Inc. (“Petitioner” or “Apple”).

I. INTRODUCTION

Masimo is the technology leader in the field of noninvasive physiological monitoring. In 1989, Masimo was a small startup operating in an inventor’s condo. Today, Masimo is a publicly traded company that employs 6,300 people worldwide and has annual revenues exceeding one billion dollars. Masimo technology is used in clinical care to monitor over 200 million patients a year. This growth followed Masimo’s development of a range of technologies that revolutionized the field of noninvasive physiological monitoring. Other Masimo patents have withstood extensive attacks, including in litigation through trial, inter-partes reexamination, and appeal.¹

Apple’s Petition arises from a dispute with Masimo in the International Trade Commission. Apple was not, historically, a company that had any involvement in physiological monitoring devices. But, around 2013, Apple decided to enter the

¹ See *Mallinckrodt, Inc. v. Masimo Corp.*, 147 Fed. Appx. 158, 2005 WL 2139867 at *3 (Fed. Cir. Sept. 7, 2005) (nonprecedential); *Masimo Corp. v. Philips Electronic N, Amer. Corp.*, 2015 WL 2379485 at *1 (D. Del. May 18, 2015).

field and sought out Masimo for that technology. Although claiming an interest to integrate Masimo’s technology into Apple products, Apple began poaching employees, one after another. The poached employees included Chief Technical Officer Marcelo Lamago, one of the inventors on the ’501 Patent challenged in this Petition. Lamago took Masimo’s sensor design knowledge with him to Apple. Masimo has accused Apple’s devices of using Masimo technology, including key features disclosed and claimed in the ’501 Patent.

Masimo asserted the ’501 Patent against Apple in an ITC proceeding—Inv. No. 337-TA-1276 (the “ITC Investigation”). At the evidentiary hearing, Apple promised the ALJ it would “present the best possible evidence on the issues,” including the validity of the ’501 Patent. *See* EX2008, 39:11-17. During the ITC Investigation, including at the hearing and in post-hearing briefing, Masimo identified, presented, and explained extensive objective evidence of nonobviousness of the ’501 Patent. Yet, despite Apple’s full awareness of Masimo’s assertion of extensive evidence of nonobviousness, Apple’s Petition is completely silent on that evidence, not even disclosing any of it to the PTAB.

II. BACKGROUND

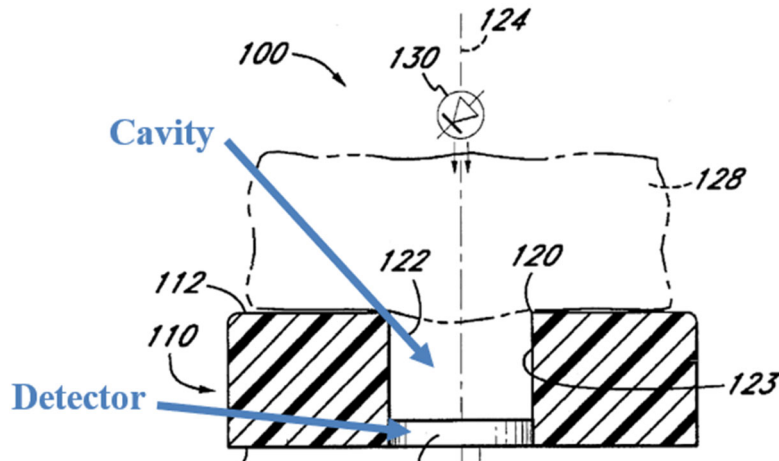
A. Masimo’s Pioneering Technology

Masimo developed innovative sensor designs that allow more accurate noninvasive measurement of physiological parameters such as oxygen saturation,

hemoglobin, and glucose. EX2008, 98:9-102:1. It is very challenging to extract the signal needed for such measurements. *Id.*, 98:9-100:3. Masimo faced difficulties reducing errors in the detected signal, such as the problem of emitted light reaching a detector without being attenuated by the user's tissue, which cause inaccuracies in resulting measurements. *Id.*, 100:4-102:1. The inventors discovered solutions to these problems and sought to protect their inventions, including those recited in the '501 Patent.

B. '501 Patent Overview

At the time of the invention, those of skill in the art of noninvasive sensors, such as those for pulse oximetry, typically did everything possible to avoid placing any pressure on the tissue. Indeed, the prevailing wisdom before Masimo's inventions in the '501 patent was to avoid pressing against the tissue because pressure was thought to decrease the signal-to-noise ratio, resulting in measurement errors. EX1023, 2:47-57, 3:27-67, 4:59-65, 5:15-21, 5:31-37, 6:1-3, 6:8-13, 6:26-31, 10:49-53, 12:62-13:5. Extensive teaching in the literature directed a POSITA to a flat surface for a pulse oximeter. *Id.*; EX1024 ¶34; EX2002 ¶50. An earlier Masimo invention went further by using a cavity over a photodetector to allow the tissue to remain undisturbed by any contact from the sensor. For example, Masimo's noninvasive sensors included a cavity in a flat surface that avoided pressing against the tissue, as shown below. EX2008, 98:23-99:4.



See, e.g., EX2009, FIG. 4 (annotated), 7:8-19. Masimo's largest competitor, Nellcor, also used such a cavity. See, e.g., EX2010, FIGS. 4-5. After years of litigation, Apple has never identified any prior art disclosing, teaching, or suggesting adding a convex protrusion over multiple detectors in a pulse oximetry sensor. That is because it defies all conventional thought at the time. Indeed, *Apple's* own and much later 2016 patent filing asserted that a convex pressure-inducing protrusion in a pulse oximeter sensor was inventive, as further explained below.

In the early 2000s, the inventors were researching techniques to noninvasively measure hemoglobin and glucose—signals that are extremely small and very difficult to extract. EX2008, 98:9-17. During their research, the inventors experimented with creating an artificial, active pulse stronger than the natural human pulse. *Id.*, 98:9-99:16. They used a tiny hammer pressing a protrusion into the finger (or digit) to create the active pulse. *Id.*, 98:9-99:16. As a '501 Patent inventor explained, “one time the active pulse detector hammer had been left in, and when it

pushed up against the digit we noticed the signal got stronger, *which was a surprise to us.*” *Id.*, 98:23-99:1. Thus, the inventors’ discovery that pressing a protrusion into the user’s tissue created a stronger signal was unexpected. *Id.*, 98:18-99:3, 99:12-16; EX1001, FIG. 5, 21:9-43.

Continued experiments revealed that contrary to industry belief, applying pressure in the right amounts with a convex protrusion could actually *strengthen* the signal. EX2008, 99:2-16. The convex protrusion improved signal strength by an order of magnitude and significantly improved the sensor’s signal-to-noise ratio. EX1001, 20:29-33, 21:9-15, 21:26-43. The inventors disclosed the magnitude of the improvement in Figure 5, which shows a tenfold signal-strength increase.

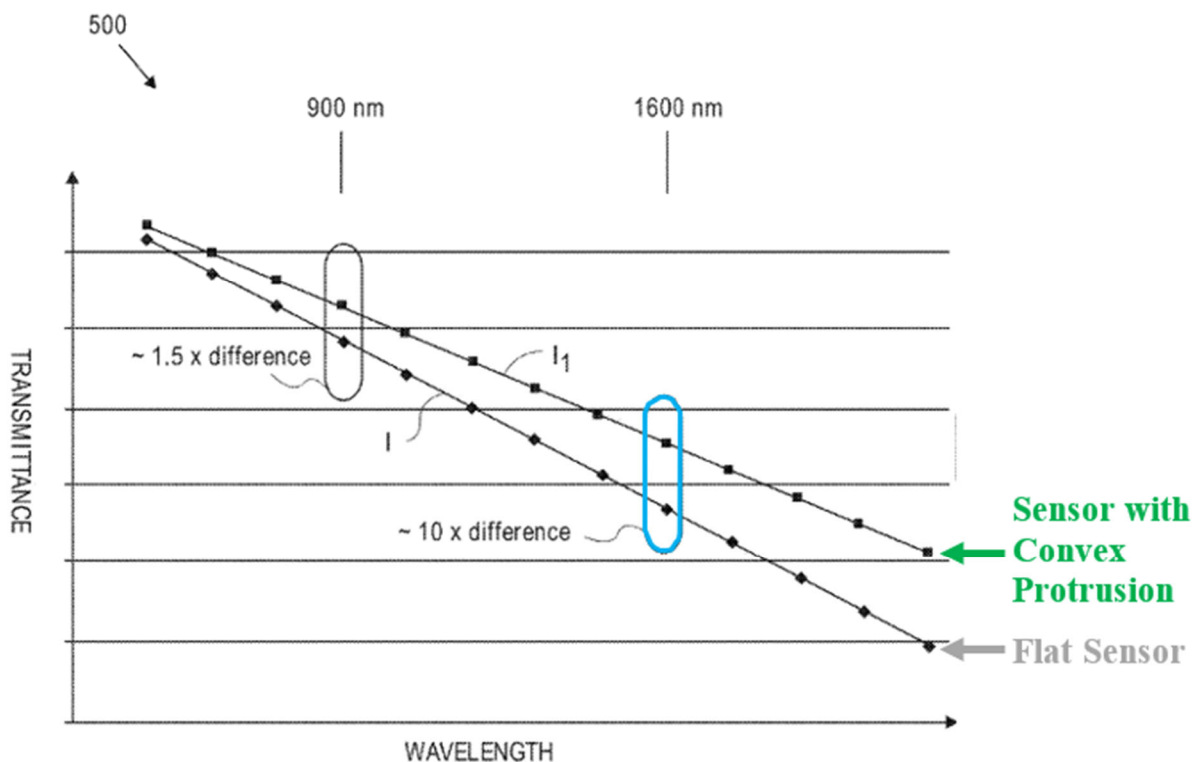
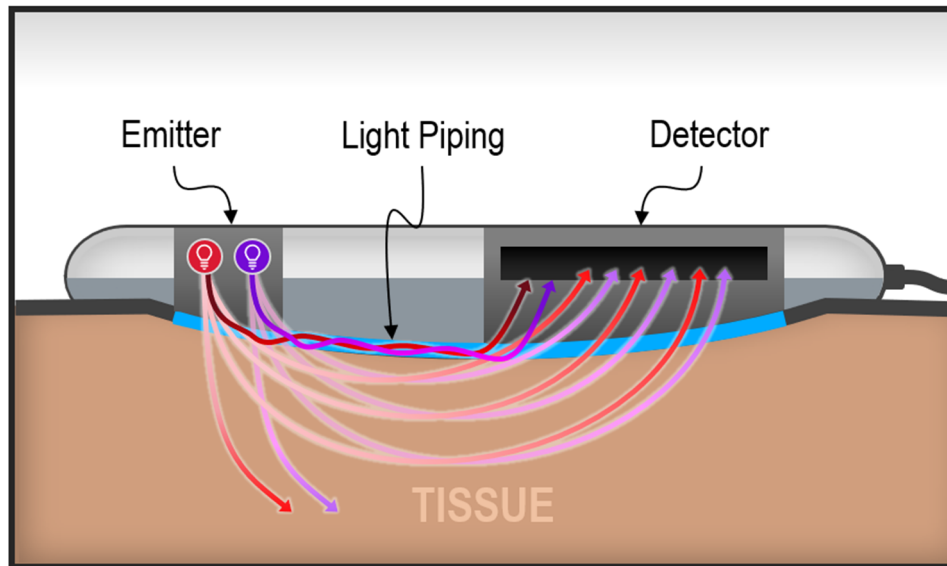


FIG. 5

EX1001, FIG. 5 (annotated). The inventors' discovery that a protrusion comprising a convex surface significantly improved sensor performance would have been an unexpected result to a POSITA, given the understanding at the relevant time that increased or varying pressure caused measurement errors. EX2002 ¶¶51-52.

The inventors found several additional benefits of a protrusion comprising a convex surface over multiple photodetectors, which the '501 Patent discloses. The protrusion thins out the measurement site on the body, resulting in improved transmittance of attenuated light back to the photodetectors and increased signal strength. EX1001, 20:25-33, 21:9-43; EX2002 ¶53. The protrusion also increases the area for measuring attenuated light with the photodetectors. EX1001, 7:61-63; EX2002 ¶53.

The inventors found that, while the claimed protrusion increased signal strength, it also had a negative effect—increased light piping. EX2008, 100:14-101:5. The '501 Patent describes light piping as “light that bypasses [the] measurement site” by going from the light source/emitter directly to the detector without being attenuated by tissue, as shown below. EX1001, 22:48-50.



The inventors developed solutions to this problem. For example, they determined how to reduce or avoid light piping through the protrusion by using opaque material, light barriers, and windows. *See, e.g., id.*, 7:65-8:7, 9:33-38, 18:66-19:12, 19:25-26, 22:23-39, 22:50-62, 23:10-12, 26:64-27:3; EX2002 ¶¶54-55. They also determined how to use multiple photodetectors to help cancel noise. *See, e.g., EX1001*, 9:30-33, 20:25-29; EX2002 ¶55. Exemplary configurations are shown in the '501 Patent. *See, e.g., EX1001*, FIGS. 3-4, FIG. 7B; EX2002 ¶55. Accordingly, the '501 Patent explains how different pieces of the sensor work together to provide an order-of-magnitude signal strength increase and greater cancellation of light piping.² The

² Apple implies the challenged claims are somehow inadequately supported by the specification. Pet. 2. Such argument is improper in an IPR, which considers only arguments “under section 102 or 103.” 35 U.S.C. § 311(b). Regardless, in the ITC Investigation, Masimo demonstrated Apple’s argument lacks merit. EX2011, 176-179.

claims at issue recite combinations of these elements that work together to obtain these benefits and defied conventional wisdom.

The '501 Patent has three independent claims, Claims 1, 19, and 26. Claim 1 illustrates some of the limitations at issue (bolded), and recites:

A user-worn device configured to non-invasively measure a physiological parameter of a user, the user-worn device comprising:

at least three light emitting diodes (LEDs);

at least three photodiodes arranged on an interior surface of the user-worn device and configured to receive light attenuated by tissue of the user;

a protrusion arranged over the interior surface, the protrusion *comprising a convex surface* and a plurality of openings extending through the protrusion and positioned over the three photodiodes, the openings each comprising an *opaque lateral surface*, the plurality of openings configured to allow light to reach the photodiodes, *the opaque lateral surface configured to avoid light piping through the protrusion*; and

one or more processors configured to receive one or more signals from the photodiodes and *calculate a measurement of the physiological parameter of the user.*

EX1001, Claim 1.³

III. CLAIM CONSTRUCTION

Apple identifies no terms for construction. In the ITC Investigation, Apple argued that (1) “over” and “above” in the claims mandated a particular orientation for noninfringement and (2) an opening requires “an absence of material.” EX2011, 42-53. Masimo disagreed, *id.*, and Apple appears to jettison those constructions here. Pet. 3. Thus, the Board should give the claim terms their ordinary and customary meaning, consistent with the specification, as a POSITA would understand them. 37 C.F.R. § 42.100(b); *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (*en banc*).

The preambles of the independent claims—Claims 1, 19, and 26—are limiting because they provide antecedent basis for the “user-worn device,” “user,” “physiological parameter,” “pulse rate,” and/or “oxygen saturation” limitations recited in the bodies of the claims. Apple does not contend otherwise.

³ All emphasis is added unless indicated otherwise.

IV. LEVEL OF ORDINARY SKILL IN THE ART

Apple's asserted level of skill requires no coursework, training, or experience with optics, optical physiological monitors, or physiology, and focuses on data processing rather than sensor design. Apple does not contend that the level of skill in the art affects the patentability of the challenged claims. Pet. 2; EX2002 ¶¶31-34. However, Masimo submits that Apple's asserted level of skill confirms patentability, as explained below.

V. LEGAL STANDARD

"In an IPR, the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable." *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016). An IPR may not be instituted unless "the information presented in the petition ... shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314(a).

A patent claim is unpatentable as obvious only if the differences between the claimed subject matter and the prior art are such that the subject matter, *as a whole*, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. 35 U.S.C. § 103; *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness relies on underlying factual determinations including: (1) the scope and content of

the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966). Furthermore, “the prior art, taken as a whole, must *enable* a skilled artisan to make and use the claimed invention” without undue experimentation. *Raytheon Techs. Corp. v. Gen. Elec. Co.*, 993 F.3d 1374, 1380 (Fed. Cir. 2021).

To prevail on any obviousness ground, it is insufficient to simply identify individual components of the claims in the prior art—one must show why a “skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed.” *In re Kotzab*, 217 F.3d 1365, 1371 (Fed. Cir. 2000). To satisfy its burden of proving obviousness, Apple cannot rely on “mere conclusory statements.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016). Rather, it must set forth “some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *KSR*, 550 U.S. at 418-19 (internal citation omitted). An appropriate obviousness inquiry also must be made without any “hint of hindsight.” *Star Sci., Inc. v. R.J. Reynolds Tobacco Co.*, 655 F.3d 1364, 1375 (Fed. Cir. 2011).

Additionally, a motivation to combine references must be “accompanied by a reasonable expectation of achieving what is claimed in the patent-at-issue.”

Intelligent Bio-Sys., Inc. v. Illumina Cambridge, Ltd., 821 F.3d 1359, 1367 (Fed. Cir. 2016).

VI. NO GROUND ESTABLISHES OBVIOUSNESS

The Petition does not establish a reasonable likelihood of Apple successfully showing any challenged claim would have been obvious to a POSITA. Apple’s grounds—Grounds 1A-1B—fail for many reasons. The following table summarizes the independent reasons for denying all grounds as to all claims:

Independent Reasons for Denial of All Grounds as to All Claims	Section
Apple failed to address known objective indicia of nonobviousness; the objective indicia support the claims’ validity.	§VI.A
Apple’s analysis is based on hindsight.	§VI.B
Apple fails to establish any reference discloses, teaches, or suggests the claimed convex protrusion.	§VI.C
A POSITA would not have been motivated to combine Lumidigm with Kotanagi’s curved surface.	§VI.D
A POSITA would not have reasonably expected success in the proposed combination of Lumidigm with Kotanagi’s curved surface.	§VI.E
Apple fails to establish any references discloses, teaches, or suggests opaque surfaces/material configured to avoid/reduce light piping or unattenuated light.	§VI.F
Apple failed to articulate a motivation to combine or expectation of success regarding the opaque surfaces/material limitations.	§VI.G
Apple fails to establish any reference discloses, teaches, or suggests a user-worn device configured to measure physiological parameters.	§VI.H
No motivation to configure, or reasonable expectation of success in configuring, Lumidigm’s wristwatch to calculate/measure a physiological parameter or pulse rate.	§VI.I

Independent Reasons for Denial of All Grounds as to All Claims	Section
Apple fails to establish a motivation to combine, or reasonable expectation of success in combining, three photodiodes “on an interior surface of”/“within” Lumidigm’s wristwatch.	§VI.J

A. Apple’s Failure to Inform the PTAB of, Much Less Address, Known Objective Indicia of Nonobviousness Warrants Denying Institution

“Objective indicia of nonobviousness must be considered in every case where present.” *Apple Inc. v. Samsung Elecs. Co.*, 839 F.3d 1034, 1048 (Fed. Cir. 2016) (the obviousness inquiry “requires consideration of all four *Graham* factors”). Apple violated this rule by completely ignoring all objective evidence of nonobviousness in its Petition. Apple has known of this evidence and its significance at least since Masimo presented it during the June 6-10, 2022 evidentiary Hearing in the parties’ ITC Investigation and discussed it at length in Masimo’s June 27 post-Hearing briefing. *See, e.g.*, EX2011, 158-175. Despite Apple’s awareness of the relevance of this evidence, and despite having ample time to address it, and despite Apple’s duty of candor (37 C.F.R. § 42.11), Apple failed to inform the PTAB of this evidence. In fact, Apple used a different expert for these proceedings, seemingly to shield him from the known objective indicia. Apple’s expert here acknowledges the importance of objective indicia to his analysis.

EX1003 ¶205. But neither Apple nor its expert addressed this evidence well-known to Apple. *See generally* Pet.; EX1003.

Apple’s failure justifies denying institution. *See, e.g., Stryker Corp. v. KFX Medical, LLC*, IPR2019-00817, Paper 10 at 28-29 (PTAB Sept. 16, 2019) (denying institution; explaining “***We have cautioned petitioners in prior proceedings that petitions may be denied if they do not address known evidence of secondary considerations.***”; citing cases); *Robert Bosch Tool Corp. v. SD3, LLC*, IPR2016-01751, Paper 15 at 23-25 (PTAB Mar. 22, 2017) (same; denying institution for failure to address objective indicia presented during an ITC proceeding); *Gilead Sciences, Inc. v. United States*, IPR2019-01456, Paper 17 at 52-53 (PTAB Feb. 5, 2020) (denying institution; “***Petitioner’s failure*** to persuasively address the [publicly available objective indicia of nonobviousness] in its Petition ***means Petitioner falls short of is burden*** to establish a reasonable likelihood of success in prevailing on its challenge.”).

Apple’s silence here is particularly egregious because Masimo relied on substantial evidence of objective indicia of nonobviousness within Apple’s own records. EX2011, 158-175. Apple nonetheless chose not to inform the PTAB of any of that evidence and has refused to allow Masimo to even present much of it in this response. EX2015.

Indeed, rather than address the known objective indicia, Apple repeatedly attempted to conceal it from the Board. Masimo asked the ITC to modify the Protective Order to allow Masimo to use such evidence in this proceeding. EX2012. Apple opposed, arguing that Masimo should directly obtain the evidence via discovery in this proceeding. EX2013, 10. Masimo then sought the Board's authorization to file a motion for discovery of the same information. EX2014. Apple opposed, this time arguing the opposite—that Masimo should not be permitted such discovery here because of the ITC's Protective Order. EX2015; Paper 10. Apple concealing objective evidence of nonobviousness from the Board is particularly concerning because, in the ITC Investigation concerning the '501 Patent, Apple explained it “wants to provide Your Honor with the best possible evidence of all the issues Your Honor needs to decide in this investigation.” EX2008, 40:7-13. Yet, in its Petition, Apple had no such desire to share the relevant evidence with the Board.

As a result of Apple's three-card monte before the ITC and the Board, Masimo can only identify certain publicly available objective indicia of nonobviousness. As discussed below, however, even that evidence, none of which Apple addressed, confirms the patentability of the challenged claims, and thus each Petition ground fails.

1. **The Unexpected Results Achieved by the Claimed Protrusions Demonstrates the Nonobviousness of the Challenged Claims**

Mendelson-799 discouraged inducing excessive or varying pressure because such designs were understood to cause measurement errors. *Infra* Section VI.D.1; *see also* EX2016, 69:8-21. Consistent with this conventional understanding, before the inventions claimed in the '501 Patent, Masimo and others in the field avoided pressure-inducing sensor designs, which were understood to “cause the signal to go away.” EX2008, 99:8-13; *see, e.g.*, EX2009, 7:8-19, FIG. 4; EX1023, 2:37-53, 3:27-67, 4:59-65, 5:15-21, 6:1-3, 6:8-13, 6:16-35, 10:49-53, 12:62-13:5; EX2010, FIG. 5; EX1024 ¶13, 34, FIGS. 1B, 5. For example, Masimo used the “opposite” of a convex protrusion—a “cavity”—for its sensors. EX2008, 98:23-99:4; EX2009, 7:8-19, FIG. 4. Nellcor also disclosed using such a cavity or void. EX2010, FIG. 5.

While Masimo was developing technology for noninvasively measuring hemoglobin and glucose, its engineers found “[j]ust getting to the signal is really challenging.” EX2008, 98:13-16; *supra* Section II.B. The engineers experimented with creating an active pulse (i.e., mechanically inducing a vibration to act as an artificial pulse stronger than the natural human pulse) in their quest to obtain a better signal for measuring these parameters. *Id.*, 98:9-99:16. Surprisingly, these experiments revealed applying pressure did not cause errors, but ***strengthened*** the signal. As a '501 Patent inventor explained, “one time the active pulse detector

hammer had been left in, and when it pushed up against the digit we noticed the signal got stronger, ***which was a surprise to us.***” *Id.*, 98:23-99:1.

This surprise led the ’501 Patent’s inventors to the claimed protrusion comprising a convex surface. *Id.*, 99:2-16. The inventors discovered, to their surprise, that using such a convex protrusion improved signal strength by an order of magnitude and significantly improved the sensor’s signal-to-noise ratio. EX1001, 20:29-33, 21:9-15, 21:26-43; EX2008, 98:9-99:16. In July 2008, a POSITA would have found a convex protrusion significantly improving the signal-to-noise ratio and increasing signal strength to be a surprising and unexpected result. EX2002 ¶180.

The ’501 Patent has an effective filing date in July 2008. Ex. 1001, 2. It was not until years later that others, including Apple, recognized the benefit of the claimed convex protrusion and its associated structures. In the ITC Investigation, Masimo presented evidence that, as late as 2015, Apple’s skilled sensor engineers did not appreciate how pressure-inducing sensor designs significantly improved signal strength. EX2011, 163.

After Apple’s engineers became aware of the significance of convex protrusions on signal strength, Apple filed multiple patent applications describing and claiming the benefits of such protrusions. For example, Apple filed U.S. Patent No. 10,702,211 (the “’211 patent”) in July 2016, listing Apple engineers as inventors. The patent describes and claims a convex exterior surface with openings

extending from an interior surface to the exterior surface and an opaque light block separating the openings. EX2018, 2:31-39, 4:18-19, 5:25-33, Claim 1.

In Claim 1 of the '211 patent, Apple claimed “a convex surface that forms a portion of an exterior surface.” *Id.*, Claim 1. Apple also claimed “an opening,” “window positioned within the opening,” and “an opaque region positioned between and optically isolating the first transparent region from the second transparent region.” *Id.* Apple claimed that these features were inventive as late as 2016. Yet, these features are analogous to those invented by Masimo nearly ten years earlier. *Compare id.*, Claim 1 with EX1001, Claims 1, 19, 26; EX2002 ¶182. Now, after learning that Masimo discovered these innovations first, Apple performs an about face by arguing the same features recited in the challenged claims would have been obvious to a POSITA years earlier in July 2008. *See, e.g.*, Pet. 18-29.

Moreover, in a 2017 Apple patent filing Apple explained a convex protrusion actually improves the signal by imparting certain pressure on tissue. EX2019. FIGS. 3A-3B show “protrusion 302” applying “pressure 320.”

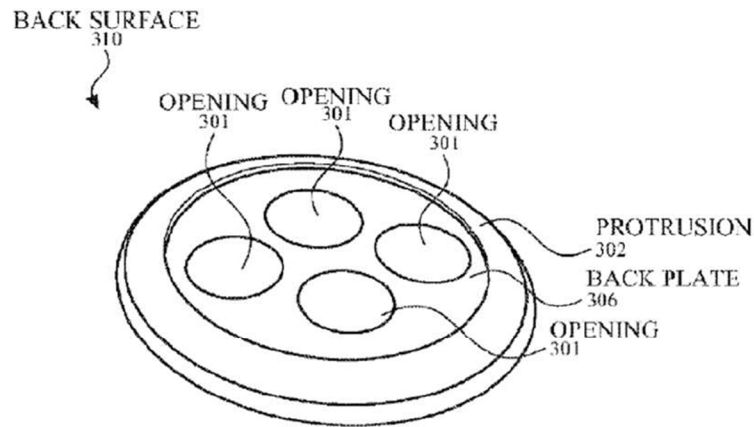


FIG. 3A

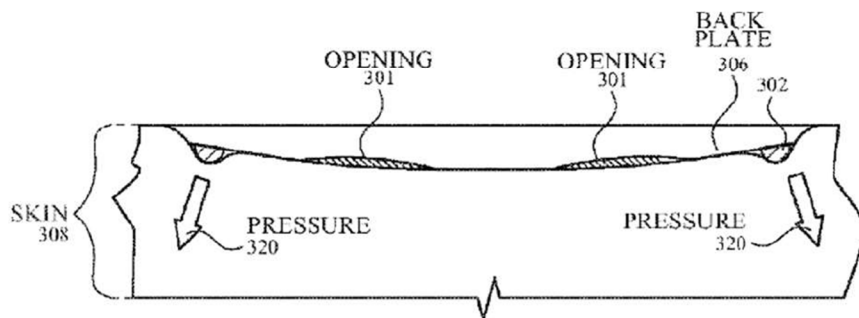


FIG. 3B

Id., FIGS. 3A-3B. The specification explains “Protrusion 302 can be configured to create pressure to skin 308,” and “applying localized pressure to the individual’s skin ... can lead to an increase in pulsatile (AC) signal.” *Id.* ¶¶[0032]-[0033]. Apple describing and claiming such a protrusion almost 10 years after the ’501 Patent further demonstrates the Petition’s obviousness arguments are based on hindsight, not fact. Apple cannot rewrite history by arguing the challenged claims would have been obvious in 2008 when the evidence shows Apple claimed to the Patent Office

that a convex protrusion *is* innovative and patentable years after Masimo's inventions.

Accordingly, both the state of the art and Apple's own patent filings demonstrate that a POSITA in July 2008 would not have expected the benefits achieved by a protrusion comprising a convex surface. Every independent claim of the '501 Patent requires a physiological measuring device with a protrusion comprising a convex surface. EX1001, Claims 1, 19, 26; EX2002 ¶184. The above evidence of unexpected results thus bears a nexus to, and supports the validity of, every challenged claim. EX2002 ¶184.

2. **Apple's Skepticism Demonstrates Nonobviousness of the Challenged Claims**

a. **Protrusion Comprising a Convex Surface**

Light piping is problematic because it "causes inaccuracies in the measurement" of the physiological parameter. EX2008, 100:14-101:5; EX1001, 7:65-8:7; EX2002 ¶185. In the ITC Investigation, Masimo presented evidence that the engineers working on the first-generation Apple Watch's sensor were skeptical of its convex shape because it caused *more* light piping than a flat sensor. EX2011, 160-161. But Apple refuses to reveal such evidence to the Board or allow Masimo to disclose it. EX2015.

Every independent claim of the '501 Patent requires a user-worn, non-invasive physiological measuring device with a protrusion comprising a convex

surface. EX1001, Claims 1, 19, 26; EX2002 ¶185. Thus, Apple’s skepticism of using a protrusion comprising a convex surface in its Apple Watch bears a nexus to, and supports the validity of, every challenged claim. EX2002 ¶185; *see, e.g., Neptune Generics, LLC v. Eli Lilly & Co.*, 921 F.3d 1372, 1377 (Fed. Cir. 2019) (holding industry skepticism supported finding of nonobviousness).

b. Measuring Oxygen Saturation at the Wrist

In January 2013, Masimo debuted its “iSpO2 Pulse Oximeter for iOS Platform (iPhone, iPad & iPod touch)” at the Consumer Electronics Show in Las Vegas. EX2020; EX2008, 103:7-16. “Within two to three months [Apple] contacted [Masimo],” invited Masimo to a meeting at Apple’s Cupertino headquarters, and explained that Apple “want[ed] to work with [Masimo] to integrate [Masimo’s] technology into [Apple’s] products.” EX2008, 104:11-18. The parties met and discussed integrating Masimo technology into Apple’s products. A ’501 Patent inventor attended that meeting. *Id.*, 104:19-20.

Rather than enter into a partnership with Masimo, Apple began raiding Masimo for its employees. Apple first hired Masimo’s Chief Medical Officer, Michael O’Reilly, in July 2013. EX2011, 166. In October 2013, Marcelo Lamego (a named inventor of the ’501 Patent and then, the Chief Technical Officer of a Masimo spin-off company, Cercacor Labs) contacted Apple’s CEO Tim Cook, offering to solve what he characterized as the very deceptive and difficult “patient

equation” for Apple’s patient monitoring based on his 10 years of experience at Masimo and Cercacor. EX2021. Apple hired Lamego, who “started [in] January 2014 at Apple.” EX2008, 187:16.

Apple’s “raiding” of Masimo’s employees did not stop there. In all, Apple ended up recruiting about 30 engineers and stopped communicating with Masimo. EX2011, 167. After providing Apple with Masimo’s technology, Lamego left Apple in the middle of 2014. EX2021; *see, e.g.*, EX2022 (Apple patent regarding optical sensors listing Lamego as inventor); EX2023 (same); EX2024 (same); EX2025 (same).

Later in 2014, Apple hired Dr. Paul Mannheimer, an engineer formerly employed by Nellcor, Masimo’s major competitor in the pulse oximetry space. EX2008, 1009:2-20. Apple tasked Mannheimer with “look[ing] into doing pulse oximetry at the wrist for the Apple Watch.” EX2008, 996:9-997:5.

At the ITC hearing, Masimo presented evidence that various Apple engineers, including Mannheimer, were skeptical that oxygen saturation could be measured at the wrist. EX2011, 169-172. Dr. Stephen Waydo, the director of Apple’s team for health algorithms on the Apple Watch, testified it was “extremely challenging” to develop the blood-oxygen feature of the Apple Watch. EX2008, 919:2-8, 938:21-24. Such skepticism years after the relevant time in 2008 supports the

nonobviousness of the claimed user-worn physiological parameter-measuring devices. *Id.*; EX2002 ¶¶186-187.

3. Apple’s Failures Demonstrate the Nonobviousness of Measuring Oxygen Saturation at the Wrist

Even with the benefit of Masimo’s poached employees and a former lead engineer at Nellcor, it took Apple years to develop a user-worn device with an oxygen saturation measuring feature. In 2015, Apple began selling the original Apple Watch—“Series 0”—which could not measure oxygen saturation. EX2008, 818:10-15. Apple Watch Series 1 through 5 also did not measure oxygen saturation. *See* EX2026, 3-4. Apple did not release a watch with an oxygen saturation feature until it released the accused Apple Watch Series 6 in 2020. *Id.* And the Apple Watch’s oxygen saturation-measuring feature uses the ’501 Patent’s claimed inventions. EX2011, 54-65; EX2002 ¶189. That it took Apple so long to develop the oxygen saturation-measuring feature of its Apple Watches (i.e., Apple’s failures in developing products embodying the ’501 Patent’s claims) bears a nexus to, and supports the validity of, the challenged claims. EX2002 ¶¶188-190.

4. Copying by Apple Demonstrates the Nonobviousness of the Challenged Claims

Lamego, who was named as an inventor on the ’501 Patent, offered to take Masimo’s technology to Apple. EX2021. After receiving his offer, Apple promptly took Lamego up on it. *Supra* Section VI.A.2.b. A district court found Masimo likely

to succeed in establishing that Lamego disclosed Masimo's trade secrets to Apple. EX2027, 7-10; *see also Masimo Corp. v. True Wearables, Inc.*, No. 2021-2146, 2022 WL 205485 (Fed. Cir. 2022) (affirming preliminary injunction preventing Lamego from disclosing Masimo trade secrets).

Apple ultimately developed the Apple Watch Series 6 and Series 7, which are accused in the ITC Investigation of infringing the '501 Patent. There is a nexus between the accused Apple Watch products and the claimed inventions because the accused products embody the '501 Patent claims. *See, e.g.*, EX2011, 54-65; EX2002 ¶192. In the ITC Investigation, Masimo presented additional evidence of Apple's copying that is not available here because Apple refuses to disclose it to the Board. EX2011, 172-173; EX2015; Paper 10. Regardless, the above evidence supports the validity of the challenged claims. EX2002 ¶193.

5. Commercial Success Demonstrates the Nonobviousness of the Challenged Claims

Masimo also presented evidence in the ITC Investigation that the Apple Watches Series 6 and 7 accused of infringing the '501 Patent have been commercially successful. EX2011, 173-175. The Series 6 and 7 are the only Watches with the accused "blood-oxygen" measurement feature, and enjoyed increased sales compared to generations without this claimed feature. *Id.* This commercial success bears a nexus to the '501 Patent claims because it is significantly attributable to the Watches' accused blood-oxygen feature. Apple marketed, and the

market understood, the Series 6's blood-oxygen feature as the key differentiating feature over the prior generation (Series 5). EX2028; EX2026; EX2029, 1:16-5:05; EX2030, 1:28-2:06. Apple's consistent highlighting of the Watches' accused feature in its marketing materials demonstrates the nexus between their commercial success and the challenged claims. *See, e.g., Apple*, 839 F.3d at 1055-56 (selecting claimed feature for emphasis in commercial supports provides evidence of nexus). Indeed, the nexus between the success of the Apple Watch Series 6 and Series 7 and '501 Patent claims is presumed because such products embody the claimed features. *See Supra* Section VI.A.4.

6. **Apple Considering the Claimed Features Inventive Years After the Inventions Claimed in the '501 Patent Demonstrates the Nonobviousness of the Challenged Claims**

In July 2016, Apple filed the '211 patent, listing Mannheimer and other Apple engineers as inventors. EX2018. Apple's '211 patent describes and claims an exterior convex surface with openings and windows that are separated by an opaque region. Apple claimed that these features were inventive as late as 2016. Yet, these features are analogous to those invented by Masimo nearly ten years earlier. *Compare id.*, Claim 1 with EX1001, Claims 1, 19, 26; EX2002 ¶195; *see id.* ¶182. Now, after learning that Masimo discovered these innovations first, Apple performs an about face by arguing the same features recited in the challenged claims would have been obvious to a POSITA years earlier in July 2008. *See, e.g., Pet.* 18-29.

In sum, the objective evidence of unexpected results associated with the claimed convex protrusion, Apple’s skepticism, Apple’s lengthy development path and developmental failures, Apple’s copying, the commercial success of Apple’s accused products, and Apple’s later recognition of the inventiveness and importance of Masimo’s claimed features demonstrates the devices recited in the challenged claims would not have been obvious to a POSITA many years earlier in July 2008. EX2002 ¶196.

B. Apple’s Analysis Is Driven by Hindsight and Fails to Treat the Challenged Claims as an Integrated Whole

The Petition treats the challenged claims as mere lists of disparate parts, disregarding the part-to-part relationships that give the claims their meaning. For both grounds, Apple’s analysis begins by describing the challenged claim limitations allegedly found in the asserted references. Pet. 5-13, 71-74. That is, Apple improperly “break[s] [each] invention into its component parts, then find[s] a prior art reference [allegedly] corresponding to each component.” *Princeton Biochemicals, Inc. v. Beckman Coulter, Inc.*, 411 F.3d 1332, 1337 (Fed. Cir. 2005). The Federal Circuit, however, has cautioned against this hindsight-driven approach of “using the invention as a roadmap to find its prior art components.” *Id.*

Completely unhinged from any proper analysis, Apple then describes “the structure of the combination device” it contrived using the challenged claims as its guide. Pet. 13-19, 74-76. Apple starts with the claims and works backwards to

cobble together each claim feature into a “combination device,” *id.*, but “[t]his type of piecemeal analysis is precisely the kind of hindsight that the Board must not engage in.” *In re NTP, Inc.*, 654 F.3d 1279, 1299 (Fed. Cir. 2011). Accordingly, Grounds 1A-1B fail because Apple’s analysis is based on impermissible hindsight. *See, e.g., id.* (“Care must be taken to avoid hindsight reconstruction by using ‘the [challenged patent] as a guide’”) (internal citation omitted).

Apple tries to glue its analysis together by arguing, on a part-by-part basis, that a POSITA would have been motivated to combine Lumidigm embodiments and other references as needed to yield ***claim limitations*** satisfied by its “combination device.” Pet. 19-28, 76-79. Similarly, Apple alleges an expectation of success in its proposed combinations of certain parts without addressing the full scope of the claims. *Id.* Apple thus attempts to bypass the statutory requirement to consider the claimed invention “as a ***whole***”—a requirement that helps protect against exactly this hindsight by “***prevent[ing] evaluation of the invention part by part.***” *Princeton Biochemicals*, 411 F.3d at 1337. As a result, Apple’s obviousness arguments for Grounds 1A-1B fail because they are driven exclusively by hindsight. Apple merely argues reasons supporting the construction of the “combination device” it fabricated using the challenged claims as its map (Pet. 19-28, 76-79)—i.e., improper reasons for combining its references “in the right way so as to achieve the [limitations] of the [challenged claims].” *NTP*, 654 F.3d at 1299 (internal citation omitted).

Accordingly, Apple has not established a likelihood of success on Grounds 1A-1B because of the impermissible hindsight underlying its arguments.

C. Apple Fails To Establish Any Reference Discloses, Teaches, or Suggests the Claimed Convex Protrusion

The independent claims require a protrusion arranged over at least three photodiodes and comprising a convex surface. EX1001, Claims 1, 19, 26. None of the cited art discloses a convex protrusion arranged over at least three photodiodes. The Petition is deficient on this basis alone.

Lumidigm discloses biometric sensors for identifying an individual and/or authorizing them to do something. EX1006, 5:30-6:5, 10:42-59, 1:53-2:58. One Lumidigm embodiment (below) is a wristwatch with a biometric sensor having *one* detector and eight light sources. *Id.*, FIG. 8B, 11:60-67, 8:43-53.

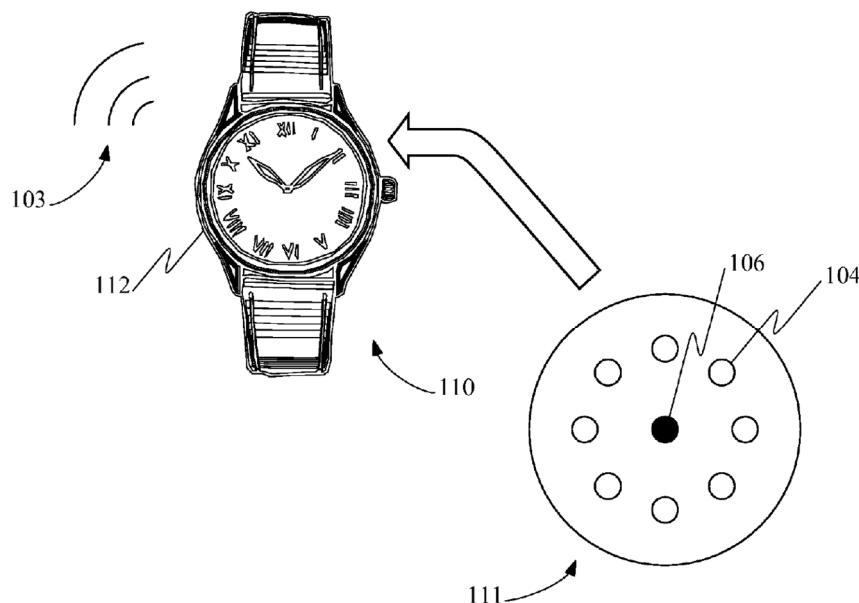


FIG. 8B

Lumidigm's sensors are flat. *Id.*, FIGS. 1-8E. EX2002 ¶¶62.

Scharf discloses a wearable reflectance pulse oximeter. EX1025, FIGS. 3-4, Abstract, 9:27-29.

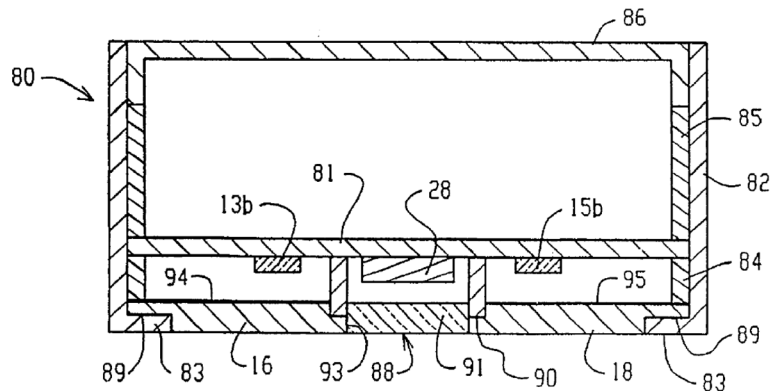
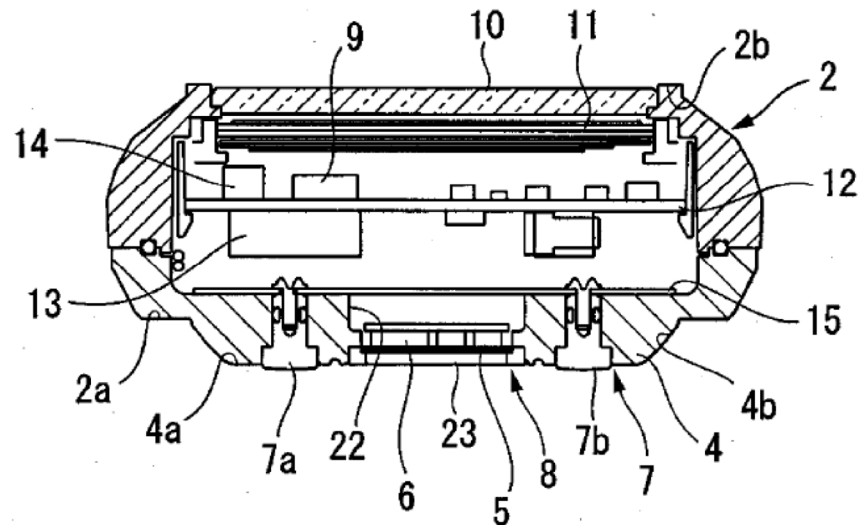


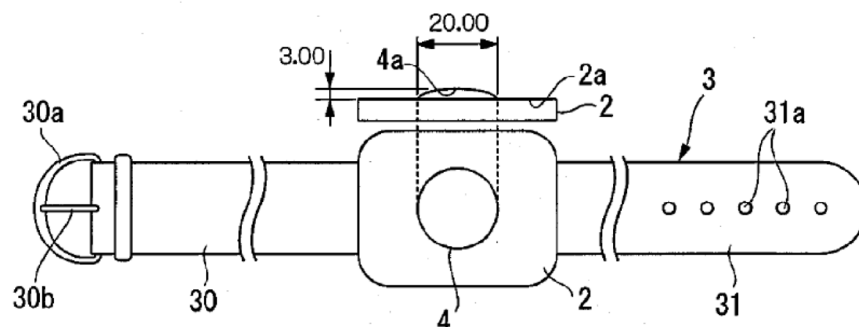
FIG. 4

Scharf's sensor has a flat face 88. *Id.*, FIGS. 3-4, 8:38-9:7. Scharf's flat face 88 includes flat "face pieces" (16, 18) covering two sets of LEDs (13, 15) and flat "face piece" (91) covering the single optical detector (26). EX2002 ¶¶69-70.

Kotanagi discloses wristwatch-based pulse rate measuring devices. EX1007, Abstract, ¶44.



EX1007, FIG. 7. The device of FIGS. 1-7 (above) includes a flat part 4 that contacts the user's tissue when used. *Id.*, FIGS. 2-3, 5-7, ¶(0063).



The device of FIG. 10 includes an embodiment of part 4, but with a curved surface (shown above). *Id.*, FIG. 10, ¶¶(0079)-(0080), (0033). Included within the part 4 of each Kotanagi device is one light source (LED 5) and one detector (PD 6). *Id.*, ¶¶(0055)-(0056), (0070). Kotanagi explains “the LED 5 and the PD 6 are as close to the [tissue] as possible” to ensure the device can “detect the pulse rate with high precision.” *Id.*; EX2002 ¶61.

Tran discloses optical sensors included in, for example, sunglasses or the wristband of a wearable device. EX1008, FIGS. 6A, 14B, 46:53-55; EX2002 ¶71. But Apple does not rely on Tran with respect to any independent claim limitations. Pet. 80-90.

Because none of Apple's references discloses a convex protrusion over at least three photodiodes, no combination of those references results in the claimed inventions. Thus, Apple simply modifies the combination to fit the claims, revealing Apple's hindsight analysis. However, a POSITA would not have combined the alleged protrusion of Kotanagi with Lumidigm's FIG. 8B wristwatch as modified by Apple, or reasonably expected that combination to succeed. Rather, the prior art teaches away from Apple's combination. Moreover, Apple's combination is not motivated by improving contact or coupling, would be less comfortable, and contradicts Kotanagi's teachings. The Petition fails for these reasons too.

1. No Reference Discloses Or Suggests The Claimed Protrusion

Every independent claim requires a protrusion arranged over at least three photodiodes and comprising a convex surface:

- Claims 1 and 26 require “a protrusion arranged over the interior surface [on which “at least three photodiodes [are] arranged”], the protrusion comprising a convex surface”

- Claim 19 requires “a protrusion extending over the three photodiodes [that are “arranged within the user-worn device”] and comprising a convex surface”

Although none of the references disclose the claimed protrusion, Apple cites passages of Lumidigm in an attempt to construct the claimed protrusion. Pet. 37, 68, 88. But none of those passages disclose the claimed protrusion. Apple and its expert make no attempt to explain how Lumidigm discloses the claimed protrusion. *Id.*; EX1003 ¶112. And Apple “has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic*, 815 F.3d at 1363. “[M]ere conclusory statements” like Apple’s unexplained string citation “cannot satisfy the petitioner’s burden of demonstrating obviousness.” *Magnum Oil*, 829 F.3d at 1380.

Regardless, Apple’s cited passages do not disclose the claimed protrusion. EX1006 at 7:5-6 (stating “FIG. 2 shows a cross-sectional view of the sensor head 32”), 8:1-4 (stating “FIG. 2 illustrates a sensor-head geometry”), 8:27-28 (optional “light relay” for transferring light between sensor and skin), FIG. 2 (flat sensor head). Lumidigm mentions that sensor head 32 of FIG. 2 “may also have a compound curvature on the optical surface” but does not show such a curvature in its figures. *Id.*, 7:58-63; EX2002 ¶141. However, a POSITA would not have understood the “compound curvature” referred to a protrusion comprising a convex

surface. Lumidigm expressly explains that its compound curvature may be included “to match the profile of a device in which it is mounted, to incorporate ergonomic features that allow for good optical and mechanical coupling with the tissue being measured, or for other technical or stylistic reasons.” EX1006, 7:58-63. A POSITA would have understood “compound curvature” referred to a surface to match the tissue. EX2002 ¶141. A **concave** surface would better match the profile of the wrist, whereas a convex surface would not be ergonomic. EX1006, 7:58-63; EX2002 ¶141.

Indeed, Apple subpoenaed Lumidigm’s inventor (Rowe) for a deposition and later brought him to testify at the ITC hearing as the cornerstone of its invalidity defense. But that defense collapsed, as Rowe confirmed what was clear to everyone except supposedly Apple, that the “compound curvature” refers to a **concave** surface “that approximates the surface of the skin.” EX2016, 69:8-21; EX2002 ¶142.

Additionally, the “compound curvature” does not inherently disclose a convex protrusion because it is neither “necessarily” included nor “necessarily” convex. EX1006, 7:58-63; EX2002 ¶143; *PAR Pharm., Inc. v. TWI Pharms., Inc.*, 773 F.3d 1186, 1194 (Fed. Cir. 2014) (missing limitation “necessarily must be present” for inherent disclosure). Moreover, the prevailing wisdom was to avoid protrusions. *Infra* Section VI.D.1 (discussing Mendelson-799).

Elsewhere in the Petition, Apple relies on Lumidigm stating that “any of the sensor geometries previously disclosed” may be used for the FIG. 8B wristwatch. Pet. 6; EX1006, 11:65-12:2. But “sensor geometries” in Lumidigm refers only to specifically disclosed arrangements of light sources and detectors. EX1006, 12:26-32, 12:9-14, 12:44-48; EX2002 ¶144. Indeed, Lumidigm’s inventor testified that “any of the sensor geometries previously disclosed” refers only to the sensors shown in “FIGS. 3 through 7.” EX2008, 1152:7-21. Lumidigm only describes the “compound curvature” in connection with FIG. 2, and FIG. 2 does not show a compound curvature. EX1006, 7:58-63; EX2002 ¶144. Lumidigm’s mention of possibly using “sensor geometries previously disclosed” thus does not disclose or suggest adding any type of curvature to its FIG. 8B wristwatch. EX2002 ¶144.

Because Lumidigm is missing a protrusion, Apple proposes combining it with Kotanagi. Specifically, Apple proposes implementing the curved surface part 4 Kotanagi’s FIG. 10 device as the optical surface of Lumidigm’s FIG. 2. Pet. 14-15, 37-38. Kotanagi, however, also does not disclose, teach, or suggest the claimed protrusion. For example, every embodiment of Kotanagi has just one photodetector (“PD 6”). EX1007 ¶46; FIGS. 5-13; EX2002 ¶145. Kotanagi thus does not disclose a protrusion “arranged over the interior surface [on which the “at least three photodiodes” are arranged]” (Claims 1, 26) or “extending over the three photodiodes” (Claim 19). *Id.* Likewise, Kotanagi’s *single* photodetector design

lacks **multiple** protrusion openings “positioned over” (Claim 1) or “aligned with” (Claim 26) the three photodiodes. *Id.* Kotanagi’s **single** photodetector design similarly lacks **multiple** protrusion windows “associated with” the three photodiodes (Claim 19). *Id.*

Apple’s expert’s declaration is a near-verbatim copy of Apple’s conclusory and incorrect Petition arguments, with no independent analysis or explanation. *Compare* Pet. 13-19, 24-25, 37-38 with EX1003 ¶¶58-69, 83-86, 112-113. Such testimony does not suffice to establish obviousness. *See, e.g., TQ Delta, LLC v. CISCO Sys., Inc.*, 942 F.3d 1352, 1358-63 (Fed. Cir. 2019) (conclusory and unhelpful expert testimony inadequate to support an obviousness finding; reversing Board’s obviousness finding on that basis).

For these reasons, the prior art of Grounds 1A-1B fails to disclose or suggest the claimed protrusion.

D. A POSITA Would Not Have Been Motivated to Combine Lumidigm with Kotanagi’s Curved Surface

Grounds 1A-1B also fail for the independent reason that the Petition fails to establish a motivation to combine. Apple offers two reasons that supposedly would have motivated a POSITA to combine the biometric sensor of Lumidigm’s FIG. 8B wristwatch with the alleged protrusion comprising a convex surface of Kotanagi: “better contact” and “more comfortable.” Pet. 24-25. But a POSITA would not have been motivated to combine Lumidigm and Kotanagi because (1) the prior art

teaches away from the combination; (2) “better contact” would not have motivated the combination; (3) user comfort would not have motivated the combination; and (4) the combination contradicts Kotanagi’s teachings.

1. Mendelson-799 Teaches Away From The Combination

Apple argues a POSITA would have been motivated to implement the curved surface of Kotanagi’s FIG. 10 sensor with Lumidigm’s FIG. 8B wristwatch to “provide better contact between the sensor surface and the tissue.” Pet. 24-25. But, as explained above, Lumidigm teaches a flat surface or alternatively a compound curvature to match the surface of the user’s tissue and provide better coupling—which the inventor confirmed is a *concave* surface, the opposite of a convex protrusion. *Supra* Section VI.C.1. And the contemporaneous prior art teaches away from a protrusion comprising a convex surface.

Lumidigm and Mendelson-799 both describe reflectance sensors because their “light sources and detector lie on the same side of the tissue.” EX1006, 7:12-14, FIGS. 1-8B; EX1023, FIGS. 3-5, 2:14-17; EX2002 ¶148. Mendelson-799 stated the prevailing understanding at the time of a well-known problem associated with reflectance sensors:

[V]ariations in contact pressure between the sensor and the skin can cause larger errors ... since some of the blood near the superficial layers of the skin may be normally displaced away from the sensor housing towards deeper subcutaneous structures. Consequently, the highly reflective bloodless tissue compartment near the surface of the skin can

cause large errors even at body locations where the bone is located too far away to influence the incident light generated by the sensor.

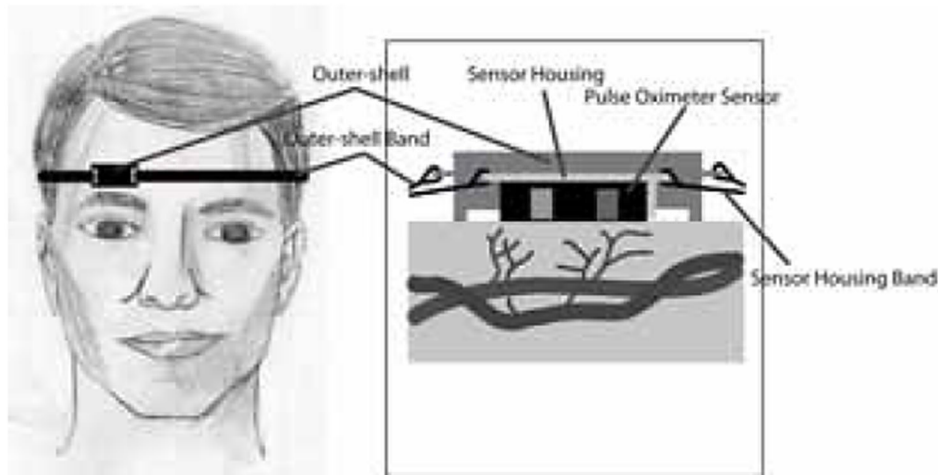
EX1023, 2:47-57; EX2002 ¶¶149, 88-89. Mendelson-799 taught that pressure displacing blood away from the sensor would cause particularly “large errors” in reflectance sensors because such sensors already receive weaker signals before any pressure is applied. EX1023, 2:53-57; EX2002 ¶89.

Mendelson-799 repeatedly warns against exerting pressure at the measurement site for reflectance sensors. For example, Mendelson-799 explains that “mechanical pressure exerted by the sensor on the skin” is a “major source of ... errors.” EX1023, 3:23-31; EX2002 ¶89. Mendelson-799 teaches throughout its disclosure that pressure causes large errors in reflectance sensors’ measurements of blood-based parameters. *See, e.g.*, EX1023, 2:37-53, 3:27-67, 4:59-65, 5:15-21, 6:1-3, 6:8-13, 6:16-35, 10:49-53, 12:62-13:5; EX2002 ¶89. Mendelson-799 demonstrates the understanding of those of skill in the art at the relevant time that excessive or varying pressure caused errors in reflectance measurements of blood-based parameters. EX2002 ¶89.

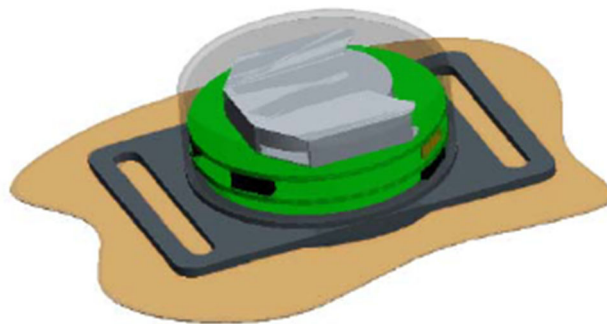
Mendelson-799 also explains why excessive and/or varying pressure was known at the relevant time to cause large errors in reflectance sensors’ measurements of blood-based parameters. EX2002 ¶¶42-43, 90. Mendelson-799 teaches, for example, that accurately measuring oxygen saturation requires obtaining consistent, high-quality red and infrared photoplethysmographic (“PPG”) signals. EX1023,

6:16-22, 1:33-60, 8:65-9:7; EX2002 ¶90. Each PPG signal has a pulsatile (AC) component caused by arterial blood and a non-pulsatile (DC) component that is caused by bloodless tissue. EX1023, 1:42-2:7; EX2002 ¶90. However, pressure was understood to cause large measurement errors because the AC and DC components of PPG signals signal “*are affected differently by pressure.*” EX1023, 6:25-30; EX2002 ¶90. Mendelson-799 thus teaches that pressure disproportionately impacts the DC component of PPG signals, causing erroneous measurements. EX1023, 6:16-35; EX2002 ¶90.

Other contemporaneous art reiterates the understanding a POSITA had at the relevant time regarding the pressure problem. For example, Mendelson made prototype sensors and published about them 2006, made commercial sensors and presented about them in 2007-2008, and published about his commercial sensors in 2013. EX2032; EX2004; EX2005; EX2006; EX2007; EX2002 ¶¶44-49. In 2006, Mendelson explained that applying excessive or varying contact pressure between the sensor and skin was “known to interfere with local blood flow, consequently leading to diminished or loss of the photoplethysmographic (PPG) signal” and thus, “affect[s] the measurement accuracy.” EX2032, 49-50; EX2002 ¶45. His prototype sensors were flat.



Id. Around the same time in 2005-2006, Professor Mendelson developed another prototype reflectance pulse oximetry sensor, which he published about and presented at an industry conference in 2006. EX2004; EX2005; EX2002 ¶46. As shown below, that prototype reflectance sensor was flat.



Id. In 2007-2008, Mendelson designed and manufactured commercial forehead-mounted pulse oximeters. EX2006; EX2002 ¶47. That reflectance sensor design included the slightly concave curvature shown below to match the tissue surface, just like Lumidigm, not press into it. *Id.* This makes sense because Mendelson repeatedly taught that pressure would introduce significant errors by displacing the superficial (capillary) blood being measured, as was well understood in the industry.



EX2006. In August 2008, Professor Mendelson gave a presentation regarding the above sensor design at an industry conference. EX2006; EX2002 ¶47. In 2013, Mendelson published an article explaining “[e]xcessive contact pressure between a reflectance pulse oximeter sensor and the skin is known to interfere with local blood flow, consequently leading to diminished or loss of the PPG signals.” EX2007, 3; EX2002 ¶48. Accordingly, Mendelson’s work over many years consistently taught that before, during, and after the relevant 2008 timeframe, a POSITA understood that pressure at the measurement site caused errors in reflectance measurements of blood-based parameters. EX2002 ¶49.

Based on that understanding, as demonstrated by Mendelson-799, a POSITA would have understood that adding a convex protrusion to a reflectance sensor like Lumidigm would add excessive and varying pressure to the measurement site. EX2002 ¶¶149, 91. That pressure was understood to displace blood away from the sensor, which was taught to *cause* large errors in blood-based parameter measurements, as explained above. *Id.* Indeed, Masimo’s own inventors accepted

this understanding before conducting the research leading to the discovery of the convex protrusions claimed in the '501 Patent. EX2008, 98:9-99:16.

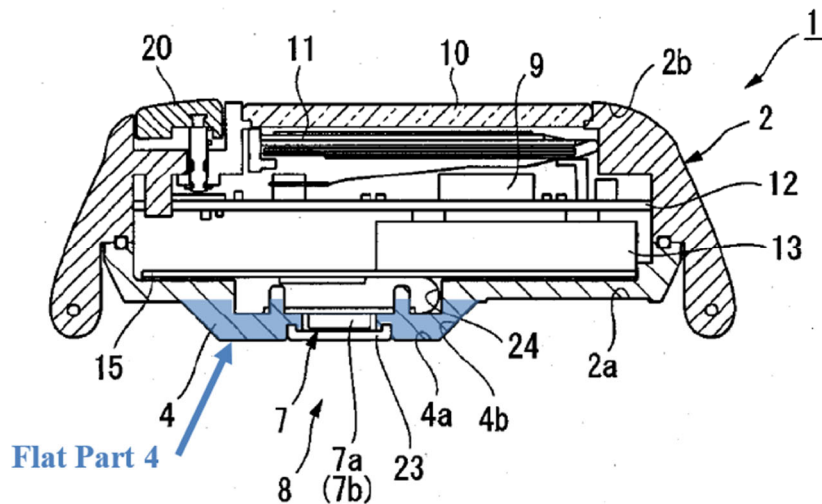
Accordingly, the leading art, repeatedly and consistently taught away from Apple's proposed combination because a POSITA "would be discouraged" or "led in a direction divergent from" combining a pressure-inducing convex protrusion with Lumidigm's sensors. *Ricoh Co., Ltd. V. Quanta Computer Inc.*, 550 F.3d 1325, 1332 (Fed. Cir. 2008); *Chemours Co. FC, LLC v. Daikin Indus., Ltd.*, 4 F.4th 1370, 1376-77 (Fed. Cir. 2021) (repeated warnings or "cautions" that a path "should not be used" constitutes teaching away); EX2002 ¶¶149, 91. And the "inference of nonobviousness is especially strong" because the prior art's "teachings undermine the very reason being proffered as to why a [POSITA] would have combined" Kotanagi with Lumidigm. *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1326 (Fed. Cir. 2009); Pet. 24-25 (proposing combining Kotanagi and Lumidigm to increase contact pressure); EX2002 ¶¶149, 91.

2. "Better Contact" Would Not Have Motivated the Combination

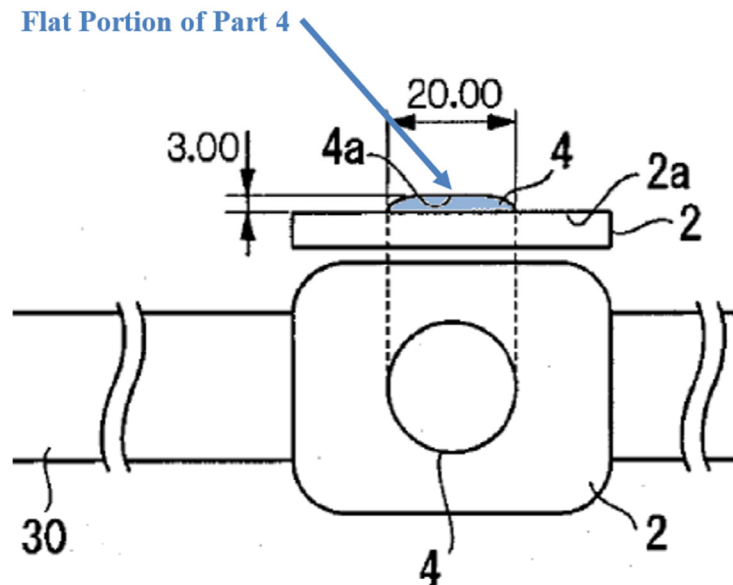
Apple also failed to show the art would motivate adding a protrusion comprising a convex surface to Lumidigm, for several reasons.

Apple relies on Kotanagi's FIG. 10 "curved surface" of its part 4. Pet. 14-15, 24-25, 37-38. Apple refers to Kotanagi's statement that part 4 can be mounted so tissue "deforms smoothly" and "contact pressure" and "adherence" are increased.

Id. 24 (quoting EX1007 ¶80). But Kotanagi also explains that a flat “part 4” provides the same benefit. EX1007 ¶63 (flat part 4 causes tissue to *deform smoothly*), ¶73 (flat part 4 *enhances contact* with tissue); EX2002 ¶151. Kotanagi’s flat part 4, which is included in its FIGS. 1-7 device, does not comprise a convex surface as shown below.



EX1007, FIG. 6 (annotated above), FIGS. 2-3, 5-7; EX2002 ¶151. Kotanagi also explains that part 4 of its FIG. 9 sensor, which comprises a flat surface, provides the same benefit. EX1007 ¶79 (part 4 of FIG. 9 “makes it possible to *further enhance the adherence*”); EX2002 ¶151. And the part 4 of FIG. 9 includes a flat portion over a single detector—not a convex surface over multiple photodiodes or the surface on which they are mounted, as shown below.



EX1007, FIG. 9 (annotated above); EX2002 ¶151. Thus, Kotanagi does not attribute better contact to the curved surface of its FIG. 10 device because it specifically teaches a flat protruding surface. EX2002 ¶151. As such, Apple cannot establish that “*better* contact” provides any motivation because no such teaching is attributable to the curved surface it proposes combining with Lumidigm. *Id.* Kotanagi provides no teaching that the curved surface provides “better contact.” Apple thus fails to establish a reason why a POSITA would have selected Kotanagi’s curved surface rather than a part 4 with a flat surface for the same “better contact” benefit. Pet. 24-25. Furthermore, the contemporaneous art, including Aizawa, taught a flat sensor would “improve adhesion to the wrist.” EX1024, ¶34; EX2002 ¶151; *see, e.g.*, EX2016, 69:8-21. As such, providing better contact with the tissue would not have motivated a POSITA to add a convex protrusion to Lumidigm’s sensors.

In furtherance of its “better contact” motivation, Apple string cites Lumidigm and three references that form no part of the grounds. Pet. 24-25. But none of these references support Apple’s alleged motivation.

First, Apple relies on Lumidigm’s statement that the flat FIG. 2 sensor head (shown below) “may also have a compound curvature on the optical surface ... to incorporate ergonomic features that allow for good optical and mechanical coupling” Pet. 25 (citing EX1006, 7:58-63).

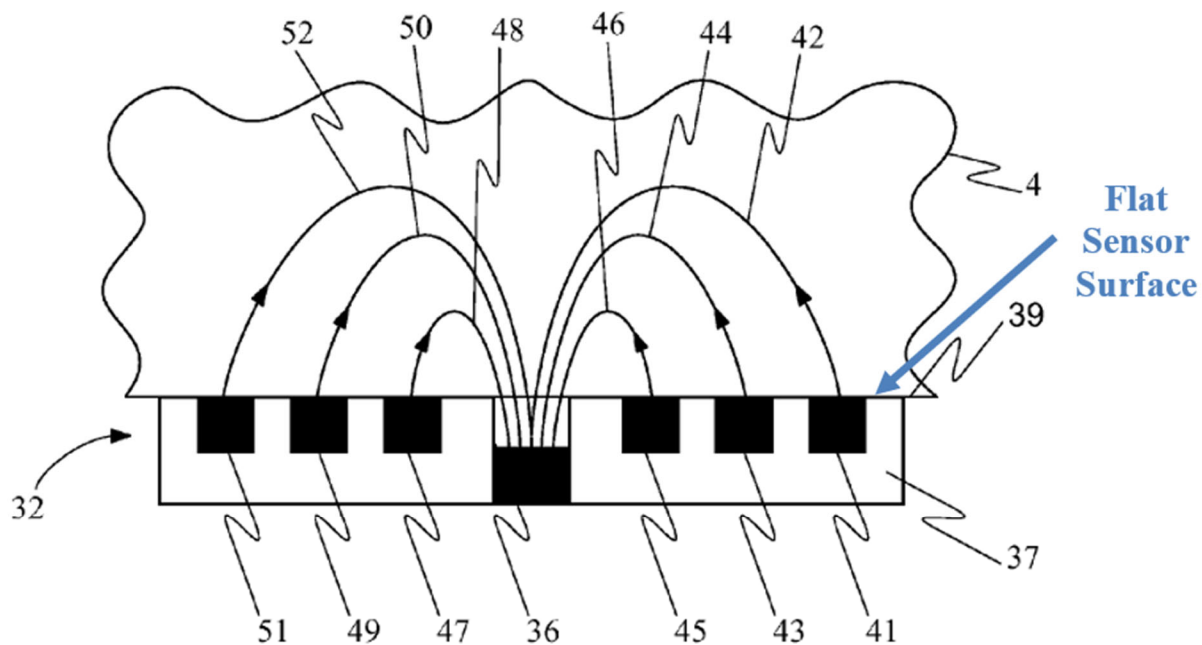


FIG. 2

EX1006, FIG. 2 (annotated). But that statement does not refer to a *convex* protrusion at all. As discussed above, *supra* Section VI.C.1, Apple elicited testimony from Lumidigm’s inventor (Rowe) that Lumidigm’s patent describes a *concave* compound curvature—not convex. He explained that this concave curvature would

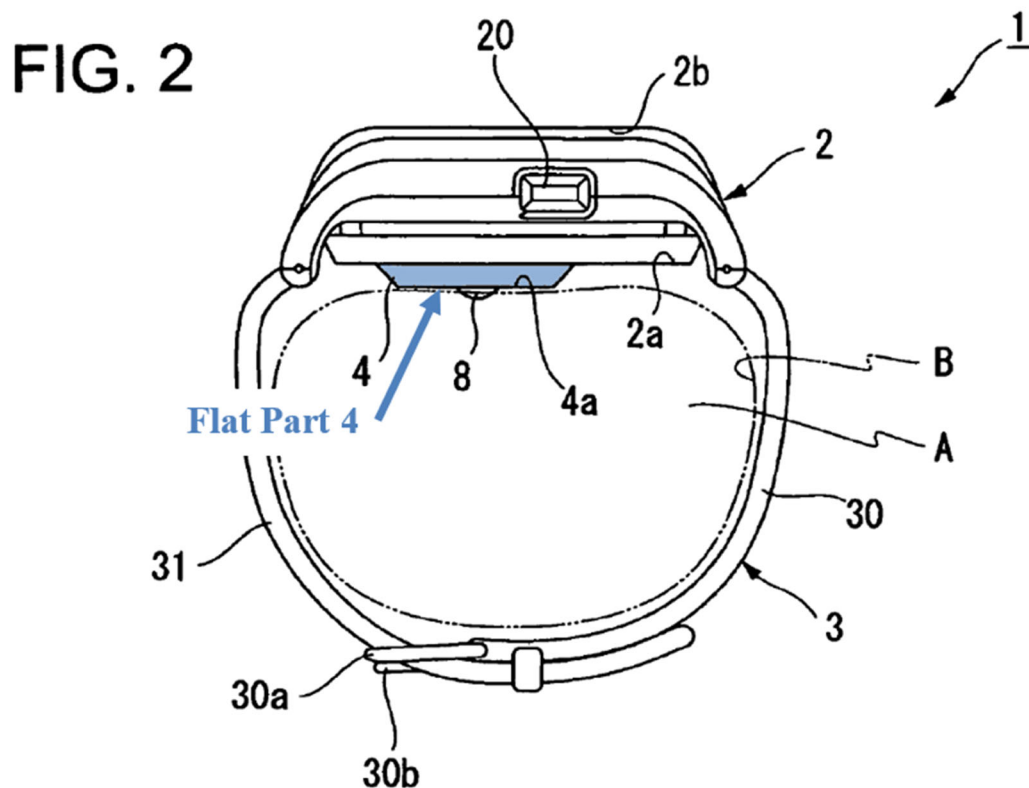
better “approximate the surface of the skin” and achieve better coupling. EX2016, 69:8-21. Here, the claimed protrusion does the opposite, by *protruding into* the skin. EX1001, 20:25-33, 21:26-29; EX2002 ¶153. Despite tracking Rowe down decades after Lumidigm’s filing, deposing him, and subpoenaing him to testify at the ITC trial—where he was represented by the same law firm that filed this Petition—Apple ignores Rowe’s testimony on the very subject Apple sought from him. EX2016; EX2031; EX2017; EX2008, 1140:4. Instead, Apple concealed this evidence, justifying adverse inferences against Apple’s arguments. Regardless, Lumidigm lacks the claimed protrusion and would not have motivated a POSITA to add a convex protrusion over multiple detectors to its wristwatch. EX2002 ¶153.

Consistent with Rowe’s testimony, Mendelson’s work (discussed above) further demonstrates that a POSITA in July 2008 would have selected a concave—not convex—surface to improve coupling. *Supra* Section VI.D.1.

Second, Apple cites two passages of Kondo without any explanation. Pet. 25. Apple provides no rationale that would motivate a POSITA to turn to Kondo, much less to motivate combining structure from Kotanagi with Lumidigm. *Id.* Notably, the structures of Kondo (an under-finger sensor) differ from those in Kotanagi (a wrist sensor). EX1009, FIG. 28; EX1007, FIG. 10. Apple does not even address whether the teachings of Kondo’s finger sensor applies to Kotanagi or Lumidigm. Pet. 25. Kondo says nothing about advantages or disadvantages of the Kotanagi

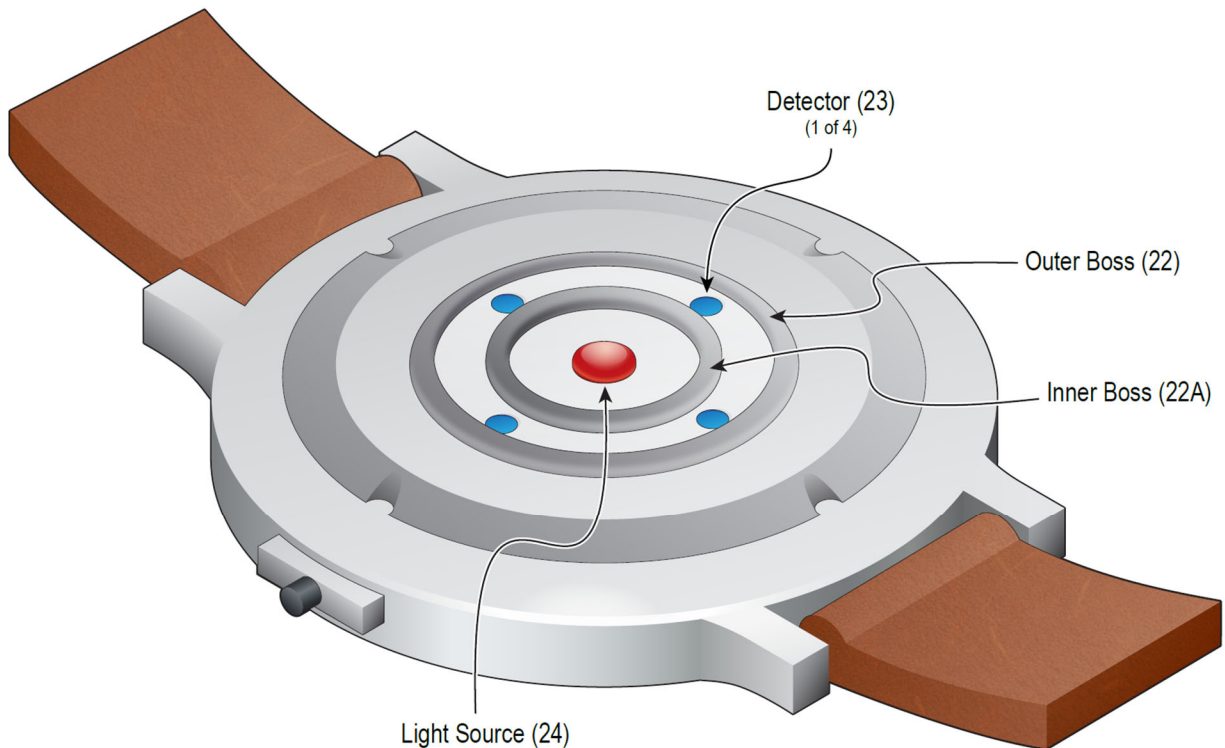
structure. EX1009, 3:22-28, 19:8-13. Regardless, Kondo includes a single detector (32). EX1009, FIG. 28, 10:14-19; EX2002 ¶154. Kondo's *single* photodetector design lacks *multiple* protrusion openings "positioned over" (Claim 1), "aligned with" (Claim 26), or "associated with" (Claim 19) the three photodiodes. *Id.* Kondo lacks the claimed protrusion and thus would not have motivated a POSITA to add such a protrusion to Lumidigm. *Id.*

Third, Apple cites another Seiko reference, Maegawa, without explanation. Pet. 25. Apple relies on three lines from Maegawa regarding part 4 of the FIGS. 2-3 sensor. Pet. 25 (citing EX1011, 7:52-55). But part 4 is flat, as shown below.



EX1011, FIGS. 2 (annotated), 3, 7:60-67 (explaining item 8, above, is a “pair of electrodes”); EX2002 ¶155. Maegawa’s part 4 does not disclose the claimed convex protrusion. *Id.* Accordingly, Maegawa would not have motivated a POSITA to combine structure from Kotanagi with Lumidigm, and still would not have resulted in the claimed inventions. *Id.* Apple provides no rationale that would motivate a POSITA to turn to Maegawa, much less to motivate combining structure from Kotanagi with Lumidigm, and then modifying it to match the claimed inventions. Pet. 25.

Fourth, Apple lists Cramer but never explains any rationale that would motivate a POSITA to turn to Cramer, much less to motivate combining structure from Kotanagi with Lumidigm and then to modify them to meet the claims. Pet. 25. Cramer describes coaxial bosses (22/22A) as providing “effective sensing” and “minimum discomfort.” EX1010, 5:41-68; EX2002 ¶156. Moreover, Cramer shows a very different structure that does not include a convex surface protrusion, much less one that covers the detectors (23) and light source (24).



EX1010, FIGS. 2-3, 6 (3D rendering of Cramer's optical sensor provided above), 5:41-68; EX2002 ¶156. Cramer's bosses do not extend over the detectors. *Id.* Consistent with the teachings at the time from Masimo, Nellcor, Mendelson, Aizawa, and others, those of skill understood to avoid pressure on the skin surface. EX2002 ¶156. Cramer thus would not have motivated a POSITA to add a convex pressure-inducing protrusion over at least three photodiodes or to combine structure from Kotanagi with Lumidigm, and then modify that structure further. EX1010, 5:41-68; EX2002 ¶156.

Accordingly, none of the references Apple relies on support its assertion that “better contact” would have motivated the proposed combination of Kotanagi's

curved surface with Lumidigm, much less then modifying that structure such that a single protrusion comprising a convex surface over at least three photodiodes.

3. User Comfort Would Not Have Motivated the Combination

Apple also argues that providing more comfort would have motivated combining Kotanagi with Lumidigm. Pet. 25. But Apple fails to identify any comfort problem with Lumidigm. *Id.* Lumidigm does not indicate any problem with comfort. *See generally* EX1006; EX2002 ¶158. Rather, Lumidigm teaches to create a conforming surface (not a protrusion into the surface). Moreover, Apple relies on three passages from Kotanagi that do not establish a curved surface would be “more comfortable” or provide the argued benefit compared to the flat surface. *Id.*

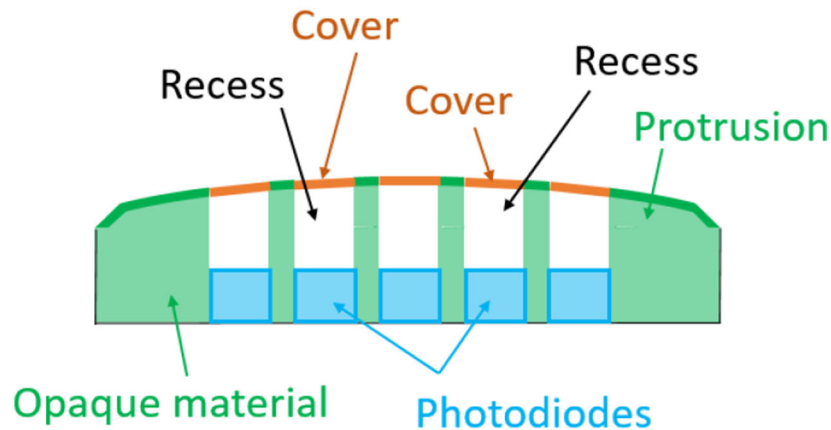
Apple relies on Kotanagi passages stating that devices with the curved surface 4 “are comfortable to wear.” Pet. 25 (citing EX1007 ¶¶79-80, 33). But Kotanagi does not compare curved surfaces to flat surfaces or teach that a curved surface is somehow more comfortable than another design. *See generally* EX1007; EX2002 ¶159. Kotanagi repeatedly associates comfort with all its embodiments. EX1007, ¶¶9, 33, 35, 40, 68, 73, 79-80, 89, Abstract. Apple’s conclusory assertion that Kotanagi’s curved surface is more comfortable than a flat sensor is “inadequate to support a finding that there would have been a motivation to combine.” *TQ Delta*, 942 F.3d at 1359. The reference itself provides no such teaching.

In fact, Kotanagi’s devices are comfortable because of the elastic bands, regardless of the protrusion shape. Specifically, Kotanagi explains “the device does not cause discomfort, even when worn for a long time” because “the main body is mounted to the wrist A with the fixing means 3”—i.e., elastic bands 30-31. EX1007 ¶73; *see id.* ¶68; EX2002 ¶160. Accordingly, improving comfort would not have motivated a POSITA combine Kotanagi’s curved surface to Lumidigm’s wristwatch, much less to modify it as Apple proposes using the claims as its guide. *Id.*

The very art Apple relies on teaches that pressing into the tissue would be less comfortable, not “more comfortable” as Apple alleges. For example, Cramer teaches that forcing a watch-based sensor into the tissue would be “*uncomfortable* over a prolonged period of time.” EX1010, 5:26-29; EX2002 ¶161. A POSITA would have expected that securing a sensor with a protrusion comprising a convex surface to the user with Lumidigm’s watchband would force the sensor into the user’s wrist tissue, causing a pressure point and associated discomfort at the wrist. *Id.* Thus, a POSITA would have understood the combination would be *less comfortable* than a flat sensor. *Id.* And a POSITA would not have been motivated to combine features that were expected to make Lumidigm’s sensors less comfortable. EX1006, 7:58-63; EX2002 ¶161.

4. The Combination Contradicts Kotanagi's Teachings

Apple also further modifies the combination to include light sources and detectors *recessed away from the tissue*. Pet. 17-19, 38.



Id., 18. Apple contends the recessed-away feature satisfies the limitations regarding openings and opaque walls. *Id.*, 17-19, 38. But Kotanagi repeatedly discloses that the light source (LED 5) and detector (PD 6) “touch the inside of the glass cover 23” of part 4 so that they are “*as close to the living body surface B as possible.*” EX1007 ¶¶55-56, 70; EX2002 ¶163. Kotanagi explains this configuration “makes it possible to detect the pulse rate with high precision.” EX1007 ¶70; EX2002 ¶163. Apple’s proposed combination, which modifies the combination to add the above recesses, contradicts Kotanagi’s teachings. *Id.* It is impermissible for Apple to selectively “pick and choose” from Kotanagi while ignoring Kotanagi’s above-described contradictory teachings. *In re Wesslau*, 353 F.2d 238, 241 (CCPA 1965); *In re*

Fritch, 972 F.2d 1260, 1264 (Fed. Cir. 1992) (“a prior art reference is relevant for all that it teaches to [a POSITA].”).

Furthermore, Apple’s expert merely copies Apple’s conclusory and incorrect Petition arguments, with no independent analysis or explanation. *Compare* Pet. 24-25 *with* EX1003 ¶¶83-86. Such ill-supported and unhelpful testimony is inadequate to establish obviousness. *See, e.g., TQ Delta*, 942 F.3d at 1358-63.

Accordingly, Apple fails to establish any motivation to make the proposed combination of Kotanagi and Lumidigm.

E. A POSITA Would Not Have Reasonably Expected Success in the Proposed Combination of Lumidigm with Kotanagi’s Curved Surface

Grounds 1A-1B also fail for the independent reason that the Petition fails to establish a reasonable expectation of success. Pet. 25.

Apple proposes combining Kotanagi’s pulse rate sensor with Lumidigm’s wristwatch. Apple contends Lumidigm’s wristwatch measures oxygen saturation. *Id.*, 30-31, 42-43. Masimo disagrees. *Infra* Section VI.H. And the testimony of Lumidigm’s inventor, Rowe, confirmed that Lumidigm’s extended functionality was merely the result of a “brainstorming” session. EX2008, 1146:18-1147:3.

However, even if Lumidigm had disclosed such a feature, a POSITA would not have expected the combination of Kotanagi and Lumidigm to succeed. A pulse rate sensor determines pulse by simply counting the number of pulse waves.

EX1007 ¶65. Because pulse rate sensors like Kotanagi do not require consistent, high-quality PPG signals to accurately calculate a measurement, they are not susceptible to the same pressure-induced errors of oxygen saturation sensors. *See, e.g.,* EX1023, 1:42-2:2, 6:16-35; EX2002 ¶164. A POSITA would have understood this difference and would not have expected a pressure-increasing feature from a pulse rate sensor to succeed in a pulse oximeter. *Id.*

For example, Dr. Waydo, the director of Apple’s team for health algorithms on the Apple Watch, testified during the ITC hearing that oxygen saturation and heart rate measurements are “very different” and require solving “a different set of problems.” EX2008, 937:2-938:24. Waydo also testified that “oxygen saturation is a more difficult measurement than heart rate measurement.” *Id.* Waydo’s testimony is consistent with the understanding of a POSITA that features of a pulse rate sensor would not be expected to succeed in a pulse oximeter because pulse oximetry is significantly different and more difficult than pulse rate measurement. *Id.*; EX2002 ¶164.

Apple argues a POSITA would have expected the proposed combination to succeed because “Lumidigm already contemplates that the optical surface of the sensor can have a curvature.” Pet. 25. But that only addresses what “can” be done, not what a POSITA would have been motivated to do with two different sensor designs. *See, e.g., Adidas AG v. Nike, Inc.*, 963 F.3d 1355, 1359 (Fed. Cir. 2020)

(obviousness inquiry asks what a POSITA would have been motivated to do, not what “could” be done). Apple never explains how to incorporate the combined sensor into Lumidigm’s wristwatch. Pet. 25. Apple merely states that “[i]n the combination, the optical sensor is ‘built into the case of a wristwatch,’” with no explanation as to how or why that would have been done. *Id.*, 14 (quoting EX1006, 11:60-62), 13, 15-19, 24-25. Apple never addressed success in various other claimed features, such as openings in a convex protrusion with opaque material configured to avoid light piping. *Id.* Apple fails to address the likelihood of success in meeting the full scope of the claimed invention, and thus has not met its burden in the Petition. *Intelligent Bio-Sys.*, 821 F.3d at 1367-69.

Apple also argues a POSITA would expect the proposed combination’s success because “Lumidigm and Kotanagi pertain to the same field” Pet. 25. But the mere existence of two references in the “same field” provides no reasonable expectation of success in the specific combination Apple proposes. *See, e.g., Securus Techs., Inc. v. Global Tel*Link Corp.*, 701 Fed. Appx. 971, 977 (Fed. Cir. 2017) (affirming nonobviousness finding).

Accordingly, Apple has not shown a reasonable likelihood of success on Grounds 1A-1B for any challenged claim.

F. Apple Fails To Establish Any Reference Discloses, Teaches, or Suggests Opaque Surfaces/Material Configured to Avoid/Reduce Light Piping or Unattenuated Light

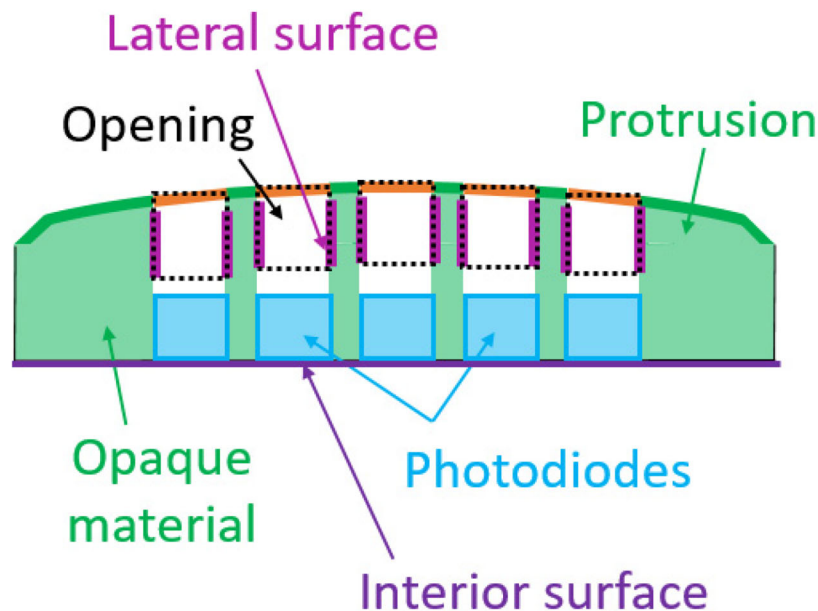
Every independent claim requires that the “openings” include an “opaque lateral surface configured to avoid light piping through the protrusion” (Claim 1), an “opaque surface extending through the protrusion and configured to avoid light piping” (Claim 26) or the “windows” are lined with “opaque material configured to reduce an amount of light reaching the photodiodes without being attenuated by the tissue” (Claim 19).

No reference discloses a convex protrusion with openings having opaque surfaces or opaque material extending through the protrusion configured to avoid or reduce light piping or unattenuated light. Apple relies solely on Lumidigm for such limitations, but Lumidigm does not discuss protecting against light piping or unattenuated light, recognize it as a problem, or provide or suggest a solution to resolve it. And Apple did not articulate a motivation to combine or expectation of success for such limitations.

Each argument applies to independent Claims 1, 19, and 26. Accordingly, Grounds 1A-1B fail for each reason in this section.

1. No Reference Discloses Or Suggests Opaque Surfaces/Material Configured To Avoid/Reduce Light Piping Or Unattenuated Light

Apple’s “combination device” does not contain an opaque surface or opaque material extending through the protrusion. Pet. 39. Apple’s illustration of its “combination device” is shown below.



Id. Apple’s illustration misleadingly suggests its “combination device” need only have an opaque lateral surface (purple) up to the cover or window (orange). *Id.* But Apple’s modification to add an opaque surface does not even extend “through the protrusion” (Claims 1, 26)—it stops short. This shortcoming also shows the windows of Apple’s combination device are not lined with any opaque material (Claim 19). Therefore, Apple did not establish a prima facie case of obviousness for Claims 1, 19, and 26.

In an effort to overcome this shortcoming, Apple deceptively shades the opaque material and the convex surface in nearly the same color. Pet. 39. Apple shades the opaque material with a medium-light shade of green-cyan. *Id.* Apple shades the convex surface of its combination device with a medium-dark shade of green-cyan. *Id.* But Apple’s artistic liberty fails because the convex surface is clear. Indeed, Apple states the convex surface is a “*clear face*.” Pet. 16. Apple’s combination device thus lacks an opaque surface extending through the alleged protrusion or opaque material lining the windows. Therefore, Apple did not establish a prima facie case of obviousness for Claims 1, 19, and 26.

For Claims 1 and 26, Apple argues its combination device reduces/avoids light piping because Lumidigm states that recessing a detector in opaque material “minimizes the amount of light that can be detected after reflecting off the first (epidermal) surface of the tissue.” *Id.* (quoting EX1006, 8:4-7). But the ’501 Patent describes “light piping” as “light that bypasses measurement site 102.” EX1001, 22:48-50; EX2002 ¶166. Because Lumidigm discusses light that interacts with the measurement site, it does not concern light piping. EX1006, 7:64-8:18; EX1001, 22:48-50; EX2002 ¶166. Rather, it describes light reflecting off the tissue. *Id.* Lumidigm does not recognize light piping through the protrusion as a problem or provide a solution to address it. *Id.*

Similarly, for Claim 19, Apple argues its combination device reduces the amount of unattenuated light reaching the photodiodes because Lumidigm states that recessing a detector in opaque material “minimizes the amount of light that can be detected after reflecting off the first (epidermal) surface of the tissue.” Pet. 69 (quoting EX1006, 8:4-7). But Lumidigm’s discussion of light reflecting from the tissue concerns *attenuated* light. Indeed, the ’501 Patent explains that “[*light is attenuated as it passes through or is reflected from the tissue ...*]” EX1001, 26:40-41. Thus, Lumidigm does not recognize unattenuated light as a problem or provide a solution to address it. EX1006, 7:64-8:18; EX1001, 26:40-41; EX2002 ¶167.

Apple also argues that using opaque material to reduce light piping was well-known. Pet. 39-40. But Apple’s only support is the ’501 Patent itself, and nowhere does it say that such information was known. *Id.* Apple’s reliance on the ’501 Patent reveals its impermissible hindsight analysis. *NTP*, 654 F.3d at 1299; EX2002 ¶168.

Apple’s expert’s declaration is a near-verbatim copy of Apple’s conclusory and incorrect Petition arguments, with no independent analysis or explanation. *Compare* Pet. 38-41 *with* EX1003 ¶¶114-118. Such testimony is inadequate to show obviousness. *See, e.g., TQ Delta*, 942 F.3d at 1358-63.

G. Apple Failed to Articulate a Motivation to Combine or Expectation of Success Regarding the Opaque Surfaces/Material Limitations

Apple failed to meet its burden to establish a motivation to combine Lumidigm’s sensors with the claimed opaque lateral surfaces (Claim 1), opaque

material (Claim 19), or opaque surfaces (Claim 26). Pet. 19-28, 39-41, 68-69, 88-89. Apple also failed to meet its burden to establish a reasonable expectation of success. *Id.* Apple relies solely on different Lumidigm embodiments for these limitations without articulating a motivation to combine the claimed features with Lumidigm’s sensors or a reasonable expectation of success in such combinations. *Id.*; EX2002 ¶169. Accordingly, Apple ignores that when “combining multiple embodiments from a single reference, or selecting from large lists of elements in a single reference, *there must be a motivation to make the combination and a reasonable expectation that such a combination would be successful*, otherwise a [POSITA] would not arrive at the claimed combination.” *In re Stepan Co.*, 868 F.3d 1342, 1346 n.1 (Fed. Cir. 2017). For each of these reasons, Grounds 1A-1B fail.

H. Apple Fails To Establish Any Reference Discloses, Teaches, or Suggests a User-Worn Device Configured to Measure Physiological Parameters

Each independent claim requires a user-worn device configured to measure, calculate, or otherwise determine a physiological measurement of a user.

- Claim 1 requires a “user-worn device configured to non-invasively measure a physiological parameter of a user” comprising “one or more processors configured to receive one or more signals from the photodiodes and calculate a measurement of the physiological parameter”

- Claim 19 requires a “user-worn device” comprising “one or more processors configured to” both “receive one or more signals from at least one of the photodiodes” and “output measurements ... indicative of a physiological parameter of the user”
- Claim 26 (and dependent Claims 7, 25) require “a user-worn device configured to non-invasively measure a pulse rate of a user” comprising “one or more processors configured to receive one or more signals from the photodiodes and calculate” or output a pulse rate measurement

Apple relies on Lumidigm’s FIG. 8B wristwatch (below) as the “user-worn device” in each ground. Pet. 6, 13-14, 29, 68, 88.

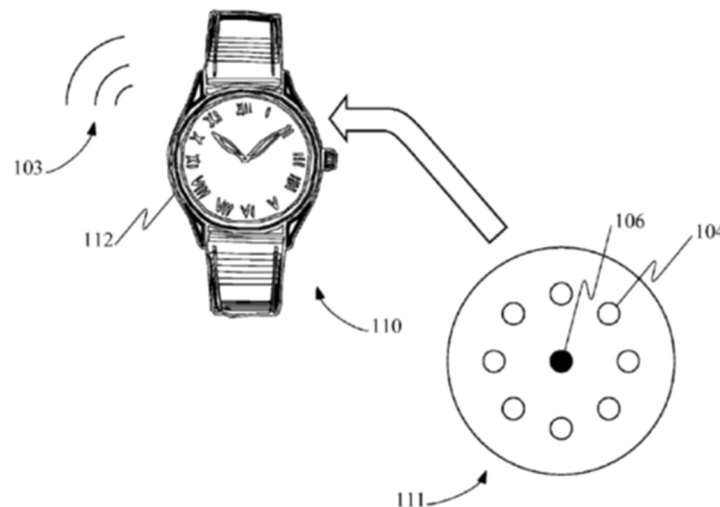


FIG. 8B

However, Lumidigm does not disclose its wristwatch is configured to measure a physiological parameter, and a POSITA would not have configured Lumidigm’s wristwatch to determine such measurements, as explained below.

Each argument applies to independent Claims 1, 19, and 26. Accordingly, Grounds 1A-1B fail for each reason in this section.

1. **Lumidigm Does Not Disclose Or Suggest a User-Worn Device Configured to Non-Invasively Calculate/Measure a Physiological Parameter**

Apple argues that Lumidigm discloses its FIG. 8B wristwatch is configured to measure a physiological parameter. Pet. 5-6, 30-31. But Lumidigm describes its wristwatch as a “personal spectral biometric system”—not a physiological measurement device. EX1006, 11:60-12:2, 10:53-59; EX2002 ¶122. Using the wristwatch’s biometric sensor, “tissue spectral data” is “detected from the skin in the area of the wrist.” EX1006, 11:60-64, 5:30-44; EX2002 ¶122. This “spectral data” includes “spectral features that are unique to the individual.” EX1006, 5:30-44; EX2002 ¶122. Lumidigm explains its wristwatch “confirms the identity of a person authorized to use the device” using this spectral data. EX1006, 10:45-59; *see id.*, 5:30-44, 11:15-28; EX2002 ¶122. Lumidigm’s identification and authorization functions have nothing to do with calculating or determining the measurement of any physiological parameter. *Id.*

Apple relies on various other functions (hemoglobin-monitor and complexion-monitor functions) related to other embodiments. Pet. 30-31, 42-43. These functions are aspirational concepts merely listed in Lumidigm (EX1006, 3:35-59) and vaguely described in a separate section concerning “Extended Functionality”

(*id.*, 17:60-24:25). EX2002 ¶¶123-124. Such functionality includes: fruit-ripeness-monitor, counterfeit currency detector, lie-detector, stress-detector, paint color matcher, barcode scanner, entertainment functions, “mood meter,” motion detector, smoke detector, laser pointer, trickle charger, tanning-meter, complexion-monitor, toxicity-monitor, alcohol-monitor, bilirubin-monitor, hemoglobin monitor, ambient light sensor, personal-security function, and other *functions*. EX1006, 17:60-24:25; EX2002 ¶124. Lumidigm’s “primary” inventor testified this list of “extended functionality” resulted from a “brainstorming session”—not any work Lumidigm did or attempted. EX2008, 1146:18-1147:3. Thus, it was merely an aspirational and very diverse wish list. Lumidigm provides no technical description about how any of the items in its wish list would perform any of the extended functionality. EX1006, 11:65-12:2, 19:4-28, 17:60-24:25, 3:35-59; EX2002 ¶124. There are no embodiments described for any of these aspirational ideas. Lumidigm’s aspirational disclosure of extended functionality is akin to stating a space shuttle could be used to fly to Mars. However, merely expressing an aspirational goal does not disclose achieving that goal or enable a POSITA to do so.

Accordingly, a POSITA would not have understood Lumidigm’s high-level functional concepts to disclose a device configured to calculate or otherwise determine a measurement of any physiological parameter. EX2002 ¶124. Relatedly, in view of the missing disclosure regarding Lumidigm’s extended functionality and

the level of ordinary skill in the art in July 2008, and even today, undue experimentation would have been required for a POSITA to make and use a device that performed the extended functionality relied upon by Apple. EX2002 ¶124. Thus, Lumidigm does not enable a device configured to calculate or determine a measurement of a physiological parameter. *Raytheon*, 993 F.3d at 1382 (reversing Board’s obviousness finding because reference was not enabling).

Moreover, Apple never explains how Lumidigm discloses that the FIG. 8B wristwatch performs any of this extended functionality. Pet. 5-6, 30-31, 42-43. Indeed, Lumidigm does not disclose or suggest its biometric wristwatch performs any of the above functionality. EX1006, 11:60-12:2, 17:60-24:25; EX2002 ¶125. The testimony of Rowe confirms no one ever tried—Lumidigm’s extended functionality was just a list of brainstorming ideas yet to be achieved. EX2008, 1146:18-1147:3.

For the preambles of the independent claims, Apple also string-cites nine passages of Lumidigm without explanation. Pet. 30. But those passages merely concern the same biometric functions and aspirational concepts discussed above—none of which are determining the measurement of a physiological parameter or disclose that the FIG. 8B wristwatch measures a physiological parameter. EX1006, 10:11-15, 3:35-37, 4:7-29, 5:31-34, 10:11-21, 11:2-5, 11:45-56, 19:16-40, claim 12; EX2002 ¶125. Regardless, Apple’s argument-via-citation should be rejected

because “mere conclusory statements” cannot establish obviousness. *TQ Delta*, 942 F. at 1359.

For Claims 7 and 26, Apple argues that Lumidigm discloses measuring pulse rate because it discloses “measuring hemoglobin measurements,” which a POSITA would recognize “involves measuring the heart or pulse rate of the user.” Pet. 45-46. But Lumidigm does not disclose determining the measurement of hemoglobin for the reasons explained above. Apple fails to show that disclosure of the aspirational hemoglobin monitor function inherently discloses measuring pulse rate. *Guangdong Alison Hi-Tech Co. v. Int’l Trade Comm’n*, 936 F.3d 1353, 1364 (Fed. Cir. 2019) (element inherently disclosed only if “‘necessarily present,’ not merely probably or possibly present, in the prior art.’”).

Apple’s expert merely copies Apple’s conclusory and incorrect Petition arguments, with no independent analysis or explanation. *Compare* Pet. 38-41 *with* EX1003 ¶¶114-118. Such testimony is inadequate to show obviousness. *See, e.g., TQ Delta*, 942 F.3d at 1358-63.

Accordingly, Apple has not established obviousness for any challenged claim because a user-worn device configured to measure, calculate, or otherwise output measurements of any physiological parameter is missing from Grounds 1A-1B.

I. No Motivation to Configure, or Reasonable Expectation of Success in Configuring, Lumidigm’s Wristwatch to Calculate/Measure a Physiological Parameter or Pulse Rate

1. Physiological Parameter

Apple provides no motivation to configure Lumidigm’s sensors or wristwatch with any of the extended functionality embodiments it relies on, nor a reasonable expectation of success in any such combination. Pet. 19-31. Accordingly, Ground 1A fails because Apple did not set forth a *prima facie* case of obviousness for Claims 1, 19, and their dependents. *Stipan*, 868 F.3d at 1346 n.1 (motivation to combine and expectation of success required to show obviousness); EX2002 ¶ 128.

2. Pulse Rate

Apple argues a POSITA would have been motivated to “implement pulse rate measurement” in Lumidigm’s wristwatch because pulse rate: (1) is a “vital physiological measurement”; (2) can be measured with a reflectance sensor; (3) “can be measured easily” on the wrist; and (4) measurements are “useful for people monitoring exercise levels.” Pet. 46-47. Apple’s list of motivations is merely aspirational, just like Lumidigm’s list of extended functionality. And Lumidigm, even in its aspirational wish list of extended functionality or elsewhere, does not disclose pulse rate measurement. *See generally* EX1006; EX2002 ¶126.

Further, none of Apple’s reasons are specific to adding the feature to Lumidigm’s wristwatch. Pet. 46-47. Apple does not address why a POSITA would

have been motivated to add pulse rate measurement to the “personal spectral biometric system” that is Lumidigm’s FIG. 8B wristwatch. *Id.*; EX1006, 11:60-64. And Apple ignores that pulse rate measurement is not even mentioned in Lumidigm’s wide-ranging wish list of brainstorming ideas. Pet. 46-47; EX1006, 17:60-24:25. Apple merely argues that a POSITA would have been motivated to combine this feature with Lumidigm because it *could* be done or may be useful. Pet. 46-47. But, simply because Apple argues someone “could” do something does not mean that a POSITA *would have been motivated* to do it. *See, e.g., Adidas*, 963 F.3d at 1359. Apple’s generic and unexplained motivation arguments reveal the underlying hindsight. Apple thus fails to establish a motivation to combine Kotanagi and Lumidigm as it proposes. EX2002 ¶130.

Apple asserts that a POSITA would have expected success in incorporating pulse rate measurement capability in the combination device because Lumidigm “contemplates” using its sensors to identify changes manifested through spectroscopic changes in the skin or other tissue. Pet. 47-48. This broad assertion is not explained by Apple or its expert, who merely copies the Petition on this issue without providing any analysis. *Compare* Pet. 45-48 *with* EX1003 ¶¶124-132. Such conclusory assertions cannot establish obviousness. *TQ Delta*, 942 F.3d at 1359. Regardless, none of the Lumidigm passages Apple relies on demonstrates a POSITA would have reasonably expected success in combining Kotanagi’s pulse rate

measurement with Lumidigm’s biometric wristwatch, and then modifying it as Apple simply assumes. EX1006, 18:14-34, 3:35-59, 24:20-25; EX2002 ¶¶131-135.

Accordingly, Apple fails to establish obviousness for Claim 26 and its dependents, and Claims 7 and 25, and Grounds 1A-1B fail for these claims.

J. Apple Fails To Establish a Motivation to Combine, or Reasonable Expectation of Success in Combining, Three Photodiodes “On An Interior Surface Of”/“Within” Lumidigm’s Wristwatch

Each independent claim requires at least three photodiodes inside a user-worn device. Claims 1 and 26 require “at least three photodiodes arranged on an interior surface of the user-worn device.” Claim 19 requires “at least three photodiodes arranged within the user-worn device.”

Apple relies on Lumidigm’s wristwatch for a “user-worn device.” Pet. 6, 29, 68, 88. Lumidigm’s wristwatch includes the “sensor geometry of FIG. 4,” with one central detector surrounded by light sources. EX1006, 11:65-67, 8:50-53, FIGS. 4, 8B. But Lumidigm is silent regarding the relative location of the single detector of FIG. 4. *Id.*, 11:60-67, 8:43-53; EX2002 ¶137.

Apple proposes combining Lumidigm’s wristwatch with the sensor arrangements of FIGS. 6, 7A, or 7B. Pet. 20-21, 34-35. Apple argues “[t]he photodiodes (arranged per Lumidigm’s Fig. 6 7A or modified 7B) are arranged on a bottom surface ... of the sensor.” *Id.*, 35. However, FIGS. 6-7B only show the lateral locations of detectors and light sources from a top view, and do not disclose

the location of any detector relative to the sensor surface or whether any detector is on a bottom surface of the sensors. EX1006, FIGS. 6-7B, 9:12-45; EX2002 ¶138.

Apple thus relies on yet another configuration—shown in FIG. 2—where the single detector is “recessed from the sensor surface.” Pet. 35-36; EX1006, 8:1-4, FIG. 2. But Apple did not articulate a motivation to add or combine, or reasonable expectation of success in adding or combining, the FIG. 2 configuration to its imaginary “combination device.” Pet. 19-28, 34-37; EX1003 ¶¶70-96, 106-111. Apple fails to set forth any reason it allegedly would have been obvious to include three or more detectors inside Lumidigm’s wristwatch. *Stepan*, 868 F.3d at 1346 n.1 (combining different embodiments of single reference requires motivation to combine and expectation of success); EX2002 ¶139.

Accordingly, the Petition fails to establish that Claims 1, 19, and 26 would have been obvious to a POSITA, and thus Grounds 1A-1B fail.

K. A POSITA Would Not Have Been Motivated to Combine Scharf’s “Covers” with Lumidigm or Reasonably Expected the Combination to Succeed

Every independent claim requires “a plurality of openings” in the protrusion over the photodiodes (Claims 1, 26) or “windows” associated with each of the photodiodes (Claim 19). Apple relies on Lumidigm for openings and Scharf for windows. But none of Apple’s references discloses a convex protrusion with a plurality of openings. And Apple fails to establish a motivation to combine

Lumidigm, Scharf, and Kotanagi in a manner satisfying these limitations, or a reasonable expectation of success in such a combination.

Apple argues that protecting sensor components from contamination would have motivated the combination of Lumidigm’s biometric sensors with the alleged “covers” from Scharf’s reflectance pulse oximeter. Pet. 27. However, Apple fails to explain why a POSITA would have been motivated to protect sensor components when Lumidigm already explains that the biometric sensor of its wristwatch is “built into the case of a wristwatch 112.” *Id.*, EX1006, 11:60-67. Apple also identifies no shortcoming in Lumidigm or Kotanagi that would have led a POSITA to search for protective “covers” like those Apple proposes adding to Lumidigm. Pet. 27. The two references Apple relies on to support this motivation merely indicate that some type of covers could provide protection, not that a POSITA would have been motivated to use covers in a convex protrusion to protect Lumidigm’s sensors. EX1015, 3:23-25; EX1014, 5:25-27; EX2002 ¶173. Apple’s expert merely copies the Petition on this issue without explanation or any analysis, and such conclusory expert testimony fails to establish a motivation to combine. EX1003 ¶92.

Apple also argues that “provid[ing] light filtering functionality” would have motivated the proposed combination. Pet. 27-28. Apple fails to identify any problem with Lumidigm or otherwise provide any explanation as to why a POSITA would have been motivated to add “light filtering functionality” to the biometric

sensor of Lumidigm’s FIG. 8B wristwatch. *Id.* Neither of the references Apple relies on establish this supposed motivation. *Id.* The first (Scharf) merely indicates that a reflectance pulse oximeter—which Lumidigm is not—could include a face (88) comprising two filtered pieces (16, 18). EX1025, 8:60-9:15; EX2002 ¶174. Scharf does not explain the benefit of the alleged “light filtering functionality” or supply a reason to add such functionality to Lumidigm’s biometric sensor or wristwatch. *Id.* And Apple’s second reference addresses dark ink “masks” on either side of a fiber plate—features irrelevant to the proposed combination. EX1015, 6:23-27; EX2002 ¶174. Again, Apple’s expert copies the Petition on this issue without explanation or analysis. EX1003 ¶93.

Apple further argues “obtain[ing] the light focusing effects of [Scharf’s] covers” (i.e., “face pieces” 16, 18, 91) would have motivated adding them to the combination. Pet. 28. But Apple identifies no shortcoming in Lumidigm or Kotanagi that would have led a POSITA to search for a light-focusing effect, and fails to establish such “effects” would somehow be beneficial. *Id.* Yet again, Apple’s expert copies the Petition arguments on this issue without explanation or analysis. EX1003 ¶93.

Furthermore, Scharf distinguishes its flat face pieces from those that are shaped to form discrete lenses. EX1025, 9:1-5; EX2002 ¶175. It explains that, “[a]lthough shown as flat surfaces, face pieces 16, 18, and 91 can alternatively be

shaped to form discrete lenses (not shown) to focus the radiant energy from the LEDs.” EX1025, 9:1-5; EX2002 ¶175. Apple ignores that the light-focusing effect comes from the shape of the discrete lenses. Pet. 27-28. Apple provides no motivation that would account for adding flat covers such as those shown in its combination device. *Id.* Indeed, in view of Scharf’s teaching, a POSITA would have understood Apple’s flat “covers” would not focus light. EX1025, 9:1-5; EX2002 ¶175.

Apple likewise fails to explain how its covers would “facilitate optical performance.” Pet. 28. Nothing in Lumidigm or Scharf suggests that adding flat “covers” would somehow facilitate optical performance. EX1006, 8:19-32; EX1025, 8:60-9:15.

Additionally, the contemporaneous art counseled against adding light-conducting elements to a device for measuring physiological parameters. For example, Haar (EX1015) explains that using “light-conducting elements” between the sensor and skin in a reflectance pulse oximeter “*in many cases cause signal variations*” which are far higher than the desired measuring accuracy” EX1015, 3:5-15, Abstract; EX2002 ¶¶176-177. Thus, in view of Haar, a POSITA would not have been motivated to combine, or expected success in combining, Apple’s covers between the sensor and skin in a physiological parameter-measuring device. *Id.*

Furthermore, contrary to Apple’s argument (Pet. 28), the alleged existence of Lumidigm and Scharf in “the same field” is not sufficient to establish a reasonable expectation of success in the specific combination proposed. *Securus*, 701 Fed. Appx. at 977.

Finally, Apple asserts a POSITA would have expected the proposed combination to succeed because “covers ... over the photodiodes of a wearable sensor, were well known in the art.” Pet. 28. But Apple ignores the full scope of the claims, which require other features, such as a convex protrusion with opaque material configured to reduce the amount of unattenuated light reaching the photodiodes. *Id.*; EX2002 ¶178. Indeed, a cover would provide an unwanted light path, and there is no reason to add such a risk of light noise to Apple’s references or combination device. EX2002 ¶177. Apple fails to address the likelihood of success in meeting the full scope of the claimed invention, and thus has not met its burden in the Petition. *Intelligent Bio-Sys.*, 821 F.3d at 1367-69.

Accordingly, Apple fails to establish obviousness for Claim 19 and its dependents as well as Claim 2, and Ground 1A fails as to these claims.

VII. RESERVATION OF RIGHTS

Should the Board decide to institute an *inter partes* review, Masimo reserves all rights to make additional arguments in, and present claim constructions and evidence with, its Patent Owner Response. Masimo’s silence on any claim or

limitation herein is not a concession that the Petition's discussion of the same is correct. Masimo also reserves the right to dispute the level of ordinary skill in the art. Accordingly, Masimo reserves the right to submit additional or alternative arguments of patentability, and nothing in this Preliminary Response is an admission, acquiescence, or estoppel on the merits of the Petition.

VIII. CONCLUSION

For the reasons discussed above, the Petition is deficient and Masimo respectfully requests that the Board deny institution.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: October 26, 2022

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CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), Counsel for Patent Owner Masimo Corporation hereby certifies that this document complies with the type-volume limitation of 37 C.F.R. § 42.24(b). According to Microsoft Office Word 2010's word count, this document contains approximately 13,963 words, including any statement of material facts to be admitted or denied in support, and excluding the table of contents, table of authorities, mandatory notices under § 42.8, exhibit list, certificate of service or word count, or appendix of exhibits or claim listing.

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CERTIFICATE OF SERVICE

I hereby certify that, pursuant to 37 C.F.R. § 42.6(e) and with the agreement of counsel for Apple, a true and correct copy of the foregoing **PATENT OWNER PRELIMINARY RESPONSE AND EXHIBITS 2002-2032** are being served electronically on October 26, 2022, to the e-mail addresses shown below:

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