

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 PGR2024-00039
U.S. Patent No. 11,874,702

DECLARATION OF DR. PATRICK MERCIER

Patent Owner Oura Ex. 2018, 0001

Petitioner Samsung Ex-1062, 0001

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I. INTRODUCTION

1. I, Patrick Mercier, Ph.D., submit this Declaration on behalf of Patent Owner Ouraring, Inc. (“Patent Owner” or “Oura”). I have been retained by counsel for Oura to offer my independent technical opinion as to the validity of the U.S. Patent No. 11,874,702 (“’702 patent”).

2. I have been asked to review the Declaration of Dr. Brian Anthony and provide any opinions I have in response. As part of my analyses, I have reviewed the ’702 patent, its file history, all references cited by Dr. Anthony in his Declaration, as well as testimony and exhibits from various individuals, to assess the validity of the ’702 patent in light of the same.

3. I am being compensated at my usual consulting rate of \$650 per hour, as well as reimbursed for any reasonable expenses I incur in the course of my consultation in this matter. No part of my compensation is conditioned upon the outcome of this or any related proceeding.

II. BACKGROUND

A. Overview of Qualifications and Experience

4. My educational background, professional experience, and a list of my publications are set forth in my *curriculum vitae*, attached to this Declaration as **Exhibit A**.

5. As discussed in more detail below, I have particular expertise in the subject matter discussed in the '702 patent as I am the co-founder and co-director of the Center for Wearable Sensors at the University of California San Diego ("UCSD").

6. I received my B.Sc. degree in Electrical and Computer Engineering in 2006 from the University of Alberta. I received my S.M. in 2008, and my Ph.D. in Electrical Engineering in 2012, both from the Massachusetts Institute of Technology.

7. In 2012, after receiving my Ph.D., I joined UCSD as an Assistant Professor, and I became a Full Professor in 2023 and Vice Chair of the Electrical and Computer Engineering department in 2024. My professional experience includes three main components: research, teaching, and service to the scientific community.

B. Research and Development

8. My research relates to the design of energy-efficient microsystems, including the design of RF circuits, power converters, and sensor interfaces for miniaturized systems. My research has involved the development of wearable sensors, low-power wireless sensing systems, and power management integrated circuits. My research has been and/or is being incorporated for use in retinal prosthetics, diagnostic saliva sensing, and wearable microneedle platforms.

9. I currently lead an approximately 20-person group undertaking high-impact research spanning multiple domains, from near-zero-power integrated circuits, power management, energy harvesting, neural interfaces, wearable physiochemical sensors, RFICs and RF systems, and beyond.

10. As noted above, I am the co-founder and co-director of the Center for Wearable Sensors at UCSD, which includes over 20 faculty across four engineering departments within UCSD, the School of Medicine, and the Arts and Humanities Department (Department of Visual Arts). The purpose of the Center is to bring together top UCSD faculty, students, and researchers with complementary expertise in areas such as sensors, low-power circuits, materials, electrochemistry, bioengineering, wireless network technologies, preventive medicine, and life sciences to create an environment that fosters the acceleration of research and system development.

11. I am also the Site Director for the Power Management Integration Center (“PMIC”), a National Science Foundation Industry University Collaborative Research Center that is a partnership between UCSD and Dartmouth College. The mission of the PMIC is to target innovations that support higher efficiency, smaller size, and reduced cost by considering system reliability, robustness, and performance in a diverse range of industry sectors and applications spanning consumer, industrial, and automotive electronics. My work with both the Center for

Wearable Sensors and the PMIC includes hardware design for wearable, wireless, and power management systems.

12. My research has resulted in over 200 peer-reviewed publications, including 30 ISSCC papers, 33 JSSC papers, and several papers in high-impact journals such as *Science*, *Nature Biotechnology*, *Nature Biomedical Engineering*, *Nature Electronics*, *Nature Communications*, *Advanced Science*, and *Energy and Environmental Science*. Some of the articles I have published on the topic of wearables and power management include, for example:

- E. De La Paz, N.H. Maganti, A. Trifonov, I. Jeerapan, K. Mahato, L. Yin, T. Sonsa-ard, N. Ma, W. Jung, R. Burns, A. Zarrinpar, J. Wang, P.P. Mercier, “A Self-Powered Ingestible Wireless Biosensing System for Real-Time in Situ Monitoring of Gastrointestinal Tract Metabolites,” *Nature Communications*, Vol. 13, 7405, Dec. 2022.
- F. Tehrani, H. Teymourian, B. Wuerstle, J. Kavner, R. Patel, A. Furnidge, R. Aghavali, H. Hosseini-Toudeshki, C. Brown, F. Zhang, K. Mahato, Z. Li, A. Barfidokht, L. Yin, P. Warren, N. Huang, Z. Patel, P.P. Mercier & J. Wang, “An Integrated Wearable Microneedle Array for the Continuous Monitoring of Multiple Biomarkers in Interstitial Fluid,” *Nature Biomedical Engineering*, May 2022.
- J. Tian, P. Mercier, C. Paolini, “Ultra Low-Power, Wearable, Accelerated Shallow-Learning Fall Detection for Elderly At-Risk Persons,” *Smart Health*, Vol. 33, Sept. 2024.
- A. Akinin, J.M. Ford, J. Wu, C. Kim, H.D. Thacker, P.P. Mercier, G. Cauwenberghs, “An Optically Addressed Nanowire-Based Retinal Prosthesis with Wireless Stimulation Waveform Control and Charge Telemetry,” *IEEE Journal of Solid-State Circuits*, Vol. 56, No. 11, pp. 3263-73, Nov. 2021.

- P.P. Mercier, J. Wang, “Why Sweat Will Power Your Next Wearable,” *IEEE Spectrum*, Jun. 2020 (Cover article).
- A. Abdulslam, P.P. Mercier, “A Symmetric Modified Multilevel Ladder PMIC for Battery-Connected Applications,” *IEEE Journal of Solid-State Circuits*, Vol. 55, No. 3, pp. 767-80, Mar. 2020. (CICC Special Issue).
- J. Warchall, P. Theilmann, Y. Ouyang, H. Garudadri, P. Mercier, “Robust Biopotential Acquisition Via a Distributed Multi-Channel FM-ADC,” *IEEE Transactions on Biomedical Circuits and Systems*, Vol. 13, No. 6, pp. 1229-42, Dec. 2019.
- J. Park, P.P. Mercier, “A Sub-10pJ/bit 5Mbps Magnetic Human Body Communication Transceiver,” *IEEE Journal of Solid-State Circuits*, Vol. 54, No. 11, pp. 3031-42, Nov. 2019.
- J. Kim, J.R. Sempionatto, S. Imani, M.C. Hartel, A. Barfidokht, G. Tang, A.S. Campbell, P.P. Mercier, J. Wang, “Simultaneous Monitoring of Interstitial Fluid and Sweat Using a Single Flexible Wearable Iontophoretic-Biosensor Platform,” *Advanced Science*, 5, 1800880, Aug. 2018.
- J. Park, H. Garudadri, P.P. Mercier, “Channel Modeling of Miniaturized Battery-Powered Capacitive Human Body Communication Systems,” *IEEE Transactions on Biomedical Engineering*, Vol. 64, No. 2, pp. 452-62, Feb. 2017.
- S. Imani, A.J. Bandodkar, A.M.V. Mohan, R. Kumar, S. Yu, J. Wang, P.P. Mercier, “A Wearable Chemical-Electrophysiological Hybrid Biosensing System for Real-Time Health and Fitness Monitoring,” *Nature Communications*, Vol. 7, May 2016.

13. I have also published chapters and edited books in the area of wearable and implantable medical monitors and power management. For example, I was co-editor of books entitled “Power Management Integrated Circuits,” “Ultra-Low-Power Short-Range Radios,” and “High-Density Integrated Electrocardiac Neural Interfaces,” and also authored a chapter titled “Low-Power Integrated Circuits for

Wearable Electrophysiology” in the book titled “Wearable Sensors – Fundamentals, Implementation and Applications 2nd Edition.”

14. Beyond my scientific articles and publications, I am also a named inventor on 24 U.S. patents, including several directed to power circuits and systems.

C. Teaching Experience

15. At UCSD, I have taught the following semester-long courses:

- Digital Integrated Circuits, ECE 165 (2013-2015, 2017-2025): a course that discusses fundamentals of transistor-based implementations of Boolean logic functions, then expands towards design of various combinational and sequential logic circuits. The final project involves the design of a high-speed, yet low-power digital arithmetic circuit for use in microprocessors.
- Biomedical Integrated Circuits and Systems, ECE 203 (2013-2024): a course of my own design that covers the basics of low-power integrated circuit design, including topics on pulse oximetry, instrumentation amplifiers, wearable medical devices, and more.
- VLSI Digital System Algorithms and Architectures (2014-2016): this is the graduate version of ECE 165 that includes advanced topics on microprocessor design.

16. These and the other courses I teach include a number of subjects that bear on the technology in this case. For example, in ECE 203 we discuss how pulse oximeters work, and discuss methods to develop low-power and low-noise optical readout technologies. Beyond this specific example, much of ECE 203 is focused on how to minimize power in both analog and digital circuits, while meeting performance (e.g., noise for analog, clock frequency/throughput for digital) targets.

We discuss concepts like duty-cycling, power gating, power-saving modes, dynamic voltage and frequency scaling (and thus dynamic power scaling), and so on.

17. I have received a number of awards recognizing my teaching. For example, in 2016 I received the UCSD Academic Senate Distinguished Teaching Award, which is awarded yearly to five distinguished teachers across all departments at UCSD. In 2023, I received the Teacher of the Year Award from the Jacobs School of Engineering at UCSD, which is selected by ballot of UCSD students.

18. Beyond my teaching at UCSD, I have taught tutorials as part of engineering organization conferences. For example, I taught a tutorial entitled “Interface Circuits for Wearable and Implantable Sensing Systems” at the IEEE International Solid-State Circuits Society. I also presented a tutorial entitled “Power Management for the Internet-of-Things” at the IEEE Custom Integrated Circuits Conference (CICC), and gave a keynote presentation entitled “Energy-Efficient Power Management Circuits for IoT and Wearable Devices” at the IEEE Sensor Interfaces Meeting. As part of these presentations, I dive into circuit design techniques that can deliver low-power operation.

D. Service to the Scientific Community

19. My most time-consuming role related to UCSD service is the directorship of the Center for Wearable Sensors and the Power Management Integration Center, covered earlier.

20. Beyond UCSD, I have been an Associate Editor with IEEE Solid-State Circuits Letters (2017-2023), IEEE Transactions on Biomedical Circuits & Systems (2013-2023), and IEEE Transactions on VLSI (2015-2017). I have been a Guest Editor with IEEE Open Journal of the Solid-State Circuits Society (OJ-SSCS) Special Issue on Low-Power RF Circuits and Systems (2023), and IEEE Journal of Solid-State Circuits Special Issue on the 2018 International Solid-State Circuits Conference (ISSCC) (2018). I have chaired numerous committees for international conferences including, for example, as the Executive Committee member – Demo Chair – IEEE International Solid-State Circuits Conference (ISSCC) (2022-present), Technical Program Co-Chair – IEEE Sensor Interfaces Meeting (2022-2024), Subcommittee Chair – Power Management – IEEE Custom Integrated Circuits Conference (CICC) (2021-2023), Technical Program Committee member – IEEE VLSI Circuits Symposium (2018-2022), International Technical Program Committee member – IEEE International Solid-State Circuits Conference (ISSCC) Technology Directions subcommittee (2017-2022), and Technical Program Committee member – IEEE Custom Integrated Circuits Conference (CICC) (2017-2023). I am also a peer reviewer for numerous journals including, for example, IEEE *Journal of Solid-State Circuits* (JSSC), IEEE *Transactions on Circuits and Systems I* (T-CAS I), IEEE *Transactions on Circuits and Systems II* (T-CAS II), IEEE *Transactions on Microwave Theory and Techniques* (T-MTT), IEEE *Sensors*

Journal, IEEE Transaction on Power Electronics, Journal of Low Power Electronics and Applications (JLPEA), IET Circuits, Devices & Systems, IEEE International Conference on Ultra-Wideband (ICUWB), IEEE Transactions on Biomedical Circuits & Systems (TBioCAS), IEEE Transactions on Biomedical Engineering (TBME), IEEE International Conference on Circuits and Systems (ISCAS), IEEE Biomedical Circuits and Systems Conference (BioCAS), IEEE Journal of Emerging and Selected Topics in Power Electronics, and IEEE Transactions on Industrial Electronics.

E. Materials Considered

21. In reaching the opinions that I express in this Declaration, I have considered and relied upon my education, knowledge of the relevant field, and experience. I have also reviewed and considered the materials cited in this Declaration, including the '702 patent. Further, I have also listed certain additional materials that I have reviewed as part of my Declaration preparation which is attached as **Exhibit B**.

III. LEGAL PRINCIPLES

22. I am not a patent attorney, nor am I an expert in patent law. In reaching the opinions set forth here in this Declaration, I have applied the following legal principles, which have been explained to me by counsel for Oura.

A. The Person of Ordinary Skill in the Art

23. Counsel has informed me that the '702 patent (including each claim) and the prior art is interpreted from the perspective of a person of ordinary skill in the art ("POSITA"), which I understand is a hypothetical person considered to have the skill level and knowledge of a particular field related to an alleged invention claimed in a patent. Counsel has also informed me that this hypothetically skilled person is presumed to have before him or her all of the relevant prior art. I understand that this "hypothetical person" can be more than one person or a team of people of different disciplines.

24. Counsel has informed me that factors that are relevant and germane in determining the knowledge base of a POSITA include: (1) the type of problems encountered in the art; (2) the solutions to those problems disclosed in the prior art; (3) the speed of innovation in the field; (4) the sophistication of the technology; and (5) the educational level of active workers in the field engaged in innovation.

25. Counsel for Oura has informed me that the "time of the invention" for the '702 patent is the date that the inventors filed their earliest patent application to which the '702 patent claims priority. I understand that the '702 patent claims priority to a provisional application filed Nov. 29, 2013.

26. I understand that Dr. Anthony contends that for the '702 patent, a 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 person of ordinary skill in the art would have also been familiar with, for example, sensor system design and signal processing.

Ex-1002 at ¶ 133.

27. I generally agree with Dr. Anthony's proposed definition for a POSITA with respect to the '702 patent and will apply his definition throughout my testimony.

28. As of the time of the invention, I had at least the level of knowledge and skill possessed by a POSITA in the relevant the field. For example, as noted above, I am the co-founder and co-director of the Center for Wearable Sensors and have extensive experience in areas such as sensors, low-power circuits, materials, electrochemistry, and bioengineering. I also had extensive experience in power-management systems specifically for hardware designs for wearable devices. My relevant experience is also based on my teaching and supervising of graduate students. In my analysis of the claims and the prior art, I have viewed them from the point of view of one of ordinary skill in the art.

B. Claim Construction

29. I understand that the claims in the '702 patent are to be given their ordinary and customary meaning to a POSITA in view of the context in which they

appear, including the claims, the patent disclosure, and the file history of the patent. The claim terms are to be interpreted from the perspective of those in the art at the time of filing. I am informed that there may be exceptions to the general rule of claim interpretation if the patentee, either in the patent or its file history, has expressly or impliedly defined a term or phrase used in the claims or has expressly disavowed the claim scope that would otherwise be encompassed by the ordinary and customary meaning of the terms.

C. Anticipation

30. I understand that, to anticipate a claim, a single qualifying prior art reference must disclose, expressly or inherently, all of the elements of the asserted claim. I understand that a reference expressly discloses a claim limitation when a POSITA, reading the reference, would understand that it discloses the limitation. I understand that a prior art reference inherently discloses a particular claim element if, even though not expressly described, that element would necessarily be present in the prior art reference. I understand, however, that inherency, however, cannot be shown by mere likelihood or probabilities. My understanding is that Petitioner does not contend any claims of the '702 patent are anticipated by prior art.

31. I understand that to analyze a claim for anticipation requires two steps. First, the claims should be construed and second, the construed terms compared to

the identified prior art references to determine if all elements are expressly or inherently present in the prior art reference.

D. Obviousness

32. Counsel has informed me that a claim may be invalid as obvious if the differences between a prior art reference and the claimed invention are such that the claimed invention would have been obvious to a POSITA in view of his or her general knowledge, or in combination with other prior art references that a POSITA would be motivated to combine with the original prior art reference. I understand, however, that a patent claim may not be shown to be obvious through hindsight reconstruction of the invention from elements disclosed in the prior art.

33. Counsel has informed me that, to guard against hindsight reconstruction of an invention, certain factors must be analyzed to determine if a claim is obvious: (1) the scope and content of the prior art; (2) the level of ordinary skill in the art; (3) the difference between the prior art and the claims at issue; and (4) objective evidence of secondary considerations if offered by the patent owner.

34. I understand from counsel that, in analyzing obviousness, the prior art must be considered “as a whole.” Inventions typically are new combinations of existing principles or features, and the “as a whole” instruction prevents evaluation of the invention part by part. Accordingly, it is my understanding that an obviousness assessment cannot break an invention into its component parts (A+B+C), then find

a prior art reference containing A, another containing B, and another containing C, and on that basis alone declare the invention obvious. I understand that this is an impermissible form of hindsight reasoning, using the invention as a roadmap to find its prior art components, which would discount the value of combining various existing features or principles in a new way to achieve a new result—often the very definition of invention.

35. I also understand that obviousness requires a patent challenger to make two distinct showings: (i) that a POSITA would have been motivated to combine prior art references or to modify the prior art in a manner that yields and enables the claimed invention, and (ii) that the POSITA would have had a reasonable expectation of success in doing so.

36. I have been informed that the motivation to combine references, or to modify the prior art, may be found in many different places and forms, including common knowledge or understanding of those skilled in the art, the prior art as a whole, any need or problem in the field, common sense, and the inferences, judgments, and ordinary creativity of a POSITA in the field. However, I also understand that the reasonable expectation of success must be founded in the prior art. Finally, neither the motivation to combine nor the reasonable expectation of success can result from the disclosure of the challenged patent.

37. I have also been informed that the reasonable expectation of success requirement for obviousness does not necessitate an absolute certainty for success and allows for some degree of unpredictability in the art so long as there was a reasonable probability of success. However, I understand that there is no reasonable expectation of success where the prior art gave no indication of which parameters were critical nor direction as to which of many possible choices is likely to be successful, and instead only gave general guidance as to the particular form of the invention or how to achieve it. I also understand that reports which demonstrate POSITAs using the prior art met with failure provide strong evidence that there was no reasonable expectation of success. Similarly, if a POSITA would have viewed the reference as describing teachings that were contrary to the patented invention, i.e., the reference taught away from it, a strong inference exists that the reference does not provide a reasonable expectation of success to render the invention obvious.

38. Counsel has informed me that one of the factual inquiries when determining the obviousness of a patent is to consider objective evidence related to the issue of obviousness, sometimes called “secondary considerations of non-obviousness” or “objective indicia of non-obviousness.” I understand that such evidence can often be probative of the issues of obviousness. Such objective indicia of non-obviousness can include:

- a. commercial success of the products and processes covered by the invention;
- b. copying of the invention by others in the field;
- c. praise of the invention by others skilled in the art;
- d. long-felt and unmet need in the art that was satisfied by the invention of the patent;
- e. failure of others to achieve the results of the invention;
- f. expression of disbelief of skepticism by those skilled in the art upon learning of the invention; and
- g. unexpected results achieved by the invention.

39. I understand that there must be a nexus between the patented invention and the evidence of secondary considerations. I further understand that there is a presumption of such a nexus if the claims of the patent are coextensive with a product or products that are the subject of the secondary considerations evidence. I further understand that in order for a claim to be coextensive with a product, one must look at the claim as a whole and not just the new claimed feature. In addition, the claimed invention should not be merely a subcomponent of the products sold but should encompass the entire apparatus.

IV. OVERVIEW OF THE '702 PATENT

A. Specification

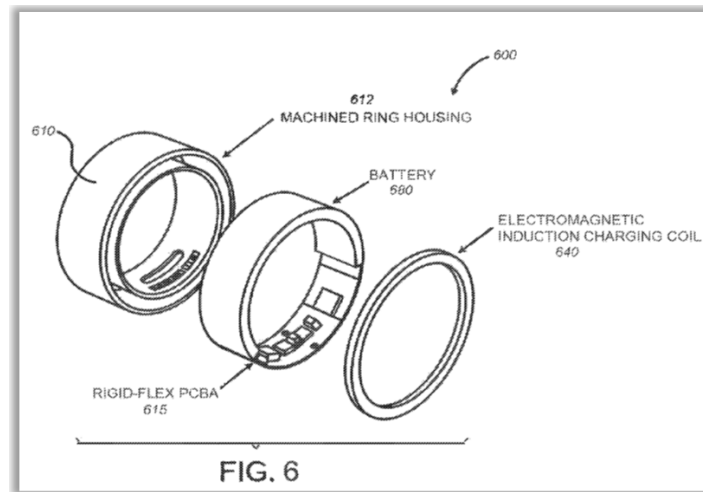
40. The '702 patent titled “Wearable computing device” issued on January 16, 2024, and has an earliest effective priority date of November 29, 2013. *See* '702 patent (Ex-1001) at Cover. The '702 lists three inventors: Curt C. von Badinski, Michael J. Strasser, and Peter Twiss. *Id.*

41. The invention disclosed in the '702 patent “is in the field of wearable electronic devices.” *Id.*, 1:34-35. The inventors of the '702 patent recognized that “many current wearable electronics are bulky and can be intrusive or interfere with a person’s daily life.” *Id.*, 1:42-44. Consequently, “conventional wearable fitness monitors such as clip-on devices, wristbands, or watch-type monitors still often suffer from inaccuracy mainly because they lack constant and consistent ways to read from the body areas they aim to monitor.” *Id.*, 9:32-36. Thus, the “invention overcomes the disadvantages of the prior art by providing a wearable computing device (WCD) in the shape of a ring. The wearable computing device can be worn for extended periods of time and can take many measurements and perform various functions because of its form factor and position on the finger of a user.” *Id.*, 1:50-55.

42. In particular, the patent describes “[a] smart ring [that] includes a curved housing having a U-shape[d] interior storing components including: a curved

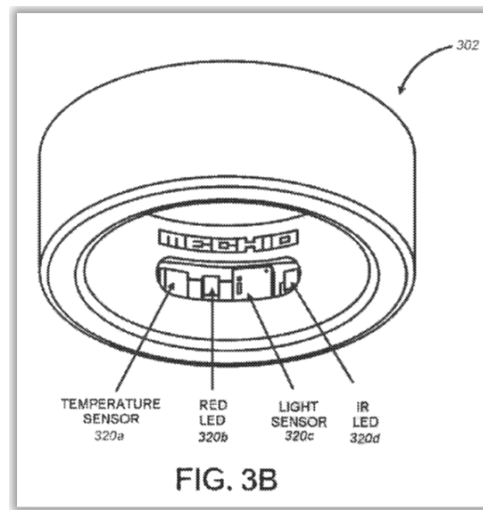
battery approximately conforming to the curved housing, a semiflexible PCB [(printed circuit board)] approximately conforming to the curved housing” and one or more sensors. Ex-1001, Abstract.

43. Fig. 6 shows an exploded view of one embodiment of the invention:



Id. at Fig. 6.

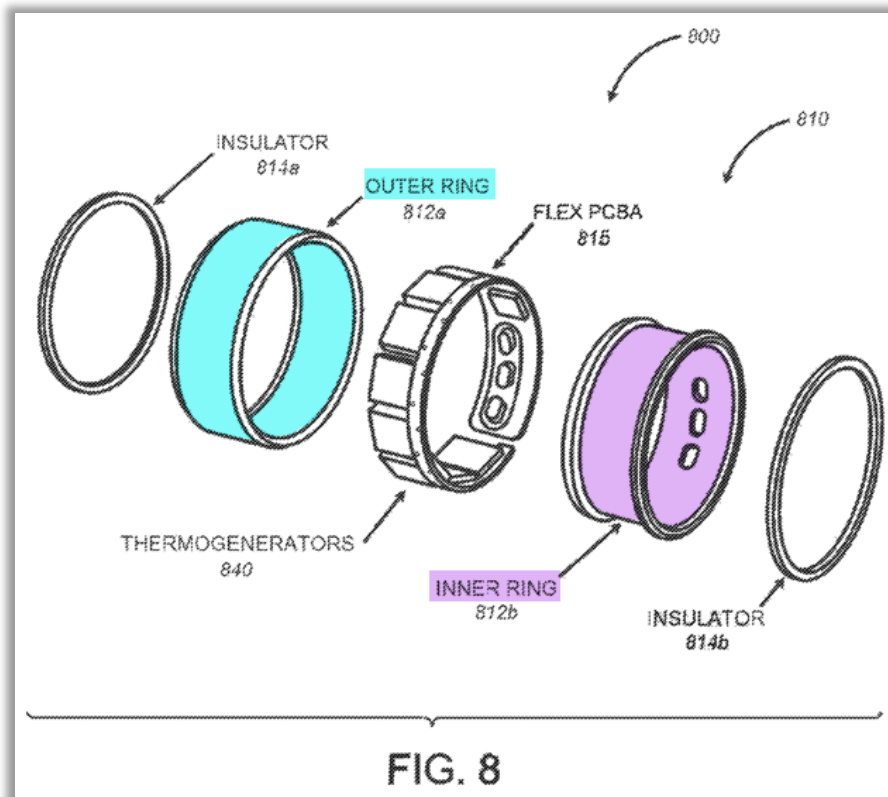
44. As shown in Fig. 6, a curved battery 680 and printed circuit board 615 are shaped and configured to fit within ring housing 612. The ring is also equipped with sensors that enable the ring to “function as a sleep monitor, a heart rate sensor, a cardiac monitor[,], a body temperature detector, or the like.” Ex-1001, 9:47-48. Examples of such sensors are shown below in Fig. 3B.



Id. at Fig. 3B.

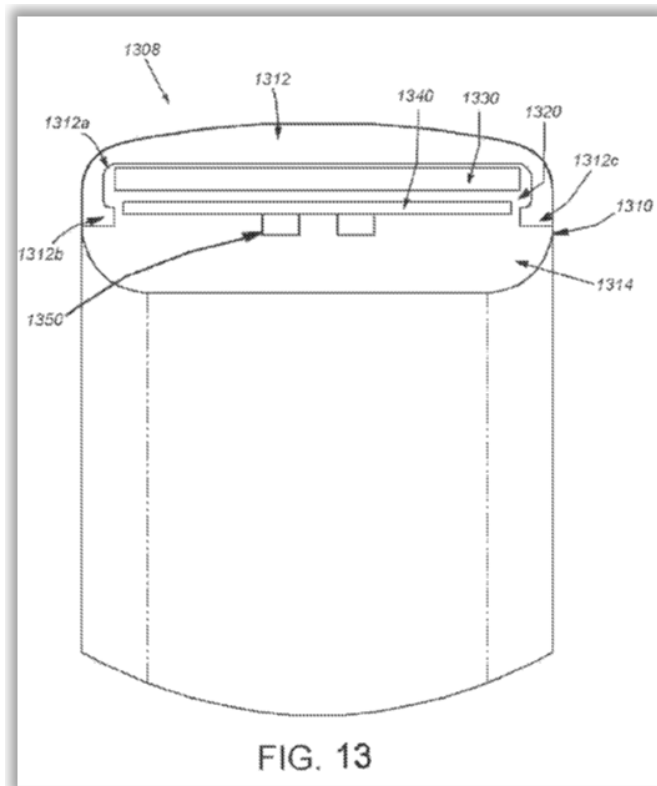
45. Sensors 320a-320d “are directly related to biological sign monitoring [and] can be configured and positioned in a way that is close to the skin (e.g., facing the interior window 130 of the WCD 110).” *Id.*, 11:21-23. A motion sensor (not shown) may also be used to detect an “activity level” of the wearer and whether the wearer is sleeping or engaged in exercise. *Id.*, 11:61-67 (“In some embodiments, the WCD 110 can utilize the accelerometer to measure the activity level (e.g., arm movement) in conjunction with the measured heart rate to determine if the user is walking horizontally, running, swimming, or climbing stairs. Other activities can be identified by the WCD 110 may include biking or sleeping.”).

46. Significant to the claims, the ’702 patent discloses an **outer housing component** coupled to an **inner housing component** to form a cavity for accommodating the battery, circuit board, and sensors. *Id.*, 44:65-45:2.



Id. at Fig. 8.

47. Fig. 13 below shows a cross section of one embodiment of the ring having a housing 1310 comprising internal and external housing components 1314 and 1312. Ex-1001, 19:6-10. A space 1320 is formed and occupied by battery 1330 and printed circuit board 1340. *Id.*, 19:16-21.



Id. at Fig. 13.

B. Prosecution History

48. When the examiner allowed the claims, they issued the following reasons for allowance:

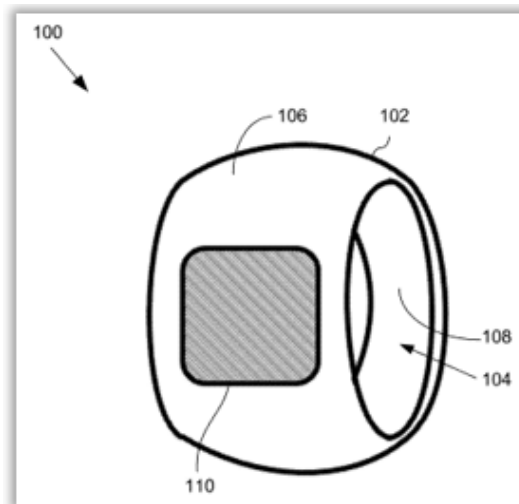
The following is an examiner's statement of reasons for allowance: the prior art does not disclose nor suggest a wearable electronic device with the particular claimed limitations, including the particular structural limitations of the internal and external housing with light-emitting/receiving components along with a transparent material for light permissibility. The closest prior art to Vescovi (US 20150277559) discloses a similar computing device structure but fails to disclose the particular claimed limitations.

Ex-1004 at 1169.

49. As shown herein, these reasons remain applicable to the prior art relied on by Petitioner, as the prior art does not disclose or suggest the “particularly claimed structure” of internal and external housing components, a battery positioned and shaped to fit inside a first portion of a cavity formed between outer and inner circumferential surfaces of the external and internal housing components, and a circuit board extending through a portion of the cavity different than the first portion.

50. The closest prior art identified by the examiner was Vescovi (Ex. 2015).

Fig. 1 of Vescovi is shown below:



Ex. 2015 at Fig. 1.

51. As stated in Vescovi:

Fig. 1 illustrates a ring computing device 100 in accordance with some embodiments of the present invention. A structural member 102 houses one or more electronic components (such as a processor, memory, and sensors, as

described in greater detail below with reference to Fig. 7) and defines an aperture 104 capable of receiving a user's finger. The member 102 includes an outer peripheral surface 106 and an inner peripheral surface 108.

Id., ¶ [0032].

52. Vescovi also discloses that the ring includes biometric sensors:

In some embodiments, the ring computing device (902) includes one or more biometric sensors (716) and controllers (760). These sensors may be used to collect biometric data of the user, such as heart rate, temperature, motion, cardiac rhythm, perspiration, and galvanic skin response, and this information may be collected and displayed by the ring computing device (902) and/or a paired electronic device so that the user may monitor his or her health, fitness, activity, or caloric energy expended.

Id., ¶ [0166].

53. As noted by the examiner, however, Vescovi fails to disclose the “particularly claimed structure” of the ’702 patent. Indeed, Vescovi does not disclose the internal structure of the housing 102 nor how the electronic components are shaped and configured within the housing, which are disclosed and claimed in detail in the ’702 patent.

V. CLAIM CONSTRUCTION

54. As stated above in Section III regarding legal principals of patent law, I have been informed by counsel that the first step in a validity analysis is properly construing the terms of the Asserted Patent claims. I understand that Dr. Anthony states that he does not believe that any claim term in the ’702 patent requires explicit

construction to resolve the issues presented in the Petition. Ex-1002 at ¶¶ 134-35. I generally agree.

55. I also understand that in a co-pending U.S. International Trade Commission Investigation, the Administrative Law Judge construed certain terms of the '178 patent that is related to the '702 patent. *Certain Smart Wearable Devices, Systems, and Components Thereof*, Inv. No. 337-TA-1398, Order No. 17 (Oct. 23, 2024) (Ex. 2016). Specifically, the ALJ first adopted constructions agreed-upon by the parties¹:

Claim Term	Agreed Construction
“A finger-worn wearable ring device” Claim 1 [preamble]	The preamble is limiting
“[positioned / configured to fit] within a cavity” Claim 1	Plain and ordinary meaning, which is “[positioned/configured to fit] within a hollow space”
“[the internal housing component] coupled with [the external housing component]” Claim 1	Plain and ordinary meaning, which is “[the internal housing component] is connected with [the external housing component]”

Id. at 5.

56. The ALJ also construed two disputed terms: (1) “an [internal/external] housing component” and (2) “circumferential” as follows:

Claim Term	ALJ Construction
“an [internal/external]”	Plain and ordinary, “which is an

¹ I understand that the Petitioner was not a party to the ITC Investigation.

Claim Term	ALJ Construction
housing component”	[internal/external] structure that encloses space and which does not necessarily exclude potting material.” <i>Id.</i> at 14
“circumferential”	Plain and ordinary meaning and does not require a closed shape. <i>Id.</i> at 17.

Id. at 6, 14.

57. I do not believe that the above constructions impact the issues presented in this Petition. Nonetheless, I have taken the above constructions into consideration for my below analysis.

VI. TECHNOLOGY BACKGROUND

A. State of Wearable Ring Devices up to 2013

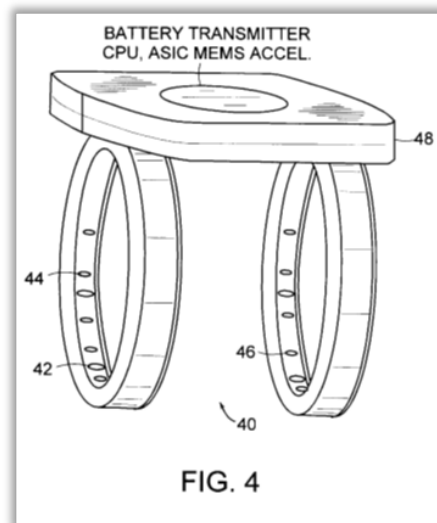
58. In 2013, there were no commercially available smart rings. I know because in 2012-2013 timeframe, I was establishing the Center of Wearable Sensors at UCSD, and thus I am familiar with the state of the art at the time of the invention of the '702 patent.

59. The lack of commercially available smart rings in 2013 is not surprising. Prior to the '702 patent, no one had managed to construct a wearable smart ring that people would actually want to wear continuously. Continuous wear is critical to measure certain characteristics related to cardiac health or sleep. Despite the known goals of comfort and compactness in a ring design, prior designs located components outside of the ring housing, formed a large protrusion above the finger,

and generally failed to teach one of ordinary skill in the art how to arrange the components within a housing (like Vescovi).

60. A team of researchers at MIT performed the first significant research into designing and constructing a wearable ring. Professor Asada, who I have personally met, and his team filed for patents, constructed prototypes, and published articles about their work.

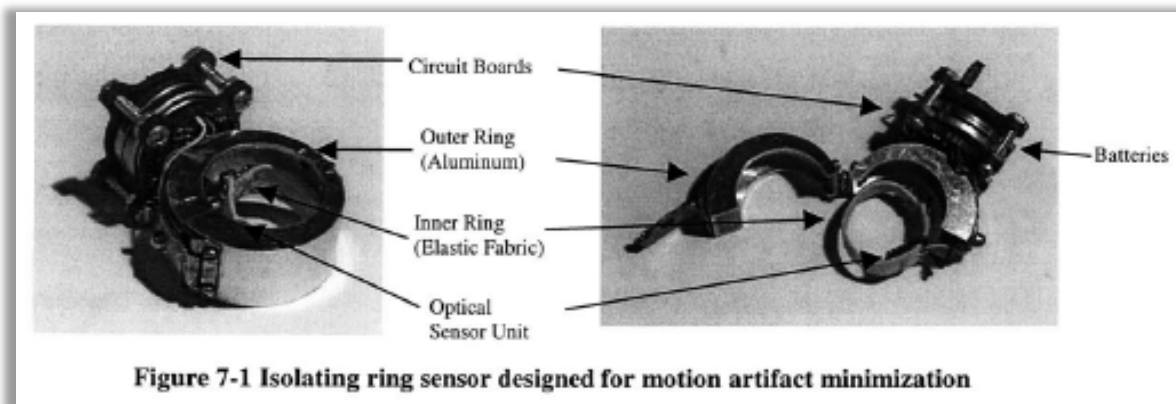
61. In 1997, Asada filed for a patent and recognized the advantage of health monitoring using a finger ring: “The finger ring sensor may be worn by the patient at all times, hence the health status is monitored 24 hours a day.” Ex. 2025 at 1:56-58. The implementation of the finger ring taught mounting the battery, CPU, and other components on top of the ring:



Id. at Fig. 4.

62. Three years later in 2000, MIT graduate student Rhee published his dissertation on a wearable ring and noted “it is important that the ambulatory monitoring devices should be easy to wear in everyday life. Such long-term, ambulatory devices must be compact, lightweight, and comfortable to wear at all times.” Ex-1035 at 9-10.

63. The two prototypes—of which the top one I have personally held and inspected—shown in the dissertation stacked components on top of the ring:



Ex-1035 at 68

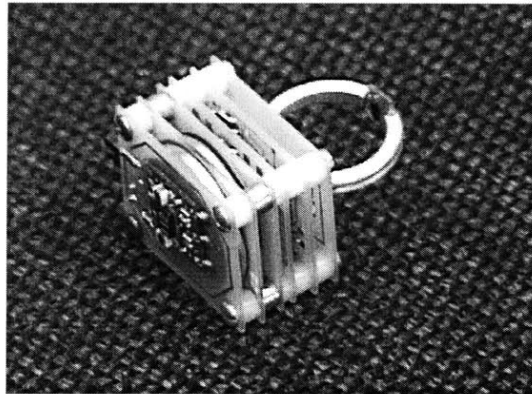


Figure 8-1 First Prototype Ring Sensor

Id. at 75.

64. Rhee acknowledged that “the size of the first prototype, as shown in Figure 8-1, was too large to be of use in real life.” *Id.* at 74. Rhee’s proposed solution sought to reduce the number of circuit boards, but continued the practice of mounting components on top of the ring:

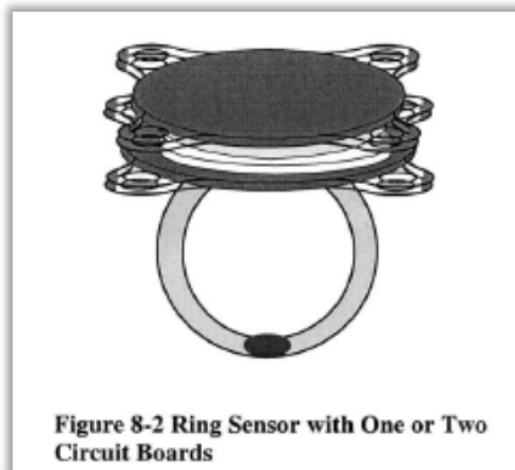
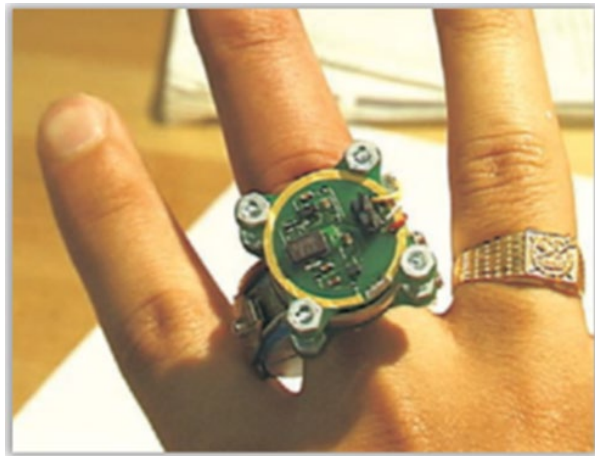


Figure 8-2 Ring Sensor with One or Two Circuit Boards

Id. at 75.

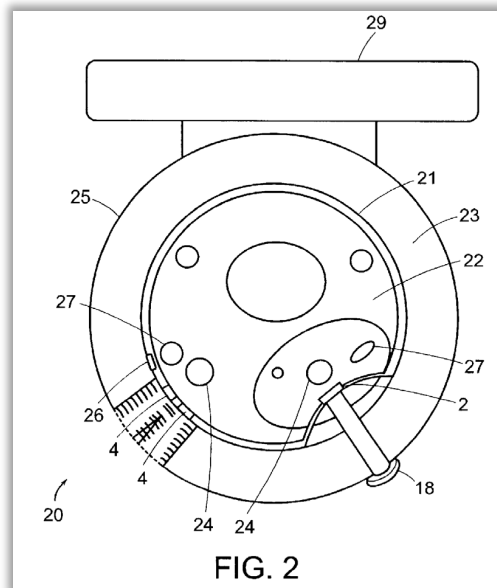
Id. at 74 (“Therefore, the final ring must be compact and light enough so that the person who wears it does not feel its presence. In the initial effort, we plan to consolidate all the circuit elements on to a small, multi-layer printed circuit board (Figure 8-2).”).

65. In an IEEE article published in 2003, Asada again acknowledged that the ring is “ideal for long term measurements.” Ex-1037 at 3. Asada again acknowledged that “comfort” and “compactness” were keys to making a useable wearable finger ring. Ex-1037 at 1-2. In terms of comfort and compactness, Asada’s prototype changed little in the three years since the Rhee dissertation—again mounting the circuit board and battery on top of the ring:



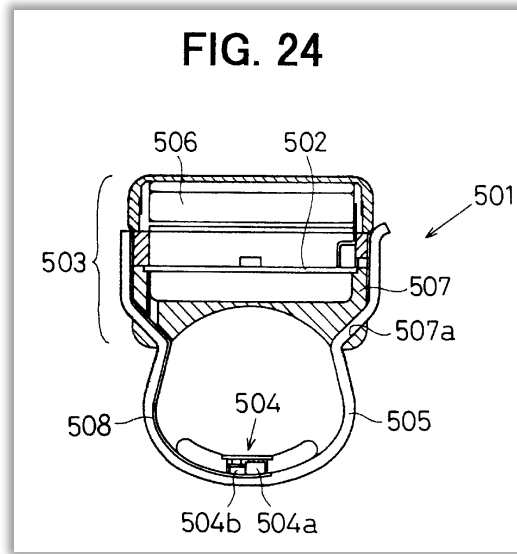
Ex-1037 at 7.

66. U.S. Patent No. 6,699,199 issued to Asada in 2004. Ex-1034. The preferred embodiment of that patent similarly teaches locating “circuit module 29 containing battery 12, processor 6, and transmitter 8” outside base ring 23 which includes sensor band 21. *Id.*, 3:18-19.



Id. at Fig. 2.

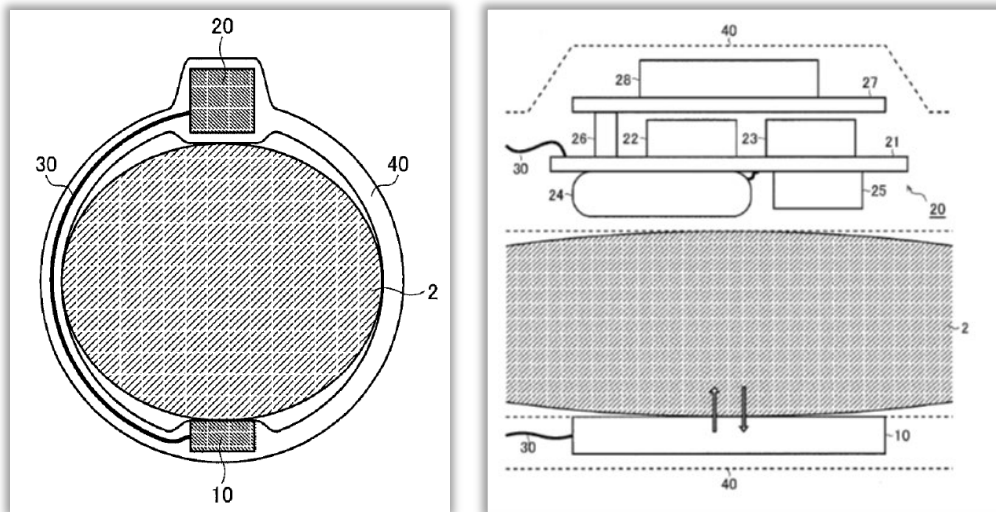
67. Other researchers followed Asada’s design choices. U.S. Patent No. 6,608,562 issued in 2003 to Kimura. Ex-1028. Kimura followed Asada’s arrangement of externally mounting components to the ring body above the finger:



Ex-1028 at Fig. 24. Like Asada, Kimura shows the battery 506 and circuit 502 mounted on top of the ring and the light detector 504 at the bottom of the finger.

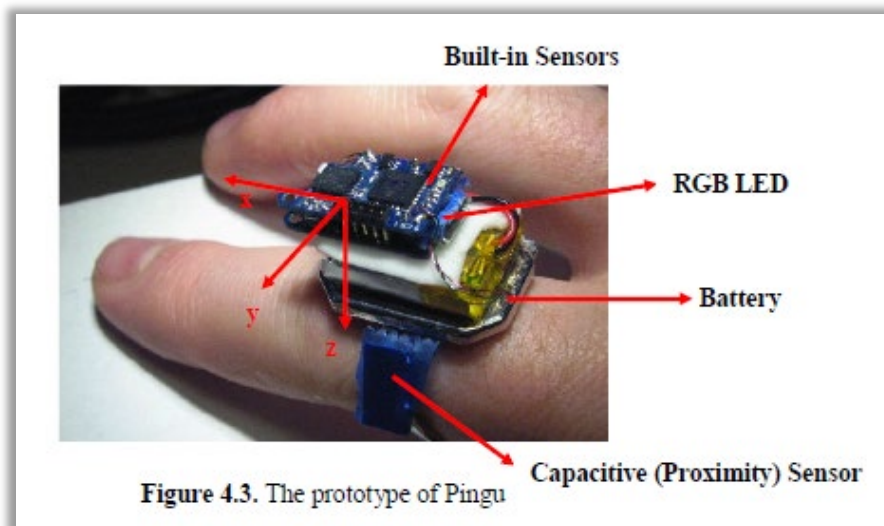
Id., 14:55-67.

68. In 2012, about ten years after Asada's design, Niwa (Ex-1005) again kept the same basic design taught by Asada. Niwa stacked its circuit and battery 20 at the top of the ring and mounted the light sensor 10 at the bottom of the finger.



Ex-1005 at Fig. 22; id. at Fig. 29

69. Another effort in 2012 showed those skilled in the art were still “stacking” circuit boards and batteries on top of the ring:

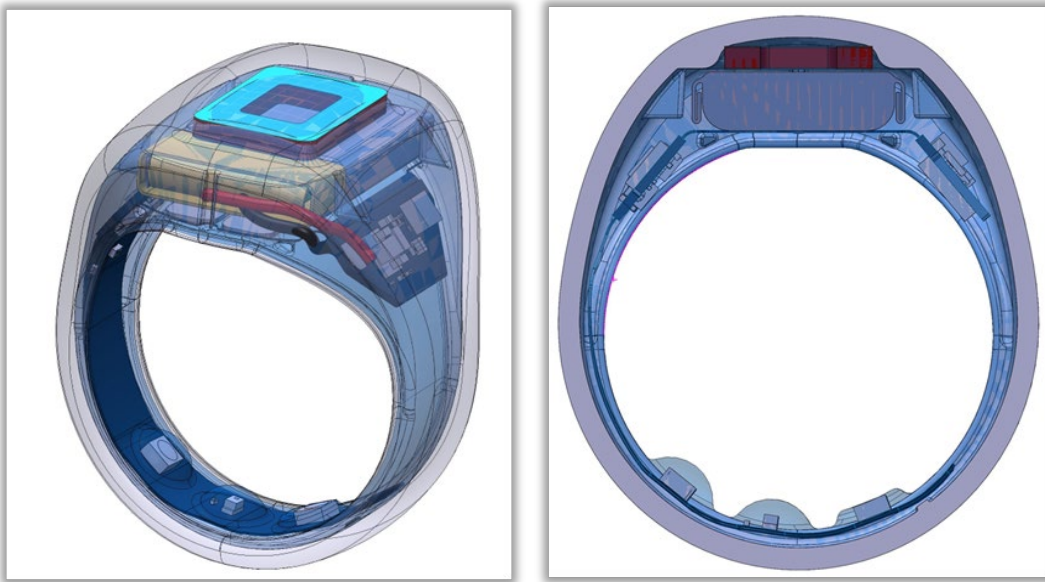


Ex. 2115.

70. Indeed, in 2012-2013 timeframe when I was establishing the Center of Wearable Sensors at UCSD, I considered building a finger-worn wearable smart ring

device. However, my colleagues and I also looked to stacking the components external to the ring given a number of constraints related to components, power requirements needed for the finger-worn wearable smart rings.

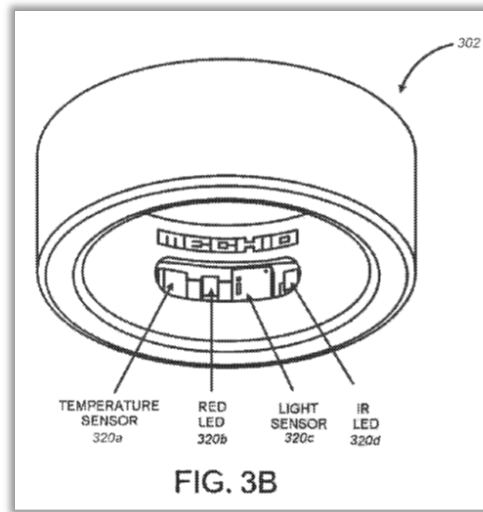
71. Even after the priority date of the '702 patent, Oura's first generation ring released in 2015 used a Superbowl ring-type design, with a rectangular battery and other components mounted on top of the ring.²



Ex. 2034.

72. In sum, nothing similar to the design implemented in the '702 patent had ever been seen before.

² I understand that the inventors of the '702 patent were part of a company called Motiv that launched Motiv Ring. Ex. 2033. I understand that Oura subsequently acquired Motiv and its patented technology.



Ex-1001 at Fig. 3B.

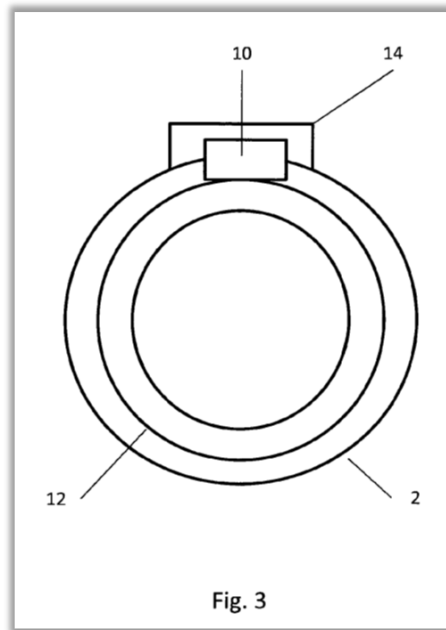
B. The Prior Art Relied on by Petitioner

1. Schröder

73. Schröder describes an “external secure unit” for the purpose of authenticating a user. Ex-1007, Abstract (“security-relevant data necessary for executing the application program in the communication device are stored the external unit[.]”). Schröder attempts to improve upon the existing “smart card” and RFID devices, which have poor range. *Id.*, 4:63-5:9. Schröder employs an antenna coil in the ring to achieve this purpose. *Id.*, 5:12-13 (“For solving these problems, the invention therefore proposes integrating into the external secure unit 2, e.g., the finger ring 2, an antenna coil 8 . . .”).

74. The only electronic component shown in the figures of Schröder is chip module 10, which protrudes beyond the surface of the ring housing, making it

accessible via a hinged cover 14. *Id.*, at Fig. 3; *Id.*, 9:1-3 (“The chip module 10 is arranged in particular replaceably in the finger-ring 2.”).



Id., at Fig. 3.

75. None of the embodiments depicted in the figures of Schröder include a battery or a sensor because its focus is an improved antenna. *Id.*, 5:12-14. Schröder’s specification does suggest that a “further embodiment example” has a battery, which is “connected to” a chip module 10. *Id.*, 11:48-49. However, Schröder does not disclose where the battery might be located, nor does it disclose that the chip module is mounted to a printed circuit board. Rather, Schröder discloses that the chip module 10 is connected to an antenna coil 8 that is located on the inlay 12. *Id.*, 8:57-58 (“The inlay 12 serves as a carrier for at least one antenna coil 8.”); *id.*, 8:63-66 (“The chip

module 10 is electroconductively connected by means of electroconductive contacts to the at least one antenna coil 8 which is located on the inlay 12.”).

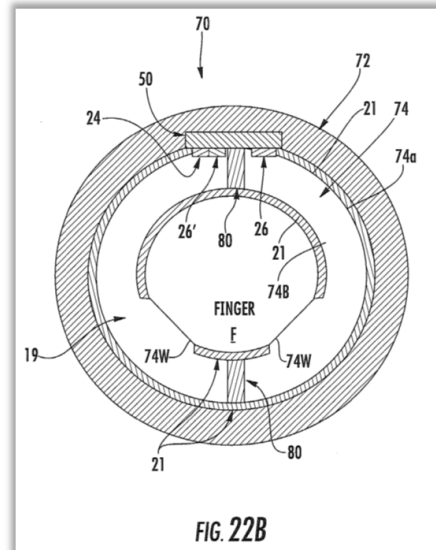
76. Schröder also discloses an embodiment using a “biometric sensor” for authentication purposes. *Id.*, 9:54-56 (“In a further embodiment example of the invention, the external secure unit 2 has a biometric sensor. This enables the user of the external secure unit 2 to authenticate himself.”). But Schröder does not disclose using this biometric sensors to monitor any health parameters. Like the battery, the biometric sensor is not depicted in any figure, but “can be arranged on the chip module 10 or it can be arranged in the finger-ring 2 separately from the chip module 10 e.g., on a separate circuit foil.” *Id.*, 9:60-62.

77. Schröder teaches scanning the ring wearer’s vein pattern and comparing it to a stored pattern for authentication. *Id.*, 10:42-45 (“The user of the finger-ring 2 authenticates himself by means of the biometric data stored in the finger-ring 2. The terminal compares the biometric data received from the finger-ring 2, e.g. the data of finger veins, with the data stored in a background system and authorizes e.g. a transaction in dependence on the comparison.”).

2. LeBoeuf

78. LeBoeuf discloses an earbud that includes an optical emitter and detector for monitoring health parameters. Ex-1012, Abstract. The main focus of

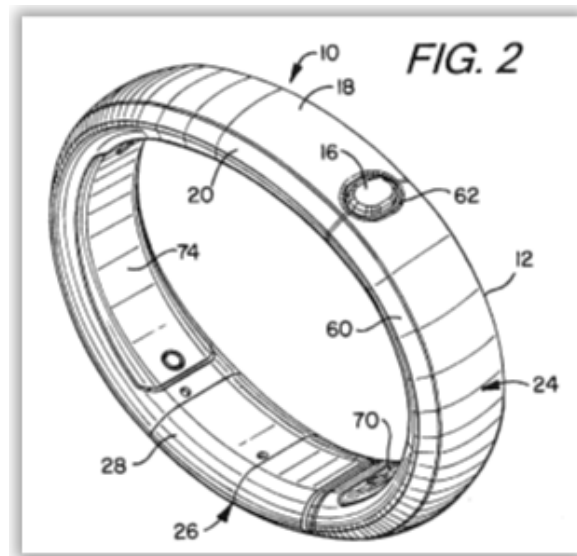
LeBoeuf is related to optical waveguides to earbud form factors. *Id.* In one embodiment, LeBoeuf discloses a finger ring. *Id.* Figs. 22A-22B.



79. LeBoeuf discloses a very specific (and very different) structure used to direct light to the finger. LeBoeuf discloses an inner housing 74 and an outer housing 72. Base 50 supports optical emitter 24 and optical detector 26. *Id.*, 28:14-17. Light guiding region 19 serves to “deliver[] light from the optical emitter 24 to the finger F of a subject at one or more predetermined locations and that collects light from the finger F and delivers light to the optical detectors.” *Id.*, 28:31-34. LeBoeuf states that outer housing 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.*, 28:4-6.

3. Mestas

80. Mestas discloses a wearable device of a much larger form factor that is not constructed to be worn as a ring: “In addition, the wearable athletic device may be worn in a variety of locations on a user's body including on a user's chest (e.g., a chest strap), around a user's wrist, around a user's arm, on a user's head, on a user's ankle or thigh, and the like.” Ex-1010, ¶ [0143]. Mestas preferred embodiment is as a wristband, as shown in Fig. 2 below:



Id. at Fig. 2; ¶ [0152] (“As further shown in FIGS. 2-6, the wearable device assembly **10** is annular or generally circular in shape and, in this illustrative example, is configured for wearing around a user's wrist.”).

81. While Mestas is not listed on the '702 patent, U.S. Patent Application Pub. No. US 2013/0106603 (“Weast”) (Ex. 2005) was considered by the examiner

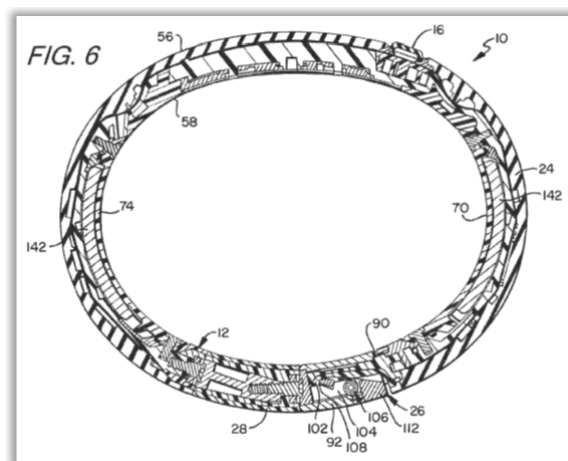
both during prosecution of the '702 patent itself, *see* Ex-1001 at 3 (“References Cited”), and in prosecution of related parent U.S. Patent No. 10,768,666 (Ex. 2006). Weast and Mestas have a common assignee and contain the same disclosure that is relied on by Petitioner.

82. During prosecution of the '666 patent, the examiner specifically rejected the pending claims (which recited a curved battery) over Vescovi in view of Weast:

The claimed battery being curved is not specifically disclosed by Vescovi. Weast teaches a wearable electronic device that is curved and utilizes a curved battery (Weast: paragraph 422). Modifying Vescovi to use a curved battery would increase the overall functionality of the device by providing the user with a battery shape to fit the shape of the ring itself, thereby more efficiently using the space inside the ring. Therefore it would have been obvious to one of ordinary skill in the art to modify Vescovi according to Weast.

Ex. 2007, at 4. Weast's figures are identical to Mestas' and disclose the same battery

142 relied on by Petitioner in Mestas:



Ex. 2005 at Fig. 6.

83. Oura responded, inter alia, that Weast's battery was inapplicable to a ring and not a proper basis for the Office's obviousness rejection:

As acknowledged by the Office, Vescovi is further deficient for failing to teach a curved battery, a flexible printed circuit board, and the functionality of remotely unlocking a computing device. The Office, therefore, relies on Weast for the teaching of a curved battery.

However, as the Applicants' claims are directed to a ring, and the device of Weast is directed to a bracelet, the two devices are not capable of being combined in the manner suggested by the Office. ***Specifically, a battery for a bracelet, curved or otherwise, would not be of a dimension to be fitted within the confines of a cavity of a ring. Nor is there any teaching within Weast as to how such a battery can be re-configured to do so.***

Consequently, even if the two references of Vescovi and Weast could be combined, there is no likelihood that the Applicants' claimed invention would thereby be successfully derived. Consequently, a *prima facie* case for obviousness has not been established, and this rejection may be withdrawn.

Ex. 2008, at 3.³

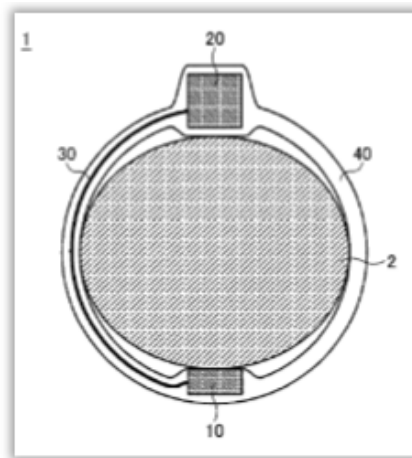
84. In response to this argument, the examiner withdrew the rejection and allowed the claims. Ex. 2009. Thus, the Patent Office has considered and rejected Petitioner's argument that it would be obvious to use the battery of Weast/Mestas in a ring. I agree with the Patent Office's reasoning.

³ All emphasis added unless stated otherwise.

4. Niwa

85. Niwa discloses a plethysmogram sensor. Ex-1005, Abstract. Photoplethysmograms direct light at an individual's blood vessel and measure the light that is reflected from the vessel. *Id.*, at Fig. 1. The resultant measured light can be used to measure changes in heart rate over time. Fluctuations in heart rate can provide useful information about a person. *Id.*, ¶ [0118] (“A fatigue level, a pleasant sleep level, and a stress level of the measured person can be learned from the fluctuation of the heart rate.”).

86. Niwa discloses one implementation of the sensor in a ring, as shown in Fig. 22 below:



Id. at Fig. 22.

87. This implementation is similar to Schröder (and other finger ring prior art) in that it shows a significant protrusion from the ring to accommodate certain

components. In Niwa, second unit 20 is used to supply power via cable 30 to first unit 10, which is used to measure the plethysmogram. *Id.*, ¶¶ [0192] (“The first unit 10 is a unit to measure the plethysmogram . . .”), [0193] (“The second unit 20 is a unit to supply a power to the first unit 10 mainly.”). Niwa states that “it is desirable to construct the thickness of the second unit 20 twice as large as the thickness of the first unit 10.” *Id.*, ¶ [0199]. Niwa also teaches locating power supply unit 20 “as far as possible” from the first unit 10 to avoid noise in the first unit 10. *Id.*, ¶ [0215].

88. Unlike the ’702 patent, Niwa teaches using a “highly flat” battery “located right above the finger 2 . . . to enhance an affinity of the plethysmogram sensor 1 when the pulse sensor 1 is worn on the finger” *Id.*, ¶ [0217]. Niwa includes little detail of the construction of housing 40, other than showing it as a unitary structure. *Id.*, Fig. 22.

VII. CHALLENGED CLAIMS ARE NOT OBVIOUS

A. Ground 1: Claims 1, 5, 7, and 12-15 are patentable over Schröder.

1. Schröder in view of knowledge of POSITA fail to disclose limitation 1[b(ii)]

89. Limitation 1[b(ii)] of the ’702 patent requires:

wherein the internal housing component comprises a substantially transparent material that enables light to pass through the internal housing component

Ex-1001, 45:4-8.

90. By way of example, as shown in Fig. 13 below and recited in claim 1, the '702 patent discloses that the internal housing component 1314 “comprises a substantially transparent material that enables light to pass through the internal housing component” to allow light to pass from and to light emitting and receiving components 1350. *See* Ex-1001 at 19:30-31 (“the internal potting 1314 can be transparent”); *id.* at 2:46-50 (“In one example, 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.”). Petitioner agrees that “substantially transparent” broadly means “material that enables light (“visible and non-visible”) or other radiation to pass through with or without alteration of its optical properties.”). Pet. at 22 n.9.

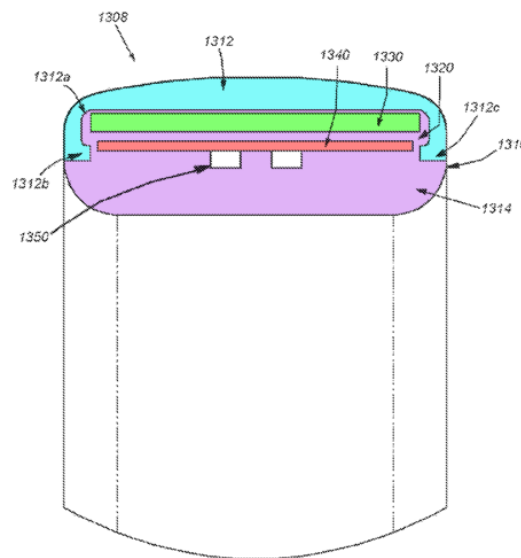


FIG. 13

Ex-1001 at Fig. 13.

91. Schröder does not disclose or suggest this limitation. Petitioner relies on Schröder’s disclosure of a window. Pet. at 21-22. The passage of Schröder on which Petitioner relies describes features which would be visible on the outer surface of the ring, not an internal housing component. Schröder explicitly teaches that the transparent regions are “security elements” or “security features” disposed “on an outer area” of the finger ring, not an internal housing component with an inner circumferential surface. Ex-1007, 9:27-34 (“The external secure unit 2, e.g. a finger-ring 2 has security elements for example incorporated into the surface, applied thereto or integrated therein, such as ... transparent regions, e.g. windows, etc.”); 2:38-42 (“The at least one security feature can be arranged e.g. **on an outer area of the external secure unit.**”); *see also id.*, 9:30-34 (Schröder listing visual security features, such as “holograms, Kinegrams, security threads, microprint, guilloches, fluorescent, or phosphorescent inks, optically variable inks, color gradations, e.g. gradients, iridescent print, intaglio print, transparent regions, e.g. windows, etc.”).

92. Schröder only discloses that the housing is made of “plastic or metal.” Ex-1007 at 12:14-15. There is no suggestion that the plastic or metal is “transparent” to all light, nor did Dr. Anthony so suggest. Indeed, Petitioner argued that a “infrared transmissive window” was needed in Schröder to accomplish his goal of vein imaging. Pet. at 22. Even if Schröder’s housing had an “infrared transmissive

window,” which is the only light used by Schröder for imaging, that does not constitute a “transparent material” that passes visible light.

93. Thus, in my opinion, Schröder does not teach or suggest the “internal housing component comprises a substantially transparent material that enables light to pass through the internal housing component” of claim 1.

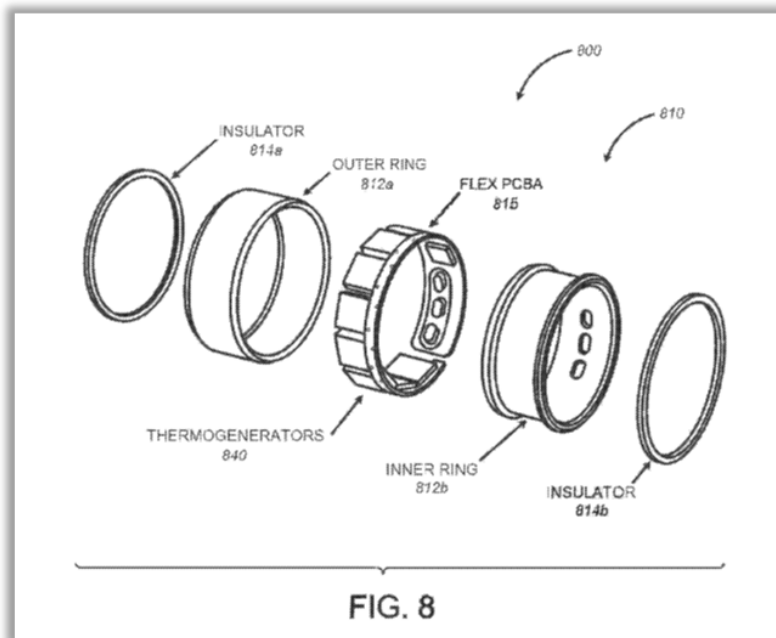
2. Schröder does not disclose or suggest limitation 1[c]

94. Limitations 1[c] of the ’702 patent require:

a printed circuit board disposed within a cavity defined by the external housing component and the internal housing component, wherein the printed circuit board is configured to conform to arc within the cavity

Ex-1001, 45:8-11.

95. As shown below in Fig. 8 of the ’702 patent and recited in claim 1, the battery (840) and printed circuit board (815) and sensors are constructed and arranged to occupy different portions of the cavity between the internal (inner ring 812b) and external housing (outer ring 812a) components:

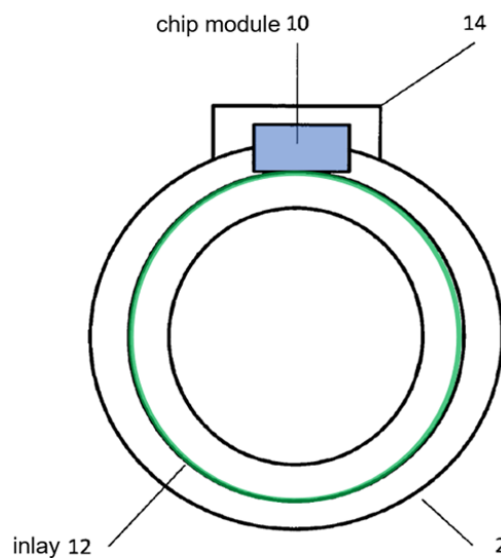


Ex-1001 at Fig. 8.

96. Dr. Anthony identifies inlay 12 of Schröder as the claimed printed circuit board. Ex-1002 at ¶¶ 157-158. But this conclusion has no merit. Schröder itself does not identify inlay 12 as a printed circuit board, rather referring to it as a “carrier”: “The inlay 12 serves as a carrier for at least one antenna coil 8.” Ex-1007 at 8:57-59. This suggests that the inlay is merely a substance for holding the coil in place, not a printed circuit board. In fact, when Schröder meant to describe a “printed circuit board”—it did: “The NFC antenna can be realized for example as part of a circuit on a *circuit board* e.g. of a GSM modem.” Ex-1007, 22:47-49. In contrast, Schröder never refers to inlay 12 as a printed circuit board. And printed circuit boards have a well-known construction and characteristics that are not present in

inlay 12. *See e.g.*, Ex. 2009. Dr. Anthony’s notion that the inlay materials are “commonly understood to be printed circuit board materials” does nothing to support the conclusion that inlay 12 is a printed circuit board. Ex-1002 at ¶ 157.

97. To the extent Petitioner relies on “chip module 10” as part of the printed circuit board, that component is entirely outside of the cavity identified by Petitioner.



Ex-1007, 8:63-66 (“The chip module 10 is electroconductively connected by means of electroconductive contacts to the at least one antenna coil 8 which is located on the inlay 12.”).

98. Schröder teaches and shows that the chip module is located “on” the carrier inlay, which is located “in” the recess: “The chip module 10 and the antenna coil 8 and the possibly further electronic devices are arranged on a carrier as

described above. The carrier is preferably inserted into a recess in the second component.” Ex-1007, 15:19-22. Locating the chip outside of the inlay recess serves a function, as Schröder teaches that the chip is replaceable using hinged window 14. *Id.*, 8:60-63 (“The chip module 10 is protected against external influences by a cover 14. The cover 14 is e.g, a hinged cover or a cover that is connected e.g., by means of a thread to the finger-ring 2.”). Locating chip module 10 on the inlay 12 is at cross purposes with the disclosure of Schröder and therefore not obvious.

99. Moreover, the chip module 10 is shown by Schröder to be much too large to fit on a flexible circuit board. Schröder acknowledges that chip module would extend beyond inlay 12 and require a paste to compensate for the shape: “Should steps or shoulders nevertheless arise e.g. through the chip module 10, said steps or shoulders can be compensated by applying a paste which is e.g. thermally or UV-curing.” Ex-1007 at 14:10-13. Thus, Schröder expressly teaches (and shows) that the chip module is located outside the recess occupied by inlay 12, contrary to the Petition. *Cf.*, Pet. at 26 (“Schröder’s finger ring includes chip module 10, which is in inlay 12 . . .”).

100. Additionally, Petitioner’s own definition of “printed circuit board” is inconsistent with its analysis of Schröder. For example, Dr. Anthony pointed to a Wiki page article for definition of “printed circuit board.” Ex. 2020 at 73:12-74:11;

76:14-20; *see also* Ex-1002 (PGR2024-00030), ¶ 32, n. 1. But the Wiki page that

Dr. Anthony cites to define a PCB states that:

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

Ex. 2023 at 1.

101. Despite adopting this as his definition of printed circuit board, Dr. Anthony fails to provide any analysis as to how the inlay 12 of Schröder meets this definition. Indeed, Schröder’s inlay does not include the described features. This supports the notion that Schröder’s use of the term “circuit board” in other embodiments is further evidence that a POSITA would not consider inlay 12 a printed circuit board. *See* Ex-1007 at 22:48-49.

102. Because Schröder does not disclose or suggest that the internal housing component “comprises substantially transparent material,” it is my opinion that Schröder also does not disclose or suggest “one or more light-emitting/receiving components . . . configured to emit/receive light through the substantially transparent material.”

3. Schröder does not disclose or suggest dependent claim 12 and 13.

103. Dependent claim 12 of the ’702 patent requires:

“a power management module disposed within the cavity between the inner circumferential surface and the other circumferential surface, the power management module configured to wirelessly transfer energy from an external energy source to a battery of the finger-worn wearable ring device through the inner circumferential surface, the outer circumferential surface, or both.”

Ex.-1001 at 46:23-32.

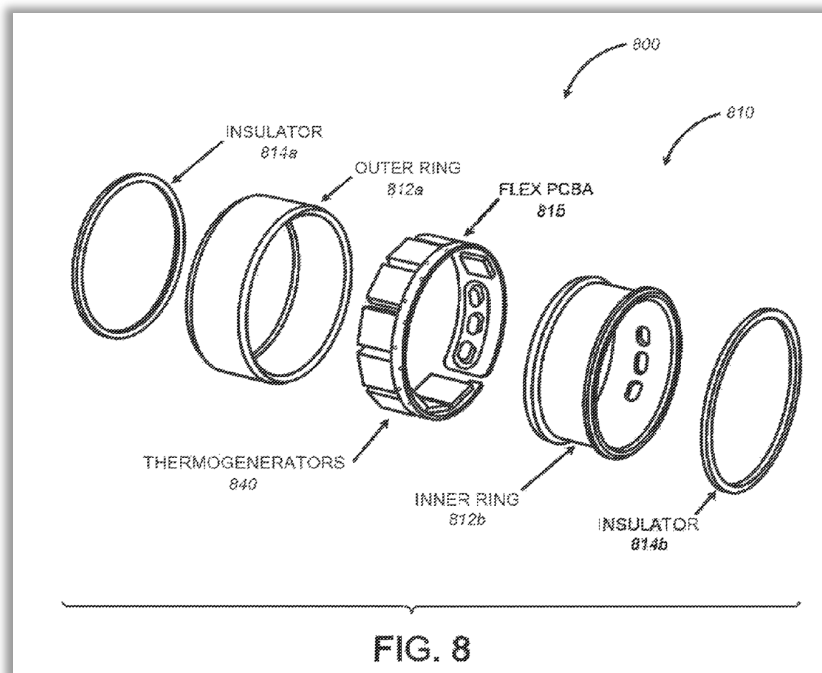
104. Dependent claim 13 requires:

wherein the power management module comprises an inductive charging component configured to transfer energy from the external energy source to the battery via an inductive charging process.

Id. at 46:33-37.

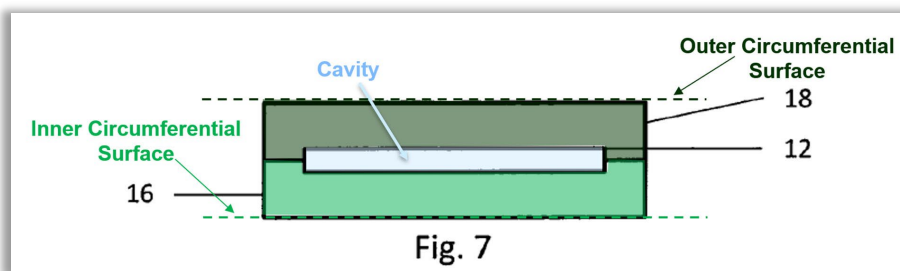
105. Dr. Anthony stated that the power management module in Schröder included a rectifier, chip module 10, a battery, and the antenna. Ex. 2021 at 428:13-18; 426:10-429:12. But claim 12 requires that all of these power management module components are “disposed within the cavity between the inner circumferential surface and the outer circumferential surface[.]” Ex-1001 at 46:23-32.

106. By way of example, Fig. 8 of the '702 shows power management module in the form of thermogenerators 840 disposed between inner and outer circumferential surfaces of the internal and external housing components, respectively:



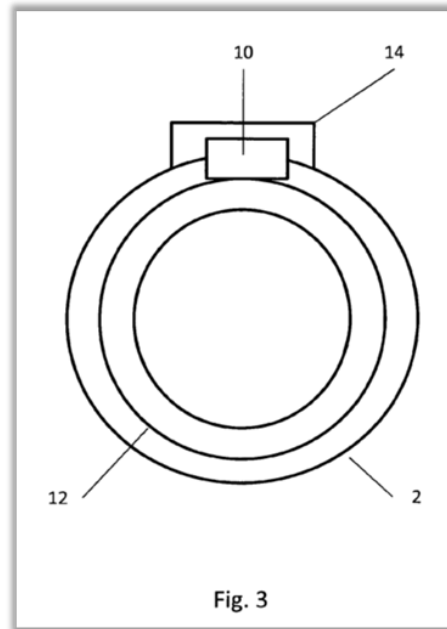
Ex-1001 at Fig. 8.

107. In contrast, Schröder discloses a rectangular “inlay 12,” which Petitioner contends is a cavity that contains all the power management components detailed by Dr. Anthony:



Ex.-1002 at 102.

108. The problem with Petitioner's theory is that the only one of these components for which Schröder actually shows a position is chip module 10, which is not disposed within the alleged cavity identified by Petitioner:



Ex-1007 at Fig. 3.

109. As shown in Fig. 3, chip module 10 is far too large to fit within inlay 12 and protrudes beyond the surface of the ring housing, making it accessible via hinged cover 14. *Id.*, at Fig. 3; *Id.*, 9:1-3 (“The chip module 10 is arranged in particular replaceably in the finger-ring 2.”).

110. Dr. Anthony confirmed that Schröder did not disclose this claimed arrangement but that he relied on the a POSITA to “fill in the blanks:”

Q. Where does the rectangle tell them to put the battery relative to the printed circuit board relative to the antenna coil relative to the sensors, relative to any communication module, relative to

any power regulation circuitry? Where does the rectangle tell the POSITA where to put all that stuff and how to arrange it?

...

A. Right. And as I was going through my declaration pointing out it's Schröder with the knowledge of a POSITA, and I subsequently started to describe the various arrangements of components inside of that cavity. So knowledge of POSITA in addition to what's disclosed in Schröder gives them the guidance in how to arrange this.

Q. So Schröder doesn't tell them, but the knowledge of the POSITA fills in all those blanks?

A. Yes. And I described that in the subsequent parts of my declaration

Ex. 2020 at 208:5-209:15.

111. This asks too much of the ordinary artisan. Schröder's design is meant to accommodate a thin antenna coil. Moreover, RFID and NFC applications, for which Schröder is designed, typically involve ultra-thin applications such as a credit card chip or a hotel room key card. While placing an antenna coil on an inlay might be within the skill of a POSITA, arranging a power management module and its associated components within a cavity occupied by inlay is not.

112. Indeed, Dr. Anthony testified that he didn't know the size of the battery in Schröder nor did he conduct any analysis to figure that out, instead simply suggesting that a skilled artisan would know that information:

Q. So how big is the battery or what's the size of the battery that's occupying the second half of the rectangle in Figure 7? Would a POSITA know that?

A. A POSITA would size the battery appropriately for the function that they were trying to accomplish.

Q. And you haven't done that analysis, have you?

A. It was not necessary to do that analysis in forming my opinion .
..

Ex. 2020 at 214:7-215:10.

113. But without knowing the size of the battery, it is entirely conclusory of Dr. Anthony to suggest that the skilled artisan would place the battery, power management module, and all associated circuitry, which according to Dr. Anthony, included a rectifier, chip module 10, a battery, *and* the antenna, within half of the cavity. Ex. 2021 at 428:13-18; 426:10-429:12. Beyond the passive RFID authentication functionalities of Schröder, the additional proposed functionalities of Schröder would add significant power requirements and thus impact the size of the power management module, and in turn impact the placement of these components on the ring. Dr. Anthony agrees. Ex. 2020 at 162:14-163:11 (“[Schröder is] silent on the particular capacity you start talking about these further embodiments that are taught, power requirements build up.”); *Id.*, at 166:11-19 (“as is envisioned in Schröder there are embodiments that include very power hungry things like display units.”). Thus, Dr. Anthony’s conclusion that all of the components of the power

management module would be included within the cavity of Schröder is unsupported.

114. Dr. Anthony's position is also contrary to the knowledge of the teachings of the prior art that is charged to one of ordinary skill in the art. The ordinary artisan would apply the teachings of the wearable ring prior art to date. When deciding where to locate the power management module in Schröder, the POSITA would apply these teachings:

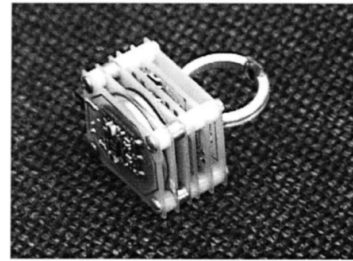
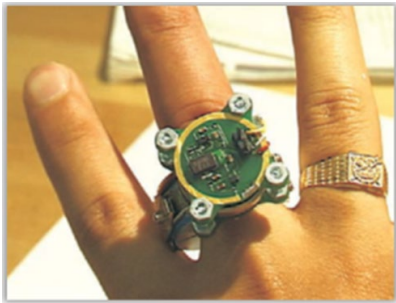
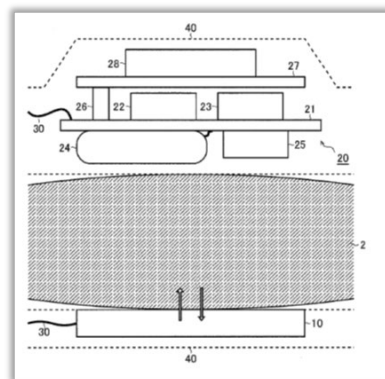
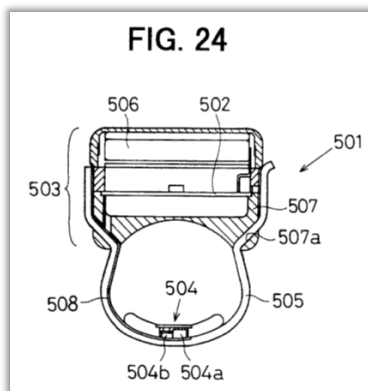


Figure 8-1 First Prototype Ring Sensor



Ex-1037 at 7; Ex-1035 at 75; Ex-1028 at Fig. 24; Ex-1005 at Fig. 29.

115. Thus, the more likely result of a modified Schröder is locating the power management module above the ring (similar to the prior art).

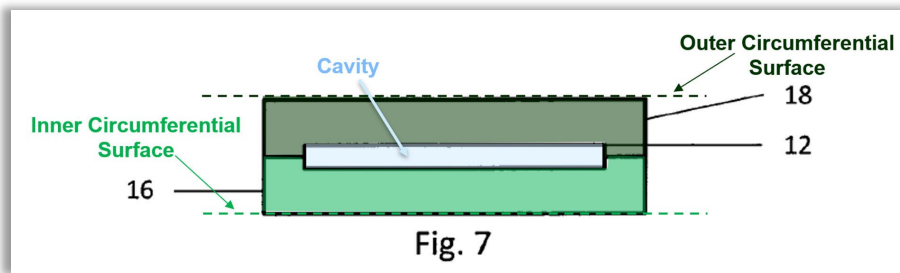
116. Dr. Anthony also cited the following passage as support for the notion that “a POSITA would have understood that the battery being connected to the chip module is arranged inside the finger ring’s cavity surrounding inlay 12 to power the interior electrical components” (Ex-1002, ¶ 170):

In the finger-ring **2** as an external secure unit **2** there can be arranged at least one inlay **12**. The inlay **12** can have at least one chip module **10** with at least one antenna coil **8**, with at least one further electronic device, e.g. a display, optionally being arranged on the inlay **12**.

Ex-1007 at 12:61-65.

117. Dr. Anthony contends that this passage discloses that chip module 10 and battery are located within inlay 12 of Fig. 7. But this paragraph is also general enough to accurately describe Fig. 3, which shows the chip module “arranged on the inlay 12.” Furthermore, one of ordinary skill in the art would understand that the display referred to by Schröder would be mounted so as to be externally visible, which suggests mounting the display in the manner of chip module 10 in Fig. 3.

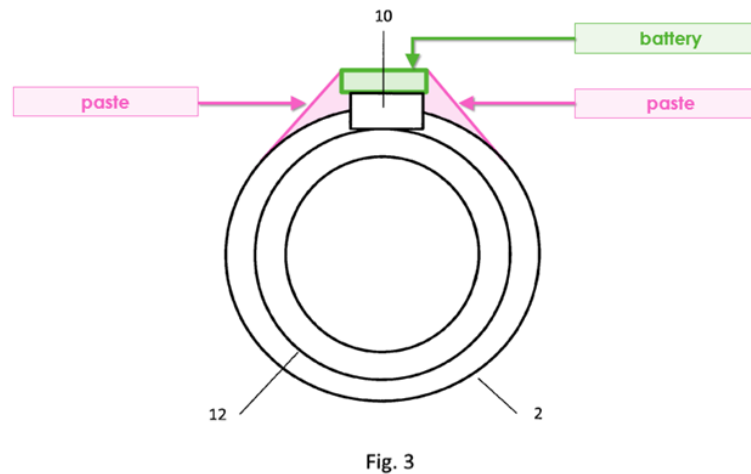
118. With respect to Dr. Anthony’s annotated Fig 7, shown below, there is no reference to chip module 10 or a battery.



Pet. at 30; Ex-1002 at 102.

119. Fig. 7 is a cross section of one slice of the ring in which the inventor did not include chip module 10. That is, a cross-section of Fig. 3 in a location that did not include chip module 10 would look identical to Fig. 7. Thus, Fig. 7 in and of itself does not suggest the location of any of these components.

120. Schröder does provide additional clues as to how the chip module 10 and other comparably sized components would appear in the context of Fig. 7. Schröder states: “Should steps or shoulders nevertheless arise e.g. through the chip module 10, said steps or shoulders can be compensated by applying a paste which is which is e.g. thermally or UV-curing.” Ex-1007 at 14:10-13. This passage plainly acknowledges the fact that chip module 10 is too large to fit in the thin inlay and would result in a protrusion similar to Fig. 3 (the difference being that the chip module is not “replaceably mounted” as in Fig. 3). Thus, the following is a likely application of the teachings of Schröder:



Id. at Fig. 3 (modified)

121. For the above reasons, it is my opinion that dependent claims 12 and 13 are also patentable over Schröder.

B. Ground 2: Claims 2-4, 6, and 8-11 are patentable over Schröder in view of Niwa .

1. A POSITA would not combine Schröder and LeBoeuf with any reasonable expectation of success.

122. A POSITA in the art would not be motivated to combine Schröder and LeBoeuf in the manner suggested. Dr. Anthony aptly stated: “the sole goal of Schröder in isolation is targeted to providing security.” Ex. 2020 at 244:18-20. Thus, Schröder is directed to security verification while LeBoeuf is directed to physiological sensing. Ex-1007, 1:5-6 (“The present invention describes an external secure unit”); Ex-1012 at 1:38-45 (“As such, improved ways of collecting, storing and analyzing physiological information are needed. In addition, improved ways of seamlessly extracting physiological information from a person during everyday life

activities, especially during high activity levels, may be important for enhancing fitness training and healthcare quality, promoting and facilitating prevention, and reducing healthcare costs.”).

123. The focus of LeBoeuf is an improved earbud for sensing physiological conditions. *Id.*, Abstract. A single alternative embodiment shows a finger ring. *Id.* at Figs. 22A and 22B. All embodiments utilize light guiding region 19 internal to the ring to deliver light from the optical emitter 24, to the finger, and/or to the optical detector 26. The light guiding region enables the light emitter and receiver to be located side by side on the same base 50. Applying this light guiding region to the ring of Schröder would result in a major redesign of Schröder which does not serve the security function of Schröder.

124. Dr. Anthony cites to “design incentives and market forces” as motivation to combine Schröder and LeBoeuf, but fails to identify those incentive and forces. Ex-1002 at ¶ 185. There is no evidence that a POSITA would be motivated to incorporate the light guiding region of LeBoeuf to Schröder as there is no evidence that feature would improve vein pattern detection.

2. Dependent claims 2-4, 6, and 8-11 are patentable over Schröder in view of LeBoeuf.

125. Claim 2 requires that the “substantially transparent material is configured to filter or modify one or more wavelengths of the light that passes

through the internal housing component.” Ex-1001, 45:31-33. Petitioner identifies inner body portion 74 of LeBoeuf as the internal housing component. LeBoeuf states that inner body portion 74 includes “light transmissive material” such as silicon. Ex-1012 at 28:18-25. Petitioner points to windows 74W, however, to meet the limitation that the substantially transparent material “is configured to alter one or more optical properties of the light that passes through the internal housing.” Ex-1002 at ¶ 187.

126. Petitioner’s mapping plainly does not meet claim 2. Petitioner identifies inner body portion 74 comprised of a “soft, resilient material such as silicone” as the substantially transparent material. Pet. at 37. Petitioner, however, points to an entirely different component window 74W to meet claimed function of filtering or modifying wavelengths. *Id.* at 38.

127. Claims 3, 4, 6, and 8 recite further properties of the “substantially transparent material” for which Petitioner also cites to windows 74W. Thus, for the same reasons stated above with respect to claims 1 and 2, these claims are also patentable over Schröder-LeBoeuf.

128. Claims 9, 10, and 11 describe, in part, the use of multiple light-emitting components that emit light at different wavelengths. One of ordinary skill in the art would not be motivated to combine Schröder and LeBoeuf in the manner suggested. Dr. Anthony aptly stated: “the sole goal of Schröder in isolation is targeted to providing security.” Ex. 2020 at 244:18-20. Schröder is directed to security

verification while LeBoeuf is directed to sensing physiological parameters using a light. Ex-1007, 1:5-6 (“The present invention describes an external secure unit”); Ex-1012 at 2:46-52 (“body temperature, skin temperature, blood gas levels, muscle tension, heart rate, blood flow, cardiopulmonary functions, etc.”).

129. LeBoeuf uses multiple wavelengths “with the goal or providing specialized physiological information for each wavelength.” Ex-1012 at 27:11-12. This is entirely different from Schröder’s “sole goal” to use infrared to detect vein patterns for security verification. Given Schröder’s stated goal, a POSITA would have no motivation to add the multiple wavelength sensors of LeBoeuf. This would require a redesign of Schröder to accommodate additional emitters, sensors, power requirements, and associated circuitry to the already space-starved design of Schröder to add features that are outside the security goal of Schröder. A POSITA would have no motivation to modify Schröder in this fashion.

130. In conclusory fashion, Dr. Anthony states that the ordinary person would find this combination obvious “because doing so would enable the ring to assess multiple biological parameters.” Ex-1002 ¶ 193. But since Schröder’s goal is security—not assessing biological parameters—this motivation is nothing more than hindsight guided by the patented invention. A POSITA would not consider adding the teachings of LeBoeuf to achieve the vein pattern matching goal of Schröder.

C. Ground 3: Claims 8-11 are patentable over Schröder in view of LeBoeuf and Niwa.

131. A POSITA in the art would not combine Niwa with Schröder for the reasons similar to those stated above with respect to LeBoeuf. Like LeBoeuf, Niwa is directed to monitoring health parameters using light sensors. Ex-1005, ¶ [003] (“This disclosure relates to a plethysmogram sensor”). Petitioner’s suggestion that one of ordinary skill in the art would apply Niwa’s multiple wavelength teachings to Schröder has no support, and one of ordinary skill in the art would have no use for a PPG sensor to achieve Schröder’s “sole goal” to use infrared to detect vein patterns for security verification. Such a redesign of Schröder would add unneeded components, circuitry, and power requirements to an already space-starved design.

132. With respect to claim 8, one of ordinary skill in the art would also not combine the teachings of LeBoeuf and Niwa in the manner suggested. Petitioner contends “A POSITA would have been motivated to add a measurement window to Schröder-LeBoeuf, as taught in Niwa, such that the window contacts and covers the light-emitting and light receiving components in Schröder-LeBoeuf’s ring.” Pet. at 53. This combination, however, is directly contrary to the teachings of LeBoeuf. LeBoeuf teaches the use of a light guiding region in which light is guided through a channel to the window. This is the most prominent feature of LeBoeuf, as evidenced by its Title “Light-Guiding Devices and Monitoring Devices Incorporating Same.”

See also Ex-1012 at 27:58-61 (“According to other embodiments of the present invention, monitoring devices with light-guiding regions may be configured to be attached to earlobes, fingers, toes, other digits, etc.”); *id.* at 17:26-29 (“The inspection light 111 generated by the optical emitter 24 passes isotropically into the light guiding region 19 through the windows 16w.”). As shown in Fig. 22B of LeBoeuf, as well as in all other embodiments, light emitter 24 is separated from window 74W by lightguide 19. A POSITA in the art would not modify LeBoeuf to have the window “contact and cover” the light emitter as such a modification would result in a complete redesign of LeBoeuf that eliminates its most prominent feature.

D. Ground 4: Claims 16 and 17 are patentable over Schröder in view of Mestas.

1. A POSITA would have no motivation to combine Mestas’s curved battery with Schröder with any reasonable expectation of success

133. Mestas’s batteries, layout, and other components, in the words of Dr. Anthony, would have to be scaled down “5 to 10” times to be appropriately sized for a finger worn ring. Ex. 2021 at 313:12. I agree. As such, the curved batteries of Mestas could not be used in Schröder, which Dr. Anthony seems to acknowledge. *Id.* at 307:21-22 (“Nor did I propose just copying and pasting it wholesale.”).

134. Petitioner and Dr. Anthony initially proposed that “miniaturization” of Mestas’s curved battery would be “trivial”:

As miniaturization of electronic components improved, a POSITA would have found it trivial to implement Mestas's teachings into a ring form like that of Schröder's "finger-ring."

Ex-1002 at ¶ 272.

135. I disagree. The ordinary person is not skilled in battery design and would not have the skill to "miniaturize" the battery of Mestas. Dr. Anthony agrees that battery design was beyond the skill of the ordinary person. Ex. 2021 at 315:18-19 ("They're not going to design an LED or a battery from scratch."). He also admitted that the miniaturization process to which he referred could take "years." *Id.* at 455:6-8. I also agree with that statement.

136. Changing course, Dr. Anthony at his deposition testified that the POSITA would not need to miniaturize the battery, because they would contact vendors for an appropriate battery. Ex. 2021 at 317:18-22 (miniaturizing "would not be necessary"); *Id.* at 318:2-4 ("They would identify the battery they needed, a curved battery with the appropriate energy density, and secure it appropriately."). Dr. Anthony, however, did not know the specifications of the battery he proposed be used in his Schröder-Mestas combination, nor did he know or research what batteries were available in 2013:

Q. Have you in your work on this case attempted to find whether there was a battery available in 2013 that was appropriate to fit in Schröder as you've proposed?

A. I did not find it necessary to do that, no.

Ex. 2021 at 321:5-10.

137. I see no evidence in the record that curved batteries of an appropriate size and specification were available in 2013 to power Schröder, and I am not aware of any. The named inventor of the '702 patent (Curt von Badinski), in fact, recently testified under oath that during the development leading up the invention, he initially looked at flat and coin-type batteries. Ex. 2024, 182:3-12; 187:3-4 (“I looked at button cell batteries, which are what you use in hearing aids.”). He even considered “taking flat standard batteries and just bending them.” 187:8-9. He researched flexible cells but testified “we weren’t able to actually validate that any of the flexible cells that were available would work for us.” *Id.*, 187:23-25. He also could not find any commercially available curved battery appropriate for the invention. *Id.*, 188:8-10 (“There were curved cells, but . . . to my recollection, there weren’t any that would be [dropped in] for our application.”).

138. With respect to Mestas-sized wrist worn batteries, he testified “There was no way it would work”:

Q. Could a curved cell for a wrist wearable work for a ring form factor?

A. If the ring was very, very, very big, but for our application, the sizes of the other wearables that were out there were nowhere near where we needed them to be. Capacity was great, but the size was just massive. ***There was no way it would work.***

Ex. 2024 at 188:11-17.

139. He also testified he could not find a curved battery with the appropriate size and specifications so eventually they had a flat battery made and just bent it. 188:18-189:11. The battery companies he talked to “passed on the opportunity” because it would take too much effort:

A. . . . Most of those vendors, if not all of them, passed on the opportunity. I think a lot of the feedback that we had was the technology to make it as small as we required would be a lot of lift, and a lot of them just didn’t want to take on the challenge.

Ex.2024 189:12-190:3.

140. But Dr. Anthony did not take any of these issues into account when he suggested a skilled artisan would simply “identify the battery they needed, a curved battery with the appropriate energy density, and secure it appropriately.” Ex. 2021 at 318:2-4.

141. The power requirements of Schröder and Mestas would also be different, given that Mestas is constantly monitoring health conditions and Schröder only takes vein pattern images in a security validation event. Given the typically low power requirements of Schröder’s intended RFID and NFC applications, and its description of the battery as optional, a POSITA would not be motivated to combine the references, or have a reasonable expectation of success in doing so. Indeed, as Dr. Anthony admits, Mestas’ battery would have to be reduced in size on the magnitude of 5-10 times from its current size to fit in a ring of Schröder. Ex. 2021

at 313:12. But with the reduction of size, a skilled artisan would also expect a significant decrease in battery capacity at minimum by approximately the same magnitude (i.e., 5-10x decrease). And Dr. Anthony appears to agree. *Id.* at 325:10-326:5. Yet Dr. Anthony offers no explanation or rationale of why a skilled artisan would have any reasonable expectation of success in powering all the components of Schröder, including the additional components that Dr. Anthony proposes to include in Schröder (e.g., PPG sensor from Mestas) given the significant reduction in battery capacity.

142. Dr. Anthony also neglects to address the fact that unlike coin or button cells, flexible or curved batteries include flexible packaging materials such as aluminum laminated films that house the electrodes and electrolyte. Ex. 2026. Thus even if the battery itself could be miniaturized—and there is no evidence in the record that such miniaturized batteries with the required power requirements existed—a curved cell would have required a POSITA to separately address the issue of battery packaging that also requires real estate which is already limited when designing a finger-worn wearable ring device.

143. Given all of the development in finger ring wearables up to the '702 patent had used “coin” type batteries, the ordinary person would look to that type of battery. Unlike pouch cells, coin and button cells are known for their compact size and reliability in low-power devices. *Id.* Mestas is further evidence of this. While

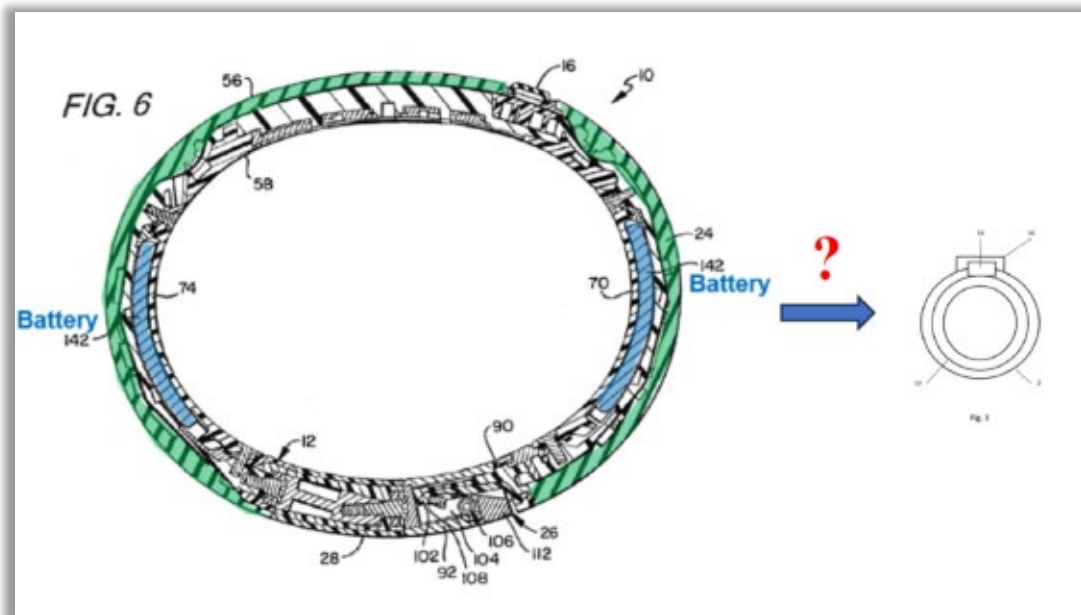
Mestas does use curved batteries, it gives an exhaustive list of body locations where its device could be located. The finger is not mentioned, and all of the locations would be wrist-sized or greater. Ex-1010, ¶ 143 (“the wearable athletic device may be worn in a variety of locations on a user’s body including on a user’s chest (e.g., a chest strap), around a user’s wrist, around a user’s arm, on a user’s head, on a user’s ankle or thigh, and the like.”).

144. Given the state of the prior art, I do not believe the ordinary person would attempt to have a curved battery custom made for this application because such batteries were not used in finger worn rings. Like the world leading MIT researcher Asada, the ordinary person would find the smallest coin-sized battery they could and construct the ring appropriately.

2. Schröder-Mestas combination does not disclose or suggest dependent claims 16 and 17.

145. The combination of Schröder and Mestas does not teach a “curved battery [that] comprises an arc that approximates an arc of the cavity” of a finger-worn wearable ring, as recited in claim 17.

146. At best, the Schröder-Mestas combination teaches curved batteries that are 5-10 times too big to be of any use in a finger ring, as illustrated below:



147. Thus, not only is the proposed combination incompatible, it fails to teach a critical element of the claimed invention—a curved battery within internal and external housing components of a finger ring. Combining the teachings of Mestas and Schröder in the manner suggested would require a wholesale redesign of both references, which is beyond the skill of the ordinary person and therefore not obvious.

148. The USPTO supports my opinion in this respect. The USPTO considered and rejected Petitioner’s argument that it would be obvious to apply the curved batteries of Mestas to a ring form factor. *See* Section IV.B, *supra*; Ex. 2008 at 3 (Patent Owner successfully arguing: “Specifically, a battery for a bracelet, curved or otherwise, would not be of a dimension to be fitted within the confines of

a cavity of a ring. Nor is there any teaching within Weast as to how such a battery can be re-configured to do so.”). I agree with the Patent Owner and in my opinion the Patent Office was correct to accede to this argument.

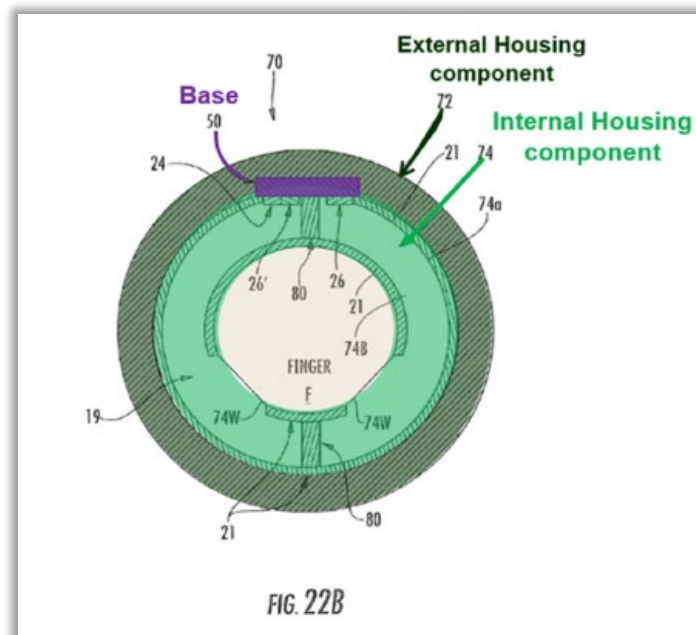
E. Ground 5: Claims 1-15 are patentable over LeBoeuf in view of Schröder.

1. A POSITA would not combine LeBoeuf and Schröder with a reasonable expectation of success.

149. For the reasons that I stated above with respect to the Schröder-LeBoeuf combination, a POSITA would not combine LeBoeuf with Schröder. One would not look to combine Schröder’s security application with LeBoeuf’s physiological sensing application, particularly in light of LeBoeuf’s use of a light guiding region that would require a complete redesign of Schröder, with no ascertainable benefit. Petitioner cites as motivation to combine a number of features that appear to have no relevance to the claimed invention, such as a personalization of rings, rings of different dimensions to facilitate manufacturing, U-shaped housing components, and the use of “ring blanks” for manufacturing that are not relevant to LeBoeuf. Pet. at 65; Ex-1002, ¶¶ 223-24. And the manner in which Petitioner is combining the two references is also entirely unclear. Pet. at 66; Ex-1002, ¶ 225 (“[T]hose 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.”).

- 2. LeBoeuf in view of Schröder does not disclose or suggest element 1[c]: a printed circuit board disposed within a cavity defined by the external housing component and the internal housing component, wherein the printed circuit board is configured to conform to [an] arc within the cavity.”**

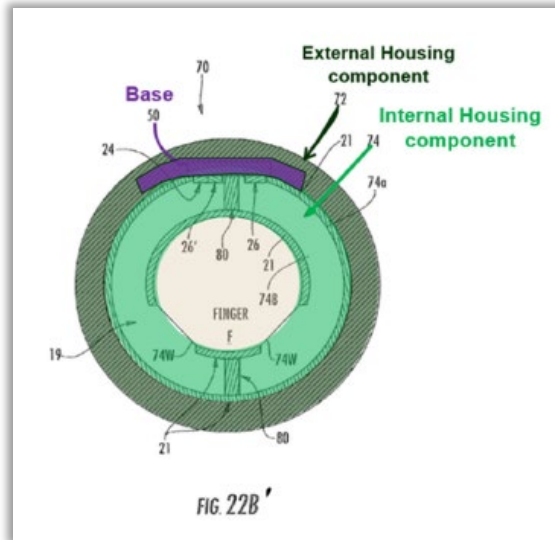
150. Petitioner relies on Fig. 22B of LeBoeuf to meet the “printed circuit board” limitation of claim 1:



151. LeBoeuf states that the outer body portion 72 and inner body portion 74 are “secured together in a concentric relationship.” Ex-1012 at 27:64-28:1. Claim 1 requires that the printed circuit board “is configured to conform to [an] arc within the cavity.” Petitioners’ argument fails on two fronts. First, there is no cavity formed between the inner and outer body portions that has an “arc.” Even if the base 50 is

construed to occupy a cavity defined by the inner body and outer body, the cavity is rectangular and has no arc.

152. Recognizing this weakness, Petitioner engages in more hindsight reconstruction, attempting to modify LeBoeuf to mirror the claim limitation at issue:



153. But LeBoeuf discloses the use of multiple light emitters and did not make the modification proposed by Petitioner. It is pure speculation (driven by hindsight) to conclude, as Dr. Anthony does, that “a POSITA would have placed the additional light emitter along the circumference of the internal housing component of the ring.” Ex-1002 at 162. There is no evidence that LeBoeuf’s disclosed embodiment could not accommodate the additional emitters without the substantial revision proposed by Dr. Anthony.

154. In a confusing exercise of picking and choosing elements guided by hindsight, Petitioner and Dr. Anthony propose a different proposed modification of

LeBoeuf and Schröder. Pet. at 76; Ex-1002, ¶ 237 (“A POSITA would have been motivated to have LeBoeuf’s printed circuit board as Schröder’s flexible carrier material in order to provide electrical connections to all of components inside the ring, such as additional light emitters.”). This modification apparently relies on the fact that Schröder discloses that inlay 12 is a printed circuit board, which, as explained above, it is not.

155. Accordingly, in my opinion, this limitation is not met by LeBoeuf in view of Schröder.

F. Ground 6: Claims 8-11 are patentable over LeBoeuf in view of Schröder in further view of Niwa.

156. For the same reasons stated above with respect to Schröder-LeBoeuf-Niwa, claims 8-11 are patentable over LeBoeuf-Schröder-Niwa.

G. Ground 7: Claims 16-17 are patentable over LeBoeuf in view of Schröder in further view of Mestas.

157. For the same reasons stated above (Section VII.D) with respect to Schröder-Mestas, claims 16 and 17 are patentable over LeBoeuf-Schröder-Mestas.

VIII. SECONDARY CONSIDERATION OF NON-OBVIOUSNESS

A. Nexus

158. Oura manufactures the Oura Ring that embodies the claims of the ’702 patent. Since its founding, Oura has released four generations of Oura Ring: Generation (“Gen.”) 1 in 2015, Gen. 2 in 2018, Gen. 3 in 2021, and Gen. 4 in 2024.

159. Both Oura Ring Gen. 3 and 4 are coextensive with the Challenged Claims of the '702 patent. In coming to this conclusion, I conducted an element-by-element analysis of the claims against Oura Ring for both Gen. 3 and 4 as detailed below.

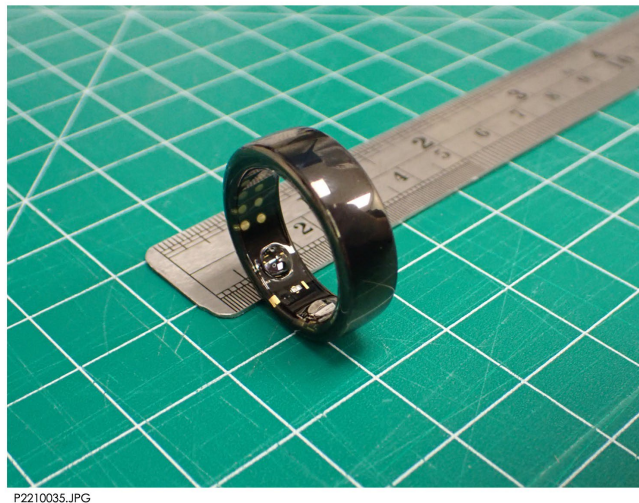
1. Independent Claim 1

a. Limitation 1 [Pre]

160. The preamble of the claim 1 requires “a finger-worn wearable ring device.” Ex-1001, 44:64. Both Oura Ring Gen. 3 and Gen. 4 practice this limitation.

i. Oura Ring Gen. 3

161. Oura Ring Gen. 3 is a finger-worn wearable ring device configured to be worn on user's finger:



Ex. 2029.

ii. Oura Ring Gen. 4

162. Oura Ring Gen. 4 is also a finger-worn wearable ring device configured to be worn on user's finger:



Ex. 2030.

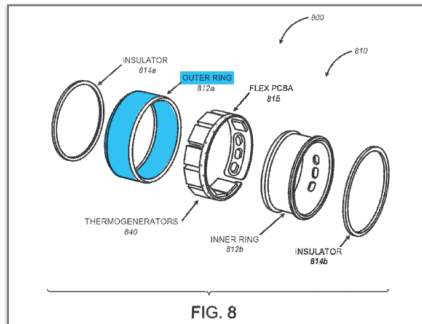
b. Limitation 1[a]

163. Limitation 1[a] requires “an external housing component defining an outer circumferential surface of the finger-worn wearable ring device.” Ex-1001, 44:65-67. Both Oura Ring Gen. 3 and Gen. 4 practice this limitation.

i. Oura Ring Gen. 3

164. Oura Ring Gen. 3 includes an **external housing component** defining an **outer circumferential surface** of the finger-worn wearable ring device. Indeed, as shown in below side-by-side comparison of the '702 patent and Oura's own depiction of Oura Ring, the external metal structure of the ring is the **external**

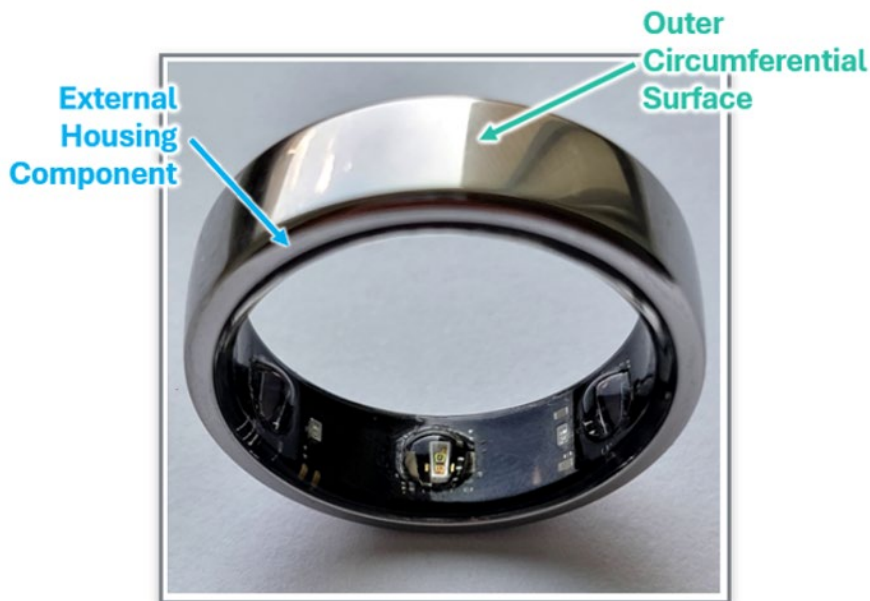
housing component and the **outer circumferential surface** is the curved surface that is visible when the user is wearing the ring.



Ex-1001 at Fig. 8 (Annotated)



Ex. 2031 (annotated)

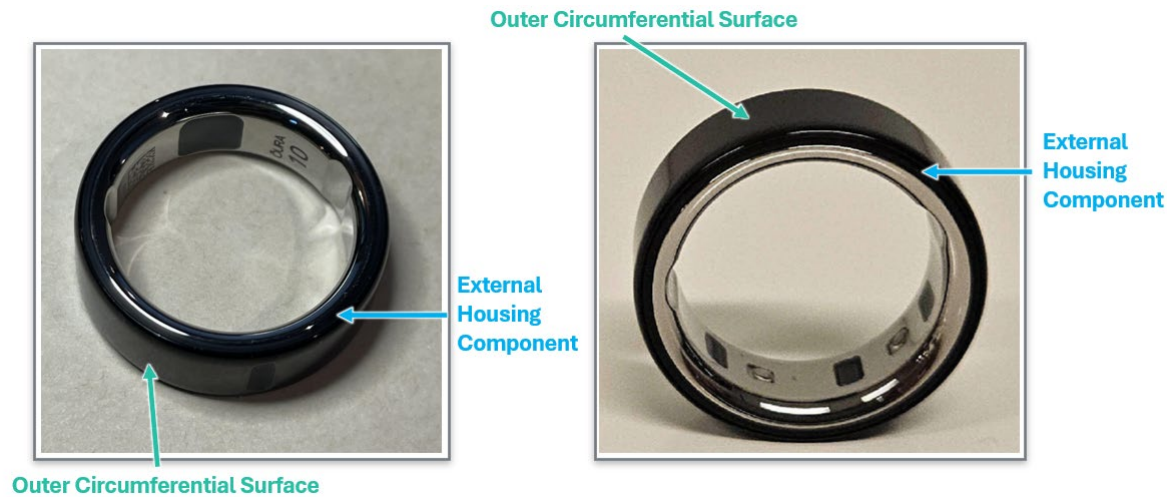


Ex. 2029.

ii. Oura Ring Gen. 4

165. Oura Ring Gen. 4 also includes include an **external housing component** defining an **outer circumferential surface** of the finger-worn wearable

ring device. Indeed, in the Gen. 4, the external metal structure of the ring is the **external housing component** and the **outer circumferential surface** is the curved surface that is visible when the user is wearing the ring:



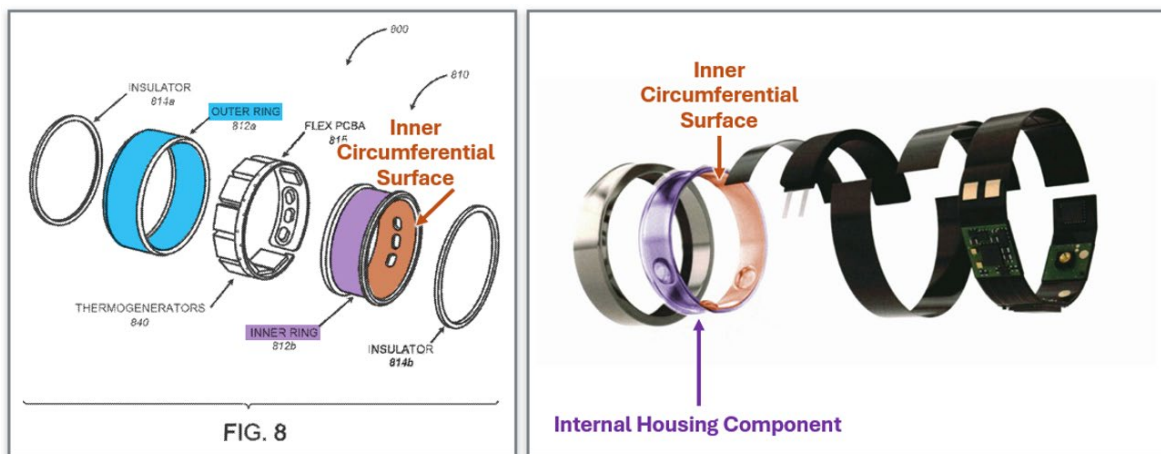
Ex. 2030.

c. Limitation 1[b]

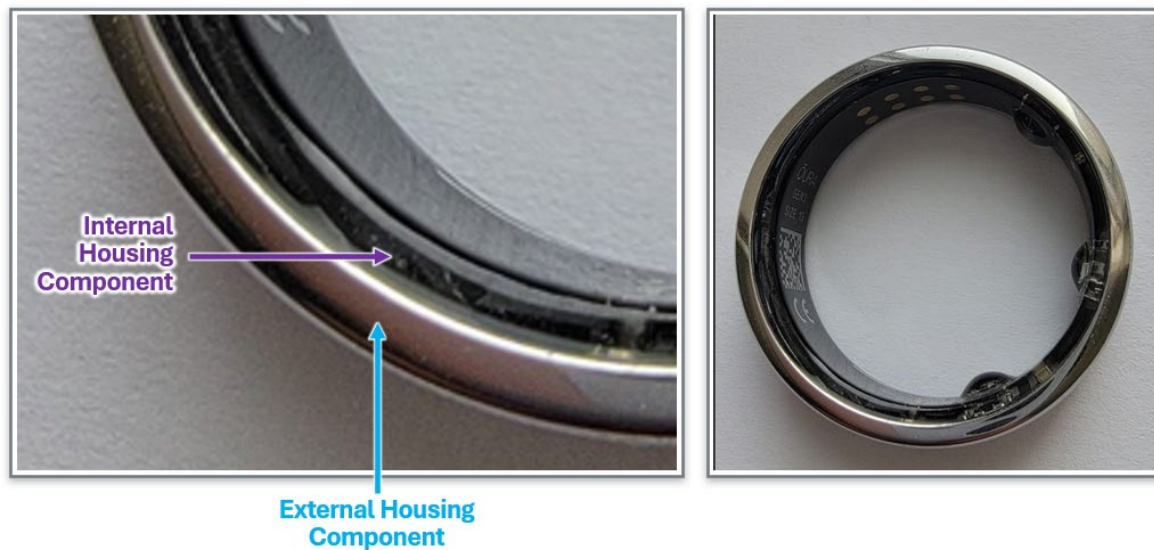
166. Limitation 1[b-i] requires “an internal housing component coupled to the external housing component, the internal housing component defining an inner circumferential surface of the finger-worn wearable ring device, wherein the internal housing component comprises a substantially transparent material that enables light to pass through the internal housing component.” Ex-1001 at 45:1-7. Both Oura Ring Gen. 3 and Gen. 4 practice this limitation.

i. **Oura Ring Gen. 3**

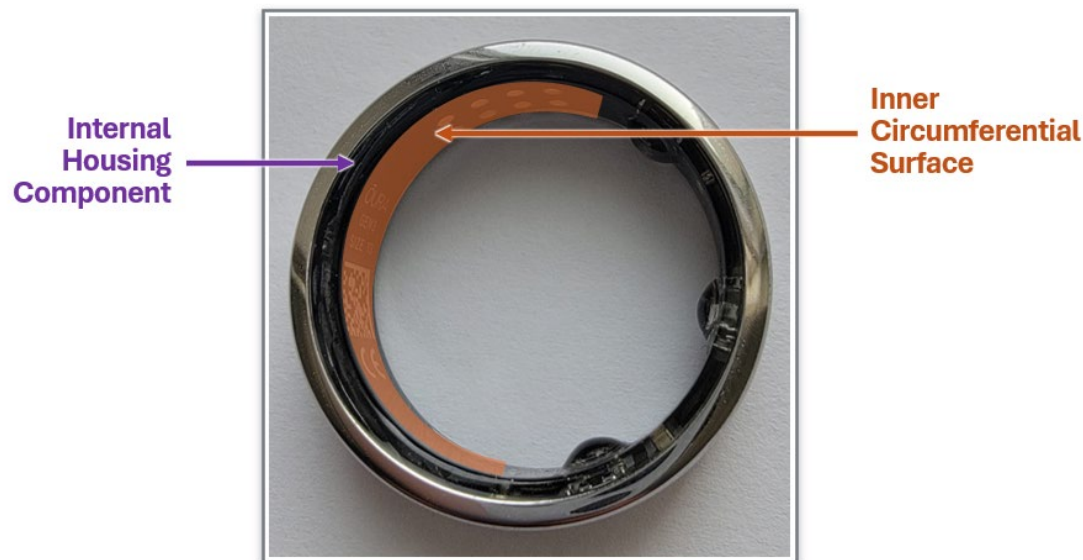
167. Oura Ring Gen. 3 includes an **internal housing component** coupled to the **external housing component**, the **internal housing component** defining an **inner circumferential surface** of the finger-worn wearable ring device, wherein the internal housing component comprises a substantially transparent material that enables light to pass through the internal housing component. As shown below, Oura Ring Gen. 3 includes an **internal housing component** that is a structure formed from cured epoxy (i.e., potting material that is substantially transparent to light) which includes a curved surface that touches the user's finger when worn, thus includes an **inner circumferential surface**:



Ex-1001 at Fig. 8; Ex. 2031 (annotated).



Ex. 2029.

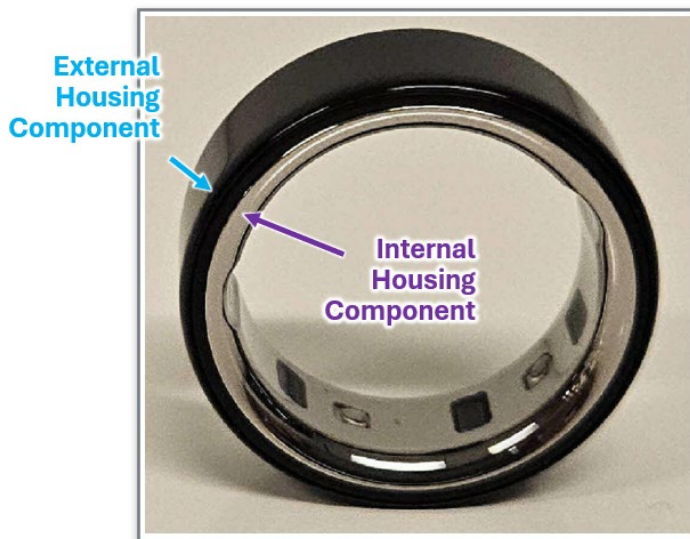


Id.

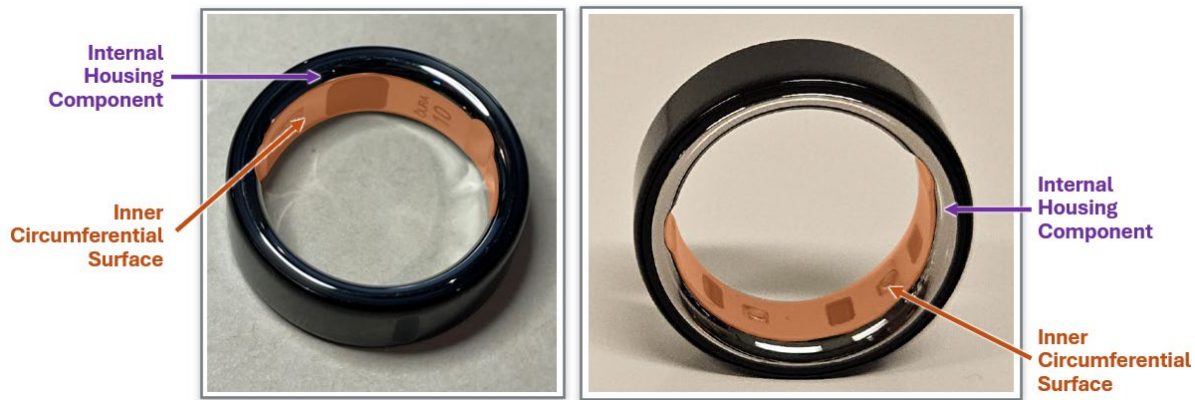
168. Thus, as shown above, the internal housing component is the layer of potting material that covers the battery and PCB, forms a seal with the external housing component, and defines the inner circumferential surface of the ring.

ii. **Oura Ring Gen. 4**

169. Oura Ring Gen. 4 also includes an **internal housing component** coupled to the **external housing component**, the **internal housing component** defining an **inner circumferential surface** of the finger-worn wearable ring device, wherein the internal housing component comprises a substantially transparent material that enables light to pass through the internal housing component. In contrast, to the Oura Ring Gen. 4 where the internal housing component is made of potting material, the Gen. 4 internal housing component is made of metallic and epoxy material that include the windows that allow light to pass towards the user's finger.



Ex. 2030.



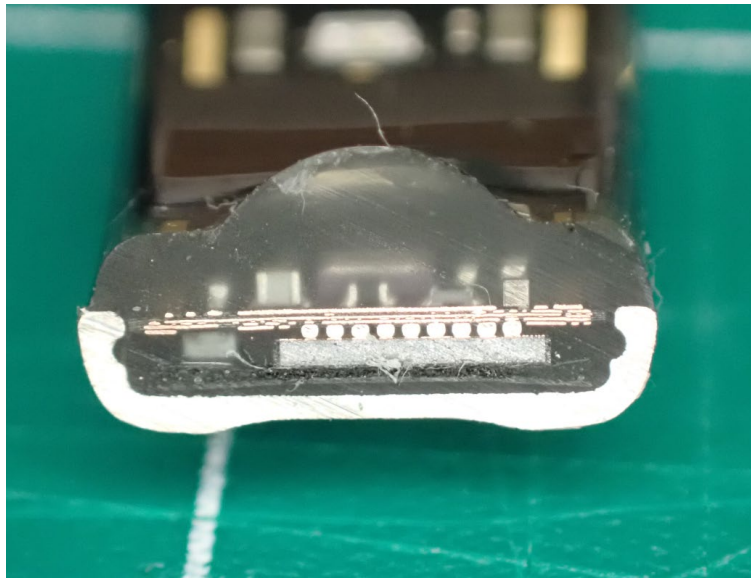
Id.

d. Limitation 1[c]

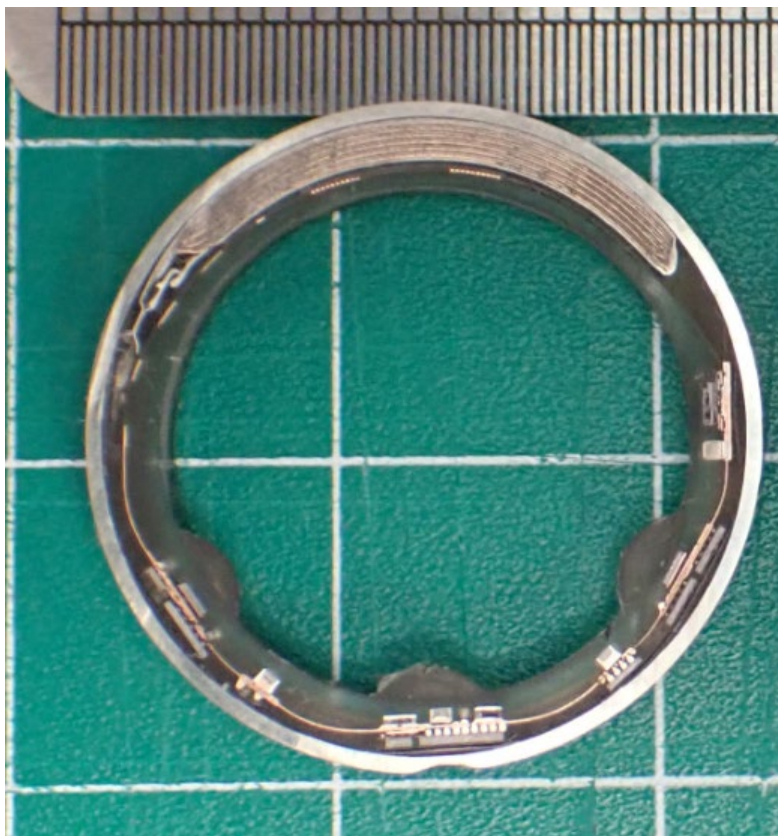
170. Limitation 1[c] requires “a printed circuit board disposed within a cavity defined by the external housing component and the internal housing component, wherein the printed circuit board is configured to conform to arc within the cavity” Ex-1001 at 45:8-11. Both Oura Ring Gen. 3 and Gen. 4 practice this limitation.

i. Oura Ring Gen. 3

171. Oura Ring Gen. 3 includes a printed circuit board disposed within a cavity defined by the external housing component and the internal housing component, wherein the printed circuit board is configured to conform to arc within the cavity:



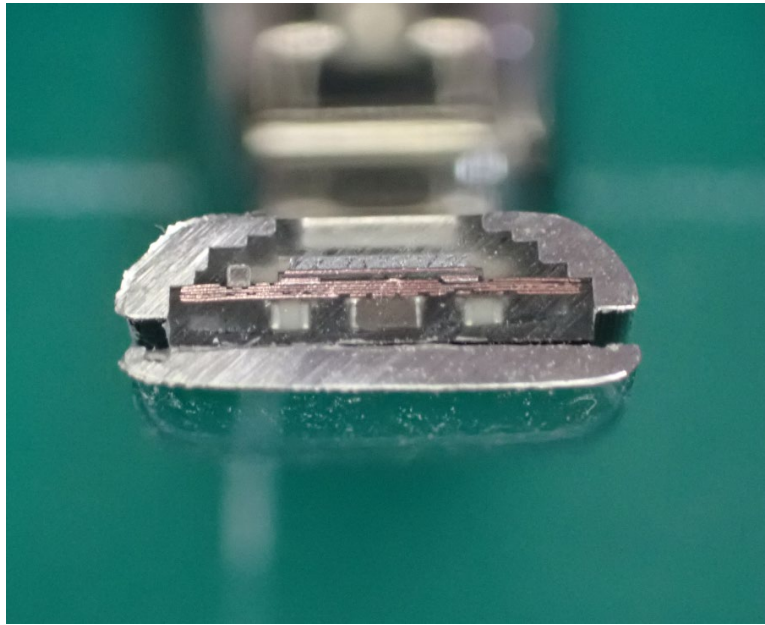
Ex. 2029.



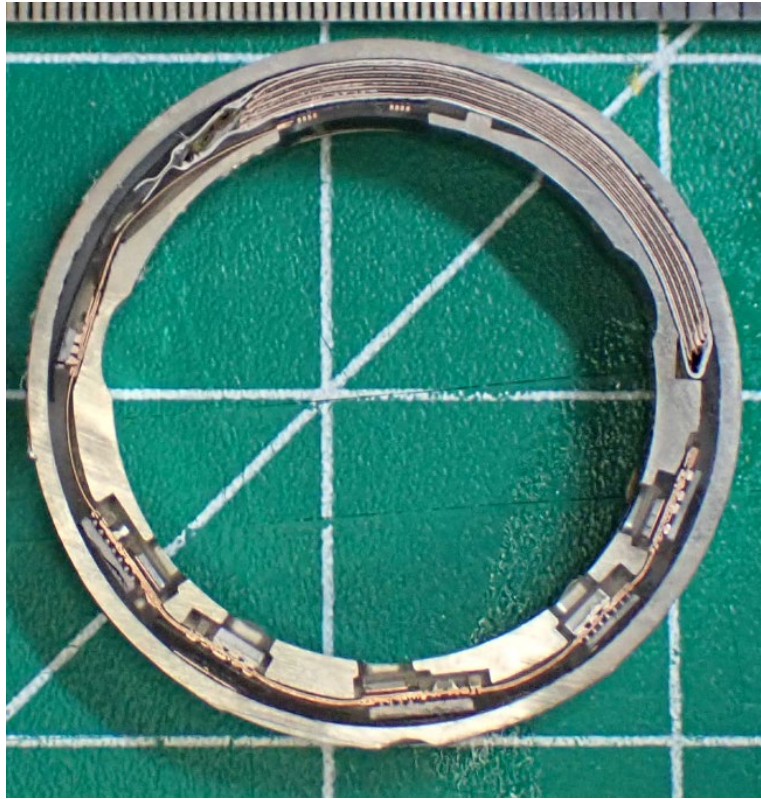
Id.

ii. Oura Ring Gen. 4

172. Oura Ring Gen. 4 also includes a printed circuit board disposed within a cavity defined by the external housing component and the internal housing component, wherein the printed circuit board is configured to conform to arc within the cavity:



Ex. 2030.



Id.

e. Limitation 1[d]

173. Limitation 1[d] requires “one or more light-emitting components electrically coupled with the printed circuit board, the one or more light-emitting components configured to emit light through the substantially transparent material of the internal housing component into a tissue of a user.” Ex-1001 at 45:12-16. Both Oura Ring Gen. 3 and Gen. 4 practice this limitation.

i. Oura Ring Gen. 3

174. Oura Ring Gen. 3 includes one or more light-emitting components electrically coupled with the printed circuit board, the one or more light-emitting

components configured to emit light through the substantially transparent material of the internal housing component into a tissue of a user as it includes LED for emitting red, green, and infrared light through the internal potting material:

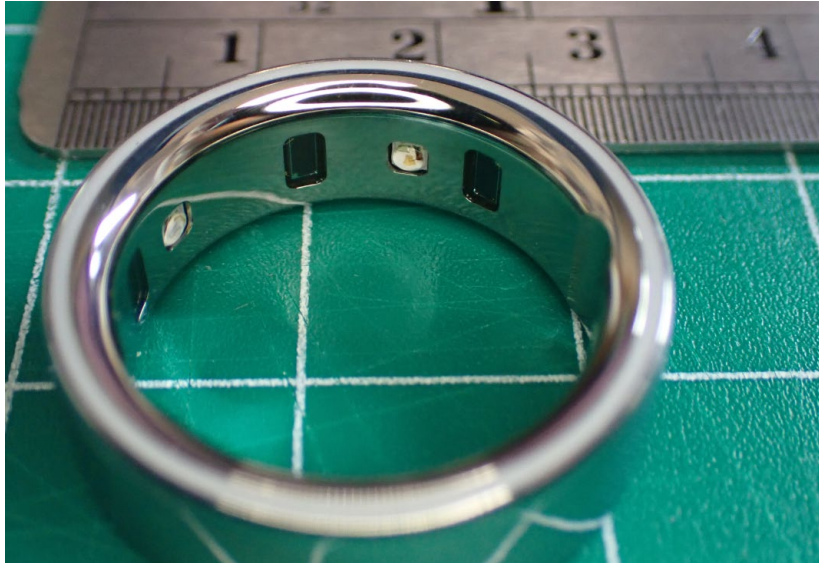


Ex. 2029.

ii. Oura Ring Gen. 4

175. Oura Ring Gen. 4 also includes one or more light-emitting components electrically coupled with the printed circuit board, the one or more light-emitting components configured to emit light through the substantially transparent material

of the internal housing component into a tissue of a user as it includes LED for emitting red, green, and infrared light through the internal potting material within the windows of the internal housing component:



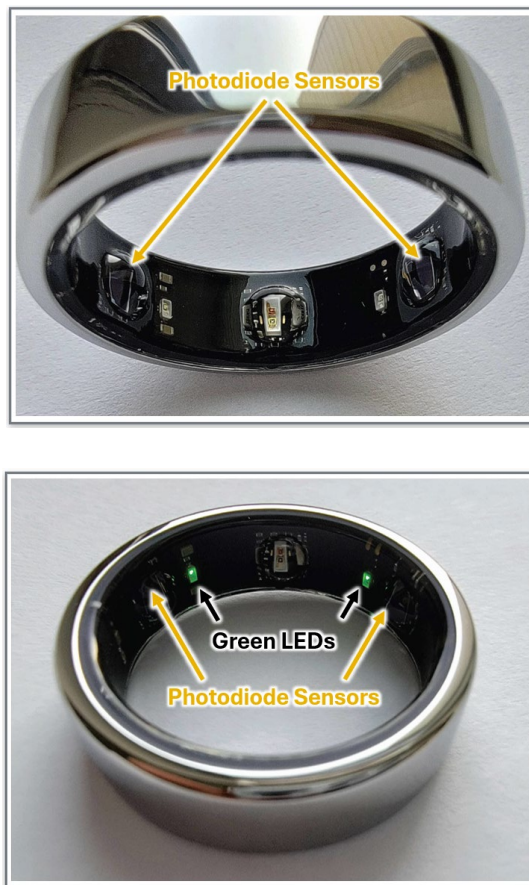
Ex. 2030.

f. Limitation 1[d]

176. Limitation 1[d] requires “one or more light-receiving components electrically coupled with the printed circuit board, the one or more light-receiving components configured to receive, through the substantially transparent material of the internal housing component, the light transmitted by the one or more light-emitting components.” Ex-1001 at 45:17-23. Both Oura Ring Gen. 3 and Gen. 4 practice this limitation.

i. Oura Ring Gen. 3

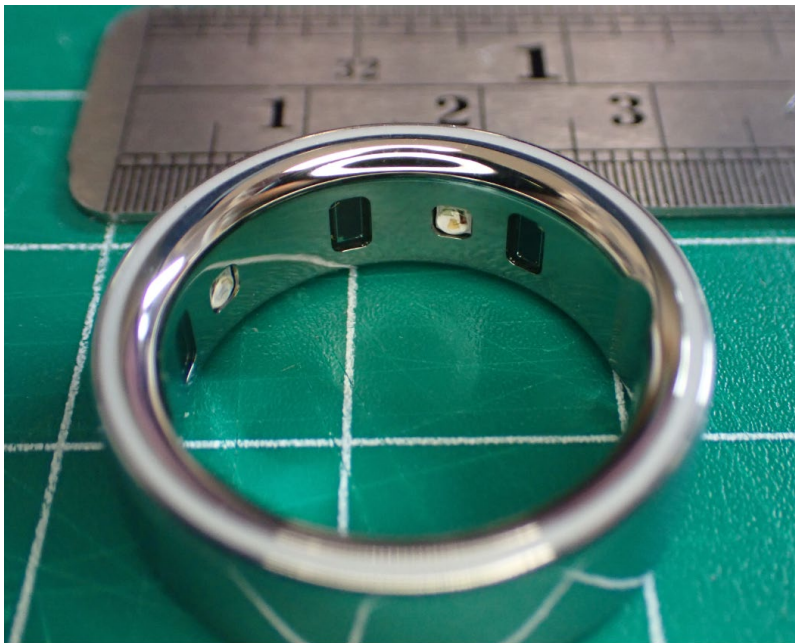
177. Oura Ring Gen. 3 includes one or more light-receiving components that are photodiodes that electrically coupled with the printed circuit board, the photodiodes are configured to receive, through the substantially transparent material of the internal housing component, the light transmitted by the one or more light-emitting components.



Ex. 2029.

ii. Oura Ring Gen. 4

178. Oura Ring Gen. 4 also includes one or more light-receiving components that are photodiodes that electrically coupled with the printed circuit board, the photodiodes are configured to receive, through the substantially transparent material of the internal housing component, the light transmitted by the one or more light-emitting components.



Ex. 2030.

g. Limitation 1[e]

179. Limitation 1[e] requires “one or more processors configured to process data that is based at least in part on the light received by the one or more light-

receiving components.” Ex-1001 at 45:23-25. Both Oura Ring Gen. 3 and Gen. 4 practice this limitation.

i. Oura Ring Gen. 3

180. Oura Ring Gen. 3 includes a PPG sensor and a processor that processes data that is based at least in part on the light received by the one or more light-receiving components.

ii. Oura Ring Gen. 4

181. Oura Ring Gen. 4 also includes a PPG sensor and a processor that processes data that is based at least in part on the light received by the one or more light-receiving components.

h. Limitation 1[e]

182. Limitation 1[f] requires “a communication module communicatively coupled with the one or more processors, the communication module configured to transmit the data processed by the one or more processors.” Ex-1001 at 45:26-29. Both Oura Ring Gen. 3 and Gen. 4 practice this limitation.

i. Oura Ring Gen. 3

183. Oura Ring Gen. 3 includes Bluetooth chip module communicatively coupled with the one or more processors, the communication module configured to transmit the data processed by the one or more processors.

ii. Oura Ring Gen. 4

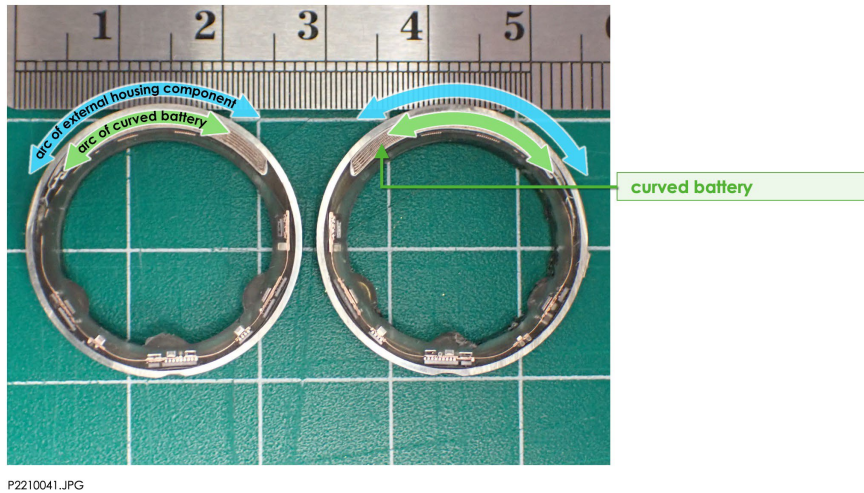
184. Oura Ring Gen. 4 includes Bluetooth chip module communicatively coupled with the one or more processors, the communication module configured to transmit the data processed by the one or more processors.

2. Claims 16 and 17

185. Dependent claim 16 further specifies that a curved battery is electrically coupled with the one or more light-emitting components, the one or more light-receiving components, the one or more processors, and the communication module. Dependent claim 17 states that the curved battery comprises an arc that approximates an arc of the cavity. Both Oura Ring Gen. 3 and Gen. 4 practice this limitation.

a. Oura Ring Gen. 3

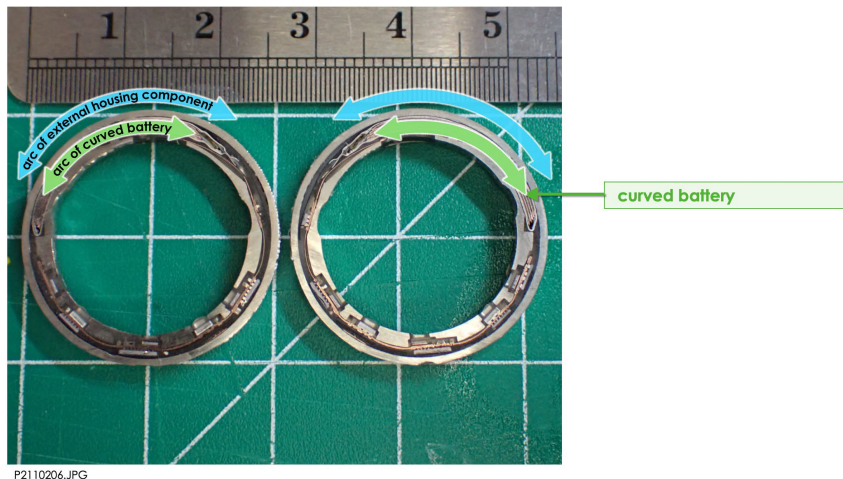
186. Oura Ring Gen. 3 includes a curved battery is electrically coupled with the one or more light-emitting components, the one or more light-receiving components, the one or more processors, and the communication module, and the curved battery comprises an arc that approximates an arc of the cavity:



Ex. 2029.

b. Oura Ring Gen. 4

187. Oura Ring Gen. 4 includes a curved battery is electrically coupled with the one or more light-emitting components, the one or more light-receiving components, the one or more processors, and the communication module, and the curved battery comprises an arc that approximates an arc of the cavity:



Ex. 2030.

188. Thus, as shown above, the claimed invention of the '702 patent is not merely a subcomponent of Oura Ring, but rather encompasses the entire structural apparatus. Because the claims of the '702 patent are coextensive with Oura Ring Gen. 3 and 4, I understand that there is a presumption of a nexus between the secondary consideration evidence and the merits of the claimed invention.

B. Evidence of Copying of Oura Ring Gen. 3 by the Industry

189. Oura Ring has been recognized for its ingenuity in the smart ring market. *See e.g.*, Ex. 2003 (“A big part of awarding the Oura Ring 3 [the wearable of the year award] is how it’s defined a whole segment of wearables – and moved forward the discussion about what a wearable should be.”). Thus, it’s no surprise that new entrants in the ring market would seek replicate Oura’s success.

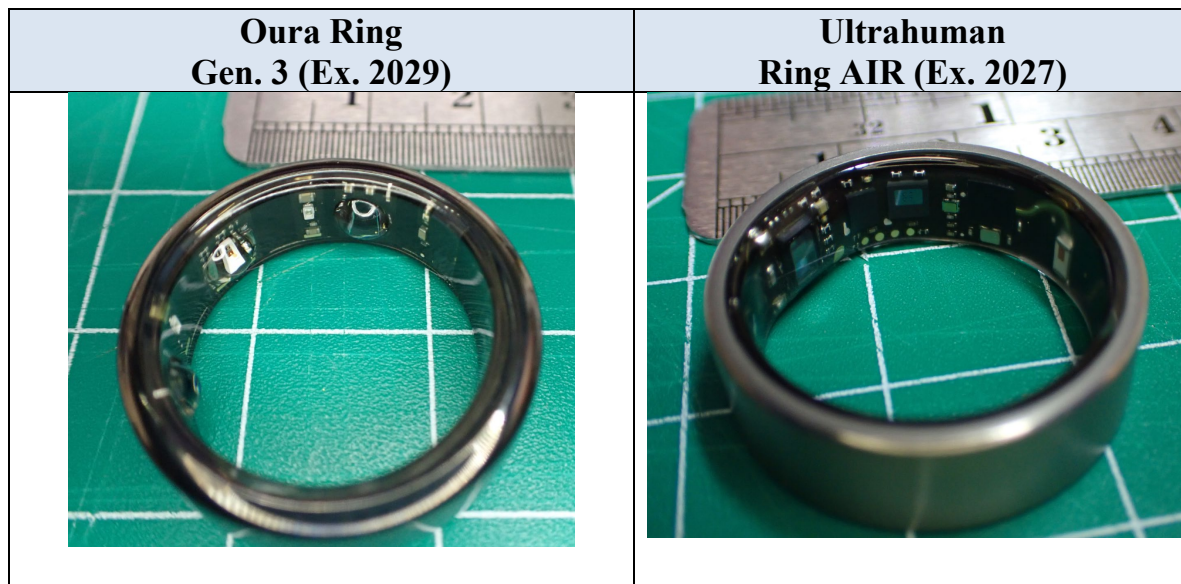
190. There is, however, evidence that a number of manufactures of smart rings copied the Oura Ring Gen. 3, including the use of internal potting as the internal housing component as disclosed in the '702 patent.

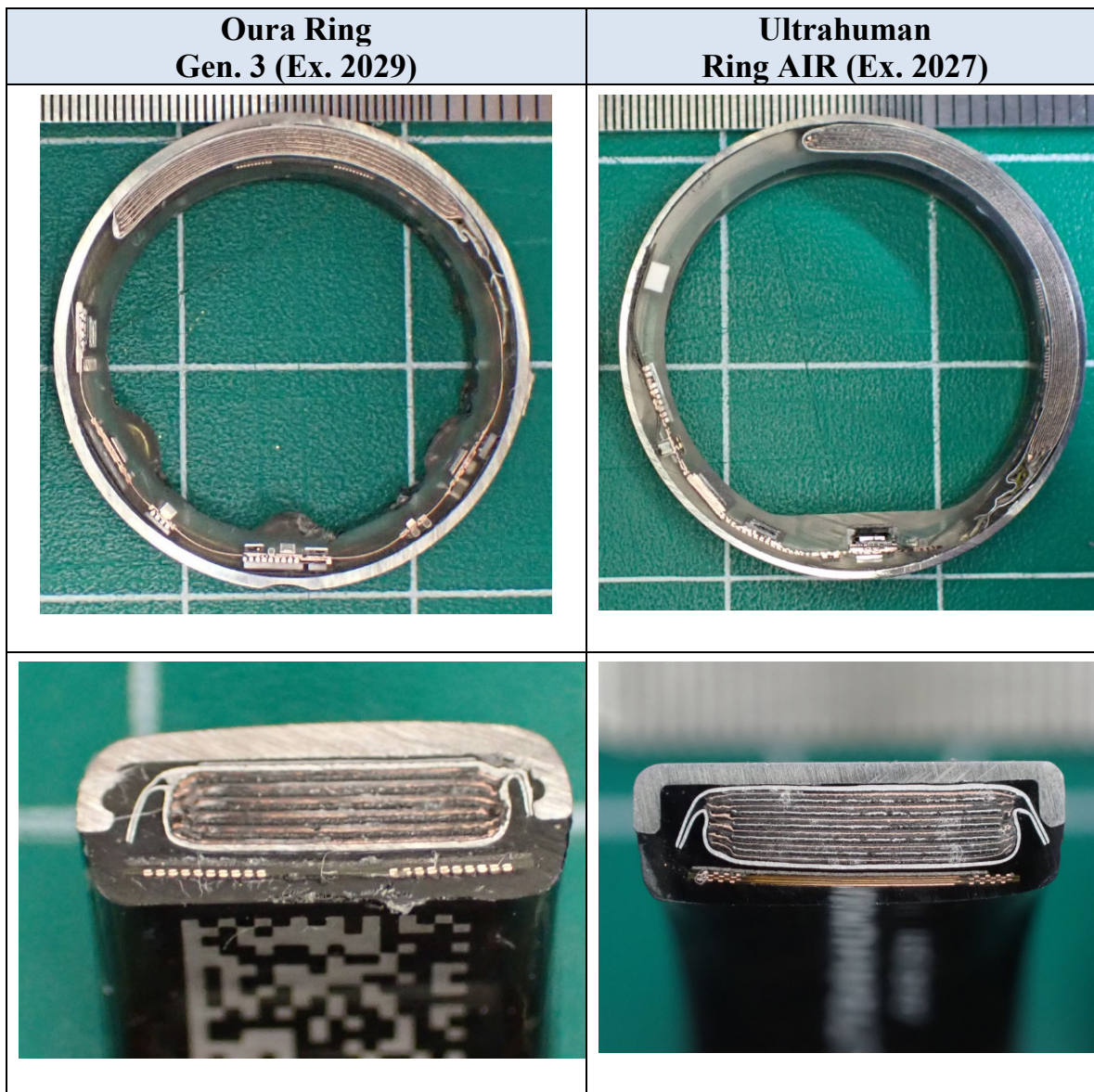
1. Ultrahuman Ring AIR

191. I understand that Ultrahuman Healthcare Pvt. Ltd. is an Indian Non-Government Company incorporated in India that manufactures a smart ring (Ultrahuman Ring AIR) that competes against Oura Ring. I also understand from

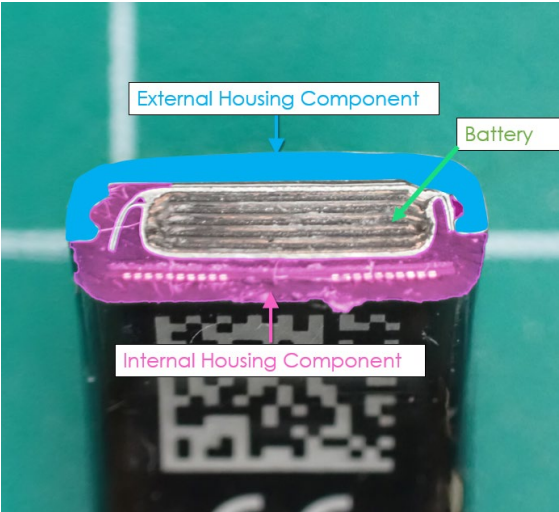
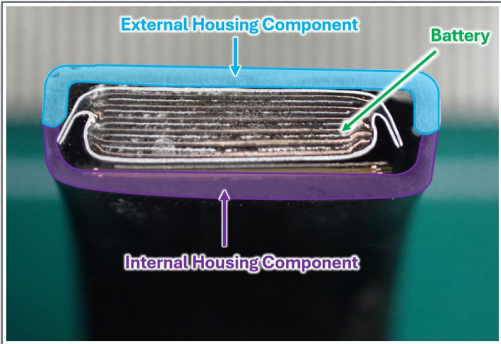
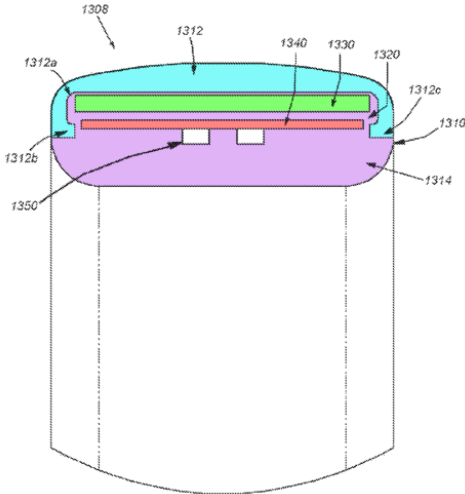
counsel that Oura currently has a pending International Trade Commission investigation against Ultrahuman with trial that was held in December 2024.

192. As shown below in side-by-side comparison of Oura Ring Gen. 3 and Ultrahuman Ring AIR, Ultrahuman adopted the use of external housing and internal housing component of Oura Ring where the internal housing is made of internal potting to develop a directly competing product:



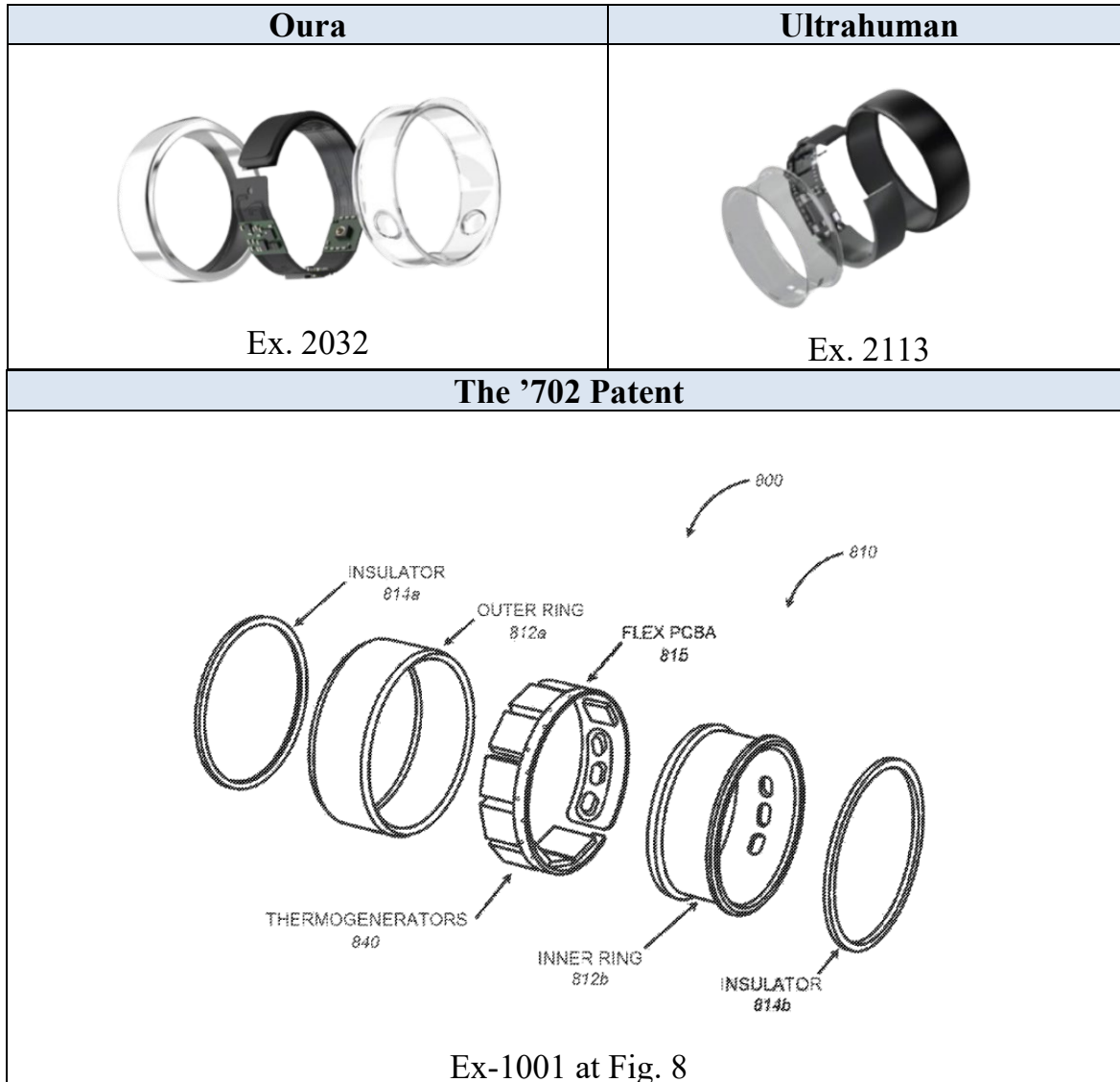


193. Oura Ring Gen. 3 and Ultrahuman ring both embody the disclosure of the '702 patent that shows **potting material** forming the internal housing component:

Oura	Ultrahuman
 Ex. 2029	 Ex. 2027
The '702 Patent	
 FIG. 13 Ex-1001 at Fig. 13	

194. The industry also appears to have copied the marketing materials of Oura Ring. For example, Ultrahuman copied the marketing materials of Oura that depicted the ring's structural design, which mirrors figure 8 of the '702 patent—

Ultrahuman simply reversing the orientation and changing the silver external housing to black:

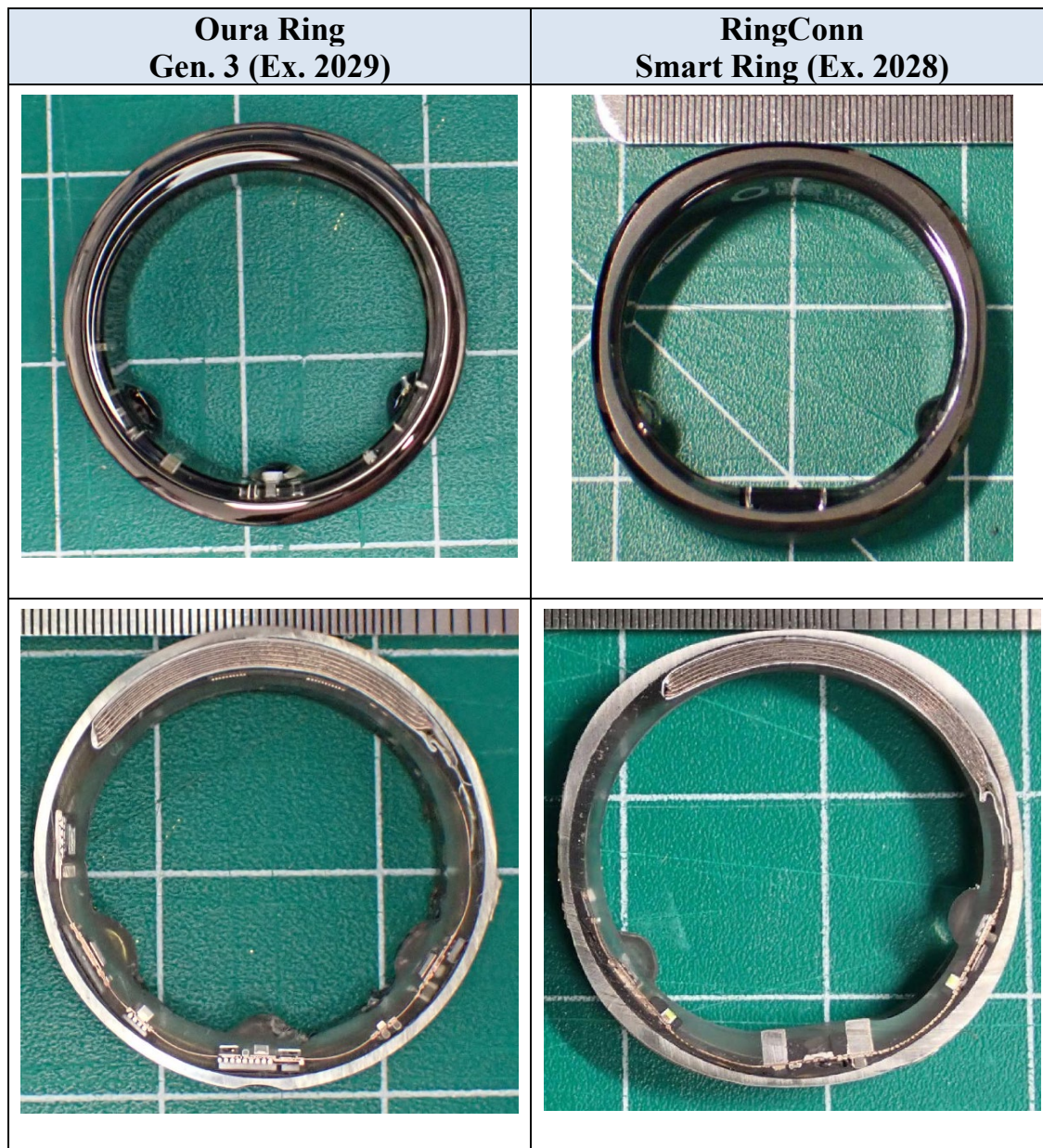


195. The similarities do not appear to be mere coincidence. At the ITC hearing, Ultrahuman’s chief executive officer (CEO) admitted that he was personally an early adopter of the Oura Ring and bought a Gen. 1 product in 2015—

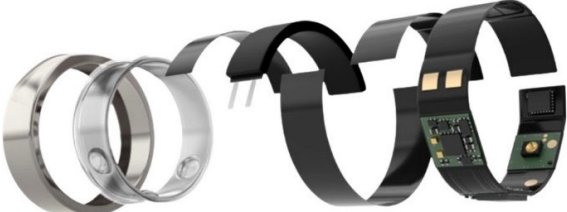
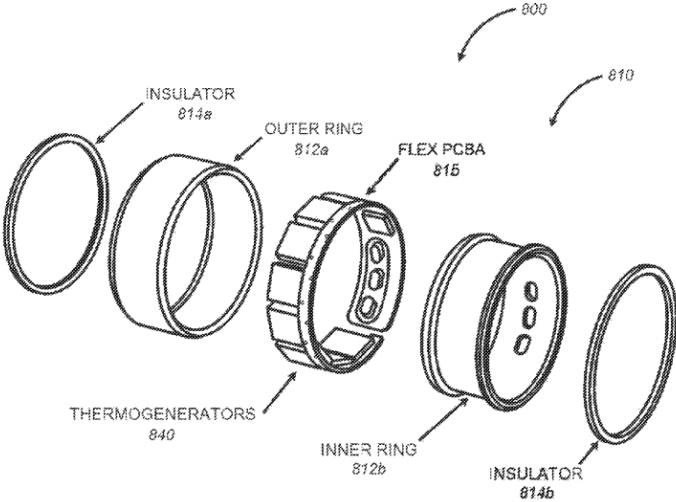
years before he founded Ultrahuman in 2019. Ex. 2024 (Kumar) 683:19-21, 686:15-24. Kumar bought a Gen. 2 product in 2018. *Id.* 685:16-24. Ultrahuman bought another 5-10 Oura Ring Gen. 3 for analysis later. *Id.* 692:19-693:8. And Ultrahuman’s entire R&D team, including the hardware, software, and firmware teams, analyzed Oura Rings to learn their structure and design. *Id.* 695:1-21, 698:3-24. Ultrahuman also reviewed video teardowns of the Gen. 3 product. *Id.* 696:12-698:2. Ultrahuman’s extensive internal teardowns had the goal of “figur[ing] out everything” about the Oura Ring, including components and structure. *Id.* 699:2-5 (“I think we would have figured out everything . . . like how large the battery is, what is the Rx coil, how does the PCB look? But that would be like the overview of how devices are made.”).

2. RingConn Smart Ring

196. I understand from counsel that another respondent in the pending ITC Investigation is Shenzhen Ninenovo Technology Ltd., a Chinese manufacturer that sells smart ring in the U.S. called RingConn Smart Ring. It is my understanding that RingConn Smart Ring was released in 2023—two years after Oura Ring Gen. 2. There is also evidence that RingConn Smart Ring appears to have copied Oura Ring Gen. 1, including the optical protrusions in the potting material, based on significant similarities that are more than coincidental.



197. And like Ultrahuman, RingConn also appears to have copied the marketing materials of Oura that depicted the ring's structural design, which mirrors figure 8 of the '702 patent:

Oura	RingConn
 Ex. 2031	 Ex. 2114 at 8
The '702 Patent	
 Ex-1001 at Fig. 8	

C. The '702 patent fulfilled a long felt need for a company and comfortable wearable finger ring.

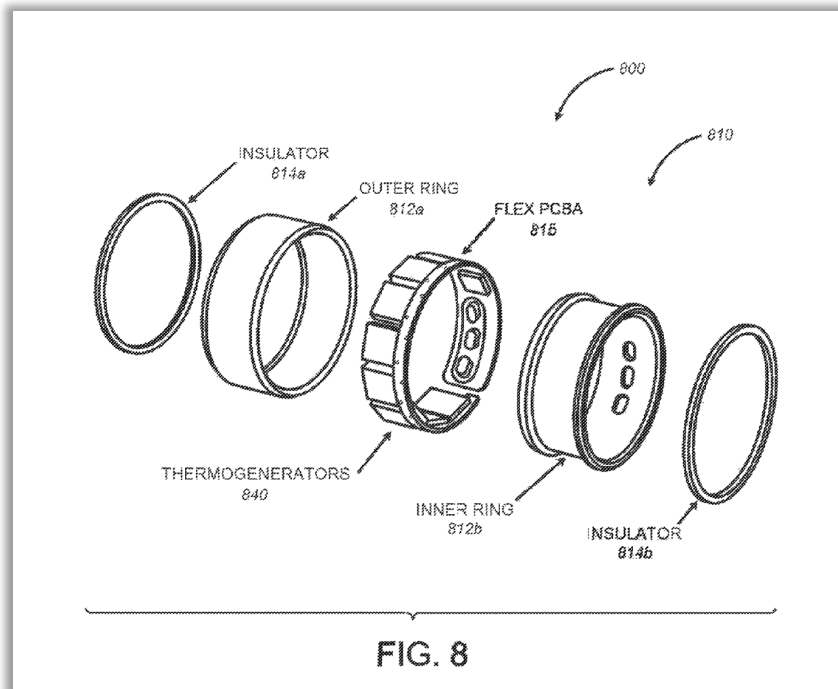
198. The world’s leading wearable ring researcher Asada recognized the advantages a wearable ring has over wearables worn on other parts of the body a decade prior to the '702 patent. Ex-1025 at 1:56-58. Asada recognized, however,

that comfort and compactness were the keys to realizing the advantages of a finger-worn ring. Ex-1035 at 9-10; Ex-1037 at 3. If the ring were as comfortable as a wedding band, the wearer would not take it off, thereby achieving the goal of round-the-clock biometric monitoring. Asada even recognized that his prototype—which as I noted above I have previously inspected— failed to achieve these goals. Ex-1035 at 74 (“the size of the first prototype, as shown in Figure 8-1, was too large to be of use in real life.”).

199. The development of wearable rings did not fulfill these needs until the ’702 patent. The prior art largely followed Asada’s lead, bunching components at the top of the ring in an attempt at least make the ring wearable by limiting the width of the sides of the ring. Even my own efforts in 2013 in creating a smart ring as part of the Center of Wearable Sensors at UCSD required me to put components and battery atop of the ring similar to Asada. None of these efforts proposed using a curved battery in conjunction with a printed circuit board mounted within a ring housing. Indeed, in my own endeavor on this front in 2013, the balancing of power requirements, component sizes, and functionality drove the decisions by myself and my colleagues at the time to design a ring similar to Asada and other prior designs.

200. Even Oura followed the Superbowl ring-type design with its first generation product, released after the priority date of the ’702 patent. Ex. 2034. It

was not until the '702 patent that wedding band-like comfort and compactness were achieved with the following inventive design:



Ex-1007 at Fig. 8.

201. This arrangement finally satisfied the long felt need for a finger-ring wearable device that the user would actually want to wear around the clock. I personally was surprised that Oura managed to fit all the components and functionality into a wedding band-type ring. The satisfaction of this long felt need is validated by the considerable commercial success enjoyed by the commercial embodiment as well as competitors copying this layout in the market.

IX. SUPPLEMENTATION

202. I reserve my right to supplement or amend this Declaration in light of any additional information or documents, or in response to any critique of my Declaration or alternative opinions advanced by or on behalf of Petitioner.

A handwritten signature in black ink, appearing to read "P. Mercier", written over a horizontal line.

Dr. Patrick Mercier

Dated: April 15, 2025

EXHIBIT B

Patrick Mercer Declaration Materials Considered

In addition to the materials I have cited in this Declaration, I also considered the following materials in connection with my opinions in this Declaration:

Hearing Transcripts

Inv. No. 337-TA-1398, Hearing Transcript Day 1 (p. 173-241) (Open Session), dated December 11, 2024

Inv. No. 337-TA-1398, Hearing Transcript Day 2 (p.288-611) (Open Session), dated December 12, 2024

Inv. No. 337-TA-1398, Hearing Transcript Day 3 (p. 612 - 882) (Open Session), dated December 13, 2024

Inv. No. 337-TA-1398, Hearing Transcript Day 4 (p. 833 - 1138) (Open Session), dated December 16, 2024

Inv. No. 337-TA-1398, Hearing Transcript Day 5 (p. 1139-1308) (Open Session), dated December 17, 2024

Deposition Transcripts

PGR2024-00039, Deposition Transcript of Brian W. Anthony, Ph.D., dated February 25, 2025

PGR2024-00039, Deposition Transcript of Brian W. Anthony, Ph.D., dated February 26, 2025

Filings

PGR2024-00039 Petition for Post Grant Review, dated January 28, 2024 Exhibits:

Exhibit 1001 - U.S. Patent No. 11,874,702 (“the ’702 Patent”)

Exhibit 1002 - Declaration of Dr. Brian W. Anthony

Exhibit 1003 - Curriculum Vitae of Dr. Brian W. Anthony

Exhibit 1004 - Prosecution History of U.S. Patent No. 11,874,702

Exhibit 1005 - U.S. Patent Publication No. 20120016245 to Niwa (“Niwa”)

Exhibit 1006 - U.S. Patent No. 8,954,135 to Yuen (“Yuen”)

Exhibit 1007 - U.S. Patent No. 10,303,867 to Schröder (“Schröder”)

Exhibit 1008 - Certified Translation of DE 102013012339.9 to Schröder

- Exhibit 1009** - Original DE 102013012339.9 to Schröder
- Exhibit 1010** - U.S. Patent Publication No. 20140244009 to Mestas (“Mestas”)
- Exhibit 1011** - U.S. Provisional Patent Application No. 61/768,279 to Mestas
- Exhibit 1012** - U.S. Patent No. 8,700,111 to LeBoeuf (“LeBoeuf”)
- Exhibit 1013** - U.S. Patent Publication No. 20120218184 to Wissmar (“Wissmar”)
- Exhibit 1020** - Claim Mapping Table
- Exhibit 1022** - Parallel Citations (Schröder ’867 to Certified Translation of DE 102013012339.9)
- Exhibit 1023** - *Dynamic Drinkware*-type analysis for Mestas
- Exhibit 1024** - U.S. Patent No. 4,830,014 to Goodman (“Goodman”)
- Exhibit 1025** - U.S. Patent No. 6,745,061 to Hicks (“Hicks”)
- Exhibit 1026** - U.S. Patent No. 7,190,986 to Hannula (“Hannula”)
- Exhibit 1027** - Volker Konig et al., *Reflectance Pulse Oximetry – Principles and Obstetric Application in the Zurich System*, 14 Journal of Clinical Monitoring (Aug. 1998) (“Konig”)
- Exhibit 1028** - U.S. Patent No. 6,608,562 to Kimura (“Kimura”)
- Exhibit 1029** - Kevin K. Tremper et al., *Pulse Oximetry*, 70 Journal of American Society of Anesthesiologists, Inc. (Jan. 1989) (“Tremper”)
- Exhibit 1030** - Y. Mendelson et al., *A Wearable Reflectance Pulse Oximeter for Remote Physiological Monitoring*, Proceedings of 28th IEEE EMBS Annual International Conference (Aug. 30-Sept. 3, 2006) (“Mendelson 2006”)
- Exhibit 1031** - Sokwoo Rhee et al., *Artifact-Resistant, Power-Efficient Design of Finger-Ring Plethysmographic Sensors Part I: Design and Analysis*, IEEE (2000) (“Rhee 2000 Part I”)
- Exhibit 1032** - Sokwoo Rhee et al., *Artifact-Resistant, Power-Efficient Design of Finger-Ring Plethysmographic Sensors Part II: Prototyping and Benchmarking*, IEEE Proceedings of 22nd Annual EMBS Int’l Conference (July 23-28, 2000) (“Rhee 2000 Part II”)
- Exhibit 1033** - Sokwoo Rhee et al., *Artifact-Resistant Power-Efficient Design of Finger-Ring Plethysmographic Sensors*, 48 IEEE Transactions of Biomedical Engineering (July 2001) (“Rhee 2001”)

Exhibit 1034 - U.S. Patent No. 6,699,199 to Asada (“Asada ’199”)

Exhibit 1035 - Sokwoo Rhee, *Design and Analysis of Artifact-Resistive Finger Photoplethysmographic Sensors for Vital Sign Monitoring*, MIT (June 2000) (“Rhee Thesis 2000”)

Exhibit 1036 - C.T. Olofson et al., *Machining of Titanium Alloys* (1965) (“Olofson”)

Exhibit 1037 - H. Harry Asada et al., *Mobile Monitoring with Wearable Photoplethysmographic Biosensors*, IEEE Engineering in Medicine & Biology Magazine 28 (May-June 2003) (“Asada 2003”)

Exhibit 1038 - Denisse Castaneda et al., *A review on wearable photoplethysmography sensors and their potential future applications in health care*, Int J Biosens Bioelectron (2018)

Exhibit 1039 - U.S. Patent No. 7,468,036 to Rulkov et al. (“Rulkov”)

Exhibit 1040 - U.S. Patent Publication No. 2006/0211924 to Dalke et al. (“Dalke”)

Exhibit 1041 - *Guidelines To Enhancing The Heart-Rate Monitoring Performance Of Biosensing Wearables* (2014)

Exhibit 1042 - U.S. Patent No. 4,880,304 to Jaeb et al. (“Jaeb”)

Exhibit 1043 - Tom Lister et al., *Optical Properties of human skin*, Journal of Biomedical Optics (2012)

Exhibit 1044 - John G. Webster, *Design of Pulse Oximeters*, CRC Press (1997)

Exhibit 1045 - U.S. Patent Publication No. 20130211291 to Tran (“Tran”)

Exhibit 1046 - WO 2001/017421A1 to Lindberg (“Lindberg”)

Exhibit 1047 - WO 2011/132009 to Nyiradi (“Nyiradi”)

Exhibit 1048 - U.S. Patent Application Publication No. 2014/0361945 to Misra et al. (“Misra”)

Exhibit 1049 - U.S. Patent Application Publication No. 2014/0361934 to Ely et al. (“Ely”)

Exhibit 1050 - European Patent No. 2281205 (Chen)

- Exhibit 1051** - Lawrence K. Au et al., *Episodic Sampling: Towards Energy-Efficient Patient Monitoring with Wearable Sensors*, Annual International Conference of the IEEE Engineering in Medicine and Biology Society (2009)
- Exhibit 1052** - Anastasios Petropoulos et al., *Flexible PCB-MEMS flow sensor*, *Procedia Engineering* 47 236-239 (2012) (“Petropoulos”)
- Exhibit 1053** - Tianjia Sun et al., *Wireless Power Transfer for Medical Microsystems*, Springer (2013) (“Sun”)
- Exhibit 1054** - U.S. Patent Pub. No. 2014/0187160 to Prencipe (“Prencipe”)
- Exhibit 1055** - H. Ardebili and Michael G. Pecht, *Encapsulation Technologies for Electronic Applications*, William Andrew (2009) (“Ardebili”)
- Exhibit 1056** - Ciprian Ciofu et al., *Injection and Micro Injection of Polymeric Plastics Materials: A Review*, *Int’l J. Modern Mfg. Techs.* 49 (2013)
- Exhibit 1057** - Richard J. Ross, *LCP Injection Molded Packages—Keys to JEDEC 1 Performance*, IEEE, 2004 Electronic Components and Technology Conference 1807 (2004)
- Exhibit 1058** - Tadamoto Sakai, *Encapsulation Process for Electronic Devices Using Injection Molding Method*, *12 Advances in Polymer Technology* 61 (1993)
- Exhibit 1059** - N.J. Teh et al., *Embedding of Electronics within Thermoplastic Polymers using Injection Moulding Technique*, IEEE, 2000 Int’l Electronics Manufacturing Technology Symposium 10 (2000)
- Exhibit 1060** - U.S. Patent No. 6,201,698 to Hunter (“Hunter”)
- Exhibit 1061** - U.S. Patent No. 4,012,629 to Simms (“Simms”)
- Exhibit 1062** – Certified Translation of Japanese Published Application No. JP2008-79676 (“Imai”)
- Exhibit 1063** – Japanese Published Application No. JP2008-79676
- Exhibit 1064** – Alexander Silverman, *Fifty Years of Glass-Making*, *18 Indus. & Eng’g Chem.* 896-899 (1926)
- Exhibit 1065** – B. A. J. Clark, *Color in Sunglass Lenses*, *46 Optometry & Vision Sci.* 825-840 (1969)
- Exhibit 1066** – Frank Kaltenbach ed., *Translucent Materials*, Institut für Internationale Architektur-Dokumentation GmbH & Co.KG (2004)

Exhibit 1078 - Takashi Uchino et al., *Prediction of optical properties of commercial soda-lime-silicate glasses containing iron*, 261 Journal of Non-Crystalline Solids 72-78, 1-3 (2000)