

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ULTRAHUMAN HEALTHCARE PVT. LTD, ULTRAHUMAN HEALTHCARE
SP LLC, and ULTRAHUMAN HEALTHCARE LTD.,
Petitioners

v.

OURARING, INC.,
Patent Owner.

Case No. IPR2025-00411
U.S. Patent No. 11,868,178

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 11,868,178**

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LIST OF EXHIBITS¹

Ex. No.	Description
Ex-1001	U.S. Patent No. 11,868,178 (“the ’178 Patent”)
Ex-1002	Declaration of Dr. Brian W. Anthony
Ex-1003	Curriculum Vitae of Dr. Brian W. Anthony
Ex-1004	Prosecution History of the ’178 Patent (Application No. 18/323,385)
Ex-1005	U.S. Patent Publication No. 20120016245 to Niwa (“Niwa”)
Ex-1006	U.S. Patent No. 8,954,135 to Yuen (“Yuen”)
Ex-1007	U.S. Patent No. 10,303,867 to Schröder (“Schröder”)
Ex-1008	Certified Translation of DE 102013012339.9 to Schröder
Ex-1009	Original DE 102013012339.9 to Schröder
Ex-1010	U.S. Patent Publication No. 20140244009 to Mestas (“Mestas”)
Ex-1011	U.S. Provisional Patent Application No. 61/768,279 to Mestas
Ex-1012	U.S. Patent No. 8,700,111 to LeBoeuf (“LeBoeuf”)
Ex-1013	U.S. Patent Publication No. 20120218184 to Wissmar (“Wissmar”)
Ex-1014	INTENTIONALLY LEFT BLANK
Ex-1015	INTENTIONALLY LEFT BLANK
Ex-1016	INTENTIONALLY LEFT BLANK

¹ Four-digit pin citations that begin with 0 are to the branded numbers added in the bottom right corner of the exhibits. All other pin citations are to original page, column, paragraph, or line numbers.

Ex. No.	Description
Ex-1017	INTENTIONALLY LEFT BLANK
Ex-1018	INTENTIONALLY LEFT BLANK
Ex-1019	INTENTIONALLY LEFT BLANK
Ex-1020	Claim Mapping Table
Ex-1021	INTENTIONALLY LEFT BLANK
Ex-1022	Parallel Citations (Schröder '867 to Certified Translation of DE 102013012339.9)
Ex-1023	<i>Dynamic Drinkware</i> -type analysis for Mestas
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

Ultrahuman Healthcare Pvt. Ltd, Ultrahuman Healthcare SP LLC, and Ultrahuman Healthcare Ltd. (collectively, “Petitioners”) request *inter partes* review (“IPR”) of Claims 1-10 and 12-18 of U.S. Patent No. 11,868,178 (“the ’178 Patent”) (Ex-1001), currently assigned to Ouraring Inc. (“PO”).

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

Real Parties-in-Interest Under 37 C.F.R. § 42.8(b)(1): Petitioners identify the following real parties-in-interest: Ultrahuman Healthcare Pvt. Ltd, Ultrahuman Healthcare SP LLC, and Ultrahuman Healthcare Ltd.

Related Matters Under 37 C.F.R. § 42.8(b)(2):

PO has asserted the ’178 Patent against Petitioners Ultrahuman Healthcare Pvt., Ltd. and Ultrahuman Healthcare Ltd. in *Oura Health Oy et al. v. Ultrahuman Healthcare Pvt. Ltd., et al.*, No. 23-cv-00396 (E.D. Tex.) (the “Ultrahuman Action”); PO has also asserted the ’178 Patent against Circular SAS, Guangdong Jiu Zhi Technology Co. Ltd., RingConn LLC, and Petitioners Ultrahuman Healthcare Ltd., Ultrahuman Healthcare Pvt., Ltd., and Ultrahuman Healthcare SP LLC in *Smart Wearable Devices, Systems, and Components Thereof*, Inv. No. 337-TA-1398 (Int’l Trade Comm’n). PO has asserted the ’178 Patent against RingConn in *Ouraring, Inc. v. RingConn LLC*, No. 24-cv-01020 (D. Del.).

Samsung filed a suit against PO seeking a declaratory judgment of

noninfringement of the '178 Patent: *Samsung Electronics Corporation, Ltd. et al v. Ōura Health Oy et al.*, No. 24-cv-03245 (N.D. Cal. filed May 30, 2024).

For the Board's convenience, Petitioners note that Samsung also has challenged U.S. Patent Nos. 11,868,179; 11,599,147; 10,893,833; 11,874,702; 11,874,701; 10,842,429; 10,281,953; 10,139,859; and 9,582,034—all either owned by PO or a related entity—in the following proceedings: PGR2024-00039; PGR2024-00038; IPR2024-01080; IPR2024-01079; IPR2024-01078; IPR2024-01077; PGR2024-00031; IPR2024-00930; IPR2024-00929; IPR2024-00928.

Lead and Back-Up Counsel Under 37 C.F.R. § 42.8(b)(3):

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Service Information Under 37 C.F.R. § 42.8(b)(4): Please address all correspondence and service to the lead and backup counsel at the addresses listed above. Petitioners consent to electronic service by E-mail at docketing@cwt.com.

III. FEE AUTHORIZATION

The PTO is authorized to charge any fees due during this proceeding to Deposit Account No. 50-4387.

IV. GROUNDS FOR STANDING (37 CFR 42.104(a))

The '178 Patent is available for IPR, and Petitioners are not barred or estopped from requesting one on these grounds.

V. PRECISE RELIEF REQUESTED

Petitioners request review and cancellation of Claims 1-10 and 12-18 as unpatentable based on the following grounds supported by a declaration from Dr. Brian W. Anthony. Ex-1002 ¶¶1-131; Ex-1003.

Ground	Summary
1	Claims 1-3 and 17-18 are obvious over Schröder (Ex-1007).
2	Claims 1-3 and 13-16 are obvious over Schröder in view of Niwa (Ex-1005).
3	Claims 3 and 12 are obvious over Schröder in view of Mestas (Ex-1010).
4	Claims 1, 4-10 and 13-16 are obvious over Schröder in view of Yuen (Ex-1006).
5	Claims 1-3 and 13-18 are obvious over Niwa.
6	Claims 1-3 and 13-18 are obvious over Niwa in view of Schröder.
7	Claim 12 is obvious over Niwa in view of Mestas.
8	Claim 12 is obvious over Niwa-Schröder in view of Mestas.
9	Claims 4-10 are obvious over Niwa in view of Yuen.
10	Claims 4-10 are obvious over Niwa-Schröder in view of Yuen.

VI. '178 PATENT

Independent Claim 1, from which all other claims depend, recites “a finger-worn wearable ring device” with an external and internal housing component, a battery, a printed circuit board (“PCB”), and one or more sensors. The battery and PCB are located in a cavity “formed between the internal housing component and the external housing component.” The '178 Patent claims are obvious.

VII. PROSECUTION HISTORY

The '178 Patent was filed May 24, 2023, and claims priority through a series of continuation and divisional applications to U.S. Application Serial No. 14/556,062, filed November 28, 2014. Ex-1001. It also claims priority to two provisional applications, U.S. Application No. 62/006,835, filed June 2, 2014, and No. 61/910,201, filed November 29, 2013.

The patent was granted prioritized examination under 1.102(e)(1) and a Notice of Allowance issued November 15, 2023. Ex-1004, 1307, 1309.

This Petition presents arguments and prior art not considered during prosecution, and nothing precludes consideration under 35 U.S.C. §325(d). The claims are invalid as obvious.

VIII. LEVEL OF ORDINARY SKILL IN THE ART

A person of ordinary skill in the art at the relevant time (“POSA”) 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 POSA 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 ¶¶18-22.

IX. PRIORITY DATE

For this Petition, Petitioners assume that the ’178 Patent is entitled to a priority date of November 29, 2013 and apply AIA-35 U.S.C. §102.

X. CLAIM CONSTRUCTION

No term requires express construction for the purposes of this Petition. 37 C.F.R. §42.100(b); CTPG, 44; Ex-1002 ¶¶15-17.

XI. PRIOR ART

A. 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 is prior art. 35 U.S.C. §102(a)(2).² Schröder’s German counterpart is essentially identical to the U.S. filing. 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.³ Ex-1002 ¶134. Because the 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 §365. 35 U.S.C. §102(a)(2) and (d)(2); MPEP §2152. Schröder teaches a biometric sensing, “finger-ring” device. Ex-1007, 3:61-63; Fig. 1.

B. Niwa (Ex-1005)

Niwa (U.S. Patent Publication No. 2012/0016245) was filed July 13, 2011, and published January 19, 2012. Niwa is prior art. §§102(a)(1)-(2). Niwa teaches a wearable electronic sensing device with light-emitting and light-receiving components to acquire a plethysmogram—e.g., information relating to blood volume—of the wearer. Ex-1005, ¶¶29, 62, 120, 147, 192, 194-195; Figs. 3, 22, and 26.

² Petitioners are unaware of any facts supporting an exception under §102(b) for any prior art.

³ Parallel citations for Schröder ’867 citations are provided in Ex-1022.

C. Mestas (Ex-1010)

Mestas (U.S. Pat. Pub. No. 2014/0244009) was filed February 21, 2014, claiming priority to Provisional App. No. 61/768,279, filed February 22, 2013. Mestas was published August 28, 2014, and is prior art to the '178 Patent. §102(a)(2). Mestas's provisional application is essentially identical to the published application. *Compare* Ex-1010, *with* Ex-1011. The figures and the specification are identical.⁴ Ex-1002 ¶142. Mestas's disclosures were thus effectively filed as of Mestas's provisional application, and Mestas is thus available as prior art as of its provisional filing date. 35 U.S.C. §102(d)(2).⁵ Mestas teaches a wearable electronic device (arm-band or a wrist-band) and can be used to monitor user biometrics such as heart rate. Ex-1010 ¶148; *id.*, ¶¶143, 151, 164, 168, 177, Figs. 14-16.

D. Yuen (Ex-1006)

Yuen (U.S. Patent No. 8,954,135) was filed June 24, 2013 and issued February

⁴ The only difference is the Mestas published application enumerates all paragraphs in the Brief Description of Drawings; the provisional does not. *Compare* Ex-1010 ¶¶9-137, *with* Ex-1011 ¶7.

⁵ *Penumbra, Inc. v. RapidPulse, Inc.*, IPR2021-01466, Paper 34 (PTAB Mar. 10, 2023) (precedential as to §II.E.3). For completeness, a pre-AIA Dynamic Drinkware analysis is included in Ex-1023.

10, 2015. Yuen is prior art. §102(a)(2). Yuen teaches a wearable electronic device that monitors physiological and/or environmental data from or on the wearer. Ex-1006, 1:19-27, 2:29-39, 3:52-62, 6:57-7:6, 9:15-35, 10:14-25, 12:18-61, 14:42-49, 21:14-45, 28:40-49, Figs. 5, 15.

XII. §325(d)

Petitioners submit herewith a Motion to Consolidate or Join with PGR2024-00030. In view of the Decision Granting Institution of Post-Grant Review of PGR2024-00030 (PGR2024-00030, Paper 9, 12-15), the Board should also decline to deny this Petition.

XIII. GROUNDS

A. Ground 1: Claims 1-3 and 17-18 are obvious over Schröder in view of knowledge of a POSA.

1. Claim 1

a. 1[pre]: A finger-worn wearable ring device, comprising:

Schröder teaches 1[pre], to the extent limiting. Ex-1002 ¶¶149-151.

Schröder's finger-worn wearable ring device is an "external secure unit" worn as a "finger-ring." Ex-1007, 2:60-65, Fig. 1.

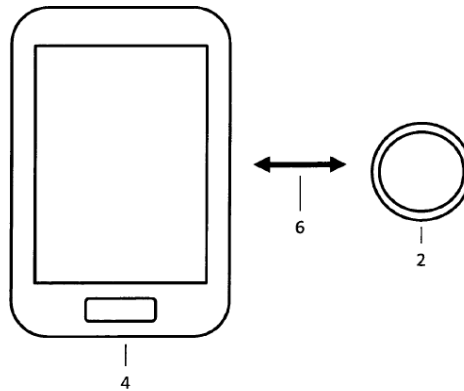


Fig. 1

- b. **1[a]: an external housing component defining an outer circumferential surface of the finger-worn wearable ring device;**

Schröder teaches 1[a]. Ex-1002 ¶¶152-154.

Schröder’s “finger-ring” has an external housing that defines the outer circumferential surface. Ex-1002 ¶¶153-154. Schröder’s “finger-ring” consists of “two ring halves 16 and 18.” Ex-1007, 12:7-9. Shown in Figure 4, ring half 18 is the claimed external housing component (green) that defines an outer circumferential surface of the finger-worn wearable ring device because it is the side of Schröder’s “finger-ring” that is exposed to the outside environment. *Id.*

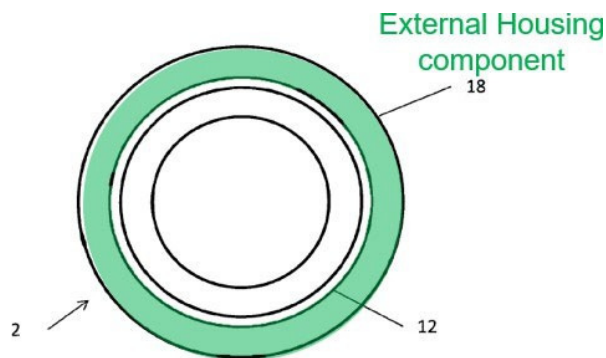


Fig. 4

- c. **1[b(i)]: an internal housing component defining an inner circumferential surface of the finger-worn wearable ring device, the internal housing component coupled with the external housing component,**

Schröder teaches 1[b(i)]. Ex-1002 ¶¶155-158.

Schröder teaches an internal housing component defining an inner circumferential surface. Ex-1002 ¶156. Schröder’s “finger-ring 2 is worn by a user, e.g., permanently on the finger.” Ex-1007, 3:61-62, 7:38-39, 10:52-56. Schröder’s “finger-ring” consists of “two ring halves 16 and 18.” *Id.*, 12:7-9. Shown in Figure 4, ring half 16 (green) is the internal housing component defining an inner circumferential surface of the finger-worn wearable ring device because it is the inside ring that contacts the user’s skin. Ex-1002 ¶156.

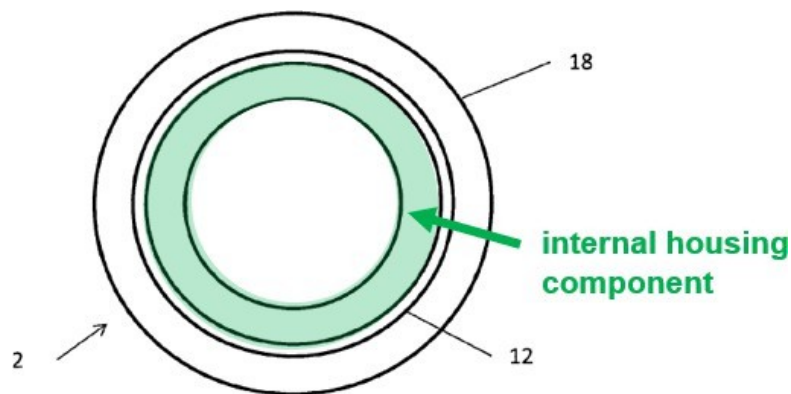


Fig. 4

Schröder’s internal housing component is coupled with the external housing

component to form the “finger-ring.” Schröder’s inner ring half 16 and outer ring half 18 “are interconnected by a suitable technology, e.g., by plugging, gluing, screwing, crimping, etc.” Ex-1007, 12:20-22, Fig. 5. Schröder’s coupling is illustrated by the abutting components 16 and 18 forming the “finger-ring” in Figure 5. Ex-1002 ¶157.

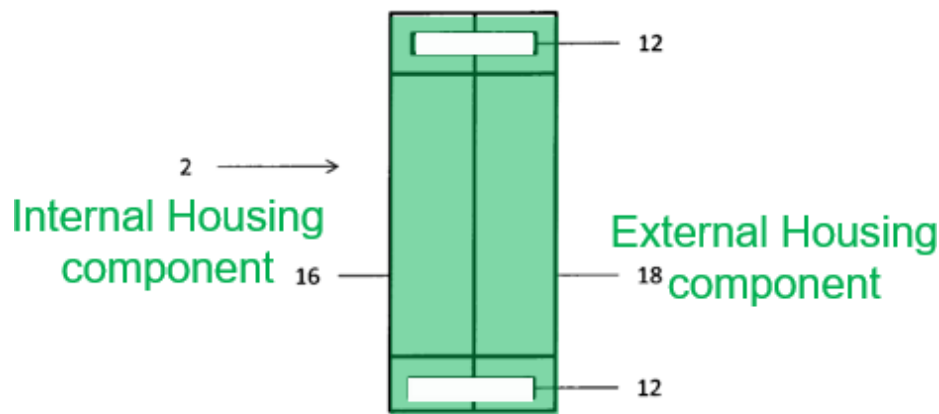


Fig. 5

- d. **1[b(ii)]: wherein at least a portion of the inner circumferential surface of the internal housing component is configured to contact a tissue of a user when the finger-worn wearable ring device is being worn by the user;**

Schröder teaches 1[b(ii)]. Ex-1002 ¶¶159-160. A POSA would have understood that Schröder’s internal housing component contacts the user’s tissue when the finger-worn wearable ring device is being worn. *Id*; see also Ex-1007, 3:61-62, 7:38-39, 10:52-56; Ex-1002 ¶160.

- e. **1[c]: a battery positioned within a cavity formed between the internal housing component and the external housing component, wherein the battery comprises a shape and size configured to fit within the cavity between the outer circumferential surface of the external housing component and the inner circumferential surface of the internal housing component, and wherein the battery extends through at least a first portion of the cavity of the finger-worn wearable ring device;**

Schröder teaches 1[c]. Ex-1002 ¶¶161-168.

Schröder’s “finger-ring” has a battery positioned within a cavity between the internal and external housing components. Ex-1002 ¶¶162-165. Schröder’s “finger-ring” consists of “two ring halves 16 and 18” with a recess so that “inlay 12 is inserted.” Ex-1007, 12:7-9; 8:56-57. Inlay 12 has a “chip module 10 with at least one antenna coil 8, with at least one further electronic device.” *Id.*, 12:61-65, 8:58-60 (“chip module 10 is inserted into a recess of the finger-ring 2”); Ex-1002 ¶¶165-168.



Fig. 7

Schröder teaches a battery positioned within a first portion of the cavity of the “finger-ring.” Ex-1002 ¶168. Schröder’s “finger-ring” has a battery “connected to

the chip module 10.” Ex-1007, 11:46-50, 11:58-61. Schröder’s battery is charged wirelessly “by means of the reader’s electromagnetic field.” *Id.*, 11:54-55. It would have been obvious that because the energy storage unit—i.e., battery—powers chip module 10 and chip module 10 resides in inlay 12, the battery is also positioned inside the ring. Ex-1002 ¶¶166-168. To fit inside the “finger-ring,” the battery must be configured in size and shape to fit within the cavity because it must be arranged between the internal and external housing components. *Id.* ¶¶166-168. The battery’s location within the cavity defines the “first portion” of the cavity because a battery necessarily takes up a portion of the cavity. *Id.* ¶168

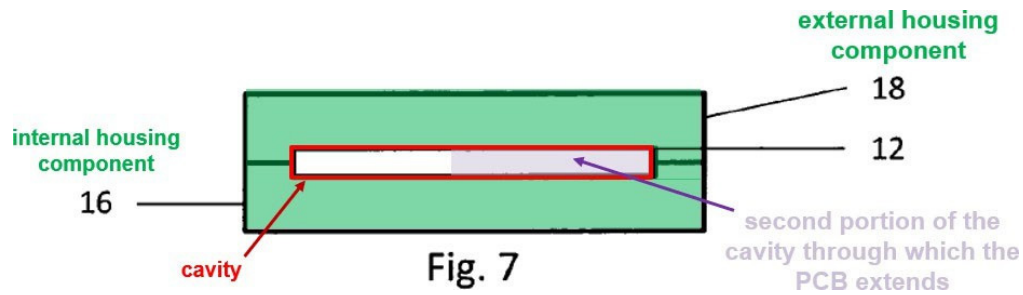
- f. 1[d]: a printed circuit board disposed between the internal housing component and the external housing component, wherein the printed circuit board extends through at least a second portion of the cavity of the finger-worn wearable ring device different from the first portion; and**

Schröder teaches 1[d]. Ex-1002 ¶¶169-176.

Schröder’s “finger-ring” has a PCB in the cavity between the internal and external housing components. *Id.* A POSA would have understood that a cavity exists between the internal and external housing components. §XIII.A.1.d; Ex-1002, ¶¶170-171. Schröder’s inlay 12 is explicitly arranged “in the interior of the finger-ring” and “serves as a carrier.” Ex-1007, 8:54-57, 12:61-65. Inlay 12 consists of “flexible carrier material” like PET and Kapton, which are common PCB materials.

Id., 12:28-29; Ex-1002 ¶171. A POSA would have understood that Schröder’s inlay corresponds to the claimed PCB disposed between the internal and external housings. Ex-1002 ¶171.

Schröder teaches a PCB that extends through a second portion of the cavity different than the first portion (where the battery is located). By existing inside a “finger-ring,” the battery is disposed in a portion of the cavity. A POSA would have understood that two solid components cannot simultaneously occupy the same space so that a portion occupied by any other component is different from the portion where the other resides. Ex-1002 ¶¶172-175. It would have been obvious that the PCB—existing within the “finger-ring”—extends through a “portion of the cavity” that is necessarily different from the “portion of the cavity” occupied by the battery. *Id.* ¶¶172-176. Figure 7 (cross-section) illustrates how a POSA would have understood that Schröder’s PCB extends through at least a second portion of a cavity (Schröder’s “recess,” light purple) between inner and outer housing components (green) but does not extend through the entire cavity of “finger-ring” 2 to allow space for other components. *Id.* ¶176.



- g. **1[e]: one or more sensors electrically coupled with the printed circuit board and the battery and configured to acquire data from the user through the internal housing component.**

Schröder teaches 1[e]. Ex-1002 ¶¶177-180.

Schröder’s “finger-ring” has a sensor electrically coupled to the PCB and battery to acquire user data. *Id.* ¶¶178-180. Schröder has “biometric sensors...integrated into the finger-ring” to “capture[] e.g., at least a partial vein image in the finger while the finger-ring 2 is being pushed over a finger.” Ex-1007, 9:62-10:4. A POSA would have understood that the sensor would be electrically coupled to the PCB and battery because the sensor needs power to operate. *Id.*, 9:60-62; Ex-1002 ¶178. Because the biometric sensor “captures” a finger vein image, the sensor “acquire[s] data from the user through the internal housing component” by acquiring information through the ring half 16 that touches the finger. Ex-1002 ¶¶178-180.

2. Claims 2-3 and 17-18

- a. Claim 2: The finger-worn wearable ring device of claim 1, wherein the first portion of the cavity of the finger-worn wearable ring device is non-overlapping with the second portion of the cavity of the finger-worn wearable ring device.**

Schröder teaches Claim 2. Ex-1002 ¶¶181-84.

Schröder teaches that the first portion of the cavity does not overlap with the second portion of the cavity of the finger-worn wearable ring device. *Id.* A POSA would have understood that there were only two ways to position the battery and PCB—i.e., position them within overlapping portions of the cavity or within non-overlapping portions of the cavity, and each would have been obvious to try. *Id.*, ¶¶183-184; *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007).

A POSA would have been motivated to design the first portion of the cavity that has the battery to not overlap with the portion of the cavity that has the PCB to have a thinner, more compact finger-worn wearable ring device that saves on material costs, reduces the volume of the cavity, and makes the ring more comfortable. *Id.* ¶184; *DyStar Textilfarben GmbH v. C.H. Patrick Co.*, 464 F.3d 1356, 1368 (Fed. Cir. 2006). The non-overlap of cavity portions is of ordinary skill. *KSR*, 550 U.S. at 421; Ex-1002 ¶¶183-184.

As with 1[c] and 1[d], Schröder teaches that the battery is located in a first portion of the cavity and the PCB is located in a different portion of the cavity. This

would have been an obvious design choice, as evidenced by Niwa. Niwa explicitly teaches that the PCB and battery do not overlap. §§XIII.B.2, XIII.E.3.a; Ex-1002 ¶¶207-213.

- b. Claim 3: The finger-worn wearable ring device of claim 1, wherein the first portion of the cavity of the finger-worn wearable ring device at least partially overlaps with the second portion of the cavity of the finger-worn wearable ring device.**

Schröder teaches Claim 3. Ex-1002 ¶¶185-188; §§XIII.A.1.e-f, XIII.A.2.a. A POSA would have also been motivated to design the first portion with the battery to partially overlap the portion having the PCB to reduce the risk of electrical components and the PCB losing mechanical or electrical connections to each other and to reduce the device's diameter. Ex-1002 ¶188; *DyStar*, 464 F.3d at 1368. The overlap of the portions of the cavity is of ordinary skill. *KSR*, 550 U.S. at 421; Ex-1002 ¶188. This also would have been an obvious design choice, as evidenced by Mestas. Ex-1002 ¶187, ¶¶242-45; §XIII.C.2.a.

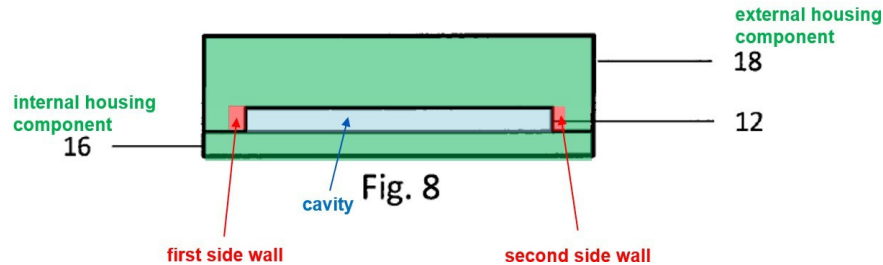
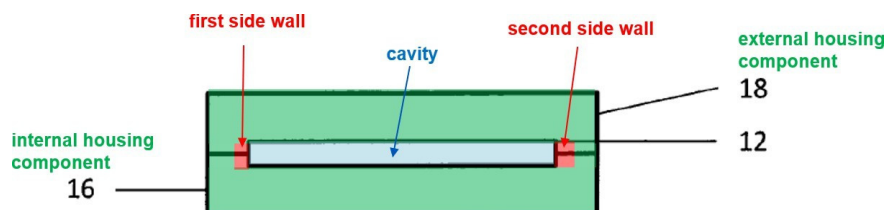
- c. **Claim 17: The finger-worn wearable ring device of claim 1, wherein the external housing component and the internal housing component define the cavity configured to at least partially surround the battery, and the printed circuit board, wherein one of the external housing component or the internal housing component comprises: a first side wall and a second side wall that extend between the internal housing component and the external housing component, wherein the cavity is defined at least in part by the outer circumferential surface, the inner circumferential surface, the first side wall, and the second side wall.**

Schröder teaches Claim 17. Ex-1002 ¶¶189-190.

The cavity of Schröder’s “finger-ring” is defined by the external and internal housing components. *Id.* ¶190. Schröder’s “finger-ring” has a cavity between the internal and external housing components that houses and thus surrounds Schröder’s inlay 12 (PCB) and battery. §XIII.A.1.e-f (1[c]-1[d]); Ex-1002 ¶¶162-165, 171, 190.

Schröder’s “finger-ring” has internal and external housing components that have a first and second side wall that extend between the internal and external housing components to further define the cavity. Ex-1002 ¶¶190. Ring halves 16 and 18 are manufactured by casting, milling, or embossing and “interconnected.” Ex-1007, 12:10-22. The ring halves may be U-shaped with inlay 12 being arranged between. *Id.*, 12:45-55. The U-shaped housing components are connected and thus form “side walls” (red) that extend from external housing component 18 to internal housing component 16 and surround the cavity (occupied by inlay 12). *Id.*, Fig.

7; Ex-1002 ¶180. Similarly, Figure 8's external housing portion 18 is a U-shape component and connects to internal housing component 16 and defines the cavity by surrounding inlay 12, therefore forming "side walls" (red). *Id.*

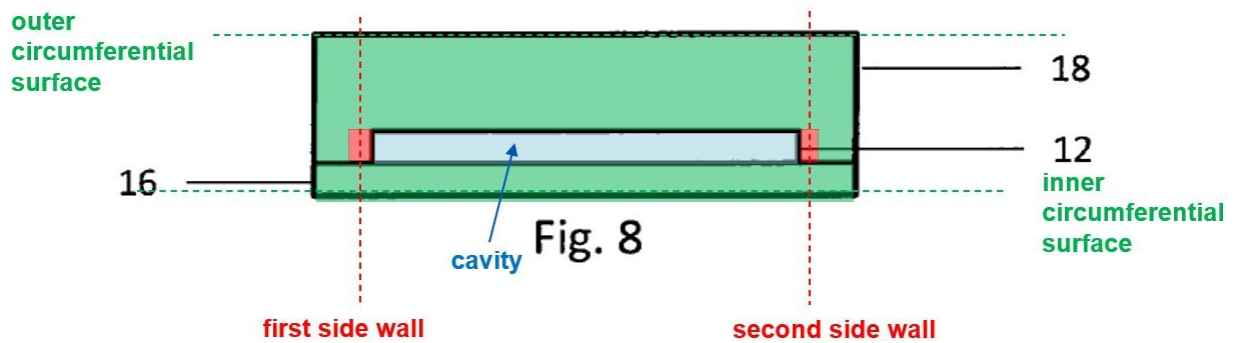
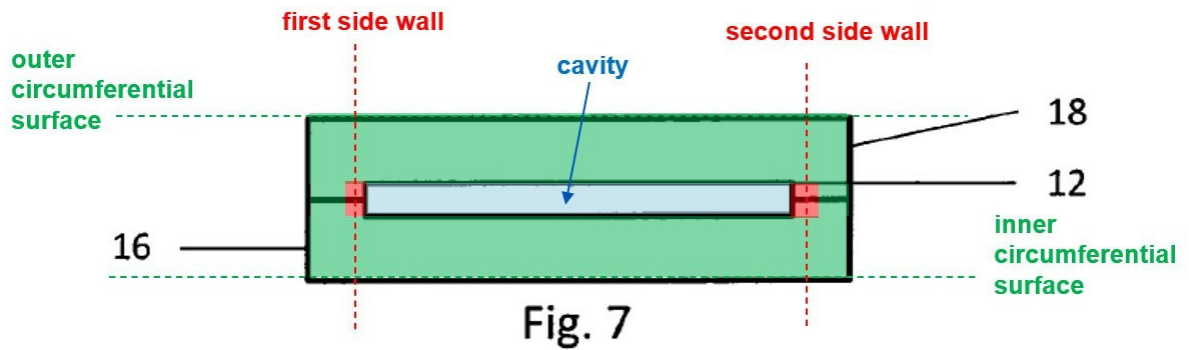


- d. **Claim 18: The finger-worn wearable ring device of claim 17, wherein the first side wall, the second side wall, or both, are substantially perpendicular to the inner circumferential surface, the outer circumferential surface, or both.**

Schröder teaches Claim 18. Ex-1002 ¶¶191-193.

Schröder's first and second side walls are substantially perpendicular to the inner and outer circumferential surfaces. *Id.* ¶¶192-193. The side walls are the part of the U-shaped components that extend from external housing component 18 to internal housing component 16 and surround the cavity. As shown in Figures 7-8, the side walls (red) are substantially perpendicular to the inner and outer

circumferential surfaces, i.e., outside surfaces of the internal and external housing components (green).



B. Ground 2: Claims 1-3 and 13-16 are obvious over Schröder in view of Niwa.

1. Motivation/Reasonable Expectation

A POSA would have been motivated to apply the teachings of Niwa to Schröder (“Schröder-Niwa”), and would have had a reasonable expectation of success in doing so because each relates to the same well-known technologies. Ex-1002 ¶¶194-198.

A POSA would have been motivated to combine Schröder with Niwa because they are analogous art and teach improvements to the same type of devices having similar structural components (inner and outer housing components), a cavity, and electronic components (battery and PCB) within the cavity. Ex-1007, 11:46-48 (battery), 12:26-42 (PCB), Figs. 4-10; Ex-1005 ¶¶67-68 (circuits and substrate), 194-95 (a PCB), 213 (battery), Figs. 22, 26-29. Schröder’s “finger-ring” includes a “recess” (cavity) within at least one of its components (16, 18) where an electronic part (chip module 10 and/or inlay 12) is inserted. Ex-1007, 12:10-32, 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. Niwa likewise teaches a cavity that houses electrical components. Ex-1005 ¶¶201, 205. Niwa further teaches a battery and a PCB arranged in non-overlapping portions of a cavity, as well as partially overlapping portions of a cavity. Ex-1005, Figs. 27, 28. Depending on the POSA’s design criteria, it would have been obvious

to implement either arrangement in Schröder. Ex-1002 ¶¶195-196.

Niwa further offers additional design and manufacturing benefits to Schröder’s “finger-ring.” Niwa explains that, for the comfort of the ring’s wearer, “it is desirable to restrain the largeness of the first unit 10 and the second unit 20 not to protrude from the third joint of the finger 2.” Ex-1005 ¶206. A POSA would have been motivated to avoid overlap between the first and second portions of the cavity for many reasons: material costs, ease of assembly, thermal management, or smaller form factor. Ex-1002 ¶196; Ex-1007, 3:9-11; Ex-1005 ¶206.

Niwa provides beneficial configurations for Schröder’s sensor. Ex-1002 ¶197. Schröder’s teachings involve methods of capturing vein information from the finger. Ex-1007, 8:30-53, 9:54-10:11. Niwa further teaches a sensor with multiple light emitting portions with different wavelengths and positioning. Ex-1005 ¶¶32, 34, 35. A POSA would have recognized that Niwa’s teachings, which discuss capturing pulse oximetry data, also indirectly involves capturing information about veins. Ex-1002 ¶¶58-61, 197. A POSA would have understood that both Schröder’s and Niwa’s techniques involve data collection from veins. This understanding would indicate that advances or techniques developed in one application (like pulse oximetry) could potentially inform or enhance methodologies in the other (like vein pattern biometrics), highlighting the interconnectedness of these imaging and sensing technologies in capturing venous information. It follows that it would have

been obvious to modify Schröder’s sensor based on Niwa’s teachings to emit different wavelengths from different light emitting components and/or place the light emitting components and photodetector at different positions. *Id.* ¶197. A POSA would have been motivated to make this modification to capture a broader range or more accurate data and better utilization of the limited space inside the “finger-ring.” *Id.*

A POSA would have had a reasonable expectation of success in combining Schröder and Niwa. *Id.* ¶198. A POSA would have understood that these wearable ring electronic devices, are restricted by form factors. *Id.* ¶¶72-73, 198. A POSA 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 smaller and more comfortable wearable devices. *Id.* ¶¶194-198.

2. Claim 1

a. 1[pre]-1[c], 1[e]

Schröder teaches Elements 1[pre]-1[c] and 1[e]. Ex-1002 ¶199; §XIII.A.1.

b. 1[d]

Schröder-Niwa also teaches 1[d]. Ex-1002 ¶¶200-206; §XIII.B.1.

Niwa’s finger ring has a PCB disposed between internal and external housing components. Ex-1002 ¶¶202-203. Niwa describes components and circuits that are

“mounted” onto the surface of a “substrate.” Ex-1005 ¶¶68, 69, 213. A POSA would have understood Niwa’s substrate to be a PCB because an “electrical connection” is “established between the surface and back side of the...substrate...by means of the through hole and the via hole.” Ex-1005 ¶214; *id.*, ¶194 (describing “FPC”); Ex-1002 ¶¶202-203.

Niwa’s PCB is disposed inside the ring. Shown in Figures 27 and 28 (cross-sections), Niwa’s ring housing 40 utilizes substrates in first unit 10 and second unit 20. Ex-1005 ¶¶194-95, 207. The claimed PCB corresponds to a substrate in Niwa because its substrate is a PCB disposed in a cavity and connects components and circuits. Ex-1002 ¶203.

Niwa’s PCB extends through at least a second portion of the cavity of the ring device different from the first portion. *Id.* ¶¶204-205. Figures 27-28 (cross-sections) show how a first portion (light blue) surrounding battery 24 (blue) in second unit 20 is different than a second portion (light purple) surrounding PCB 11 (purple). *Id.*

FIG.28

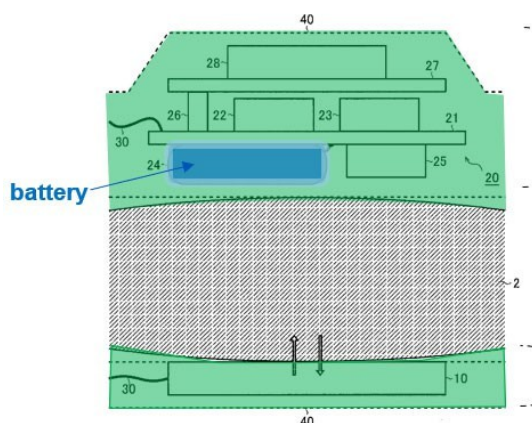
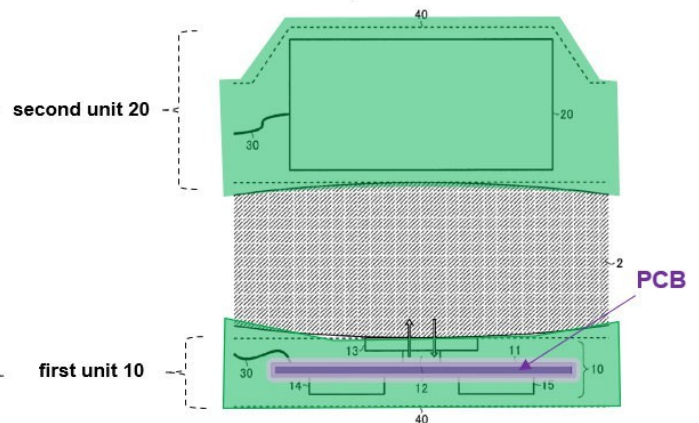
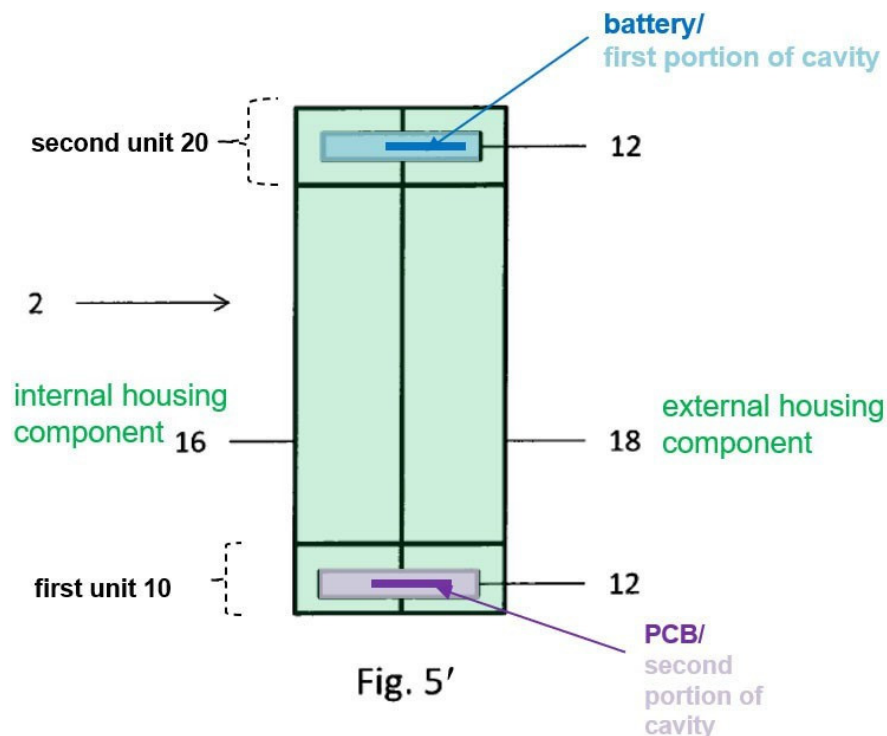


FIG.27



Niwa's first portion and second portion correspond with the respective locations of the battery and PCB. *Id.*

Moreover, Schröder's "finger-ring" combined with Niwa's PCB configuration has the battery and PCB in their respective portions of the cavity that are separate from each other. Modified Figure 5 illustrates the combination, with Schröder's "finger-ring" having the battery in the first portion of the cavity where second unit 20 would be in Niwa and the PCB in the second portion where a first unit would be in Niwa.



It would have been obvious to use Niwa's PCB configuration in Schröder as to separate a battery and PCB that are in the same ring housing. *Id.* ¶206.

3. Claims 2-3 and 13-16

a. Claim 2

Schröder-Niwa teaches Claim 2. Ex-1002 ¶¶208-211; §XIII.B.1.

A POSA would have found it obvious to design Schröder's first and second portions of the cavity to not overlap. *Id*; § XIII.A.2.a. *Id*. A POSA would have also been motivated to not have the first portion and the second portion of the cavity overlap because it was well-known, as taught in Niwa.

Shown in Figure 28 (cross-section), Niwa's finger ring type housing 40 (green) (disposed upon the wearer's finger 2) includes battery 24 (blue) in a first portion of the cavity (light blue) in second unit 20. Ex-1005 ¶¶193, 217; Ex-1002 ¶210. Shown in Figure 27 (cross-section) is substrate 11 (purple), which extends through a second portion of the cavity (light purple) in first unit 10. Ex-1002 ¶210; Ex-1005 ¶¶200, 207. Niwa's substrate is a PCB. Ex-1002 ¶¶202-203. Accordingly, Figures 27-28 illustrate a first portion of the cavity (light blue) with the battery (blue) that does not overlap with a second portion of the cavity (light purple) with the PCB (purple). *Id*. ¶210.

FIG.28

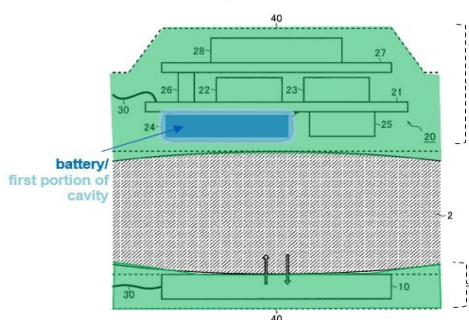
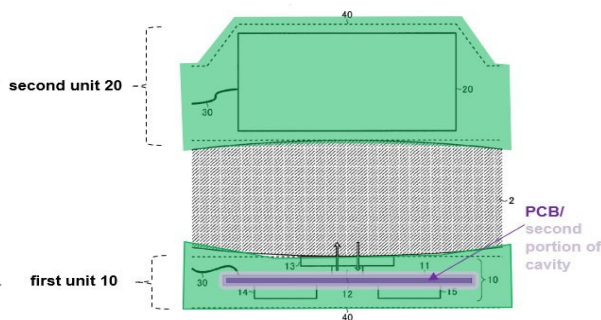


FIG.27



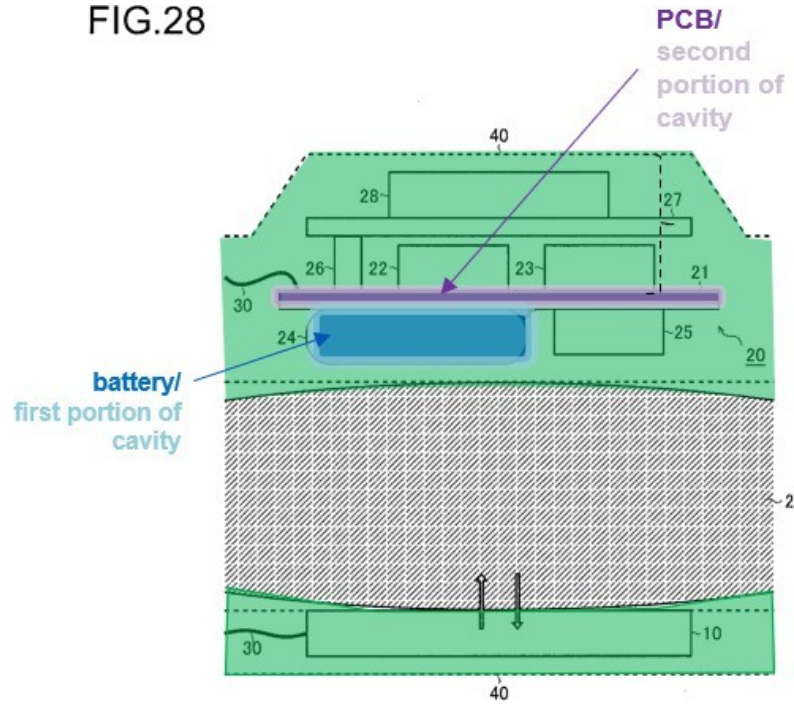
In addition to the reasons in §XIII.B.1, a POSA would have been motivated to prevent overlap, like in Niwa, when implementing Schröder’s “finger-ring” because doing so allows for a thinner, more compact finger-worn wearable ring device which saves on material costs and reduces the volume of the cavity, making the ring more comfortable. Ex-1002 ¶211; *DyStar*, 464 F.3d at 1368; Ex-1005 ¶206.

b. Claim 3

Schröder-Niwa teaches Claim 3. Ex-1002 ¶¶212-214; §XIII.B.1.

A POSA would have found it obvious to design first and second portions of Schröder’s cavity to partially overlap. §§XIII.A.1.e-f, XIII.A.2.b; Ex-1002 ¶214. Moreover, a POSA would have been motivated to partially overlap the first portion and the second portion of the cavity because it was well-known, as taught in Niwa. Figure 28 illustrates battery 24 (blue) in a first portion of the cavity (light blue) in second unit 20. §XIII.A.2.a. Also shown in Figure 28 is PCB 11 (purple), which extends through a second portion of the cavity (light purple) in first unit 10. Ex-1002 ¶213; Ex-1005 ¶¶200, 207.

FIG.28



Thus Niwa teaches a first portion of the cavity with the battery that partially overlaps with a second portion of the cavity with a PCB. Ex-1002 ¶213.

It would have been obvious to have the cavity portions at least partially overlap. A POSA would have been motivated to partially overlap the first portion of the cavity with the battery and the second portion of the cavity with the PCB, as disclosed in Niwa, when implementing Schröder's "finger-ring" because doing so permits more components to fit inside the limited volume. *Id.* ¶214; *DyStar*, 464 F.3d at 1368.

- c. **Claim 13: The finger-worn wearable ring device of claim 1, wherein the one or more sensors comprise a first light-emitting component configured to emit light associated with a first wavelength, and a second light-emitting component configured to emit light associated with a second wavelength different from the first wavelength.**

Schröder-Niwa teaches Claim 13. Ex-1002 ¶¶215-220; §XIII.B.1.

Schröder-Niwa teaches one or more sensors comprising two light-emitting components that emit light associated with two different wavelengths. Schröder's "finger-ring" includes biometric sensors, e.g., an infrared diode and sensor. §XIII.A.1.g; Ex-1007, 9:62-10:4. Niwa's sensors comprise a first light-emitting component configured to emit light of a first wavelength, and a second light-emitting component configured to emit light of a second wavelength different from the first wavelength. *Id.* Niwa's first unit 10 contains a light emitting portion, a light receiving portion, and a processing unit "to acquire information" about the user's plethysmogram. Ex-1005 ¶¶12, 27, 209-10. First unit 10's light-emitting portion can include "**LED1 to LED8**" with "**output wave lengths $\lambda 1$ to $\lambda 8$...different from one another.**" *Id.* ¶147; Ex-1002 ¶216.

- d. Claim 14: The finger-worn wearable ring device of claim 13, wherein the first wavelength is associated with visible light, and wherein the second wavelength is associated with infrared light.**

Schröder-Niwa teaches Claim 14. Ex-1002 ¶¶221-223; §XIII.B.1.

Schröder-Niwa's first light-emitting component emits visible light and another emits infrared light. *Id.* Schröder's light-emitting diode emits infrared radiation. Ex-1007, 9:62-10:4. Niwa's first light-emitting component emits visible light, and the second light-emitting component emits infrared light. Niwa describes that the "output wave lengths" from the LEDs range "from a visible light region to a near-infrared region." Ex-1005 ¶147. A POSA would have understood that first wavelength λ_1 from first light-emitting component (LED1) is associated with visible light. Ex-1002 ¶222. A POSA would have found it obvious to extend the wavelength of Niwa's LED from "a near-infrared region" to an infrared region for redundancy, to expand the type of information collected, or to use a non-visible light. *Id.* ¶222; Ex-1005 ¶147. A POSA would thus understand that a second wavelength λ_8 from LED8 in Niwa is associated with infrared light. Ex-1002 ¶¶222-223.

- e. **Claim 15: The finger-worn wearable ring device of claim 13, wherein the first light-emitting component is positioned within the finger-worn wearable ring device at a first radial position, and the second light-emitting component is positioned within the finger-worn wearable ring device at a second radial position different from the first radial position.**

Schröder-Niwa teaches Claim 15. Ex-1002 ¶¶224-233; §XIII.B.1.

Schröder-Niwa's first light-emitting component is positioned within the ring device at a first radial position, and the second light-emitting component is positioned within the ring device at a second radial position different from the first radial position. *Id.* Niwa teaches a "finger ring" "worn on the third joint of the finger 2." Ex-1005 ¶191. Niwa's finger ring has a light-emitting portion with eight light-emitting components centrally focused around photodetector PD. *Id.* ¶120, Fig. 3. Niwa further teaches two light-emitting components at different radial positions. Ex-1002 ¶227. Niwa describes Figure 3 as the "Layout of the Light Emitting Portion and the Light Receiving Portion" of the first unit's light sensor 12. Ex-1005 ¶119. Niwa states that "first unit 10 is a unit to measure the plethysmogram mainly, which is contained within the finger ring type housing 40 to be set to the ball side of the finger 2 (i.e., palm side)." *Id.* ¶192. Light sensor 12, which is part of first unit 10, "can be located at the vicinity of the finger 2 as much as possible" to improve measurement accuracy. *Id.* ¶208. A POSA would have understood that the light sensor (or any PPG sensor) would be placed tangentially or flush against the finger. Ex-1002

¶¶226-227.

Niwa further describes “a single light receiving portion PD (i.e., a photo diode or a photo transistor) and *eight light emitting portions LED1 to LED8* (i.e., a light emitting diode) *equally spaced from one another and placed on a circumference with a central focus on the light receiving portion PD.*” *Id.* ¶120. As shown in Figure 27, the first unit 10 houses the light sensor 12 (annotated), which faces the user’s skin (finger 2). *Id.* ¶¶50, 200.

FIG.27

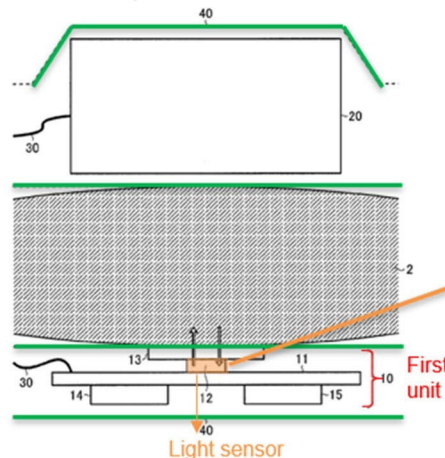
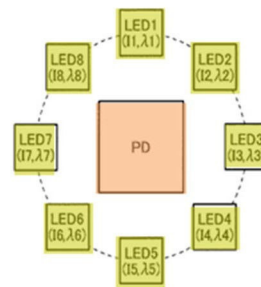


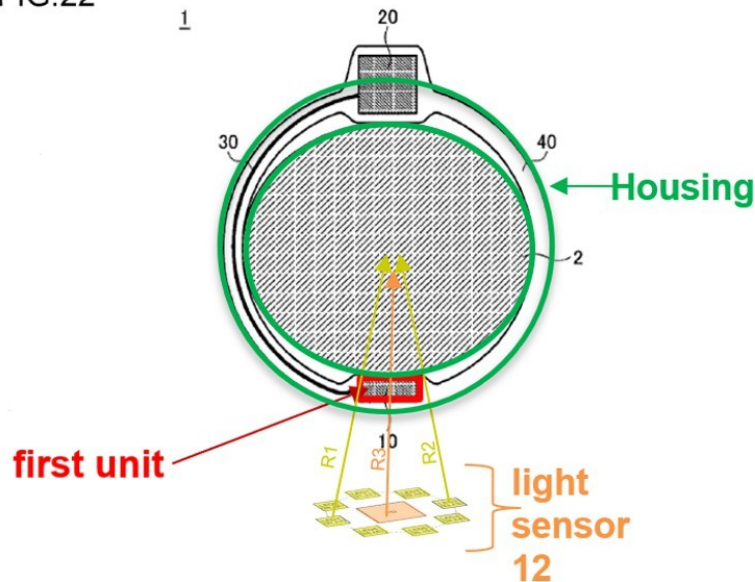
FIG.3



A POSA would have understood that the light emitters (LEDs) are at different radial positions. Ex-1002 ¶¶228-231. Modified Figure 22 superimposes the light emitting components and photodetector of Figure 3 within the light-emitting portion of first unit 10’s light sensor 12. *Id.* ¶¶228-229. Shown in modified Figure 22’, Niwa’s LED7 (yellow) is positioned at a first radial position (R1) and LED3 (yellow) is positioned at a second radial position (R2) within the finger-worn wearable ring

device (green). *Id.* ¶¶229-230.

FIG.22'



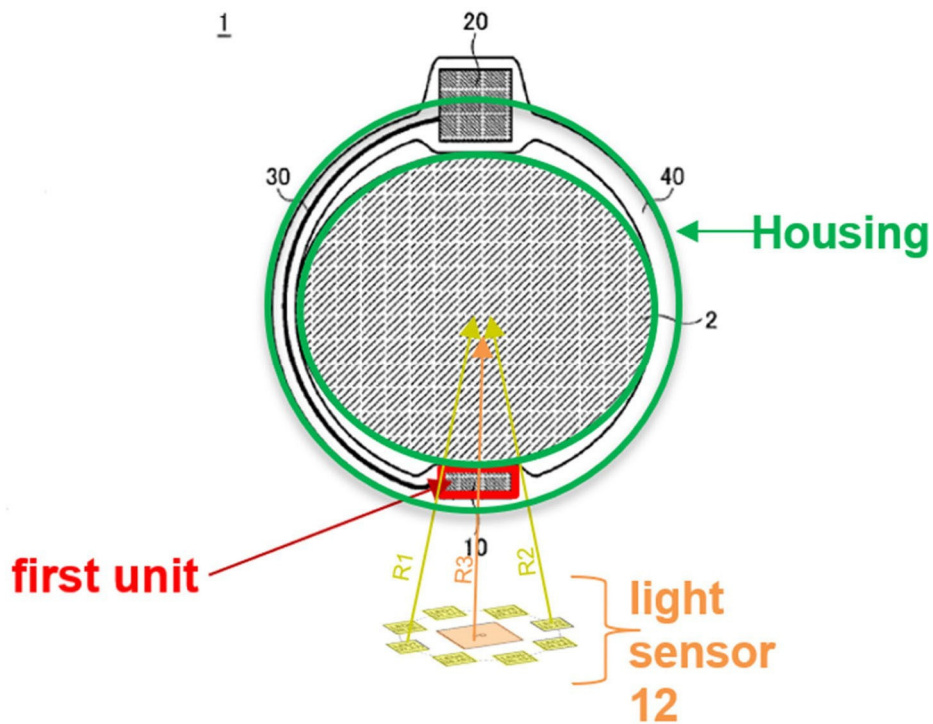
A POSA would have understood LED7 and LED3 are positioned at different radial positions because the LEDs are located at different circumferential positions along the curve of the ring (the claimed “radial position”), just like in the ’178 Patent. Ex-1001, Figs. 3B, 3C; Ex-1002 ¶¶229-230. A POSA would have further understood that the LEDs would be at different radial positions because separation between the LEDs is important to enhance the quality of the plethysmogram signal and for redundancy within the device. Ex-1002 ¶232. A POSA would have been motivated to have LEDs centrally located along the ring’s interior and away from the edges of the device, to prevent light leakage from visible LEDs and interference from ambient light. *Id.* ¶233.

- f. **Claim 16: The finger-worn wearable ring device of claim 15, wherein the one or more sensors further comprise a photodetector positioned within the finger-worn wearable ring device at a third radial position that is between the first radial position and the second radial position.**

Schröder-Niwa teaches Claim 16. Ex-1002 ¶¶234-238; §XIII.B.1.

Schröder-Niwa teaches a photodetector positioned within the ring device at a third radial position that is between the first and second radial positions. *Id.* Schröder teaches a light-emitting component and light-receiving component “arranged e.g., opposite each other such that e.g., a[] finger bone located therebetween has no adverse effect” measuring the user’s vein. Ex-1007, 9:62-10:4. Niwa’s sensor in its ring device has a photodetector positioned at a third radial position that is between the first radial position and the second radial position. Ex-1002 ¶236. Niwa discloses “multiple light emitting portions provided at different places [and] at least a single light receiving portion to detect each intensity of lights emitted from each of the multiple light emitting portions.” Ex-1005 ¶32; *id.*, ¶¶43, 117, Fig. 1.

Shown in modified Figure 22, Niwa’s light-receiving portion PD (orange) is positioned at a third radial position (R3) that is between the first radial position (R1) of LED7 (yellow) and second radial position (R2) of LED3 (yellow) within the finger-worn wearable ring device (green). Ex-1002 ¶¶236-238.



A POSA would further understand that Niwa teaches light-emitter and photodetector configurations with varying radial positions. *Id.* ¶¶32, 43, 117, Figs. 1, 14-16.

C. Ground 3: Claims 3 and 12 are obvious over Schröder in view of Mestas.

1. Motivation/Reasonable Expectation

A POSA would have been motivated to apply the teachings of Mestas to Schröder (“Schröder-Mestas”), and would have had a reasonable expectation of success because each relates to the same well-known technologies. Ex-1002 ¶¶239-242.

A POSA would have been motivated to combine Schröder with Mestas because they are analogous art and teach improvements to the same type of devices—wearable biometric sensing devices having similar structural components, including inner and outer surfaces, a cavity, and a battery and PCB within the cavity. Ex-1007, 11:46-48 (battery), 12:26-42 (PCB), Figs. 4-10 (structure); Ex-1010 ¶¶150 (cavity, battery), 151 (structure), 154 (cavity), 157 (structure), 164 (PCB), 168 (battery), Figs. 4, 6 (structure). Mestas teaches these portions of the cavity partially overlapping. Ex-1010 ¶177, Figs. 14-16. Schröder’s “finger-ring” includes a “recess” (cavity) within at least one of its components (16, 18) where an electronic part is inserted. Ex-1007, 12:10-32, 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. Mestas likewise teaches a cavity that houses electrical components. Ex-1010 ¶151. Mestas further teaches a battery

and a PCB arranged in overlapping portions of a cavity. Ex-1010 ¶¶164, 168, 177. Based on Mestas, it would have been obvious to have the first and second portion of the cavity in Schröder at least partially overlap. Ex-1002 ¶240.

Mestas offers design and manufacturing benefits to Schröder’s “finger-ring.” A POSA would have been motivated to have the first and second portions of the cavity at least partially overlap, as taught by Mestas, to reduce the risk of electrical components losing mechanical or electrical connection to the other and to allow other parts of the ring to be thinner for the wearer’s comfort. *Id.* ¶241; Ex-1007, 3:9-11; Ex-1010 ¶206. A POSA would have been motivated to implement Mestas’s curved battery in Schröder’s “finger-ring” because a curved battery allows a larger battery to conform to a ring’s circular shape without stressing the battery or ring housing. Ex-1002 ¶241.

A POSA would have had a reasonable expectation of success in combining Schröder and Mestas. *Id.* ¶242. Mestas contemplates different sizing. Ex-1010 ¶143; Ex-1002 ¶242. As miniaturization of electronic components improved, a POSA would have found it trivial to implement Mestas’s teachings into a ring like Schröder’s “finger-ring.” Ex-1002 ¶242. A POSA would have understood that rings are restricted by form factors. Ex-1002 ¶¶70-86, 242. A POSA would have understood that these references disclose interrelated teachings based on routine technologies that would have been amenable to well-understood, predictable

combinations to provide smaller and more comfortable wearable computing devices.

Id. ¶¶239-242.

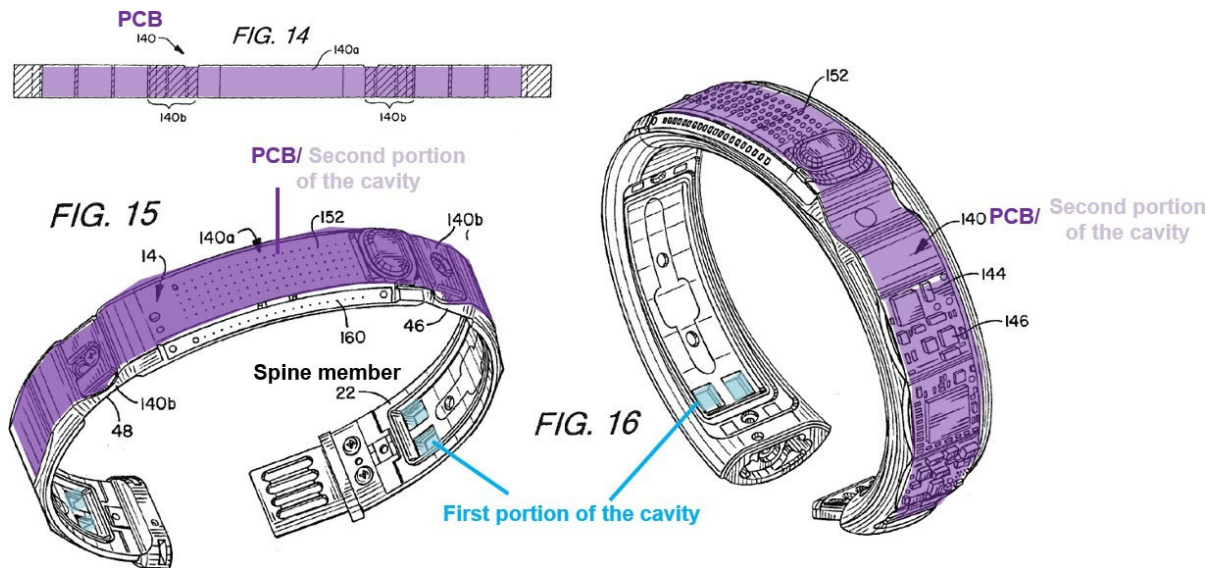
2. Claims 3 and 12

a. Claim 3

Schröder-Mestas teaches Claim 3. Ex-1002 ¶¶243-246; §XIII.C.1.

A POSA would have found it obvious to design Schröder’s first and second portions of the cavity to partially overlap. §XIII.A.2.b; Ex-1002 ¶¶185-188. A POSA would have also been motivated to at least partially overlap the first portion and the second portion of the cavity because it was well-known, as taught in Mestas. *Id.* ¶¶239-242. Mestas’s wearable computing device has housing 12 that includes inner spine member 22 that supports internal components. Ex-1010 ¶151. A POSA would have understood that the space inside housing 12 occupied by spine member 22 is Mestas’s “cavity.” Ex-1002 ¶¶244-246.

Shown in Figures 14-16, Mestas's wearable electronic device has PCB member 140 (purple) "wrapped around and mounted to the spine member 22" to "follow[] the contours of the spine member 22." Ex-1010 ¶164. Mestas's batteries are "positioned in the recessed compartments 50,52 [light blue] wherein the contacts 150 [not labelled] extend through the openings 59 [not labelled] in the compartments 50,52 and engage the PCB member 140 to provide power to the device 10." Ex-1010 ¶168. The battery contacts "are biased against mating contacts associated with PCB member 140." Ex-1010 ¶177.



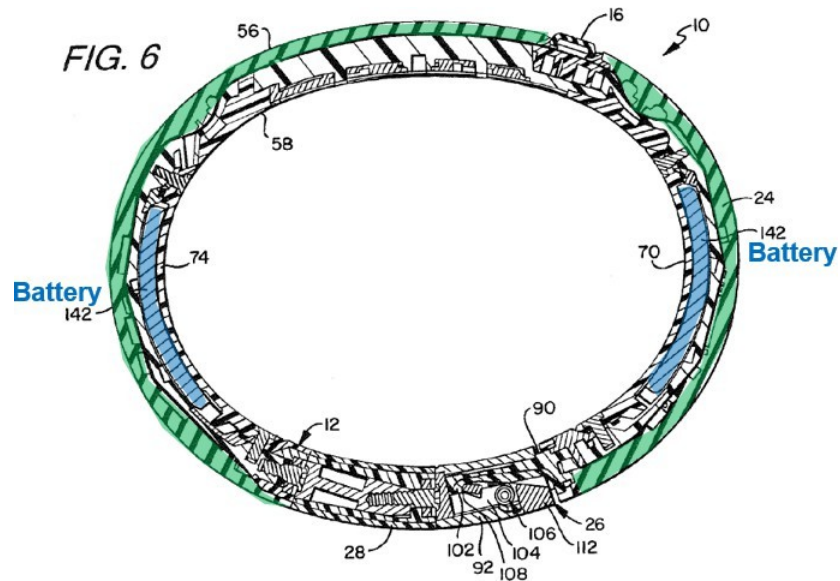
Mestas's wearable electronic device has two different portions of the cavity: the portion that the PCB occupies and the portion that the batteries occupy. Ex-1002 ¶246. A first portion of the cavity overlaps with a second portion of the cavity because the PCB member wraps around the entire length of the spine member

(defining second portion) and the first portion (with batteries) is positioned on the spine member's interior side. *Id.*

- b. **Claim 12: The finger-worn wearable ring device of claim 1, wherein the battery comprises a curved battery, wherein an arc of the curved battery approximates a corresponding arc of the external housing component.**

Schröder-Mestas teaches Claim 12. Ex-1002 ¶¶247-249; §XIII.C.1.

Schröder-Mestas teaches “the battery compris[ing] a curved battery, wherein an arc of the curved battery approximates a corresponding arc of the external housing component.” *Id.* Schröder and Mestas each disclose a battery. Ex-1007, 11:46-48; Ex-1010 ¶143. Mestas's Figure 6 shows “batteries 142 [blue] have a ***curvilinear or curved configuration***.” Ex-1010 ¶¶157, 168. A POSA would have understood that the arc of Mestas's “***curved battery***” (blue) approximates a corresponding arc of the external housing component (green). Ex-1001, Cl. 12. It would have been obvious, in view of Mestas, that this shape allows the batteries to be positioned in recessed compartments 50, 52 without increasing the wearable device's thickness and to allow for an elongated battery without stressing the battery or the housing. Ex-1010 ¶168; Ex-1002 ¶248.



D. Ground 4: Claims 1, 4-10 and 13-16 are obvious over Schröder in view of Yuen.

1. Motivation/Reasonable Expectation

A POSA would have been motivated to apply the teachings of Yuen to Schröder (“Schröder-Yuen”), and would have had a reasonable expectation of success because each relates to the same well-known technologies. Ex-1002 ¶¶250-261.

A POSA would have been motivated to combine Schröder with Yuen because they are analogous art and both teach improvements to electronic wearable devices. *Id.*; Ex-1007, 3:9-11, 3:61-62; Ex-1006, 12:50-52. Both describe the devices having a processor, battery, and one or more sensors. Ex-1007, 1:45 (processor), 1:50-51 (processor), 9:54-10:11 (sensor), 11:46-48 (battery); Ex-1006, 4:3-6 (processor,

sensor), 12:18-61 (sensor), 14:42-46 (battery), 14:60-66 (sensor), 28:40-43 (battery), Figs. 17-25 (processor,sensor).

Yuen offers design and manufacturing benefits to Schröder’s “finger-ring.”

Yuen teaches a flexible PCB. Ex-1006, 2:38-39, 12:35-38. A POSA would have been motivated to implement a flexible PCB for Schröder’s inlay because flexible PCBs are lightweight, save space, and are easier to assemble into curved constructions. Ex-1002 ¶255.

Yuen improves Schröder’s wireless charging. Schröder’s battery “is preferably charged by means of [a] reader’s electromagnetic field.” Ex-1007, 11:46-55. Yuen teaches charging a battery using magnetic properties of its device or docking station. Ex-1006, 14:42-49. Based on Yuen, it would have been obvious to use a magnetic alignment mechanism within a charger to orient Schröder’s finger-ring to facilitate wireless charging. Ex-1002 ¶¶256. A POSA would have been motivated to implement an alignment mechanism for Schröder’s “finger-ring” using Yuen’s teachings for easier, more convenient wireless charging. *Id.* Thus, design incentives and market forces would have motivated a POSA to combine the teachings of Schröder and Yuen to result in a wearable electronic device with alignment for wireless charging.

It would have been obvious to a POSA to apply Yuen’s sensor configurations—e.g., the wavelength and positioning parameters—to Schröder’s

sensor because both Schröder's and Yuen's techniques relate to data collection from veins. Ex-1002 ¶¶256-257. Both teach a sensor comprising a light-emitting component. Ex-1007, 8:30-53; Ex-1006, 2:29-33, Fig. 5. Schröder captures information about finger veins, which is crucial for biometric identification or medical diagnostics. Ex-1002 ¶259. A POSA would have recognized that Yuen, which discusses the capture of pulse oximetry data, also indirectly captures information about veins. *Id.* Both Schröder's and Yuen's techniques involve data collection from veins. This understanding would indicate that advances or techniques developed in one application—like pulse oximetry—could enhance methodologies in the other—like vein pattern biometrics,—highlighting the interconnectedness of these sensing technologies. *Id.*

Yuen adjusts the operational parameters or measurement periodicity of various sensors based on data related to a user's activity, heart rate, sleep state, and power level. Ex-1002 ¶¶257-258. Based on Yuen, it would have been obvious to modify a sensor's operational parameter or measurement periodicity in Schröder's "finger-ring." *Id.* ¶¶259; Ex-1006, 7:19-38; 17:5-16. A POSA would have understood from Yuen that a higher sampling rate or sampling resolution may "enable more accurate adaptive filtering" on the sensor data. Ex-1002 ¶257; Ex-1006, 7:1-6. Thus, it would have been obvious to adjust the operational parameters and measurement periodicity of a sensor based in part on the information from the

sensor. Ex-1002 ¶259. A POSA also would have been motivated to make these adjustments for reasons of redundancy, improved accuracy, and reduced power consumption. *Id.*

A POSA would have had a reasonable expectation of success in combining Schröder and Yuen. *Id.* ¶242. A POSA would have understood that the electronic components of Yuen and Schröder’s devices are similar and are interchangeable. *Id.*

The ’178 Patent acknowledges that a device “can be subjected to [a] magnetic field to produce a current that can charge the onboard battery in accordance with known electromagnetic principles.” Ex-1001, 30:45-48. Schröder and Yuen teach the same. Ex-1007, 11:50-55; Ex-1006, 14:42-46, 28:41-50. Moreover, a POSA would have understood that different wearable electronic devices contain similar components that can be scaled appropriately in size and power to obtain interchangeable function. Ex-1002 ¶261. A POSA would have found it obvious that Yuen’s device could be worn as a “finger ring” 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 ¶261. A POSA would have understood that these references disclose interrelated teachings based on routine technologies that would have been amenable to various well-understood and predictable combinations to provide smaller and more comfortable wearable devices. Ex-1002 ¶261.

2. Claim 1

a. 1[pre]-1[c] and 1[e]

Schröder teaches 1[pre]-1[c] and 1[e]. Ex-1002 ¶262; §XIII.A.1.

b. 1[d]

Schröder-Yuen teaches Element 1[d]. Ex-1002 ¶¶263-266; §XIII.A.1.f; §XIII.D.1.

Yuen’s monitoring device has sensors disposed on a “*flexible PCB*.” Ex-1006, 2:38-39, 12:35-38. A POSA would understand that the PCB could be applied to Schröder’s inlay, which extends through a second portion of the cavity different from the first. Ex-1002 ¶¶265-266.

3. Claims 4-10 and 13-16

a. Claim 4: The finger-worn wearable ring device of claim 1, further comprising: one or more magnetic components configured to magnetically interact with one or more additional magnetic components of a charger device to orient the finger-worn wearable ring device within a charging position on or within the charger device to facilitate charging of the finger-worn wearable ring device.

Schröder-Yuen teaches Claim 4. Ex-1002 ¶¶267-270; §XIII.D.1.

Schröder’s “finger-ring” comprises one or more magnetic components configured to magnetically interact with one or more additional magnetic components of a charger device. *Id.* ¶268. Schröder’s “finger-ring” is “*charged by*

means of [a] reader's electromagnetic field." Ex-1007, 11:54-55. A POSA would have understood that the "finger-ring" and the charger in Schröder have magnetic components to allow for inductive charging. Ex-1002 ¶268.

Schröder-Yuen teaches orienting the finger-worn wearable ring device within a charging position on or within the charger device. *Id.* ¶269. Yuen teaches "using magnetic properties to secure" an electronic device to a charger. Ex-1006, 14:42-49. Yuen's biometric monitoring device uses "*magnets to help the user align the device* to the dock." *Id.* Yuen teaches that the "magnetic field of magnets in the dock or cable and the magnets in the device itself could be strategically *oriented [so] as to force the device to self-align* and provide *a force that holds the device to the dock or cable.*" *Id.*, 28:40-49.

- b. Claim 5: The finger-worn wearable ring device of claim 4, further comprising: a charging component configured to wirelessly transfer energy from an additional charging component of the charger device to the battery when the finger-worn wearable ring device is oriented in the charging position.**

Schröder-Yuen teaches Claim 5. Ex-1002 ¶¶271-272; §XIII.D.1.

Schröder-Yuen teaches a charging component configured to wirelessly transfer energy from a charger device when the finger-worn wearable ring device is oriented in the charging position. Ex-1002 ¶272. Schröder's "finger-ring" is "charged by means of...electromagnetic field." Ex-1007, 11:54-55. Schröder's

battery is “connected directly to the antenna coil 8 via a rectifier circuit” for charging. *Id.*, 11:63-67. A POSA would have understood that antenna coil 8 is the charging component that is configured to wirelessly transfer energy from the “reader’s magnetic field” to the battery. Ex-1002 ¶272.

- c. **Claim 6: The finger-worn wearable ring device of claim 1, further comprising: one or more processors communicatively coupled to the battery and the one or more sensors, wherein the one or more processors are configured to: selectively adjust one or more operational parameters of the one or more sensors based at least in part on the data acquired by the one or more sensors.**

Schröder-Yuen teaches Claim 6. Ex-1002 ¶¶273-275; §XIII.D.1.

Schröder-Yuen teaches one or more processors communicatively coupled to the battery and the one or more sensors. Ex-1002 ¶274. Schröder and Yuen each disclose a device with a processor, battery, and one or more sensors. §XIII.D.1. Yuen further describes a device having a “sensor processor” that “*process[es] data from physiological, environmental and/or activity sensors*” or an “application processor” that “may be used to store and execute applications that *utilize sensor data acquired* and processed by” a sensor processor, while such an application process may also have sensors directly connected. Ex-1006, 22:60-23:15. A POSA would find it obvious that one or more processors in the device are coupled to the battery and one or more sensors. Ex-1002 ¶274.

Schröder-Yuen teaches one or more processors are configured to: selectively adjust one or more operational parameters of the one or more sensors based at least in part on the data acquired by the one or more sensors. *Id.* ¶275. Yuen describes “adjust[ing] or modify[ing] the sampling rate and/or resolution mode of the motion sensor(s) during...periods of user activity or motion (for example, periods where the amount of user motion exceeds a certain threshold).” Ex-1006, 6:64-7:1. Whether the user motion exceeds a threshold amount would be based on data acquired by the sensor(s). Ex-1002 ¶275.

- d. **Claim 7: The finger-worn wearable ring device of claim 6, wherein the data acquired by the one or more sensors comprises heart rate data associated with a heart rate of the user, wherein the one or more processors are further configured to: selectively adjust a measurement periodicity used by the one or more sensors to acquire the heart rate data based at least in part on the heart rate of the user.**

Schröder-Yuen teaches Claim 7. Ex-1002 ¶¶276-279; §XIII.D.1.

Schröder-Yuen teaches that data acquired by one or more sensors comprises heart rate data associated with a heart rate of the user. Ex-1002 ¶277. Yuen describes “obtain[ing] *data which is representative of, for example, a user’s heart rate, respiration, heart rate variability, oxygen saturation (SpO2).*” Ex-1006, 10:14-25; *id.*, 21:14-45. Yuen explains that “*data indicative of user activity or motion* may be employed *to adjust or modify the sampling rate and/or resolution mode of sensors*

which acquire heart rate data.” Id., 6:57-7:6.

Schröder-Yuen also teaches that its processors selectively adjust a measurement periodicity used by the one or more sensors to acquire the heart rate data based at least in part on the heart rate of the user. Ex-1002 ¶278. Yuen explains that optical detectors can obtain data representative of “a user’s heart rate,” and that these detectors “may sample, measure and/or detect one or more wavelengths that are also specific or directed to a type of physiological data to be collected and physiological parameter (of the user) to be assessed or determined.” Ex-1006, 10:7-28. Thus, a processor could selectively adjust a measurement period (e.g., sampling rate) of a sensor acquiring heart rate data based at least in part on the user’s heart rate (e.g., motion or user activity), *e.g.*, whether a user is sedentary can be determined, at least in part, from the user’s heart rate, and that a processor can decrease the sampling rate for the heart rate sensor when the user is sedentary. Ex-1002 ¶278.

- e. **Claim 8: The finger-worn wearable ring device of claim 6, wherein the data acquired by the one or more sensors comprises activity data associated with one or more activities engaged in by the user, wherein the one or more processors are further configured to: selectively adjust a measurement periodicity used by the one or more sensors to acquire the activity data based at least in part on the one or more activities engaged in by the user.**

Schröder-Yuen teaches Claim 8. Ex-1002 ¶¶280-282; §XIII.D.1.

Schröder-Yuen's processor selectively adjusts a measurement periodicity used by the one or more sensors to acquire the activity data based at least in part on the one or more activities engaged in by the user. Ex-1002 ¶281. Yuen teaches that its device “may *adjust or modify the sampling rate and/or resolution mode of the motion sensor(s)* during such *periods of user activity or motion* (for example, periods where the amount of user motion exceeds a certain threshold).” Ex-1006, 6:57-7:6.

It would have been obvious that a processor could selectively adjust a measurement period of a sensor acquiring user activity data based on the user's activity. §XIII.D.2.e; Ex-1002 ¶282.

- f. **Claim 9: The finger-worn wearable ring device of claim 6, wherein the data acquired by the one or more sensors is associated with one or more sleep states of the user, wherein the one or more processors are further configured to: selectively adjust a measurement periodicity used by the one or more sensors to acquire the data based at least in part on the one or more sleep states of the user.**

Schröder-Yuen teaches Claim 9. Ex-1002 ¶¶283-285; §XIII.D.1.

Schröder-Yuen teaches that the data acquired by the one or more sensors is associated with one or more sleep states of the user. Ex-1002 ¶284. Yuen teaches that a device can determine a user is asleep based on the user's motion. Ex-1006, 7:19-25.

Schröder-Yuen also teaches one or more processors further configured to selectively adjust a measurement periodicity used by the one or more sensors to acquire the data based at least in part on the one or more sleep states of the user. Ex-1002 ¶285. Yuen's device "may *adjust and/or reduce the sampling rate of optical heart rate sampling* when...the biometric monitoring device determines [that] the *user is* sedentary or *asleep*." Ex-1006, 7:19-25. It would have been obvious that a processor could selectively adjust a measurement period of a sensor acquiring data associated with one or more sleep states based at least in part on the one or more sleep states of the user. Ex-1002 ¶285.

- g. **Claim 10: The finger-worn wearable ring device of claim 1, further comprising: one or more processors communicatively coupled to the battery and the one or more sensors, wherein the one or more processors are configured to: selectively adjust one or more operational parameters of the one or more sensors based at least in part on a power level of the battery, a power usage of the one or more sensors, or both.**

Schröder-Yuen teaches Claim 10. Ex-1002 ¶¶286-289; §XIII.D.1.

Schröder-Yuen’s processors selectively adjust one or more operational parameters of the one or more sensors based at least in part on a power level of the battery, a power usage of the one or more sensors, or both. Ex-1002 ¶288. Yuen describes that a “monitoring device (or selected portions thereof) may implement or be placed in a lower power mode of operation—for example, *the optical heart rate sensor and/or circuitry may be placed in an off or disabled state or a lower power or sleep mode.*” Ex-1006, 9:15-24. Yuen further describes that “[u]pon such a determination, the device may *reduce its power consumption*—for example, *‘disable’ or adjust the operating conditions of the stress and/or heart rate detection sensors and/or circuitry* (for example, reduce duty cycle of or disable the light source(s) and/or detector(s), and/or disable or attenuate associated circuitry or portions thereof).” *Id.*, 9:30-35. Schröder-Yuen therefore adjusts the operating conditions of heart rate sensors based on the device being placed in a lower power mode of operation. Ex-1002 ¶288.

h. Claim 13

Schröder-Yuen teaches Claim 13. Ex-1002 ¶¶291-93; §XIII.D.1.

Schröder-Yuen teaches one or more sensors comprising two light-emitting components configured to emit light associated with two different wavelengths. Schröder’s “finger-ring” includes biometric sensors, such as an infrared diode and sensor. § XIII.A.1.g; Ex-1007, 9:62-10:4. Yuen further describes a sensor with “*a light source emitting light having a wavelength in the red spectrum*” (the claimed “first light-emitting component associated with a first wave length”), and “*a light source emitting light having a wavelength in the infrared spectrum*” (the claimed “second light-emitting component associated with a second wavelength different than the first wavelength”). Ex-1006, 10:34-42.

i. Claim 14

Schröder-Yuen teaches Claim 14. Ex-1002 ¶¶294-296; §XIII.D.1.

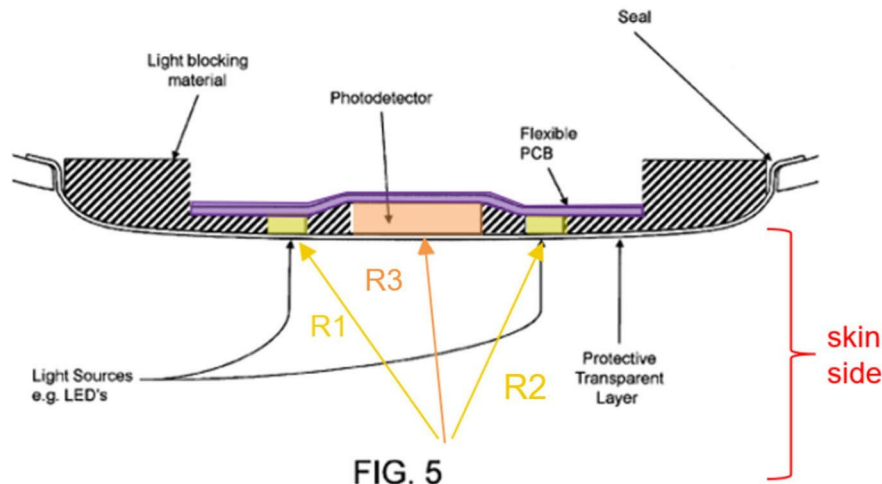
Schröder-Yuen’s first light-emitting component emits visible light and another emits infrared light. Ex-1002 ¶295. Schröder’s light-emitting diode emits infrared radiation. Ex-1007, 9:62-10:4. Yuen’s sensor has “a light source emitting light having *a wavelength in the red spectrum*” (the “first wavelength associated with visible light”), and “a light source emitting light having *a wavelength in the infrared spectrum*” (the “second wavelength...associated with infrared light”). Ex-1006, 10:34-42; Ex-1002 ¶295.

j. Claim 15

Schröder-Yuen discloses Claim 15. Ex-1002 ¶¶297-300; §XIII.D.1.

Schröder-Yuen's first light-emitting component is positioned within the finger-worn wearable ring device at a first radial position, and the second light-emitting component is positioned within the finger-worn wearable ring device at a second radial position different from the first radial position. Ex-1002 ¶298.

Yuen teaches first and second light-emitting components positioned within the finger-worn wearable device. Ex-1002 ¶299. Figure 5 shows Yuen's "light sources [(yellow)] and photodetector [(orange)] are placed on a flexible PCB [(purple)]." Ex-1006, 2:38-39. Yuen states that the "light sources (e.g. LEDs) may be located on one or more sides of the photodetector (for example, either side or opposing sides of a photodetector)." *Id.*, 2:31-35. As shown in Figure 5, a POSA would have understood that Yuen's first light source (yellow) is positioned at a first radial position (R1) and second light source is positioned at a second radial position (R2) within the device from the center of the user's wrist, when the LEDs are placed on "either side or opposing sides of a photodetector." Ex-1002 ¶¶298-300.



Moreover, a POSA would have understood that Yuen's light-emitting components are positioned at two different radial positions when Yuen's biometric monitoring device is arranged as a ring because Yuen's light sources and photodetectors can assume a circumferential and curvilinear orientation to facilitate skin contact with the user's finger. *Id.* Yuen explains that the light emitters and associated detectors are disposed on a "flexible or pliable substrate which facilitates the skin side of the device to conform...to the shape of the user's body part" 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. Thus, the light sources disposed on the flexible PCB are arranged to contact the user's finger in the same way as the light sources in Yuen's sensor protrusion contact the user's skin in Figure 5. Ex-1002 ¶299. Therefore, a POSA would have understood Yuen's light sources in the ring construction are positioned at different radial positions because the LEDs are located at different circumferential positions along the curve of the ring, (the claimed

“radial position”), like in the ’178 Patent. Ex-1001, Figs. 3B, 3C.

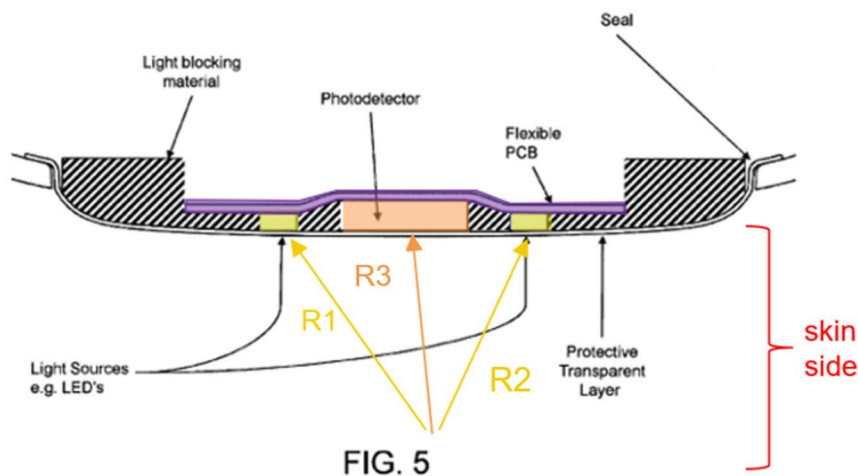
A POSA would have been motivated to implement Yuen’s light emitters at a first and second radial positions in Schröder’s “finger-ring” to enhance the quality of the plethysmogram signal and for redundancy within the device because LEDs at different radial positions—and thus physically separated from one another—provide additional readings along the user’s tissue. Ex-1002 ¶300. A POSA would have understood that the use of multiple LEDs is beneficial in case of LED malfunctions or noise interference. *Id.* ¶300.

k. Claim 16

Schröder-Yuen teaches Claim 16. Ex-1002 ¶¶301-305; §XIII.D.1.

Schröder-Yuen teaches a photodetector positioned within the finger-worn wearable ring device at a third radial position that is between the first and second radial positions. Ex-1002 ¶302. Schröder teaches a light-emitting component and light-receiving component “arranged e.g., opposite each other such that e.g., a[] finger bone located therebetween has no adverse effect” measuring the user’s vein. Ex-1007, 9:62-10:4. Yuen further teaches a photodetector in a third radial position. Ex-1002 ¶303. Yuen describes light emitting diodes and a photodetector positioned “on a flexible or pliable substrate,” which allows the inner surface of the device to adapt to the shape of the user’s appendage (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. As shown in Figure 5, Yuen’s photodetector (orange) is positioned at a third radial position (R3) that is between the first and second radial position (R1, R2) of the light sources (yellow) within the housing of the device. Ex-1002 ¶303. Yuen explains that the “light sources (e.g. LEDs) may be located on one or more sides of the photodetector (for example, either side or opposing sides of a photodetector) to enable photoplethysmography (PPG).” Ex-1006, 2:31-35. Thus, a POSA would have understood that LEDs are positioned at a first radial position and a second radial position when placed on “either side or opposing sides of a photodetector.” Ex-1002 ¶303.



Further, as previously discussed, the light sources disposed on the flexible PCB could be arranged to conform to the user’s finger as the light sources in Yuen’s sensor protrusion contact the user’s skin in Figure 5. A POSA would have understood Yuen’s photodetector is positioned within the housing at a third radial

position that is between the first radial position and the second radial position because the photodetector is located at different circumferential position along the curve of the ring, (the claimed “radial position”), like in the ’178 Patent. Ex-1001, Figs. 3B, 3C. A POSA would have further understood that the photodetector would be at a different radial position than the LEDs because separation between the LEDs and the photodetector enhances the plethysmogram signal’s quality. Ex-1002 ¶¶303, 305.

E. Grounds 5/6⁶: Claims 1-3 and 13-18 are obvious over Niwa Alone/Over Niwa in view of Schröder.

1. Motivation/Reasonable Expectation

A POSA would have been motivated to apply the teachings of Schröder to Niwa (“Niwa-Schröder”). XIII.B.a.1; Ex-1002 ¶¶306-310.

Schröder also describes various “finger-ring” constructions “consisting of ring-shaped components 16, 18 of the finger-ring 2 and of an inlay 12.” *Id.*, 12:43-47, Figs. 6-10. Schröder explains that the finger-ring’s “components 16, 18...are interconnected... so that the connection between the components 16, 18 can be undone again” to add or replace the parts inside the finger-ring. *Id.*, 12:20-26. A POSA would have been motivated to implement Schröder’s teachings in Niwa’s ring because doing it would then be easier to replace defective parts. *Id.* A POSA would

⁶ Unless indicated, arguments applicable to Grounds 5/6.

have also been motivated because Schröder's rigid cavities would improve Niwa's cavity by prolonging the internal components' lifetimes. Ex-1002 ¶¶308-309. Moreover, a POSA would have motivated to combine the design of Niwa's finger ring construction with Schröder's structure because a POSA would have found it beneficial to have multiple components that are "simple, fast and inexpensive to manufacture." Ex-1007, 12:15-17. Thus, design incentives and market forces would have also motivated a POSA to apply Schröder's teachings to Niwa. Ex-1002 ¶¶308-309.

2. Claim 1

Niwa/Niwa-Schröder teaches Claim 1. Ex-1002 ¶¶311-344; §XIII.E.1.

a. 1[pre]

Niwa teaches the preamble, to the extent limiting. Ex-1002 ¶¶311-312. Niwa discloses a finger-worn wearable ring device such as a "plethysmogram sensor" in a "*a finger ring construction* to be worn on a third joint of a finger." Ex-1005 ¶¶28-29.

FIG.22

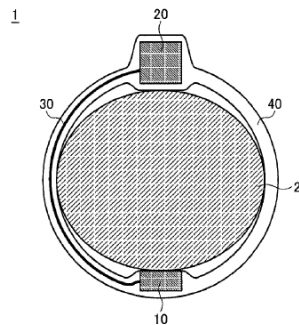
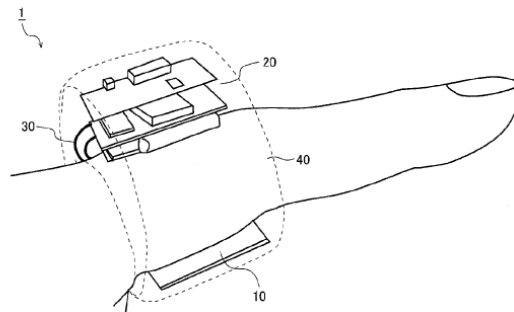


FIG.26



b. 1[a]

Ground 5: Niwa teaches 1[a]. Ex-1002 ¶¶313-315.

Niwa's ring has an external housing component that defines an outer circumferential surface. *Id.* Niwa's "finger ring type housing 40" formed as a circle (Ex-1005 ¶204) has a first unit "located at the ball side of the finger" and a "second unit...located at the back side of the finger when the finger ring type housing is worn." Ex-1005 ¶¶29, 193. Shown in Figure 22 and 26, the outside of finger ring housing 40 that is exposed to the environment is the "external housing component" (green) of Niwa's finger ring 40. Ex-1002 ¶314. Because the finger ring is a circle, the outer portion of the housing defines the outer portion of the circumferential surface of the ring. *Id.* ¶315.

FIG.22

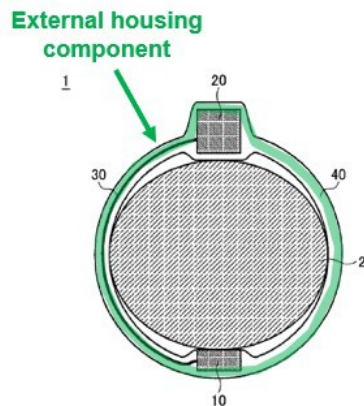
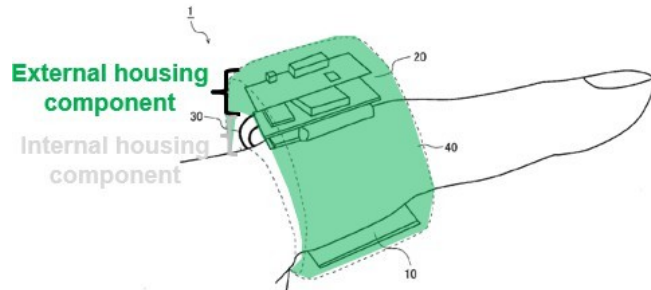


FIG.26



Ground 6: Niwa-Schröder teaches 1[a]. Ex-100 ¶¶316-317. A POSA would have understood that the external portion of the ring defines an outer circumferential surface of the ring, as taught in Schröder. Schröder’s “finger-ring” consists of “two ring halves 16 and 18” with a recess where “inlay 12 is inserted.” §XIII.A.1.b; Ex-1007, 12:7-9. As shown in Figure 4, ring half 18 is the claimed external housing component (green) that defines an outer circumferential surface of the finger-worn wearable ring device because it is the side of Schröder’s “finger-ring” that is exposed to the outside environment and provides an enclosing structure to inlay 12. Ex-1002 ¶316.

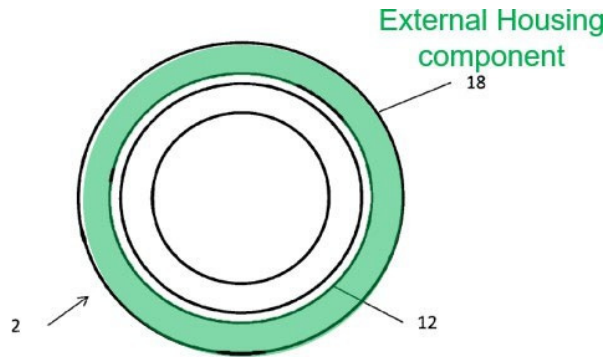


Fig. 4

c. 1[b(i)]:

Ground 5: Niwa teaches 1[b(i)]. Ex-1002 ¶¶318-320.

Niwa's finger ring has an internal housing component defining the inner circumferential surface of the ring and is coupled with the external housing component. *Id.* ¶319. Niwa's "finger ring type housing 40" has an inner portion (green) that surrounds "the ball side of the finger 2 (i.e., palm side) when the finger ring type housing 40 is worn" for the plethysmogram measurement. Ex-1005 Figs. 22, 26, ¶192. Annotated Figures 22 and 26 show the inner portion (green) is coupled with the outer portion to form Niwa's circular finger ring type housing 40. Ex-1002 ¶320.

FIG.22

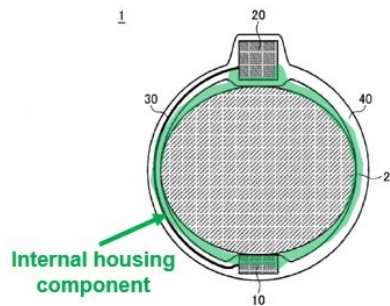
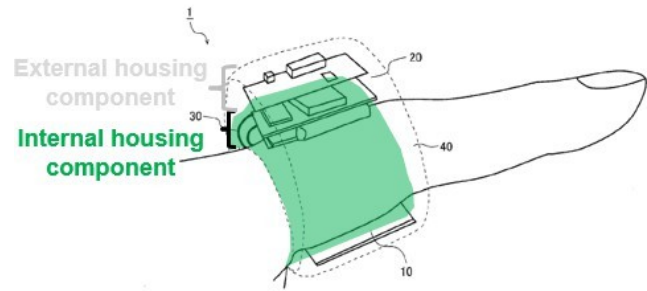


FIG.26



A POSA would have understood that the internal and external housing components could together form a housing or be coupled together, depending on the specific design requirements. *Id.*

Ground 6: Niwa-Schröder teaches 1[b]. Ex-1002 ¶¶321-323. A POSA would have understood that the inner circumferential surface of the finger ring is defined by an internal housing component that couples with the external housing component, as taught in Schröder. Schröder’s “finger-ring” consists of “two ring halves 16 and 18” with a recess so that “inlay 12 is inserted.” §XIII.A.1.c; Ex-1007, 12:7-9. Shown in Figure 4, ring half 16 (green) is the internal housing component defining an inner circumferential surface of the finger-worn wearable ring device because it is the inside ring that contacts the user’s skin when the “finger-ring” is worn. Ex-1002 ¶¶321-322.

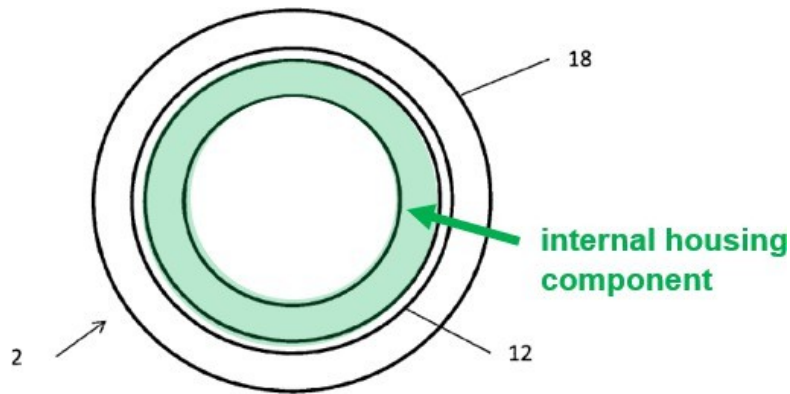


Fig. 4

Figure 5 shows Schröder's inner ring half 16 and outer ring half 18 "are interconnected by a suitable technology." Ex-1007, 12:20-22. Schröder's internal housing component is thus coupled with the external housing component. *See also id.*, Fig. 5; Ex-1002 ¶¶321-323.

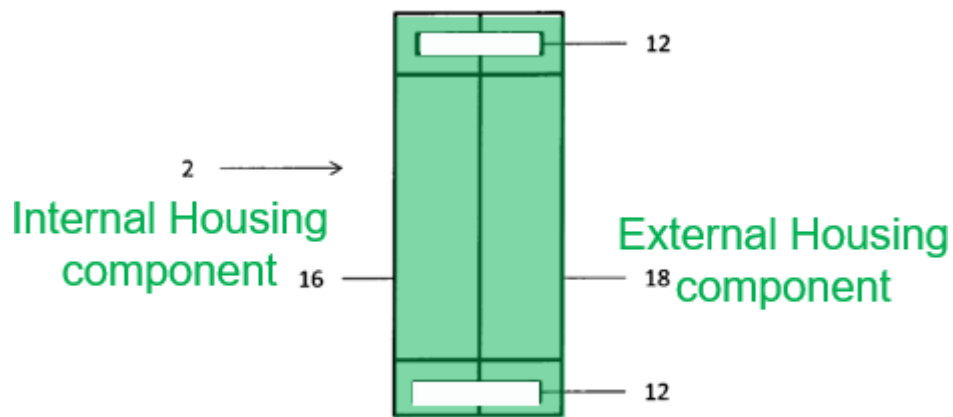


Fig. 5

d. 1[b(ii)]

Ground 5: Niwa teaches 1[b(ii)]. Ex-1002 ¶¶324-325.

Niwa's inner portion surrounds the ball side of the wearer's finger when worn. Ex-1005 ¶192, Figs. 22, 26. Thus, Niwa teaches that the inner circumferential surface of the internal housing component is configured to contact a user's tissue when the ring is worn. Ex-1002 ¶325.

Ground 6: Niwa-Schröder teaches 1[b(ii)]. Ex-1002 ¶326. A POSA would have understood that Niwa-Schröder's internal housing component contacts the user's tissue when Niwa-Schröder's finger ring is worn. §XIII.A.1.d. Schröder's "finger-ring 2 is worn by a user." Ex-1007, 3:61-62; *id.*, 7:38-39, 10:52-56.

e. 1[c]

Ground 5: Niwa teaches 1[c]. Ex-1002 ¶¶327-333.

Niwa's finger ring has a battery configured to fit between the internal and external housing components in a cavity that is between the outer circumferential surface of the external housing component and the inner circumferential surface of the internal housing component. *Id.* Niwa's finger ring 40 includes second unit 20 which "supplies" power to the first unit. Ex-1005 ¶¶62, 193, 213. The second unit 20 includes battery 24, which "is a power supply source...driv[ing] the plethysmogram sensor." *Id.* ¶217. Niwa explains that the second unit is covered by the finger ring housing and encompasses the thickness of battery 24. *Id.* ¶201. A

POSA would have understood that Niwa's battery 24 is disposed in a "cavity" formed between the outer circumferential surface of the external housing component and the inner circumferential surface of the internal housing component because the second unit (including the battery) is covered by ring housing 40 (green, made of the external side that is exposed to the environment and internal side touching the user's finger). *See id.*, Figs, 22, 26; Ex-1002 ¶¶336-338. A POSA would have designed the ring housing in Niwa to have a cavity sized to accommodate the battery and other electronic components—otherwise these components would be crushed or compressed because the solid ring and circuit components cannot simultaneously occupy the same space. *Id.*

FIG.22

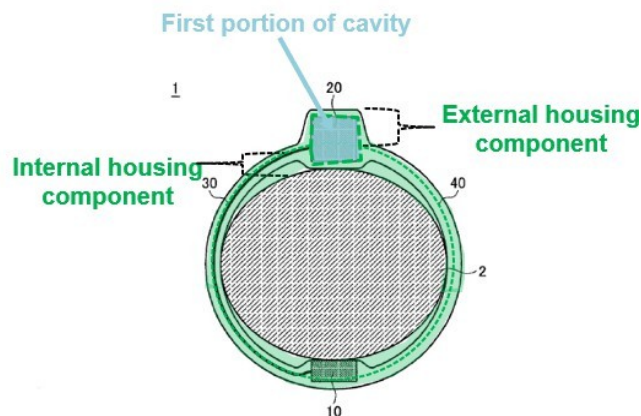
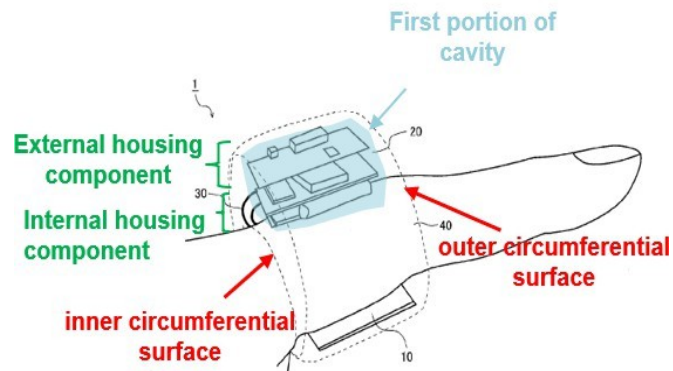


FIG.26



A POSA would have understood that by being disposed between the internal and external housing components, the battery necessarily extends through at least a first portion of the cavity and is of a size and shape in the cavity. Ex-1002 ¶¶329-333. A POSA would have understood that placing the battery between the internal and external housing components means that the battery is positioned to extend through at least a first portion of the cavity because the cavity is designed to accommodate not only the battery but also other components and parts. *Id.* A POSA would have understood that this arrangement facilitates efficient connections from the battery in the first portion to other components situated in different portions of the device and allows for optimal power management and enhanced functionality. *Id.* Additionally, this configuration improves accessibility for replacement or maintenance components thereby extending the device's operational life and ease of service. *Id.*

Ground 6: Niwa-Schröder teaches 1[c]. Ex-1002 ¶334. A POSA would have understood that Niwa's cavity would be between the external and internal housing components, as taught in Schröder. §XIII.A.1.e.

f. 1[d]

Ground 5: Niwa teaches 1[d]. §XIII.B.2; Ex-1002 ¶¶335-338. Niwa teaches a PCB. §XIII.B.2.b.

FIG.27

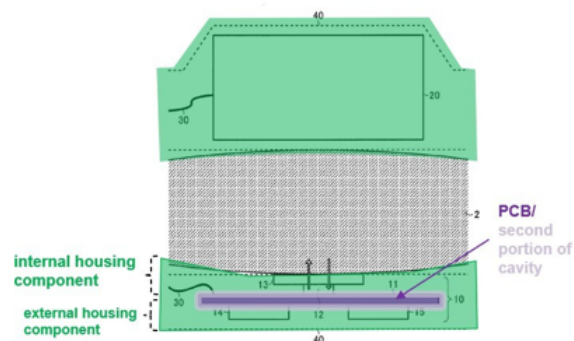
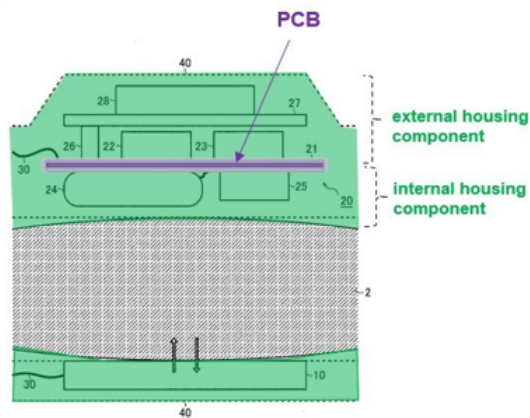


FIG.28



Niwa's PCB extends through at least a second portion of the cavity of the finger-worn wearable ring device different from the first portion. Ex-1002 ¶337. A POSA would have understood that by being disposed between the internal and

external housing components, the PCB necessarily exists within a cavity by being within the finger ring housing 40. *Id.* ¶¶337-338. In view of both the battery and the PCB being arranged inside and covered by the finger ring, the cavity must provide space for both components. *Id.* Figures 27-28 (cross-sections) show how a first portion (light blue) surrounding battery 24 (blue) in second unit 20 is different than a second portion (light purple) surrounding PCB 11 (purple). *Id.*

FIG.28

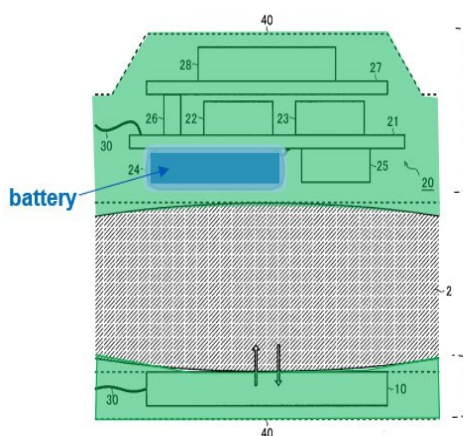
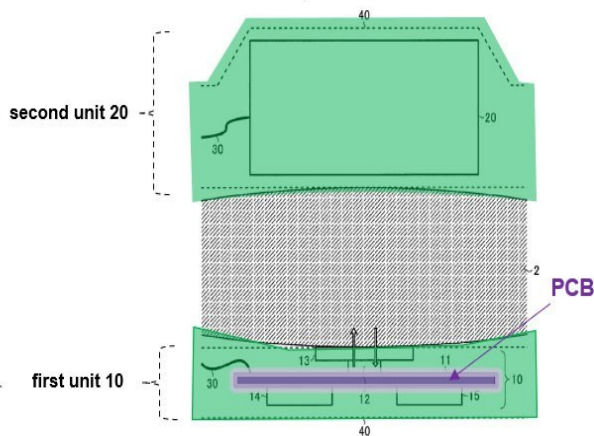


FIG.27



Ground 6: Niwa-Schröder teaches 1[d]. Ex-1002 ¶¶339-40. Niwa teaches a PCB. §XIII.B.2.b. A POSA would have understood that Niwa’s PCB would be second portion of the cavity would be between the external and internal housing components, as taught in Schröder. §XIII.A.1.f; Ex-1002 ¶340.

g. 1[e]

Ground 5: Niwa teaches 1[e]. Ex-1002 ¶¶341-343.

Niwa’s finger ring has one or more sensors electrically coupled with the PCB

and the battery. *Id.* ¶342. Niwa’s first unit 10 contains a light emitting portion, a light receiving portion, and a processing unit “to acquire information about the plethysmogram of the measured person based on a measured value provided from the light receiving portion”—i.e., a sensor. Ex-1005 ¶¶12, 27, 192. Niwa’s second unit has battery 24 power the first unit by cable 30 which “connect[s] the first unit and the second unit electrically.” *Id.* ¶62. Niwa further teaches substrates and circuits in the first and second units. *Id.* ¶¶68-69, 77, 200-201. Thus, Niwa teaches a sensor electrically coupled with the PCB and the battery. Ex-1002 ¶342.

Niwa’s sensor is configured to acquire data from the user through the internal housing component. *Id.* ¶343. First unit 10 has “light sensor 12,” comprised of “both the light emitting portion and the light receiving portion...provided at same side against the finger 2,” that “performs the measurement of the plethysmogram (i.e., *detection for the emitted light to the finger 2 and a reflected light go back from the finger 2*) via [a] measurement window 13.” Ex-1005¶¶209-10. A POSA would have understood that Niwa’s sensor acquires data from the user through window 13 that faces the finger, i.e., through the internal housing component. Ex-1002 ¶¶342-343.

Ground 6: Niwa-Schröder teaches 1[e]. *Id.* ¶344. A POSA would have understood that Niwa’s sensors would acquire data from the user through the internal housing component, as taught in Schröder. *Id.*; §XIII.A.1.g.

3. Claims 2-3 and 13-18

a. Claim 2

Niwa teaches Claim 2. §XIII.B.3.a; Ex-1002 ¶¶345-346.

b. Claim 3

Niwa teaches Claim 3. §XIII.B.3.b; Ex-1002, ¶¶347-348.

c. Claims 13-16

Niwa teaches Claims 13-16. §XIII.B.3.c-f; Ex-1005 ¶¶353-360.

d. Claim 17

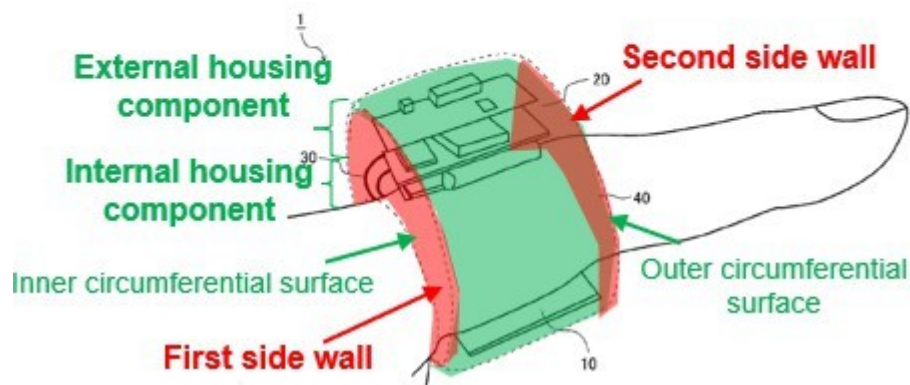
Niwa teaches Claim 17. Ex-1002 ¶¶361-364, 366.

Niwa's external and internal housings define a cavity that surround the battery and PCB. *Id.* ¶362. Niwa's "finger ring type housing 40" contains the first unit 10, second unit 20, and cable 30. Ex-1005 ¶194. Niwa's battery 24 and PCB 30 are inside the cavity of finger ring housing 40. §XIII.E.1.e-f

Niwa's finger ring has first and second side walls that extend between the internal housing component and the external housing component and further define the cavity. Ex-1002 ¶¶363-364. Niwa explains the thickness of the finger ring type housing 40 "covers" the first and second units. Ex-1005 ¶¶200-201. Side walls (red) extend between the internal and external housing components (green) and correspond to the claimed side walls because they are the material that connects the external and internal housing components at a thickness that covers the first and

second units inside the ring. *See id.*, Fig. 26(annotated) Ex-1002 ¶363.

FIG.26



Niwa's cavity is defined by the outer circumferential surface, the inner circumferential surface, the first side wall, and the second side wall. Ex-1002 ¶3664. Niwa describes that these surfaces allow the finger ring to be “water-proof” so that it is “possible to measure the plethysmogram without breaking down even if it is soaked [in] water.” Ex-1005 ¶205. A POSA would have understood that all the components in Niwa exist within a cavity inside the finger ring type housing 40, which is comprised of the outer circumferential surface and inner circumferential surface because the finger ring housing 40 “covers” and “water-proofs” the components. Ex-1002 ¶366. A POSA would have found it obvious to partially define the cavity with a first and second side wall because a POSA would have been

motivated to arrange the components in a way that reduces the wearer's consciousness of the ring. *Id.*; Ex-1005 ¶206. One arrangement would include stacking the components—making the ring taller but still comfortable to wear—rather than evenly increasing the ring's circumference and becoming less comfortable to wear. Ex-1002 ¶366. A POSA would have been motivated to include first and second side walls to strengthen the cavity's structure and extend the components' longevity.

Ground 6: Niwa-Schröder teaches Claim 17. Ex-1002 ¶¶361-362, 365.

A POSA would have understood that Schröder teaches Claim 17. §XIII.A.2.c. A POSA would have also understood that both housing components define a first side wall and a second side wall because both components are U-shaped. Similarly, in Figure 8, external housing portion 18 is a U-shape component that extends and connects to internal housing component 16 and defines the cavity by surrounding inlay 12 therefore having “side walls” (red) to form the connection. A POSA would have understood that the external housing component defines the first and second side wall because it is U-shaped. *Id.*

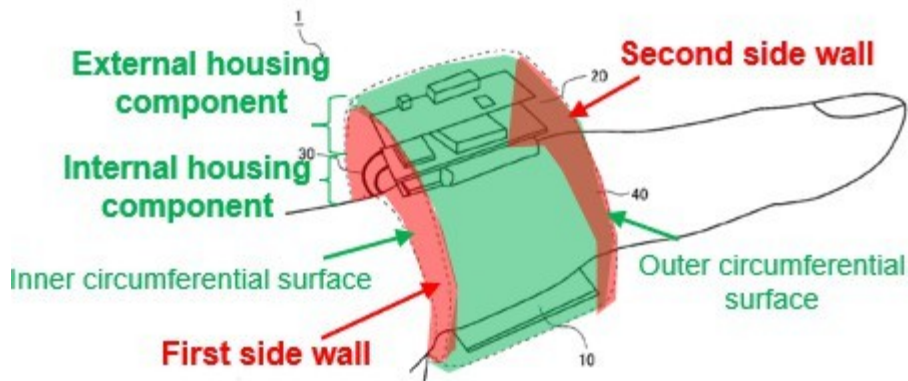


e. **Claim 18**

Ground 5: Niwa teaches Claim 18. Ex-1002 ¶366.

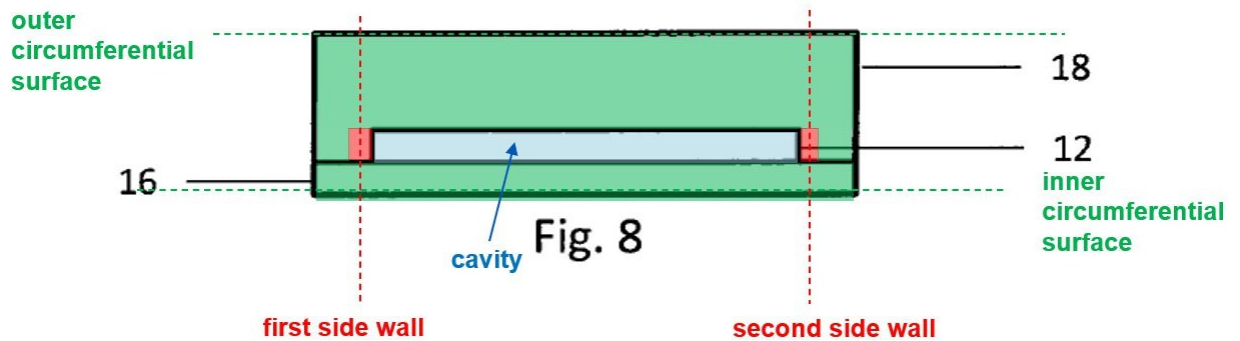
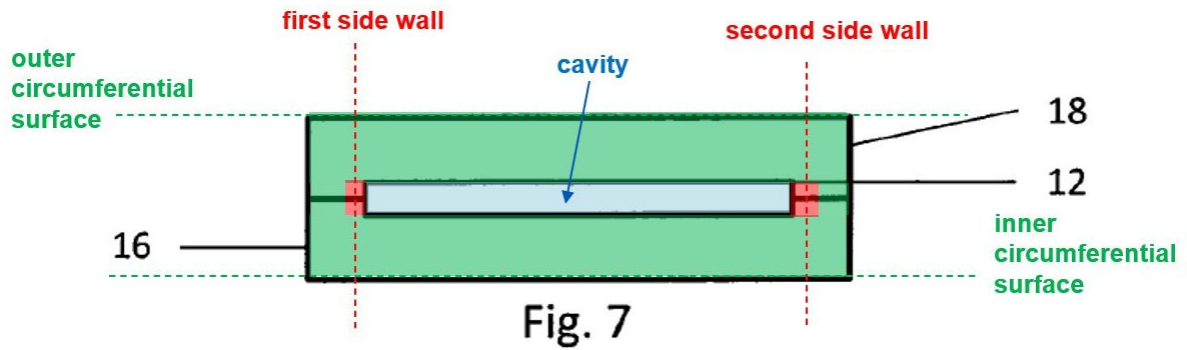
Niwa teaches the first side wall, the second side wall, or both, are substantially perpendicular to the inner circumferential surface, the outer circumferential surface, or both. *Id.* Annotated Figure 26 shows that the side walls (red) are substantially perpendicular to the inner circumferential surface or outer circumferential surface (green) to “cover” and “water-proof” the components. *Id.* A POSA would have been motivated to implement side walls that are substantially perpendicular to the inner or outer circumferential surface. *Id.*; §XIII.E.2.g.

FIG.26



Ground 6: Niwa-Schröder teaches Claim 18. Ex-1002 ¶367.

A POSA would have understood that Schröder teaches this Claim 18. §XIII.A.2.d. A POSA would have also understood that Niwa's ring combined with Schröder's cavity would have side walls substantially perpendicular to the inner and outer circumferential surfaces. *Id.* Annotated Figures 7-8 illustrate how Schröder's side walls (red) are substantially perpendicular to the inner and outer circumferential surfaces, i.e., outside surfaces of the internal and external housing components (green).



F. Grounds 7/8: Claim 12 is obvious over Niwa/Niwa-Schröder in view of Mestas.

1. Motivation/Reasonable Expectation

A POSA would have been motivated to apply the teachings of Mestas to Niwa/Niwa-Schröder (“Niwa-Mestas”/“Niwa-Schröder-Mestas”), and would have had a reasonable expectation of success because each relates to the same well-known technologies. Ex-1002 ¶¶373-377. A POSA would have been motivated to combine Niwa-Schröder. §XIII.E.1.

A POSA would have been motivated to combine Niwa/Niwa-Schröder with Mestas because they are analogous art and teach improvements to the same type of devices. Ex-1005 ¶¶11, 28; Ex-1010 ¶¶143 148. Niwa also discloses an electronic

plethysmogram—or heart or blood monitoring—device that may be worn “without restricting the behavior of the examinee.” Ex-1005 ¶11. Niwa discloses that the device may be in a “finger ring construction.” *Id.* ¶61, Cl. 16. Schröder also teaches a “finger-ring” consisting of “two ring halves 16 and 18” with a recess so that “inlay 12 is inserted.” Ex-1007, 12:7-9. Mestas also discloses an electronic health monitoring device that may be “worn in a variety of locations on a user’s body.” Ex-1010 ¶143. The three references teach analogous wearable devices.

Niwa teaches a cavity that houses electrical components. Ex-1002 ¶375; Ex-1005 ¶¶201, 205. Niwa further teaches a battery and a PCB arranged in a cavity. Ex-1005, Fig. 28. Schröder also teaches a cavity with electrical component like a battery and a PCB. Ex-1007, 12:7-9, 8:56-60. Mestas similarly teaches a device with structural components, including, inner and outer surfaces, a cavity, and a battery and PCB, within the cavity. Ex-1010 ¶¶150 (cavity; battery), 151 (structure), 154 (cavity), 157 (structure), 164 (PCB), 168 (battery), Figs. 4, 6 (structure).

Mestas offers design and manufacturing benefits to Niwa’s/Niwa-Schröder’s ring. Ex-1002 ¶376. Mestas discloses batteries having a “curved configuration.” Ex-1010 ¶168. A POSA would have been motivated to implement Mestas’s curved battery in Niwa/Niwa-Schröder’s ring because Niwa/Niwa-Schröder and Mestas relate to wearable electronic devices and doing so would provide a more compact structure with the battery conforming to the circular shape of the ring thereby

reducing the risk of stress of the circular shape. Ex-1002 ¶¶375-376. Because it is “desirable to restrain the largeness of...the second unit 20 not to protrude from...the finger,” a POSA would have been motivated to give the battery in Niwa/Niwa-Schröder a “curved configuration” like in Mestas. Ex-1005 ¶206; Ex-1002 ¶¶375-376.

A POSA would have had a reasonable expectation of success in combining Niwa/Niwa-Schröder and Mestas. Ex-1002 ¶377. A POSA would have understood that different electronic health monitoring devices contain interchangeable components. *Id.* A POSA 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 smaller, more comfortable, and more structurally sound wearable devices. *Id.*

2. Claim 12

Niwa-Mestas/Niwa-Schröder-Mestas teaches Claim 12. Ex-1002 ¶¶378-379; §XIII.F.1. Mestas teaches a curved battery that has an arc that approximates a corresponding arc of the external housing component. Ex-1002 ¶379. Mestas teaches that the battery can be “curvilinear or curved.” §XIII.C.2.b; Ex-1010 ¶168.

G. Grounds 9/10: Claims 4-10 are obvious over Niwa/Niwa-Schröder in view of Yuen.

1. Motivation/Reasonable Expectation

A POSA would have been motivated to apply Yuen's teachings to Niwa/Niwa-Schröder, and would have had a reasonable expectation of success because each relates to the same well-known technologies. Ex-1002 ¶¶380-385. A POSA would have been motivated to combine Niwa-Schröder. §XIII.E.1.

A POSA would have been motivated to combine Niwa with Yuen because they are analogous art and teach improvements to similar devices. Ex-1005 ¶¶11, 28; Ex-1006, 12:50-52. Niwa also teaches charging a battery using "a non-contact method as an electromagnetic induction method, an electric field connection method, or an electric field resonance method." Ex-1005 ¶218. Schröder's "finger-ring" is "charged by...electromagnetic field." Ex-1007, 11:54-55. Yuen further teaches charging a battery using magnetic properties of the portable biometric device or docking station. Ex-1006, 14:42-49. In view of Yuen, it would have been obvious to use the magnetic properties of a charger device to orient the ring in Niwa/Niwa-Schröder to facilitate charging or wireless energy transfer. Ex-1002 ¶¶381-382.

Yuen further offers design and manufacturing benefits to Niwa/Niwa-Schröder's ring device. A POSA would have been motivated to implement orienting Niwa/Niwa-Schröder's ring using Yuen because "battery swapping...is not required" and the sensor's "utility...can be enhanced" by not requiring wired

charging because a device will last longer and is more convenient for users. Ex-1005 ¶218; Ex-1002 ¶¶381-382. The '178 Patent acknowledges that a device “can be subjected to [a] magnetic field to produce a current that can charge the onboard battery in accordance with known electromagnetic principles.” Ex-1001, 30:45-48. Niwa/Niwa-Schröder and Yuen teach the same. Ex-1005 ¶218; Ex-1007, 11:54-55; Ex-1006, 14:42-46, 28:41-50. Thus, design incentives and market forces would have motivated a POSA to combine the teachings of Niwa and Yuen to result in a wearable ring device with wireless charging when the device is oriented in a charging position.

Moreover, Yuen improves Niwa/Niwa-Schröder’s sensor, such that it would have been obvious to modify a sensor’s operational parameter or measurement periodicity in the wearable device of Schröder based on Yuen. XIII.D.1; Ex-1005 ¶¶12, 27; §XIII.E.2.g.

A POSA would have also had a reasonable expectation of success in combining Niwa/Niwa-Schröder and Yuen to provide more versatile wearable devices. XIII.F.1; Ex-1002, ¶385.

2. Claims 4-10

a. Claim 4

Niwa-Yuen/Niwa-Schröder-Yuen teaches Claim 4. Ex-1002 ¶¶386-389; §XIII.G.1. Niwa/Niwa-Schröder teaches that its ring device comprises one or more magnetic components configured to magnetically interact with one or

more additional magnetic components of a charger device. Ex-1002 ¶¶387. Niwa’s charging circuit receives power by a non-contact method. Ex-1005 ¶74. Niwa explains its non-contact charging method as “an electromagnetic induction method, an electric field connection method, or an electric field resonance method.” *Id.* ¶218. Similarly, Schröder’s “finger-ring” is “charged by...[a] reader’s electromagnetic field.” Ex-1007, 11:54-55.

A POSA would have understood that Niwa/Niwa-Schröder’s electromagnetic induction method would use magnetic components to orient the finger ring in a charging position to facilitate the non-contact charging. Moreover, a POSA would have found it obvious, as explicitly disclosed by Yuen’s magnetic orientation. §XIII.D.3.a-b. A POSA would have been motivated to implement Yuen’s magnets to orient Niwa/Niwa-Schröder’s finger ring with its charger in order charge without contact easier. Ex-1002 ¶¶388-389.

b. Claim 5

Niwa-Yuen/Niwa-Schröder-Yuen teaches Claim 5. Ex-1002 ¶¶390-391; §XIII.G.1. Niwa-Yuen/Niwa-Schröder-Yuen teaches a charging component configured to wirelessly transfer energy from an additional charging component of the charger device. Ex-1002 ¶391. Niwa’s finger ring has a “charging circuit 25” that charges battery 24 with an outside power source supply. Ex-1005 ¶218, 221. Yuen uses magnets to orient the finger ring to the charger for inductive charging.

c. Claim 6

Niwa-Yuen/Niwa-Schröder-Yuen teaches Claim 6. Ex-002 ¶¶392-396; §XIII.G.1. Niwa/Niwa-Schröder teaches one or more processors communicatively coupled to the battery and the one or more sensors. Ex-1002 ¶393. Niwa discloses a “central processing unit” that controls the light emitting and receiving components and a “processing circuit” that “controls entire operation of the plethysmogram sensor.” Ex-1005 ¶¶120, 177, 212. Niwa illustrates a processing circuit (brown) communicatively coupled to a battery (blue) and a sensor (orange) by a cable 30 and substrates 11, 21 (pink). *Id.*, Figs. 27-28 (Annotated); Ex-1002 ¶393.

FIG.28

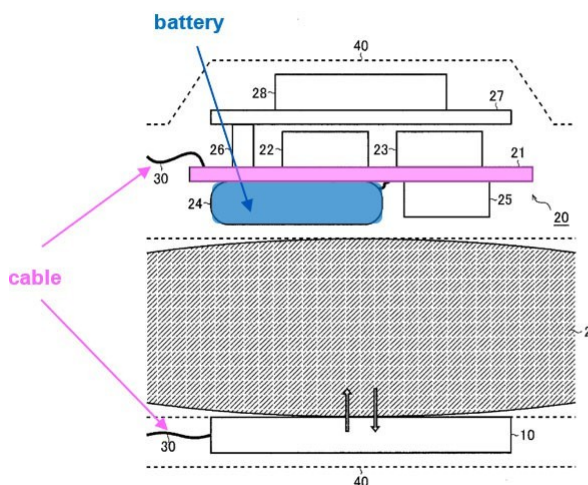
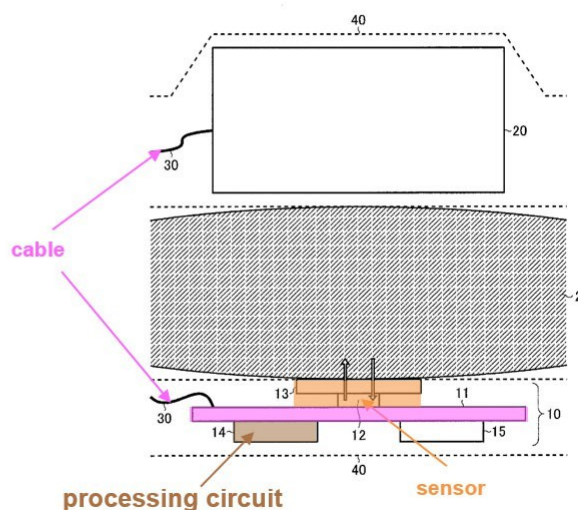


FIG.27



Yuen describes a “PPG [photoplethysmography] *sensor having a light source, light detector*, ADC, *processor*, DAC/GPIOs, and light source intensity and

on/off control.” Ex-1006, 4:3-6, Figs. 17, 25. Yuen discloses that its device “may include one or more processors,” such as a “sensor processor” that “process[es] data from physiological, environmental and/or activity sensors” or an “application processor” that “may be used to store and execute applications that utilize sensor data acquired and processed by” a sensor processor, while such an application process may also have sensors directly connected. *Id.*, 22:60-23:15.

Yuen further teaches one or more processors are configured to: selectively adjust one or more operational parameters of the one or more sensors based at least in part on the data acquired by the one or more sensors. §XIII.D.3.c; Ex-1002 ¶¶395-396.

d. Claim 7

Niwa-Yuen/Niwa-Schröder-Yuen teaches Claim 7. Ex-002 ¶¶397-398; §XIII.G.1. Niwa-Yuen/Niwa-Schröder-Yuen teaches data acquired by one or more sensors comprises heart rate data associated with a heart rate of the user. Ex-1002 ¶398. Niwa’s processing circuit controls the plethysmogram sensor 1 which “acquires” information such as the “the heart rate, the fluctuation of the heart rate, and the acceleration plethysmogram.” Ex-1005 ¶212. Yuen further teaches processors configured to selectively adjust a measurement periodicity used by the one or more sensors to acquire the heart rate data based at least in part on the heart rate of the user. Ex-1006, 6:57-7:6, 10:7-28, 21:14-45; §XIII.D.3.d.

e. Claim 8

Niwa-Yuen/Niwa-Schröder-Yuen teaches Claim 8. Ex-1002 ¶¶399-401; §XIII.G.1. Niwa-Yuen/Niwa-Schröder-Yuen’s acquired data comprise activity data. *Id.* Based on analysis of Niwa’s plethysmogram’s measured fluctuations, the user’s “athletic ability or tension” can be learned. Ex-1005 ¶118. Moreover, Yuen teaches acquiring a user’s activity data and selectively adjusting a measurement periodicity based on the activity data. §XIII.D.3.e.

f. Claim 9

Niwa-Yuen/Niwa-Schröder-Yuen teaches Claim 9. Ex-1002 ¶¶402-404; §XIII.G.1. Niwa-Yuen/Niwa-Schröder-Yuen teaches the data acquired by the one or more sensors is associated with one or more sleep states of the user. Ex-1002 ¶403. In Niwa, the user’s “fatigue level” and “pleasant sleep level” can be learned from the measured fluctuations. Ex-1005 ¶118. Moreover, Yuen teaches acquiring a user’s sleep states and selectively adjusting a measurement periodicity based on the sleep states. §XIII.D.3.f; Ex-1006, 7:19-25, 7:61-65. A POSA would have understood that Yuen’s selectively adjusting a measurement periodicity of a sensor based in part on the user’s sleep state could be applied to Niwa’s processor. Ex-1002 ¶403.

g. Claim 10

Niwa-Yuen/Niwa-Schröder-Yuen teaches Claim 10. Ex-1002 ¶¶405-408; §XIII.G.1. Niwa-Yuen/Niwa-Schröder-Yuen teaches one or more processors communicatively coupled to the battery and the one or more sensors. §XIII.G.2.c.

Yuen teaches one or more processors further configured to selectively adjust one or more operational parameters of the one or more sensors based at least in part on a power level of the battery, a power usage of the one or more sensors, or both. §XIII.D.2.g; Ex-1002 ¶407. A POSA would have understood that Yuen's selective adjustment of operational parameters of the sensor(s) based at least in part on the power level or usage of the battery and/or sensor could be applied to Niwa/Niwa-Schröder's device. *Id.*

XIV. *FINTIV*

All patent-related claims in the parallel Ultrahuman Action have been stayed since infancy pending resolution of a parallel ITC investigation. The Board should thus decline to deny institution.

XV. CONCLUSION

Petitioners request IPR of Claims 1-10 and 12-18 of the '178 Patent.

Dated: January 6, 2025

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CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. §42.24(d), Petitioners certify that this petition includes 14,000 words, as measured by Microsoft Word, exclusive of the table of contents, mandatory notices under §42.8, certificates of service, word count, and exhibits.

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

The undersigned hereby certifies that the above document and accompanying Motion for Joinder and all exhibits were served on January 6, 2025, 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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