

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.; and
SAMSUNG ELECTRONICS AMERICA, INC.,
Petitioner,

v.

OURARING, INC.,
Patent Owner.

IPR2024-00928
Patent 9,582,034 B2

Before LINDA E. HORNER, NEIL T. POWELL, and
MICHAEL A. VALEK, *Administrative Patent Judges*.

POWELL, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

A. BACKGROUND

Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. (collectively, “Petitioner”) filed a Petition for *inter partes* review of claims 1–5, 11–13, and 16–18 of U.S. Patent No. 9,582,034 B2 (Ex. 1001, “the ’034 patent”). Paper 3 (“Pet.”). Ouraring, Inc. (“Patent Owner”) filed a Preliminary Response. Paper 7 (“Prelim. Resp.”). We instituted trial on claims 1–5, 11–13, and 16–18 on all grounds in the Petition. Paper 8, 17 (“Dec.”).

Patent Owner subsequently filed its Response to the Petition (Paper 15, “PO Resp.”), Petitioner filed its Reply (Paper 19, “Reply”), and Patent Owner filed its Sur-reply (Paper 23, “Sur-reply”). We held a hearing on September 11, 2025, and a transcript is of record. Paper 35 (redacted) (“Tr.”); Paper 34 (sealed) (“Confidential Tr.”).

After considering the parties’ arguments and evidence, we find that Petitioner has shown by a preponderance of the evidence that challenged claims 1–5, 11–13, and 16–18 of the ’034 patent are unpatentable. Our reasoning is explained below.

B. RELATED PROCEEDINGS

Patent Owner notes that the ’034 patent “is not currently asserted in any judicial or administrative matters.” Paper 6, 1. Patent Owner notes, however, that the ’034 patent “belongs to the same family as U.S. Patent Nos. 11,549,147, 11,868,178, and 11,868,179” and identifies the following proceedings involving those related patents:

Certain Smart Wearable Devices, Systems, and Components Thereof,
Inv. No. 337-TA-1398 (ITC March 13, 2024);

Ōura Health Oy et al. v. Ultrahuman Healthcare Pvt., Ltd. et al.,
No. 2:23-cv-00396 (E.D. Tex. September 1, 2023); and
Samsung Electronics Co., Ltd., et al v. Ōura Health Oy et al.,
No. 3:24-cv-03245 (N.D. Cal. May 30, 2024).
Id.

Additionally, Patent Owner recently informed us that the related '178 patent has been asserted in the following matters:

Certain Smart Wearable Devices, Systems, and Components Thereof,
Inv. No. 337-3858 (ITC November 18, 2025);

Ouraring Inc. v. Zepp Health Corp., 2:25-cv-01126 (E.D. Tex.
November 17, 2025);

Ouraring Inc. v. Nexxbase Marketing Pvt. Ltd., 2:25-cv-01127 (E.D.
Tex. Nov. 17, 2025);

Ouraring Inc. v. Reebok International Limited et. al., 2:25-cv-01129
(E.D. Tex. Nov. 17, 2025); and

Ouraring Inc. v. Samsung Elec. America Inc., 2:25-cv-01067 (E.D.
Tex. October 23, 2025).

PGR2024-00030, Paper 56, 1.

Also, Petitioner notes that it has sought *inter partes* review of related U.S. Patent Nos. 11,868,178, 11,868,179, 11,599,147, and 10,893,833. Pet. 1. Specifically, Petitioner has petitioned for *inter partes* review of those patents in the following matters:

Samsung Electronics Co., Ltd., et al v. Ouraring, Inc.,
PGR2024-00030 (PTAB May 31, 2024), involving U.S. Patent
No. 11,868,178;

IPR2024-00928
Patent 9,582,034 B2

Samsung Electronics Co., Ltd., et al v. Ouraring, Inc.,
PGR2024-00031 (PTAB May 31, 2024), involving U.S. Patent
No. 11,868,179;

Samsung Electronics Co., Ltd., et al v. Ouraring, Inc.,
IPR2024-00930 (PTAB May 31, 2024), involving U.S. Patent
No. 11,599,147; and

Samsung Electronics Co., Ltd., et al v. Oura Health Oy,
IPR2024-00929 (PTAB May 31, 2024), involving U.S. Patent
No. 10,893,833.

Since the filing of this Petition, Petitioner also has challenged the following additional patents with related subject matter: U.S. Patent Nos. 10,139,859 (IPR2024-01077), 10,281,953 (IPR2024-01078), 10,281,953 (IPR2024-01079), 10,842,429 (IPR2024-01080), 11,188,124 (IPR2025-00147), 11,874,701 (PGR2024-00038), and 11,874,702 (PGR2024-00039).¹

The related '178 patent was also challenged by RingConn LLC in PGR2025-00018 and IPR2025-00412 and by Ultrahuman Healthcare Pvt. Ltd. *et al.* in IPR2025-00411. The Acting Director discretionarily denied these petitions on June 25, 2025.

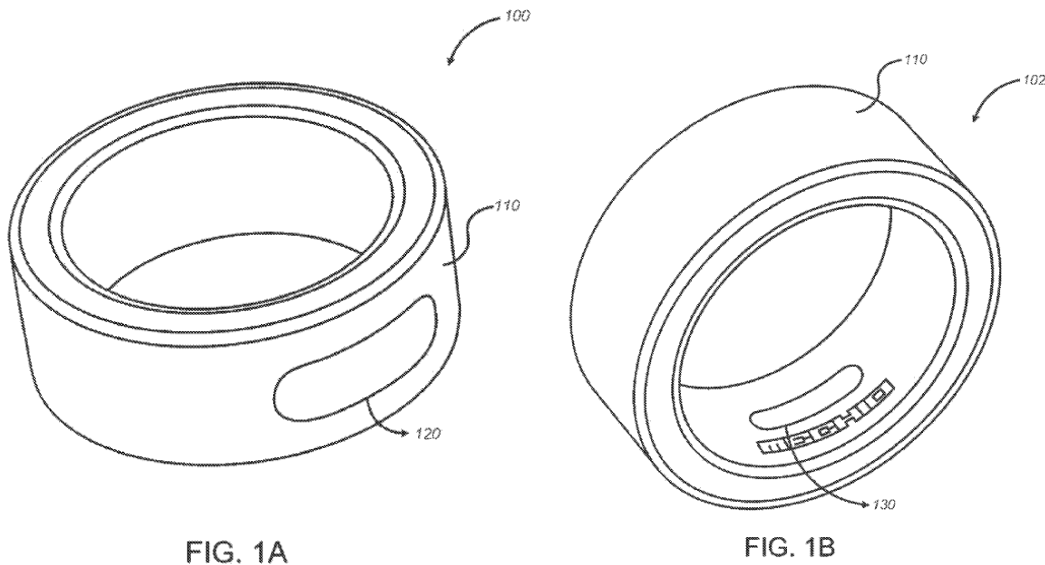
¹ The Board denied institution in IPR2024-00929, IPR2024-00930, IPR2024-01079, IPR2024-01080, PGR2024-00031, and PGR2024-00038 due to statutory disclaimer by the Patent Owner of all the challenged claims. The Board instituted the remaining six petitions: IPR2024-00928, IPR2024-01077, IPR2024-01078, IPR2025-00147, PGR2024-00030, and PGR2024-00039.

C. THE '034 PATENT

The '034 patent is titled “Wearable Computing Device” and was issued February 28, 2017, based on an application filed November 28, 2014, that asserts the benefit of two provisional applications, the earlier of which was filed November 29, 2013. Ex. 1001, codes (22), (45), (54), (60).

The '034 patent discloses “a wearable computing device (WCD) in the form of a ring that can be worn on the finger of a human user.” *Id.* at code (57).

Figures 1A and 1B of the '034 patent are reproduced below.



Figures 1A and 1B are perspective views of WCD 110. Ex. 1001, 9:7–10. “[T]he WCD 110 can include the exterior window 120 on its exterior wall for input/output data transmission and reception, battery recharge, or status indication. The WCD 110 can also include the interior window 130 on its interior wall for various monitoring or sensing activities.” *Id.* at 9:40–45.

Figure 4 of the '034 patent is reproduced below.

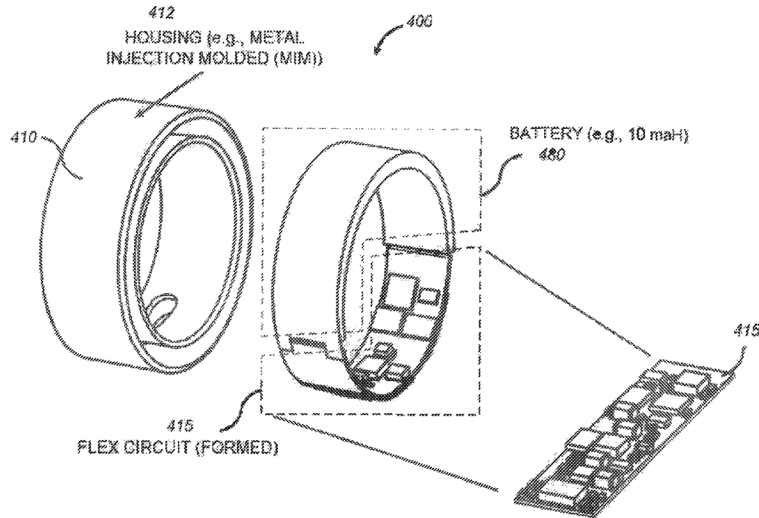


FIG. 4

Figure 4 is an exploded view of WCD 410 illustrating battery 480 and flexible printed circuit board (“PCB”) 415, which are configured to fit inside ring housing 412 of WCD 410. Ex. 1001, 5:7–9, 15:46–49.

Figures 7 and 8 of the ’034 patent are reproduced below.

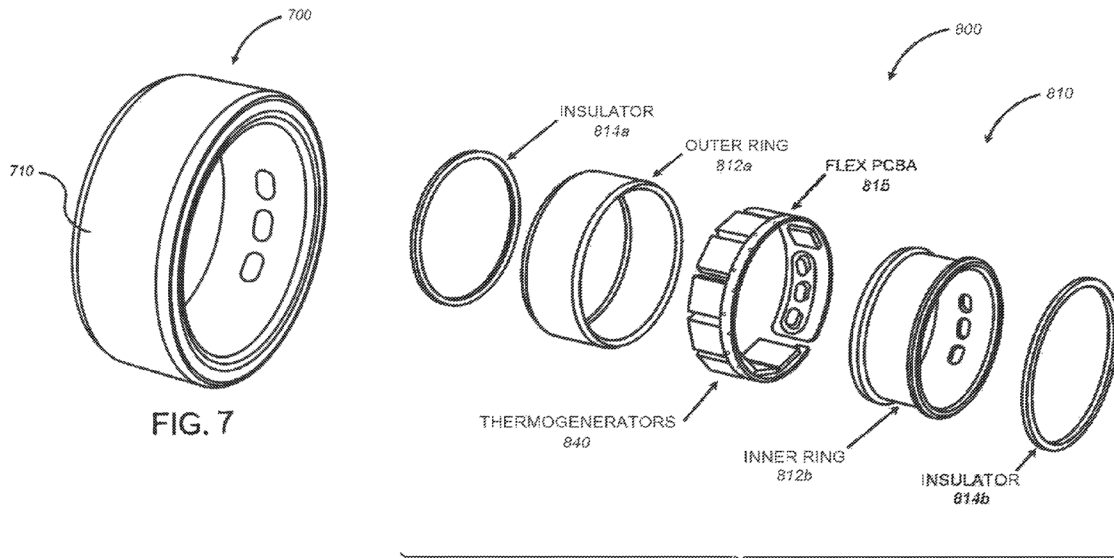


FIG. 8

Figure 7 is a perspective view of a WCD, and Figure 8 is an exploded view of the WCD of Figure 7. Ex. 1001, 5:16–20, 14:47–49. Figures 7 and 8

illustrate a design of the housing for the WCD, where the ring includes outer ring 812a, inner ring 812b, and insulators 814a and 814b. *Id.* at 14:49–54.

D. ILLUSTRATIVE CLAIM

Of the challenged claims, claims 1, 11, and 16 are independent. Each of claims 2–5, 12, 13, 17, and 18 depends, directly or indirectly, from one of independent claims 1, 11, and 16. Claim 11 is illustrative for our analysis herein and is reproduced below with certain reformatting:²

11. [11[pre]] A wearable computing device, comprising:

[11[A]] an internal housing portion defining a first enclosing structure, the internal housing portion configured to be disposed near a finger of a user;

[11[B]] a flexible printed circuit board arranged around a portion of a circumference of an interior surface of the internal housing;

[11[C]] at least one component disposed on the flexible printed circuit board; and

[11[D]] an external housing portion defining a second enclosing structure, the external housing portion configured to seal the at least one component and the printed circuit board in an internal space defined by the interior surface of the internal housing.

Ex. 1001, 36:12–25.

E. PRIOR ART AND ASSERTED GROUNDS

Petitioner asserts that claims 1–5, 11–13, and 16–18 are unpatentable on the following grounds (Pet. 4):

² We have added the same labels that Petitioner uses to identify portions of claim 1. *See, e.g.*, Pet. 20–30.

Ground	Claims Challenged	35 U.S.C. §	Reference(s)/Basis
1	1–5, 11, 12, 16–18	103	Schröder ³
2	1–5, 11–13, 16–18	103	Schröder, Yuen ⁴
3	1, 2, 11, 12, 16–18	103	LeBoeuf ⁵
4	4, 5	103	LeBoeuf, Wissmar ⁶

In support of these grounds, Petitioner relies on declarations from Dr. Brian Anthony submitted with the Petition (Ex. 1002) and Reply (Ex. 1079).

II. ANALYSIS

A. LEVEL OF ORDINARY SKILL

Petitioner contends a person of ordinary skill in the art at the relevant time would have had:

at least a four-year degree in electrical engineering, mechanical engineering, biomedical engineering, optical engineering, or related field of study, or equivalent experience, and at least two years' experience in academia or industry studying or developing physiological monitoring devices such as non-invasive biosensors.

Pet. 7 (citing Ex. 1002 ¶¶ 26–30). Petitioner also contends that a person of ordinary skill would have been “familiar with, for example, sensor system

³ U.S. Patent No. 10,303,867 B2, issued May 28, 2019 (Ex. 1007, “Schröder”).

⁴ U.S. Patent No. 8,954,135 B2, issued Feb. 10, 2015 (Ex. 1006, “Yuen”).

⁵ U.S. Patent No. 8,700,111 B2, issued Apr. 15, 2014 (Ex. 1012, “LeBoeuf”).

⁶ U.S. Patent Application Publication No. 2012/0218184 A1, published Aug. 30, 2012 (Ex. 1013, “Wissmar”).

design and signal processing” and that “[a] higher level of education or skill might make up for less experience, and vice versa.” *Id.* at 7–8.

Patent Owner agrees with Petitioner’s proposed definition of a person of ordinary skill in the art. PO Resp. 14.

We adopt this uncontested definition of the level of ordinary skill in the art. This definition is supported by the record and consistent with the disclosure in the ’034 patent and the references cited in the Petition.

B. CLAIM CONSTRUCTION

In an *inter partes* review, claim terms “shall be construed using the same claim construction standard that would be used to construe the claim 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.” 37 C.F.R. § 42.100(b).

Petitioner submits that no term requires express construction to resolve this Petition. Pet. 8 (citing Ex. 1002 ¶¶ 31–33, 150–151). Patent Owner indicates that in an ITC proceeding involving a related patent, the Administrative Law Judge (ALJ) adopted three constructions agreed-upon by the parties in that proceeding⁷ and also construed two disputed terms.⁸

⁷ In the ITC proceeding, the ALJ adopted the parties’ agreed-upon constructions that: (1) the preamble of claim 1 [a finger-worn wearable ring device] is limiting; (2) [positioned/configured to fit] within a “cavity” is [positioned/configured to fit] within a “hollow space”; and (3) [the internal housing component] “coupled with” [the external housing component] is [the internal housing component] “connected with” [the external housing component]. PO Resp. 15.

⁸ In the ITC proceeding, the ALJ construed the claims such that: (1) the internal and external housing components of claims 1, 12, and 17 enclose

PO Resp. 15. Patent Owner agrees with Petitioner, however, that no terms need to be construed to decide the issues raised in the Petition. *Id.* at 15–16.

We reviewed the constructions adopted by the ITC. PO Resp. 15. These constructions are not germane to the issues we need to decide to resolve this proceeding.

The parties’ disputes, however, raise one claim-construction issue warranting discussion. Specifically, we find it helpful to discuss certain aspects of the meaning of claim 12’s recitation that “the external housing portion comprises a substantially transparent external potting.” Ex. 1001, 36:26–28. Patent Owner’s arguments suggest that the claimed “substantially transparent external potting” must (1) have certain physical relationships with other components and (2) be “‘transparent’ to all light.” PO Resp. 29–30. We address these issues in turn below.

1. Physical Relationships

Patent Owner argues that “potting both forms the ‘overall form factor of the WCD 120, in addition to providing a housing for one or more electronic components stored withing the housing 1210 of the WCD 1200.’” PO Resp. 29 (citing Ex. 1001, 17:4–8). According to Patent Owner “[p]otting material also fills the space and encapsulates the components.” *Id.* (citing Ex. 1001, 16:16–17, 18:61–62).

Petitioner disagrees. Reply 19–20. Regarding Patent Owner’s assertion that the potting material must form the overall form factor of the device, Petitioner argues that “claim 12 recites that the external housing ‘compris[ing] a substantially transparent external potting,’ *not* that it is

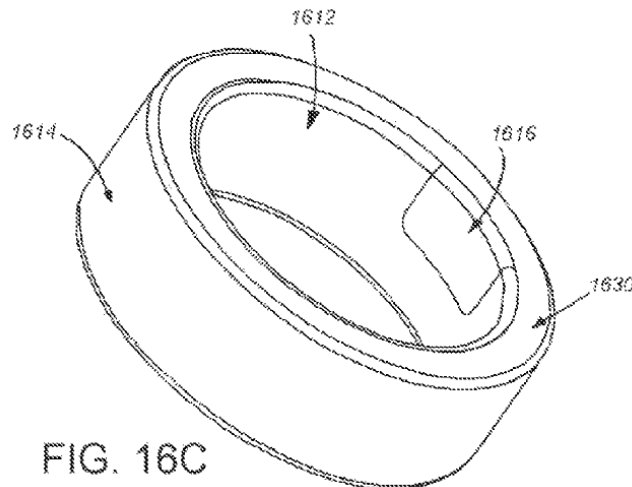
space and do not necessarily exclude potting material; and (2) “circumferential,” as recited in claims 1, 17, and 18, does not require a closed shape. PO Resp. 15.

entirely made of transparent potting.” *Id.* at 19 (citing Ex. 2021, 471:4–14, 473:6–20; Ex. 1079 ¶ 35). Petitioner further argues that the ’034 patent discloses an embodiment in which “the transparent potting is just a region or cut-out of the larger ring structure.” *Id.* at 20 (citing Ex. 1001, 20:51–57, Fig. 16C).

Petitioner has the better position, as we agree with Petitioner that the ’034 patent discloses an embodiment that uses transparent potting as a window, rather than to form the overall form factor and encapsulate components:

[Figure] 16C is a perspective view of the WCD with potting material 1630. As described above, the PCB, battery, and components can be disposed within the space. Once disposed therein, a potting 1630 can be provided atop the components and within the cutaway portion 1616. The potting 1630 can be transparent to allow for transmission of light through the cutaway portions 1616.

Ex. 1001, 20:51–57. This configuration is shown below in Figure 16C.



“[Figure] 16C is a perspective view of the WCD with potting material.” Ex. 1001, 6:1–2. As Figure 16C shows, potting material 1616 forms a window in only a portion of the WCD’s exterior.

Patent Owner cites portions of the '034 patent suggesting that potting can be used to encapsulate components and form the overall form factor in some embodiments. *E.g.*, Ex. 1001, 17:4–8, 18:61–62. But Patent Owner does not persuade us that claim 12 is limited to those embodiments. PO Resp. 29; *SuperGuide Corp. v. DirecTV Enters., Inc.*, 358 F.3d 870, 875 (Fed. Cir. 2004) (“Though understanding the claim language may be aided by the explanations contained in the written description, it is important not to import into a claim limitations that are not part of the claim.”).

Accordingly, we do not construe claim 12’s “external transparent potting” as requiring material that “forms the ‘overall form factor of the WCD 120, in addition to providing a housing for one or more electronic components,’” as suggested by Patent Owner. PO Resp. 29. Nor do we construe the claim language as requiring material that “also fills the space and encapsulates the components,” as suggested by Patent Owner. *Id.*

2. *Transparent*

Patent Owner suggests that claim 12’s “substantially transparent external potting” must be “‘transparent’ to all light,” rather than just transparent to infrared light. PO Resp. 29.

Petitioner disagrees, asserting that “[c]laim 13 requires that ‘*at least one* of visible light, infrared radiation, and ultraviolet radiation’ is emitted through claim 12’s ‘substantially transparent external potting.’” Reply 20 (quoting Ex. 1001, 36:26–33). Petitioner also argues that Dr. Mercier “in a related proceeding further explained that if the transparent material is transparent to a ‘particular wavelength of light and nothing else, then . . . it would be substantially transparent to that one wavelength and not the others.’” *Id.* at 21 (citing Ex. 1082, 183:8–185:25). “Thus, the transparent

material does not need to be transparent to ‘all light,’ but can be transparent to just one of the enumerated types of light,” Petitioner concludes. *Id.*

Weighing the parties’ arguments and evidence, we disagree with Patent Owner’s suggestion that claim 12’s “substantially transparent external potting” must be transparent to all light. PO Resp. 29; Reply 20–21. As Petitioner argues, claim 13, which depends from claim 12, illustrates that claim 12’s “substantially transparent external potting” only needs the ability to transmit “*at least one of* visible light, infrared radiation, and ultraviolet radiation.” Ex. 1001, 36:26–33 (emphasis added); Reply 20. In sum, Petitioner persuades us that “substantially transparent external potting” need only be transparent to at least one light type, not all light types.

C. REFERENCES RELIED UPON

1. *Schröder*

Schröder discloses an external secure unit comprising a memory, a processor, and an interface for sending and receiving data to and from a communication device, such as a smartphone. Ex. 1007, code (57), 1:5–11, 1:42–47, 1:64–67. The external secure unit stores security-relevant data necessary for executing an application program in the communication device. *Id.* at code (57), 1:56–61. A “finger-ring” can be employed as an external secure unit. *Id.* at 1:61–64.

Schröder's Figures 1 and 2 are reproduced below.

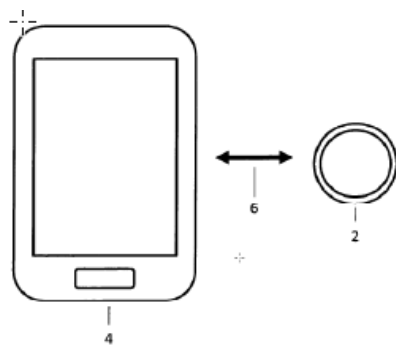


Fig. 1

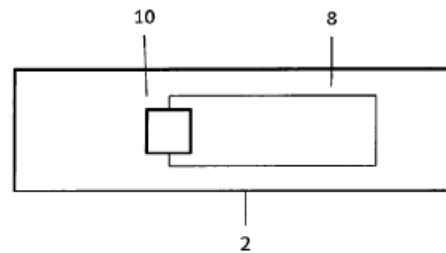


Fig. 2

Figure 1 shows finger-ring 2 as an exemplary external secure unit and smartphone 4 as a communication device, and Figure 2 shows a cross section through finger-ring 2. Ex. 1007, 3:39–44, 3:57–59, 4:58–60.

Schröder discloses a method for authentication by means of finger-ring 2 and smartphone 4. Ex. 1007, 3:59–61. According to Schröder, “[f]inger-ring 2 is worn by a user e.g. permanently on the finger,” which is advantageous as an external secure unit because the ring “cannot be taken away or employed without authorization or get lost.” *Id.* at 3:61–62, 4:16–18. Finger-ring 2 and smartphone 4 are interconnected via contactless communication connection 6, e.g., an NFC (near field communication) connection. *Id.* at 3:64–66, 4:18–22. All security-relevant data necessary for executing applications on smartphone 4, such as email, Facebook, and banking, are stored only on finger-ring 2, not on the smartphone. *Id.* at 4:3–5, 4:10–15.

Schröder's Figure 2, reproduced above, shows a cross section through finger-ring 2 as an example of an external secure unit. Ex. 1007, 4:58–60. “In the finger-ring 2 are located an antenna coil 8 and a chip or a chip module 10, which are schematically indicated” and used to communicate

with an NFC reader, such as an RFID (radio frequency identification) reader.
Id. at 4:60–62, 5:12–18, 5:49–53.

Schröder's Figure 3 is reproduced below.

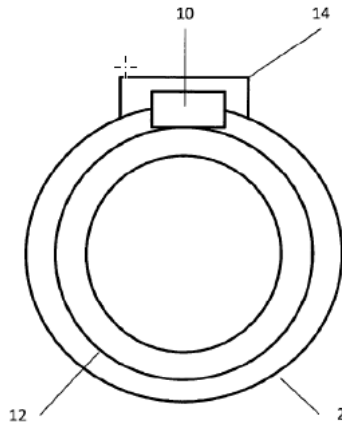


Fig. 3

Figure 3 shows a cross section through an external secure unit in the form of finger-ring 2 with a replaceable chip module 10. Ex. 1007, 3:45–46, 8:54–56. Inlay 12 is inside finger-ring 2 and serves as a carrier for antenna coil 8. *Id.* at 8:56–58. As shown in Figure 3, chip module 10 is inserted into a recess of finger-ring 2. *Id.* at 8:58–59. Chip module 10 is protected by cover 14, which has a hinged or threaded connection to the finger-ring 2. *Id.* at 8:60–63. Chip module 10 is electroconductively connected to antenna coil 8 on inlay 12. *Id.* at 8:63–66. “Advantageously, the chip module 10 is located in a module holder, in order that the contacts of the chip module 10 are properly interconnected to the contacts of a corresponding antenna coil 8.” *Id.* at 9:4–7. According to Schröder, the chip module 10 in Figure 3 is “arranged in particular replaceably,” but “[a]lternatively, the chip module 10 can . . . be firmly connected to the finger-ring 2.” *Id.* at 9:1–4; *see also id.* at 9:13–15 (“Alternatively, it is possible to connect the chip

module 10 permanently to the contacts of the inlay 12, e.g. by soldering, crimping, gluing, etc.”).

In a “further embodiment example,” Schröder describes external secure unit 2 as having “an energy storage device, e.g., an accumulator or a battery” that is “connected to the chip module 10.” Ex. 1007, 11:46–67.

Schröder also discloses “possible construction variants” of a finger-ring 2 in reference to Figures 4 to 10. Ex. 1001, 12:1–3. Schröder’s Figures 4 and 5 are reproduced below.

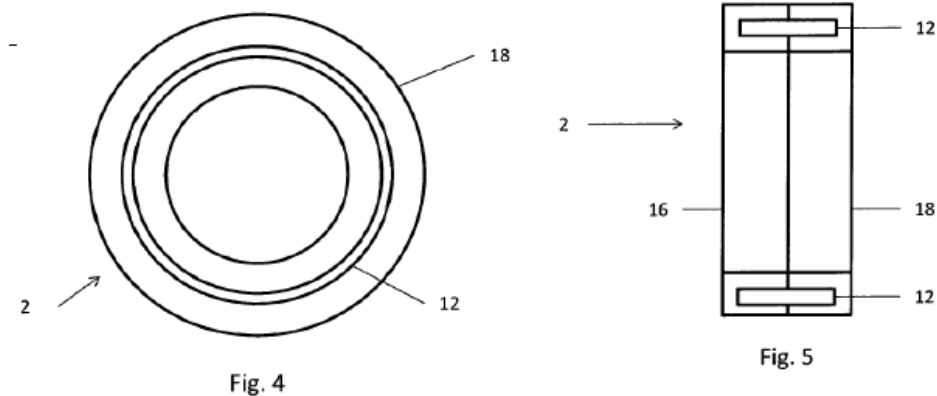
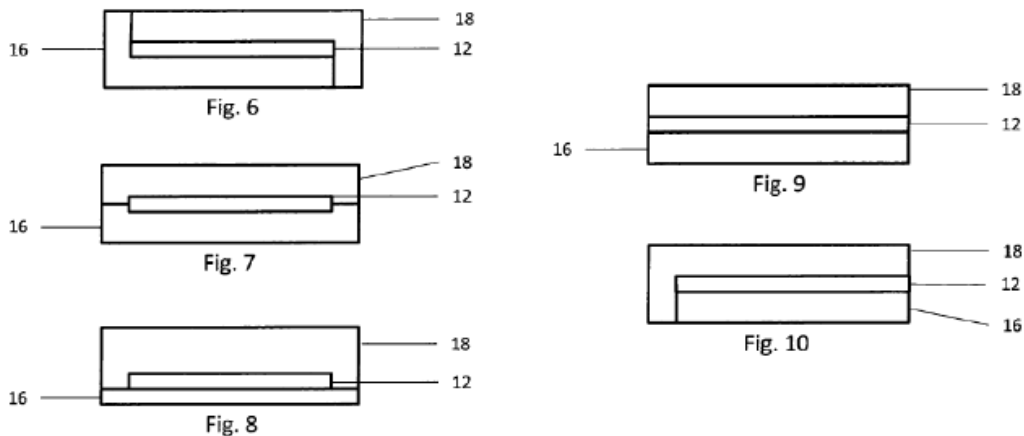


Figure 4 shows a longitudinal cross-section through finger-ring 2 as an exemplary external unit, and Figure 5 shows a cross-section of the finger-ring of Figure 4. Ex. 1007, 3:46–50, 12:4–7. Figure 4 shows one half 18 of finger-ring 2, and Figure 5 shows two ring halves 16 and 18. *Id.* at 12:5–8. As shown in Figures 4 and 5, ring halves 16 and 18 have a recess into which inlay 12 is inserted. *Id.* at 12:8–9. Components 16 and 18 of finger-ring 2 are interconnected in such a way that the connection can be undone in order to insert or exchange inlay 12. *Id.* at 12:20–26. Inlay 12 consists of a flexible carrier material, with antenna coil 8 and chip module 10 connected to each other on the inlay. *Id.* at 12:28–32.

Schröder's Figures 6 to 10 are reproduced below.



Figures 6 to 10 show different cross sections through a finger-ring, which along with Figures 4 and 5, show “possible construction variants of an external secure unit 2 in the form of a finger-ring 2.” Ex. 1007, 12:1–3; *see also id.* at 3:51–52; 12:43–45 (describing Figures 6–10). In Figures 6 to 10, finger-ring 2 has ring-shaped components 16 and 18, with inlay 12 arranged between the components. *Id.* at 12:43–55.

According to Schröder, “inlay 12 can have at least one chip module 10 with at least one antenna coil 8, with at least one further electronic device, e.g. a display, optionally being arranged on the inlay 12.” Ex. 1007, 12:61–65.

2. Yuen

Yuen discloses a portable biometric monitoring device having a physical size and shape adapted to couple to the user's body. Ex. 1006, codes (54), (57). The device includes a housing, a band to secure the monitoring device to the user's body, and a physiological sensor within the housing. *Id.* at code (57). The sensor generates data representative of a physiological condition, such as the user's heart rate. *Id.*

Figure 3 is reproduced below.

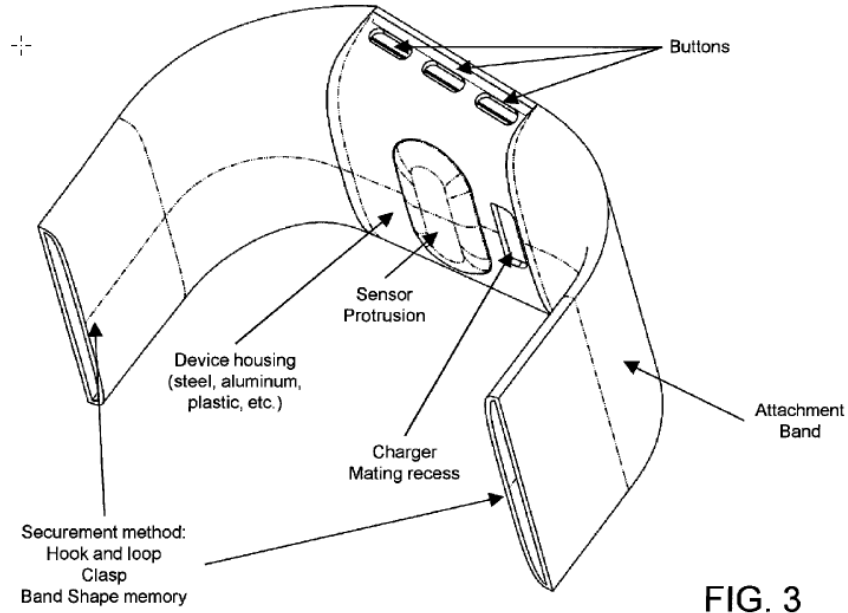


Figure 3 shows a portable biometric monitoring device, including an attachment band, a device housing, a sensor protrusion, and a recess for mating a charger and/or data transmission cable. Ex. 1006, 2:18–22, Fig. 3. According to Yuen, the protrusion firmly maintains the sensor in contact with the skin of the user. *Id.* at 2:22–25.

Figure 5 is reproduced below.

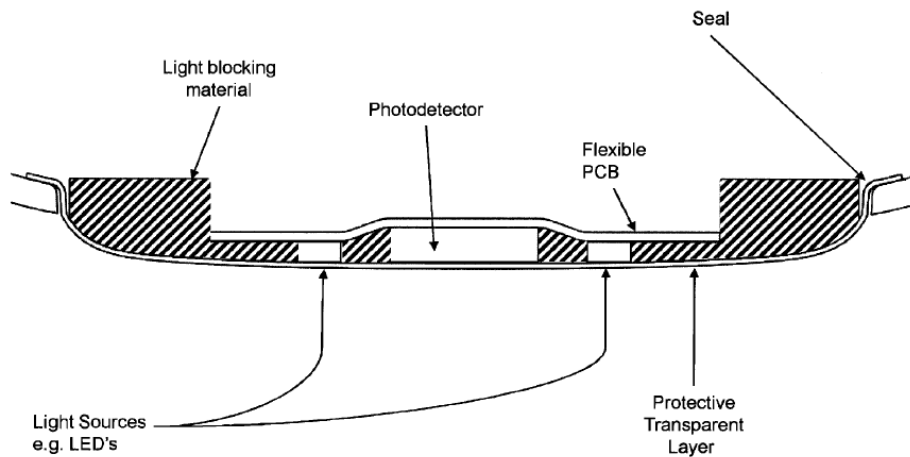


Figure 5 shows a cross section of a sensor protrusion of a portable biometric monitoring device, including light sources and a photodetector mounted on a flexible PCB. Ex. 1006, 2:29–39.

Yuen discloses that a user may wear the biometric monitoring device “on their wrist or ankle (or arm or leg)” and further discloses that “[t]he biometric monitoring device . . . may also be integrated and worn in a necklace, chest band, bra, patch, glasses, earring, or toe band.” Ex. 1006, 24:4–6, 24:35–37.

3. *LeBoeuf*

LeBoeuf is titled “Light-Guiding Devices and Monitoring Devices Incorporating Same.” Ex. 1012, code (54). According to LeBoeuf, “[t]here is growing market demand for personal health and environmental monitors.” *Id.* at 1:23–24. LeBoeuf discloses directing light to a person’s body part and then collecting light at a detector “for detecting and/or measuring, among other things, body temperature, skin temperature, blood gas levels, muscle tension, heart rate, blood flow, cardiopulmonary functions, etc.” *Id.* at 2:46–52. LeBoeuf discloses embodiments in which “a monitoring device includes a circular band capable of encircling a finger of a subject” with provisions for sending light to a subject’s finger, gathering light from the finger, and sending the gathered light to an optical detector. *Id.* at 5:44–53. LeBoeuf discloses such an embodiment in Figures 22A and 22B, which are reproduced below. *Id.* at 8:13–17, 27:61–64.

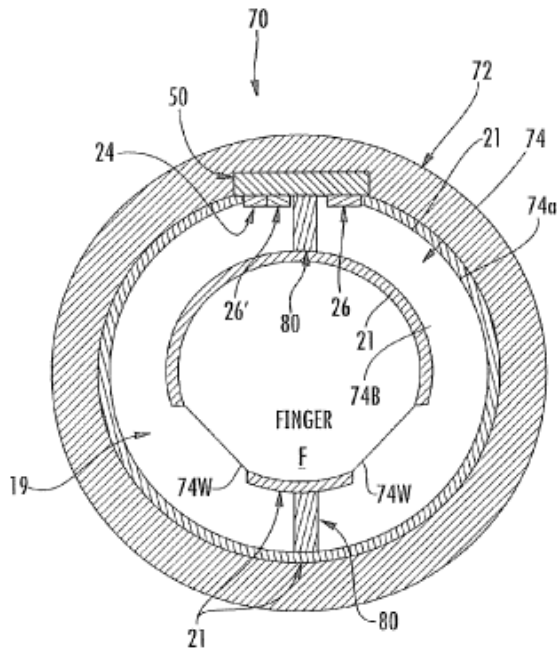


FIG. 22B

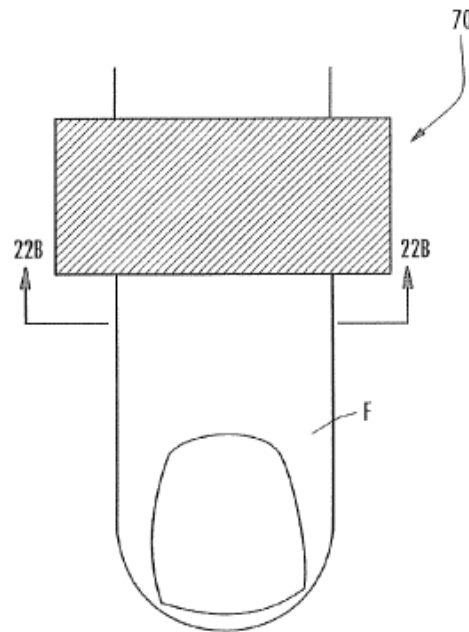


FIG. 22A

Figure 22A shows monitoring device 70 in top plan view.

Ex. 1012, 8:13–15. Figure 22B shows a cross-section of monitoring device 70 along Figure 22A’s lines 22B-22B. *Id.* at 8:16–17.

Monitoring device 70 includes structure that encircles finger F. Ex. 1012, 27:61–28:1. Specifically, monitoring device 70 “includes a generally circular band capable of encircling a finger F of a subject, with a cylindrical outer body portion 72 and a generally cylindrical inner body portion 74 secured together in concentric relationship.” *Id.* at 27:64–28:1.

Monitoring device 70 may also include other elements. For example, “outer body portion 72 may include a flex circuit containing various electronic components, such as a microprocessor, D/A converter, power source, power regulator, and the like.” Ex. 1012, 28:4–6. “A base 50 is secured to the inner and outer body portions 74, 72,” with base 50 holding

“an optical emitter 24, an optical detector 26, and an optical noise detector 26’.” *Id.* at 28:11–17.

Inner body portion 74 may route light from optical emitter 24 to finger F and back from finger F to optical detectors 26, 26’.

Ex. 1012, 28:30–34. Inner body portion 74 has light transmissive material, such as “a soft, resilient material” like silicone. *Id.* at 28:18–22. Inner body portion 74 has cladding material 21 applied to its outer and inner surfaces 74a and 74b, such that inner body portion 74 guides light to and from finger F. *Id.* at 28:26–34. “[W]indows 74w are formed in the cladding material 21 and serve as light-guiding interfaces to the finger F.” *Id.* at 28:40–42.

D. GROUND 1—ALLEGED OBVIOUSNESS OVER SCHRÖDER ALONE

In Ground 1, Petitioner asserts that claims 1–5, 11, 12, and 16–18 would have been obvious over Schröder alone. Pet. 4, 16–38. To address the “flexible printed circuit board” recited in each of independent claims 1, 11, and 16, Petitioner argues that Schröder’s inlay 12 is “the claimed flexible printed circuit board.” Pet. 23 (citing Ex. 1002 ¶ 172). Patent Owner counters that Petitioner has not shown that Schröder’s inlay 12 is a flexible printed circuit board. PO Resp. 22–23.

We agree with Patent Owner that Petitioner has not met its burden to show that Schröder’s inlay 12 is a PCB. Relying on testimony from Dr. Anthony, Petitioner asserts that Schröder’s inlay 12 serves as a flexible carrier made of materials “commonly understood to be printed circuit board materials” such as PET and Kapton. Pet. 23 (citing Ex. 1002 ¶ 172; Ex. 1006, 12:28–29).

Dr. Anthony did not provide a clear explanation of a person of ordinary skill in the art’s understanding of a PCB in his direct testimony.

During cross-examination, however, Dr. Anthony agreed that a Wikipedia article describing a PCB as a “laminated sandwich structure of conductive and insulating layers” was an accurate description of a PCB:

Q. So is the first sentence of this Wiki page, in your mind, an accurate description of a printed circuit board?

A. So, the first sentence, “A printed circuit board (PCB)[] also called [a] printed wiring board, []is a laminated sandwich structure of conductive and insulating layers, each with a pattern of traces, planes, and other features (similar to wires on a flat surface) etched from one or more sheets of copper laminated onto or between sheet layers of nonconductive substrate.”

And so your question again was?

Q. Is that a fair definition of printed circuit board in your mind?

A. It’s a fair description of the general process for circuit boards, layers of conductive traces.

Ex. 2020, 73:17–74:11; *see also* Ex. 2023, 1.

Patent Owner argues that Dr. Anthony’s testimony “fails to provide any analysis as to how the inlay 12 of Schröder meets [the Wikipedia] definition.” PO Resp. 23. Patent Owner argues that “[t]here is no support for Petitioner’s contention that a mere inlay is a PCB.” *Id.* at 22–23 (citing Ex. 2014 (describing five components and fourteen manufacturing steps for PCBs).

Responding to Patent Owner’s arguments, Petitioner replies that Schröder’s inlay 12 may be made of “flexible carrier material,” such as “Kapton,” which is a polyimide foil used for flexible printed circuits, similar to the flexible polyimide material disclosed in the ’034 patent. Reply 8–9 (citing Ex. 1007, 12:28–29; Ex. 2023, 9; Ex. 1081, 80:17–81:10; Ex. 1001, 18:20–22; Ex. 1002 ¶ 172). Petitioner also asserts that Schröder discloses its

foils “are manufactured by ‘milling, lasering, etching,’ and the electronic components are attached to specific foil layers, such that ‘[a] multilayer carrier foil composite can therefore be produced.’” *Id.* at 10 (citing Ex. 1007, 13:23–51). Petitioner also asserts that Patent Owner’s expert in a related proceeding, Dr. Mercier, acknowledged that Schröder teaches multiple layers and a wiring pattern. *Id.* (citing Ex. 1081, 106:17–25, 107:23–108:9).

We are not persuaded by Petitioner’s arguments and find that Patent Owner has the better position. Although Schröder describes some aspects that are similar to those of a printed circuit board, Petitioner has not sufficiently demonstrated that a person having ordinary skill in the art would understand Schröder’s inlay 12 or carrier foil to be a “printed circuit board,” as recited in independent claims 1, 11, and 16. As an initial matter, while Schröder refers to a “circuit board” in another context, it never refers to the carrier foil or inlay in its finger-ring embodiment as such. *See* Ex. 1007, 22:48–49; *see also* Ex. 1079 ¶ 21 (Dr. Anthony acknowledging that Schröder’s only reference to a “circuit board” is “unrelated to Schröder’s finger-ring teachings”). Instead, Schröder describes features of that inlay, explaining that “[t]he carrier foil itself consists of a flexible plastic material, e.g., PET or Kapton” and “antenna coil 8 can for example be printed on the carrier foil by means of a conductive paste” and “a depression is manufactured in the carrier foil, e.g., by milling, lasering, etching, before the chip module 10, the antenna coil 8 and optional further electronic devices are inserted into the depression.” Ex. 1007, 13:26–31, 13:35–37. Schröder further describes that “[a]t least one further foil can be applied to the carrier foil or the ring blank on at least one side” to produce a “multilayer foil composite” that can be “interconnected” by means of “glue

or lamination.” *Id.* at 13:48–51. Based on this description, Schröder’s inlay 12 may include a printed conductive antenna coil 8, multiple layers of the carrier foil, and components inserted into depressions on the carrier foil.

Schröder, however, does not describe how, if at all, the components are connected on its carrier foil. This aspect is important in PCB construction. For instance, the Wikipedia description of a PCB recites “a laminated sandwich structure of conductive and insulating layers, each with a pattern of traces, planes, and other features (similar to wires on a flat surface) etched from one or more sheets of copper laminated onto or between sheet layers of nonconductive substrate.”⁹ Ex. 2020, 73:17–74:11. Petitioner fails to identify in Schröder any copper or other conducting layer from which traces, for example, are etched.¹⁰

Further, the evidence provided by Patent Owner as to PCB manufacture evinces many specific structural features of a PCB that are missing from Schröder’s disclosure and Petitioner’s showing. Ex. 2014. For instance, this document explains PCBs “are created by placing a thin layer of conductive material onto an insulating board, called the substrate material. Tiny electronic components are then put onto the substrate and connected to these circuits through soldering.” *Id.* at 2. The document

⁹ In his Reply Declaration, Dr. Anthony states that his “reference to Wikipedia was to establish a general understanding that a [person of ordinary skill in the art] would have for a PCB” and that “Wikipedia does not define the scope of what is a PCB.” Ex. 1079 ¶ 19. He does not, however, identify anything he believes is inaccurate in the description in that article. *See id.* ¶¶ 17–21 (urging instead that Schröder’s inlay is a PCB under the Wikipedia definition).

¹⁰ Petitioner’s and Patent Owner’s counsel agreed at the hearing that inlay 12 made from Kapton, for instance, is an insulating layer. Paper 35, 65:2–4, 76:6–9.

further describes the “key parts” of a PCB as including a substrate, a prepreg, metal foil, coatings, bonding film, and vias and via fills. *Id.* at 2–3. The document also describes fourteen steps to manufacture a PCB, including etching the board to “eliminate[] exposed copper while keeping just the needed copper traces intact.” *Id.* at 3–4 (step five).

Although Schröder describes that “a depression is manufactured in the carrier foil, e.g. by milling, lasering, etching before the chip module 10, the antenna coil 8 and optional further electronic devices are inserted into the depression,” (Ex. 1007, 13:27–31), Petitioner has not explained how such step creates the needed traces to electrically connect the electronic devices. The only conductive portion identified by Petitioner are antenna coils 8, which are printed with conductive paste. Petitioner does not show where Schröder describes how chip module 10, for instance, is electrically connected to any other components, and Petitioner does not adequately demonstrate how a person having ordinary skill in the art would understand Schröder’s description to include such connections.

Further, we disagree with Petitioner’s assertion that Dr. Mercier acknowledged that Schröder teaches a wiring pattern. Reply 10 (citing Ex. 1081, 106:17–25, 107:23–108:9). We do not see where in the cited testimony Dr. Mercier discusses a wiring pattern. Instead, he testifies that although Schröder says that the antenna coil 8 can be printed on the carrier foil by means of conductive paste, he did not “see reference to printing of other devices onto the carrier foil.” Ex. 1081, 106:17–20.

In sum, we find Petitioner has not met its burden to demonstrate that Schröder’s inlay 12 is a “printed circuit board,” as recited in independent claims 1, 11, and 16. Additionally, Petitioner’s arguments regarding dependent claims 2–5, 12, 13, 17, and 18 do not cure the deficiency in

Petitioner’s challenge of independent claims 1, 11, and 16 based on Schröder alone. Pet. 30–38. Accordingly, Petitioner does not show by a preponderance of the evidence that any of claims 1–5, 11, 12, and 16–18 would have been obvious over Schröder alone.

E. GROUND 2—ALLEGED OBVIOUSNESS OVER SCHRÖDER AND YUEN

Petitioner asserts that Schröder teaches a wearable computing device with many of the features recited in claims 1–5, 11–13, and 16–18. Pet. 16–38. Petitioner cites Yuen as teaching, for example, windows, sealing, and a flexible printed circuit board. *E.g., id.* at 17–19, 24–25.

Patent Owner argues that Petitioner does not show an ordinarily skilled artisan would have had motivation to combine Schröder’s and Yuen’s teachings. PO Resp. 17–19. Additionally, Patent Owner argues that Petitioner has not persuasively addressed certain limitations of independent claim 11 and dependent claims 12 and 13. *Id.* at 20–30.

Based on all of the arguments and evidence of record, we find Petitioner has shown by a preponderance of the evidence that claims 1–5, 11–13, and 16–18 would have been obvious over Schröder and Yuen. Pet. 16–38; PO Resp. 17–30; Reply 2–22; Sur-reply 12–16. Below, we discuss in detail the issues raised by the parties’ disputes regarding Ground 2.

1. *Motivation to Combine*

Petitioner argues that “[a person of ordinary skill in the art] would have been motivated to combine the teachings of Schröder and Yuen . . . and would have had a reasonable expectation of success in doing so because each relates to the same well-known technologies.” Pet. 16 (citing Ex. 1002 ¶¶ 152–163). Petitioner asserts that “[b]oth Schröder and Yuen teach

electronic wearable devices” that have similar components. *Id.* (citing Ex. 1002 ¶¶ 153–157; Ex. 1006, 4:3–6, 12:18–61, 14:42–46, 14:60–66, 28:40–43, Figs. 17–25; Ex. 1007, 1:45, 3:9–11, 3:61–62, 11:46–48).

According to Petitioner, Yuen discloses certain things that would benefit Schröder’s finger ring, such as improved windows, a protective “watertight seal,” and “light sources and [a] photodetector . . . on a *flexible PCB*.”

Id. at 17–19 (citing Ex. 1002 ¶¶ 158–161; Ex. 1006, 10:7–12, 10:55–67, 12:20–23, 12:62–13:5, 14:66–15:4, 15:10–14; Ex. 1007 9:28–34), 24–25 (citing Ex. 1006, 2:38–39). Petitioner contends that an ordinarily skilled artisan would have recognized that Schröder and Yuen “disclose interrelated teachings based on routine technologies that would have been amenable to various well-understood and predictable combinations to provide smaller and more comfortable wearable devices.” *Id.* at 19–20. In support of its assertion of a reasonable expectation of success, Petitioner argues that an ordinarily skilled artisan “would have understood that different wearable electronic devices contain similar components that can be scaled appropriately in size and power to obtain interchangeable function,” citing similarities between the references’ devices. *Id.* at 19 (citing Ex. 1002 ¶ 163).

Patent Owner counters that an ordinarily skilled artisan would not have combined Yuen’s wrist-band teachings with Schröder’s finger-ring teachings. PO Resp. 17–20. According to Patent Owner, “the teachings in Yuen relied on by Petitioner all relate to a wristband embodiment of Yuen,” not to finger rings. *Id.* at 17–18 (citing Ex. 1006, 12:30, 12:50–55, 19:58–59, 22:51–53, 24:4–7, 24:22–24, 27:8–10, Figs. 2–13). Patent Owner contends that Yuen’s electronics package is flat and too large to work in Schröder’s finger ring. *Id.* at 18–19. Patent Owner argues that an ordinarily

skilled artisan would not have had motivation or a reasonable expectation of success for combining Yuen's disclosure with Schröder's. *Id.* at 19.

Weighing the parties' arguments and evidence, Petitioner persuades us that an ordinarily skilled artisan would have had sufficient motivation to combine Yuen's disclosures with Schröder's, as well as a reasonable expectation of success. Pet. 16–20; PO Resp. 17–20; Reply 13–15; Sur-reply 12–13. Petitioner cites evidence showing that an ordinarily skilled artisan would have recognized certain reasons for applying Yuen's disclosures of windows, sealing, a flexible PCB, and certain other components to Schröder's finger-ring. Pet. 17–19 (citing Ex. 1002 ¶¶ 158–161), 24–25 (citing Ex. 1002 ¶¶ 173–174, 177–178). And Petitioner's evidence of similarities in the configuration and uses of the wearable electronic devices persuades us that an ordinarily skilled artisan would have viewed Yuen's and Schröder's teachings as compatible. For example, as Petitioner explains, Schröder and Yuen both teach wearable electronic devices, and they both have a processor and one more sensors. *Id.* at 16 (citing Ex. 1006, 4:3–6, 12:18–61, 14:42–46, 14:60–66, 28:40–43, Figs. 17–25; 1007, 1:45, 11:46–48). Indeed, Schröder has “biometric sensors,” and Yuen discloses sensors for biometric monitoring. Pet. 10–12 (citing Ex. 1007, 9:62–10:4; Ex. 1006, 10:7–21, 10:55–66, 12:62–13:5, Ex. 1002 ¶¶ 134–144). And Dr. Anthony's testimony persuades us that an ordinarily skilled artisan would have had the ability to scale the size of Yuen's PCB for use in a finger ring or various other wearable electronic devices. *E.g.*, Ex. 1002 ¶¶ 162–163; Ex. 1079 ¶¶ 25–28.

Petitioner's arguments supported by Dr. Anthony's testimony are not persuasively rebutted by Patent Owner's counterarguments. PO Resp. 17–19; Sur-reply 12–13. Patent Owner argues that combining the

references' teachings would necessitate "a complete redesign of Yuen to fit in a finger ring, and a complete redesign of Schröder to accommodate the components of Yuen." PO Resp. 19. We agree with Patent Owner that some redesign would have been necessary, but in this instance, Petitioner has sufficiently demonstrated that an ordinarily skilled artisan would have been able to implement Yuen's teachings regarding transparent windows and a flexible PCB in Schröder's finger-ring. *E.g.*, Pet. 18 (Based on Yuen's disclosure, "[a person of ordinary skill in the art] would have been motivated to implement transparent windows on the interior and/or exterior walls of Schröder's finger ring to enhance data acquisition through the finger ring's metal housing."), 24 ("A [person of ordinary skill in the art] would have been motivated to have Yuen's flexible printed circuit board as Schröder's flexible carrier material in order to provide electrical connection to all of the components inside the finger ring."); Reply 13–14 (citing Yuen as evidence that ordinarily skilled artisan "would have known how to implement flexible PCBs in wearable devices of different form factors.").

For the first time in its Sur-reply, Patent Owner also argues that Schröder and Yuen are not analogous art, asserting that "the two references are not in the same field of endeavor and are not pertinent to one another's problem." Sur-reply 12–13. Because Patent Owner's Response did not present this argument, it is waived. Paper 9, 9 ("Patent Owner is cautioned that any arguments not raised in the response may be deemed waived."). Additionally, this argument is unavailing because the correct analysis in evaluating whether a reference is analogous is to compare each reference to the challenged patent, and not to each other. *See Sanofi-Aventis Deutschland GmbH v. Mylan Pharms. Inc.*, 66 F.4th 1373, 1377 (Fed. Cir. 2023).

2. *Independent Claim 11*

a) *Preamble*

Claim 11's preamble recites "[a] wearable computing device." Ex. 1001, 36:12. Petitioner argues that "Schröder's wearable computing device is an 'external secure unit' worn as a 'finger-ring,'" explaining that Schröder's finger ring has "a memory, processor, interface, and communication device for storing, processing, receiving, and saving data." Pet. 20 (citing Ex. 1001, 8:44–48; Ex. 1002 ¶ 164; Ex. 1007, 2:60–65, code (57)). Patent Owner does not dispute Petitioner's arguments regarding claim 11's preamble. We find persuasive Petitioner's arguments and evidence addressing claim 11's preamble.

b) *Limitation 11[A]*

Limitation 11[A] recites "an internal housing portion defining a first enclosing structure, the internal housing portion configured to be disposed near a finger of a user." Ex. 1001, 36:13–15. Petitioner argues that Schröder teaches limitation 11[A] citing Schröder's component 16 in Figure 7. Pet. 21–22. In its Response, Patent Owner did not dispute Petitioner's argument that Schröder's component 16 in Figure 7 teaches limitation 11[A].¹¹ We find persuasive Petitioner's arguments and evidence addressing limitation 11[A], and find that Schroder's component 16 in

¹¹ For the first time in its Sur-reply, Patent Owner presents arguments that Petitioner has not persuasively addressed claim 11 because of certain alleged characteristics of Schröder's components 16 and 18, including an assertion that components 16 and 18 are like "bagel" shaped ring halves and other arguments about the configuration of components 16 and 18. Sur-reply 6–12, 14–15; *see generally* PO Resp. Because these arguments were not presented in Patent Owner's Response, they are waived. Paper 9, 9 ("Patent Owner is cautioned that any arguments not raised in the response may be deemed waived.").

Figure 7 teaches the claimed “internal housing portion.” Pet. 21–22 (citing Ex. 1002 ¶¶ 165–167; Ex. 1007, 3:61–62, 7:38–39, 9:62–10:9, 10:52–56, 12:7–22, 12:45–55).

c) Limitation 11[B]

Limitation 11[B] recites “a flexible printed circuit board arranged around a portion of a circumference of an interior surface of the internal housing.” Ex. 1001, 36:16–18. Petitioner argues that “Schröder-Yuen teaches” limitation 11[B]. Pet. 24. Petitioner explains that “Yuen teaches that ‘the light sources and photodetector are placed on a *flexible PCB*.’” *Id.* at 24 (citing Ex. 1006, 2:38–39). According to Petitioner, “a [person of ordinary skill in the art] would have been motivated to have Yuen’s flexible printed circuit board as Schroder’s flexible carrier material in order to provide electrical connections to all of the components inside the finger ring with an explicit flexible printed circuit board.” *Id.* (citing Ex. 1002 ¶ 174).

Petitioner advances various reasons that an ordinarily skilled artisan would have had a reasonable expectation of success in combining Yuen’s teachings with Schröder’s teachings. *Id.* at 19–20, 24. Petitioner argues that an ordinarily skilled artisan would have recognized similarities between Yuen’s and Schröder’s wearable electronic devices. *Id.* at 19 (citing Ex. 1002 ¶¶ 162–163; Ex. 1006, 12:24–42, 24:35–40; Ex. 1007, 2:60–64, 3:61–62). Petitioner asserts that the references’ devices have “similar components that can be scaled appropriately in size and power to obtain interchangeable function,” such that an ordinarily skilled artisan would have known that “these references disclose interrelated teachings based on routine technologies that would have been amenable to various well-understood and predictable combinations to provide smaller and more comfortable wearable devices.” *Id.* at 19–20 (citing Ex. 1002 ¶ 163).

Patent Owner counters that Petitioner has not shown that it would have been obvious to a person of ordinary skill in the art to modify Schröder to have a flexible printed circuit board based on Yuen's disclosure. PO Resp. 23–26. Patent Owner argues that Yuen's "main PCB" is too large to fit in a finger ring. *Id.* at 24.

Patent Owner contends that Petitioner does not cite "any teaching as to how one would adapt the PCB of Yuen to an appropriate size and shape for a ring." *Id.* at 24–25. Patent Owner also asserts that Petitioner fails to provide a reason that an ordinarily skilled artisan would have modified Schröder to use Yuen's PCB. *Id.* According to Patent Owner, Petitioner does not provide "evidence that Schröder's arrangement has any shortcomings with respect to 'electrical connection'" or explain "why the electrical connections of a wearable device for monitoring fitness like Yuen would be appropriate for an RFID security device such as Schröder." *Id.* at 25.

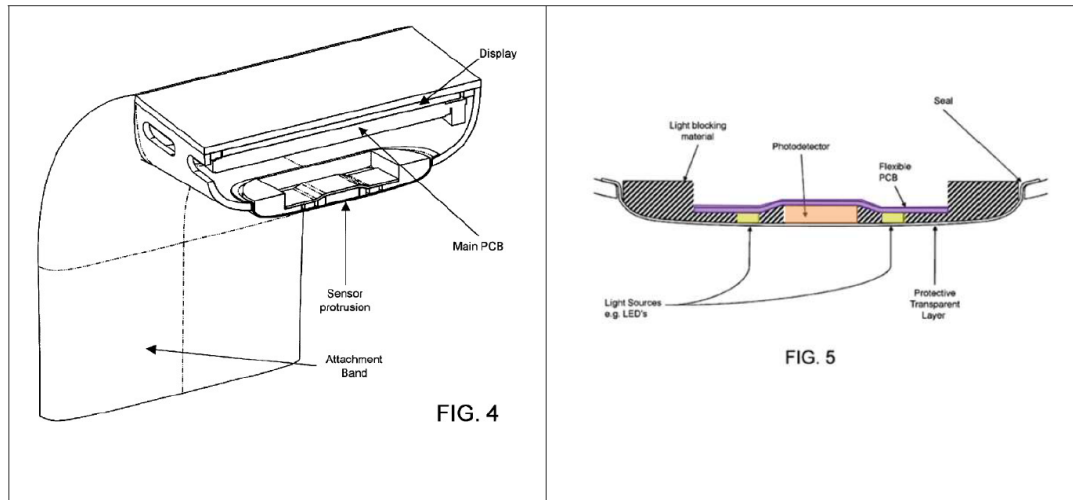
Weighing the parties' arguments and evidence, we find Petitioner's more persuasive. Pet. 16–20; 23–24; PO Resp. 23–26; Reply 11–15; Sur-reply 12–13. Petitioner provides evidence that an ordinarily skilled artisan would have had certain reasons to use a flexible printed circuit board like Yuen's in Schröder's device, including to electrically connect Schröder's electrical components in a small, comfortable configuration. Pet. 19–20 (citing Ex. 1002 ¶¶ 162–163). Even if Patent Owner were correct that Schröder does not have any deficiency of electrical connections, that does not negate Petitioner's evidence that an ordinarily skilled artisan would have recognized a flexible printed circuit board like Yuen's as a suitable option to provide the electrical connections needed by Schröder's device. Ex. 1002 ¶ 174; Ex. 1079 ¶ 28. This reasoning supports Petitioner's assertion that it

would have been obvious to use a flexible printed circuit board like Yuen's in Schröder's device. *PAR Pharm., Inc. v. TWI Pharms., Inc.*, 773 F.3d 1186, 1197–98 (Fed. Cir. 2014) (holding that the stated motivation does not need to be the best option, it must only be a suitable option from which the prior art did not teach away). Petitioner also provides persuasive evidence that an ordinarily skilled artisan would have had a reasonable expectation of success in using a printed circuit board like Yuen's in Schröder's device. Pet. 19–20 (citing Ex. 1002 ¶¶ 162–163; Ex. 1007, 2:60–64, 3:61–62; Ex. 1006, 12:24–42).

Petitioner's arguments supported by Dr. Anthony's testimony are not persuasively rebutted by Patent Owner's counterarguments. PO Resp. 23–26; Sur-reply 12–13. Patent Owner argues, for example, that Yuen's "main PCB" is large and flat, such that it would not work in Schröder's finger ring. PO Resp. 24 (citing Ex. 1006, Fig. 4.

Contrary to Patent Owner's suggestion, Petitioner does not argue that it would have been obvious to install Yuen's main PCB in Schröder's finger-ring. Reply 11–12 (citing Ex. 1006, 2:38–39, 12:35–38, Figs 4, 5). Rather, Petitioner cites Yuen's disclosure of another printed circuit board, specifically a flexible printed circuit board in its wearable electronic device, evincing that it would have been obvious to implement Schröder's finger-ring by using a flexible printed circuit board in place of inlay 12. Pet. 24 (quoting with emphasis Ex. 1006, 2:38–39 ("the light sources and photodetector are placed on a *flexible PCB*"); Reply 13–15 (citing Ex. 1002 ¶¶ 152–163; Ex. 1079 ¶ 28; Ex. 1081:147:20–22; Ex. 2021, 351:3–356:11). Thus, the size and shape of Yuen's main PCB have no bearing on Petitioner's position.

Moreover, Petitioner persuades us that Yuen’s flexible printed circuit board is not flat or as large as its main PCB. Reply 11–12 (citing Ex. 1006, 2:38–39, Figs. 4 and 5; Pet. 24, 25). Petitioner shows this in its Reply with a graphic showing Yuen’s Figures 4 and 5 beside one another with color coding added to certain components, as reproduced below. Reply 12.



Petitioner’s graphic shows Yuen’s Figure 4 on the left, along with Yuen’s Figure 5 on the right with certain components color coded. *Id.* Given the similarities between Yuen’s flexible PCB and Schröder’s carrier, we credit Petitioner’s evidence that it would have been obvious to incorporate the former into Schröder’s finger ring to connect devices such as sensors within the inlay. *See* Ex. 1002 ¶¶ 172, 174 (explaining that Schröder’s carrier and flexible PCBs are made of similar materials that allow mechanical bending around a circumferential shape while maintaining circuit functionality).

d) Limitation 11[C]

Limitation 11[C] recites “at least one component disposed on the flexible printed circuit board.” Ex. 1001, 36:19–20. Petitioner cites both Schröder and Yuen for the claimed “at least one component.” Pet. 24–25. For example, Petitioner argues that Schröder teaches “at least one antenna

coil 8 and at least one chip module 10,” as well as a “display unit,” disposed on inlay 12. *Id.* (citing Ex. 1002 ¶¶ 175–176; Ex. 1007, 12:30–33, 12:40–43). Petitioner also asserts that “Yuen teaches that ‘the light sources and photodetector are placed on a flexible PCB,’” arguing that an ordinarily skilled artisan “would have been motivated to have Schroder’s electronic components ‘disposed on’ the flexible printed circuit board, as taught in Yuen.” *Id.* at 25 (citing Ex. 1002 ¶¶ 177–178; Ex. 1006, 2:38–39). Patent Owner does not dispute Petitioner’s arguments regarding limitation 11[C]. *See generally* PO Resp. We find persuasive Petitioner’s arguments and evidence addressing limitation 11[C]. Pet. 24–25 (citing Ex. 1002 ¶¶ 175–178; Ex. 1006 2:38–39; Ex. 1007, 12:30–33, 12:40–43).

e) Limitation 11[D]

Limitation 11[D] recites “an external housing portion defining a second enclosing structure, the external housing portion configured to seal the at least one component and the printed circuit board in an internal space defined by the interior surface of the internal housing.” Ex. 1001, 36:21–25. Petitioner argues that Schröder teaches its “housing portions ‘seal’ the component and printed circuit board in an internal space defined by the interior surface of the internal and external housings.” Pet. 28 (citing Ex. 1002 ¶¶ 187–188). Petitioner cites Schröder’s components 16 and 18 of Figure 7 as corresponding to the claimed “internal housing component” and “external housing component,” respectively. *Id.* at 22 (citing Ex. 1002 ¶¶ 168–170; Ex. 1007, 12:7–9); *id.* at 28–29 (citing Ex. 1007, 12:20–23, 12:45–55; Ex. 1002 ¶ 188).

As noted above in Section II.E.2.d), Petitioner addresses the claimed “at least one component” by arguing that (1) Schröder teaches the at least one component in the form of “at least one antenna coil 8 and at least one

chip module 10” and a “display unit” and (2) the “at least one component” would have been obvious over Yuen’s disclosure that “the light sources and photodetector are placed on a flexible PCB.” *Id.* 24–25 (citing Ex. 1002 ¶¶ 175–178; Ex. 1006, 2:38–39; Ex. 1007, 12:30–33, 12:40–43). Petitioner further argues that “a [person of ordinary skill in the art] would have been motivated to ‘seal’ the component and circuit board in an internal space defined by the interior surface of the internal and external housings, because doing so was well-known as taught by Yuen.” *Id.* at 29 (citing Ex. 1002 ¶¶ 188–190).

Patent Owner counters that “[t]he only component in Schröder that can be considered a component described and claimed in the ’034 patent is the chip module 10, which is not sealed.” PO Resp. 27–28. “Schröder actually teaches the opposite—that the chip module be accessible and replaceable via a hinged cover 14,” Patent Owner argues. *Id.* at 26. Patent Owner cites Schröder’s Figure 3 and accompanying discussion. *Id.* Patent Owner suggests that in all of Schröder’s embodiments, “chip module 10 is located outside of the recess occupied by inlay 12.” *Id.* at 21. For example, in the case of Figure 7, Patent Owner argues that Schröder “plainly acknowledges the fact that chip module 10 is too large to fit in the thin inlay and would result in a protrusion similar to [Figure] 3 (the difference being that the chip module is not ‘replaceably mounted’ as in [Figure] 3).” *Id.* at 21–22 (citing Ex. 1007, 14:10–13 (“Should steps or shoulders nevertheless arise e.g. through the chip module 10, said steps or shoulders can be compensated by applying a paste which is e.g. thermally or UV-curing.”))).

Weighing the parties’ arguments and evidence, we find Petitioner’s more persuasive. The parties agree that Schröder’s chip module 10

constitutes a “component,” as recited in 11[C] and 11[D]. Pet. 24–25; PO Resp. 27–28. The pivotal dispute regarding limitation 11[D] is whether Schröder teaches or suggests that chip module 10 is enclosed between components 16 and 18.

Petitioner persuades us that this is taught or suggested by Schröder. Petitioner persuades us that Schröder’s inlay 12 includes chip module 10. Pet. 10 (citing Ex. 1007, 12:28–33, 12:61–65); Reply 17. As Petitioner notes, Schröder expressly discloses that its “inlay 12 can have at least one chip module 10 . . . with at least one further electronic device . . . arranged on the inlay 12.” Ex. 1007, 12:62–65; Reply 17. Petitioner further persuades us that “[Patent Owner’s] argument that chip module 10 is too large to fit within inlay 12 is wrong.” Reply 6 (citing PO Resp. 21–22). Indeed, Petitioner persuades us that Schröder teaches mounting chip module 10 in a recess in inlay 12, and that, in preferred embodiments, chip module 10 does not protrude from inlay 12. Reply 7 (citing Ex. 1007, 13:27–35, 14:9–20). Accordingly, we do not agree with Patent Owner’s suggestion that Schröder’s ring must have a protrusion like that shown in Figure 3 for chip module 10 in the case of the embodiment shown in Figure 7. PO Resp. 21–22.

To the contrary, Petitioner persuades us that Schröder teaches to an ordinarily skilled artisan that its Figure 7 embodiment has chip module 10 and inlay 12 inside the same recess between components 16 and 18. Pet. 10 (citing Ex. 1007, 12:7–9, 12:28–33, 12:61–65, Fig. 7), 21–22 (citing Ex. 1002 ¶¶ 165–170, Ex. 1007, 12:7–22, 12:45–55), 24–25 (citing Ex. 1002 ¶¶ 175–176, Ex. 1007, 12:30–33, 12:40–43). For example, we find persuasive Dr. Anthony’s testimony that Schröder’s “[i]nlay 12 . . . can have a ‘chip module 10 with at least one antenna coil 8’” (Ex. 1002 ¶ 137 (citing

Ex. 1007, 12:28–33, 12:61–65)) and that Schröder teaches enclosing inlay 12 between components 16 and 18 (*id.* ¶ 135 (citing Ex. 1007, 12:45–55)). *See also id.* ¶ 188 (“Schröder provides that the ring halves can have a U-shape with the inlay 12 being arranged between the components 16 and 18) (citing Ex. 1007, 12:45–55). Indeed, as Petitioner notes, Dr. Mercier “agree[d] that ‘inlay 12, with chip module 10 and various other components on it, is inserted into a recess between ring halves 16 and 18 in Schröder.’” Reply 3 (quoting Ex. 1081, 82:10–12). Thus, Petitioner persuades us that Schröder’s Figure 7 embodiment has inlay 12 with chip module 10 fully enclosed between components 16 and 18.¹²

Furthermore, Petitioner persuades us that it would have been obvious to configure Schröder’s finger ring with other components in the recess between components 16 and 18. Pet. 25. For example, Petitioner provides persuasive evidence that it would have been obvious to implement Yuen’s disclosure that “the light sources and photodetectors are placed on a flexible PCB” in Schröder’s ring. *Id.* (citing Ex. 1006, 2:38–39; Ex. 1002 ¶¶ 177–178). This would have contributed to acquiring biometric data, which Schröder teaches. *Id.* at 17–18 (citing Ex. 1002 ¶ 160); Ex. 1007, 9:62–66 (“The biometric sensor can be integrated into the finger-

¹² For the first time in its Sur-reply, Patent Owner presents arguments that Petitioner has not persuasively addressed claim 11 because of certain alleged characteristics of Schröder’s components 16 and 18, including an assertion that components 16 and 18 are like “bagel” shaped ring halves and other arguments about the configuration of components 16 and 18. Sur-reply 6–12, 14–15; *see generally* PO Resp. Because these arguments were not presented in Patent Owner’s Response, they are waived. Paper 9, 9 (“Patent Owner is cautioned that any arguments not raised in the response may be deemed waived.”).

ring 2 e.g. such that the biometric sensor captures e.g. at least a partial vein image in the finger while the finger-ring is being pushed over a finger.”).

Additionally, Petitioner persuasively addresses limitation 11[D]’s requirement to “seal the at least one component” inside the recess. Pet. 28–30. For example, Petitioner provides persuasive evidence that Schröder teaches or suggests components 16 and 18 seal the enclosure containing inlay 12 and its chip module 10. *Id.* at 28–30 (citing Ex. 1007, 12:20–23, 12:45–55, Figs. 7, 8; Ex. 1002 ¶ 188). Additionally, to the extent Schröder’s biometric sensor is located within the inlay, Petitioner provides persuasive evidence that Yuen’s disclosure would have motivated an ordinarily skilled artisan to seal that sensor inside components 16 and 18. Pet. 29–30 (citing Ex. 1006, 14:64–15:4, 15:10–14; Ex. 1002 ¶ 190 (Yuen’s disclosure of a “watertight seal for the sensor package”).

3. *Claims 12 and 13*

Claim 12 depends from claim 11 and further requires that “the external housing portion comprises a substantially transparent external potting.” Ex. 1001, 36:26–28. Claim 13 depends from claim 12 and further requires that “the at least one component comprises at least one LED configured to emit at least one of visible light, infrared radiation, and ultraviolet radiation through the external potting.” *Id.* at 36:29–33.

Petitioner contends that claims 12 and 13 would have been obvious over Schröder and Yuen, arguing that each of Schröder and Yuen teaches transmitting light from an LED through “substantially transparent external potting.” Pet. 35–38 (citing Ex. 1002 ¶¶ 203–211; Ex. 1006, 10:29–31, 10:34–39, 10:55–67, 10:63–66, 11:29–36, 12:62–13:5; Ex. 1007, 8:32–53, 9:28–34, 9:62–10:4, 12:7–9, 15:10–11, 15:14–15; Ex. 1001, 2:62–64). For example, Petitioner asserts that “Schröder teaches that a light-emitting diode

is configured to emit visible light through external ‘transparent regions, e.g., windows’ incorporated into the surface . . . when the LED displays a sequence of colors or the optical display (made of LEDs) transmits ‘application specific data.’” *Id.* at 37 (citing Ex. 1007, 8:32–53, 9:28–34). Petitioner adds that Schröder teaches transmitting infrared radiation when it gathers “a partial vein image in the finger.” *Id.* (citing Ex. 1007, 9:62–10:4). Petitioner also argues that “Yuen acquires the user’s biometric data by light from optical sensors (LEDs) being emitted through a window.” *Id.* (citing Ex. 1006, 10:55–58).

Petitioner contends that an ordinarily skilled artisan would have understood that Schröder’s housing “made of polyethylene terephthalate would be a transparent thermoplastic polymer resin and thus made of a ‘transparent potting.’” *Id.* at 35 (citing Ex. 1002 ¶ 204). Petitioner also argues that Yuen teaches making windows with transparent potting:

Yuen describes “a window (for example, a visually opaque window) in the housing to facilitate optical transmission between the optical sensors and the user.” Ex-1006, 10:55-58. The window is made of “plastic or a glass layer.” *Id.*, 10:63-66. Yuen further employs a “double-shot or two step molding” to form “a light transmissive structure having an optically opaque portion (including certain optical properties) and an optically transparent portion (including optical properties different from the optically opaque portion).” Ex-1006, 11:29-36.

Id. at 35–36. According to Petitioner, an ordinarily skilled artisan “would have been motivated to implement transparent external and internal potting (that allows an LED to emit light through the potting), as taught by Yuen, in Schröder’s ring (that already has transparent windows) for more accurate sensor readings and to protect the LED or optical display from ambient conditions.” *Id.* at 36 (citing Ex. 1002 ¶ 207).

Patent Owner counters that “[n]one of Petitioner’s citations to Schroder or Yuen disclose an external housing comprised of transparent potting material. PO Resp. 29. Regarding Schröder, Patent Owner argues as follows:

Schroder disclose merely that his housing can be made or “plastic or metal.” Ex-1007 at 12:14-15. Plastic or metal is not by itself potting material. Rather, potting both forms the “overall form factor of the WCD 120, in addition to providing a housing for one or more electronic components stored withing [sic] the housing 1210 of the WCD 1200[.]” Ex. 1001, 17:4-8. Potting material also fills the space and encapsulates the components. *Id.*, 16:16-17 (“In these embodiments, the body of the WCD 410 can be filled with clear material”); 18:61-62 (“The components can be encapsulated by the internal [or external] potting 1314.”). *Id.* Patent Owner also argues Petitioner fails to show Schröder teaches the claimed external potting because Petitioner does not cite anything in Schröder that is “‘transparent’ to all light.” *Id.* at 29–30. Regarding Yuen, Patent Owner argues that “Petitioner relies on Yuen’s disclosure of a window with ‘plastic or a glass layer.’ Pet. at 36. But again ‘plastic’ or ‘glass’ is not potting material.” *Id.* at 30.

Weighing the parties’ arguments and evidence, Petitioner persuades us that claims 12 and 13 would have been obvious over Schröder and Yuen. Pet. 35–36; PO Resp. 28–30; Reply 19–22; Sur-reply 15–16. It is undisputed that Schröder teaches LEDs transmitting light through its ring’s exterior portion, such as through windows. *E.g.*, Pet. 37 (citing Ex. 1007, 8:32–53, 9:28–34). And Petitioner has the better position regarding whether the windows disclosed by Schröder and Yuen meet claim 12’s recitation that “the external housing portion *comprises* a substantially transparent external potting.” Ex. 1001, 36:26–28. As discussed above in Section II.B.1, the word “comprising” means the external

housing need only have a portion, such as a window, composed of transparent potting. And we agree with Petitioner that the '034 patent shows a window made of potting in the embodiment of Figure 16C, further supporting Petitioner's position. Reply 19–20 (citing Ex. 1001, 20:51–57, Fig. 16C).

Additionally, we find unavailing Patent Owner's arguments that plastic, metal, or glass cannot be potting unless it encapsulates components and forms the overall form factor of the device. PO Resp. 29. Patent Owner's arguments that the potting must encapsulate components and form the overall form factor rest on an incorrect understanding of the claim language, as we explained in more detail above in Section II.B.1. And Patent Owner does not provide reasoning or evidence that would support its conclusory suggestion that the external potting cannot be plastic or metal. *See* PO Resp. 29; *see also* Ex. 1001, 17:17–22 (describing wide range of potting materials).

We also find unavailing Patent Owner's argument that Petitioner does not show Schröder and Yuen suggest a material that is transparent to all light. PO Resp. 29. As discussed above in Section II.B.2 we do not agree with Patent Owner's suggestion that the claimed “transparent external potting” must be transparent to all light.

F. GROUND 3—ALLEGED OBVIOUSNESS OVER LeBOEUF ALONE

1. *Discussion*

In support of its position that claims 1, 2, 11, 12, and 16–18 are unpatentable as obvious over LeBoeuf, Petitioner cites LeBoeuf's finger-ring shown in Figures 22A and 22B. Pet. 39–50. According to Petitioner and Dr. Anthony, LeBoeuf teaches every limitation of claims 1, 2, 11, 12, and 16–18. *Id.*; Ex. 1002 ¶¶ 212–224. Patent Owner does not dispute those

allegations. *See generally* PO Resp. We find that Petitioner shows by a preponderance of the evidence that claims 1, 2, 11, 12, and 16–18 would have been obvious over LeBoeuf. Pet. 39–50. Below, we discuss Petitioner’s contentions with respect to independent claim 11.

a) Claim 11

(1) Preamble

Addressing claim 11’s preamble, Petitioner asserts that “LeBoeuf teaches a wearable computing device as a “monitoring device” that can be configured to be worn on a user’s earlobes, fingers, or toes.” Pet. 39 (citing Ex. 1002 ¶ 212; Ex. 1012, 27:58–64, Figs. 22A, 22B). We find persuasive Petitioner’s arguments and evidence addressing claim 11’s preamble.

(2) Limitation 11[A]

Addressing limitation 11[A]’s “internal housing portion,” Petitioner argues that LeBoeuf’s ““cylindrical inner body portion 74’ and its cladding 21 (green) are the finger-ring’s interior wall or housing that defines an enclosing structure by enclosing the circuit and various electronic components (light emitter and detector) inside the finger ring.” Pet. 40–41 (citing Ex. 1002 ¶ 213; Ex. 1012, 27:61–28:1, 28:18–19, 28:26–34). We find persuasive Petitioner’s arguments and evidence addressing limitation 11[A].

(3) Limitation 11[B]

Addressing limitation 11[B]’s “flexible printed circuit board,” Petitioner argues that LeBoeuf’s “finger ring may include a flex circuit containing various electronic components, such as a microprocessor, D/A converter, power source, power regulator, and the like,” asserting that LeBoeuf teaches it is disposed around at least a portion of the interior housing’s circumference. Pet. 42–44 (citing Ex. 1002 ¶¶ 216–217,

Ex. 1012, 28:3–8, 28:11–18, 14:28–38). We find persuasive Petitioner’s arguments and evidence addressing limitation 11[B].

(4) *Limitation 11[C]*

Addressing limitation 11[C]’s “at least one component,” Petitioner argues that LeBoeuf’s “finger ring’s flex circuit . . . contains various electronic components, such as a microprocessor, D/A converter, power source, power regulator, and the like.” Pet. 44 (citing Ex. 1002 ¶ 218; Ex. 1012, 28:3–8). We find persuasive Petitioner’s arguments and evidence addressing limitation 11[C].

(5) *Limitation 11[D]*

Addressing limitation 11[D]’s “external housing portion,” Petitioner argues that LeBoeuf’s Figures 22A and 22B show that “‘cylindrical outer body portion 72’ . . . is the exterior wall or housing that defines an enclosing structure by being concentrically secured to the inner body portion to enclose various electronic components inside.” Pet. 41–42 (citing Ex. 1002 ¶¶ 214–215; Ex. 1012, 27:61–28:1, 28:3–8). Addressing limitation 11[D]’s recitation that the external housing portion is “configured to seal the at least one component and the printed circuit board in an internal space defined by the interior surface of the internal housing,” Petitioner argues that “[a person of ordinary skill in the art] would have understood that the secure concentric relationship between outer body portion 72 and inner body portion 74 seals the component and printed circuit board between the two housing portions in order to ‘enclose and protect’ the electronic components inside.” *Id.* at 46 (citing Ex. 1002 ¶ 220; Ex. 1012, 1:1–26, 1:38–44, 2:31–35, 12:3–8, 27:61–28:1). We find persuasive Petitioner’s arguments and evidence addressing limitation 11[D].

G. GROUND 4—ALLEGED OBVIOUSNESS OVER LEBOEUF AND
WISSMAR

Ground 4 challenges claims 4 and 5, which depend from independent claim 1. Pet. 50–54. Building from Ground 3’s challenge of independent claim 1 as obvious over LeBoeuf, Ground 4 cites Wissmar to address dependent claim 4’s recitation that “an antenna is accessible via the window.” *Id.* at 53. Patent Owner does not dispute Petitioner’s challenge of claims 4 and 5 as obvious over LeBoeuf and Wissmar. *See generally* PO Resp. Petitioner’s arguments and evidence show by a preponderance of the evidence that claims 4 and 5 would have been obvious over LeBoeuf and Wissmar. Pet. 50–54.

III. CONCLUSION

For the foregoing reasons, we are persuaded that Petitioner has established by a preponderance of the evidence that claims 1–5, 11–13, and 16–18 of the ’034 patent are unpatentable.

Ground	Claims	35 U.S.C. §	References/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1	1–5, 11, 12, 16–18	103	Schröder		1–5, 11, 12, 16–18
2	1–5, 11–13, 16–18	103	Schröder, Yuen	1–5, 11–13, 16–18	
3	1, 2, 11, 12, 16–18	103	LeBoeuf	1, 2, 11, 12, 16–18	
4	4, 5	103	LeBoeuf, Wissmar	4, 5	

Ground	Claims	35 U.S.C. §	References/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
Overall Outcome				1–5, 11–13, and 16–18 ¹³	

IV. ORDER

It is:

ORDERED that claims 1–5, 11–13, and 16–18 of the '034 patent have been shown to be unpatentable; and

FURTHER ORDERED that, because this is a Final Written Decision, the parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

¹³ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner's attention to the April 2019 Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding, 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. §§ 42.8(a)(3), (b)(2).

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