

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

v.

OURARING, INC.
Patent Owner.

Case No. IPR2024-00928
U.S. Patent No. 9,582,034

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 9,582,034**

TABLE OF CONTENTS

	Page
I. INTRODUCTION	1
II. MANDATORY NOTICES UNDER 37 C.F.R. §42.8.....	1
III. FEE AUTHORIZATION	3
IV. GROUNDS FOR STANDING.....	3
V. PRECISE RELIEF REQUESTED	3
VI. THE CHALLENGED PATENT	4
VII. PROSECUTION HISTORY OF THE '034 PATENT.....	6
VIII. LEVEL OF ORDINARY SKILL IN THE ART.....	7
IX. PRIORITY DATE	8
X. CLAIM CONSTRUCTION	8
XI. BRIEF DESCRIPTION OF THE APPLIED PRIOR ART	8
A. Schröder (Ex-1007).....	8
B. Yuen (Ex-1006).....	11
C. LeBoeuf (Ex-1012).....	12
D. Wissmar (Ex-1013)	13
XII. THE BOARD SHOULD NOT EXERCISE ITS DISCRETION UNDER §325(D) TO DENY HEARING THESE INVALIDITY ISSUES FOR THE FIRST TIME IN THIS PETITION	14
XIII. DETAILED EXPLANATION OF THE UNPATENTABILITY GROUNDS	16
A. Grounds 1/2: Claims 1-5, 11-13, and 16-18 Are Obvious Over Schröder Alone / Over Schröder in view of Yuen.....	16
1. A POSITA would have been motivated to combine Schröder's and Yuen's teachings and would have had a reasonable expectation of success.....	16
2. Independent Claims 1, 11, and 16.....	20
a. Elements 1[pre]/11[pre]/16[pre]: A wearable computing device, comprising:.....	20

TABLE OF CONTENTS

(continued)

	Page
b. Element 1[A]: an interior wall defining a first enclosing structure;.....	21
Elements 11[A(i)]/16[D(i)]: an internal housing portion defining a [first]/[second] enclosing structure,.....	21
Element 11[A(ii)]: the internal housing portion configured to be disposed near a finger of a user;.....	21
c. Elements 1[B]/11[D(i)]/16[A]: an exterior [wall]/[housing portion] defining a [second]/[first] enclosing structure;.....	22
d. Element 1[C]: a flexible printed circuit board disposed between the interior wall and the exterior wall;	23
Elements 11[B]/16[B]: a flexible printed circuit board arranged around a portion of a circumference of an interior surface of the [internal]/[external] housing;	23
e. Elements 1[D]/11[C]/16[C]: at least one component disposed on the flexible printed circuit board; and	24
f. Element 1[E]: wherein at least one of the interior wall and the exterior wall defines a window that facilitates at least one of data acquisition, data transmission, and battery recharge.	25
g. Elements 11[D]/16[D(ii)]: the [external]/[internal] housing portion configured to seal the at least one component and the printed circuit board in an internal space defined by the interior surface of the [internal]/[external] housing.	28
3. Dependent Claims 2-5, 12-13, and 17-18	30
a. Claim 2: The wearable computing device of claim 1, wherein the window comprises an internal window defined by the interior wall.....	30

TABLE OF CONTENTS

(continued)

	Page
b. Claim 3: The wearable computing device of claim 1, wherein the window comprises an exterior window defined by the exterior wall.	31
c. Claim 4: The wearable computing device of claim 1, wherein an antenna is accessible via the window.	32
d. Claim 5: The wearable computing device of claim 4, wherein at least one of an LED or a photovoltaic cell is accessible via the window.	33
e. Claims 12/17: The wearable device of claim [11]/[16], wherein the [external housing portion]/[internal housing portion] comprises a substantially transparent [external]/[internal] potting.	35
f. Claims 13/18: The wearable computing device of claim [12]/[17], wherein the at least one component comprises at least one LED configured to emit at least one of visible light, infrared radiation, and ultraviolet radiation through the [external]/[internal] potting.	36
B. Ground 3: Claims 1, 2, 11, 12, and 16-18 are obvious over LeBoeuf.....	39
1. Independent Claims 1, 11, 16	39
a. Elements 1[pre]/11[pre]/16[pre]: A wearable computing device, comprising:.....	39
b. Element 1[A]: an interior wall defining a first enclosing structure;.....	40
Elements 11[A(i)]/16[D(i)]: an internal housing portion defining a [first]/[second] enclosing structure, ...	40
Element 11[A(ii)]: the internal housing portion configured to be disposed near a finger of a user;.....	40

TABLE OF CONTENTS

(continued)

	Page
c. Elements 1[B]/11[D(i)]/16[A]: an exterior [wall]/[housing portion] defining a [second]/[first] enclosing structure;.....	41
d. Element 1[C]: a flexible printed circuit board disposed between the interior wall and the exterior wall;	42
Elements 11[B]/16[B]: a flexible printed circuit board arranged around a portion of a circumference of an interior surface of the [internal]/[external] housing;.....	42
e. Elements 1[D]/11[C]/16[C]: at least one component disposed on the flexible printed circuit board; and	44
f. Element 1[E]: wherein at least one of the interior wall and the exterior wall defines a window that facilitates at least one of data acquisition, data transmission, and battery recharge.	44
g. Elements 11[D]/16[D(ii)]: the [external]/[internal] housing portion configured to seal the at least one component and the printed circuit board in an internal space defined by the interior surface of the [internal]/[external] housing.	46
2. Dependent Claims 2, 12, 17, and 18	47
a. Claim 2: The wearable computing device of claim 1, wherein the window comprises an internal window defined by the interior wall.....	47
b. Claim 12: The wearable device of claim 11, wherein the external housing portion comprises a substantially transparent external potting.....	48
c. Claim 17: The wearable device of claim 16, wherein the internal housing portion comprises a substantially transparent internal potting.....	48

TABLE OF CONTENTS
(continued)

	Page
d. Claim 18: The wearable computing device of claim 17, wherein the at least one component comprises at least one LED configured to emit at least one of visible light, infrared radiation, and ultraviolet radiation through the internal potting.	49
C. Ground 4: Claims 4 and 5 are obvious over LeBoeuf in view of Wissmar.....	50
1. A POSITA would have been motivated to combine LeBoeuf’s and Wissmar’s teachings and would have had a reasonable expectation of success.....	50
2. Dependent Claims 4 and 5	53
a. Claim 4: The wearable computing device of claim 1, wherein an antenna is accessible via the window.	53
b. Claim 5: The wearable computing device of claim 4, wherein at least one of an LED or a photovoltaic cell is accessible via the window.....	54
XIV. THE BOARD SHOULD NOT USE ITS DISCRETION TO DENY INSTITUTION UNDER <i>FINTIV</i>	55
XV. CONCLUSION.....	55

LIST OF EXHIBITS¹

Ex. No.	Description
Ex-1001	U.S. Patent No. 9,582,034 (“the ’034 Patent”)
Ex-1002	Declaration of Dr. Brian W. Anthony
Ex-1003	Curriculum Vitae of Dr. Brian W. Anthony
Ex-1004	Prosecution History of the ’034 Patent (Application No. 15/556,062)
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
Ex-1017	INTENTIONALLY LEFT BLANK

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

Ex. No.	Description
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	INTENTIONALLY LEFT BLANK
Ex-1024	U.S. Patent No. 4,830,014 to Goodman (“Goodman”)
Ex-1025	U.S. Patent No. 6,745,061 to Hicks (“Hicks”)
Ex-1026	U.S. Patent No. 7,190,986 to Hannula (“Hannula”)
Ex-1027	Volker König et al., <i>Reflectance Pulse Oximetry – Principles and Obstetric Application in the Zurich System</i> , 14 Journal of Clinical Monitoring (Aug. 1998) (“König”)
Ex-1028	U.S. Patent No. 6,608,562 to Kimura (“Kimura”)
Ex-1029	Kevin K. Tremper et al., <i>Pulse Oximetry</i> , 70 Journal of American Society of Anesthesiologists, Inc. (Jan. 1989) (“Tremper”)
Ex-1030	Y. Mendelson et al., <i>A Wearable Reflectance Pulse Oximeter for Remote Physiological Monitoring</i> , Proceedings of 28th 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-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 22nd Annual EMBS Int’l Conference (July 23-28, 2000) (“Rhee 2000 Part II”)

Ex. No.	Description
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-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. No.	Description
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-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)

U.S. Patent No. 9,582,034
Petition for *Inter Partes* Review

Ex. No.	Description
Ex-1060	U.S. Patent No. 6,201,698 to Hunter (“Hunter”)
Ex-1061	U.S. Patent No. 4,012,629 to Simms (“Simms”)

I. INTRODUCTION

Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. (collectively, “Petitioner”) request *inter partes* review (“IPR”) of Claims 1-5, 11-13, and 16-18 of U.S. Patent No. 9,582,034 (“the ’034 Patent”) (Ex-1001), currently assigned to OuraRing Inc. (“PO”).

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

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

Related Matters: PO has not asserted the ’034 Patent.

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

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III. FEE AUTHORIZATION

Pursuant to 37 C.F.R. §42.15(a) and §42.103(a), the PTO is authorized to charge any and all fees to Deposit Account No. LA500639.

IV. GROUNDS FOR STANDING

Petitioner certifies that the '034 Patent is available for review, and Petitioner is not barred or estopped from requesting review.

V. PRECISE RELIEF REQUESTED

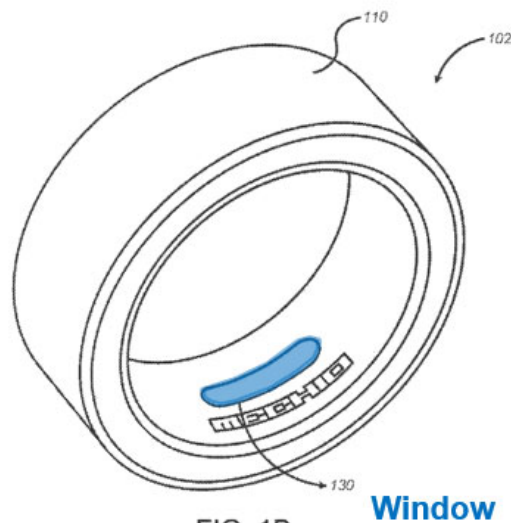
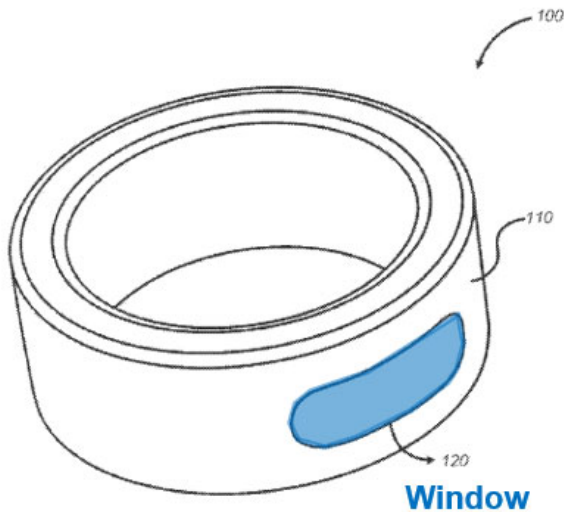
Petitioner respectfully requests cancellation of Claims 1-5, 11-13, and 16-18 of the '034 Patent under AIA 35 U.S.C. § 103 on the following grounds, supported by a declaration from Dr. Brian W. Anthony. Ex-1002 ¶¶1-34, 43-132; Ex-1003.

Ground	Summary
1	Claims 1-5, 11, 12, 16, and 17-18 are obvious over Schröder (Ex-1007)
2	Claims 1-5, 11-13, and 16-18 are obvious over Schröder in view of Yuen (Ex-1006)
3	Claims 1, 2, 11, 12, and 16-18 are obvious over LeBoeuf (Ex-1012)
4	Claims 4 and 5 are obvious over LeBoeuf in view of Wissmar (Ex-1013)

VI. THE CHALLENGED PATENT

The challenged claims are directed to a wearable computing device having specific components including interior and exterior housing components and an electronic component disposed on a flexible printed circuit board. Ex-1001, Cl. 1. Claim 1 also requires a window on either the interior or exterior wall to facilitate at least one of data acquisition, data transmission, and battery recharge. Independent Claims 11 and 16 further require that a housing component is “configured to seal” the components and printed circuit board in an internal space defined by the interior surface of the housing.

An example of a wearable electronic device is illustrated in Figures 1A and 1B of the '034 Patent.² As shown below, the ring has an exterior wall and can include an exterior window 120 (blue) “for input/output data transmission and reception, battery recharge, or status indication.” Ex-1001, 9:39-43. The ring also has an interior wall facing the skin which can include “interior window 130” for various monitoring or sensing activities. Ex-1001, 9:43-51. When the housings are made of a material that prevents light from passing “through” the housing, the '034 Patent explains that the windows are formed so to allow radiation (e.g., light) to be emitted through the housing without disruption. *Id.*, 17:45-54.



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

Similarly, the '034 Patent teaches the use of “potting.” The wearable computing device can be completely sealed using “potting epoxy” such as silicone, epoxy, polyester resin, or any other polymer to “provide resistance to shock and/or vibration and...prevent moisture and/or debris from entering the housing.” Ex-1001, 17:17-22. A transparent potting is also used to allow electromagnetic radiation, such as visible, infrared (IR), or ultraviolet (UV) light sources from inside the housing to pass through the housing. Ex-1001, 16:12-15, 17:23-29.

The '034 Patent recognizes that prior wearable electronic devices had “many applications for the wearer” and “help[ed] monitor activity within the wearer’s body.” *Id.*, 1:20-23. The patent alleges that its claimed device is inventive and patentable because the device purportedly overcomes the disadvantages of other wearable devices and can be worn for extended periods of time and can perform measurements on the finger. *Id.*, 1:23-27.

As explained below, all subject matter of the challenged claims is described in the prior art and the '034 claims are obvious in view of the prior art. Ex 1002 ¶¶35-39.

VII. PROSECUTION HISTORY OF THE '034 PATENT

The '034 Patent was filed November 28, 2014, and claims priority to two provisional applications, U.S. Application No. 62/006,835, filed June 2, 2014, and U.S. Application No. 61/910,201, filed November 29, 2013. Ex-1001.

After the Examiner rejected the claims, Applicant amended the claims to recite that the interior and exterior walls define enclosing structures and that the internal window facilitates at least one of data acquisition, data transmission, and battery recharge. Ex-1004, 0982-0986. The Examiner allowed the claims noting that the closest prior art of record had an exterior window for “indication and not for data acquisition, data transmission, or battery recharge.” *Id.*, 1005-1006. The ’034 Patent issued February 28, 2017. *Id.*, 1027. PO later filed a certificate for correction to correct the dependency of Claim 4 to depend from Claim 1 instead of Claim 3. *Id.*, 1028, 1040; Ex-1002 ¶¶40-42.

This Petition presents new arguments and prior art not considered during prosecution, and nothing precludes considering them in the first instance under 35 U.S.C. §325(d). All challenged 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 (“POSITA”) would have had at least a four-year degree in electrical engineering, mechanical engineering, biomedical engineering, optical engineering, or related field of study, or equivalent experience, and at least two years’ experience in academia or industry studying or developing physiological monitoring devices such as non-invasive biosensors. A POSITA would have also been familiar with, for example, sensor

system design and signal processing. A higher level of education or skill might make up for less experience, and vice versa. Ex-1002 ¶¶26-30.

IX. PRIORITY DATE

For purposes of this proceeding only, Petitioner applies the earliest alleged priority date of the '034 Patent: November 29, 2013. Accordingly, post-AIA 35 U.S.C. §102 applies.

X. CLAIM CONSTRUCTION

Petitioner interprets the claims according to *Phillips*. 37 C.F.R. §42.100(b). To resolve this Petition, Petitioner does not believe that any term requires express construction.³ CTPG 44; Ex-1002 ¶¶31-33, 150-151.

XI. BRIEF DESCRIPTION OF THE APPLIED 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

³ There is currently no pending district court litigation against Petitioner. Petitioner respectfully reserves all rights to raise claim construction and other arguments in district court. Additionally, if a district court litigation is filed, Petitioner will request leave to submit the district court's claim construction as soon as it becomes available. Moreover, should PO raise implied claim construction arguments in its Preliminary Response, Petitioner will respectfully seek a Preliminary Reply to respond. CTPG 44-45 (permitting petitioner to respond to claim construction raised by patent owner).

filed July 25, 2013. Schröder qualifies as prior art under AIA 35 U.S.C. §102(a)(2). Petitioner is unaware of any facts supporting an exception under §102(b). Schröder's German counterpart is essentially identical to the U.S. filing. *See generally* Ex-1007 (U.S. issued patent); Ex-1009 (German application); Ex-1008 (certified translation of German application). The figures are identical, and the specification is equivalent.⁴ Ex-1002 ¶¶133-138. Because the described subject matter is identical, Schröder's '867 Patent should be considered to have been effectively filed as of its German priority date of July 25, 2013, because the '867 Patent is entitled to claim a right of priority to DE 102013012339 under §365. AIA 35 U.S.C. §102(a)(2) and (d)(2); MPEP §2152.

Schröder teaches a biometric sensing device, depicted in Figure 1 below, which is a finger ring “worn by a user, e.g., permanently on the finger.” Ex-1007, 3:61-63, Fig. 1 (finger ring 2 communicating with smartphone 4).

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

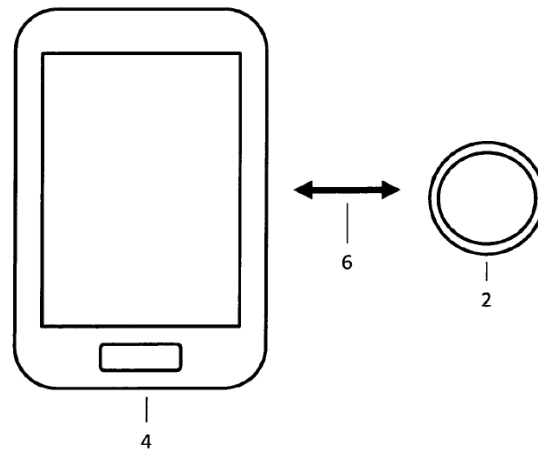


Fig. 1

As shown in Figure 7 below in cross-section, Schröder's finger ring consists of "two ring halves 16 and 18" with a recess within which "inlay 12 is inserted." Ex-1007, 12:7-9. Inlay 12 consists of "flexible carrier material" like PET and Kapton and can have a "chip module 10 with at least one antenna coil 8." Ex-1007, 12:28-33, 12:61-65. A battery powers chip module 10 and is charged wirelessly. Ex-1007, 11:46-58. The finger ring also has "biometric sensors" such as an infrared diode and sensor 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; Ex-1002 ¶¶134-138.



Fig. 7

B. Yuen (Ex-1006)

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

Yuen describes a “biometric monitoring device” that can be worn in any number of ways including, but not limited to a chest band, necklace, patch, bra, earring, glasses, “or toe band.” Ex-1006, 24:35-40. Yuen’s biometric monitoring device is metal that maintains structural integrity while “accommodating a watertight seal for the sensor package.” Ex-1006, 14:66-15:4.

Yuen acquires the user’s biometric data by light from optical sensors, or LEDs, emitted through a “window” made of “plastic or a glass layer.” *Id.*, 10:55-66. Yuen’s biometric monitoring device has optical sensors “arranged on the skin side” so light is emitted upon the user’s skin and detected by a light detector to measure a “user’s heart rate, respiration, heart rate variability, oxygen saturation (SpO2), blood volume, blood glucose, skin moisture and/or skin pigmentation level.” Ex-1006, 10:7-21. Yuen’s biometric monitoring device also measures the user’s heart rate by an optical heart rate monitor on the external side of the device so “the user may touch an optical window...to initiate a heart rate measurement.” Ex-1006, 12:62-13:5.

Yuen further employs a “double-shot or two step molding process wherein optically opaque material is injected and optically transparent material is injected” to form a “light transmissive structure having an optically opaque portion (including certain optical properties) and an optically transparent portion (including optical properties different from the optically opaque portion).” Ex-1006, 11:29-36; Ex-1002 ¶¶139-144.

C. LeBoeuf (Ex-1012)

LeBoeuf (U.S. Patent No. 8,700,111) was filed June 21, 2010, and issued April 15, 2014. LeBoeuf qualifies as prior art under AIA 35 U.S.C. §102(a)(2). Petitioner is unaware of any facts supporting an exception under §102(b).

LeBoeuf teaches a “monitoring device” that can be configured to be worn on a user’s earlobes, fingers, or toes. Ex-1012, 27:58-61. As shown in Figures 22A and 22B below, the wearable monitoring device can be a “circular band capable of encircling a finger F of a subject, with a cylindrical outer body portion 72 and a generally cylindrical inner body portion 74 secured together in concentric relationship” and thus worn as a “finger ring.” Ex-1012, 27:61-28:1. The finger ring may include a flex circuit containing various electronic components, such as a microprocessor, power source, power regulator, and the like. Ex-1012, 28:3-8.

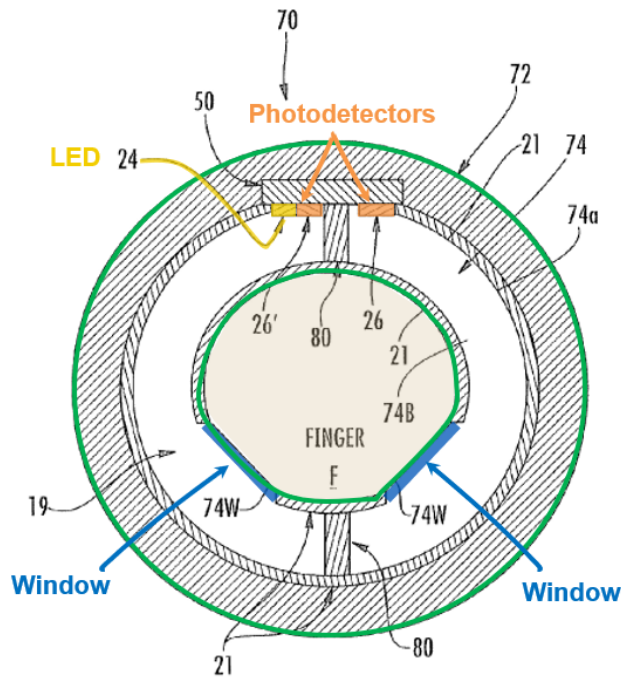


FIG. 22B

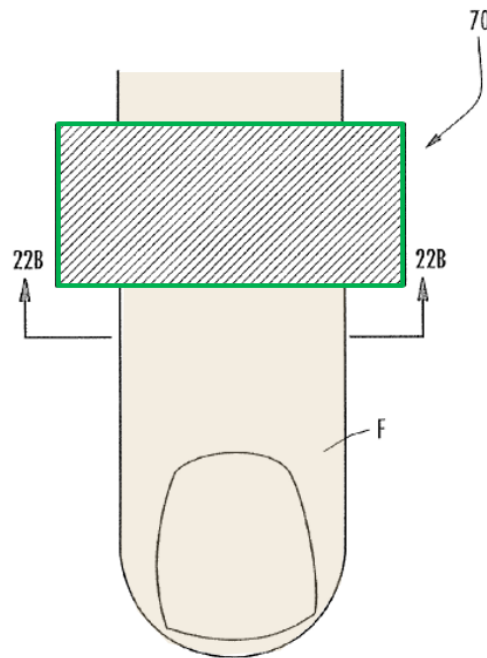


FIG. 22A

LeBoeuf's finger ring has "windows 74w" (blue) which serve as light-guiding interfaces to the finger from optical emitter 24 (yellow) to light detectors 26, 26' (orange). Ex-1012, 28:40-50. The windows may incorporate optical filters to selectively pass one or more optical wavelengths and reflect and/or absorb other optical wavelengths. *Id.*, 28:48-50. Light detectors 26, 26' measure the light scattered by the window lens to determine the user's motion or physiological activity. Ex-1012, 28:63-29:11; Ex-1002 ¶¶145-147.

D. Wissmar (Ex-1013)

Wissmar (U.S. Patent Application Publication No. 2012/0218184) was filed May 1, 2012, as the U.S. national stage application of International Patent

Application PCT/SE2010.051167 filed October 27, 2010, and issued August 30, 2012. Wissmar qualifies as prior art under AIA 35 U.S.C. §102(a)(1) and §102(a)(2). Petitioner is unaware of any facts supporting an exception under §102(b).

Wissmar teaches an electronic finger ring with electronic components packaged and integrated within the ring for radio frequency (RF) transmission. Ex-1013, Abstract. Wissmar's finger ring is a toroidal shaped finger ring structure, constituted of two different metallic shells to enclose the major parts of the finger ring using gold and silver. Ex-1013 ¶73. All electronic components, including "an antenna," are mounted on a flexible printed circuit board (FPCB). Ex-1013 ¶¶71, 91. The antenna is specifically "located under the portion of the ring which has no outer shell metal" to allow "unperturbed RF radiation" when the outer shell is made of a metal that would otherwise prevent RF radiation from passing. Ex-1013 ¶91; Ex-1002 ¶¶148-149.

XII. THE BOARD SHOULD NOT EXERCISE ITS DISCRETION UNDER §325(D) TO DENY HEARING THESE INVALIDITY ISSUES FOR THE FIRST TIME IN THIS PETITION

In considering its discretion under 35 U.S.C. §325(d), "the Board uses the following two-part framework: (1) whether the same or substantially the same art previously was presented to the Office or whether the same or substantially the same arguments previously were presented to the Office; and (2) if either condition of first

part of the framework is satisfied, whether the petitioner has demonstrated that the Office erred in a manner material to the patentability of challenged claims.” *Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6 at 8 (PTAB Feb. 13, 2020) (precedential).

Here, the first *Advanced Bionics* prong is not met. While the Wissmar (Ex-1013) reference (Ground 4) was listed on a PTO-892 form (a Notice of References Cited, Ex-1004, 0906), this would not be sufficient to satisfy the first prong of *Advanced Bionics* because the record is silent as to the examiner’s consideration or understanding of Wissmar’s teachings.⁵

Even if Wissmar was considered as indicated by the 892 form, under the second prong of *Advanced Bionics*, which need not be reached, it was a material error for the examiner not to have considered the disclosures of Wissmar. That is because Wissmar clearly teaches the additional features of Dependent Claim 4. *See infra* §§XIII.C. Because the record is silent as to the examiner’s understanding of Wissmar, the examiner must have overlooked it because Wissmar, in combination with LeBoeuf, teaches the claim limitations. *See K/S HIMPP v. Bragi GmbH*,

⁵ Although only a proposed rule, under the April 19, 2024 Notice of Proposed Rulemaking on discretionary denials, §325(d) is not applied to references not “meaningfully considered,” which is defined as situations “where the Office has evaluated the art or arguments and articulated its consideration of the art or arguments in the record of the application....” 89 Fed. Reg. 28693, 28700 (Apr. 19, 2024).

IPR2023-01205, Paper 8 at 20-21 (PTAB March 19, 2024). In view of the foregoing, the Board should not exercise its discretion under §325(d) to deny institution because LeBoeuf was not before the office and alone renders a majority of the claims unpatentable.

XIII. DETAILED EXPLANATION OF THE UNPATENTABILITY GROUNDS

A. Grounds 1/2: Claims 1-5, 11-13, and 16-18 Are Obvious Over Schröder Alone / Over Schröder in view of Yuen

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

A POSITA would have been motivated to combine the teachings of Schröder and Yuen ("Schröder-Yuen") and would have had a reasonable expectation of success in doing so because each relates to the same well-known technologies. Ex-1002 ¶¶152-163.

A POSITA also would have been motivated to combine Schröder with Yuen because they are analogous art and teach improvements to the same type of devices. Both Schröder and Yuen teach electronic wearable devices. Ex-1002 ¶¶153-157; 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), 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 further offers additional design and manufacturing benefits to Schröder's finger ring. Ex-1002 ¶¶158-161. First, Schröder's windows may be improved by Yuen. Schröder's finger ring has security elements like "transparent regions, e.g., windows" incorporated into its surface. Ex-1007, 9:28-34. Yuen further teaches "a window (for example, a visually opaque window) in the housing" to permit light from one or more LEDs to emit onto the user's skin and a response/reflection to pass into the housing and be measured by one or more photodiodes. Ex-1006, 10:55-63; *see also id.*, 10:63-67 ("infrared lens which permits infrared light to pass"), 10:7-12 ("arranged on the skin side"). Yuen also describes an optical heart rate monitor on the exterior of the device so that the user "may touch an optical window" to begin the measurement. *Id.*, 12:62-13:5. Yuen further employs a "double-shot or two step molding process wherein optically opaque material is injected and optically transparent material is injected" to form "light transmissive structure having an optically opaque portion (including certain optical properties) and an optically transparent portion (including optical properties different from the optically opaque portion)." Ex-1006, 11:29-36. Yuen therefore teaches the use of transparent materials as interior and exterior windows to allow for light to be emitted through and sensed for data acquisition. Ex-1002 ¶¶158-159.

Based on Yuen's teachings, it would have been obvious to use Yuen's windows in Schröder so that an optical sensor can acquire the user's biometric data

without any intervening material that may block or prevent the transmission of light to the user's body and photodetector. Ex-1002 ¶¶160. A POSITA would have been motivated to implement transparent windows on the interior and/or exterior walls of Schröder's finger ring to enhance data acquisition through the finger ring's metal housing. *Id.* Thus design incentives and market forces would have motivated a POSITA to combine the teachings of Schröder and Yuen to result in a wearable electronic finger ring with transparent windows for acquiring the user's biometric information. *Id.*

Second, a POSITA would have understood that Yuen can improve Schröder's finger ring's durability by sealing the housing components together. Ex-1002 ¶161. Schröder's ring halves 16 and 18 "are interconnected by a suitable technology, e.g., by plugging, gluing, screwing, crimping, etc." Ex-1007, 12:20-23. Yuen's metal biometric monitoring device has a "watertight seal" made using "watertight glues, hydrophobic membranes such as Gore-Tex, O-rings, sealant, grease, or epoxy to secure or attach the optical sensor package/module and the device body." Ex-1006, 14:66-15:4, 15:10-14. Based on Yuen's teachings, it would have been obvious to modify the seal of Schröder's ring halves that are interconnected to make the finger ring "watertight." Ex-1002 ¶161. A POSITA would have understood from Yuen that a watertight seal protects the interior components from water (e.g., rain) or sweat and allows the biometric monitoring device to continue acquiring the wearer's

biometric data. *Id.* Thus, a POSITA would have been motivated to seal Schröder's finger ring with a watertight seal in order to make it stronger, more durable, and efficient during all of the user's daily activities. *Id.*; *DyStar Textilfarben GmbH v. C.H. Patrick Co.*, 464 F.3d 1356, 1368 (Fed. Cir. 2006) (making things stronger, cheaper, lighter, smaller, more durable, or more efficient are universal motivators to combine/modify prior art).

A POSITA would have had a reasonable expectation of success in combining Schröder and Yuen. Ex-1002 ¶¶162-163. A POSITA would have understood that the electronic components of Yuen's and Schröder's devices are similar and are interchangeable regardless of whether the devices are in the form of, for example, a toe band or a finger ring. *Id.*; Ex-1007, 2:60-64 (finger ring), 3:61-62 (worn by a user e.g., permanently on the finger); Ex-1006, 24:35-40 (chest band, necklace, patch, bra, earring, glasses, or toe band); 12:25-30 (light emitters 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"), 12:24-42 (adapt to the shape of the user's appendage 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"). Moreover, a POSITA 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 ¶163. A POSITA would have understood,

therefore, that these references disclose interrelated teachings based on routine technologies that would have been amenable to various well-understood and predictable combinations to provide smaller and more comfortable wearable devices. *Id.*

2. Independent Claims 1, 11, and 16

a. Elements 1[pre]/11[pre]/16[pre]: A wearable computing device, comprising:

Grounds 1 and 2: Schröder teaches⁶ the preambles of Claims 1, 11, and 16 to the extent that they are limiting. Ex-1002 ¶164. Schröder’s wearable computing device is an “external secure unit” worn as a “finger-ring.” Ex-1007, 2:60-65. Schröder’s finger ring is a “computing device” that includes a memory, processor, interface, and communication device for storing, processing, receiving, and saving data. *Id.*, Abstract. Therefore, Schröder’s finger ring is a “wearable computing device” just like in the ’034 Patent because it is a wearable monitor/computer suitable for prolonged usage with accurate results. Ex-1001, 8:44-48; Ex-1002 ¶164.

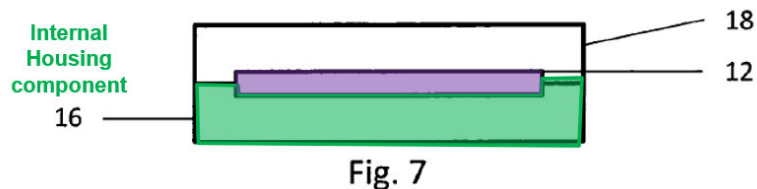
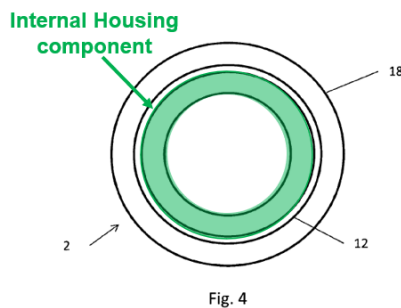
⁶ Petitioner uses the term “teaches” as including both express teachings or those fairly suggested to a person of ordinary skill in the art. *In re Baird*, 16 F.3d 380, 383 (Fed. Cir. 1994); *In re Keller*, 642 F.2d 413, 425 (CCPA 1981) (“The test for obviousness is...what the combined teachings of the references would have suggested to those of ordinary skill in the art.” (citations omitted))

- b. **Element 1[A]: an interior wall defining a first enclosing structure;**

Elements 11[A(i)]/16[D(i)]: an internal housing portion defining a [first]/[second] enclosing structure,

Element 11[A(ii)]: the internal housing portion configured to be disposed near a finger of a user;

Grounds 1 and 2: Schröder teaches Elements 1[A], 11[A(i)]/16[D(i)], and 11[A(ii)]. Ex-1002 ¶¶165-167. Schröder’s wearable computing device has an interior housing portion that defines an enclosing structure. *Id.* As shown in Figures 4 and 7 below, Schröder’s finger ring consists of “two ring halves 16 and 18 [green]” with a recess so that “inlay 12 is inserted [purple].” Ex-1007, 12:7-9. Ring halves 16 and 18 are manufactured by casting, milling, or embossing and “interconnected by a suitable technology, e.g., by plugging, gluing, screwing, crimping, etc.” Ex-1007, 12:10-22. Schröder’s ring halves can be formed in a U-shape to enclose inlay 12 between the components 16 and 18. *Id.*, 12:45-55.



Schröder’s internal housing portion is configured “to be disposed near a finger of a user.” Ex-1002 ¶167. Ring half 16 is the side of the finger ring that touches the user’s finger. *Id.* Schröder’s “finger-ring 2 is worn by a user, e.g., permanently on

the finger.” Ex-1007, 3:61-62; *see id.* at 7:38-39 (“a user wears the external secure unit...directly on his body”), 10:52-56 (“continually worn on the body, e.g., on the finger.”). Moreover, Schröder’s finger ring uses biometric sensors to capture a “vein image in the finger” using an infrared diode and infrared sensor. Ex-1007, 9:62-10:9. In order to capture the biometric data of a vein, the finger ring’s half 16 has to be “disposed” near the user’s finger. Ex-1002 ¶167.

c. Elements 1[B]/11[D(i)]/16[A]: an exterior [wall]/[housing portion] defining a [second]/[first] enclosing structure;

Grounds 1 and 2: Schröder teaches Elements 1[B]/11[D(i)]/16[A]. Ex-1002 ¶¶168-170. Schröder’s wearable computing device has an exterior portion that defines an enclosing structure. *Id.* As shown in Figures 4 and 7 below, 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. Schröder’s ring halves can be formed in a U-shape with the inlay 12 being arranged between the components 16 and 18. *Id.*, 12:45-55. Ring half 18 is the exterior wall or housing portion that defines a second enclosing structure because it is the side of Schröder’s finger ring that is exposed to the environment and provides an enclosing structure to inlay 12. Ex-1002 ¶¶169-170; Ex-1001, 16:39-42 (exterior surface is portion facing away from the finger).

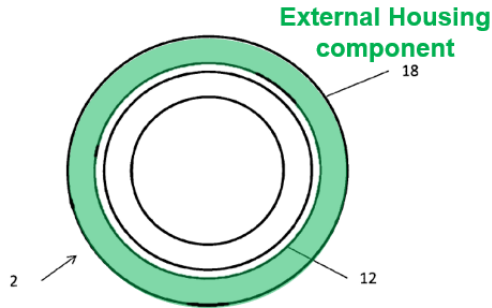


Fig. 4

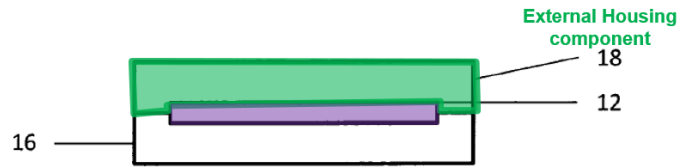


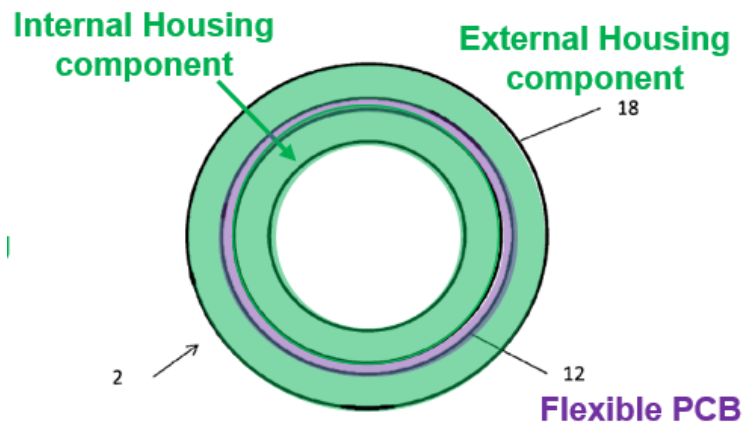
Fig. 7

- d. **Element 1[C]: a flexible printed circuit board disposed between the interior wall and the exterior wall;**

Elements 11[B]/16[B]: a flexible printed circuit board arranged around a portion of a circumference of an interior surface of the [internal]/[external] housing;

Ground 1: Schröder teaches Elements 1[C] and 11[B]/16[B]. Ex-1002

¶¶171-172. Schröder’s wearable computing device has a flexible printed circuit board arranged around a portion of a circumference of an interior surface of the housing. *Id.* Schröder’s finger ring has “a recess into which the inlay 12 is inserted.” Ex-1007, 12:8-9. Inlay 12 consists of “flexible carrier material” like PET and Kapton, which are commonly understood to be printed circuit board materials. *Id.*, 12:28-29; Ex-1002 ¶172 (citing Ex-1006, 12:35-42; Ex-1010 ¶¶151, 153). As shown below in Figure 4, inlay 12 (the claimed flexible printed circuit board) is “arranged around a portion of a circumference of an interior surface” of both the internal and external housings because it is between the circular internal and external housing. Ex-1002 ¶172.



Ground 2: Schröder-Yuen teaches Elements 1[C] and 11[B]/16[B]. Ex-1002 ¶¶173-174. Schröder-Yuen’s wearable computing device has a flexible printed circuit board arranged around a portion of a circumference of an interior surface of the housing. *Id.* Yuen teaches that “the light sources and photodetector are placed on a *flexible PCB*.” Ex-1006, 2:38-39. A POSITA would have been motivated to have Yuen’s flexible printed circuit board as Schroder’s flexible carrier material in order to provide electrical connection to all of the components inside the finger ring with an explicit flexible printed circuit board and would have had a reasonable expectation of success in doing so for the same reasons discussed in §XIII.A.1. Ex-1002 ¶174.

- e. **Elements 1[D]/11[C]/16[C]: at least one component disposed on the flexible printed circuit board; and**

Ground 1: Schröder teaches Elements 1[D]/11[C]/16[C]. Ex-1002 ¶¶175-176. Schröder’s flexible printed circuit board has at least one component. *Id.*

Schröder’s flexible carrier material (the claimed flexible printed circuit board) has “at least one antenna coil 8 and at least one chip module 10” and “display unit.” Ex-1007, 12:30-33, 12:40-43.

Ground 2: A POSITA would have been motivated to have at least one component disposed on the flexible printed circuit board in view of Yuen. Ex-1002 ¶¶177-178. As discussed in the previous section, Yuen teaches that “the light sources and photodetector are placed on a flexible PCB.” Ex-1006, 2:38-39. A POSITA would have been motivated to have Schroder’s electronic components “disposed on” the flexible printed circuit board, as taught in Yuen, in order to provide electrical connection to all of the components inside the finger ring with an explicit flexible printed circuit board and would have had a reasonable expectation of success in doing so for the same reasons discussed in §XIII.A.1. Ex-1002 ¶¶178.

- f. **Element 1[E]: wherein at least one of the interior wall and the exterior wall defines a window that facilitates at least one of data acquisition, data transmission, and battery recharge.**

Ground 1: Schröder teaches Element 1[E]. Ex-1002 ¶¶179-183. Schröder’s wearable computing device has at least one window to facilitate data transmission. Ex-1002 ¶180. Schröder’s finger ring may have security elements like “transparent regions, e.g., windows” incorporated into the surface. Ex-1007, 9:28-34. Schröder explains that security codes or “application specific data” such as “[one-time

passwords], PIN numbers, hash values, random numbers, payment amounts, contents of an electronic purse” may be displayed as a sequence of colors by an LED or displayed by an “optical display unit.” Ex-1007, 8:32-53. A POSITA would have understood that the finger ring would have a (optically transmissive) window in order to transmit the code or colors of the user’s data to the application program on the communication device that is requesting the security-relevant data from the secure finger ring. *Id.*, Abstract, 4:5-7 (same), 4:37-42 (data transfers take place between the finger ring and smartphone); Ex-1002 ¶180.

Schröder’s wearable computing device has at least one window for battery recharge. Ex-1002 ¶181. Schröder’s finger ring has an “energy storage device” such as a battery that supplies chip module 10 with energy from an outside “electromagnetic field of a reader.” Ex-1007, 11:46-55. The energy storage device is charged by its direct connection to antenna coil 8 via a rectifier circuit. Ex-1007, 11:63-68. A POSITA would have understood that in order for antenna coil 8 to charge the battery, coil 8 acts as an inductive coil using an electromagnetic field to wirelessly and inductively charge the battery which would only be made possible if there is an electromagnetic-field window to allow inductive coupling for “battery recharge.” Ex-1002 ¶181.

Moreover, Schröder’s wearable computing device has at least one window for data acquisition. Ex-1002 ¶182. Schröder’s finger ring includes biometric sensors

such as an infrared diode and sensor arranged opposite to each other to capture “a partial vein image in the finger.” Ex-1007, 9:62-10:4. A POSITA would have understood that an internal infrared transmissive window must be provided for the infrared diode to transmit infrared radiation from the diode to the tissue and then back to the sensor to capture the vein image because Schröder’s internal housing is made of metal which would impede or block the infrared transmission. Ex-1007, 12:14-15; Ex-1002 ¶182 (citing Ex-1042, 5:21-27; Ex-1045 ¶295; Ex-1005 ¶¶200, 210, 217). Schröder’s window is thus used for “data acquisition” when capturing the user’s “vein image.” Ex-1002 ¶182.

Thus, Schröder meets the claim in three ways: (1) a window on the exterior wall for data transmission by the LED or optical display, (2) a window on either the exterior or interior for battery recharge by the antenna coil, and (3) a window on the interior wall for data acquisition using an infrared diode and sensor. Ex-1002 ¶183.

Ground 2: A POSITA would have been motivated to explicitly include windows for data acquisition because doing so was well-known, as taught by Yuen. Ex-1002 ¶¶184-186. Yuen’s biometric monitoring device includes “*a window* (for example, a visually opaque window) in the housing” to permit light from one or more LEDs to emit onto the user’s skin and permit a response/reflection to pass into the housing to the photodiodes. Ex-1006, 10:55-63; *see also id.*, 10:63-67 (“infrared lens which permits infrared light to pass”), 10:7-12 (“arranged on the skin side”).

Yuen's biometric monitoring device further collects data of the user's heart rate by an optical heart rate monitor on the external side of the device so "the user may touch an *optical window* (behind which optical elements of the optical heart rate monitor are located) with a finger on the opposing hand to initiate a heart rate measurement." *Id.*, 12:62-13:5. Yuen therefore teaches both interior and exterior windows for data acquisition. Ex-1002 ¶185. A POSITA would have been motivated to implement Yuen's interior and exterior windows for efficient light and radiation emission into Schröder's finger ring to further acquire additional biometric data. Ex-1002 ¶186; *DyStar*, 464 F.3d at 1368.

- g. Elements 11[D]/16[D(ii)]: the [external]/[internal] housing portion configured to seal the at least one component and the printed circuit board in an internal space defined by the interior surface of the [internal]/[external] housing.**

Ground 1: Schröder teaches Elements 11[D]/16[D(ii)]. Ex-1002 ¶¶187-188. Schröder's housing portions "seal" the component and printed circuit board in an internal space defined by the interior surface of the internal and external housings. *Id.* Schröder provides that the ring halves can have a U-shape with the inlay 12 being arranged between the components 16 and 18. Ex-1007, 12:45-55. The ring halves 16 and 18 "are interconnected by a suitable technology, e.g., by plugging, gluing, screwing, crimping, etc." *Id.*, 12:20-23. As shown in Figure 7 below, the U-shaped housing components extend from external housing component 18 to

internal housing component 16 and are connected to each other to surround and seal inlay 12 (and its component). Ex-1002 ¶188. Similarly, in Figure 8, external housing portion 18 is a U-shape component that extends and connects to internal housing component 16 to surround inlay 12 (and its component). *Id.* Therefore, the component and printed circuit board (inlay 12) are “sealed” in the space between the internal surfaces of the housing portions (ring halves 16, 18). Ex-1002 ¶188.



Ground 2: A POSITA would have been motivated to “seal” the component and circuit board in an internal space defined by the interior surface of the internal and external housings, because doing so was well-known as taught by Yuen. Ex-1002 ¶¶189-190. Yuen’s biometric monitoring device is metal that maintains structural integrity while “accommodating a watertight seal for the sensor package.”

Ex-1006, 14:66-15:4. Yuen further explains using “watertight glues, hydrophobic membranes such as Gore-Tex, O-rings, sealant, grease, or epoxy to secure or attach the optical sensor package/module and the device body.” *Id.*, 15:10-14. A POSITA would have been motivated to implement Yuen’s waterproofing sealant techniques into Schröder’s finger ring to “prevent[] liquid ingress into the body of the biometric monitoring device,” and thus increase durability and prevent any damage to the internal components in the device. Ex-1006, 14:64-66; Ex-1002 ¶190; *DyStar*, 464 F.3d at 1368.

3. Dependent Claims 2-5, 12-13, and 17-18

- a. Claim 2: The wearable computing device of claim 1, wherein the window comprises an internal window defined by the interior wall.**

Ground 1: Schröder teaches Claim 2. Ex-1002 ¶191. Schröder’s wearable device has an internal window defined by the interior wall. *Id.* As explained above in Section XIII.A.2.f (Element 1[E]), Schröder’s finger ring comprises an internal window defined by the interior wall for inductive coupling of the antenna to the charger coil and/or data acquisition using an infrared diode and infrared sensor to capture an image of the user’s vein. *Id.*; Ex-1007, 9:62-10:4, 11:46-55, 11:63-66.

Ground 2: A POSITA would have been motivated to have an internal window defined by the interior wall, as explicitly described in Yuen. Ex-1002 ¶192. As explained above in Section XIII.A.2.f (Element 1[E]), Yuen’s biometric

monitoring device has optical sensors “arranged on the skin side” so that light is emitted upon the user’s skin and detected by a light detector to measure a “user’s heart rate, respiration, heart rate variability, oxygen saturation (SpO2), blood volume, blood glucose, skin moisture and/or skin pigmentation level.” Ex-1006, 10:7-12, 10:19-21. The light from the optical sensors, or LEDs, is emitted and passed through “a window (for example, a visually opaque window).” *Id.*, 10:55-63; *see also id.*, 10:63-67 (“infrared lens which permits infrared light to pass”). A POSITA would have been motivated to implement Yuen’s explicit interior window that allows for light and radiation emission into Schröder’s finger ring to measure additional biometric data of the user to enhance Schröder’s authentication methods or detection of when the user is wearing the finger ring. Ex-1007, 10:4-18 (user authentication), 8:20-23 (sensing when the user is wearing the ring); Ex-1002 ¶192; *DyStar*, 464 F.3d at 1368.

b. Claim 3: The wearable computing device of claim 1, wherein the window comprises an exterior window defined by the exterior wall.

Ground 1: Schröder teaches Claim 3. Ex-1002 ¶¶193-194. Schröder’s wearable device has an external window defined by the exterior wall. *Id.* As explained above in Section XIII.A.2.f (Element 1[e]), Schröder’s window is an exterior window defined by the exterior wall because it allows data transmission of the application-specific data, or user data of the LED’s color sequence or optical

display's transmission of "[one-time passwords], PIN numbers, hash values, random numbers, payment amounts, contents of an electronic purse." Ex-1007, 8:32-53.

Ground 2: A POSITA would have been motivated to have an exterior window defined by the exterior wall, in view of Yuen. Ex-1002 ¶¶195-196. Yuen's biometric monitoring device collects data of the user's heart rate by an optical heart rate monitor on the external side of the device by having the user "touch *an optical window* (behind which optical elements of the optical heart rate monitor are located) with a finger on the opposing hand to initiate a heart rate measurement." Ex-1006, 12:62-13:5. A POSITA would have been motivated to implement Yuen's external window defined by the monitoring device's exterior wall into Schröder's finger ring in order to collect the user's biometric data using an exterior sensor. Ex-1002 ¶196; *DyStar*, 464 F.3d at 1368. A POSITA would have been motivated to combine the teachings of Schröder and Yuen and would have had a reasonable expectation of success in doing so for the same reasons discussed in §XIII.A.1.

c. Claim 4: The wearable computing device of claim 1, wherein an antenna is accessible via the window.

Grounds 1 and 2: Schröder teaches Claim 4.⁷ Ex-1002 ¶¶197-198. Schröder's antenna is accessible via the window. *Id.* As explained above in Section

⁷ Claim 4 was corrected to depend from Claim 1 instead of Claim 3 in Patent Owner's Certificate of Correction filed September 4, 2018. Ex-1004, 1043. To the extent that Claim 4 depends from Claim 3, Schröder still meets the claim.

XIII.A.2.f (Element 1[E]), Schröder's antenna coil 8 is accessible via the window because a window that is transmissive to magnetic fields would allow for inductive coupling of the antenna coil with the electromagnetic field reader's antenna for charging the finger ring's battery. Ex-1002 ¶198.

- d. Claim 5: The wearable computing device of claim 4, wherein at least one of an LED or a photovoltaic cell is accessible via the window.**

Ground 1: Schröder teaches Claim 5. Ex-1002 ¶¶199-200. Schröder's wearable device has an LED accessible via the window. *Id.* As explained above in Section XIII.A.2.f (Element 1[E]), Schröder's exterior window allows data transmission of the application-specific data or user data by the LED's color sequence or optical display's transmission of "[one-time passwords], PIN numbers, hash values, random numbers, payment amounts, contents of an electronic purse." Ex-1007, 8:32-53. Moreover, Schröder's LED can be "lit green" when an electromagnetic field of a reader is present, and flash red when the operation of charging is completed. *Id.*, 8:34-38. A POSITA would have understood that Schröder's LED is accessible via the same window as antenna coil 8 that forms an inductive coupling when charging the battery because the LED emits green or red during the charging operation. Ex-1002 ¶200.

Ground 2: Schröder-Yuen teaches Claim 5. Ex-1002 ¶¶201-202. Schröder-Yuen's wearable device has an LED accessible via the window. *Id.* Yuen acquires

the user's biometric data by light from optical sensors (LEDs) being emitted through a window. Ex-1006, 10:55-58. Specifically, the LEDs and circuitry are "disposed in the interior of the device housing and underneath a plastic or glass layer" to allow the light to emit onto the user's skin and be measured by the photodiodes. Ex-1006, 10:58-67. Yuen discusses three light sources separate from one another emitting different wavelengths of light: "an LED that emits light having wave lengths corresponding to the green spectrum," "an LED that emits light having wavelengths corresponding to the red spectrum," and "an LED that emits light having wavelengths corresponding to the IR spectrum." *Id.*, 10:29-31, 10:34-39. A POSITA would have understood that the LED is thus configured to emit light (visible or infrared) through the window in order to sense the user's biometric data. Ex-1002 ¶202. A POSITA would have been motivated to combine the teachings of Schröder and Yuen in order for Schroder's LED to emit light through a window, as explicitly taught in Yuen for efficient light transmission and would have had a reasonable expectation of success in doing so for the same reasons discussed in §XIII.A.1.

- e. **Claims 12/17: The wearable device of claim [11]/[16], wherein the [external housing portion]/[internal housing portion] comprises a substantially transparent [external]/[internal] potting.**

Ground 1: Schröder teaches Claims 12/17. Ex-1002 ¶¶203-204. Schröder teaches that the external and internal housing portions comprise a transparent potting. *Id.* 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. Ring halves 16 and 18 are manufactured by casting, milling, or embossing and “interconnected by a suitable technology, e.g., by plugging, gluing, screwing, crimping, etc.” Ex-1007, 12:10-22. The first ring half can be made of a metal such as silver, gold, titanium, or steel and the other half can be made of “PET, PVC, [or] carbon.” *Id.*, 15:10-11, 15:14-15. A POSITA would have understood that the ring half (either the internal or external housing components) made of polyethylene terephthalate would be a transparent thermoplastic polymer resin and thus made of a “transparent potting.” Ex-1002 ¶204.

Ground 2: Schröder-Yuen teaches that the external and internal housing portions comprise a transparent potting. Ex-1002 ¶¶205-206. Schröder’s finger ring incorporates “transparent regions, e.g., windows” incorporated into the surface (Ex-1007, 9:28-34) of its metal ring. Ex-1007, 12:14-15. A POSITA would have understood to form Schröder’s windows using transparent potting, as explicitly

taught by Yuen. Ex-1002 ¶206. Yuen describes “a window (for example, a visually opaque window) in the housing to facilitate optical transmission between the optical sensors and the user.” Ex-1006, 10:55-58. The window is made of “plastic or a glass layer.” *Id.*, 10:63-66. Yuen further employs a “double-shot or two step molding” to form “a light transmissive structure having an optically opaque portion (including certain optical properties) and an optically transparent portion (including optical properties different from the optically opaque portion).” Ex-1006, 11:29-36.

A POSITA would have been motivated to implement transparent external and internal potting (that allows an LED to emit light through the potting), as taught by Yuen, in Schröder’s ring (that already has transparent windows) for more accurate sensor readings and to protect the LED or optical display from ambient conditions. Ex-1002 ¶207; Ex-1001, 2:62-64 (“configured to allow concentrated light to pass therethrough”). A POSITA would have been motivated to combine the teachings of Schröder and Yuen and would have had a reasonable expectation of success in doing so for the same reasons discussed in §XIII.A.1. Ex-1002 ¶207.

- f. **Claims 13/18: The wearable computing device of claim [12]/[17], wherein the at least one component comprises at least one LED configured to emit at least one of visible light, infrared radiation, and ultraviolet radiation through the [external]/[internal] potting.**

Ground 2: Schröder-Yuen teaches Claims 13/18. Ex-1002 ¶¶208-211.

Schröder-Yuen teaches that light from an LED emits through the external or internal

transparent potting. *Id.* Schröder teaches that a light-emitting diode is configured to emit visible light through external “transparent regions, e.g., windows” incorporated into the surface (Ex-1007, 9:28-34) when the LED displays a sequence of colors or the optical display (made of LEDs) transmits “application specific data” such as “[one-time passwords], PIN numbers, hash values, random numbers, payment amounts, contents of an electronic purse.” Ex-1007, 8:32-53. Schröder further teaches a light-emitting diode that is configured to emit infrared radiation through an internal window to capture “a partial vein image in the finger.” Ex-1007, 9:62-10:4.

A POSITA would have been motivated to configure the emission of the visible light of the external LED or the infrared radiation of the internal infrared diode through transparent potting, as taught in Yuen. Ex-1002 ¶210. Yuen acquires the user’s biometric data by light from optical sensors (LEDs) being emitted through a window. Ex-1006, 10:55-58. Specifically, the LEDs and circuitry are “disposed in the interior of the device housing and underneath a plastic or glass layer” so as to allow the light to emit onto the user’s skin and be measured by the photodiodes. Ex-1006, 10:58-67. Yuen discusses three light sources separate from one another emitting different wavelengths of light: “an LED that emits light having wavelengths corresponding to the green spectrum,” “an LED that emits light having wavelengths corresponding to the red spectrum,” and “an LED that emits light

having wavelengths corresponding to the IR spectrum.” *Id.*, 10:29-31, 10:34-39. A POSITA would have understood that the LED is thus configured to emit light (visible or infrared) through the transparent potting in order sense the user’s biometric data. Ex-1002 ¶210.

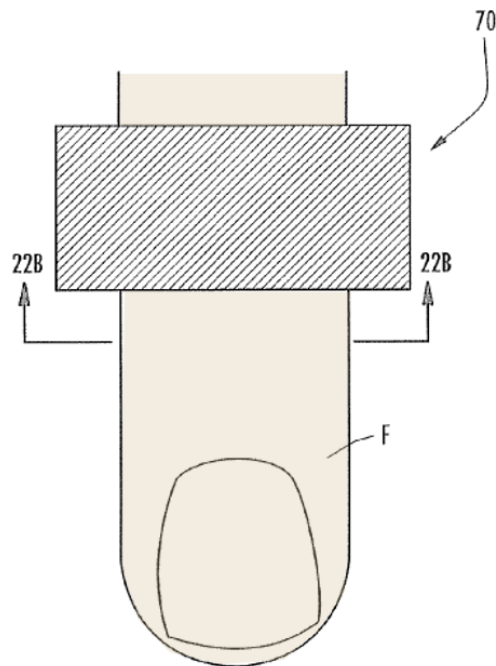
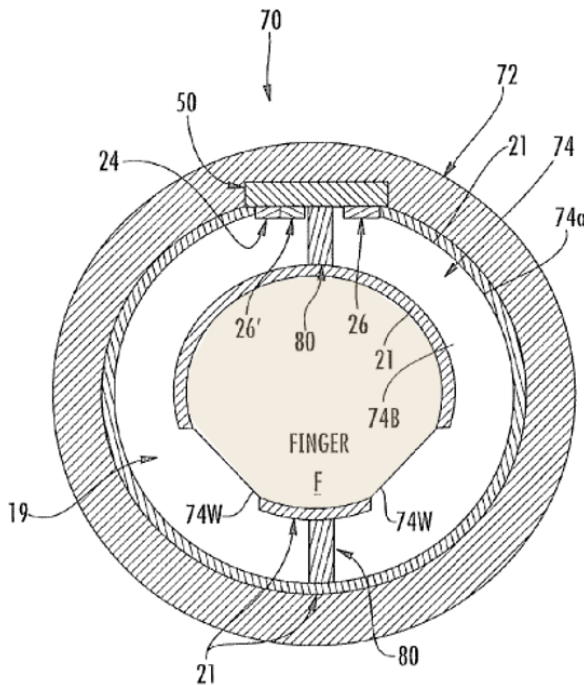
Moreover, a POSITA would have been motivated to configure the emission of the visible light of the external LED through transparent potting, as taught in Yuen. Ex-1002 ¶211. As discussed in Section XIII.A.2.f (Element 1[E]), Yuen’s biometric monitoring device has an optical heart rate monitor on the external side of the device so “the user may touch *an optical window* (behind which optical elements of the optical heart rate monitor are located) with a finger on the opposing hand to initiate a heart rate measurement.” Ex-1006, 12:62-13:5. A POSITA would have been motivated to configure the LED to emit light through the external potting as taught in Yuen, in Schröder’s finger ring, in order to collect the user’s biometric data (like their heart rate) using an exterior sensor. Ex-1002 ¶211. A POSITA would have been motivated to combine the teachings of Schröder and Yuen and would have had a reasonable expectation of success in doing so for the same reasons discussed in §XIII.A.1. *Id.*

B. Ground 3: Claims 1, 2, 11, 12, and 16-18 are obvious over LeBoeuf

1. Independent Claims 1, 11, 16

a. Elements 1[pre]/11[pre]/16[pre]: A wearable computing device, comprising:

LeBoeuf teaches the preambles of Claims 1, 11, and 16 to the extent that they are limiting. Ex-1002 ¶212. LeBoeuf teaches a wearable computing device as a “monitoring device” that can be configured to be worn on a user’s earlobes, fingers, or toes. Ex-1012, 27:58-61. Figures 22A and 22B below illustrate LeBoeuf’s monitoring device configured as a finger ring. *Id.*, 27:61-64.



b. Element 1[A]: an interior wall defining a first enclosing structure;

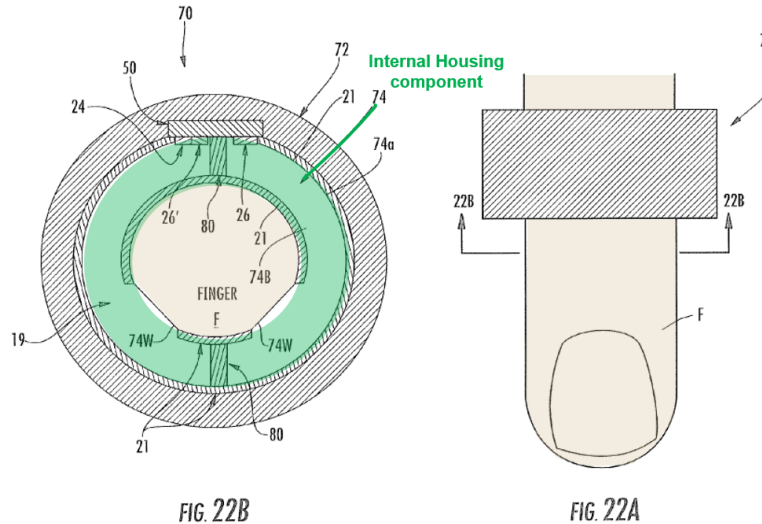
Elements 11[A(i)]/16[D(i)]: an internal housing portion defining a [first]/[second] enclosing structure,

Element 11[A(ii)]: the internal housing portion configured to be disposed near a finger of a user;

LeBoeuf teaches Elements 1[A], 11[A(i)]/16[D(i)], and 11[A(ii)]. Ex-1002

¶213. LeBoeuf’s wearable monitoring device has an interior portion that defines an enclosing structure “disposed” near a user’s finger. *Id.* As shown in Figures 22A and 22B below, the wearable monitoring device is a “circular band” that surrounds the user’s finger “with a cylindrical outer body portion 72 and a generally cylindrical inner body portion 74 secured together in concentric relationship” and thus worn as a “finger ring.” Ex-1012, 27:61-28:1. A layer of cladding material 21 is applied to both sides of the inner body portion 74 to define the inner body portion 74 as a “light-guiding region.” *Id.*, 28:26-30. Specifically, the inner body portion is made from a “soft, resilient material such as silicone,” to be a “light transmissive material” and serve as a “light guide” to deliver light from a light emitter to the finger and from the finger to the light detector. *Id.*, 28:18-19, 28:30-34. The “cylindrical inner body portion 74” and its cladding 21 (green) are the finger ring’s interior wall or housing that defines an enclosing structure by enclosing the circuit and various electronic components (light emitter and detector) inside the finger ring. Ex-1002 ¶213. The

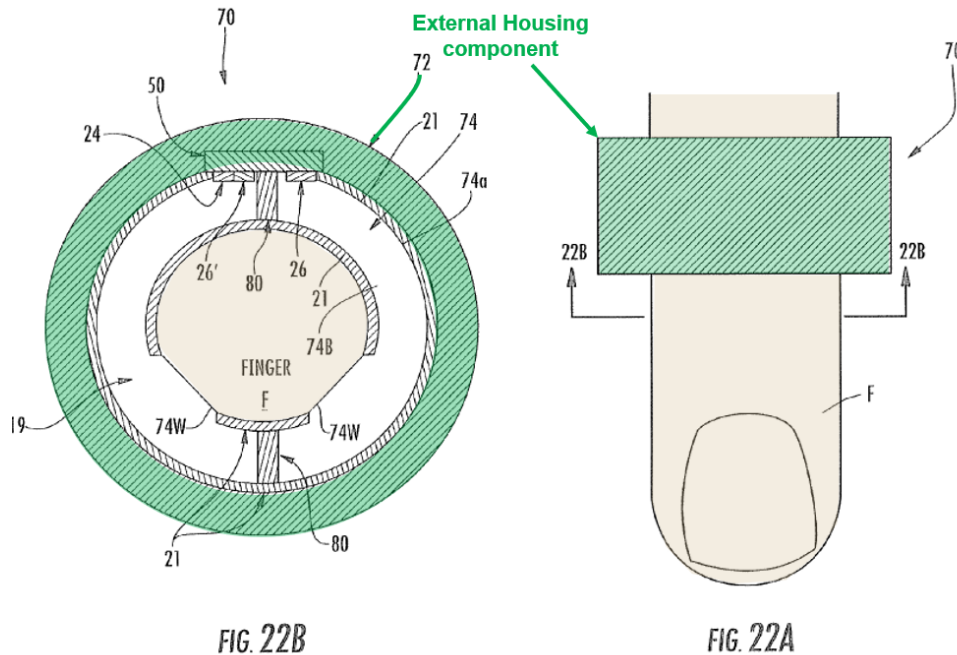
cylindrical inner body portion is the side of the finger ring that touches the user's finger and thus is "disposed near a finger of the user." *Id.*



c. Elements 1[B]/11[D(i)]/16[A]: an exterior [wall]/[housing portion] defining a [second]/[first] enclosing structure;

LeBoeuf teaches Elements 1[B]/11[D(i)]/16[A]. Ex-1002 ¶¶214-215. LeBoeuf's wearable monitoring device has an exterior portion that defines an enclosing structure. *Id.* As described in the previous section, the finger ring is a "circular band capable of encircling a finger F of a subject, with a cylindrical outer body portion 72" which is secured to an inner body portion. Ex-1012, 27:61-28:1. Outer body portion 72 may include a flex circuit containing various electronic components, such as a microprocessor, D/A converter, power source, power regulator, and the like. *Id.*, 28:3-8. As shown in Figures 22A and 22B, "cylindrical outer body portion 72" (green) is the exterior wall or housing that defines an

enclosing structure by being concentrically secured to the inner body portion to enclose various electronic components inside. Ex-1002 ¶215.



- d. **Element 1[C]: a flexible printed circuit board disposed between the interior wall and the exterior wall;**

Elements 11[B]/16[B]: a flexible printed circuit board arranged around a portion of a circumference of an interior surface of the [internal]/[external] housing;

LeBoeuf teaches Elements 1[C] and 11[B]/16[B]. Ex-1002 ¶¶216-217.

LeBoeuf's monitoring device has a flexible printed circuit board arranged around a portion of a circumference of an interior surface of the housing. *Id.* Specifically, the finger ring may include a flex circuit containing various electronic components, such as a microprocessor, D/A converter, power source, power regulator, and the like. Ex-1012, 28:3-8. For example, base 50 (purple) in Figure 22B may be a printed

circuit board that provides support for one or more sensors and is “secured to the inner and outer body portions 74, 72.” *Id.*, 28:11-18 (applying base 50 from other embodiments), 14:28-38 (base 50 of the earbud embodiments is a PCB). A POSITA would have understood that LeBoeuf’s “flex circuit” is a flexible printed circuit board disposed between the interior and exterior walls of the device, like base 50, because it has electronic components positioned on it and is arranged inside the finger ring (i.e., by the ring’s outer body portion 72 and interior body portion 74). Ex-1002 ¶216.

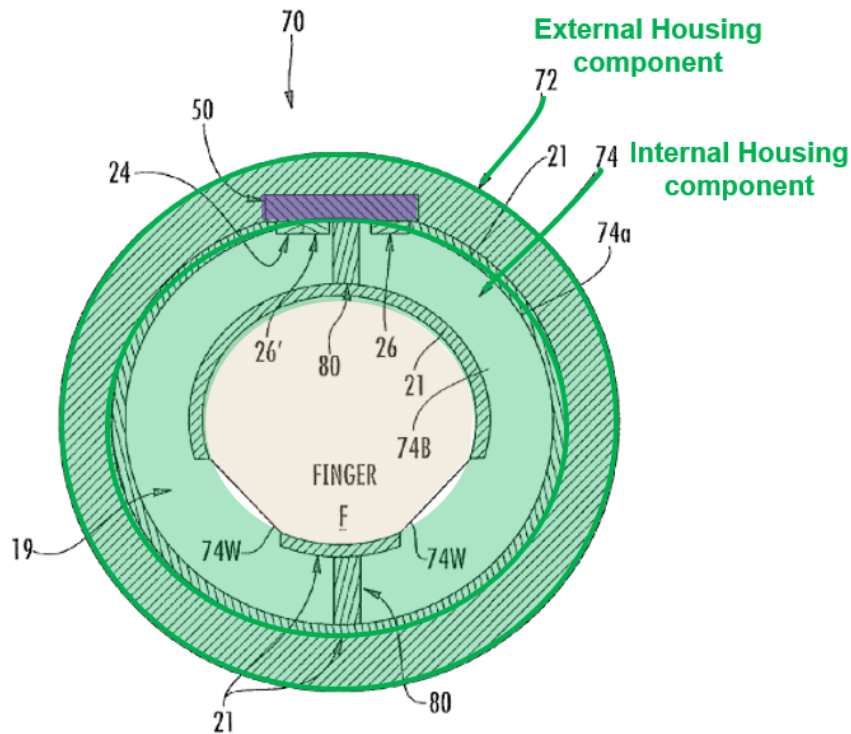


FIG. 22B

A POSITA would have understood that LeBoeuf's flexible printed circuit board follows the circumference of the interior surfaces of the internal housing (inner body portion 74) and external housing (outer body portion 72) because the flexible printed circuit board is inside the ring and between the ring's circular body portions. Ex-1002 ¶217.

e. Elements 1[D]/11[C]/16[C]: at least one component disposed on the flexible printed circuit board; and

LeBoeuf teaches Elements 1[D]/11[C]/16[C]. Ex-1002 ¶218. LeBoeuf's monitoring device has at least one component disposed on the flexible printed circuit board. *Id.* Specifically, the finger ring's flex circuit (the claimed flexible printed circuit board) contains various electronic components, such as a microprocessor, D/A converter, power source, power regulator, and the like. Ex-1012, 28:3-8.

f. Element 1[E]: wherein at least one of the interior wall and the exterior wall defines a window that facilitates at least one of data acquisition, data transmission, and battery recharge.

LeBoeuf teaches Element 1[E]. Ex-1002 ¶219. LeBoeuf's monitoring device has at least one window that facilitates data acquisition. *Id.* As shown in Figure 22B below, LeBoeuf's finger ring has "windows 74w" (blue) formed in the cladding material 21 which serve as light-guiding interfaces to the finger from the optical emitter 24 (yellow) to light detectors 26, 26' (orange) to acquire data. Ex-1012, 28:40-50. The windows may incorporate optical filters to selectively pass one or

more optical wavelengths and reflect and/or absorb other optical wavelengths. *Id.*, 28:48-50. Light detectors 26, 26' measure the light scattered by the window lens to determine the user's motion or physiological activity. Ex-1012, 28:63-29:11. LeBoeuf's "windows 74w" are positioned in the interior wall of the finger ring, through cladding 21 of inner housing portion 74 to acquire data by measuring light. Ex-1002 ¶219.

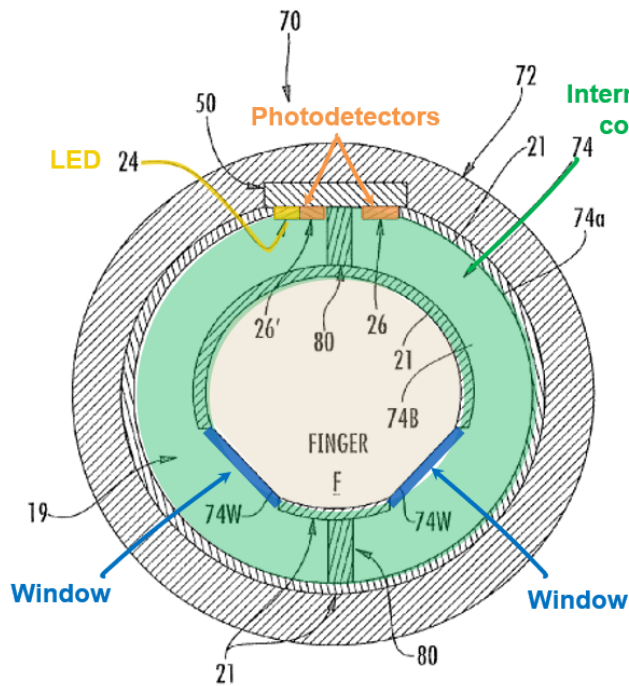


FIG. 22B

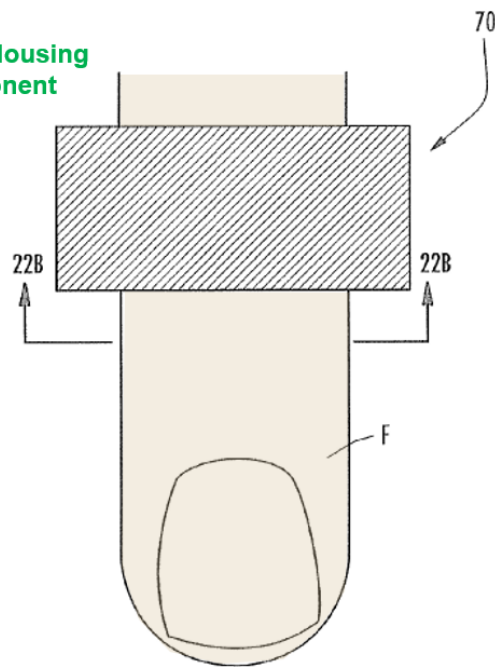


FIG. 22A

- g. Elements 11[D]/16[D(ii)]: the [external]/[internal] housing portion configured to seal the at least one component and the printed circuit board in an internal space defined by the interior surface of the [internal]/[external] housing.**

LeBoeuf teaches Elements 11[D]/16[D(ii)]. Ex-1002 ¶220. LeBoeuf’s monitoring device housing is configured to seal the component and printed circuit board in an internal space defined by the internal and external housing. *Id.* As discussed above, the finger ring is a “circular band... with a cylindrical outer body portion 72 and a generally cylindrical inner body portion 74 secured together in [a] concentric relationship.” Ex-1012, 27:61-28:1. LeBoeuf explains that a “housing is secured to and overlies the base so as to *enclose and protect* the speaker, optical emitter and optical detector, as well as other electronic components secured to the base (e.g., sensors, processor, transmitter etc.).” *Id.*, 2:31-35; *see also id.*, 12:3-8 (“enclose and protect the various electronic components... from ambient interferences (air, humidity, particulates, electromagnetic interference, etc.)”). A POSITA would have understood that the secure concentric relationship between outer body portion 72 and inner body portion 74 seals the component and printed circuit board between the two housing portions in order to “enclose and protect” the electronic components inside. Ex-1002 ¶220. Moreover, a POSITA would have understood that the seal between the two housing portions would “enclose and protect” the components from water or dust entering the monitoring device because

LeBoeuf explains that the device can be worn during daily life activities (such as athletic exercise) which would expose the finger ring to various elements that could alter the finger ring if it is not properly protected. Ex-1012, 1:1-26, 1:38-44; Ex-1002 ¶220.

2. Dependent Claims 2, 12, 17, and 18

- a. **Claim 2: The wearable computing device of claim 1, wherein the window comprises an internal window defined by the interior wall.**

LeBoeuf teaches Claim 2. Ex-1002 ¶221. LeBoeuf teaches Claim 2 for the same reasons described above in Section XIII.B.1.f (Element 1[F]). Ex-1012, 28:40-50 (windows 74w), Fig. 22B.

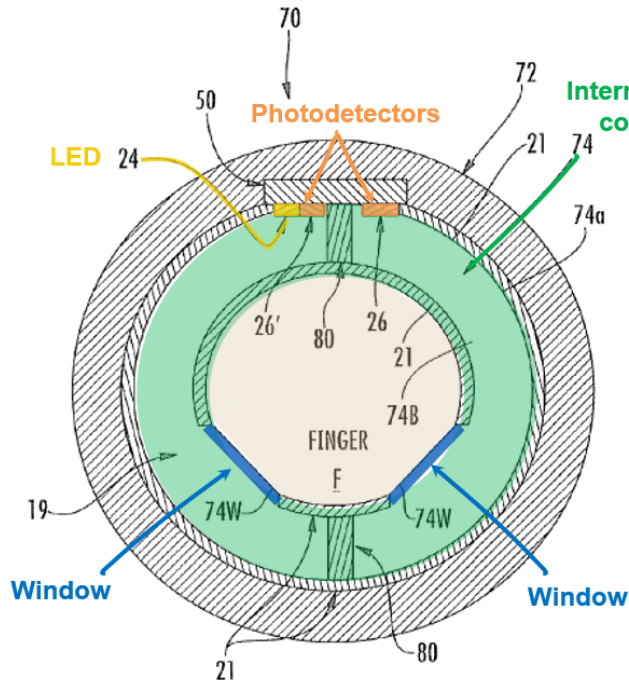


FIG. 22B

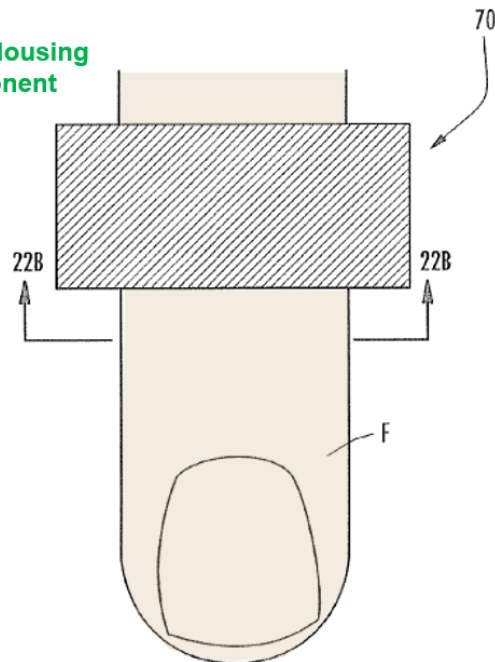


FIG. 22A

b. Claim 12: The wearable device of claim 11, wherein the external housing portion comprises a substantially transparent external potting.

LeBoeuf teaches Claim 12. Ex-1002 ¶222. LeBoeuf's external housing portion comprises substantially transparent external potting. *Id.* As explained above in Section XIII.B.1.c (Element 1[B]), LeBoeuf's outer body portion 72 is the external housing portion. LeBoeuf describes that "outer body portion 72 may serve as a cladding layer adjacent to the inner body portion." Ex-1012, 28:37-39. LeBoeuf describes that the cladding material may be a polymer material that is "optically transparent or mostly transparent with a lower index of refraction." Ex-1012, 33:1-2 (Cl. 41, polymer), 14:62-65. A POSITA would have understood that the external housing portion thus is made of a transparent potting, just like the external potting in the '034 Patent that can provide "resistance to shock and/or vibration and can prevent moisture and/or debris from entering the housing 1210 of the WCD 1200, such as silicone, epoxy, polyester resin or any other polymer." Ex-1002 ¶222; Ex-1001, 17:17-22.

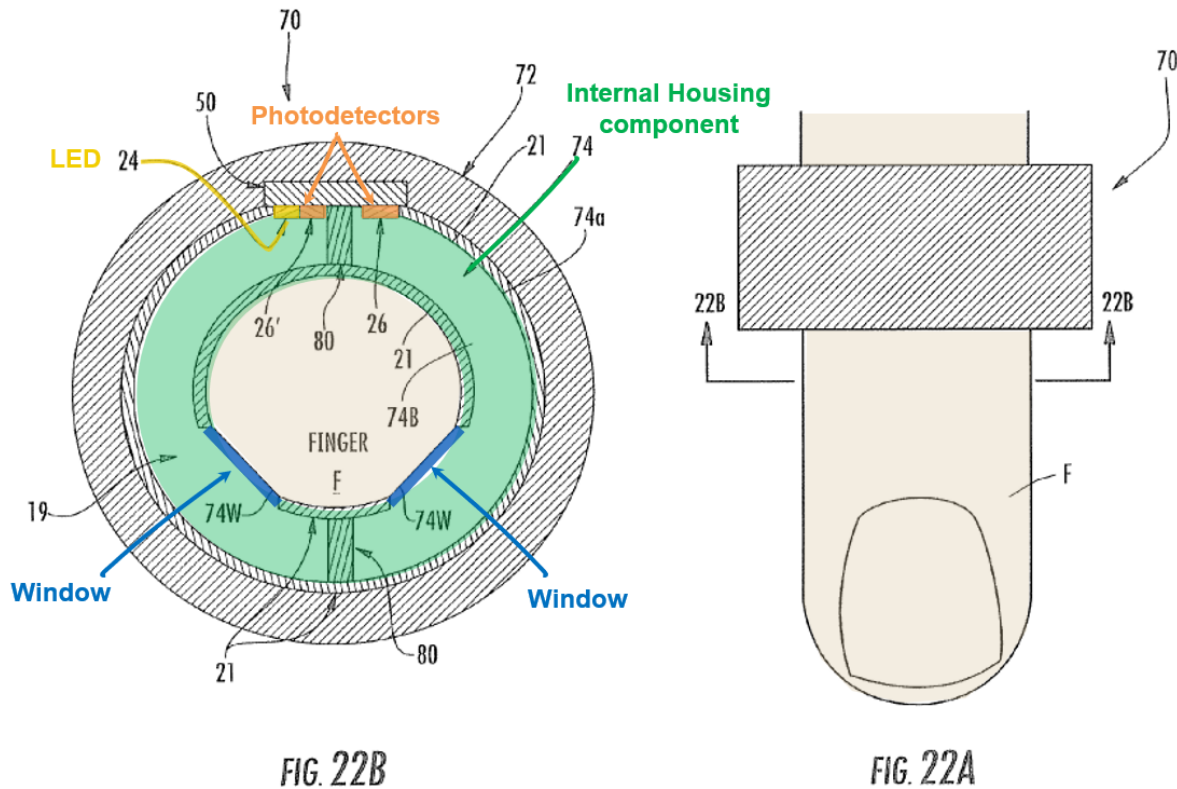
c. Claim 17: The wearable device of claim 16, wherein the internal housing portion comprises a substantially transparent internal potting.

LeBoeuf teaches Claim 17. Ex-1002 ¶223. LeBoeuf's internal housing portion comprises a substantial transparent internal potting. *Id.* LeBoeuf describes that its inner body portion 74 is made of "light transmissive material" and serves as

a “light guide” to deliver light from the emitter to the finger and from the finger to the detector. Ex-1012, 28:18-19, 28:30-34. Inner body portion 74 is “formed from a soft, resilient material, such as silicone,” just like in the ’034 Patent’s potting material. Ex-1012, 13:49-52; Ex-1001, 17:17-22.

- d. Claim 18: The wearable computing device of claim 17, wherein the at least one component comprises at least one LED configured to emit at least one of visible light, infrared radiation, and ultraviolet radiation through the internal potting.**

LeBoeuf teaches Claim 18. Ex-1002 ¶224. LeBoeuf’s finger ring has at least one LED configured to emit visible light and/or infrared radiation through the internal potting. *Id.* As described above, LeBoeuf’s inner body portion 74 is made of “light transmissive material” and serves as a “light guide” to deliver light from the emitter to the finger and from the finger to the detector. Ex-1012, 28:18-19, 28:30-34. Moreover, LeBoeuf’s “windows 74w” formed in the cladding material serve as light-guiding interfaces from optical emitter 24 (yellow) to light detectors 26, 26’ (orange) to acquire data. Ex-1012, 28:40-47. LeBoeuf’s finger ring may utilize “multiple light emitters 24” of “different wavelengths.” Ex-1012, 28:60-62. Because light detectors 26, 26’ may be configured to measure light at different wavelengths like visible light or infrared radiation, a POSITA would have understood that LeBoeuf’s emitters 24 emit visible light or infrared radiation through windows 74w. Ex-1012, 29:5-9.



C. Ground 4: Claims 4 and 5 are obvious over LeBoeuf in view of Wissmar

- 1. A POSITA would have been motivated to combine LeBoeuf's and Wissmar's teachings and would have had a reasonable expectation of success.**

A POSITA would have been motivated to combine the teachings of LeBoeuf and Wissmar ("LeBoeuf-Wissmar") and would have had a reasonable expectation of success in doing so because each relates to the same well-known technologies.

Ex-1002 ¶¶225-229.

A POSITA would have been motivated to combine LeBoeuf and Wissmar because they are analogous art and teach improvements to the same type of devices. Both LeBoeuf and Wissmar teach electronic wearable devices. Ex-1002 ¶226; Ex-1012, 27:58-64; Ex-1013 ¶1. Both describe the devices having a processor, battery, components, and light emitting diodes. Ex-1012, 28:3-8 (processor, battery), 28:60-62 (light emitters and sensors); Ex-1013 ¶¶71 (internal antenna), 74 (processor), 21 (battery), 100 (light emitting source).

Wissmar further offers additional design and manufacturing benefits to LeBoeuf's finger ring. Ex-1002 ¶227. LeBoeuf's finger ring has windows 74w which serve as "light-guiding interfaces" to focus light emitted by the emitter 24 to the finger or focus collected light to light detectors 26, 26'. Ex-1012, 28:40-47. The finger ring also includes may include a flex circuit containing various electronic components, Ex-1012, 28:3-8; *see also id.*, 12:30-34 (wireless module with an antenna). Wissmar further provides an "RF window" for unperturbed RF radiation from an internal antenna in the electronic finger ring made of a RF-shielding metal (like gold and silver). Ex-1013 ¶91. Wissmar therefore employs using an exterior window for uninterrupted RF radiation to be emitted through a gold and silver electronic ring. Ex-1002 ¶227.

Based on Wissmar's teachings, it would have been obvious to use the windows properties in LeBoeuf so that an internal antenna can emit the RF radiation

without any intervening material that may block or prevent the transmission. Ex-1002 ¶228. A POSITA would have been motivated to implement an RF window, as taught in Wissmar, into LeBoeuf's finger ring to allow RF radiation to an outside device through the finger ring's metal housing. Ex-1002 ¶228. Thus, design incentives and market forces would have motivated a POSITA to combine the teachings of Wissmar and LeBoeuf to result in a wearable electronic finger ring with an RF window for unperturbed RF radiation while giving the user the "sensation" of wearing gold/silver jewelry. *Id.*; *DyStar*, 464 F.3d at 1368.

A POSITA would have had a reasonable expectation of success in combining LeBoeuf and Wissmar. Ex-1002 ¶229. A POSITA would have understood that the electronic components of LeBoeuf and Wissmar's devices are similar and are interchangeable. *Id.* Moreover, a POSITA would have understood that different wearable electronic devices contain interchangeable components. A POSITA would have understood, therefore, that these references disclose interrelated teachings based on routine technologies that would have been amenable to various well-understood and predictable combinations to provide smaller and more comfortable wearable devices. Ex-1002 ¶229; *DyStar*, 464 F.3d at 1368.

2. Dependent Claims 4 and 5

a. Claim 4: The wearable computing device of claim 1, wherein an antenna is accessible via the window.

LeBoeuf-Wissmar teaches Claim 4. Ex-1002 ¶¶230-231. LeBoeuf-Wissmar teaches an antenna accessible via the window. *Id.* LeBoeuf’s windows 74w serve as “light-guiding interfaces” to focus light emitted by emitter 24 to the finger or focus collected light to light detectors 26, 26’. Ex-1012, 28:40-47. A POSITA would have been motivated to implement an antenna accessible via the window, because doing so was well-known, as taught by Wissmar which similarly teaches an electronic finger ring with a window. Ex-1002 ¶230. Specifically, an internal antenna is located under an opening of the “outer metal shell” serving “as a window for RF radiation.” Ex-1013 ¶¶107-110. A POSITA would have been motivated to implement Wissmar’s RF window that allows the antenna to be accessible via the window in LeBoeuf’s finger ring in order to allow “unperturbed RF radiation” while giving “the user the sensation of a conventional jewellery [*sic*] ring” by having an outer shell made of gold or silver. *Id.* ¶91; Ex-1002 ¶230. A POSITA would have been motivated to combine the teachings of LeBoeuf and Wissmar and would have had a reasonable expectation of success in doing so for the same reasons discussed in §XIII.C.1. Ex-1002 ¶231.

- b. **Claim 5: The wearable computing device of claim 4, wherein at least one of an LED or a photovoltaic cell is accessible via the window.**

LeBoeuf-Wissmar teaches Claim 5. Ex-1002 ¶232. LeBoeuf-Wissmar teaches at least one LED accessible via the window. *Id.* As explained above, LeBoeuf windows 74w serve as “light-guiding interfaces” to focus light emitted by emitter 24 to the finger or focus collected light to light detectors 26, 26’. Ex-1012, 28:40-47. Therefore, a POSITA would have understood that LeBoeuf-Wissmar’s finger ring has at least one LED accessible via the window. Ex-1002 ¶232.

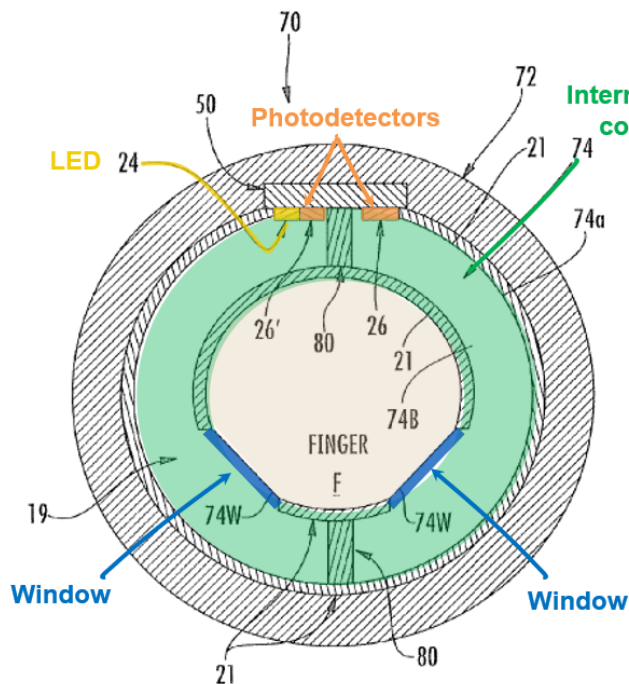


FIG. 22B

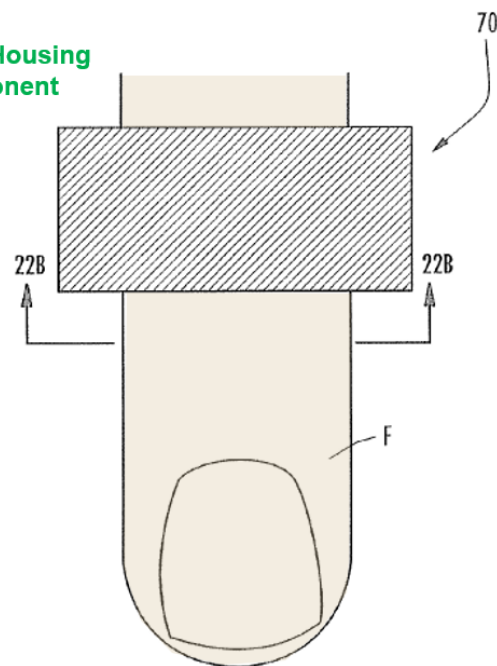


FIG. 22A

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

The Board should decline to exercise its discretion to deny institution under 35 U.S.C. § 314(a) because there is no pending district court litigation against Petitioner.

XV. CONCLUSION

Petitioner requests institution of IPR for Claims 1-5, 11-13, and 16-18 of the '034 Patent based on each of the grounds in this Petition.

Respectfully Submitted,

/s/ William M. Fink

William M. Fink (Reg. No. 72,332)

CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. §42.24(d), Petitioner certifies that this petition includes 9,914 words, as measured by Microsoft Word, exclusive of the table of contents, mandatory notices under §42.8, certificates of service, word count, and exhibits.

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

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

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