

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

IRHYTHM, INC.,

Petitioner,

v.

WELCH ALLYN, INC.,

Patent Owner.

CASE: IPR2025-00376

U.S. PATENT NO. 9,155,484

PATENT OWNER PRELIMINARY RESPONSE

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TABLE OF PATENT OWNER EXHIBITS

Exhibit No.	Description
2001	Information Disclosure Statement dated May 18, 2015 in Application No. 13/890,144, submitted by Petitioner indicating it was aware of the '007 Patent, reference no. 67
2002	Information Disclosure Statement dated August 7, 2013 in Application No. 13/890,144, submitted by Petitioner indicating it was aware of the pre-grant publication that issued as the '007 Patent, reference no. 101
2003	iRhythm's Amended Answer alleging infringement against PO's related company, Bardy Diagnostics
2004	26(f) Report from <i>Bardy Diagnostics, Inc. v. iRhythm Technologies, Inc.</i> , 1:24-cv-01355, indicating Petitioner iRhythm's intent to assert additional patents.
2005	Scheduling order in <i>Welch Allyn Inc. v. iRhythm Technologies, Inc.</i> , 1:24-cv-00224
2006	Notice of Service of Party Discovery in <i>Welch Allyn Inc. v. iRhythm Technologies, Inc.</i> , 1:24-cv-00224 (ECF 26)
2007	Notice of Service of Party Discovery in <i>Welch Allyn Inc. v. iRhythm Technologies, Inc.</i> , 1:24-cv-00224 (ECF 27)
2008	Notice of Service of Third-Party Discovery in <i>Welch Allyn Inc. v. iRhythm Technologies, Inc.</i> , 1:24-cv-00224 (ECF 41)
2009	Notice of Service of Third-Party Discovery Responses in <i>Welch Allyn Inc. v. iRhythm Technologies, Inc.</i> , 1:24-cv-00224 (ECF 47)
2010	Excerpt from Zenious et al., BIODESIGN; THE PROCESS OF INNOVATING MEDICAL TECHNOLOGIES
2011	Notice of Service of Third-Party Discovery in <i>Welch Allyn Inc. v. iRhythm Technologies, Inc.</i> , 1:24-cv-00224 (ECF 48)

Exhibit No.	Description
2012	Statutory Disclaimer of U.S. Patent No. 9,155,484
2013	[Reserved]
2014	[Reserved]
2015	Declaration of Dr. Brian Anthony for IPR2025-00376 of U.S. Patent No. 9,155,484
2016	[Reserved]
2017	[Reserved]

Patent Owner, Welch Allyn, Inc. (“Welch Allyn” or “Patent Owner”), submits this Patent Owner Preliminary Response (“Response”) pursuant to 37 C.F.R. § 42.107(a) to the *Inter Partes* Review petition (“Petition”) filed by iRhythm, Inc. (“Petitioner”) for Claims 1-8, 11-12, and 15-20 (the “Challenged Claims”) of U.S. Patent No. 9,155,484 (the “’484 Patent”) (Ex. 1005).

Although Petitioner challenges Claims 1-8, 11-12, and 15-20 of the ’484 Patent, only Claims 2, 3, 6-8, 11-12, and 15-20 are relevant to the Board’s consideration of the Petition because Patent Owner statutorily disclaimed Claims 1, 4, and 5. Ex. 2012. “The patent owner may file a statutory disclaimer” and “[n]o *inter partes* review will be instituted based on disclaimed claims.” 37 CFR § 42.107.

I. INTRODUCTION

The ’484 Patent claims a novel structure for a body-worn patient monitoring device by bifurcating the device into two main components—the communication-computation module and the flexible circuit layer—to provide “a medical-grade monitor that can intelligently measure and transmit data” while balancing disposable and non-disposable portions. Ex. 1005, Cls. 1, 7, Abstract, 2:37-38; Ex. 2015, ¶[0045]. The ’484 Patent provides a flexible printed circuit layer, which is part of the disposable electrode portion, that includes electrical traces for carrying an

electrical signal from the electrodes to a connection pad, and further to the processor for analysis. Ex. 1005, Cl., 7, 7:47-58; Ex. 2015, ¶[0046].

The Petition does not identify a single reference that includes this bifurcated structure with the communication-computation module and the disposable substrate having the flexible circuit layer. With the benefit of hindsight, the Petition attempts to reconstruct the novel features of the '484 Patent. The Petition worsens this issue by offloading its analysis to the Board. Moreover, the Petition relies extensively on Exhibit 1012, a purported English translation of Japanese Pat. Pub. JP2004/121360 to *Matsumura*, but Petitioner failed to establish that Exhibit 1012 is an accurate translation, leaving the Board and Patent Owner to guess regarding the accuracy. *See* Exs. 1065-1066, 1012 (all lacking any connection).

The Petition is also fundamentally flawed. To form the basis of its challenges, the Petition gap-fills the prior art by expressly relying on the “General Knowledge of a POSA.” Petition, 1-2. This approach contradicts Federal Circuit law and 35 U.S.C. § 311(b), which allows challenges “*only* on the basis of prior art consisting of patents or printing publications.” *Qualcomm Inc. v. Apple Inc.*, No. 2023-1208, 2025 WL 1174161 (Fed. Cir. Apr. 23, 2025). The “General Knowledge of a POSA”—which plagues every Ground of the Petition—is neither a patent nor

printed publication. The Petition should be denied for failing to comply with § 311. In addition to these procedural failures, the Petition also fails on the technical merits.

In Ground 1, the Petition relies on the combination of *Matsumura*,¹ and the “General Knowledge” of a POSA. Petition, 1-2. This challenge fails because the Petition does not establish that *Matsumura* renders obvious the claimed method of manufacture, the disposable substrate made from an insulating material, or the flexible printed circuit board layer. Because Petitioner cannot set forth a rational basis for obviousness, the Petition relies on improper claim constructions and improper motivations to modify *Matsumura* in view of the so-called “General Knowledge” of a POSA. Under a proper construction, the Petition fails. Without using the claims as a guide, a POSA would not have been motivated to modify *Matsumura*’s three-dimensional conductive materials into printed circuitry made from insulating materials. Accordingly, Ground 1 fails.

In Ground 2, the Petition relies on the combination of *Jensen*² and the “General Knowledge” of a POSA. Petition, 1-2. However, *Jensen*, alone or in

¹ Purported Translation of Japanese Pat. Pub. JP2004/121360 to *Matsumura* (Ex. 1012).

² U.S. Patent Publication No. 2003/0149349 to *Jensen* et al. (Ex. 1011).

combination with *Matsumura*, or Petitioner's amorphous "General Knowledge," fails to teach or suggest both the claimed disposable substrate or computation-communication module. Moreover, the Petition fails to articulate a rational basis to support the Petition's alleged modifications and combination. In view of the references' teachings, it becomes clear that the Petition uses the '484 Patent as a guide to redesign *Jensen* to arrive at the Challenged Claims. This is blatant improper hindsight reconstruction, and thus Ground 2 also fails.

In Ground 3, the Petition relies on the combination of *Ozguz*, and the "General Knowledge" of a POSA. Petition, 1-2. This challenge fails because the Petition does not establish that *Ozguz* renders obvious the claimed housing "retaining" or "containing" a processor, and the claimed flexible printed circuit layer. Because Petitioner cannot set forth a rational basis for obviousness, the Petition relies on improper claim constructions and improper motivations to modify *Ozguz* in view of the so-called "General Knowledge" of a POSA. Under a proper construction, the Petition fails. Even worse, the Petition relies on passages from *Ozguz* that are not enabled, as *Ozguz* is a non-enabled reference. Without using the claims as a guide, a POSA would not have been motivated to modify *Ozguz* to achieve the claimed invention, and indeed a POSA could not have achieved the claimed invention using the teachings of *Ozguz*. As a result, Ground 3 fails.

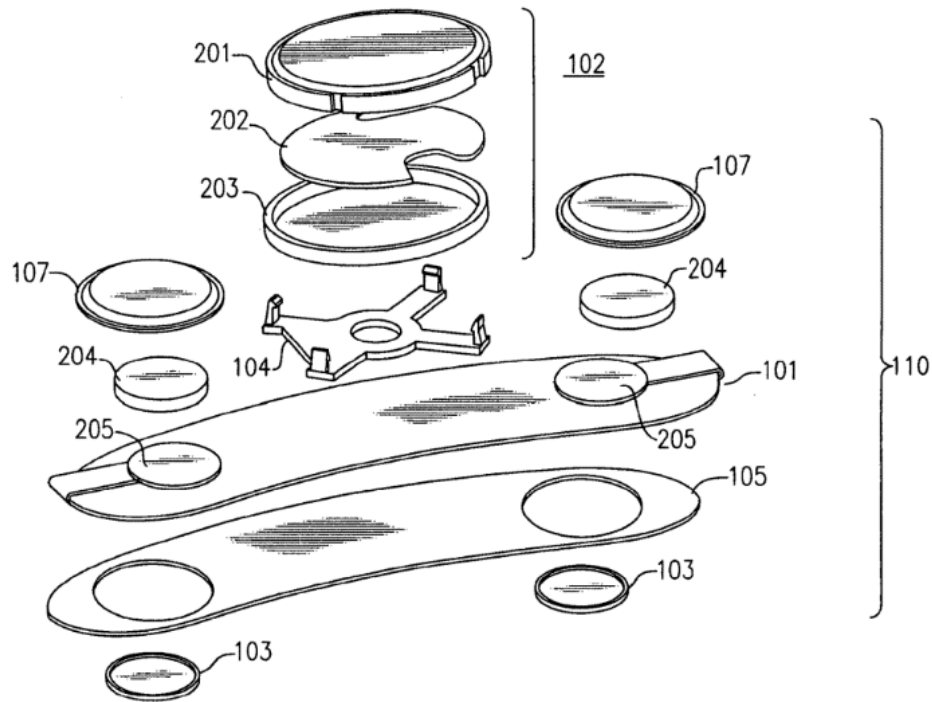
In Ground 4, the Petition relies on the combination of *Ozguz*³ and the “General Knowledge” of a POSA or *Matsumura*. This challenge fails because the Petition does not establish that *Ozguz*, alone or in combination with the “general knowledge” or *Matsumura*, renders obvious the “processor disposed in the housing.” The Petition also fails to articulate any plausible bases for modifying *Ozguz* with the purported “General Knowledge” of a POSA or to combine *Ozguz* with *Matsumura*. And like Ground 3, the Petition relies on passages from *Ozguz* that are not enabled. In doing so, the Petition ignores the aspirational disclosure of *Ozguz*, applies—without reason or support—its own improper claim constructions, and employs impermissible hindsight to meet the Challenged Claims. Under a proper analysis, and without using the claims as a guide, a POSA would not have understood *Ozguz*, alone or in combination with the “General Knowledge” of a POSA or *Matsumura*, to disclose the limitations of the Challenged Claims. Therefore, Ground 4 fails.

II. SUMMARY OF THE '484 PATENT

The '484 Patent provides a body-worn physiological sensor that adhesively attaches to a patient's skin for measuring physiological signals. Ex. 1005, Abstract, Cl. 1; Ex. 2015, ¶[0045]. The body-worn patient monitoring device includes computation-communication module 102 releasably attached to disposable electrode

³ U.S. Patent Publication No. 2005/0096513 to *Ozguz* et al. (Ex. 1014).

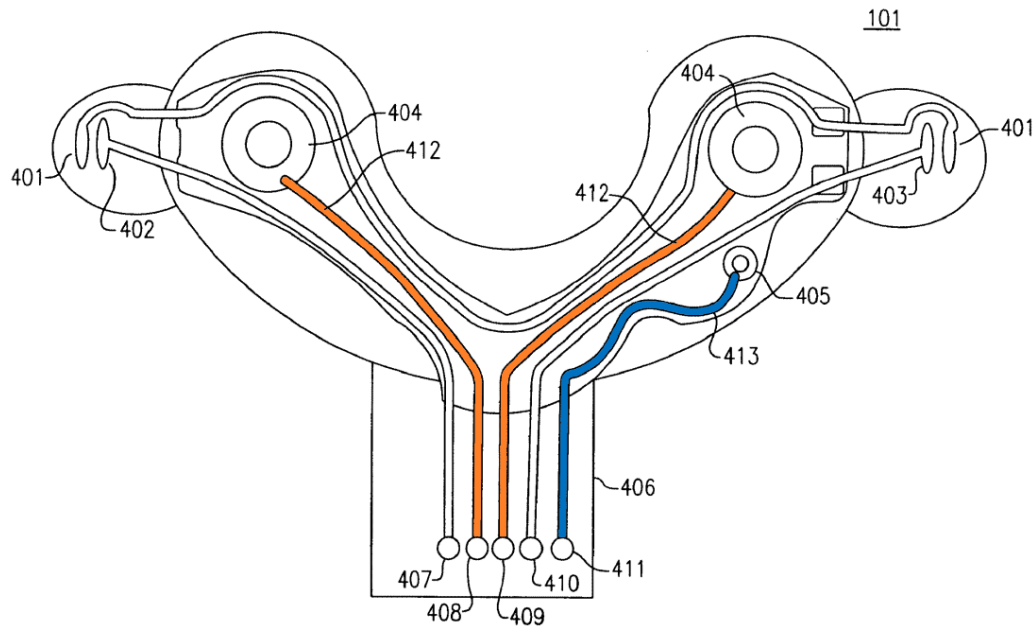
module 110. Ex. 1005, Cl. 7, 4:59-67, Figure 2; Ex. 2015, ¶[0045]. In Figure 2, retention clip 104 secures the computation-communication module to the disposable electrode module. Ex. 1005, Cl. 7; Ex. 2015, ¶[0045].



Ex. 1005, Figure 2.

The disposable electrode module includes flexible printed circuit layer 101 made from an insulating material. Ex. 1005, 5:15-28, Cl. 1; Ex. 2015, ¶[0046]. The flexible printed circuit layer transmits electrical signal via traces, which connect a connection pad and an electrode. Ex. 1005, 7:47-58, Cls. 1, 7; Ex. 2015, ¶[0046]. The traces 412 (orange), which are preferably printed, “extend[] between conductive surface 404 and connection pads 408 and 409.” Ex. 1005, Figure 4A (annotated),

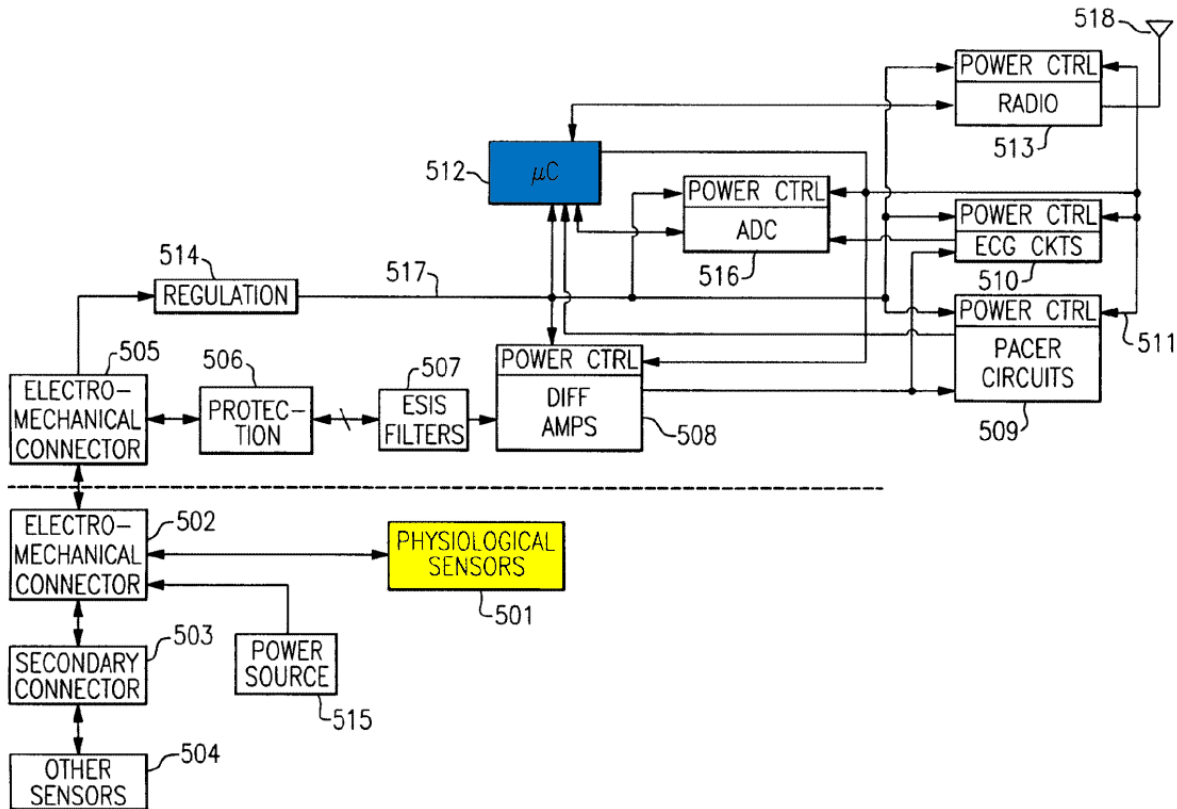
5:36-40 (defining the conductive surface as part of the electrode), 7:53-58; Ex. 2015, ¶[0046]. Similarly, the trace 413 (blue), “extend[s] between conductive surface 405 and connection pad 411.” Ex. 1005, 7:47-58, Figure 4A (annotated); Ex. 2015, ¶[0046]. The traces are made from a resistive material. Ex. 1005, 7:53-58.



Ex. 1005, Figure 4A (annotated); Ex. 2015, ¶[0046].

This pathway from the electrodes to the computation-communication module is also shown in the block diagram of Figure 5. Ex. 1003, 11:33-50, Figure 5. There, the physiological sensors (*e.g.*, electrodes) for capturing an ECG difference potential are indicated in yellow. Ex. 1005, 11:33-50, Figure 5 (annotated); Ex. 2015, ¶[0047]. The physiological sensors are coupled to electromechanical connector 502, which is further connected to the processor for performing computational analysis

on the detected signals. Ex. 1005, 11:33-50, Figure 5 (annotated), Figure 4A; Ex. 2015, ¶[0047]. The computation-communication module further includes a housing that contains this processor. Ex. 1005, Cl. 1; Ex. 2015, ¶[0047].



Ex. 1005, Figure 5 (annotated); Ex. 2015, ¶[0047].

III. ORIGINAL PROSECUTION OF THE '484 PATENT

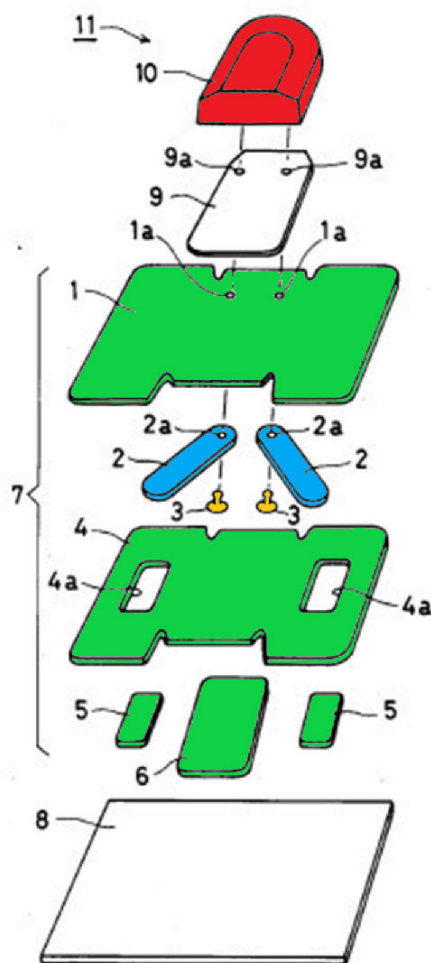
The '484 Patent was filed as U.S. Patent Application No. 14/595,815 and claims priority to U.S. Patent Application No. 11/591,619, filed on November 1, 2006. Ex. 1005, Cover. On March 4, 2015, the Patent Office rejected Claims 1 to 6 and 15 to 20 under § 102 and rejected Claim 7 for double patenting over U.S. Patent

No. 8,965,492. Ex. 1006, 63-65. The Applicant amended Claim 1 to specify that the computation-communication module “includ[es] a housing retaining a housing” and is “attached to the flexible circuit layer.” *Id.* at 45. Similar amendments were made to Claim 15, and the Applicant also filed a Terminal Disclaimer. *Id.* at 51, 63. A Notice of Allowance was issued on July 24, 2015. *Id.* at 23.

IV. OVERVIEW OF THE ART

A. Overview of *Matsumura*

Matsumura describes a waterproof wearable monitor for detecting bioelectric potential, addressing concerns regarding water submersion of the monitor. Ex. 1012, Abstract; Ex. 2015, ¶[0048]. In reference to Figure 1, *Matsumura* provides bioelectric potential detector 11 comprised of disposable pad 7 (green) and reusable signal processor 10 (red). Ex. 1012, ¶[0016]. Disposable pad 7 further comprises first sheet 1, conductive material 2 (blue), hooks 3 (orange), second sheet 4, conductive gels 5, and double-sided adhesive tape 9. Ex. 1012, ¶[0016]. Conductive material 2 creates a conductive path between conductive gel 5 and hooks 3, and hooks 3 provide a conductive path upwards through first sheet 1 and double-sided adhesive tape 9 to processor 10. Ex. 1012, ¶[0019]; Ex. 2015, ¶[0048].



Ex. 1012, Figure 1 (annotated); Ex. 2015, ¶[0048].

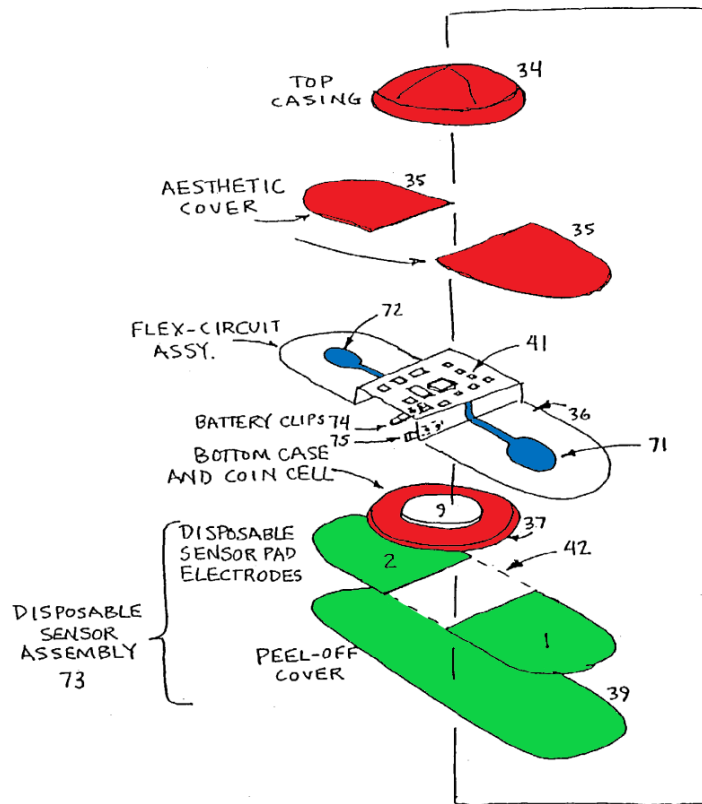
Matsumura explains “two pieces of conductive material 2 and two hooks 3 are arranged to transmit the bioelectric potential detected by the conductive gel 5, which is placed in the openings 4a of the second sheet 4.” Ex. 1012, ¶[0019]. Conductive material 2 is rod-shaped with one end that contacts conductive gel 5 and the other end that “has two holes 2a through which the protruding portions of hook 3 are inserted.” Ex. 1012, ¶[0019]. This configuration allows the “the bioelectric

potential detected by the conductive gel 5 [to be] transmitted through the conductive material 2 and the hooks 3.” Ex. 1012, ¶[0019]; Ex. 2015, ¶[0049].

Hooks 3 play a vital electro-mechanical role in preserving the device’s electrical and structural integrity by securely, but releasably, attaching the disposable pad 7 to signal processor 10, while also transmitting bioelectric potential signals received from conductive material 2 to the signal processor for processing. Ex. 1012, ¶[0019]; Ex. 2015, ¶[0050].

B. Overview of *Jensen*

Jensen provides a cardiac monitor that adheres to a patient’s skin. Ex. 1011, Abstract; Ex. 2015, ¶[0051]. *Jensen* further provides disposable sensor assembly 73, which includes cover 39, connective material 42, and pads 1 and 2. Ex. 1011, ¶[0040], Figure 5 (indicating the disposable components in green); Ex. 2015, ¶[0052]. These three components are the full extent of *Jensen*’s disposable components. Ex. 2015, ¶[0052]; *see generally* Ex. 1011.

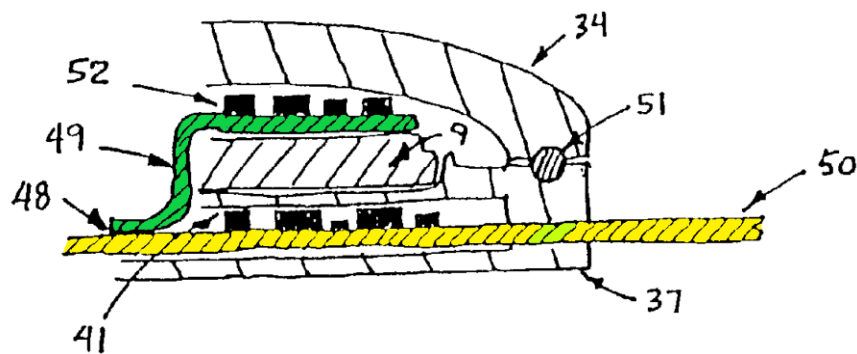


Ex. 1011, Figure 5 (annotated); Ex. 2015, ¶[0052].

Jensen describes an additional, non-disposable flexible circuit assembly 36 having “traces” (annotated in blue above). Ex. 1011, ¶[0040], Figure 5; Ex. 2015, ¶[0053]. These “traces” connect circuit 41 to sensor contacts 71 and 72, which in turn connect to pads 1 and 2 of disposable sensor assembly 73. Ex. 1011, ¶[0040], Figure 5; Ex. 2015, ¶[0053]. *Jensen* further discloses that bottom case 37, top casing 34, and two aesthetic covers 35 are the “re-usable (non-disposable) portion[s] of the invention.” Ex. 1011, ¶[0040], Figure 5 (indicating the reusable components in red); Ex. 2015, ¶[0052]. The “aesthetic covers 35 may be constructed from Mylar sheet,

for example, and enclose the entire top side of the flexible circuit assembly 36.” Ex. 1011, ¶[0043]. *Jensen* does not describe how aesthetic covers 35 are attached to flexible circuit assembly 36. Ex. 2015, ¶[00102].

Jensen describes an alternative structure for its device in Figure 8. Ex. 1011, ¶[0046], Figure 8; Ex. 2015, ¶[0055]. In this alternative embodiment, *Jensen’s* device includes two flexible printed circuits 49, 50. Ex. 1011, ¶[0046], Figure 8 (indicating the first circuit 50 in yellow and the second circuit 49 in green); Ex. 2015, ¶[0055]. As shown in Figure 8, *Jensen’s* electronic circuit 41, which includes a transmitter and a microcontroller, is disposed on flexible circuit 50 closest to the skin. Ex. 1011, ¶[0046], Figure 8; Ex. 2015, ¶[0054]-[0055]. The second flexible circuit assembly 49 is connected to first flexible circuit 50 via a set of pads 48. Ex. 1011, ¶[0046]; Ex. 2015, ¶[0055].



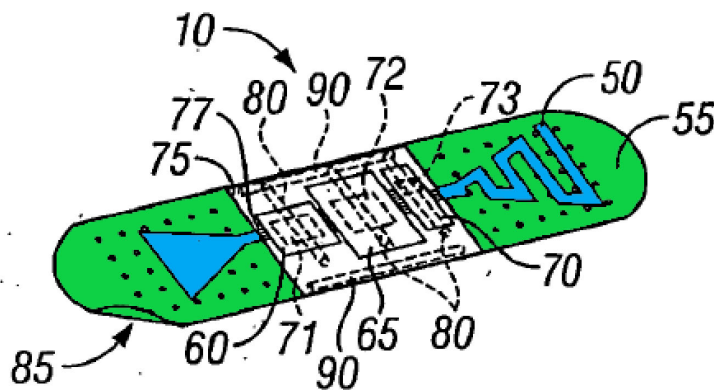
Ex. 1011, Figure 8 (annotated); Ex. 2015, ¶[0055].

To create this connection, pads 48 on each circuit are matched together. Ex. 1011, ¶[0046], Figure 8A; Ex. 2015, ¶[0056]. Then, pads 48 “are heat re-flowed

together, melting the tinning metal, to connect the two circuits.” Ex. 1011, ¶[0046], Figure 8, 8A; Ex. 2015, ¶[0056].

C. Overview of Ozguz

Ozguz aspirationally describes a wearable sensor module for monitoring physiological characteristics. Ex. 1014, ¶[0003]. The alleged module is described as having a “form similar to an adhesive bandage[,]” both in appearance and application to a patient’s skin. Ex. 1014, ¶¶[0003], [0007]. *Ozguz* purports to “overcome[] the need for [a] stiff substrate material that is normally used to support thin silicon to prevent breaking of the silicon and destruction of any micro-circuitry thereon.” Ex. 1014, ¶[0019]; Ex. 2015, ¶[0057]. The resulting device is described as a module that is approximately 30 to 60 mm in length and 10 to 20 mm in width, approximately the size of a Band-Aid. Ex. 1014, ¶[0052]; Ex. 2015, ¶[0057].



Ex. 1014, Figure 1 (in-part); Ex. 2015, ¶[0057].

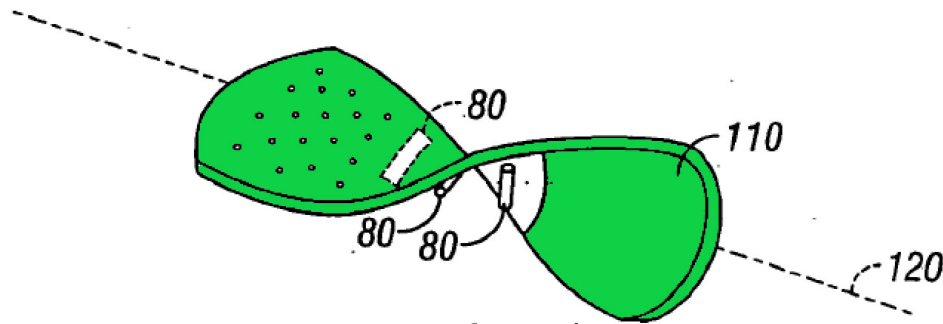
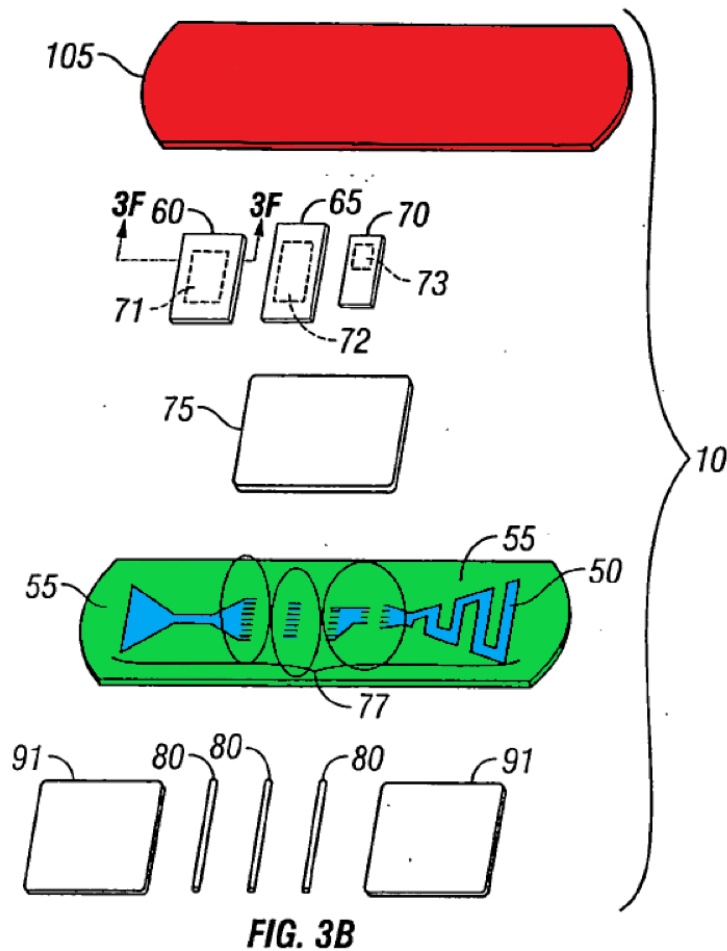


FIG. 3E

Ex. 1014, Figure 3E (annotated); Ex. 2015, ¶[0057].

Ozguz further states that its sensor module is either entirely disposable (*i.e.*, the entire sensor module is discarded) or entirely reusable. Ex. 1014, ¶[0049] (“The sensor module can be sterilized in an autoclave, for example, between uses. Alternatively, the sensor modules are made disposable and are discarded after monitoring a particular subject body 20 for purposes of good hygiene.”).

Ozguz describes a sensor module including a flexible battery 105. Ex. 1014, ¶[0046]; Ex. 2015, ¶[0059]. Flexible battery 105 is described as laying atop silicon substrates 60, 65, 70 and their respective integrates circuits (“ICs”) 71, 72, 73. Ex. 1014, ¶[0048]. Additionally, flexible battery 105 (red) may lay on top of and/or cover flexible substrate 55 (green) and metallization 77 (blue). Ex. 1014, ¶[0048]; Ex. 2015, ¶[0069].



Ex. 1014, Figure 3B (annotated); Ex. 2015, ¶[0059].

Further, metallization 77 connects electrodes 80 to the ICs, and the metallization is generally “integral with and forms part of the layer of the flexible substrate.” Ex. 1014, ¶¶[0047]-[0048]. The described sensor module is a single unit, and none of the components are intended to be detached from the module except for adhesive pads 91. Ex. 1014, ¶[0049]; Ex. 2015, ¶[0060]. Otherwise, the “sensor modules are made disposable and are discarded after monitoring a particular subject body 20.” Ex. 1014, ¶[0049]; Ex. 2015, ¶[0060].

V. “GENERAL KNOWLEDGE” AND CLAIM CONSTRUCTION

A. The Petition Fails to Comply with 35 U.S.C. § 311(b)

The Petition does not satisfy 35 U.S.C. § 311(b) because the Petition relies on the “General Knowledge of Person of Ordinary Skill in the Art” as a basis in all Grounds. Petition, 1-2; 35 U.S.C. § 311(b) (permitting challenges “only on the basis of prior art consisting of patents or printing publications”). Petitioner’s strategy, summarized in its proposed grounds of unpatentability, is improper.

This conclusion, which is supported by Federal Circuit law, is established by two principles. First, § 311(b) only permits challenges on the “basis of prior art consisting of patents or printing publications.” 35 U.S.C. § 311(b). And second, the Petition expressly relies on “General Knowledge” as a basis for its challenges in Grounds 1 to 4. Petition, 1-2. Specifically, the Petition opens with a table, prominently labeled: “Proposed Grounds of Unpatentability.” Petition, 1-2. In one example, Ground 1, which applies equally to Grounds 2 to 4, relies on “Matsumura and *General Knowledge of a POSA*.” Petition, 1. This combination and listing of “General Knowledge” is repeated throughout the Petition. *See* Petition, 3 (listing “General Knowledge” in the overview of challenges), Petition, 14 (listing “General Knowledge” in the subheading for Ground 1’s challenge).

The Federal Circuit’s holding in *Qualcomm Inc. v. Apple Inc.*, Nos. 2023-1208, -1209 2025 WL 1174161 (Fed. Cir. Apr. 23, 2025) is instructive. There, the petitioner provided a table outlining its challenge to the claims and expressly listed AAPA (*i.e.*, applicant admitted prior art) for two of its grounds. *Id.* at *9. The court held that this listing was an “express statement[]” that AAPA is part of the basis of its ground. *Id.*

Ground	'674 Patent Claims	Basis for Rejection
Ground 1	1, 2, 5-7	§103: Steinacker in view of Doyle and Park
Ground 2a	1, 2, 5, and 6,	§103: <u>Applicants Admitted Prior Art (AAPA)</u> in view of Majcherczak
Ground 2b	7	§103: <u>AAPA in view of Majcherczak and Matthews</u>

Id. at *4.

Just as the petition’s listing of AAPA was viewed as an express statement in *Qualcomm*, the Petition’s listing of “General Knowledge” is likewise an express statement that “General Knowledge” is part of the basis of Grounds 1 to 4.

Proposed Grounds of Unpatentability	
<u>Ground 1</u>	Claims 1-5 and 15-20 are obvious under pre-AIA § 103 over Matsumura and <u>General Knowledge of a Person of Ordinary Skill in the Art</u>
<u>Ground 2</u>	Claims 1-5, 15, 17, 18, and 20 are obvious under pre-AIA § 103 over Jensen and <u>General Knowledge of a Person of Ordinary Skill in the Art</u>
<u>Ground 3</u>	Claims 1-8, 15, 19, and 20 are obvious under pre-AIA § 103 over Ozguz and <u>General Knowledge of a Person of Ordinary Skill in the Art</u>
<u>Ground 4</u>	Claims 6-8, 11, and 12 are obvious under pre-AIA § 103 over Matsumura, Ozguz, and <u>General Knowledge of a Person of Ordinary Skill in the Art</u>

Petition, 1-2 (annotated).

In *Qualcomm*, the Federal Circuit ultimately held that the petition failed to comply with § 311(b) by including AAPA as part of its *basis* for its challenge. *Id.* at *11. The same conclusion should follow here. Like the petitioner in *Qualcomm*, the Petitioner chose not to limit its challenges to “patents or printing publications.” 35 U.S.C. § 311(b). Instead, the Petition relies on “General Knowledge” to teach elements missing from the references themselves.

Thus, in view of Federal Circuit law and a plain reading of § 311(b), the Petition cannot advance “General Knowledge” as the basis for its challenges.

B. The Petition Fails to Advance A Legally Cognizable Claim Construction Position

When construing claims, the Board applies the principles set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312-17 (Fed. Cir. 2005) (en banc). The *Phillips* standard establishes that the words of a claim are generally given their plain and

ordinary meaning, which is the meaning the term would have to a POSA at the time of the invention, in the context of the entire patent. *Phillips*, 415 F.3d at 1312-13. Although Petitioner claims to apply the ordinary and customary meaning of the terms (*see* Petition, 2), the Petition is instead filled with implicit claim constructions that lack support or explanation. *See ams AG v. 511 Innovations, Inc.*, IPR2016–01792, Paper 15 at 8, 13 (P.T.A.B. Mar. 16, 2017) (denying institution where “Petitioner improperly attempts to shift the burden of construing the claim term ‘minimal height’ to the Board. *See* 37 C.F.R. § 42.104(b)(3).”). This failure renders the Petition fundamentally defective, as it leaves the Board without a clear and reasoned basis to evaluate claim scope, thereby shifting the burden of claim clarification to the Patent Owner and the Board. The Petition’s flaws are exacerbated by its extensive reliance on non-prior art references, as well as significantly outdated and non-relevant references.⁴

i. The Petition is Riddled with Claim Construction Yet Fails to Propose Actual Constructions

According to 37 C.F.R. § 42.104(b)(3), Petitioner has an affirmative burden to set forth how the challenged claims should be construed. *See, e.g.*,

⁴ The Petition’s reliance on non-prior art documents is also covered in Patent Owner’s Argument for Discretionary Denial. *See* Paper 7 at 21-27.

Orthopediatrics Corp. v. K2M, Inc., IPR2018-01548, Paper 9 at 10 (P.T.A.B. Mar. 1, 2019). A petition for *inter partes* review must clearly articulate a rationale for “[h]ow the challenged claim is to be construed.” 37 CFR § 42.104(b)(3). If the petitioner construes a claim term, but “does not establish that such interpretations are appropriate[,]” it is fatal to the petitioner’s ground. *Vicor Corp. v. Delta Elecs., Inc.*, IPR2024-00704, Paper 11 at 8 (P.T.A.B. Oct. 2, 2024). Controlling law mandates that claim terms in an IPR be construed using the same standard as in a civil action under 35 U.S.C. § 282(b), including “construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” *Id.*; see also 37 C.F.R. § 42.100(b) (2021). Thus, to determine the meaning of a disputed claim term, one must “look principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence.” *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312-17).

Like the petition in *Vicor Corp.*, the Petition here does not even purport to apply the controlling law of *DePuy Spine, Inc.* and *Phillips*. The Petition’s singular reference to claim construction states, “Claims are interpreted with their ordinary and customary meaning as understood from the perspective of a person of ordinary

skill in the art.” Petition, 2 (citing *Phillips*, 415 F.3d at 1303). Despite this, the Petition repeatedly engages in improper claim construction, deviating significantly from the “ordinary and customary meaning” of the construed terms without providing any rationale for doing so, often treating an amalgamation of non-contemporaneous, unhelpful, irrelevant documents as if they were helpful to the *Phillips* inquiry.

For example, and as discussed further below in Section VI.A.i, the Petition improperly construes the claim term “traces” because it provides no evidence, support, or argument that “show[] a reasonable likelihood that it would prevail in its challenge asserted as Ground [1].” *Vicor Corp.*, IPR2024-00704, Paper 11 at 9. The Petition seemingly construes “traces” to include any non-printed conductive material. Ex. 2015, ¶¶[0068]-[0069]; *infra* Section VI.A.i.

In support of this dubious interpretation, the Petition cites no supporting evidence, and Dr. Heikenfeld substantially parrots the Petition, which is not “persuasive or helpful as it repeats the Petitioner’s arguments and offers little or no elaboration as to how one of ordinary skill in the art would understand the term.” *InfoBionic, Inc. v. Braemer Manuf., LLC*, IPR2015-01704, Paper 11 at 6 (P.T.A.B. Feb. 16, 2016) (denying institution). Dr. Heikenfeld states “a POSA would have understood hook 3 and a first portion of conductive material to be a “trace” because

they are conductors on a printed circuit board[,]” without establishing that *Matsumura* includes a printed circuit board (it does not) or that all conductors are somehow “traces” (they are not). Moreover, Dr. Heikenfeld “does not disclose the underlying facts or data on which the opinion is based” and his opinion is therefore “entitled to little or no weight.” *Xerox Corp. v. Bytemark, Inc.*, IPR2022-00624, Paper 9 (P.T.A.B. Aug 24, 2022) (precedential) (citing 37 C.F.R. § 42.65(a) (“Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight.”)); *Upjohn Co. v. Mova Pharm. Corp.*, 225 F.3d 1306, 1311 (Fed. Cir. 2000) (“Lack of factual support for expert opinion to factual determinations, however, may render the testimony of little probative value in a validity determination.”).

Another example of the Petition’s improper claim construction involves the Petition’s improper interpretation of the claim terms “housing,” “containing,” and “retaining.” *Infra* Section VI.C.i.b. As discussed further below, the Petition repeats the same fatal flaws when it construes the claim terms “housing,” “containing,” and “retaining” as it does with “traces,” including failing to apply the *Phillips* framework, failing to provide any plausible support or factual bases for its broad and erroneous interpretations, and ignoring the expressly contrary disclosure of the relied upon references. *Infra* Section VI.C.i.b.

ii. Petitioner Improperly Shifts the Burden of Claim Clarification to the Board and Patent Owner

As a result of the Petition's improper and unclear claim constructions, Petitioner improperly shifts the burden of claim clarification to the Patent Owner and the Board. As discussed, the Petition fails to adequately articulate a construction of the claim terms "traces," "housing," "containing," and "retaining," despite applying an impermissibly broad interpretation of the claim language throughout the Petition. *See infra* Section V.A.i.; VI.C.i.b. Where Petitioner sets forth arguments or observations of what a claim term means, but does not provide an explicit construction for the claim term, the "Petitioner improperly attempts to shift the burden of construing the claim term...to the Board[,]" and institution should be denied. *ams AG*, IPR2016-01792, Paper 15 at 8, 13 (denying institution) ("[U]nder the circumstances discussed above, including that the parties disagree over whether the prior art discloses or suggests the claimed 'minimal height,' Petitioner fails to meet its burden under 37 C.F.R. § 42.104(b)(3) of providing a claim construction for the term 'minimal height.' Therefore, we decline to institute an *inter partes* review of the challenged claims.").

iii. The Petition's Reliance on Non-Prior Art, Outdated, and Irrelevant References Significantly Burdens the Patent Owner and the Board

In addition to the issues outlined above, the Petition improperly relies extensively on non-prior art, outdated, and irrelevant references.

The Petition seemingly agrees that no combination of the actual prior art references identified in the specific Grounds of alleged unpatentability actually teaches the independent claims of the '484 Patent. Instead, it resorts to reliance on amorphous "General Knowledge" for *each* ground, leaving the reader to guess which limitations this "General Knowledge" purportedly teaches, how to interpret this "General Knowledge," or how a POSA would have applied this "General Knowledge" in the prior art period.

The Petition's reliance on non-prior art, outdated, and irrelevant references is an aggravating factor that undermines its obviousness theories. Specifically, the Petition claims to establish the "state of the art" using of 55 references. However, many of these references are not actually prior art, and the Petition fails to distinguish which references qualify as valid art for the state-of-the-art determination.

As described above, of the 66 exhibits submitted with the Petition, Petitioner relies on 55 references (Exs. 1011 through 1065) as supporting its unpatentability theories. Of these 55 references, eight are decidedly not prior art, being from *after*

the November 2006 priority date of the '484 Patent. For example, Exhibits 1020 (dated in 2008); 1021 (dated in 2013); 1024 (dated in 2023); 1025 (dated in 2012); 1027 (dated in 2025), 1030 (dated in 2022), 1043 (dated in 2019), and 1035 (dated in 2006), are all dated anywhere from months to *19 years after* the priority date of the '484 Patent (November 1, 2006). Dr. Heikenfeld's reliance on these non-prior art documents is extensive: He cites Ex. 1035 approximately 62 times in his declaration and Exhibit 1043 approximately ten times in his declaration, not including any internal cross references that incorporate these references. He further relies on Exhibits 1020, 1021, 1024, 1025, 1027, and 1030 in his "background sections" which are cross-referenced repeatedly throughout his declaration including his actual analysis of claim elements and explanations for why the alleged combinations would be made.

That the Petition relies on references from after the priority date of the '484 Patent as alleged evidence of the "state of the art" at the time of the invention—2006—creates confusion, undermines the foundation of the obviousness challenge, and distorts the obviousness inquiry making it difficult for both the Patent Owner and the Board to decipher the proper state of the art at the time of the claimed invention.

Moreover, many of the other cited references are significantly outdated, lack contextual explanations, and are presented without sufficient clarity as to their

relevance to the technology at issue. For example, the Petition does not explain why some very old references (some 50+ years prior to the priority of the '484 Patent) are relevant to the problems facing the state of the art in 2006 or provide any insight into how they would contribute to a POSA's understanding of the technology at the time of the claimed invention. *See, e.g.*, Exs. 1022 (dated 1979), 1026 (dated 1960), 1048 (dated in 1956), 1060 (dated in 1917). Nothing about these references from decades before the priority of the '484 Patent was filed suggests how a POSA would understand the problems facing the industry in 2006.

In light of the Petition's failure to establish the relevancy of these references, one can only assume they are irrelevant, unreliable, and inapplicable to the field of the invention as of 2006. There is no rational basis for relying on the references, as they lack the modern technological relevance necessary for a POSA to reasonably combine them.

VI. THE PETITION FAILS TO SHOW THAT THERE IS A REASONABLE LIKELIHOOD THAT PETITIONER WILL PREVAIL ON A SINGLE CLAIM

A. Ground 1 Fails to Render Obvious the Challenged Claims

The combination of *Matsumura* and the Petition's amorphous "general knowledge" fails to teach or suggest the claimed "trace" of Claim 2.

i. Ground 1 Fails to Render Obvious the Traces of Claim 2

Ground 1 fails to establish that *Matsumura* as modified by the so-called “General Knowledge” renders obvious the “traces” of Claim 2. First, the Petition improperly construes the claim term “traces” to reach the claim. Second, the Petition ignores *Matsumura*’s disclosure that its conductive materials are not traces.

a. The Petition’s improper interpretation of “traces” fails to render obvious Claim 2

The Petition alleges *Matsumura*’s “hook 3 and a first portion of conductive material 2 to be a ‘trace.’” Petition, 21 (citing Ex. 1009, ¶1048). The cited portion of the Heikenfeld Declaration does not support the assertion made by the expert, much less the Petition. Specifically, the cited portion of the Heikenfeld Declaration states “a POSA would have understood hook 3 and a first portion of conductive material to be a ‘trace’ ***because they are conductors on a printed circuit board.***” Heikenfeld Decl., Ex. 1009, ¶1048 (citing Ex. 1035 at 129 for the proposition that “trace” and “conductor” are used interchangeably) (emphasis added). In doing so, Heikenfeld seemingly equates all conductive elements to be traces and baselessly concludes that the hook of *Matsumura* is printed (without any explanation in support of this incorrect interpretation). Ex. 2015, ¶¶[0067]-[0069]. Moreover, the cited portion of the Heikenfeld Declaration assumes, without explanation, that *Matsumura* discloses a ***printed*** circuit board, ***printed*** hooks, and equates hooks with conductive

traces. *Matsumura* itself does none of those, nor would a POSA interpret *Matsumura* in such a way. Ex. 2015, ¶¶[0070]-[0073].

Accordingly, the Petition's reliance on Dr. Heikenfeld for the argument that any conductive material is a trace, independent of a printed circuit board context, is misplaced because Dr. Heikenfeld's opinion necessarily relies on the existence of a printed circuit board, which the Petition has not established.

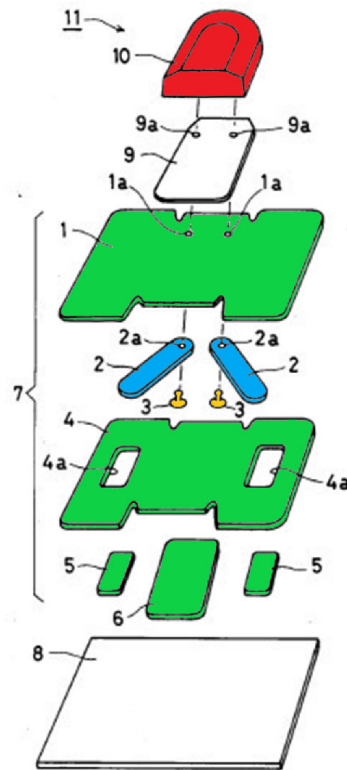
Notably, Exhibit 1035, which Dr. Heikenfeld cites for support for this interpretation, actually supports a finding that *Matsumura*'s hook 3 and a first portion of conductive material 2 ***cannot be*** a trace based on the definition the exhibit provides:

“**Traces:** The metallic conductive strips that provide connections between components, terminals, etc., on **printed** circuits.”

Ex. 1035, at 665 (emphasis added); Ex. 2015, ¶[0070].

Matsumura's device includes a protruding hook 3 and a rod-shaped conductive material 2. *Matsumura*, Ex. 1012, ¶[0019]; Fig. 1 (annotated) (reproduced below). While *Matsumura*'s protruding hook 3 and rod-shaped conductive material 2 may function like a conductor to transmit the bioelectric potential detected by the electrode gels 5 to the signal processor 10, the hooks and conductive material 2 are not part of a ***printed*** circuitry and are physically incapable

of being “printed” given the multiple layers through which they must extend. Ex. 2015, ¶[0071]. These hooks are, therefore, not “traces.” Ex. 2015, ¶[0071].



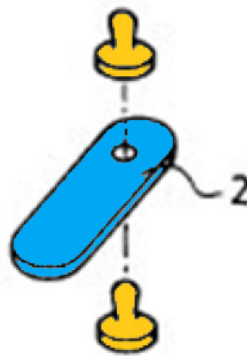
Ex. 1012, Figure 1 (annotated); Ex. 2015, ¶[0071].

As further evidence of the Petition’s fatal flaw, it provides inconsistent interpretations of the term “traces.” The Petition first proposes that “a POSA would have understood [Matsumura’s] hook 3 and a first portion of conductive material 2 to be a ‘trace.’” *Id.* at 21. Later, the Petition states that “Matsumura discloses ‘electrical traces’ in the form of portions of the conductive material 2 made of silver/silver chloride.” *Id.* at 80. On the one hand, the Petition identifies multiple

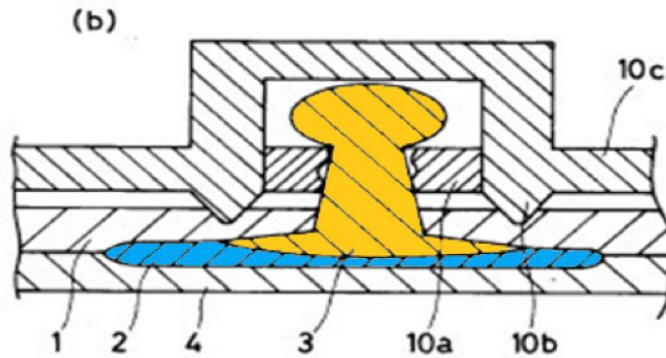
distinct components, necessary to address the limitation that the trace “electrically couple the computation-communication module to the flexible circuit layer.” On the other hand, the Petition eschews the hooks, because the hooks no longer fit the claimed configuration. Under either interpretation, and as discussed above, Ground 1 fails.

b. *Matsumura* does not disclose traces

Matsumura explains that “the protruding portions of the hook 3” extend upwards “from the back side of the conductive material 2,” clamping both sides of conductive rod 2. Ex. 1012, ¶¶[0019], [0021], Figures 4(b) (annotated), 8 (annotated); Ex. 2015, ¶[0072]. The organization of these components was not by accident but rather provides the electrical and mechanical connection essential to *Matsumura*’s device. Ex. 1012, ¶[0019]; Ex. 2015, ¶[0072].



Ex. 1012, Figure 8 (annotated); Ex. 2015, ¶[0072].



Ex. 1012, Figure 4(b) (annotated); Ex. 2015, ¶[0072].

The Petition fails to identify any disclosure in *Matsumura* that suggests it teaches or discloses the claimed traces. Indeed, *Matsumura* does not teach or suggest the traces. *Matsumura*'s three-dimensional, protruding hooks 3, or "studs" (see Ex. 1012, ¶[0021].), that clamp down on both sides of rod-shaped conductive material 2 are not traces. Ex. 2015, [0021], Figures 4(b), 8 (annotated above); Ex. 2015, ¶[0073]. *Matsumura*'s hooks 3 and conductive material 2 are arranged to transmit signals, which are detected by conductive gel 5, to signal processor 10, but the tightly compressed physical orientation of these three separate components (conductive gel 5, conductive material 2, and hooks 3) preclude the existence of "traces." Ex. 2015, ¶[0073], Ex. 1012, ¶¶[0019], [0021].

Because the "Petitioner does not explain how those positions can be reconciled, nor does Petitioner adequately explain, much less support, a claim interpretation that would be satisfied by a proposed combination in which" a

protruding hook and a separate rod-shaped piece of conductive material is a singular electrical trace, the “Petitioner has not shown a reasonable likelihood that it would prevail in the challenges presented” in the Petition. *See Vicor Corp.*, IPR2024-00704, at 10. The Petition does not otherwise point to any disclosure in *Matsumura* that suggests *Matsumura* discloses traces because *Matsumura* does not teach or suggest the claimed traces, and Ground 1 fails. Ex. 2015, ¶[0062].

ii. The Non-Obvious Combination of *Matsumura* and the General Knowledge of the POSA Fails to Render Obvious Claim 15

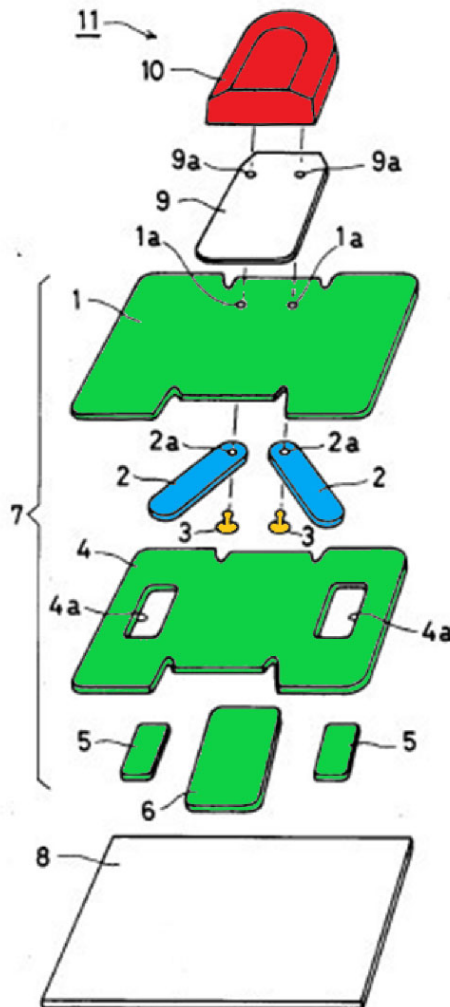
The Petition’s proposed modification fails to render obvious the flexible printed circuit layer of Claim 15. Moreover, the Petition does not provide a sufficient motivation to modify *Matsumura* in view of the general knowledge of a POSA, and in fact, presents a modification that renders *Matsumura*’s device completely inoperable for its intended purpose of providing a waterproof wearable monitor.

a. *Matsumura* does not disclose the flexible printed circuit layer of Claim 15

Matsumura does not teach any flexible ***printed*** circuit layer. Rather, *Matsumura* discloses a “bioelectric pad” composed of (1) a first sheet, (2) a conductive material, (3) a hook, (4) a second sheet, (5) a conductive gel, (6) a third sheet, and (7) double-sided adhesive tape. Ex. 1012, ¶[0016]. The Petition, while

alleging *Matsumura* teaches a printed circuit layer, concedes that there are no disclosures of printing or a PCB in *Matsumura*. Petition, 25.

Matsumura rather discloses that the conductive material is rod-shaped and that the hooks (orange) are studs that protrude through the back side of conductive material 2 (blue). Ex. 1012, ¶[0019]; Figure 1 (annotated below).



Ex. 1012, Figure 1 (annotated); Ex. 2015, ¶[0077].

A POSA would understand that neither the conductive material nor the hooks are printed, and therefore *Matsumura* does not disclose or suggest any *printed* circuit layer. Ex. 2015, ¶[0078]. It is not disputed that *Matsumura* lacks a printed circuit layer.

Additionally, a POSA would have known that replacing the conductive rods and hooks with insulating material and printed conductive traces, respectively, would “render[] [*Matsumura*] inoperable for its intended purpose.” *In re Gordon*, 733 F.2d 900, 902 (Fed. Cir. 1984); Ex. 2015, ¶[0078]. This is because replacing the rod-shaped conductive material with a sheet of insulating material with printed traces would prevent the hooks from being able to clamp down on the rigid structure of conductive material 2. Without that upward force (i.e., the bottom portion of hook 3 pressing upward on the underside of conductive material 2), *Matsumura*’s device loses the waterproof connection because conductive material 2 and hooks 3 would no longer be compressed securely between first sheet 1 and second sheet 4, which are intentionally made of insulating materials to prevent moisture from penetrating the device. Ex. 2012, ¶¶[0017]-[0019], [0021]; Ex. 2015, ¶[0078].

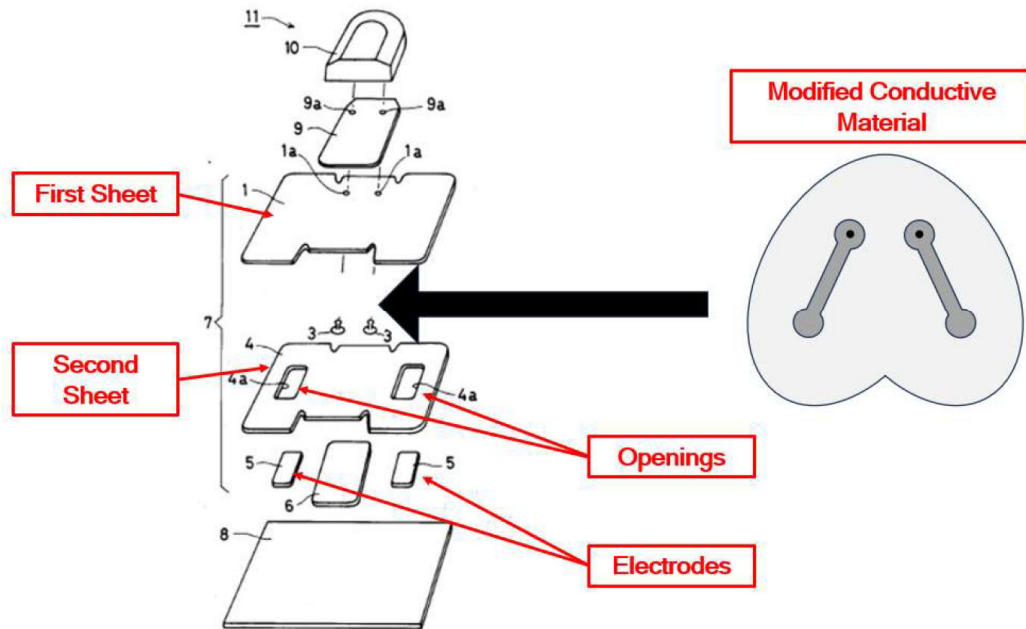
In some instances, the Petition identifies “hook 3 and a first portion of conductive material 2 to be a ‘trace.’” *See* Petition, 21. Other times, the Petition identifies the traces as only “the sheet with printed traces (substitute for conductive

material 2).” Petition, 80. For example, the Petition alleges that “A POSA would further understand that where Matsumura’s hooks contact the traces of the flexible printed circuit layer.” Petition, 77. The Petition’s modifications, which are themselves inconsistent, are further inconsistent with *Matsumura*’s disclosure that “the protruding portion of the hook 3 [] transmits the bioelectric potential” to the signal processor. Ex. 1012, ¶[0023]; Ex. 2015, ¶[0082]. Somehow, the Petition still concludes that a POSA would have modified *Matsumura* to replace the conductive rods with a sheet of insulating material with printed conductive traces, thereby eliminating the hooks as the traces. Ex. 2015, ¶[0079]. A POSA would not have made such a modification because the hooks are required to carry the bioelectric signals to the processor. Ex. 2015, ¶¶[0079]-[0080].

- i. Replacing *Matsumura*’s conductive material and hooks with a single insulating sheet and printed traces ignores the electrical function of the hooks

Despite initially characterizing “hook 3 and a first portion of conductive material 2 to be a ‘trace,’” (*see, e.g.*, Petition, 21-22), Petitioner, for claim element 15[b], proposes replacing *Matsumura*’s rigid, rod-shaped conductive material 2 with a single sheet of insulating material “that contains printed-ink conductive traces.” Petition, 25-26. To support its position, Petitioner uses self-created clip art as “modified sheet of conductive material,” which it then inserts in a self-serving

location within Figure 1 to baselessly suggest that a POSA would have known that conductive rods 2 could be replaced with a flexible printed circuit layer made from insulating material. Ex. 2015, ¶[0080].



See Petition, 25-26. The Petition's proposed modification to add printed traces is infeasible because it ignores the critical electrical function of the hooks necessary for carrying the detected bioelectric signals to *Matsumura's* signal processor. See Petition, 21-22; Ex. 1012, ¶[0019]; Ex. 2015, ¶¶[0081]-[0082].

Petitioner identifies no disclosure within *Matsumura* nor any knowledge of a POSA suggesting the replacement of conductive rods with a sheet of insulating material and printed traces and placing it in the middle of Figure 1. Ex. 2015, ¶[0081]. Instead, the Petition relies on six paragraphs of the expert declaration,

which in turn relies on a non-prior art reference as support for this modification. *See* Petition, ¶¶25-27 (citing Ex. 1009, ¶¶1069-74, which in turn cites Ex. 1035, a non-prior art reference). Therefore, the Petition’s illustration of Figure 1 is merely the application of hindsight—unsupported by any disclosure in the reference itself—to meet the claim limitation.

- ii. Replacing *Matsumura*’s conductive material and hooks with a single insulating sheet and printed traces destroys *Matsumura*’s waterproofing

At base, the Petition ignores the express teachings of *Matsumura*. Ex. 2015, ¶[0081]. *Matsumura*’s disclosure is explicit: “two pieces of conductive material 2 and two hooks 3 are arranged to transmit the bioelectric potential detected by the conductive gel 5.” Ex. 1012, ¶[0019]. Further, *Matsumura* is clear that “[t]he bioelectric pad 7 and the signal processor 10 are detachable with hooks.” Ex. 1012, ¶[0016]. *Matsumura* discloses that first sheet 1 and second sheet 4 are “made of an insulating material that does not allow moisture to penetrate.” Ex. 1012, ¶¶[0017]-[0018]. *Matsumura* further discloses that “two pieces of conductive material 2 and two hooks 3” are located “[b]etween the first sheet 1 and the second sheet 4,” and that “[t]he two hooks 3 are arranged so that the protruding portions of the hook 3 can be inserted through the holes 2a and 1a from the backside of the conductive material

2.” Ex. 1012, ¶[0019]. This three-dimensional layering is essential to waterproofing

Matsumura’s device:

[T]he circular protrusion 10b contacts and sinks into the first sheet 1 of the bioelectrode pad 7 so as to cover the periphery of the engagement portion of the protruding portion of hook 3 and the hook engagement portion 10a, so that the engagement portion between the protruding portion of the hook 3 and the hook engagement portion 10a is waterproofed.

Ex. 1012, ¶[0029] (referring to Figure 4(b)), Figure 4; Ex. 2015, ¶[0082].

Accordingly, the three-dimensional structures of both conductive material 2 and hook 3 are necessary for the electrical and mechanical connections, and a POSA would not have been motivated to replace them with printed circuitry. Ex. 2015, ¶[0082].

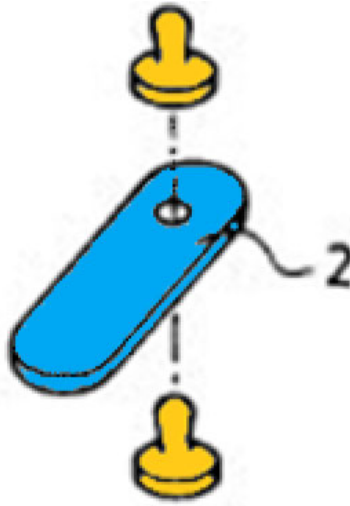
- b. A POSA would not have been motivated to replace *Matsumura’s* conductive material with insulating material

Atop admitting that *Matsumura* fails to teach or suggest the claimed flexible circuit layer (in fact, *Matsumura* affirmatively **requires** teachings that are at odds with the claimed device). *See supra* Section VI.A.i; Ex. 1012, ¶[0019]; Ex. 2015, ¶[0083]. Conductive material 2 is a rigid “rod-shaped” piece of material through which the “protruding” hook 3 vertically protrudes through. Ex. 1012, ¶[0019]. Despite *Matsumura’s* express teachings, Petitioner somehow concludes that it would have been obvious to replace *Matsumura’s* rod-shaped conductive material 2 “with a single, flexible sheet of insulating material that contains printed-ink conductive

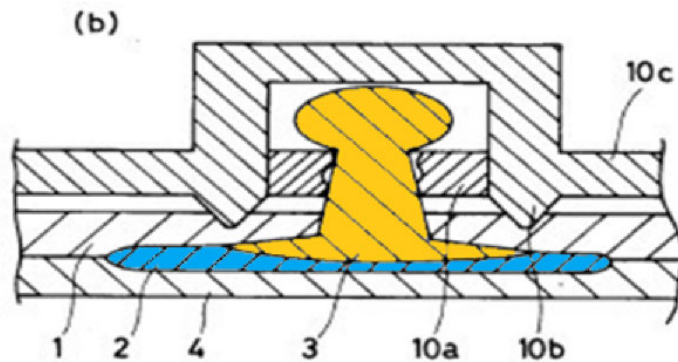
traces.” Petition, 25. To Petitioner, “Matsumura’s conductive material would comprise a flexible printed circuit, which combined with Matsumura’s insulating second sheet 4, would form a flexible printed circuit layer. Accordingly, Matsumura discloses providing a disposable substrate made from an insulating material.” Petition, 15. Not so. Ex. 2015, ¶[0083].

Matsumura is clear that its bioelectrode pad comprises “a conductive material 2,” a conductive “hook 3,” and “a conductive gel 5.” Ex. 1012, ¶[0016]. These conductive materials are essential to the operation of *Matsumura*’s waterproof design. Ex. 2015, ¶[0084]; *see, e.g.*, Ex. 1012, ¶[0006] (“In order to enable hospitalized or home-bound patients/subjects to measure electrocardiograms while showering or bathing, a waterproof bioelectric potential detector is first required. [And] [t]he present invention was made in order to achieve these objectives.”). In this regard, *Matsumura*’s processor and housing are located separate and apart from the bioelectric pad. Ex. 2015, ¶[0084]; Ex. 1012, ¶[0016], Figures 1-2. To accomplish the waterproof design, there must be a vertical conductive protrusion that allows for the electrical flow of signals from the bio-pad upwards to the processor. Ex. 1012, ¶¶[0024], [0027], Figures 4-5; Ex. 2015, ¶[0084]. It is clear from Figures 4 and 5 that to provide this waterproof design, the rigid nature of conductive rods 2 provides a stable support for hook 3. Ex. 2015, ¶[0084]; Ex. 1012,

¶[0019], Figures 4-5. Specifically, “the protruding portions of the hook 3” extend upwards “from the back side of the conductive material 2,” clamping both sides of conductive rod 2. Ex. 2015, ¶¶[0072], [0085]; Ex. 1012, ¶[0021], Figures 4(b) (annotated), 8 (annotated). The organization of these components is essential for the dual electrical and mechanical connection required for *Matsumura*’s device. Ex. 2015, ¶¶[0072], [0085]; Ex. 1012, ¶[0019].



Ex. 1012, Figure 8 (annotated); Ex. 2015, ¶¶[0072], [0085].



Ex. 1012, Figure 4(b) (annotated); Ex. 2015, ¶¶[0072], [0085].

In the face of this express teaching of *Matsumura*, the Petition proposes removing conductive rods and replacing them with “traces,” for no other reason than to reach the claims. Nothing in *Matsumura*, the single reference used in this ground, suggests the replacement of these rigid conductive rods. Ex. 2015, ¶¶[0086]-[0087].

Instead, the Petition and its expert simply allege that “It would have been obvious to a POSA to use well-known techniques to replace the two pieces of insulating material coated with conductive Ag/AgCl with a single, flexible sheet of insulating material that contains printed-ink conductive traces.” Petition, 25. This is nothing more than hindsight driven efforts to arrive at the claim. In support of this argument, Petitioner relies on two paragraphs of its expert declaration. See Petition at 25, (citing Ex. 1009, ¶¶1070-71), which itself cites two non-prior art disclosures: clip-art created for the Petition in 2024 and Ex. 1035 (a non-prior art reference). Despite the expert’s lack of factual support, (*see Xerox Corp.*, IPR2022-00624, Paper 9 (precedential); *Upjohn Co. v. Mova Pharm. Corp.*, 225 F.3d at 1311), Petitioner (erroneously) concludes: “*Matsumura* already discloses silver/silver chloride (Ag/AgCl) conductive material, which a POSA would understand could easily be printed on the single piece of flexible, insulating material.” Ex. 1009, ¶1071. Ultimately, Petitioner’s challenge amounts to nothing more than “different technology was independently known.” This fails. See *Virtek Vision Int’l ULC v.*

Assembly Guidance Sys. Inc., 97 F.4th 882, (Fed. Cir. 2024) (explaining arguments “grounded in the fact that the claim elements are known in the prior art” without more “does not show a motivation to combine” (citing *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007) (“[A] patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.”))).

In support of this substantial modification, Petitioner’s expert simply concludes, without any basis, that this alleged change would be made to “reduc[e] the cost of manufacturing” and to “improve, at minimum, efficiency of manufacture and assembly” Ex. 1009, ¶¶1070-71. Dr. Heikenfeld provides no evidence of this “cost savings” opinion. *Id.* The PTAB has long held that conclusory expert testimony is to be given little weight. *See TQ Delta, LLC v. CISCO Sys., Inc.*, 942 F.3d 1352, 1358-59 (Fed. Cir. 2021).

- c. The implementation of a printed circuit layer would frustrate *Matsumura*’s goal of a waterproof device

Replacing *Matsumura*’s conductive rods and conductive hooks with a sheet of insulating material and printed electrical traces destroys the electro-mechanical structure of *Matsumura* necessary for the device to function as intended. *Matsumura* discloses:

By using the structure described above, the housing of the signal

processor 10, the part that transmits bioelectric potential from the bioelectrode pad 7 to the signal processor 10, i.e. engagement portion between the protruding part of the hook 3 and the hook engagement portion 10a is waterproofed, thus the entire bioelectric potential detector 11 is waterproofed.

Ex. 1012, ¶[0027]. A POSA would not have been motivated to replace the hooks with a printed conductive trace because the POSA would have known that the hooks are necessary for waterproofing “the entire bioelectric potential detector” as described above. Ex. 2015, ¶¶[0086]-[0087]; Ex. 1012, ¶¶[0027]-[0030]. The Petition is silent with regard to the device being waterproof and fails to recognize or address the hooks’ electro-mechanical role altogether. Instead, the Petition proposes replacing *Matsumura*’s non-printed electronic circuitry with a printed circuit layer including printed conductive traces; however, the Petition’s combination frustrates *Matsumura*’s goal of providing a waterproof device. Ex. 2015, ¶¶[0086]-[0087]; *see, e.g.*, Ex. 1012, ¶¶[0001], [0006], [0025]-[0032].

Specifically, *Matsumura* discloses that first sheet 1 and second sheet 4 are “made of an insulating material that does not allow moisture to penetrate.” Ex. 1012, ¶¶[0017]-[0018]. *Matsumura* further discloses that “two pieces of conductive material 2 and two hooks 3” are located “[b]etween the first sheet 1 and the second sheet 4,” and that “[t]he two hooks 3 are arranged so that the protruding portions of the hook 3 can be inserted through the holes 2a and 1a from the backside of the

conductive material 2.” Ex. 1012, ¶[0019]. This three-dimensional layering is essential to waterproofing *Matsumura*’s device:

[T]he circular protrusion 10b contacts and sinks into the first sheet 1 of the bioelectrode pad 7 so as to cover the periphery of the engagement portion of the protruding portion of hook 3 and the hook engagement portion 10a, so that the engagement portion between the protruding portion of the hook 3 and the hook engagement portion 10a is waterproofed.

Ex. 1012, ¶[0029] (referring to Figure 4(b)), Figure 4; Ex. 2015, ¶[0082].

Matsumura’s disclosure is explicit: “two pieces of conductive material 2 and two hooks 3 are arranged to transmit the bioelectric potential detected by the conductive gel 5.” Ex. 1012, ¶[0019]. Further, *Matsumura* is clear that “[t]he bioelectric pad 7 and the signal processor 10 are detachable with hooks.” Ex. 1012, ¶[0016].

Accordingly, a POSA would not have been motivated to modify *Matsumura* in this way, and Ground 1 fails. Ex. 2015, ¶[0087].

B. Ground 2 Fails to Render Obvious the Challenged Claims

The combination of *Jensen* and the Petition’s amorphous “General Knowledge” initially fails to teach or suggest each element of Claim 1. These elements include (1) the computation-communication module attached to a flexible circuit layer and (2) the adhesive covering at least a portion of the flexible layer. The Petition also fails to render obvious the traces of Claim 2.

Moreover, the combination of Ground 2 fails to render obvious Claim 15. For the same reason as in Claim 1, *Jensen* and the “General Knowledge” does not render obvious a computation-communication module attached to the flexible printed circuit layer. Ground 2 additionally fails to render obvious the “flexible printed circuit layer configured to be coupled to a skin” of Claim 15.

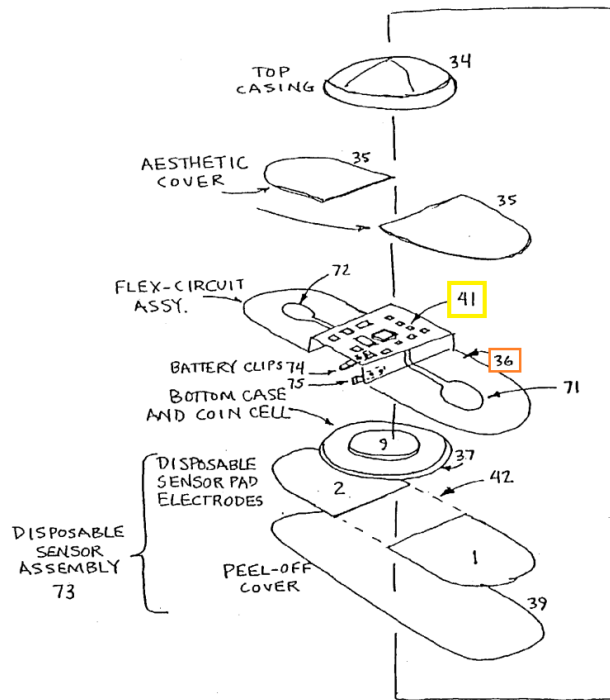
To arrive at the Challenged Claims, the Petition uses the Challenged Claims as a guide to modify *Jensen*, redistributing its electronics while creating new adhesive layers. This is blatant hindsight reconstruction. In view of the actual teachings, the Petition fails to render obvious Claims 1 and 3.

i. Ground 2 fails to render obvious a computation-communication module attached to the flexible circuit layer

The claimed computation-communication module must be attached to the flexible circuit layer. *See* Ex. 1005, Cl. 1 (reciting a “computation-communication module being attached to the flexible circuit layer”); Ex. 2015, ¶[0093]. The Petition contends that *Jensen*’s electronics circuit 52 includes a microcontroller and transmitter, which allegedly discloses the computation-communication module. Petition, 36. Ex. 2015, ¶¶[0093]-[0094]. This is not true.

Jensen’s microcontroller and electronics are part of electronics circuit 41. As shown in Figure 5, *Jensen*’s electronics circuit 41 (yellow below) connects to flexible circuit assembly 36 (orange below). Ex. 1011, ¶[0040]; Ex. 2015, ¶[0095].

Jensen explains that electronics circuit 41 includes the microcontroller and transmitter. Ex. 1011, ¶¶[0031]-[0032], Figure 1; Ex. 2015, ¶[0095].



Ex. 1011, Figure 5 (annotated); Ex. 2015, ¶[0095].

Jensen also illustrates its electronics circuit 41 in Figure 8, which is disposed on circuit 50. Ex. 1011, ¶[0046], Figure 8; Ex. 2015, ¶[0096]. In other words, the microcontroller and transmitter are explicitly identified as part of electronics circuit 41 on circuit 50. Ex. 2015, ¶[0096]; Ex. 1011, Figure 8 (indicating the circuit 49 in green). *Jensen* provides zero disclosure to support the Petition's conclusion that electronics circuit 52 contains the microcontroller and transmitter rather than electronics circuit 41. Ex. 2015, ¶[0096]; Petition, 36.

understand that the electronics circuit comprising a ‘microcontroller’ and ‘transmitter’ could be located on electronics circuit 52.”).

Finally, the Petition contradicts its own position regarding the location of *Jensen’s* electronics. When analyzing a different claim element, the Petition states that “Jensen discloses an *electronics circuit 41* that includes a ‘microcontroller’ for computation and a ‘transmitter.’” Petition, 33. But the Petition also contends that “Jensen discloses an *electronics circuit 52* that contains a ‘microcontroller’ for computation and a ‘transmitter’ for communication.” Petition, 36; Ex. 2015, ¶[0098]. The Petition uses the Challenged Claims as a roadmap to relocate *Jensen’s* electronics under the guise that a POSA “would understand” the location of the microcontroller and transmitter “could be” on electronics circuit 52. Petition, 36.

Without explaining *why* a POSA would have understood the electronics to be part of electronics circuit 52, the Petition’s argument fails, and Dr. Heikenfeld’s testimony should be given little weight. Ex. 2015, ¶[0099]; Petition, 36.

ii. The Petition Fails to Render Obvious the Claimed “adhesive covering at least a portion of the flexible circuit layer”

The Petition identifies two different adhesives in *Jensen* that allegedly render obvious the “adhesive” of Claim 1. Neither succeed. Ex. 2015, ¶[0100].

First, the Petition identifies *Jensen’s* adhesive that “attach[es] aesthetic covering 35 to the top surface of the flexible circuit assembly.” Petition, 38. This

theory fails because there is no disclosure that *Jensen* provides an adhesive for attaching covering 35 to the flexible circuit assembly. Ex. 2015, ¶[0101].

Second, the Petition identifies *Jensen*'s "conductive adhesive" between the sensor pad and the flexible circuit assembly. Petition, 37. This theory fails because *Jensen* does not include a covering that protects the "conductive adhesive" as required by Claims 1 and 15. Ex. 2015, ¶[0105].

- a. *Jensen* does not disclose an adhesive to attach the aesthetic covering to the flexible circuit assembly

Contrary to Petition's argument, *Jensen* does not "disclose[] an adhesive to attach aesthetic covering 35 to the top surface of the flexible circuit assembly." Petition, 38. *Jensen* is silent on how aesthetic covering attaches to the flexible assembly. Ex. 2015, ¶¶[0101]-[0102]; see Ex. 1011, ¶[0043] ("[T]wo aesthetic covers 35 may be constructed from Mylar sheet, for example, and enclose the entire top side of the flexible circuit assembly 36"). Rather than address *Jensen*'s failure to provide an adhesive, the Petition just states that *Jensen* discloses an adhesive, which is not true. Petition, 38. The Petition chose not to apply a proper obviousness analysis and explain, for example, why an adhesive would have been used. For this reason alone, the Petition's alternative theory suffers from a failure of proof.

The Petition compounds this fatal issue by continuing to apply an improper obviousness standard. Namely, *Jensen*'s aesthetic covering is only provided in

reference to the embodiment of Figure 5. Ex. 2015, ¶[0101]; *see* Ex. 1011, ¶[0043]. As a common tactic used through its challenges, the Petition ignores *Jensen's* disclosure (which, again, is silent as to the adhesive) and simply concludes that a POSA “would have understood...that an adhesive would be used to attach flexible circuit assembly 50 to aesthetic covering 35.” Petition, 38. This is not proper.

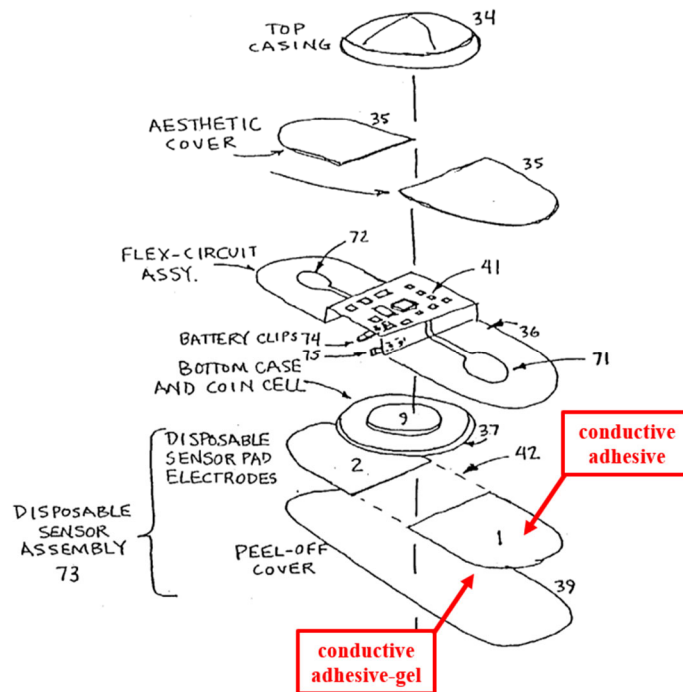
The obviousness question is not concerned with whether the adhesive cover “would also be included” or whether an adhesive “would be used” in a different embodiment of *Jensen*. The Petition must establish *why* a POSA would have been motivated to modify the embodiment of Figure 8 in *Jensen* as proposed, especially when *Jensen* does not even disclose the adhesive in the first place. The Petition cannot fill gaps in art by relying on a POSA without giving any reason why a POSA would have known that *Jensen* used such adhesive.

Based on this failure, the Petition fails to establish that *Jensen* discloses an adhesive to attach the aesthetic covering to the flexible circuit assembly. And for the reasons explained in Section VI.B.ii.b, the Petition cannot save this position by identifying the adhesive between the sensor pad to the flexible circuit assembly.

- b. *Jensen* does not disclose a protective covering that protects the “conductive adhesive”

Jensen's sensor pads 1, 2 include “a conductive adhesive on the circuit side and a conductive adhesive-gel.” Ex. 1011, ¶[0041]. These adhesive layers, which

include (1) the conductive adhesive between sensor pad 1 and flexible circuit assembly 36 and (2) the conductive adhesive-gel between the sensor pad 1 and peel-off cover 39 are shown below. *Id.*, Figure 5 (annotated, identifying the adhesives).



Ex. 1011, Figure 5 (annotated); Ex. 2015, ¶[0103].

The Petition contends that the conductive adhesive between the sensor pad and the flexible circuit assembly is somehow protected by *Jensen's* peel-off covering. *See* Petition, 39 (“This peel-off cover 39 protects all portions of the sensor pad electrode component, including the adhesive covering on that component.”). This argument is not persuasive because it conflates the conductive adhesive-gel on the *bottom side* of the sensor pads (which the peel-off cover does protect) with the conductive adhesive on the *top side* of the sensor pads. Ex. 2015, ¶[0104]; *see*

Petition, 39. The Petition confirms this deficient position through its annotations of Figure 5, which identify the protective covering and the “adhesive covering” on the top surface of the sensor pad. *See* Petition, 39 (annotating Figure 5 of *Jensen*).

As made clear by Figure 5 (annotated above) and the Petition’s annotations to Figure 5, the peel-off cover ***does not*** protect the “conductive adhesive on the circuit side” of the sensor pads because the conductive adhesive is between sensor pad 1 and flexible circuit assembly 36. Petition, 37; Ex. 2015, ¶[0105]. If anything, the peel-off cover only protects the adhesive on the bottom surface of the sensor pads, which *Jensen’s* disclosure confirms. Ex. 2015, ¶[0105]; Ex. 1011, ¶[0042] (“The pads, when they are first installed, typically come pre-applied to a peel-off cover 39 that protects the conductive surface of sensor pads 1 and 2 until ready for use.”). The Petition provides no explanation as to how the peel-off cover would protect an adhesive between the sensor pad and the flexible circuit assembly. Accordingly, the Petition does not render obvious the claimed “protective covering” based on *Jensen’s* peel-off cover 39. Ex. 2015, ¶[0106].

iii. The Petition Fails to Render Obvious the Claimed “traces of determinable electrical resistance” of Claim 2

Jensen’s “copper wiring traces” do not render obvious “traces of determinable electrical resistance.” Ex. 1006, Cl. 1. To reach this conclusion, the Petition obviates the entire language of Claim 2, contending that “copper in the wiring trace

has a determinable electrical resistance” simply because “every substance has a determinable electrical resistance.” Petition, 40; Ex. 1009, ¶1141. This is improper.

A POSA would have understood that Claim 2 requires traces to be comprised of a resistive material to satisfy a “determinable electrical resistance.” Ex. 2015, ¶¶[0107]-[0109]. The ’484 Patent states that “[t]races 412 extending between conductive surface 404 and connection pads 408 and 409 and trace 413 extending between conductive surface 405 and connection pad 411 can be made from resistive materials including resistive metals, carbon, silver ink, powders, paints, or other material of determinable electrical resistance.” Ex. 1006, 7:53-58. In view of the specification, which the Petition did not consider, *Jensen’s* copper traces do not satisfy Claim 2 because copper is not a resistive material. Ex. 2015, ¶[0110].

iv. Ground 2 Fails to Render Obvious “a flexible printed circuit layer” as Required by Claim 15

Claim 15 requires “a flexible printed circuit layer configured to be coupled to a skin surface.” Ex. 1006, Cl. 15. *Jensen’s* flexible circuit 36, 50 are not coupled to the skin surface and thus cannot render obvious the flexible printed circuit layer. Ex. 2015, ¶[0111]; *see* Petition, 43 (“A POSA would understand that *Jensen’s* flexible circuit layer 36, 50 is fashioned as a flexible printed circuit board.”).

A POSA would have understood that *Jensen’s* disposable sensor pads are coupled to the skin surface, not flexible circuit 36, 50. Ex. 2015, ¶[0112]. The

Petition contends that “flexible printed circuit 50 in the embodiment of Figure 8 is analogous to flexible circuit assembly 36.” Petition, 35. But the sensors are the skin contacting layer in Figure 7. Ex. 1006, Figure 7; Ex. 2015, ¶[0112]. This is important because *Jensen*’s sensors are not printed, and the Petition does not identify any disclosure to suggest otherwise. Ex. 2015, ¶[0112]. For this reason, *Jensen* does not render obvious the flexible printed circuit later or Claim 15. Ex. 2015, ¶[0113].

C. Ground 3 Fails to Render Obvious the Challenged Claims

Ozguz, alone or as modified with the “general knowledge” of a POSA does not render obvious the claimed housing retaining a processor. The Petition fails to provide any rational basis for modifying *Ozguz* in view of the so-called “general knowledge” of a POSA, and instead relies on an improper claim construction of the term “housing,” “containing,” and “retaining.” These shortcomings arise primarily from the Petition’s reliance on a reference that is nothing more than an aspirational disclosure that is itself not enabled: *Ozguz*. Ex. 2015, ¶[0114]. As a result, Ground 3 fails to render obvious Claims 1, 2, 3, 6, 7, and 15.

i. The Non-Obviousness Combination of *Ozguz* and the General Knowledge Fails to Render Obvious Claims 1, 7, and 15

Ozguz in view of the general knowledge of a POSA fails to render obvious Claims 1, 7, and 15. Ex. 2015, ¶[0114]. Specifically, *Ozguz* does not disclose the “housing” much less the “housing *retaining* a processor” of Claims 1 and 15 or the

“housing *containing* a processor” of Claim 7. The Petition improperly concludes the flexible battery is somehow analogous to a “housing” without providing any rationale for such an assumption. Ex. 2015, ¶[0117]. The flexible battery disclosed in *Ozguz* is a single flat layer that does not “house” anything, and a POSA would have recognized this. Ex. 2015, ¶[0118]. Even worse, *Ozguz* is an aspirational reference that does not enable the relied upon disclosure. Ex. 2015, ¶[0116]. Notably, neither the flexible battery nor the microns-thick device is adequately enabled, and for that reason alone a POSA would not have been able to arrive at the Challenged Claims using *Ozguz*’s teachings. Ex. 2015, ¶[0132]. The Petition fails to establish that Claims 1, 7, and 15 are obvious. Ex. 2015, ¶¶[0114]-[0116].

- a. Ground 3 fails to render obvious the housing and the housing “retaining” or “containing” a processor

The Petition fails to render obvious Claims 1, 7, and 15 because *Ozguz*’s “flexible, thin battery” is not a housing, and the processor is not “retained in” or “contained in” the flexible battery. Ex. 2015, ¶[0117]. Dr. Heikenfeld’s own annotation highlights that the flexible battery 105 is not a housing, but a single layer on top. Ex. 2015, ¶¶[0117]-[0118].

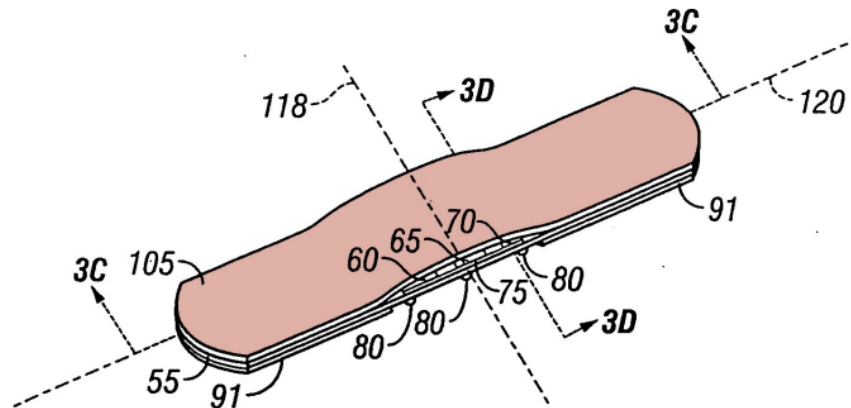


FIG. 3A

See Ex. 1009, ¶1217; Ex. 2015, ¶¶[0117]-[0118].

Second, *Ozguz* itself characterizes the flexible battery 105 as simply an “overlying battery 105” that “overlays” other components of the device. Ex. 1014 ¶¶[0048], [0055]. A POSA would not have understood the term “housing” to mean an overlay. Ex. 2015, ¶¶[0119]-[0124]. *Ozguz* does not disclose any structure that is reasonably considered a housing, and the Petition’s conclusory allegation that the flexible battery is “shaped in a way that houses the computation-communication module” does not pass muster. Ex. 2015, ¶[0117]. The Petition fails to establish that *Ozguz* teaches or suggests the “housing” as recited in Claims 1, 7, and 15. Ex. 2015, ¶[0121].

Because *Ozguz* does not disclose a housing, it also does not disclose a processor contained in or retained in the housing as recited by Claims 1, 7, and 15.

Ex. 2015, ¶[0121]. Moreover, *Ozguz* teaches that the flexible battery sits atop silicon substrates 60, 65, 70 and their respective ICs 71, 72, 73. Ex. 1014, ¶[0048]. *Ozguz*'s silicon substrates 60, 65, 70 may include circuitry further including a microprocessor. Ex. 1014, ¶[0058]. However, the Petition's allegation is a far leap from the disclosure of *Ozguz* that the flexible battery merely sits atop the silicon substrates. Ex. 2015, ¶¶[0123]-[0125]. This does not somehow mean that the silicon substrates are disposed in the flexible battery. Ex. 2015, ¶[0127]. A POSA would have understood that the flexible battery is merely an upper layer to the device and is not critical for housing anything. Ex. 2015, ¶¶[0124]-[0125]. Petitioner fails to establish that *Ozguz* teaches or suggests the housing and the processor disposed in the housing, and therefore this Ground fails to render obvious Claim 1. Ex. 2015, ¶[0125].

- b. Any implicit claim construction by the Petition is improper and should be ignored

Without any explanation or support, the Petition improperly applies an overly broad construction of the terms “housing,” “retaining,” and “containing.” *See* Petition, 48, 63. The Petition's flawed approach should be ignored for two reasons. First, the Petition did not apply the *Phillips* framework. *See* Petition, 2. Second, even if Petitioner followed the rules and explained its claim construction analysis, the Petition's constructions for “housing,” “retaining,” and “containing” are

unreasonably broad and do not align with the meaning of those terms in Claims 1, 7, and 15.

The Petition hides behind the “ordinary and customary meaning” for all claim terms, leaving the Board to guess the Petition’s position on “housing,” “retaining,” and “containing.” *See* Petition, 2. In its analysis, the Petition seemingly construes “housing” to mean any type of unenclosed overlay—an interpretation that contradicts the ordinary meaning of “housing,” which a POSA would have understood implies an enclosure rather than a mere layer placed on top. Ex. 2015, ¶[0128]. Dr. Heikenfeld’s own annotation makes clear that the flexible battery is not a “housing” but is instead a thin layer sitting atop the rest of *Ozguz*’s device. Ex. 2015, ¶[0118]; Ex. 1009, ¶1217 (annotating Figure. 3A, reproduced below).

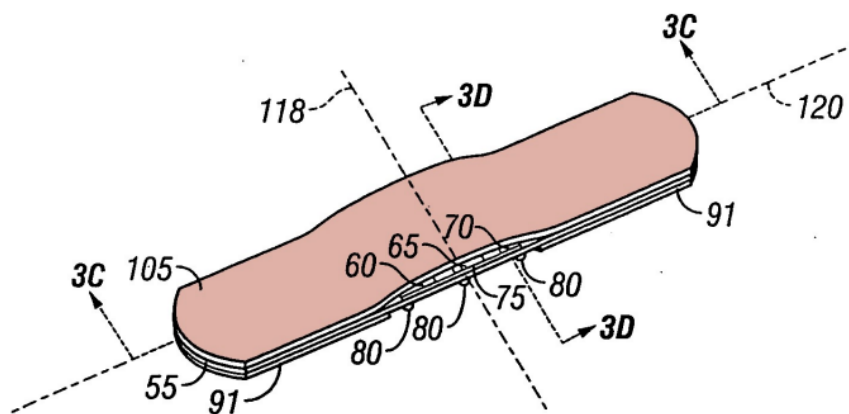


FIG. 3A

Ex. 1014, Figure 3A (original annotations in Petition).

Based on Figure 3A, the Petition alleges that flexible battery 105 “is shaped in a way that houses the computation-communication module.” Petition, 53. Yet, the Petition fails to explain what it means by “shaped in a way” and provides no additional analysis or support that the flexible battery is a housing. Ex. 2015, ¶[0117]. This leaves the Patent Owner and the Board to ask: “Shaped in what way?” Such a conclusory allegation is entirely insufficient to establish that the flexible battery qualifies as a “housing.”

Ozguz itself characterizes flexible battery 105 as an “overlying battery 105” that “overlays” other components of the device. Ex. 1014 ¶¶[0048], [0055]. A POSA would not have understood the terms “housing” and “overlay” to be interchangeable, particularly in the context of how housings are typically described in the art. Ex. 2015, ¶[0124]. A housing is typically structured to provide a protective barrier or containment, which is not the role of a flexible battery. Ex. 2015, ¶¶[0123]-[0124]. The Petition cites no evidence to establish that a POSA would have thought any different. *See* Petition, 48, 63. To conclude (as the Petition does) that a POSA would have considered a flexible battery layer to be a housing ignores the actual construction of *Ozguz*. Ex. 2015, ¶[0125]. Thus, the Petition fails to establish the recited housing. Ex. 2015, ¶[0125].

Further, because the Petition applies an improper construction of “housing,” it also improperly construes “retaining” as recited in Claims 1 and 15 and “containing” as recited in Claim 7. Ex. 2015, ¶[0126]. However, the Petition also provides an improper construction of “retaining” and “containing” separate and apart from its erroneous understanding of “housing.” Ex. 2015, ¶¶[0126]-[0131]. *Ozguz*’s states that its silicon substrates may include circuitry that further includes a microprocessor. Ex. 1014, ¶[0058]. However, the flexible battery merely sits atop of the silicon substrates, and at no point does the microprocessor enter inside any boundary of the flexible battery’s outer walls. Ex. 2015, ¶[0127]. Despite the express teachings of *Ozguz*, the Petition somehow construes the housing “retaining a processor” (Claims 1 and 15) and the housing “containing a processor” (Claim 7) to mean anything that touches the flexible battery layer. Ex. 2015, ¶[0127]. The Petition’s application of this broad construction is erroneous on the merits but is made even worse because Petitioner failed to actually construe the terms “retaining a processor” and “containing a processor.” The Petition’s interpretation of these claim terms are improper and should be ignored. Ex. 2015, ¶¶[0130]-[0131].

ii. *Ozguz* is Non-Enabling for Obviousness

Ozguz discloses speculative and unrealistic features that were not achievable at the time of the invention. Ex. 2015, ¶[0132]. As a result, a POSA would not have

been motivated to modify *Ozguz* to reach the Challenged Claims with a reasonable expectation of success. *See In re Stepan Co.*, 868 F.3d 1342, 1345-46 (Fed. Cir. 2017) (“An obviousness determination requires finding both ‘that a skilled artisan would have been motivated to combine the teachings of the prior art ... and that the skilled artisan would have had a reasonable expectation of success in doing so.’” (quoting *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1367-68 (Fed. Cir. 2016))); Ex. 2015, ¶[0132].

Petitioner does not propose using any combination of references with *Ozguz* to meet independent Claims 1 or 15. In the absence of such other supporting evidence to enable a skilled artisan to make the claimed invention, a standalone § 103 reference must enable the portions of its disclosure being relied upon. *Ashland Oil, Inc. v. Delta Resins & Refractories, Inc.*, 776 F.2d 281, 297 (Fed. Cir. 1985). Here, the portions of *Ozguz* relied on by the Petition are not enabled and *Ozguz* cannot render obvious the claimed invention. “In the absence of such other supporting evidence to enable a skilled artisan to make the claimed invention, a standalone § 103 reference must enable the portions of its disclosure being relied upon.” *Raytheon Techs. Corp. v. GE*, 993 F.3d 1374, 1377, 1380-81 (Fed. Cir. 2021) (rejecting, as dispositive, the standalone prior art reference asserted in § 103 concerning a “futuristic turbine engine” as not self-enabled). “[I]f an obvious case

is based on a non-self-enabled references and no other prior art reference or evidence would have enabled a skilled artisan to make the claimed invention, then the invention cannot be said to have been obvious.” *Id.* at 1376.

- a. A POSA would not have relied on *Ozguz* to reach the challenged claims

Ozguz describes the use of futuristic flexible batteries as part of the device. Ex. 1014, ¶[0048]. However, at the time of the invention, flexible batteries were not viable or available in the form described in *Ozguz*. Ex. 2015, ¶[0133]. While the concept of flexible batteries may have been proposed or theoretically envisioned, the technology to implement such a feature in a real-world, working device was in its infancy, and its availability was far from practical. Ex. 2015, ¶[0134]. A POSA, relying on the state of the art at the time of the invention, would not have considered using a flexible battery as described in *Ozguz*. Ex. 2015, ¶[0134].

Ozguz suggests the use of integrated flexible batteries to power the biomonitor. *See, e.g.*, Ex. 1014, ¶[0019]. However, at the time of the invention, flexible batteries were not capable of supporting extended use without frequent recharging or replacement. Ex. 2015, ¶[0135]. *Ozguz* oversimplifies the real-world constraints on battery capacity, longevity, and energy efficiency, overlooking the fact that flexible battery technologies at that time were not sufficiently advanced to support the sustained, low-power requirements of continuous physiological

monitoring. Ex. 2015, ¶[0135]. These batteries lacked the reliability and durability needed to power such a device over extended periods, and in the context of a patient wearable medical device where patient safety is top priority, a flexible battery would not have been considered a suitable option. Ex. 2015, ¶[0135]. Importantly, the miniature size and layered structure of *Ozguz*'s device would significantly increase the risk of thermal overheating in the flexible battery, making the design impractical for real-world use. Ex. 2015, ¶[0135].

Further, a POSA would have recognized that using a flexible battery as described in *Ozguz* conflicted with the cost-effective goals of the '484 Patent. Ex. 2015, ¶[0136]; Ex. 1007, 1:65-2:8. Finally, even if a theoretical or experimental flexible battery existed at the time of the invention, it would not have been reliable enough for use in a wearable cardiac device. Ex. 2015, ¶[0136]. Consequently, a POSA would not have been able to implement the flexible battery in a functional ambulatory monitor, undermining the enablement of *Ozguz*. Ex. 2015, ¶[0136].

Moreover, the use of flexible batteries for a patient wearable device, particularly one designed for continuous monitoring, would have faced significant challenges regarding user comfort and practicality. Ex. 2015, ¶[0137]. A wearable device would need to offer long-term battery life, ideally without frequent recharging or the discomfort of bulky or frequently replaced batteries. Ex. 2015,

¶[0137]. In medical monitoring devices, battery reliability and longevity are critical not only for user convenience but also for accurate, consistent monitoring. Ex. 2015, ¶[0137]. Flexible batteries of the time were not capable of achieving this, making them impractical for the intended use in wearable devices. Ex. 2015, ¶[0137]. The failure to address these technical and practical limitations in *Ozguz* renders *Ozguz* non-enabling, as the proposed device could not have been practically implemented with the technology available at the time. Ex. 2015, ¶[0137].

Finally, *Ozguz*'s discussion of waterproofing is overly simplistic and ignores the technical challenges of protecting flexible electronics from moisture and sweat—two critical environmental factors for a wearable monitor. Ex. 2015, ¶[0138]. *Ozguz*, and Petitioner, assume that basic waterproofing techniques, such as standard skin adhesion methods, would suffice to ensure the device's operation under real-world conditions. Ex. 2015, ¶[0138]. However, this assumption overlooks the complexity of waterproofing flexible materials, which was not feasible with available materials and methods at the time. Ex. 2015, ¶[0138]. Waterproofing such a device requires the integration of specialized coatings or barriers that can protect sensitive electronic components from moisture without compromising the flexibility or comfort of the device. Ex. 2015, ¶[0138]. At the time, long-term environmental

resistance in flexible electronics was nascent, with no reliable way to ensure durability against sweat, moisture, or other conditions. Ex. 2015, ¶[0138].

Specifically, a critical and overlooked challenge in *Ozguz's* design is the incompatibility between the rigid battery and the flexible layers of the device. The use of a rigid battery inside a flexible structure would create significant waterproofing issues, particularly at the edges where the battery meets the flexible layers. Ex. 2015, ¶[0139]. This combination of rigid and flexible components would lead to poor sealing around the edges, allowing moisture to seep into the device. Ex. 2015, ¶[0139]. The lack of a reliable seal would expose the internal electronics to potential water damage, particularly in environments where sweat, moisture, or even rain could compromise the device's integrity. Ex. 2015, ¶[0139]. This issue further highlights the unrealistic nature of *Ozguz's* proposal, as a practical, wearable device could not afford to risk water damage, especially when used in environments that are prone to moisture exposure. Ex. 2015, ¶[0139].

These challenges would apply to *Ozguz's* proposed device making the device highly susceptible to failure upon exposure to moisture or sweat, undermining its viability as a continuous-use wearable monitor. Ex. 2015, ¶[0140]. The failure to address these concerns in *Ozguz's* reference renders the device impractical and speculative. Therefore, a POSA at the time would not have been motivated to

combine *Ozguz's* teachings with the intention of creating a functional, reliable, sterilizable, wearable monitor. Ex. 2015, ¶[0140]. The lack of consideration for long-term environmental resistance and the durability and sterilizability of flexible materials significantly diminishes the relevance of *Ozguz* as prior art, as its teachings do not provide an enabling disclosure for creating a wearable monitor that could withstand real-world use. Ex. 2015, ¶[0140]. A POSA would have recognized that these barriers could not be overcome with the materials and technologies available at the time, making the combination of *Ozguz's* teachings with other prior art unrealistic and impractical. Ex. 2015, ¶[0140].

b. The Petition's reliance on *Ozguz's* infeasible flexible battery technology is fatal to Ground 3

The Petition relies on *Ozguz's* “flexible battery 105” for at least two of the claim elements in independent Claims 1 and 15. Petition, 48, 53, 66, 68. However, this flexible battery technology was infeasible at the time of *Ozguz's* purported priority date (2005), infeasible at the time of the priority date of the '484 Patent (2006), and still infeasible up to at least 2015 for at least four reasons. Ex. 2015, ¶[0141].

First, in 2005 there was limited mechanical flexibility of commercially available batteries. Ex. 2015, ¶[0142]. While several battery technologies—such as lithium polymer (Li-poly), thin-film batteries, and printed primary cells—were

theoretically flexible by 2005, none could achieve the mechanical flexibility described in the *Ozguz* patent, particularly the repeated bending and twisting needed for a wearable “adhesive bandage” form factor. Ex. 2015, ¶[0142]. Specifically, commercially available Li-poly pouch cells could slightly bend to conform to curved surfaces, but were neither repeatedly flexible nor stretchable without risking internal short circuits or physical damage. Ex. 2015, ¶[0142]. Similarly, thin-film lithium-ion cells developed by Oak Ridge National Laboratory (ORNL) demonstrated limited bending capabilities and were typically fabricated on rigid substrates, severely constraining their real-world flexibility and practical use in dynamic, wearable applications. Ex. 2015, ¶[0142].

Second, as of 2005 there were significant energy density and power delivery constraints that would have precluded using a flexible battery in *Ozguz*’s device. Ex. 2015, ¶[0143]. Printed thin-film zinc-based batteries, like those from Power Paper Ltd. and Enfucell, were indeed thin and highly flexible but had severely limited energy storage (tens of milliamp-hours at best). Ex. 2015, ¶[0143]. Such batteries were adequate only for low-power, short-duration tasks (like RFID tags or greeting cards), insufficient for continuous physiological monitoring devices that require sustained power delivery for data collection, digitization, and wireless data transmission. Ex. 2015, ¶[0143]. Rechargeable technologies like NEC’s Organic

Radical Battery (ORB), while flexible and seemingly promising, were only experimental prototypes with very limited energy density (~ 1 mWh/cm²). Ex. 2015, ¶[0143]. By 2005, flexible battery technologies could not offer sufficient power density and durability required by the *Ozguz* device. Ex. 2015, ¶[0143].

Third, incorporating flexible battery technology into *Ozguz*'s device would not have been feasible from a manufacturing standpoint, nor would it have provided reliable performance in such a device. Ex. 2015, ¶[0144]. As of 2005, flexible battery manufacturing was either experimental or limited to niche applications. Ex. 2015, ¶[0144]. Mass-scale production processes (roll-to-roll printing) of thin-film batteries remained in pilot stages, with limited reliability and inconsistent quality. Ex. 2015, ¶[0144]. The flexible, thin-film silicon-based integrated circuit described in *Ozguz* specifically highlights a degree of integration and complexity requiring robust, reliable power delivery. Ex. 2015, ¶[0144]. No battery technology available prior to or in 2005 were manufactured with the reliability, consistency, and volume required to power such an integrated wearable monitoring device. Ex. 2015, ¶[0144].

Fourth, integrating the flexible battery into *Ozguz*'s device would have presented significant challenges. Ex. 2015, ¶[0145]. *Ozguz* explicitly describes integrating a thin, flexible battery layer with equally flexible silicon circuitry and

substrates. Ex. 1014, ¶[0048]. Further, *Ozguz* emphasizes significant mechanical flexibility—such as twisting about the longitudinal axis (Ex. 1014, Figure 3E) and bending along multiple axes (Ex. 1014, Figs. 3C, 3D). Ex. 2015, ¶[0145]. Achieving this degree of flexibility with battery technologies available by 2005 was not only impractical but posed significant risks for battery failure, leakage, or structural breakdown. Ex. 2015, ¶[0145]. The delicate thin-silicon layers and sensitive integrated circuitry required extremely uniform and mechanically stable battery technology. Ex. 2015, ¶[0145]. The available battery solutions could not satisfy this stringent mechanical integration requirement (without compromise in structural integrity, operational lifetime, or safety). Ex. 2015, ¶[0145].

c. The Petition’s reliance on *Ozguz*’s infeasible thin silicon technology is fatal to Ground 3

The Petition relies on *Ozguz*’s thinned silicon substrates for every claim element in independent Claims 1 and 15, and for at least five out of eight claim elements in independent Claim 7. Petition, 48-53 (Claim 1), 60, 61-64 (claim elements 7[b], 7[d]-7[g]), 66-68 (Claim 15). However, this thin silicon technology was infeasible in 2005 (*Ozguz*’s purported priority date), 2006 (the ’484 Patent’s filing date), and still infeasible up to at least 2015. Ex. 2015, ¶[0147].

First, in 2005, flexible thinned silicon technology was confined to experimental development and use, and suffered from low yield, high fragility, and

inadequate scalability for everyday use purposes (e.g., wearable monitors). Ex. 2015, ¶[0148]. This prevented the technology from achieving consistency, reliability, and high throughput manufacturing necessary for practical use. Ex. 2015, ¶[0148].

Second, in 2005, flexible thin silicon could not be reliably assembled or packaged, and therefore could not support a wearable patient monitor as described by *Ozguz*. Ex. 2015, ¶[0149]. Particularly, not as disclosed in *Ozguz*, which requires complex integration: flexible silicon circuitry, flexible battery, electrodes, wireless transmission capability, and adhesives into a thin, bendable form factor. Ex. 2015, ¶¶[0149]-[0150]; Ex. 1014, Figures 2a, 3a, 3b.

Indeed, there were no off-the-shelf flexible integrated circuits or thin silicon chips available in 2005 outside of research-based contexts. Ex. 2015, ¶[0151]. However, even the research-based developments of flexible thinned silicon devices suffered from difficulties with power and wireless communication interoperability. Ex. 2015, ¶¶[0151]-[0152]. The U.S. government, in 2015, recognized these inadequacies, which underscores the depth and persistence of these technical and manufacturing challenges. Ex. 2015, ¶[0153]. Thus, the wearable, flexible device as described by *Ozguz* was not realizable by a POSA in 2005. Ex. 2015, ¶[0153].

D. Ground 4 Fails to Render Obvious the Challenged Claims

The Petition fails to allege—much less establish—that *Ozguz* cures any of the deficiencies in *Matsumura* with respect to independent Claims 1 or 15. Nor does the Petition attempt to explain how a person of ordinary skill in the art (“POSA”) would bridge the substantial technological gap between *Matsumura*’s conventional, rigid electrode structures and the speculative printed electronics conceptually described in *Ozguz* such that independent Claims 1 and 15 are obvious. Moreover, the Petition fails to establish that a POSA would have combined *Matsumura* and *Ozguz* to arrive at the claims challenged in Ground 4. As a result, Ground 4 fails.

i. The Petition Fails to Establish a Motivation to Combine *Matsumura* and *Ozguz*

The Petition fails to establish that a POSA would have been motivated to modify *Matsumura* based on *Ozguz*. The Petition admits that *Matsumura* does not disclose “a specific circuit design or architecture to perform” functions including using a wireless transmitted to detect, process, and wirelessly transmit bioelectric signals. Petition, 50. For several reasons, a POSA would not have looked to *Ozguz* “to incorporate the specific design and structure of circuits and electronic components taught by *Ozguz*.” Petition, 70; Ex. 2015, ¶[0156]. First, *Ozguz* includes printed electronic traces, and as discussed above in Section VI.A.ii., a POSA would unequivocally not have been motivated to replace *Matsumura*’s

conductive rods and hooks with printed circuitry. Ex. 2015, ¶[0158]; *Supra* Section VI.A.ii.

Second, when considered in combination with *Matsumura*, *Ozguz* provides no motivation for a POSA to combine these references in a way that would lead to the claimed invention. *Ozguz*'s concepts, as discussed above in Section VI.C.ii., are speculative and futuristic, lacking the practical enablement required for a POSA to build upon them in a meaningful way. The combination of *Matsumura*'s rigid conductive rods and hooks with *Ozguz*'s speculative flexible technology is not suggested by any of the cited references. Ex. 2015, ¶[0158]. A POSA would not have been motivated to replace *Matsumura*'s rigid, waterproof components with speculative, non-enabling flexible electronics as proposed by *Ozguz*. Ex. 2015, ¶¶[0158]-[0159]; *supra* Section VI.C.ii.

Thus, the combination of these references lacks the motivation necessary to support an obviousness rejection. Accordingly, Ground 4 fails to render obvious the Challenged Claims.

VII. CONCLUSION

As each of the Grounds fail, the Petition should be denied.

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