

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

v.

OURA HEALTH OY,
Patent Owner.

Case No. IPR2024-00929
U.S. Patent No. 10,893,833

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 10,893,833**

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LIST OF EXHIBITS¹

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Ex-1004	Prosecution History of U.S. Patent No. 10,893,833
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Ex-1007	U.S. Patent No. 10,303,867 to Schröder (“Schröder”)
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Ex-1009	Original DE 102013012339.9 to Schröder
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Ex-1014	INTENTIONALLY LEFT BLANK
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¹ Four-digit pin citations that begin with 0 are to the branded numbers added by Samsung in the bottom right corner of the exhibits. All other pin citations are to original page, column, paragraph, or line numbers.

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Ex-1018	INTENTIONALLY LEFT BLANK
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Ex-1020	Claim Mapping Table
Ex-1021	Claim Construction Order, <i>Oura Health Oy v. Circular SAS</i> , No. 22-cv-00478-ADA (W.D. Tex. Feb. 2, 2024)
Ex-1022	Parallel Citations (Schröder '867 to Certified Translation of DE 102013012339.9)
Ex-1023	INTENTIONALLY LEFT BLANK
Ex-1024	U.S. Patent No. 4,830,014 to Goodman (“Goodman”)
Ex-1025	U.S. Patent No. 6,745,061 to Hicks (“Hicks”)
Ex-1026	U.S. Patent No. 7,190,986 to Hannula (“Hannula”)
Ex-1027	Volker König et al., <i>Reflectance Pulse Oximetry – Principles and Obstetric Application in the Zurich System</i> , 14 Journal of Clinical Monitoring (Aug. 1998) (“König”)
Ex-1028	U.S. Patent No. 6,608,562 to Kimura (“Kimura”)
Ex-1029	Kevin K. Tremper et al., <i>Pulse Oximetry</i> , 70 Journal of American Society of Anesthesiologists, Inc. (Jan. 1989) (“Tremper”)
Ex-1030	Y. Mendelson et al., <i>A Wearable Reflectance Pulse Oximeter for Remote Physiological Monitoring</i> , Proceedings of 28 th IEEE EMBS Annual International Conference (Aug. 30-Sept. 3, 2006) (“Mendelson 2006”)
Ex-1031	Sokwoo Rhee et al., <i>Artifact-Resistant, Power-Efficient Design of Finger-Ring Plethysmographic Sensors Part I: Design and Analysis</i> , IEEE (2000) (“Rhee 2000 Part I”)

Ex. No.	Description
Ex-1032	Sokwoo Rhee et al., <i>Artifact-Resistant, Power-Efficient Design of Finger-Ring Plethysmographic Sensors Part II: Prototyping and Benchmarking</i> , IEEE Proceedings of 22 nd Annual EMBS Int'l Conference (July 23-28, 2000) ("Rhee 2000 Part II")
Ex-1033	Sokwoo Rhee et al., <i>Artifact-Resistant Power-Efficient Design of Finger-Ring Plethysmographic Sensors</i> , 48 IEEE Transactions of Biomedical Engineering (July 2001) ("Rhee 2001")
Ex-1034	U.S. Patent No. 6,699,199 to Asada ("Asada '199")
Ex-1035	Sokwoo Rhee, <i>Design and Analysis of Artifact-Resistive Finger Photoplethysmographic Sensors for Vital Sign Monitoring</i> , MIT (June 2000) ("Rhee Thesis 2000")
Ex-1036	C.T. Olofson et al., <i>Machining of Titanium Alloys</i> (1965) ("Olofson")
Ex-1037	H. Harry Asada et al., <i>Mobile Monitoring with Wearable Photoplethysmographic Biosensors</i> , IEEE Engineering in Medicine & Biology Magazine 28 (May-June 2003) ("Asada 2003")
Ex-1038	Denisse Castaneda et al., <i>A review on wearable photoplethysmography sensors and their potential future applications in health care</i> , Int J Biosens Bioelectron (2018)
Ex-1039	U.S. Patent No. 7,468,036 to Rulkov et al. ("Rulkov")
Ex-1040	U.S. Patent Publication No. 2006/0211924 to Dalke et al. ("Dalke")
Ex-1041	<i>Guidelines To Enhancing The Heart-Rate Monitoring Performance Of Biosensing Wearables</i> (2014)
Ex-1042	U.S. Patent No. 4,880,304 to Jaeb et al. ("Jaeb")
Ex-1043	Tom Lister et al., <i>Optical Properties of human skin</i> , Journal of Biomedical Optics (2012)
Ex-1044	John G. Webster, <i>Design of Pulse Oximeters</i> , CRC Press (1997)

Ex. No.	Description
Ex-1045	U.S. Patent Publication No. 20130211291 to Tran (“Tran”)
Ex-1046	WO 2001/017421A1 to Lindberg (“Lindberg”)
Ex-1047	WO 2011/132009 to Nyiradi (“Nyiradi”)
Ex-1048	U.S. Patent Application Publication No. 2014/0361945 to Misra et al. (“Misra”)
Ex-1049	U.S. Patent Application Publication No. 2014/0361934 to Ely et al. (“Ely”)
Ex-1050	European Patent No. 2281205 (Chen)
Ex-1051	Lawrence K. Au et al., <i>Episodic Sampling: Towards Energy-Efficient Patient Monitoring with Wearable Sensors</i> , Annual International Conference of the IEEE Engineering in Medicine and Biology Society (2009)
Ex-1052	Anastasios Petropoulos et al., <i>Flexible PCB-MEMS flow sensor</i> , Procedia Engineering 47 236-239 (2012) (“Petropoulos”)
Ex-1053	Tianjia Sun et al., <i>Wireless Power Transfer for Medical Microsystems</i> , Springer (2013) (“Sun”)
Ex-1054	U.S. Patent Pub. No. 2014/0187160 to Prencipe (“Prencipe”)
Ex-1055	H. Ardebili and Michael G. Pecht, <i>Encapsulation Technologies for Electronic Applications</i> , William Andrew (2009) (“Ardebili”)
Ex-1056	Ciprian Ciofu et al., <i>Injection and Micro Injection of Polymeric Plastics Materials: A Review</i> , Int’l J. Modern Mfg. Techs. 49 (2013)
Ex-1057	Richard J. Ross, <i>LCP Injection Molded Packages—Keys to JEDEC I Performance</i> , IEEE, 2004 Electronic Components and Technology Conference 1807 (2004)

Ex. No.	Description
Ex-1058	Tadamoto Sakai, <i>Encapsulation Process for Electronic Devices Using Injection Molding Method</i> , 12 Advances in Polymer Technology 61 (1993)
Ex-1059	N.J. Teh et al., <i>Embedding of Electronics within Thermoplastic Polymers using Injection Moulding Technique</i> , IEEE, 2000 Int'l Electronics Manufacturing Technology Symposium 10 (2000)
Ex-1060	U.S. Patent No. 6,201,698 to Hunter (“Hunter”)
Ex-1061	U.S. Patent No. 4,012,629 to Simms (“Simms”)

I. INTRODUCTION

Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. (collectively, “Petitioner”) request *inter partes* review (“IPR”) of Claims 1-12 of U.S. Patent No. 10,893,833 (“the ’833 Patent”) (Ex-1001), currently assigned to Oura Health Oy (“PO”).

II. MANDATORY NOTICES UNDER 37 C.F.R. §42.8

Real Parties-in-Interest: Petitioner identifies the following real parties-in-interest: Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc.

Related Matters: PO has asserted the ’833 Patent against Ultrahuman Healthcare Pvt., Ltd. and Ultrahuman Healthcare Ltd. in *Oura Health Oy et al. v. Ultrahuman Healthcare Pvt. Ltd., et al.*, Case No. 2:23-cv-396 (E.D. Tex.); PO has also asserted the ’833 Patent against Circular SAS in *Oura Health Oy v. Circular SAS*, Case No. 6:22-cv-478 (W.D. Tex.) (“*Circular* litigation”).

Petitioner has filed a suit against PO seeking a declaratory judgment of noninfringement of the ’833 Patent: *Samsung Electronics Corporation, Ltd. et al v. Ōura Health Oy et al.*, No. 3:24-cv-03245 (N.D. Cal. filed May 30, 2024). There are no invalidity claims and therefore no overlap with this petition.

For the Board’s convenience, Petitioner notes that Petitioner is challenging the following five patents, U.S. Patent Nos. 11,868,178, 11,868,179, 11,599,147, 9,582,034, and 10,893,833. The ’833 Patent claims substantially the same subject

matter as the '147 Patent. The '178 and '179 Patents claim related subject matter.

The '034 Patent is from the same family as the '178, '179, and '147 Patents.

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III. FEE AUTHORIZATION

The PTO is authorized to charge any fees due during this proceeding to Deposit Account No. LA500639.

IV. GROUNDS FOR STANDING

Petitioner certifies that the '833 Patent is available for review, and Petitioner is not barred or estopped from requesting review.

V. PRECISE RELIEF REQUESTED

Petitioner requests review and cancellation of Claims 1-12 as unpatentable based on the following grounds, supported by a declaration from Dr. Brian W. Anthony. Ex-1002 ¶¶1-34, 40-128; Ex-1003.

Ground	Summary
1	Claims 1-11 are obvious over Yuen (Ex-1006).
2	Claim 12 is obvious over Yuen in view of Schröder (Ex-1007).
3	Claims 1-5, 8-9, and 12 are obvious over Schröder.
4	Claims 6-7 and 10-11 are obvious over Schröder in view of Yuen.

VI. THE CHALLENGED PATENT

The challenged claims are directed to a wearable electronic device having specific components including an inner surface, an outer surface, a cavity, an electronic part arranged in the cavity, and a moldable filler material that covers the electronic part and the cavity. Ex-1001, Cl. 1.

An example of the wearable electronic device is illustrated in Figures 3 and 7C, below, of the '833 Patent.² *Id.*, Fig. 3 (cross-sectional view of the device 102), Fig. 7 (cross-sectional view of the inner surface 110 of the device 102). As shown in these figures, a cavity (annotated in blue (302, 304)) is bounded by the inner surface (red (110)). The inner surface extends toward the outer surface (not labelled) of the device. *Id.*, 10:38-41. An electronic part (purple (310, 312, 314)), which may include, for example, a battery, microcontroller, and/or flexible printed circuit board ("PCB"), is arranged in the cavity and "has a thickness that is less than the depth of the" cavity. *Id.*, 10:47-11:4. A coating made of moldable filler material 330 (yellow) is applied on inner surface 110 to cover the electronic part and cavity such that any unfilled space in the cavity is coated by the moldable filler material. *Id.*, 11:5-16.

² Throughout, emphasis and annotations are added unless otherwise specified.

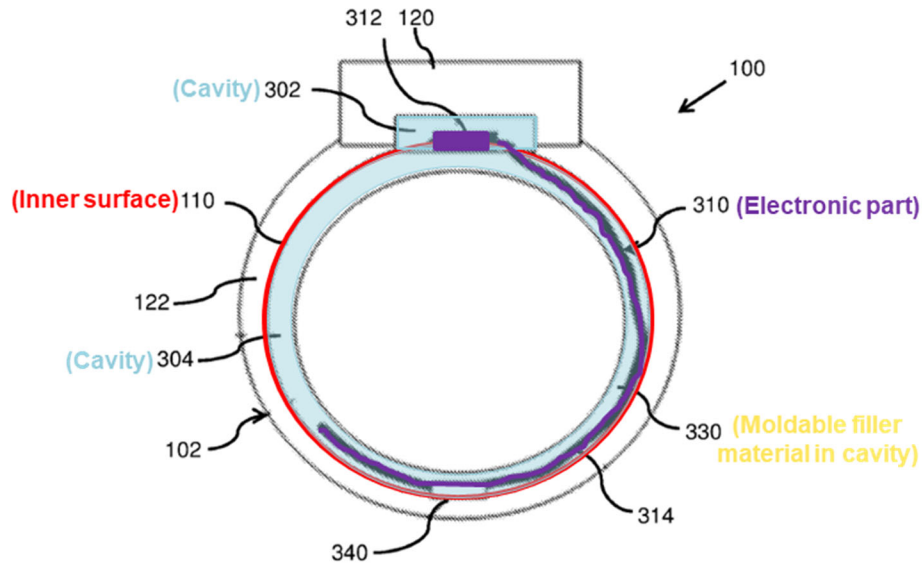


FIG. 3

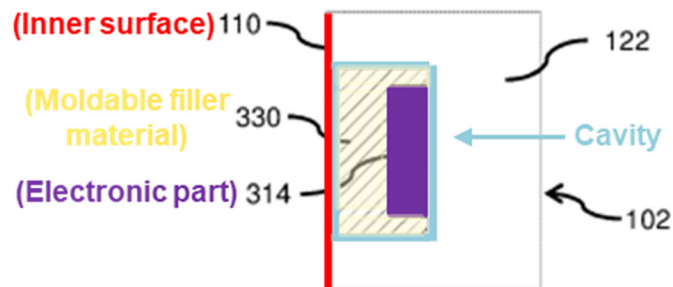


FIG. 7C

The '833 Patent recognizes that electronic devices that could be worn on the “finger, wrist or any other body part” to monitor physiological parameters of the user (such as heartbeat) and provide “a smooth skin contact to the wearer” were well-known, including the electronic elements included in such devices. *Id.*, 1:23-36. Yet the patent suggests that the claimed wearable electronic device is somehow inventive and patentable because it has “a simple structure configuration and

efficient waterproofing.” *Id.*, 2:25-29. As explained in detail below, the ’833 Patent claims are obvious in view of the prior art. Ex-1002 ¶¶35-37.

VII. PROSECUTION HISTORY OF THE ’833 PATENT

The ’833 Patent was filed December 8, 2017, as a continuation of U.S. Patent No. 9,861,315, filed August 14, 2015. Ex-1001. This Petition presents arguments not considered during prosecution. *See* Ex-1004. The prior art in this Petition was not before the PTO during prosecution. Ex-1004; Ex-1002 ¶¶38-39.

VIII. LEVEL OF ORDINARY SKILL IN THE ART

A person of ordinary skill in the art at the relevant time (“POSITA”) 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. A POSITA would have also been familiar with, for example, sensor system design and signal processing. A higher level of education or skill might make up for less experience, and vice versa. Ex-1002 ¶¶26-30.

IX. PRIORITY DATE

For purposes of this proceeding only, Petitioner applies the earliest alleged priority date of the ’833 Patent: August 14, 2015. Accordingly, AIA 35 U.S.C. §102 applies.

X. CLAIM CONSTRUCTION

Petitioner interprets the claims according to *Phillips*. 37 C.F.R. §42.100(b). To resolve this Petition, Petitioner does not believe that any term requires express construction.³ CTPG, 44; Ex-1002 ¶¶135-136.

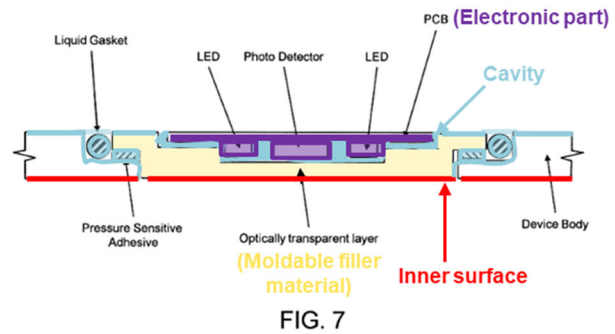
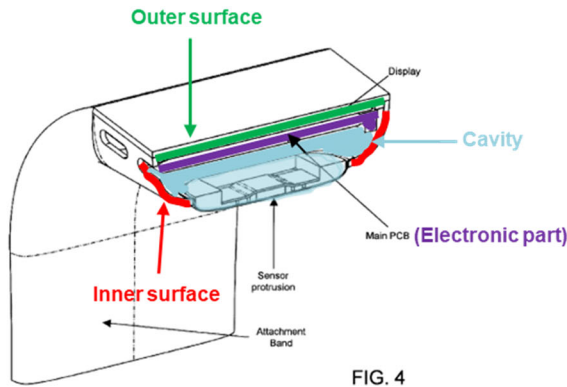
XI. BRIEF DESCRIPTION OF THE APPLIED PRIOR ART

A. Yuen (Ex-1006)

Yuen (U.S. Patent No. 8,954,135) was filed June 24, 2013 and issued February 10, 2015. Yuen qualifies as prior art under 35 U.S.C. §102(a)(2). Petitioner is unaware of any facts supporting an exception under §102(b).

Yuen teaches a biometric monitoring device, depicted in Figures 4 and 7 below, which is configured to be worn on an appendage of the user's body, for example, on the user's "arm, wrist, leg and/or ankle." Ex-1006, 12:50-52, Fig. 4 (cross-sectional view of the device), Fig. 7 (cross-sectional view of the device's photoplethysmography ("PPG") sensor).

³ There is a pending declaratory judgment action between PO and Petitioner. There are no invalidity claims and therefore no overlap with this petition. Should the circumstances regarding validity change, Petitioner will respectfully request leave to brief any discretionary denial issues, to the extent raised. Moreover Petitioner respectfully reserves all rights to raise claim construction and other arguments in district court and will request leave to submit the district court's claim construction as soon as it becomes available. Additionally, should PO raise express or implied claim construction arguments in its Preliminary Response, Petitioner will respectfully seek a Preliminary Reply to respond. CTPG, 44-45 (permitting petitioner to respond to claim construction raised by patent owner).



As shown in the figures above, Yuen teaches that a cavity (annotated blue) is formed on the inner surface (red (110)), which extends to the outer surface (Fig. 4 (green), Fig. 7 (not shown)) of the device. *Id.* The cavity houses Yuen's electronic part (purple) including, for example, "an optical sensor having one or more light sources" (such as LEDs) that emit "light into the user's body" and light detectors (such as photodiodes and/or phototransistors) that "sample, measure and/or detect a response or reflection" from the user's body, which is used by a PPG to determine the user's stress level, blood pressure and/or heart rate. Ex-1006, 6:23-31. The LEDs and photodetectors are provided on a PCB. Ex-1006, 2:38-39. Yuen further teaches that an optically transparent layer (yellow) "may be formed through in-mold labeling" on the device's inner surface, covering the unfilled cavity space and electronic part. Ex-1006, 2:44-45; Ex-1002 ¶¶129-131.

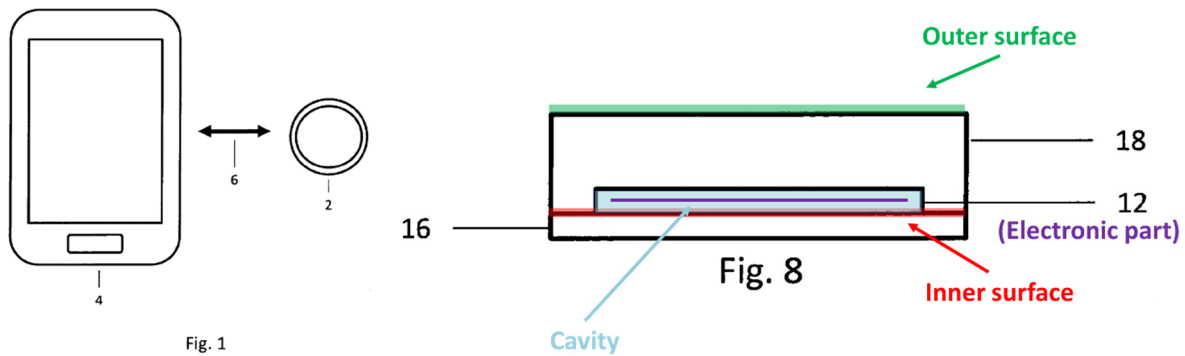
B. Schröder (Ex-1007)

Schröder (U.S. Patent No. 10,303,867) was filed January 25, 2016 as the U.S. national stage application of International Patent Application PCT/EP2014/001693

filed June 18, 2014, which claims priority to foreign application DE 102013012339, filed July 25, 2013. Schröder qualifies as prior art under 35 U.S.C. §102(a)(2). Petitioner is unaware of any facts supporting an exception under §102(b). Schröder's German counterpart is essentially identical to the U.S. filing. *See generally* Ex-1007 (U.S. issued patent); Ex-1009 (German application); Ex-1008 (certified translation of German application). The figures are identical, and the specification is equivalent. Ex-1002 ¶132. Because the described subject matter is identical, Schröder's '867 Patent should be considered to have been effectively filed as of its German priority date of July 25, 2013, because the '867 Patent is entitled to claim a right of priority to DE 102013012339 under 35 U.S.C. §365. AIA 35 U.S.C. §102(a)(2) and (d)(2); MPEP §2152.

Schröder teaches a biometric sensing device, depicted in Figures 1 and 8 below, which is a finger-ring “worn by a user, e.g., permanently on the finger.” Ex-1007, 3:61-62,⁴ Fig. 1 (finger-ring 2 communicating with smartphone 4), Fig. 8 (cross-sectional view of finger-ring 2).

⁴ Parallel citations to Schröder's German counterpart for all Schröder '867 Patent citations herein are provided in Ex-1022.



As shown in Figure 8 above, Schröder teaches that a cavity (annotated in blue) is formed on the inner surface (component 16, red), which extends to the outer surface (component 18, green) of the device. *Id.*, Fig. 8. An electronic part such as inlay 12 (purple) and/or a chip module (not shown) is inserted into or within the cavity of the finger-ring. Ex-1007, 12:10-12 (“The finger-ring 2 consists in principle of at least one component 16, 18 into which at least one inlay 12 is inserted, whereby one component can be a ring half 16, 18.”), 12:26-28 (“The inlay 12 is ... inserted into at least one recess provided therefor within at least one component [].”); *see also id.*, 8:58-59 (a chip module is inserted into the recess). Schröder further teaches that the finger-ring “can be manufactured by an injection-molding process,” which results in “a ring-shaped body in whose interior the ... electronic devices are arranged.” Ex-1007, 14:35-37, 14:46-49; Ex-1002 ¶¶133-134.

XII. DETAILED EXPLANATION OF THE UNPATENTABILITY GROUNDS

A. Ground 1: Claims 1-11 are obvious over Yuen.

1. Independent Claim 1

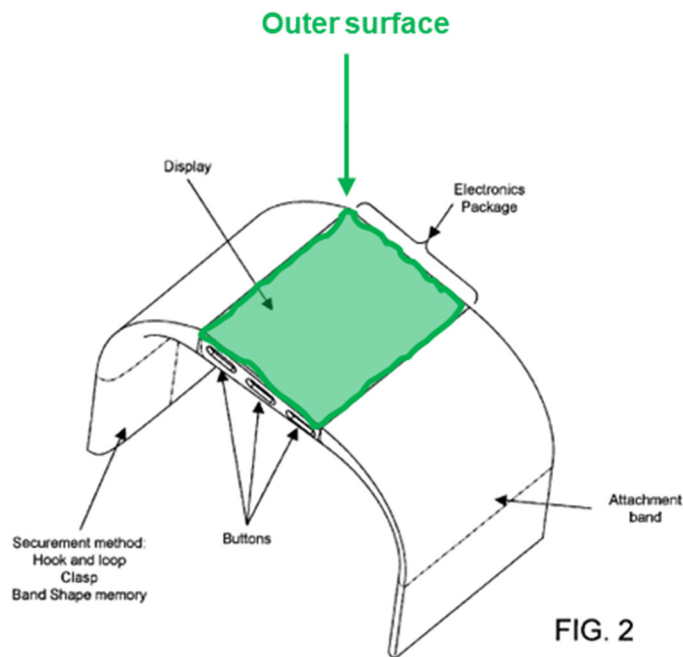
a. Element 1[pre]: A wearable electronic device comprising:

Yuen teaches⁵ the preamble, to the extent it is limiting.⁶ Ex-1002 ¶¶137-138.

Yuen teaches a portable biometric monitoring device, depicted in Figure 2, which is configured to be worn on an appendage of the user's body, for example, on the user's "arm, wrist, leg and/or ankle." Ex-1006, 12:50-52, Fig. 2 (outer surface of the device annotated in green); *see also id.*, 2:7-17. The biometric monitoring device includes "two major components—a body (containing the 'electronics')" and a band that allows the device to be attached to the user. Ex-1006, 24:14-17.

⁵ Petitioner uses the term teaches as including both express teachings or those fairly suggested to a person of ordinary skill in the art. *In re Baird*, 16 F.3d 380, 383 (Fed. Cir. 1994); *In re Keller*, 642 F.2d 413, 425 (CCPA 1981) ("The test for obviousness is...what the combined teachings of the references would have suggested to those of ordinary skill in the art." (citations omitted)).

⁶ In the *Circular* litigation, where PO asserted the '833 Patent against an unrelated party, the Court found that the preamble of Claim 1 of the '833 Patent is limiting. *See* Ex-1021, 2.

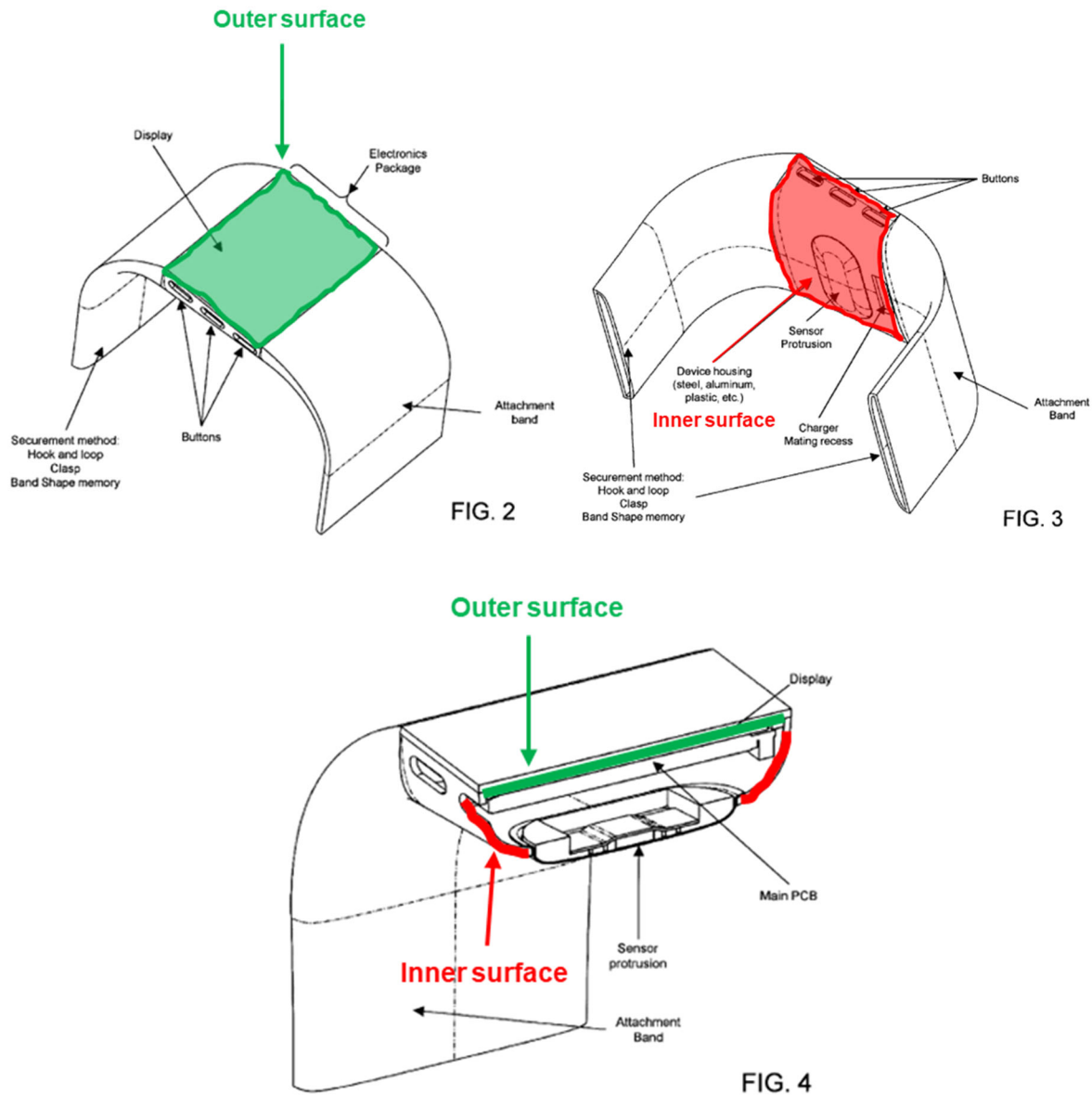


b. Element 1[a]: a body part made of a non-ceramic material,

Yuen teaches Element 1[a]. Ex-1002 ¶139.

Yuen teaches that its biometric monitoring device includes “two major components—a body (containing the ‘electronics’)” and a band that allows the device to be attached to the user. Ex-1006, 24:14-17. Yuen’s Figure 2 depicts the outer surface of the biometric monitoring device and Figure 3 depicts the inner surface of the device. Ex-1006, 2:7-11, Fig. 2 (green), Fig. 3 (red). Yuen teaches that “[s]ome or all of the interior or skin side of the housing” for the biometric monitoring device is made of “a metal material” such as, for example, stainless steel, steel, magnesium, aluminum, or titanium. Ex-1006, 14:33-36. Yuen further teaches that a device “back made out of a metal” or plastic material provides a stiff-enough

structure to maintain the device's structural integrity, while also providing “a watertight seal for the sensor package.” Ex-1006, 14:66-15:4. A metal or plastic material is a non-ceramic material. Ex-1002 ¶140.



- c. **Element 1[b]: having an inner surface and an outer surface,**

Yuen teaches Element 1[b]. Ex-1002 ¶141.

As described above, Yuen's "body" component is the claimed body part, and Yuen's body part has an inner surface and an outer surface as depicted in Figures 2-4. Ex-1002 ¶¶142-144. Specifically, Yuen's Figure 2 depicts the outer surface (green) of the biometric monitoring device, which may include, for example, a display. Ex-1006, 2:7-11, Fig. 2. Yuen's Figure 3 depicts the inner "skin facing" surface (red) of the biometric monitoring device of Figure 2, which may include, for example, the device housing, sensor protrusion, and charger mating recess. Ex-1006, 2:18-22, Fig. 3.

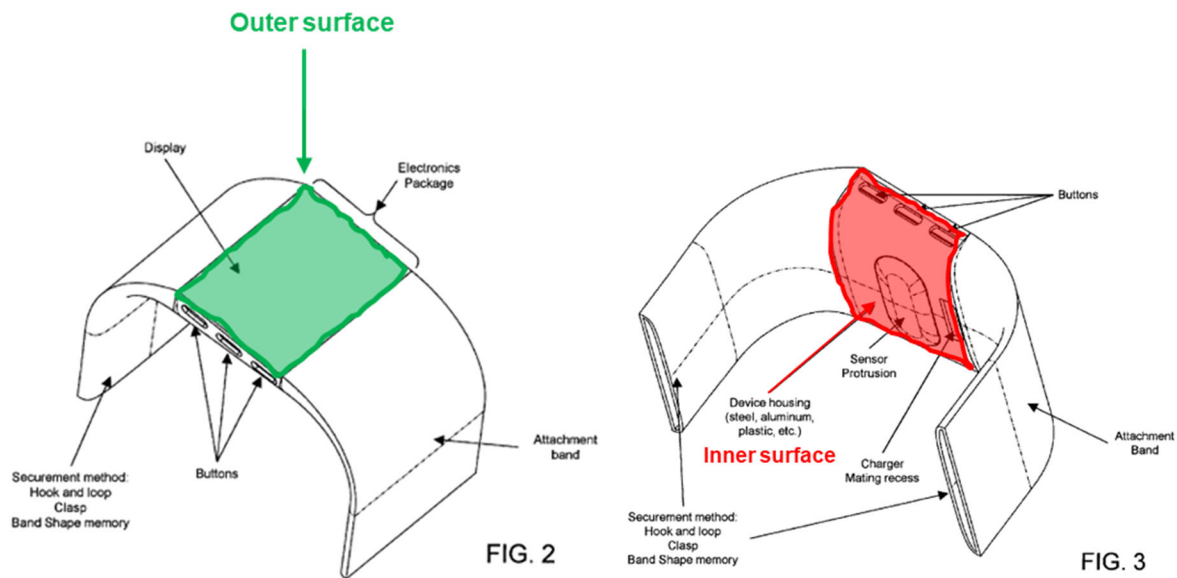
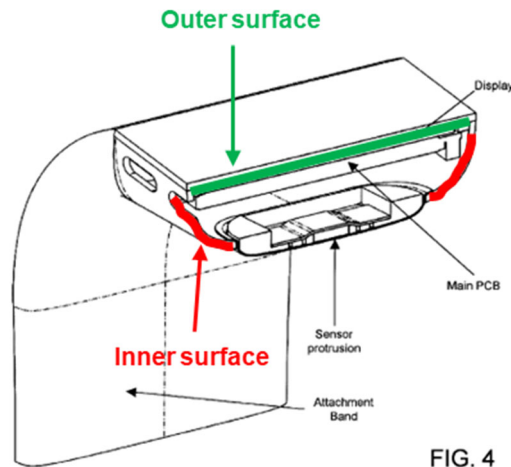


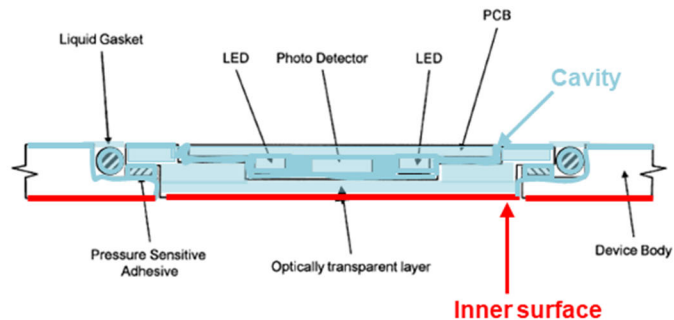
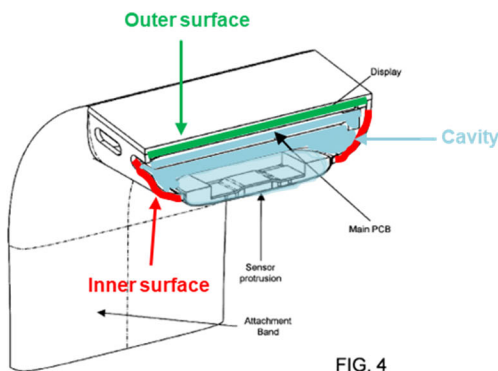
Figure 4 depicts a cross-sectional view of the biometric monitoring device through the electronic part, including the outer and inner surfaces. Ex-1006, 2:26-28, Fig. 4.



d. Element 1[c]: wherein at least one cavity is formed on the inner surface of the body part,

Yuen teaches Element 1[c]. Ex-1002 ¶145.

Yuen teaches a cavity formed on the inner surface of the body part, as depicted in Figures 4 and 7. Ex-1002 ¶¶146-152. Specifically, Yuen teaches that a cavity is formed on the inner (skin-facing) surface (red) of the biometric monitoring device, as shown in blue in Figures 4 and 7 (depicting a cross-sectional view of a PPG sensor). Ex-1006, Figs. 4, 7.

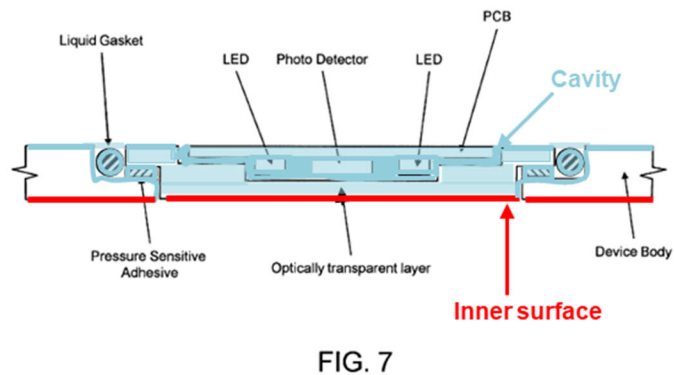
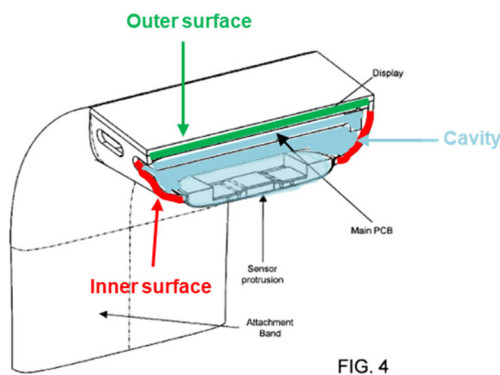


The area annotated in blue in Figures 4 and 7 is a cavity formed on the inner surface of the device because it is a depression formed in the inner surface of the device. Ex-1002 ¶147.

- e. **Element 1[d]: the at least one cavity extending from the inner surface of the body part towards the outer surface of the body part and having a depth arranged within the inner surface of the body part,**

Yuen teaches Element 1[d]. Ex-1002 ¶153.

Yuen teaches that the cavity (blue), which houses the electronic part including the LEDs and photodetector, extends from the inner (skin-facing) surface of the biometric monitoring device (red) towards the outer surface of the device (green), as shown in Figures 4 and 7. Ex-1006, Figs. 4, 7 (outer surface not shown).



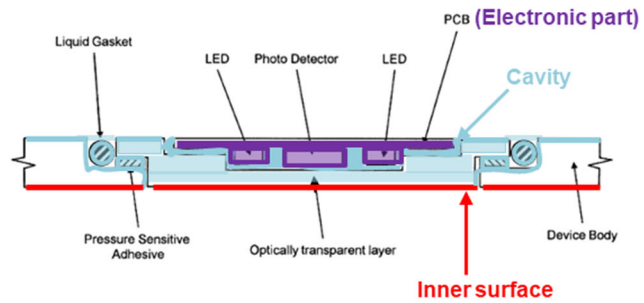
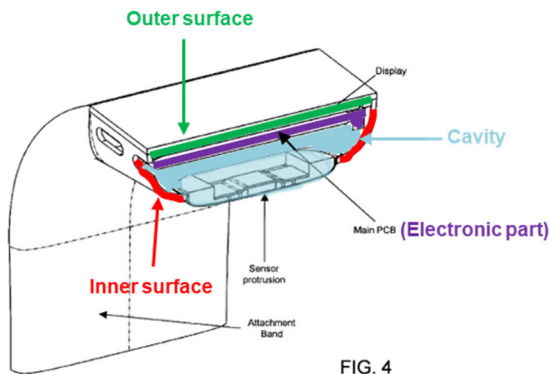
The cavity extending from the inner surface towards the outer surface of the device has a depth arranged within the inner surface because the cavity is contained entirely within the inner surface of the device, as shown in the cross section of Figure 7. Ex-1006, Fig. 7; Ex-1002 ¶¶154-155. Moreover, the cavity is designed to include

electronic components, which are 3-dimensional objects that themselves have a certain length, width, and depth. *See, e.g.*, Ex-1006, 12:35-45 (“[T]he light source(s) and/or associated detector(s) are disposed on a Flat Flex Cable or ‘FFC’ or flexible PCB. ... Optical components of differing heights may be mounted to different ‘fingers’ of flexible substrate and pressed or secured to the housing surface such that the optical components are flush to the housing surface.”); Ex-1002 ¶155. Since the cavity must be large enough to house physical electronic components that have a certain depth, the cavity must also have a corresponding greater depth (i.e., the vertical thickness of the cavity (blue) in Figures 4 and 7). Ex-1002 ¶¶155-160.

f. Element 1[e]: an electronic part arranged in said at least one cavity,

Yuen teaches Element 1[e]. Ex-1002 ¶161.

Yuen teaches that the biometric monitoring device includes “two major components”, one being the “body (containing the ‘electronics’).” Ex-1006, 24:14-17. As depicted in Figures 4 and 7, the electronic part (purple) is arranged in the cavity (blue). Ex-1006, Figs. 4, 7.

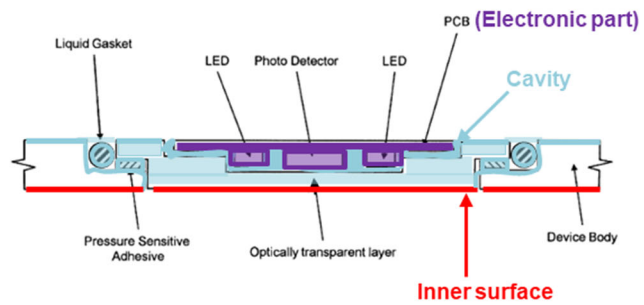
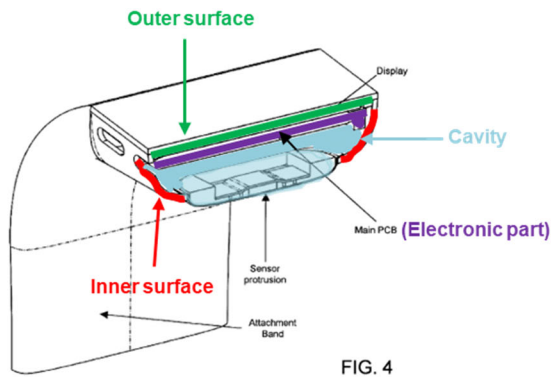


The electronic part housed in the cavity includes, for example, “an optical sensor having one or more light sources” (such as LEDs) that emit “light into the user’s body” and light detectors (such as photodiodes and/or phototransistors) that “sample, measure and/or detect a response or reflection” from the user’s body, which is used by a PPG to determine the user’s stress level, blood pressure and/or heart rate. Ex-1006, 6:23-31. The LEDs and photodetectors may be provided on a flexible printed circuit board (“PCB”). Ex-1006, 2:38-39; Ex-1002 ¶¶162-174.

g. Element 1[f]: which electronic part has a thickness that is less than the depth of the at least one cavity, and

Yuen teaches Element 1[f]. Ex-1002 ¶175.

Yuen teaches that the electronic part (purple) has a thickness that is less than the depth of the cavity (blue), as depicted in Figures 4 and 7. Ex-1006, Figs. 4, 7.



A POSITA would have understood that the electronic part, including the LEDs and photodetector attached to a PCB, has a thickness less than the depth of the cavity because the electronic part must fit within the depth of the cavity to maintain the intended structural and functional integrity of the device. Ex-1002 ¶¶176-177. Additionally, Yuen teaches at least one embodiment wherein the electronic part is “disposed or placed flush to the surface of the device.” Ex-1006, 14:59-66. A POSITA would have understood that the electronic part would have to have a thickness less than the depth of the cavity to be disposed or placed flush to the surface of the device. Ex-1002 ¶¶178-180.

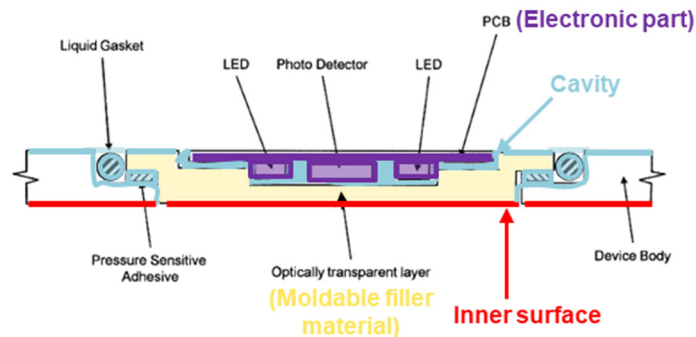
h. Element 1[g]: a coating made of a moldable filler material on the inner surface of the body part, covering the electronic part and the at least one cavity.

Yuen teaches Element 1[g]. Ex-1002 ¶¶181-183.

The '833 Patent teaches that the moldable filler material “is filled in the cavity embedded with the electronic part” such that it “sealingly covers” the “electronic part and fills the remaining space of the cavity arranged on the inner surface of the

molded body part.” Ex-1001, 5:46-54. The ’833 Patent further teaches that the moldable filler material may comprise, for example, an epoxy material or an ink. *See, e.g.*, Ex-1001, 5:55-6:11.

As depicted in Figure 7, Yuen teaches an optically transparent layer (yellow) on the inner surface of the device (red) that covers the electronic part (purple) and the cavity (blue). Ex-1006, Fig. 7.



Yuen teaches that the optically transparent layer “may be formed through in-mold labeling or ‘IML’” and “placed on the lower surface” to “form a seal” such that it prevents “liquid from entering the device where the light sources or photodetectors are disposed or placed.” Ex-1006, 2:39-45. Yuen further teaches that the moldable filler material may comprise an epoxy or an ink. Ex-1006, 10:63-11:1, 14:52-55. For example, Yuen teaches that the biometric monitoring device may use an IML “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, 11:21-33. The light

transmissive structure may be created by “a double-shot or two step molding process wherein optically opaque material is injected and optically transparent material is injected.” Ex-1006, 11:33-36.

A POSITA would have understood that Yuen’s optically transparent layer, which is formed by injection from moldable material having transparent and opaque portions, is a coating made of a moldable filler material that covers the electronic part and cavity on the inner surface of the device, as claimed. Ex-1002 ¶184. This is consistent with the ’833 Patent’s teachings on a moldable filler material. Ex-1001, 5:46-6:11; Ex-1002 ¶184. A POSITA would have understood that Yuen’s moldable material is a “moldable filler material” that fills in the cavity and encapsulates the electronic part within. Ex-1002 ¶¶184-191.

2. Dependent Claims 2-11

a. Claim 2: The wearable electronic device according to claim 1, wherein the non-ceramic material is a titanium material.

Yuen teaches Claim 2. Ex-1002 ¶192.

Yuen teaches that “[s]ome or all of the interior or skin side of the housing” for the biometric monitoring device is made of “a metal material (for example, steel, stainless steel, aluminum, magnesium, or *titanium*).” Ex-1006, 14:33-36. Yuen further teaches that a device “back made out of a metal” or plastic material provides a stiff-enough structure to maintain the device’s structural integrity, while also

providing “a watertight seal for the sensor package.” Ex-1006, 14:66-15:4.

Titanium is a non-ceramic material. Ex-1002 ¶193.

b. Claim 3: The wearable electronic device according to claim 1, wherein the non-ceramic material is a machinable material.

Yuen teaches Claim 3. Ex-1002 ¶194.

Yuen teaches that “[s]ome or all of the interior or skin side of the housing” for the biometric monitoring device is made of “a metal material (for example, steel, stainless steel, aluminum, magnesium, or titanium).” Ex-1006, 14:33-36. Yuen further teaches that a device “back made out of a metal” or plastic material provides a stiff-enough structure to maintain the device’s structural integrity, while also providing “a watertight seal for the sensor package.” Ex-1006, 14:66-15:4. A metal material is a non-ceramic material. Ex-1002 ¶195. A POSITA would have understood that the metal materials taught by Yuen are machinable. Ex-1002 ¶196. Moreover, a POSITA would have understood that using a machinable metal material in Yuen’s biometric monitoring device such as a metal alloy would have been both obvious and preferable over other materials because a machinable metal material would have, for example, better corrosion or abrasion resistance, lower cost, higher strength, weight, rigidity, and desirable manufacturing workability. Ex-1002 ¶197.

- c. **Claim 4: The wearable electronic device according to claim 1, wherein the non-ceramic material is a machinable titanium material.**

Yuen teaches Claim 4. Ex-1002 ¶198.

Yuen teaches that “[s]ome or all of the interior or skin side of the housing” for the biometric monitoring device is made of “a metal material (for example, steel, stainless steel, aluminum, magnesium, or *titanium*).” Ex-1006, 14:33-36. Yuen further teaches that a device “back made out of a metal” or plastic material provides a stiff-enough structure to maintain the device’s structural integrity, while also providing “a watertight seal for the sensor package.” Ex-1006, 14:66-15:4. A POSITA would have understood that titanium is a machinable material. Ex-1002 ¶¶199-200. Moreover, a POSITA would have understood that using a machinable titanium material such as a titanium alloy in Yuen’s biometric monitoring device would have been both obvious and preferable over other materials because a machinable titanium material would have, for example, better corrosion and abrasion resistance, higher strength (and strength to weight ratio), and better appearance. Ex-1002 ¶201. Furthermore, a machinable titanium material is a non-ceramic material. *Id.*

- d. **Claim 5: The wearable device according to claim 1 wherein the non-ceramic material is a machinable metallic material comprising one or more of titanium, steel, platinum, gold, palladium, silver or bronze or a gold based alloys.**

Yuen teaches Claim 5. Ex-1002 ¶202.

Yuen teaches that “[s]ome or all of the interior or skin side of the housing” for the biometric monitoring device is made of “a metal material (for example, *steel*, *stainless steel*, aluminum, magnesium, or *titanium*).” Ex-1006, 14:33-36; *see also id.*, 14:66-15:4 (device back may be “made out of a metal”). A POSITA would have understood that the metallic materials taught by Yuen are machinable and that using a machinable metallic material such as a titanium or steel alloy would have been both obvious and preferable over other material for the same reasons discussed in Sections XII.A.2.b-XII.A.2.c. Ex-1002 ¶¶203-205.

- e. **Claim 6: The wearable electronic device according to claim 1, wherein the electronic part is attached to the [at least one] cavity [at] a bottom of the [at least one] cavity.⁷**

Yuen teaches Claim 6. Ex-1002 ¶206.

⁷ In the *Circular* litigation, where PO asserted the ’833 Patent against an unrelated party, PO argued and the Court stated that Claim 6 is not indefinite and should read “the at least one cavity at a bottom of the at least one cavity.” *See* Ex-1021, 2. For purposes of this Petition only, Petitioner adopts the Court’s construction of Claim 6 from the *Circular litigation*, but by doing so, Petitioner does not intend to, and does not, waive any argument that Claim 6 is indefinite in any district court litigation against PO.

A POSITA would have understood that the bottom of the cavity is the end of the cavity that is away from the inner (skin-side) surface of the device. Ex-1002 ¶207. Figure 7C of the '833 Patent, depicted below, is consistent with this understanding, as it shows the electronic part 314 (purple) attached to the end of the cavity (blue) away from the inner (skin-side) surface 110 (red) of the device. Ex-1001, Fig. 7C; Ex-1002 ¶207.

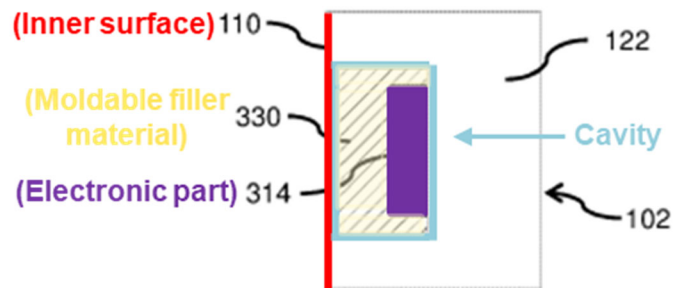
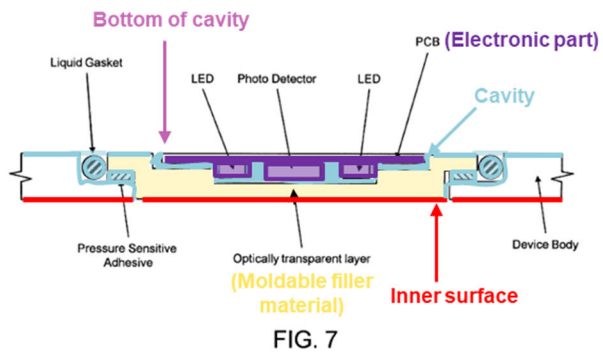
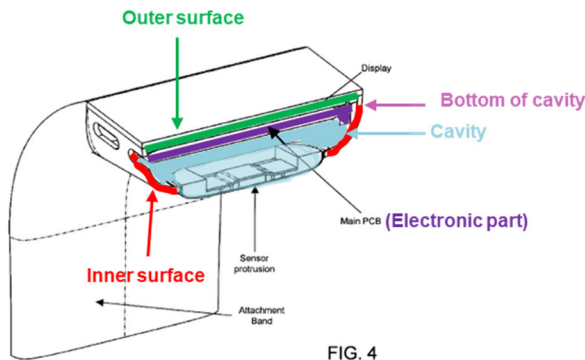


FIG. 7C

Yuen teaches that the electronic part (i.e., the main PCB and any LEDs and/or photodetectors positioned on it (Ex-1006, 2:38-39)) is attached to the bottom of the cavity, i.e., away from the inner (skin-side) surface of the biometric monitoring device. Ex-1002 ¶208. Yuen's optical sensors including the LEDs and photodetector are positioned "on an interior or skin side of the biometric monitoring device (i.e., a side whereby the surface of the device contacts, touches and/or faces the skin of the user (hereinafter 'skin side')." Ex-1006, 9:57-61; *see also id.*, 12:55-61. The LEDs/photodetector are further positioned "on a flexible or pliable

substrate,” such as a flexible PCB, which allows the inner surface of the device to adapt to the shape of the user’s appendage (for example, arm, wrist, ankle or leg) that the device is secured to so that there is “little to no gap between the skin side of the device and the juxtaposed surface of the skin of the user.” Ex-1006, 12:24-42. Yuen teaches that “optical components of differing heights may be mounted to different ‘fingers’” of the flexible PCB “and pressed or secured to the housing surface such that the optical components are flush to the housing surface.” Ex-1006, 12:42-45.

A POSITA would have understood, as depicted in Yuen’s Figures 4 and 7, that the electronic part (purple) is attached to the cavity (blue) at the bottom of the cavity, i.e., away from the inner surface. Ex-1006, Figs. 4 (depicting a cross-sectional “through the electronics package” (PCB)), 7 (depicting a cross-sectional view of the PPG sensor with the LEDs and photodetector positioned on the PCB); Ex-1002 ¶209. For example, Figure 4 shows that the main PCB is located and attached to the base (bottom) portion of the cavity (blue). Ex-1002 ¶209. Figure 7 shows that the main PCB (including the LEDs and photodetector positioned on it) are located and attached to the base (bottom) portion of the cavity (blue). *Id.*



A POSITA would have understood that it would have been beneficial to have the electronic part attached to the bottom of the cavity for a number of reasons including because it would provide a higher mechanical rigidity reducing the likelihood for relative motion between the body part and electronic part, less variable sensor reading, reduction of noise at least because of decreased pathways for “stray” light, vibration tolerance, and damage protection for the device. Ex-1002 ¶209. Electronic devices including wearable electronic devices are vulnerable to shock, damage, and vibrations, for example, if they are dropped or hit against hard surfaces. Ex-1002 ¶209. Attaching the electronic part to the bottom of the cavity of the device would have been an obvious design choice to mitigate extreme vibrations and damage to the device. Ex-1002 ¶¶209-213.

- f. **Claim 7: The wearable electronic device according to claim 6, comprising one or more of a sticker, a tape or glue that attaches the electronic part to the at least one cavity at a bottom of the at least one cavity.**

Yuen teaches Claim 7. Ex-1002 ¶214.

Yuen teaches that the electronic part is attached to the bottom of the cavity, i.e., away from the inner (skin-side) surface of the biometric monitoring device for the same reasons discussed in the previous section. Ex-1002 ¶215. Yuen also teaches that the optical sensor components—which may be disposed flush to the skin-side surface of the device—are fixed, attached, secured to and/or included in the biometric monitoring device “via a liquid-tight seal (i.e., a method/mechanism that prevents liquid ingress into the body of the biometric monitoring device).” Ex-1006, 14:59-66. Yuen further teaches, citing Figure 7, that “a package or module of the optical sensor would be connected to the device with a pressure sensitive adhesive and a liquid gasket.” Ex-1006, 15:5-7, Fig. 7 (pink).

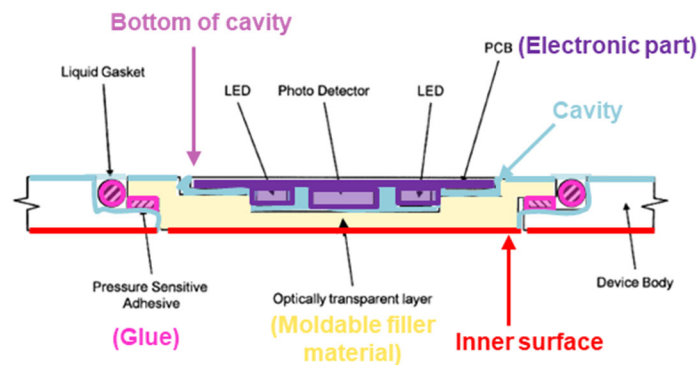
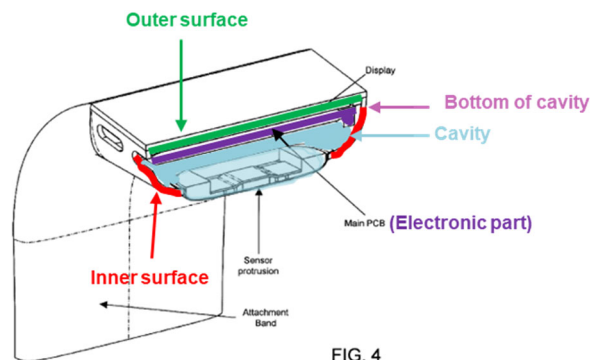


FIG. 7

Yuen’s optical sensor components may be attached or secured to the body of the device using, for example, “watertight glues, hydrophobic membranes such as Gore-Tex, O-rings, sealant, grease, or epoxy.” Ex-1006, 15:10-14. As Figure 7 illustrates, the pressure sensitive adhesive (such as glue) attaches the electronic part to the cavity

at the bottom of the cavity, as claimed, via an attachment structure in the molded body part. Ex-1002 ¶215. This is consistent with the '833 Patent's teachings as to how the electronic part is attached to the bottom of the cavity. *See, e.g.*, Ex-1001, 5:14-18 (“[T]he electronic part is attached to the cavity by an attachment means arranged at a bottom of the cavity. The attachment means is selected from a group consisting of a sticker, a tape, glue, and an attachment structure made in the molded body part.”); Ex-1002 ¶215. A POSITA would thus have understood that the electronic part is attached to the device body at the bottom of the cavity with an adhesive (such as glue). Ex-1002 ¶215.

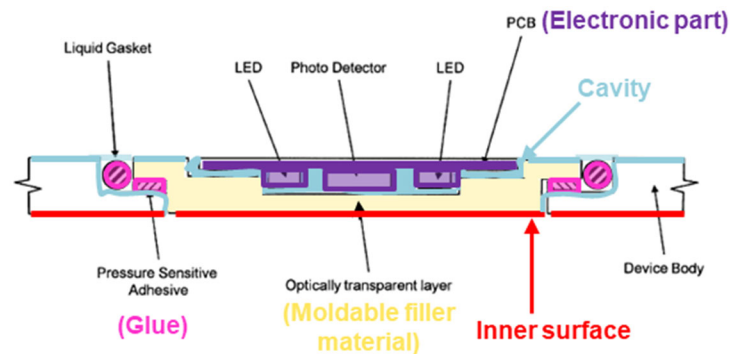
Additionally, as explained in the previous section, Figure 4 shows that the main PCB is located and attached to the base (bottom) portion of the cavity (blue). Ex-1006, Fig. 4; Ex-1002 ¶216. It would have been obvious to a POSITA that an adhesive (such as glue) would also be used to attach the main PCB to the bottom of the cavity in Figure 7, as demonstrated in Figure 4. Ex-1002 ¶216.



- g. **Claim 8: The wearable electronic device according to claim 1, wherein the moldable filler material is selected from a group consisting of at least epoxy material, Polyethylene, Polyurethane, low temperature moldable material, Loctite M-31CL, alpha-epoxy, 1,2-epoxy, EpoxAcast® 650, Bisphenol S epoxy resin, Novolac epoxy resin, Aliphatic epoxy resin and Glycidylamine epoxy resin.**

Yuen teaches Claim 8. Ex-1002 ¶217.

Yuen teaches that the moldable filler material on the inner surface of the device covering the electronic part and the cavity consists of at least epoxy material. Specifically, as depicted in Figure 7, Yuen teaches an optical transparent layer (yellow), which “may be formed through in-mold labeling or ‘IML.’” Ex-1006, 2:44-45, Fig. 7. Yuen further teaches that other sensors in addition to or instead of a heart rate sensor may be provided in “close proximity and/or secure contact to the user’s skin,” including, for example, “a skin temperature sensor (e.g., noncontact thermopile that utilizes the optical window or thermistor joined with *thermal epoxy* to the outer surface of the protrusion).” Ex-1006, 13:62-14:3. Specifically, Yuen teaches that the “skin temperature *sensor may be physically and thermally coupled*, for example *with thermal epoxy, to the metal body* to detect or sense the temperature of the user.” Ex-1006, 14:52-55.



A POSITA would thus have understood that the optically transparent layer, which is a coating made of moldable filler material on the inner surface of the device covering the electronic part and the cavity, may be epoxy material. Ex-1002 ¶¶218-221.

- h. Claim 9: The wearable electronic device according to claim 1, wherein the electronic part comprises one or more of a battery, an infrared transmitter, a microcontroller, a radio frequency transceiver, a temperature sensor and an infrared receiver.**

Yuen teaches Claim 9. Ex-1002 ¶¶222-224.

Yuen's electronic part may include a temperature sensor. Specifically, Yuen teaches that a "skin temperature sensor may be physically and thermally coupled, for example with thermal epoxy, to the metal body to detect or sense the temperature of the user." Ex-1006, 14:52-55; *see also id.*, 7:52-58, 13:62-14:3.

Yuen's electronic part may include a microcontroller. Specifically, Yuen teaches that the biometric monitoring device comprises at least one processor including, for example, at least one application processor and at least one sensor

processor. Ex-1006, 22:60-23.6; *see also id.*, 23:26-29. Yuen's Figure 17 depicts an exemplary PPG sensor that includes "a light source, light detector, ADC, processor, DAC/GPIOs, and light source intensity and on/off control." Ex-1006, 4:3-6, Fig. 17.

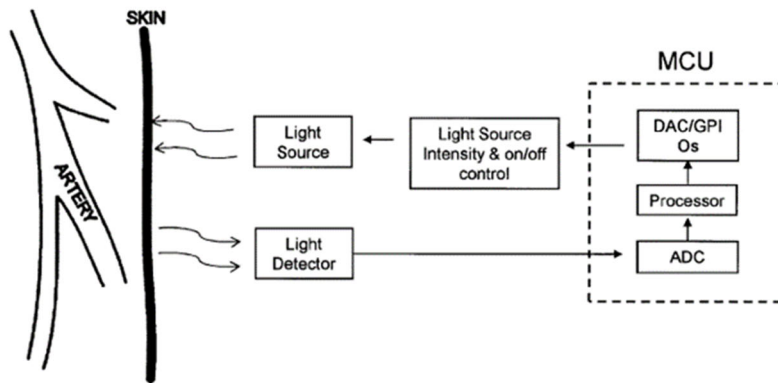


FIG. 17

Yuen additionally teaches that the main PCB may have electronics "such as, but not limited to, transimpedance amplifiers, filtering circuits, level shifters, sample and hold circuits, and a microcontroller unit." Ex-1006, 23:7-20.

Yuen's electronic part may include a battery. Specifically, Yuen teaches that the biometric monitoring device may include "a rechargeable energy source" such as a rechargeable battery, which interconnects "with a charger using magnetic properties to secure thereto." Ex-1006, 14:42-46. For example, the device "may use a wired connection to charge an internal rechargeable battery and/or transfer data to

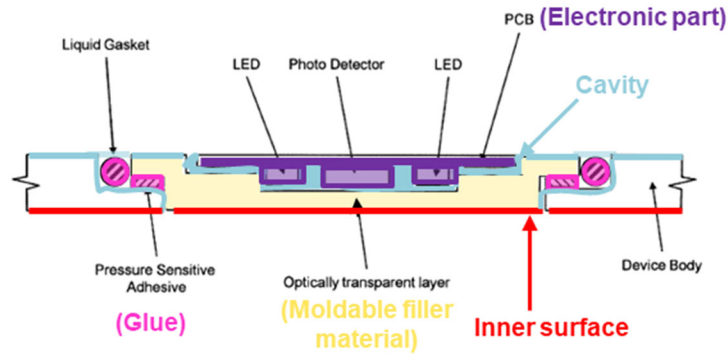
a host device such as a laptop or mobile phone.” Ex-1006, 28:40-43; Ex-1002 ¶¶225-227.

- i. **Claim 10: The wearable electronic device according to claim 9, wherein the moldable filler material comprises an ink and is configured to cover at least an area other than the infrared transmitter and the infrared receiver within the at least one cavity.**

Yuen teaches Claim 10. Ex-1002 ¶¶228-229.

Yuen teaches that the moldable filler material comprises an ink and covers an area between the optical components and the inner (skin-side) surface of the cavity. Specifically, as depicted in Figure 7, Yuen teaches an optical transparent layer (yellow), which “may be formed through in-mold labeling or ‘IML.’” Ex-1006, 2:44-45, Fig. 7. Yuen teaches that the biometric monitoring device may include a material placed on the inner (skin-side) surface that “includes high reflectivity characteristic—for example, polished stainless steel, *reflective paint*, and polished plastic,” which allows light to be scattered and/or reflected “off the skin side of the device ... back into the skin.” Ex-1006, 15:15-21. Yuen teaches that this material improves SNR by effectively increasing “the input light signal” as compared to a non-reflective device surface. Ex-1006, 15:21-23. Yuen further teaches that “the circuitry related to emitting and receiving light may be *disposed in the interior of the device housing* and underneath a plastic or glass layer (for example, *painted*

with infrared ink) or an infrared lens which permits infrared light to pass but not light in the human visual spectrum.” Ex-1006, 10:63-11:1.



A POSITA would have understood that the infrared ink taught by Yuen would be applied to the optically transparent layer (yellow) within the cavity (blue), as depicted in Figure 7, where it is shown to cover at least an area other than that corresponding to the LEDs and the photodetector. Ex-1002 ¶¶230-232.

- j. **Claim 11: The wearable electronic device according to claim 1, wherein the moldable filler material comprises an ink that increases a value of transmitted infrared light intensity divided by transmitted visible light intensity.**

Yuen teaches Claim 11. Ex-1002 ¶233.

Yuen teaches that the moldable filler material comprises an ink that allows preferential transmission of infrared light such that the ink increases a value of transmitted infrared light intensity divided by transmitted visible light intensity. In particular, Yuen teaches that “the circuitry related to emitting and receiving light may be disposed in the interior of the device housing and underneath a plastic or

glass layer (for example, *painted with infrared ink*) or an infrared lens *which permits infrared light to pass but not light in the human visual spectrum.*” Ex-1006, 10:63-11:1. As a result, “the light transmission is invisible to the human eye.” Ex-1006, 11:1-2. In effect, a POSITA would have understood that the infrared ink taught by Yuen increases the ratio of transmitted infrared light intensity to transmitted visible light intensity, as claimed, because it permits infrared light to pass through but not light that is visible to the human eye, thus decreasing the denominator and increasing the ratio. Ex-1002 ¶¶234-236.

B. Ground 2: Claim 12 is obvious over Yuen in view of Schröder.

1. A POSITA would have been motivated to combine Yuen’s teachings with Schröder’s teachings and would have had a reasonable expectation of success.

A POSITA would have been motivated to combine the teachings of Yuen and Schröder and would have had a reasonable expectation of success in doing so because each relates to the same well-known technologies. Ex-1002 ¶¶237-238. Both are directed to wearable biometric sensing devices having similar structural components including, for example, inner and outer surfaces, a cavity, and an electronic component (such as batteries and microprocessors) within the cavity. *See, e.g.,* Ex 1006, 12:50-52, Fig. 7; Ex 1007, 9:54-10:9, Figs. 6-10.

Yuen teaches that its biometric monitoring device can be worn on an appendage of the user’s body, for example, on the user’s “arm, wrist, leg and/or

ankle.” Ex-1006, 2:7-17, 12:50-52. Yuen also teaches that the device can be “worn in any number of ways including, but not limited to” a chest band, necklace, patch, bra, earring, glasses, “or toe band.” Ex-1006, 24:35-40. Schröder discloses that its biometric sensing device is “a finger-ring,” which “is worn by a user e.g., permanently on the finger.” Ex-1007, 2:60-64, 3:61-62.

A POSITA would have been motivated to combine the functionality of Yuen’s biometric monitoring device with Schröder’s finger-ring structure because a POSITA would have found it beneficial to implement Yuen’s device in a more compact form that is not intrusive or obtrusive and is easier for the user to remember to wear. Ex-1002 ¶239; *see DyStar Textilfarben GmbH v. C.H. Patrick Co.*, 464 F.3d 1356, 1368 (Fed. Cir. 2006) (making things stronger, cheaper, lighter, smaller, more durable, or more efficient are universal motivators to combine/modify prior art). Yuen teaches that the device housing should enable the device to be worn by the user without “measurably or appreciably impact[ing] the user’s activity.” Ex-1006, 23:63-67. Moreover, an exemplary structure that Yuen teaches that its device is an “earring” or “toe band,” which a POSITA would have understood are structurally equivalent and/or functionally similar or identical to a “finger ring.” Ex-1006, 24:35-40; Ex-1002 ¶239. Schröder teaches that a finger-ring is desirable because it cannot be easily lost or taken without authorization because it is worn on the user’s finger. Ex-1007, 4:15-18. Thus, design incentives, consumer preferences, and

market opportunities would have motivated a POSITA to apply the teachings of Schröder to Yuen. Ex-1002 ¶239.

A POSITA would have also understood that implementing Yuen's device with Schröder's finger-ring structure would enable a tighter fit than a device worn, for example, on the user's wrist, which would reduce motion artifact, provide better shielding against stray ambient light, and allow for a higher quality reading from any sensors on the device (e.g., heart rate, temperature, etc.). Ex-1002 ¶240. Yuen acknowledges these motivations because it teaches the desirability for "light source(s) and/or associated detector(s)" to be "close to the skin of the user (i.e., with little to no gap between the skin side of the device and the juxtaposed surface of the skin of the user)." Ex-1006, 12:24-35. Moreover, Yuen teaches that improving "sustained and/or fixed contact between the biometric monitoring device and the user's skin" is desirable because it "may reduce the amount of stray light measured by the photodetector, decrease motion between the biometric monitoring device and the user, and/or provide improved local pressure to the user's skin; all of which may increase the quality of the cardiac signal of interest." Ex-1006, 13:54-62; *see also id.*, 14:25-32 ("[T]he use of a protrusion and/or friction may improve measurement accuracy of data acquisition corresponding to certain parameters (e.g., heart rate, heart rate variability, galvanic skin response, skin temperature, skin coloration, heat flux, blood pressure, blood glucose, etc.) by reducing motions of the sensor relative

to the user's skin during operation, especially whilst the user is in motion.”). Ex-1002 ¶¶240-247.

A POSITA would have had a reasonable expectation of success in combining Yuen and Schröder. Ex-1002 ¶248. Yuen and Schröder are analogous prior art as they both involve wireless, wearable biometric sensing devices having similar structural components such as inner and outer surfaces and a cavity housing an electronic part. Ex-1002 ¶248. Moreover, a POSITA would have understood that the electronic components of Yuen and Schröder's biometric sensing devices are similar such that they are programmable using standard processors and are interchangeable regardless of whether the devices are in the form of, for example, a toe band or a finger-ring. Ex-1006, 24:35-40; Ex-1002 ¶248. A POSITA would have understood, therefore, that these references disclose interrelated teachings based on routine technologies that would have been amenable to various well-understood and predictable combinations to provide more features and enhance user interest. Ex-1002 ¶248.

2. Dependent Claim 12: The wearable electronic device according to claim 1, wherein the body part comprises a ring configured to be worn on a finger.

Yuen in view of Schröder (“Yuen-Schröder”) teaches Claim 12. Ex-1002 ¶249.

Yuen teaches that its biometric monitoring device is secured to “an appendage of the user.” Ex-1006, 2:7-17. Specifically, Yuen teaches that the device can be worn on the user’s body, for example, on the user’s “arm, wrist, leg and/or ankle.” Ex-1006, 12:50-52. Yuen also teaches that the device can be “worn in any number of ways including, but not limited to” a chest band, necklace, patch, bra, earring, glasses, “or toe band.” Ex-1006, 24:35-40. While Yuen does not explicitly state that its device can be worn as a “finger ring,” a POSITA would have found it obvious that Yuen’s device could be worn in such a manner because an “earring” or “toe band” are structurally equivalent and/or identical to a “finger ring” and would be worn and/or function in a similar manner. Ex-1006, 24:35-40; Ex-1002 ¶¶250-251 (explaining the similarities between fingers and toes and the known advantages of a finger-ring structure). This limitation is also disclosed by Schröder.

Schröder discloses a finger-ring device that utilizes biometric sensing to authenticate a user’s identity for security purposes. Schröder discloses that its biometric sensing device is “a finger-ring,” which “is worn by a user e.g., permanently on the finger.” Ex-1007, 3:61-62; Ex-1002 ¶¶252-259.

A POSITA would have been motivated to combine the teachings of Yuen and Schröder and would have had a reasonable expectation of success in doing so for the same reasons discussed in Section XII.B.1. Ex-1002 ¶260.

C. Ground 3: Claims 1-5, 7-9, and 12 are obvious over Schröder.

1. Independent Claim 1

a. Element 1[pre]: A wearable electronic device comprising:

Schröder teaches the preamble, to the extent it is limiting.⁸ Ex-1002 ¶¶261-263.

As shown below in Figure 1, Schröder teaches an electronic device, i.e., finger-ring 2, which can function as an “external secure unit” and communicate with a smartphone. Ex-1007, 3:57-59.

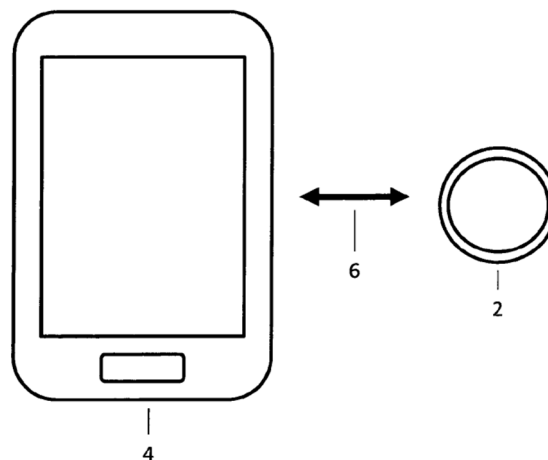


Fig. 1

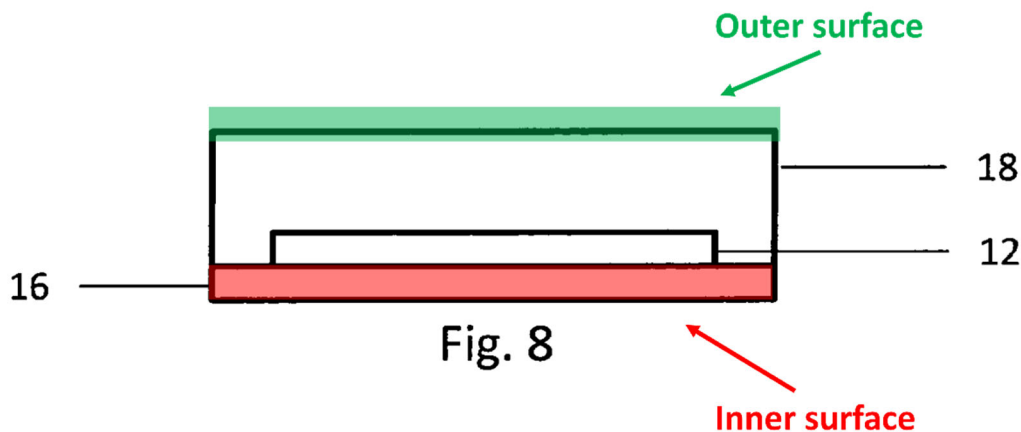
Schröder further teaches that the device is wearable: “[t]he finger-ring 2 is worn by a user, e.g., permanently on the finger.” *Id.*, 3:61-62.

⁸ As noted above, the Court in the *Circular* litigation found that the preamble of Claim 1 of the ’833 Patent is limiting. See Ex-1021, 2.

b. Element 1[a]: a body part made of a non-ceramic material,

Schröder teaches Element 1[a]. Ex-1002 ¶264.

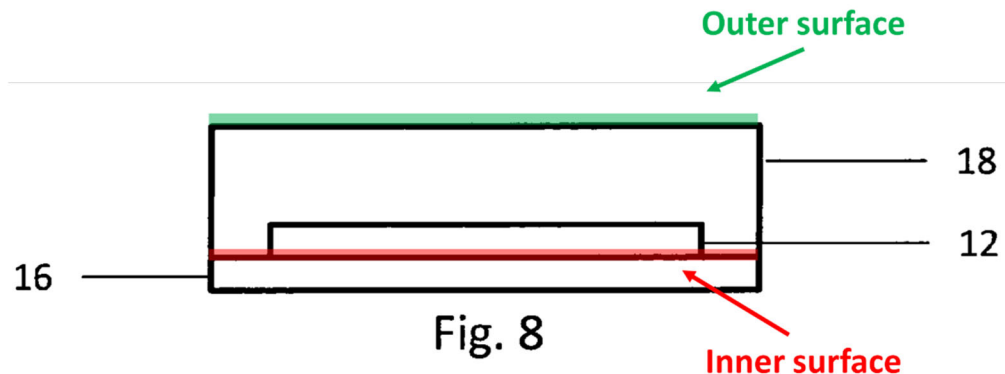
As shown in Figure 8 below, Schröder teaches a finger-ring made of two concentric shells 16 and 18. Ex-1007, 12:50-52, Fig. 8. Under the plain and ordinary meaning of “body part,” a POSITA would have understood that Schröder teaches a “body part” in two ways. Ex-1002 ¶265. First, a POSITA would have understood Schröder’s entire finger-ring to be a “body part.” Ex-1002 ¶265. As shown in Figure 8, Schröder’s two-component ring has an outer surface (part of component 18, shown in green below) and an inner surface (component 16, shown in red below). Ex-1007, Fig. 8; Ex-1002 ¶265.



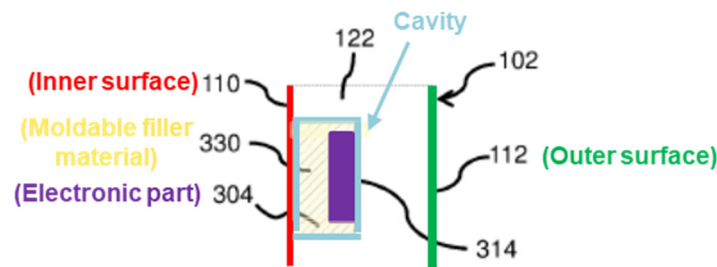
Schröder teaches that the entire finger-ring may be made of one material, as it teaches that the two ring components 16, 18 “can be manufactured from like or different materials.” Ex-1007, 12:56-57. Schröder further teaches that “[a]n expedient material for the components 16, 18 is plastic or metal.” Ex-1007, 12:14-

15. Schröder thus satisfies the claim requirement that the body part be made “of a non-ceramic material.” Ex-1002 ¶265.

A POSITA would also have understood that each of Schröder’s two finger-ring components—or halves—which are concentric rings themselves, is also a “body part.” Ex-1002 ¶266. For example, component 18 is a body part that has its own outer surface and inner surface. Ex-1007, Fig. 8; Ex-1002 ¶266.



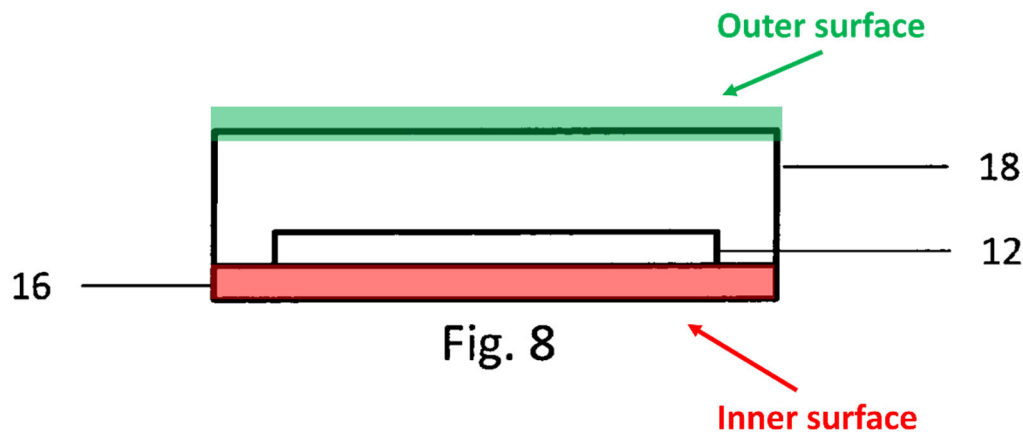
These two interpretations are consistent with how a POSITA would have understood Figure 4 of the '833 Patent, which depicts inner surface 110 (red) and outer surface 112 (green). Ex-1001, Fig. 4; Ex-1002 ¶267.



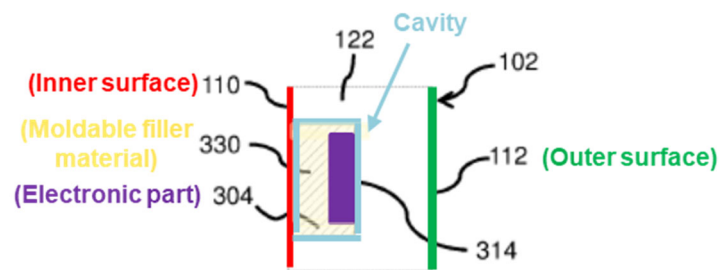
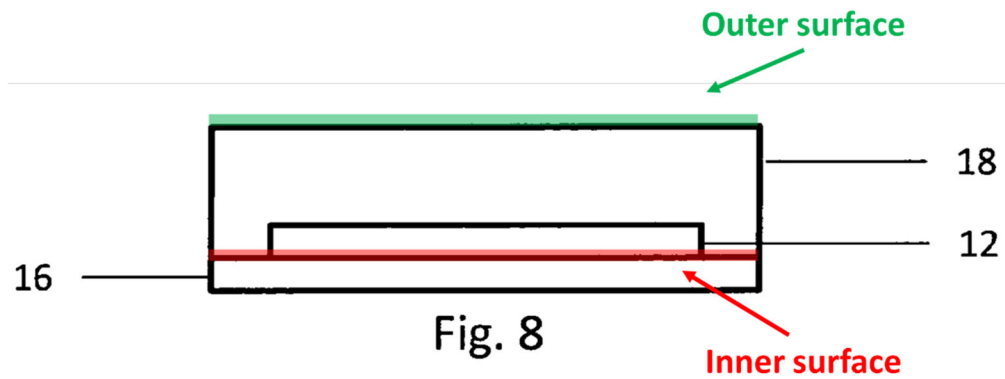
c. Element 1[b]: having an inner surface and an outer surface,

Schröder teaches Element 1[b]. Ex-1002 ¶268.

Under a POSITA's first understanding described above, with the entire finger-ring being the claimed body part, Schröder's body part has an inner surface and an outer surface as depicted in Figure 8. Ex-1002 ¶269. Specifically, Schröder's finger-ring has two components—or halves—an outer surface (part of component 18, shown in green below) and an inner surface (component 16, shown in red below). Ex-1002 ¶269; Ex-1007, Fig. 8.



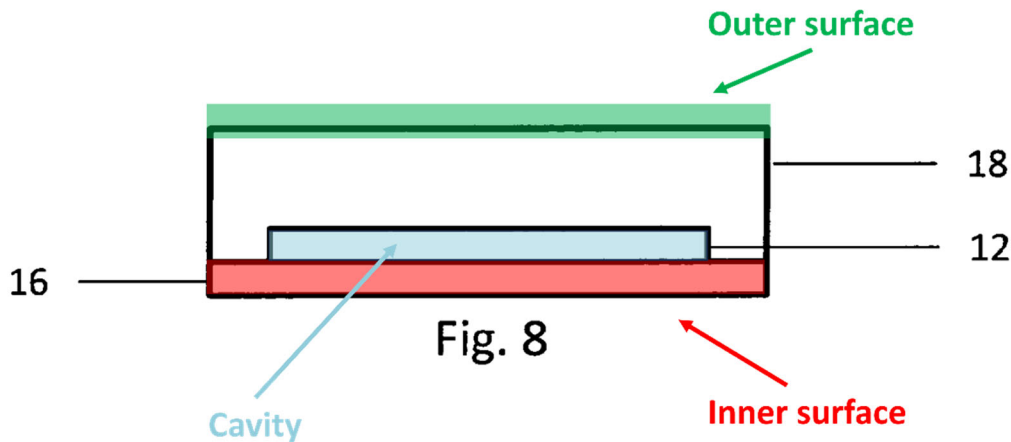
Under the second interpretation of “body part” above, a POSITA would also have understood that each of Schröder's two finger-ring components—or halves—have outer and inner surfaces. Ex-1002 ¶270. For example, component 18 has its own outer and inner surface. Ex-1007, Fig. 8; *see also* Ex-1001, Fig. 4 (depicting inner surface 110 (red) and outer surface 112 (green)); Ex-1002 ¶¶270-271.



- d. **Element 1[c]: wherein at least one cavity is formed on the inner surface of the body part,**

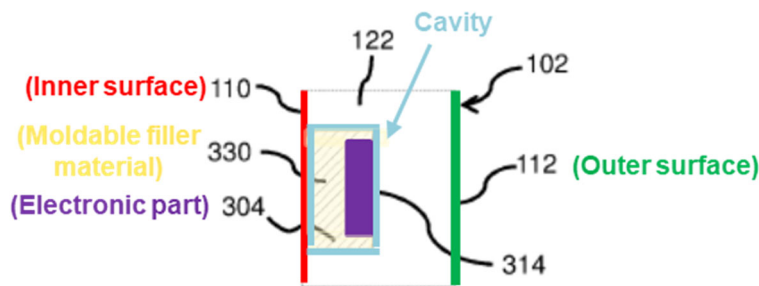
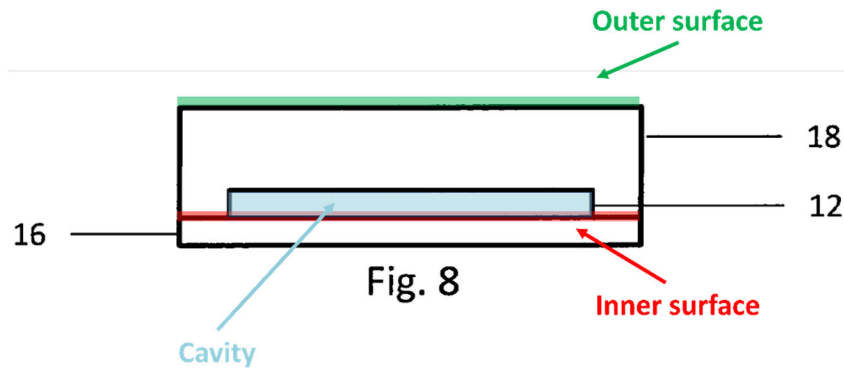
Schröder teaches Element 1[c]. Ex-1002 ¶272.

Under a POSITA's first understanding described above, with the entire fingering being the claimed body part, Schröder teaches that a cavity (shown in blue in Figure 8 below) is formed on the inner surface, i.e., component 16 (red), of the body part. Ex-1007, Fig. 8; Ex-1002 ¶¶273-274.



A POSITA would have understood that the area annotated in blue is a cavity because Schröder refers to this area as a “recess of the finger-ring 2,” in which a chip module and/or an inlay can be inserted. Ex-1007, 8:58-59 (“The chip module 10 is inserted into a recess of the finger-ring 2.”), 12:10-12 (“The finger-ring 2 consists in principle of at least one component 16, 18 into which at least one inlay 12 is inserted, whereby one component can be a ring half 16, 18.”), 12:26-28 (“The inlay 12 is ... inserted into at least one recess provided therefor within at least one component [].”).

Schröder also teaches a cavity formed on the inner surface if the “body part” is one of the ring component shells such as component 18. Ex-1002 ¶275. For example, as shown in Figure 8 below, the cavity (blue) is formed on the inner surface of component 18 (red). Ex-1002 ¶¶275-281; Ex-1007, Fig. 8; *see also* Ex-1001, Fig. 4 (depicting inner surface 110 (red) and outer surface 112 (green)).

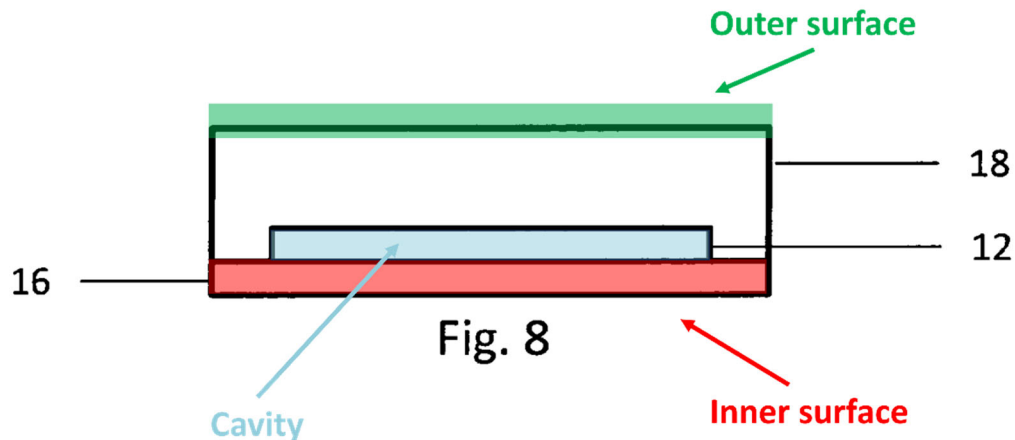


- e. **Element 1[d]: the at least one cavity extending from the inner surface of the body part towards the outer surface of the body part and having a depth arranged within the inner surface of the body part,**

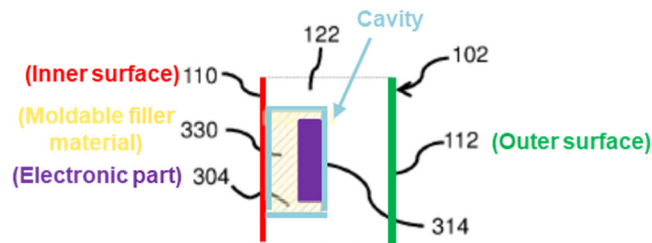
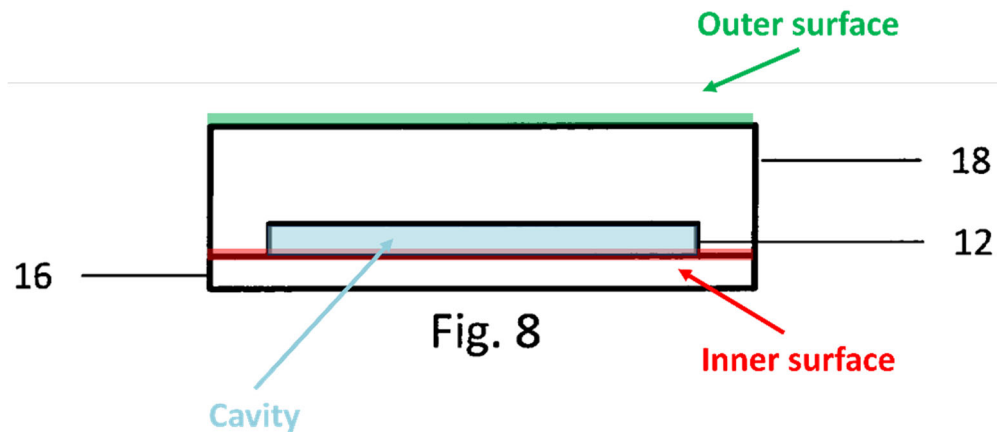
Schröder teaches Element 1[d]. Ex-1002 ¶282.

Under a POSITA's first understanding described above, with the entire finger-ring being the claimed body part, Schröder teaches that the cavity (blue), which houses the chip module and/or inlay, extends from the inner surface (component 16, red) towards the outer surface (part of component 18, green) of the finger-ring, as shown in Figure 8 below. Ex-1002 ¶283; Ex-1007, Fig. 8. A POSITA would have

understood that the cavity extending from the inner surface towards the outer surface of the body part has a depth arranged within the inner surface of the body part, as shown in the cross section in Figure 8. Ex-1007, 12:10-12, Fig. 8; Ex-1002 ¶¶284-285.



Schröder also teaches that the cavity extends from the inner surface to the outer surface of the body part, if the “body part” is one of the ring component shells such as component 18. Ex-1002 ¶286. For example, as shown in the cross section in Figure 8 below, the cavity (blue) on the inner surface of component 18 (red) extends to the outer surface of the body part. Ex-1002 ¶286; Ex-1007, Fig. 8; *see also* Ex-1001, Fig. 4 (depicting inner surface 110 (red) outer surface 112 (green)).



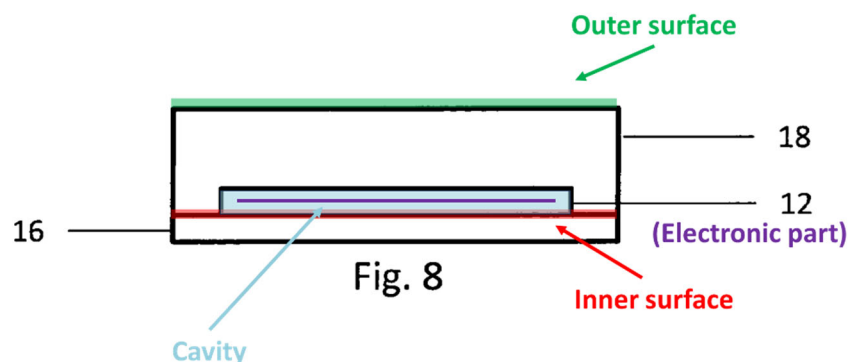
A POSITA would have understood that the cavity extending from the inner surface towards the outer surface of component 18 has a depth arranged within the inner surface of component 18, as shown in the cross section in Figure 8. Ex-1007, 12:10-12, Fig. 8; Ex-1002 ¶286. Moreover, the cavity is designed to include electronic components, which are 3-dimensional objects that themselves have a certain length, width, and depth. *See, e.g.*, Ex-1007, 13:27-35 (“Advantageously, a depression is manufactured in the carrier foil ... before the chip module 10, the antenna coil 8 and optional further electronic devices are inserted into the depression. The depression has the purpose that the devices to be inserted into the depression should not protrude

beyond the carrier foil if possible, so that an even surface is present on the carrier foil to facilitate a later processing of the carrier foil with inserted devices.”); Ex-1002 ¶286. Since the cavity must be large enough to house physical electronic components that have a certain depth, the cavity must also have a corresponding greater depth (i.e., the vertical thickness of the cavity (blue) in Figure 8). Ex-1002 ¶¶286-291.

f. Element 1[e]: an electronic part arranged in said at least one cavity,

Schröder teaches Element 1[e]. Ex-1002 ¶292.

Schröder’s finger-ring includes a “recess” (annotated in blue below) “within at least one component” such as component 18 where an inlay 12 (purple) is inserted. Ex-1007, 12:10-12, 12:26-32, Fig. 8. Schröder teaches that at least an antenna coil 8 and at least one chip module are arranged on inlay 12, which is made of “a preferably flexible carrier material.” Ex-1007, 12:26-32. Schröder thus teaches an electronic part arranged within the cavity. Ex-1002 ¶¶293-304.



g. Element 1[f]: which electronic part has a thickness that is less than the depth of the at least one cavity, and

Schröder teaches Element 1[f]. Ex-1002 ¶305.

Schröder teaches that chip module 10 and/or inlay 12 are inserted *into* or *within* the recess of finger-ring 2. Ex-1007, 8:58-59 (“The chip module 10 is inserted *into* a recess of the finger-ring 2.”), 12:10-12 (“The finger-ring 2 consists in principle of at least one component 16, 18 *into* which at least one inlay 12 is inserted, whereby one component can be a ring half 16, 18.”), 12:26-28 (“The inlay 12 is ... inserted *into* at least one recess provided therefor *within* at least one component [.]”). A POSITA would have understood that the electronic part, i.e., chip module 10 and/or inlay 12, has a thickness less than the depth of the cavity because the electronic part is inserted into or within the cavity and therefore must fit within the depth of the cavity. Ex-1002 ¶¶306-308.

h. Element 1[g]: a coating made of a moldable filler material on the inner surface of the body part, covering the electronic part and the at least one cavity.

Schröder teaches Element 1[g]. Ex-1002 ¶¶309-310.

The ’833 Patent teaches that the moldable filler material “is filled in the cavity embedded with the electronic part” such that it “sealingly covers” the “electronic part and fills the remaining space of the cavity arranged on the inner surface of the molded body part.” Ex-1001, 5:46-54. The ’833 Patent further teaches that the

moldable filler material may comprise, for example, a low temperature moldable material such as a plastic or resin. *See, e.g.*, Ex-1001, 5:55-62.

As explained in the previous sections, Schröder's electronic part is arranged in the cavity, which has a depth arranged within the inner surface of the body part. Ex-1002 ¶311. Schröder teaches that the electronic part and the cavity are covered by a coating made of a moldable material such as a low temperature moldable material (e.g., a plastic or resin). Ex-1007, 14:45-46, 15:8-10, 15:14-15; Ex-1002 ¶311. Specifically, Schröder teaches that the finger-ring "can be manufactured by an injection-molding process." Ex-1007, 14:35-37. Schröder explains the process as follows: the electronic part including, for example, chip module 10 and antenna coil 8 "are arranged on a carrier foil"; "individual ring blanks" are "singled out of the carrier foil in different lengths ... to roll up the ring blanks in a ring shape"; and "a rolled or non-rolled ring blank" are "inserted into an injection mold to overmold the ring blank with a suitable injection-molding material," such as a resin or plastic. Ex-1007, 14:38-46. The injection-molding process results in "a ring-shaped body in whose interior the chip module 10 and the antenna coil 8 and any further electronic devices are arranged." Ex-1007, 14:46-49. Schröder additionally teaches that chip module 10 and antenna coil 8 may be "inserted into an injection mold in order to be overmolded." Ex-1007, 14:50-53. This is consistent with the '833 Patent's teachings on a moldable filler material. Ex-1001, 5:46-62; Ex-1002 ¶311. A

POSITA would have understood that Schröder's moldable material is a "moldable filler material" that fills in the cavity and encapsulates the electronic part within. Ex-1002 ¶¶311-318.

2. Dependent Claims 2-5, 7-9, and 12

- a. Claim 2: The wearable electronic device according to claim 1, wherein the non-ceramic material is a titanium material.**

Schröder teaches Claim 2. Ex-1002 ¶319.

Schröder teaches that at least one of the finger-ring components can be made of, for example, "silver, gold, *titanium*, steel." Ex-1007, 15:9-11. Schröder also teaches that the finger-ring components 16 and 18 "can be manufactured from like or different materials." Ex-1007, 12:56-57. Titanium is a non-ceramic material. Ex-1002 ¶320.

- b. Claim 3: The wearable electronic device according to claim 1, wherein the non-ceramic material is a machinable material.**

Schröder teaches Claim 3. Ex-1002 ¶321.

Schröder teaches that "[a]n expedient material for the components 16, 18" of the finger-ring is metal or plastic. Ex-1007, 12:14-15. A metal material is a non-ceramic material. Ex-1002 ¶322. A POSITA would have understood that the metal materials taught by Schröder are machinable. Ex-1002 ¶¶322-323. Moreover, a POSITA would have understood that using a machinable metal material in

Schröder's finger-ring such as a metal alloy would have been both obvious and preferable over other materials because a machinable metal material would have, for example, better corrosion or abrasion resistance, lower cost, higher strength, weight, rigidity, and desirable manufacturing workability. Ex-1002 ¶324.

c. Claim 4: The wearable electronic device according to claim 1, wherein the non-ceramic material is a machinable titanium material.

Schröder teaches Claim 4. Ex-1002 ¶325.

Schröder teaches that at least one of the finger-ring components can be made of, for example, “silver, gold, *titanium*, steel.” Ex-1007, 15:9-11. Schröder also teaches that the finger-ring components 16 and 18 “can be manufactured from like or different materials.” Ex-1007, 12:56-57. A POSITA would have understood that titanium is a machinable material. Ex-1002 ¶¶326-327. Moreover, a POSITA would have understood that using a machinable titanium material such as a titanium alloy in Schröder's finger-ring would have been both obvious and preferable over other materials because a machinable titanium material would have, for example, better corrosion or abrasion resistance, higher strength (and strength to weight ratio), and better appearance. Ex-1002 ¶328. Furthermore, a machinable titanium material is a non-ceramic material. Ex-1002 ¶328.

- d. **Claim 5: The wearable device according to claim 1 wherein the non-ceramic material is a machinable metallic material comprising one or more of titanium, steel, platinum, gold, palladium, silver or bronze or a gold based alloys.**

Schröder teaches Claim 5. Ex-1002 ¶329.

Schröder teaches that at least one of the finger-ring components can be made of, for example, “*silver, gold, titanium, steel.*” Ex-1007, 15:9-11; *see also id.*, 12:56-57 (components 16 and 18 “can be manufactured from like or different materials”). Schröder further teaches that “[a]n expedient material for the components 16, 18 is plastic or metal.” Ex-1007, 12:14-15. A POSITA would have understood that the metallic materials taught by Schröder are machinable and that using a machinable metallic material in Schröder’s finger-ring such as a titanium or steel alloy would have been both obvious and preferable over other materials for the same reasons discussed in Sections XII.C.2.b-XII.C.2.c. Ex-1002 ¶¶330-332.

- e. **Claim 8: The wearable electronic device according to claim 1, wherein the moldable filler material is selected from a group consisting of at least epoxy material, Polyethylene, Polyurethane, low temperature moldable material, Loctite M-31CL, alpha-epoxy, 1,2-epoxy, EpoxAcast® 650, Bisphenol S epoxy resin, Novolac epoxy resin, Aliphatic epoxy resin and Glycidylamine epoxy resin.**

Schröder teaches Claim 8. Ex-1002 ¶333.

Schröder teaches that the moldable filler material covering the electronic part and the cavity consists of at least Polyethylene or low temperature moldable

material. Specifically, Schröder teaches that the material used for the injection molding process described in Section XII.C.1.h, can be “*plastic* or a *resin*.” Ex-1007, 14:45-46. Schröder further teaches that the second component of the ring, which houses the electronic part, can be plastic, PET, or PVC. Ex-1007, 15:8-10, 15:14-15. Schröder additionally teaches that chip module 10 and antenna coil 8 (i.e., the electronic part in the cavity) may be “inserted into an injection mold in order to be overmolded.” Ex-1007, 14:50-53. A POSITA would have understood that PET and PVC are resins, which are curable, moldable, or workable at low temperatures such that they are “low temperature moldable material[s].” Ex-1002 ¶¶334-336. Thus, Schröder teaches Claim 8. Ex-1002 ¶337.

- f. Claim 9: The wearable electronic device according to claim 1, wherein the electronic part comprises one or more of a battery, an infrared transmitter, a microcontroller, a radio frequency transceiver, a temperature sensor and an infrared receiver.**

Schröder teaches Claim 9. Ex-1002 ¶338.

Schröder’s electronic part may include a radio frequency transmitter. Schröder teaches “an antenna coil 8 for a first frequency, e.g.[,] for an NFC application, as well as a chip module 10 which optionally also has an antenna coil for a second frequency.” Ex-1007, 5:14-16. A POSITA would have understood that these Schröder teachings correspond to and would require Schröder’s electronic part to include a radio frequency transceiver. Ex-1002 ¶339.

Schröder's electronic part may include a microcontroller. Schröder teaches that its finger-ring may include "a plurality of processors." Ex-1007, 2:53-56. Moreover, Schröder teaches that chip module 10 "has at least two physically mutually separate processors," which a POSITA would have understood to teach a microcontroller. Ex-1007, 10:60-61; Ex-1002 ¶¶340-341.

Schröder's electronic part may include a battery. Schröder teaches that its finger-ring "has an energy storage device, e.g., an accumulator or a battery," which is "connected to the chip module 10 in order to supply the chip module 10 with energy outside an electromagnetic field of a reader." Ex-1007, 11:46-50.

Schröder's electronic part may also include an infrared transmitter and receiver. Schröder teaches that the energy storage device can "operate alternative communication channels, such as wireless LAN, infrared, etc., which are likewise supported by the chip module 10." Ex-1007, 11:55-58; *see also id.*, 6:42-48 (an infrared diode may be connected to chip module 10 via an electronic circuit, which switches the ring protocol from NFC to "an infrared transfer"), 10:1-2 (infrared diode and infrared sensor are arranged "opposite each other"); Ex-1002 ¶¶342-344.

- g. Claim 12: The wearable electronic device according to claim 1, wherein the body part comprises a ring configured to be worn on a finger.**

Schröder teaches Claim 12. Ex-1002 ¶¶345-353.

Schröder teaches that its biometric sensing device is “a finger-ring,” which “is worn by a user e.g., permanently on the finger.” Ex-1007, 2:60-64, 3:61-62; *see also id.*, 9:54-10:9 (the finger-ring has a biometric sensor that captures “at least a partial vein image in the finger while the finger-ring 2 is being pushed over a finger”).

D. Ground 4: Claims 6-7 and 10-11 are obvious over Schröder in view of Yuen.

1. A POSITA would have been motivated to combine Schröder’s teachings with Yuen’s teachings and would have had a reasonable expectation of success.

A POSITA 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. Ex-1002 ¶¶354-355. Both are directed to wearable biometric sensing devices having similar structural components including, for example, inner and outer surfaces, a cavity, and an electronic component (such as batteries and microprocessors) within the cavity. *See, e.g.*, Ex 1007, 9:54-10:9, Figs. 6-10; Ex 1006, 12:50-52, Fig. 7.

Schröder’s finger-ring includes a “recess” (i.e., cavity) within at least one of its components (16, 18) where an electronic part (e.g., chip module 10 and/or inlay 12) is inserted. Ex-1007, 12:10-12, 12:26-32, 15:26-28. Schröder further teaches using injection-molding to cover the electronic part and cavity with a resin or plastic to form “a ring-shaped body.” Ex-1007, 14:38-49. Yuen’s device also includes a

cavity that houses an electronic part (e.g., optical sensors with LEDs and a photodetector) and explicitly teaches that the electronic part is “pressed or secured to the housing surface such that the optical components are flush to the housing surface.” Ex-1006, 12:42-45. Moreover, Yuen teaches an optical transparent layer that covers the electronic part and cavity of the device, which “may be formed through in-mold labeling or ‘IML.’” Ex-1006, 2:44-45. Yuen further teaches that “the circuitry related to emitting and receiving light may be disposed in the interior of the device housing and underneath a plastic or glass layer (for example, painted with infrared ink) or an infrared lens which permits infrared light to pass but not light in the human visual spectrum.” Ex-1006, 10:63-11:1. As a result, “the light transmission is invisible to the human eye.” Ex-1006, 11:1-2.

A POSITA would have been motivated to attach the electronic part in Schröder’s finger-ring at the bottom of the cavity, as Yuen explicitly teaches, because it would provide, for example, a higher mechanical rigidity reducing the likelihood for relative motion between the body part and electronic part, less variable sensor reading, reduction of noise at least because of decreased pathways for “stray” light, vibration tolerance, and damage protection for the device. Ex-1002 ¶356; *see DyStar Textilfarben GmbH v. C.H. Patrick Co.*, 464 F.3d 1356, 1368 (Fed. Cir. 2006) (making things stronger, cheaper, lighter, smaller, more durable, or more efficient are universal motivators to combine/modify prior art). Schröder teaches that the

biometric sensor should capture “at least a partial vein image in the finger while the finger-ring 2 is being pushed over a finger.” Ex-1007, 9:62-66. Yuen teaches the desirability for “light source(s) and/or associated detector(s)” to be “close to the skin of the user (i.e., with little to no gap between the skin side of the device and the juxtaposed surface of the skin of the user)” (Ex-1006, 12:24-35) because it “may increase the quality of the cardiac signal of interest.” Ex-1006, 13:54-62; *see also id.*, 14:25-32; Ex-1002 ¶356. Additionally, it was known to a POSITA at the time of the invention that electronic devices including wearable electronic devices are vulnerable to shock, damage, and vibrations, for example, if they are dropped or hit against hard surfaces. Ex-1002 ¶356. Attaching the electronic part to the bottom of the cavity of the device would have been an obvious design choice to mitigate extreme vibrations and damage to the device. Ex-1002 ¶356.

A POSITA would have also been motivated to include an ink, as explicitly taught by Yuen, with Schröder’s moldable filler material because it would prevent stray light and focus the emission/receiving of sensing light to specific regions on the sensors of the device (e.g., the infrared transmitter and infrared receiver regions), resulting in a more accurate reading from the sensors. Ex-1002 ¶357. A POSITA would have been motivated to include an ink with Schröder’s moldable filler material that allows preferential transmission of infrared light such that the ink increases a value of transmitted infrared light intensity divided by transmitted visible

light intensity, as taught by Yuen, for similar reasons; namely, because it would allow the sensors of the device to select which wavelengths to transmit/receive sensing light on and which wavelengths to filter out, thus enabling a higher quality reading from the sensors. Ex-1002 ¶357. For example, Yuen teaches that selectively transmitting “light having one or more specific or predetermined wavelengths with higher efficiency than others, thereby acting as a bandpass filter,” may “improve the signal of a specific physiological data type.” Ex-1006, 11:14-21. A POSITA would thus have understood that it would have been desirable for certain regions of Schröder’s finger-ring surface to be opaque to certain sensing light wavelengths so that the sensors of the device know exactly what wavelengths are being transmitted and can then accurately calculate the desired properties that the sensors are trying to measure (e.g., oxygen blood flow, vein texture, etc.) from the wavelengths that are received while filtering out the undesirable wavelengths. Ex-1002 ¶¶357-363.

A POSITA would have had a reasonable expectation of success in combining Schröder and Yuen. Ex-1002 ¶364. Schröder and Yuen are analogous prior art as they both involve biometric sensing devices having similar structural components such as inner and outer surfaces and a cavity housing an electronic part. Ex-1002 ¶364. Moreover, a POSITA would have understood that the electronic components of Schröder and Yuen’s biometric sensing devices are similar such that they are programmable using standard processors and are interchangeable regardless of

whether the devices are in the form of, for example, a toe band or a finger-ring. Ex-1006, 24:35-40; Ex-1002 ¶364. A POSITA would have understood, therefore, that these references disclose interrelated teachings based on routine technologies that would have been amenable to various well-understood and predictable combinations to provide more features and enhance user interest. Ex-1002 ¶364.

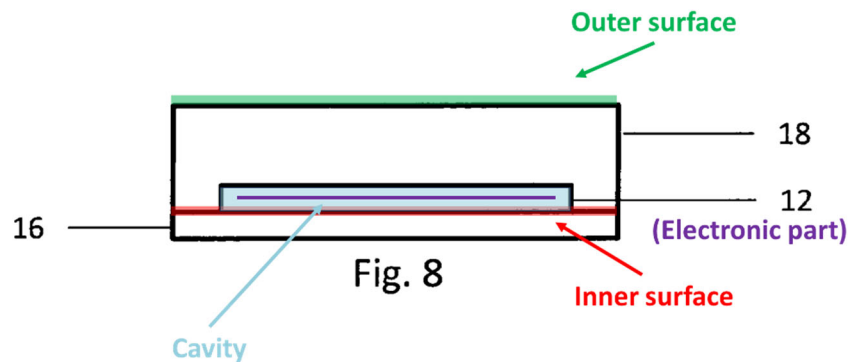
2. Dependent Claims 6-7 and 10-11

- a. **Claim 6: The wearable electronic device according to claim 1, wherein the electronic part is attached to the [at least one] cavity [at] a bottom of the [at least one] cavity.⁹**

Schröder in view of Yuen (“Schröder-Yuen”) teaches Claim 6. Ex-1002 ¶365.

As discussed in Ground 3 (Sections XII.C.1.f-XII.C.1.g), Schröder teaches that the electronic part (e.g., inlay 12 (purple)) is arranged in the cavity (blue). Ex-1007, 12:10-12, 12:26-32, Fig. 8.

⁹ In the *Circular* litigation, where PO asserted the ’833 Patent against an unrelated party, PO argued and the Court stated that Claim 6 is not indefinite and should read “the at least one cavity at a bottom of the at least one cavity.” See Ex-1021, 2. For purposes of this Petition only, Petitioner adopts the Court’s construction of Claim 6 from the *Circular litigation*, but by doing so, Petitioner does not intend to, and does not, waive any argument that Claim 6 is indefinite in any district court litigation against PO.



Schröder teaches that “inlay 12 itself consists of a preferably flexible carrier material, e.g., PET, Kapton, etc.” Ex-1007, 12:28-29. Because inlay 12 consists of a flexible carrier material such as Kapton, which is the material of a flexible printed circuit board, a POSITA would have understood that inlay 12 would be attached to the bottom of the cavity to enable a higher mechanical rigidity reducing the likelihood for relative motion between the body part and electronic part, less variable sensor reading, reduction of noise at least because of decreased pathways for “stray” light, vibration tolerance, and damage protection for the device. Ex-1002 ¶¶366-367. Attaching inlay 12 to the bottom of the cavity would have been an obvious design choice to mitigate extreme vibrations and damage to the device. Ex-1002 ¶367.

To the extent that Schröder does not explicitly teach attaching the electronic part to the bottom of the cavity, this is taught by Yuen. Ex-1002 ¶368. As discussed above at Ground 1 (Section XII.A.2.e), a POSITA would have understood that the bottom of the cavity is the end of the cavity that is away from the inner (skin-side)

surface of the device. Ex-1002 ¶368. Figure 7C of the '833 Patent, depicted below, is consistent with this understanding, as it shows the electronic part 314 (purple) attached to the end of the cavity (blue) away from the inner (skin-side) surface 110 (red) of the device. Ex-1001, Fig. 7C; Ex-1002 ¶368.

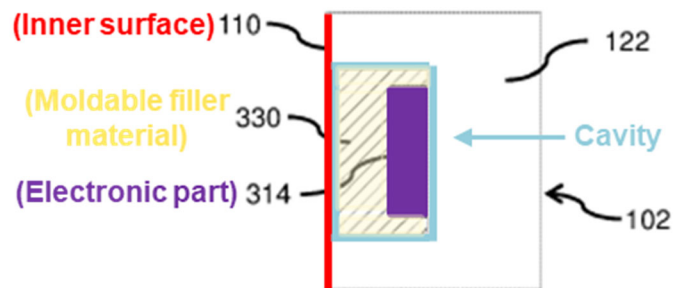
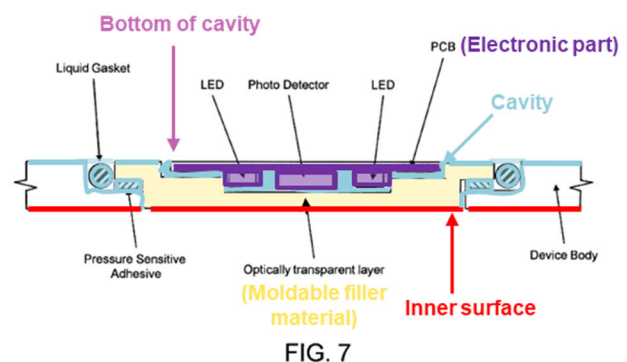
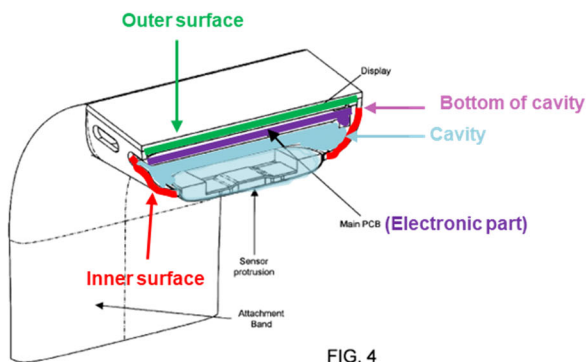


FIG. 7C

Yuen teaches that the electronic part (i.e., the main PCB and any LEDs and/or photodetectors positioned on it (Ex-1006, 2:38-39)) is attached to the bottom of the cavity, i.e., away from the inner (skin-side) surface of the biometric monitoring device. Ex-1002 ¶369. Yuen teaches that the optical sensors including the LEDs and photodetector are positioned “on an interior or skin side of the biometric monitoring device (i.e., a side whereby the surface of the device contacts, touches and/or faces the skin of the user (hereinafter ‘skin side’).” Ex-1006, 9:57-61; *see also id.*, 12:55-61. The LEDs/photodetector are further positioned “on a flexible or pliable substrate,” such as a flexible PCB, which allows the inner surface of the device to adapt to the shape of the user’s appendage (for example, arm, wrist, ankle

or leg) that the device is secured to so that there is “little to no gap between the skin side of the device and the juxtaposed surface of the skin of the user[.]” Ex-1006, 12:24-42. Yuen teaches that “optical components of differing heights may be mounted to different ‘fingers’” of the flexible PCB “and pressed or secured to the housing surface such that the optical components are flush to the housing surface.” Ex-1006, 12:42-45.

A POSITA would have understood, as depicted in Yuen’s Figures 4 and 7, that the electronic part (purple) is attached to the cavity (blue) at the bottom of the cavity, i.e., away from the inner surface. Ex-1006, Figs. 4 (depicting a cross-sectional “through the electronics package” (PCB)), 7 (depicting a cross-sectional view of the PPG sensor with the LEDs and photodetector positioned on the PCB); Ex-1002 ¶370. For example, Figure 4 shows that the main PCB is located and attached to the base (bottom) portion of the cavity (blue). Figure 7 shows that the main PCB (including the LEDs and photodetector positioned on it) are located and attached to the base (bottom) portion of the cavity (blue). Ex-1002 ¶¶370-375.



A POSITA would have been motivated to combine the teachings of Schröder and Yuen and would have had a reasonable expectation of success in doing so for the same reasons discussed in Section XII.D.1. Ex-1002 ¶376.

- b. Claim 7: The wearable electronic device according to claim 6, comprising one or more of a sticker, a tape or glue that attaches the electronic part to the at least one cavity at a bottom of the at least one cavity.**

Schröder-Yuen teaches Claim 7. Ex-1002 ¶377. As discussed in the previous section, the Schröder-Yuen combination teaches that the electronic part is attached to the cavity at the bottom of the cavity. *Id.*

Schröder teaches that a glue is used to attach Schröder's electronic components, such as the chip module or the carrier foil, to the bottom of the cavity. Specifically, Schröder teaches that chip module 10 may be permanently connected “to the contacts of the inlay 12, e.g.[,] by soldering, crimping, gluing, etc.” Ex-1007, 9:13-15; *see also id.*, 15:15-18 (“[t]he second component has arranged therein the chip module 10 and the antenna coil 8 and possibly at least one further electronic device, e.g.[,] a display”), 15:26-28 (“the carrier can also be connected firmly to the second component, e.g.[,] by means of a glue”); Ex-1002 ¶378.

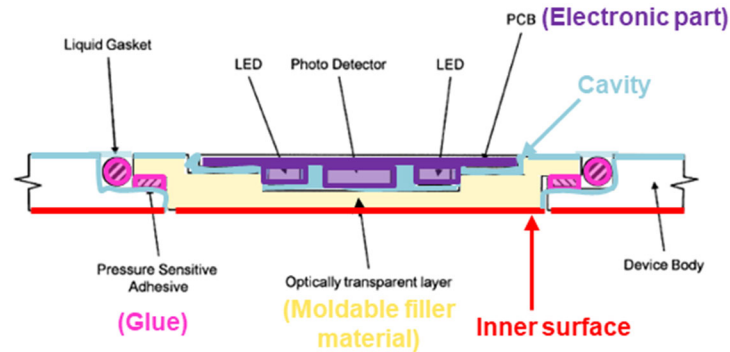
- c. Claim 10: The wearable electronic device according to claim 9, wherein the moldable filler material comprises an ink and is configured to cover at least an area other than the infrared transmitter and the infrared receiver within the at least one cavity.**

Schröder-Yuen teaches Claim 10. Ex-1002 ¶379.

Schröder teaches that its finger-ring incorporates “security elements ... into the surface,” including, for example, “fluorescent or phosphorescent inks, optically variable inks, color gradations, e.g., gradients, iridescent print, intaglio print,” or “transparent regions.” Ex-1007, 9:28-34. A POSITA would have found it obvious to also incorporate an ink into Schröder’s moldable filler material in order to achieve particular optical transmission, reflection, or absorption properties. Ex-1002 ¶¶380-381.

This limitation is also taught by Yuen for the reasons discussed in Ground 1 (Section XII.A.2.i). Yuen teaches that the moldable filler material comprises an ink and covers an area between the optical components and the inner (skin-side) surface of the cavity. As depicted in Figure 7, Yuen teaches an optical transparent layer (yellow), which “may be formed through in-mold labeling or ‘IML.’” Ex-1006, 2:44-45, Fig. 7. Yuen teaches that the device may include a material placed on the inner (skin-side) surface that “includes high reflectivity characteristic—for example, polished stainless steel, *reflective paint*, and polished plastic,” which allows light to be scattered and/or reflected “off the skin side of the device ... back into the skin.” Ex-1006, 15:15-21. Yuen teaches that this material improves SNR by effectively increasing “the input light signal” as compared to a non-reflective device surface. Ex-1006, 15:21-23. Yuen further teaches that “the circuitry related to emitting and receiving light may be *disposed in the interior of the device housing* and underneath

a plastic or glass layer (for example, *painted with infrared ink*) or an infrared lens which permits infrared light to pass but not light in the human visual spectrum.” Ex-1006, 10:63-11:1.



A POSITA would have understood that the infrared ink taught by Yuen would be applied to the optically transparent layer (yellow) within the cavity (blue), as depicted in Figure 7, where it is shown to cover at least an area other than that corresponding to the LEDs and the photodetector. Ex-1002 ¶¶382-384.

A POSITA would have been motivated to combine the teachings of Schröder and Yuen and would have had a reasonable expectation of success in doing so for the same reasons discussed in Section XII.D.1. Ex-1002 ¶385.

- d. **Claim 11: The wearable electronic device according to claim 1, wherein the moldable filler material comprises an ink that increases a value of transmitted infrared light intensity divided by transmitted visible light intensity.**

Schröder-Yuen teaches Claim 11. Ex-1002 ¶386.

Schröder teaches that its finger-ring incorporates “security elements ... into the surface,” including, for example, “fluorescent or phosphorescent inks, optically variable inks, color gradations, e.g.,[.] gradients, iridescent print, intaglio print,” or “transparent regions.” Ex-1007, 9:28-34. A POSITA would have found it obvious to also incorporate an ink into Schröder’s moldable filler material in order to achieve particular optical properties that increases a value of transmitted infrared light intensity divided by transmitted visible light intensity. Ex-1002 ¶387.

This limitation is also taught by Yuen for the reasons discussed in Ground 1 (Section XII.A.2.j). Yuen teaches that the moldable filler material comprises an ink that allows preferential transmission of infrared light such that the ink increases a value of transmitted infrared light intensity divided by transmitted visible light intensity. In particular, Yuen teaches that “the circuitry related to emitting and receiving light may be disposed in the interior of the device housing and underneath a plastic or glass layer (for example, *painted with infrared ink*) or an infrared lens *which permits infrared light to pass but not light in the human visual spectrum.*” Ex-1006, 10:63-11:1. As a result, “the light transmission is invisible to the human eye.” Ex-1006, 11:1-2. In effect, a POSITA would have understood that the infrared ink taught by Yuen increases the ratio of transmitted infrared light intensity to transmitted visible light intensity, as claimed, because it permits infrared light to

pass through but not light that is visible to the human eye, thus decreasing the denominator and increasing the ratio. Ex-1002 ¶¶388-390.

A POSITA would have been motivated to combine the teachings of Schröder and Yuen and would have had a reasonable expectation of success in doing so for the same reasons discussed in Section XII.D.1. Ex 1002 ¶¶391-395.

XIII. THE BOARD SHOULD NOT USE ITS DISCRETION TO DENY INSTITUTION UNDER *FINTIV*.

The Board should decline to exercise its discretion to deny institution under 35 U.S.C. §314(a) because while there is a pending declaratory judgment action between PO and Petitioner, there are no invalidity claims and therefore no overlap with this petition. Should the circumstances regarding validity change, Petitioner will respectfully request leave to brief any discretionary denial issues, to the extent raised.

XIV. CONCLUSION

Petitioner requests institution of IPR for Claims 1-12 of the '833 Patent based on each of the grounds in this Petition.

Respectfully Submitted,

/s/ William M. Fink

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CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. §42.24(d), Petitioner certifies that this petition includes 12,417 words, as measured by Microsoft Word, exclusive of the table of contents, mandatory notices under §42.8, certificates of service, word count, and exhibits.

CERTIFICATE OF SERVICE (37 C.F.R. §42.6(e)(1))

The undersigned hereby certifies that the above document was served on May 31, 2024, by filing this document through the Patent Trial and Appeal Board P-TACTS System, as well as delivering a copy via express mail upon the following attorneys of record for the Patent Owner:

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