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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ABBOTT LABORATORIES, ABBOTT LABORATORIES, INC.,
ST. JUDE MEDICAL, INC., and CARDIOMEMS LLC,
Petitioner,

v.

INTEGRATED SENSING SYSTEMS, INC.,
Patent Owner.

IPR2019-01338
Patent 6,926,670 B2

Before SCOTT A. DANIELS, ROBERT A. POLLOCK, and
ALYSSA A. FINAMORE, *Administrative Patent Judges.*

DANIELS, *Administrative Patent Judge.*

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

A. Background

Abbott Laboratories, Abbott Laboratories, Inc., St. Jude Medical, LLC, and CardioMEMS LLC (collectively, "Abbott") filed a Petition to institute an *inter partes* review of claims 1–4, 21, 26, 27, and 31 of U.S. Patent No. 6,926,670 B2, hereinafter "the '670 patent." Paper 2 ("Pet."). Integrated Sensing Systems, Inc. ("ISS") did not file a Preliminary Response.

We have jurisdiction under 35 U.S.C. § 314. Under § 314, an *inter partes* review may not be instituted "unless . . . there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314(a). The Board determines whether to institute a trial on behalf of the Director. 37 C.F.R. § 42.4(a). If an *inter partes* review is instituted, a final written decision under 35 U.S.C. § 318(a) must decide the patentability of all claims challenged in the petition. *SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1353 (2018).

Upon considering the Petition and the evidence of record, we determine that Abbott has shown a reasonable likelihood that it would prevail with respect to at least one of the challenged claims. Accordingly, we institute an *inter partes* review of all the challenged claims, on all asserted grounds as set out in the Order included with this Decision.

B. Related Matters

The parties identify the following district court proceeding: *Integrated Sensing Systems, Inc. v. Abbott Laboratories*, No. 2:19-cv-10041 (E.D. Mich. filed Jan. 4, 2019). Pet. 2; Paper 6, 1. There is a related proceeding before the Board, namely IPR2019-01339 (PTAB filed July 15, 2019), also challenging the ’670 patent. Paper 6, 1.

C. The ’670 Patent

The ’670 patent (Ex. 1001), titled “Wireless MEMS Capacitive Sensor for Physiologic Parameter Measurement,” describes an implantable microfabricated sensor device for measuring a physiologic parameter of a patient, for example, blood pressure, blood flow, intracranial pressure, intraocular pressure, or glucose levels. Ex. 1001, Abstract, code (54), 1:21–23. The acronym, “MEMS,” stands for “micro-electromechanical systems.” *Id.* at 1:16. The ’670 patent explains that “past efforts to develop wireless sensors have separately located the sensor and inductor and have been limited to implant-readout separation distances of 1–2 cm at most, rendering them impractical for implantation much deeper than immediately below the cutaneous layer.” *Id.* at 3:1–5. In contrast, the ’670 patent states that “the present invention provides for a wireless MEMS sensor for implantation into the body of a patient and which permits implantation at depths greater than 2 cm while still readily allowing for reading of [] signals from the implanted portion by an external readout device.” *Id.* at 3:40–46.

The wireless MEMS sensor system includes an implanted sensor which utilizes an integrated inductor, i.e., an inductor microfabricated with the sensor itself. *Id.* at 3:29–32. The sensor may be a capacitive sensor formed on a substrate including a fixed electrode and a moveable electrode. *Id.* at 3:52–60. The fixed electrode may be formed on the substrate and the moveable electrode may be formed as part of a layer on top of the substrate. *Id.* The capacitive sensor may take the form of an LC (inductor-capacitor) tank resonator. *Id.* at 1:36–42. In a LC tank resonator, “one element of the inductor-capacitor pair varies with some physical parameter (e.g., pressure), while the other element remains at a known value," thereby generating a resonant frequency for wireless communication. *Id.* at 1:33–45.

Figure 1 of the '670 patent showing a wireless MEMS sensor system including an LC tank circuit is reproduced below.

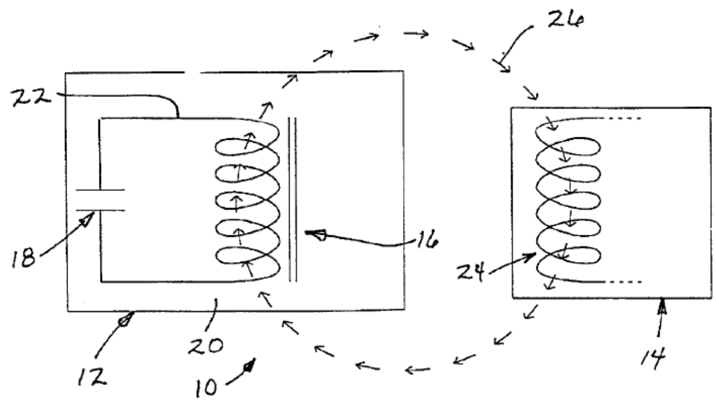

Figure 1

Figure 1 of the '670 patent, above, illustrates diagrammatically MEMS sensing system 10, including sensing device 12 and external readout device 14. *Id.* at 5:50–56. Sensing device 12 includes substrate 20 with integrated inductor 16 and capacitive pressure sensor 18. *Id.* at 5:56–62. Inductor 16 and capacitor 18 form LC tank circuit 22 which is magnetically coupled 26 with readout device 14. *Id.* at 6:7–14.[1]

Figure 3 of the '670 patent, showing a cross-sectional representation of sensing device 12, is reproduced below.

[1] An LC tank circuit consists of an inductor L and a capacitor C, the circuit acts as an electrical resonator, "storing electric energy over a band of frequencies continuously distributed about the resonant frequency, such as a coil and capacitor in parallel." *McGraw-Hill Dictionary of Scientific and Technical Terms* (Sybil P. Parker ed., 6th ed., 2003).

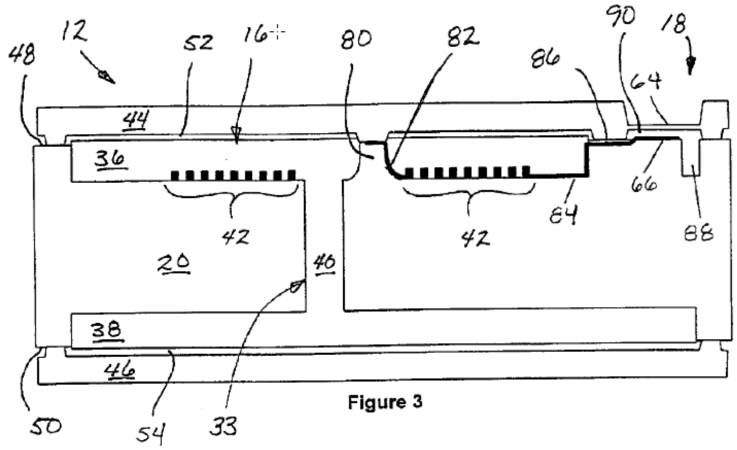

Figure 3

Figure 3 of the ’670 patent illustrates sensing device 12, including substrate 20 with integrated inductor 16 and capacitive pressure sensor 18. *Id.* at 6:15–29. Integrated inductor 16 includes coil 42 which wraps around post 40 of magnetic core 33. *Id.* Capacitive pressure sensor 18 includes fixed electrode 66 and moveable electrode 64. *Id.* at 7:26–43. Fixed electrode 66 “is defined by a conductive layer formed on . . . upper face 48 of . . . substrate 20 in a position immediately below . . . moveable electrode or diaphragm 64.” *Id.* at 7:33–36. LC tank circuit 22 is formed by electrically connecting coil 42 of inductor 16 with electrodes 64 and 66 of capacitive sensor 18. *See id.* at 8:48–9:8. Particularly, trace 82 connects coil 42 to moveable electrode 64 through conductive upper cap layer 44 or a conductive trace formed thereon. *Id.* at 8:48–60. Trace 84 connects coil 42 to fixed electrode 66. *Id.* at 8:60–65. Dielectric layer 86 may insulate trace 84 from conductive upper cap layer 44. *Id.*

D. Illustrative Claims

Of the challenged claims, claim 1 is independent. Claim 1 illustrates the claimed subject matter and is reproduced below using Abbott’s labels “pre” and “a-f” for the relevant parts of the claim.

> 1. [pre] An implantable microfabricated sensor device for measuring a physiologic parameter of interest within a patient, said sensor comprising:
>
> [a] an implantable sensing device, said sensing device being a micro electromechanical system (MEMS) comprising
>
> [b] a substrate,
>
> [c] an integrated inductor formed on the substrate,
>
> [d] at least one sensor responsive to the physiologic parameters and being formed at least in part on the substrate,
>
> [e] a plurality of conductive paths electrically connecting said integrated inductor with said sensor,
>
> [f] said integrated inductor, said sensor and said conductive paths cooperatively defining an LC tank resonator.

Id. at 14:22–35.

E. The Level of Ordinary Skill in the Art

Abbott asserts a person of ordinary skill in the art would "have had at least a bachelor's degree in electrical or mechanical engineering (or equivalent) and at least two years' industry experience, or equivalent research." Pet. 19 (citing Ex. 1024 ¶ 34). Without a preliminary response from ISS there is no dispute as to Abbott's proposed level of ordinary skill in the art. Abbott's proposed level of ordinary skill in the art is consistent with our review of the '670 patent and the prior art asserted in this proceeding. Based on the record at this stage in the proceeding, we adopt Abbott's definition of the level of ordinary skill in the art for the purposes of this Decision.

F. The Alleged Grounds of Unpatentability

Abbott asserts that the challenged claims are unpatentable on the following specific grounds:[2]

Claims Challenged	35 U.S.C. §[3]	References/Basis
1–4, 21, 26, 31	102	Petersen[4]
26, 27	103	Petersen and Renaud[5]
1–4, 21, 31	102	Park[6]
26, 27	103	Park and Renaud

II. CLAIM CONSTRUCTION

The Petition was filed on July 15, 2019. Paper 4. This filing date is after the Patent and Trademark Office implemented a new rule on claim construction adopting the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b). *See* Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340 (Nov. 13, 2018) (codified at 37 C.F.R. § 42.100(b)). This new rule was effective on November 13, 2018, and applies to all petitions filed on or after

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[2] Abbott supports its challenges with a Declaration of Mark Allen, Ph.D. (Ex. 1024).

[3] Abbott states that the ’670 patent claims priority to provisional application numbers 60/263,327 (Ex. 1003), filed Jan. 22, 2001, and 60/278,634 (Ex. 1004), filed Mar. 26, 2001. Pet. 3–4. Based on these filing dates, we understand Abbott is relying on the pre-AIA versions of 35 U.S.C. §§ 102 and 103.

[4] Ex. 1006, U.S. Patent No. 6,939,299 B1 (issued Sept. 6, 2005).

[5] Ex. 1011, U.S. Patent No. 5,488,869 (issued Feb. 6, 1996).

[6] Ex. 1008, Eun-Chul Park et al., *Hermetically Sealed Inductor-Capacitor (LC) Resonator for Remote Pressure Monitoring*, 37 Jpn. J. Appl. Phys. 7124–7128 (1998).

the effective date. *Id.* Thus, the new claim construction rule applies to this proceeding.

The claim construction standard used in a civil action under 35 U.S.C. 282(b) is generally referred to as the *Phillips* standard. *See Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). Under the *Phillips* standard, words of a claim are generally given their ordinary and customary meaning. *Phillips*, 415 F.3d at 1312 ("[T]he words of a claim are generally given their ordinary and customary meaning." (citations and internal quote marks omitted)). "[T]he ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention." *Id.* at 1313. Importantly, the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification. *Id*.

Moreover, as the Federal Circuit has explained, "we need only construe terms 'that are in controversy, and only to the extent necessary to resolve the controversy.'" *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co. Ltd.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

Abbott offers construction of two claim terms, "integrated inductor," and "micro electromechanical system (MEMS)." *See* Pet. 12–19. The specific meanings of these terms are not in controversy at this point, nor are they necessary for our determination of whether to institute *inter partes* review of the asserted claims. *See Vivid Techs.*, 200 F.3d at 803. We accept for purposes of this decision, Abbott's interpretations below, as they are consistent with the Specification and in the context of the claims themselves.

We leave any factual issues with respect to any claim construction matters that ISS may eventually dispute for development during trial.

1. "integrated inductor"

Abbott argues "integrated inductor" is expressly defined by the '670 patent Specification, which states "the sensing device utilizes an integrated inductor, and inductor microfabricated with the sensor itself." Pet. 12–13 (emphasis omitted) (citing Ex. 1001, 3:28–31). Abbott asserts that the express definition is supported by the rest of the claim language, in which the "integrated inductor" is "formed on a substrate" as part of a "microfabricated sensor device." Pet. 13–14 (citing Ex. 1024 ¶¶ 66–68). We accept, for purposes of this decision, Abbott's interpretation of "integrated inductor."

2. "said sensing device being a micro electromechanical system (MEMS)"

Abbott argues the term "MEMS" should be interpreted as a device "made using microfabrication processes." Pet. 17–19. Abbott argues "micromachining is a type of microfabrication, and both micromachining and microfabrication of the electromechanical components comprising the claimed sensor device . . . will result in the sensing device being a MEMS." Pet. 18 (citing Ex. 1024 ¶ 80). We accept, for purposes of this decision, Abbott's interpretation of "MEMS."

III. ANALYSIS

A. Discretion

Abbott has filed concurrent petition IPR2019–01339, which also challenges certain claims of the '670 patent based on different references.

Under § 314(a), the Director has discretion to deny institution of an *inter partes* review. *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2140 (2016) ("[T]he agency's decision to deny a petition is a matter committed to the Patent Office's discretion."); *SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1356 (2018) ("[Section] 314(a) invests the Director with discretion on the question whether to institute review . . . ." (emphasis omitted)); *Harmonic Inc. v. Avid Tech., Inc*., 815 F.3d 1356, 1367 (Fed. Cir. 2016) ("[T]he PTO is permitted, but never compelled, to institute an IPR proceeding.").

Our discretionary determination of whether to institute review of multiple petitions takes into consideration guidance in the Board's Consolidated Trial Practice Guide (USPTO, *Patent Trial and Appeal Board Consolidated Trial Practice Guide November 2019,* https://www.uspto.gov/TrialPracticeGuideConsolidated, "TPG"). In particular, the Trial Practice Guide states "[b]ased on the Board's experience, one petition should be sufficient to challenge the claims of a patent in most situations." TPG 59. The Board also recognizes however that "more than one petition may be necessary, including, for example, when the patent owner has asserted a large number of claims in litigation or when there is a dispute about priority date requiring arguments under multiple prior art references." *Id.*

Although the Petitions challenge some of the same claims, namely claims 1–4, 21, 26, 27, and 31, IPR2019-01339 challenges in addition claims 5, 22–25, 28, and 29 based on different prior art. Furthermore, as Abbott points out, the § 102(e) reference to Petersen here in IPR2019-01338 could potentially be antedated by ISS. Pet. 92. Similarly, in IPR2019-01339, the Allen '379 reference is a § 102(e) reference and could potentially be antedated by ISS in that case. Pet. 93. Because we do not have any substantive response from ISS indicating whether it intends, or not, to antedate the references in either proceeding, the minimal burden on the Board of two petitions is outweighed by the reasonable precaution taken by Abbot in case ISS antedates a primary reference in one or the other case.

Moreover, there are only two concurrent petitions, each including a reasonable number of grounds. The challenges in each Petition are unique and well described. For example, Abbott explains that the Akar reference in IPR2019-01339 "is the only primary reference to expressly disclose a displacement cavity defined within its substrate." *See* Pet. 93 (Abbott explaining how Akar relates specifically to the limitations of claim 27). Abbott also explains that the district court litigation is in its early stages and thus proceeding on all the grounds in both Petitions under these circumstances is an efficient use of the Board's and the parties' resources. *See* Pet. 92 (citing estoppel provisions of 35 U.S.C. § 315(e) as discussed in *Shaw Indus. Grp. v. Automated Creel Sys., Inc.*, 817 F.3d 1293, 1300 (Fed. Cir. 2016)).

Abbott has explained persuasively why the differences addressed in each of the Petitions are material and why two petitions were necessary to challenge the '670 patent. *See* TPG 60 (The TPG explains a petitioner should provide "a succinct explanation of the differences between the petitions, why the issues addressed by the differences are material, and why the Board should exercise its discretion to institute additional petitions."). ISS has not opposed the filing of two petitions, and overall we do not find these two Petitions to be a significant burden on the Board's resources. Addressing the challenges in both Petitions in these proceedings will provide a timely, fair and efficient resolution for both parties before the Board, and may ultimately be helpful in reducing issues related to patentability and resolving the dispute in the district court litigation.

B. Claims 1–4, 21, 26, 31 — Alleged anticipation by Petersen

Abbott asserts that claims 1–4, 21, 26 and 31 were anticipated by Petersen. Pet. 3. Abbott has established a reasonable likelihood of prevailing on its assertion that claims 1–4, 21, 26 and 31 were anticipated for the reasons explained below.

1. Petersen

Abbott asserts that Petersen qualifies as prior art under 35 U.S.C. § 102(e) as of its U.S. filing date of December 8, 2000. Pet. 20. Abbott asserts that Petersen also qualifies as prior art under 35 U.S.C. § 102(e) by claiming priority to Provisional application No. 60/170,450, filed December 13, 1999 (Ex. 1007). Pet. 24–29.

Petersen describes an implantable pressure sensor that integrates a capacitor and an inductor in one small chip, forming a resonant LC circuit. Ex. 1006, code (57). The pressure sensor may be used to monitor intraocular pressure or blood pressure, among other physiologic parameters. *Id.* at 9:50–65. The pressure sensor is illustrated in Figure 1B, reproduced below.

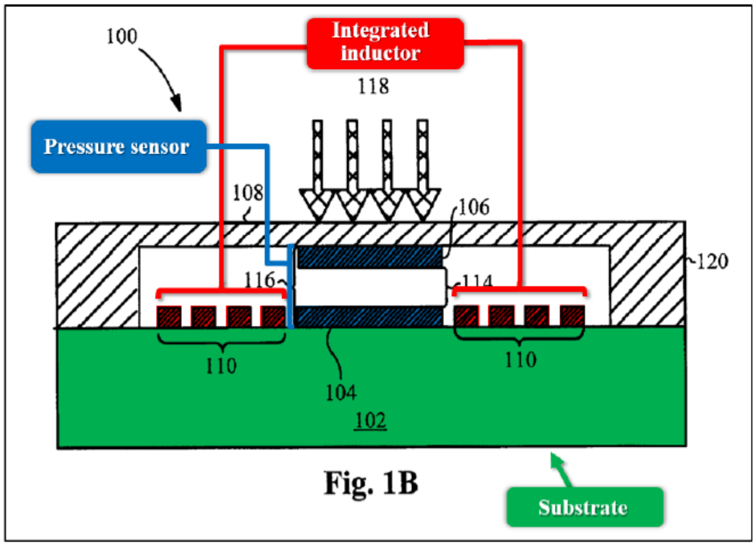

Figure 1B of Petersen, above, as annotated by Abbott, illustrates a cross-sectional diagram of pressure sensor 100, including underlying glass substrate 102, "integrated micromachined inductor coil 110," lower capacitor plate 104 and upper capacitor plate 110. *Id.* at 7:30–37; Pet. 21. Pressure sensor 100 may be fabricated using "a silicon Micro Electro Mechanical System (MEMS) approach, which is well known in the art." Ex. 1006, 7:30–37.

Petersen discloses that "capacitor 116 and . . . inductor 110 are electrically coupled to each other, thereby forming a resonant LC circuit characterized by a resonant frequency." *Id.* at 7:40–42. Petersen describes the function of the resonant LC circuit wherein "[a]n external fluid, gas, or mechanical pressure 118 deflects . . . membrane 108 along with . . . upper capacitor plate 106, which varies . . . gap 124 of . . . capacitor 116. Thus, the capacitance value and the resonant frequency vary as functions of fluid pressure 118." *Id.* at 7:43–47.

The electrical coupling of capacitor 116 and inductor 110 is shown in Figure 1A, reproduced below.

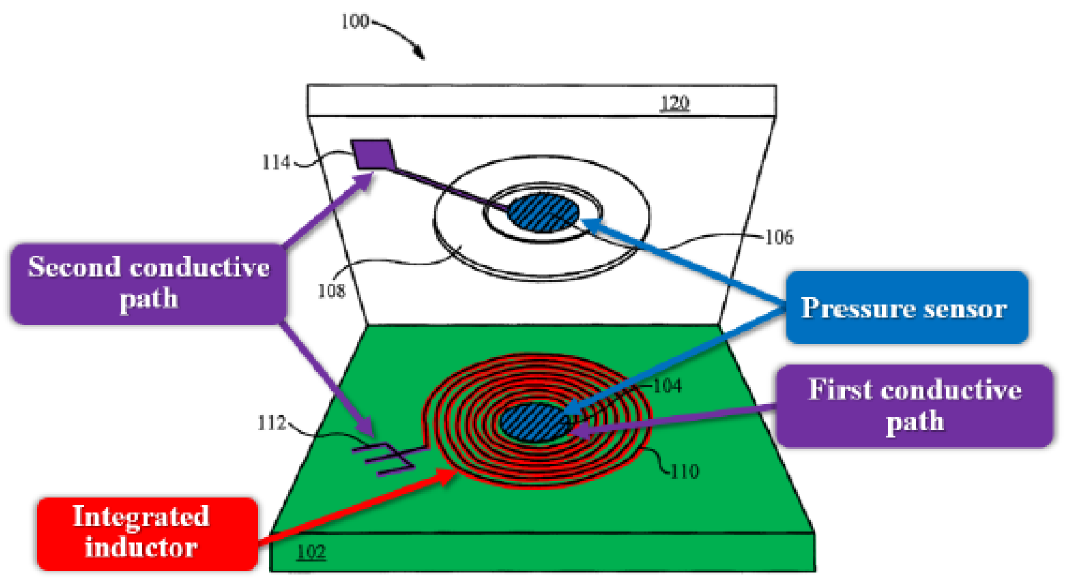

Fig. 1A

Figure 1A of Petersen, above, as annotated by Abbott illustrates a split-level diagram of pressure sensor 100, including inductor 110, lower capacitor plate 104, and upper capacitor plate 106. *Id.* at 6:29–41; Pet. 22. "[L]ower capacitor plate 104 and . . . inductor 110 are coupled with . . . upper capacitor plate 106 through . . . lower contact point 112 and . . . upper contact point 114." Ex. 1006, 6:49–52.

Figure 5, depicting a pressure measurement system including a pressure sensor and external detector, is reproduced below.

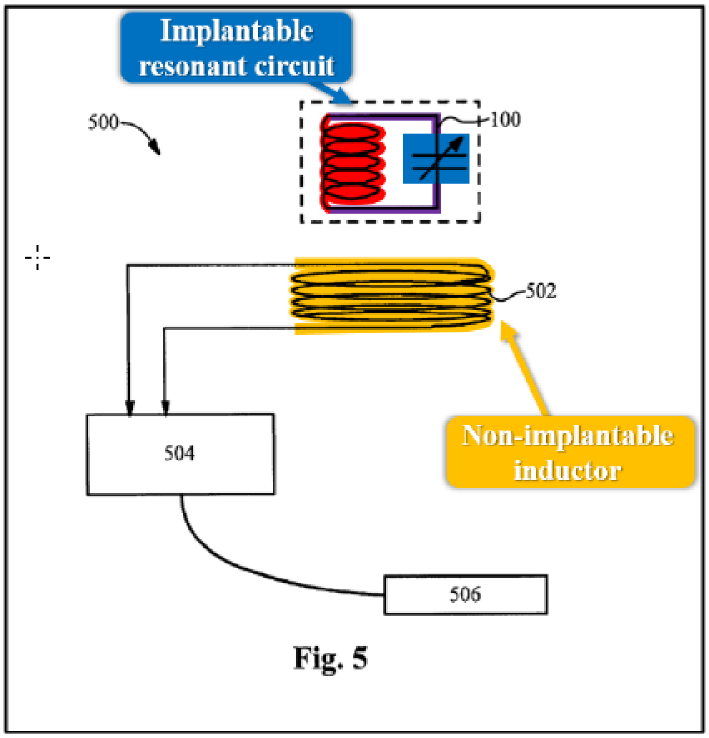

Fig. 5

Figure 5 of Petersen, above, as annotated by Abbott, illustrates pressure measurement system 500 including pressure sensor 501 and external detector pick-up coil 502. *Id.* at 8:26–28; Pet. 24.

2. Claim 1

Addressing the sensor device recited in claim 1, Abbott argues that Petersen provides a pressure sensor for measuring intraocular pressure [1pre] by fabricating pressure sensor 100 using a silicon MEMS approach [1a]. Pet. 30–31 (citing Ex. 1006, code (57), 7:29–37, 9:50–54; Ex. 1024 ¶¶ 173–177). Referring to annotated Figure 1B, Abbott argues Petersen discloses pressure sensor 100 includes substrate 102 [1b], with integrated micromachined inductor coil 110 [1c] formed on top of substrate 102. Pet. 31–33 (citing Ex. 1006, 6:30–40, 7:32–36, Fig. 1B; Ex. 1024 ¶¶ 178–181).

Again referring to annotated Figure 1B, Abbott argues Petersen describes sensor [1d] in the form capacitor 116 including lower capacitor plate 104 deposited on substrate 102 and upper capacitor plate 106. Pet. 36–40 (citing Ex. 1006, code (57), 6:30–32, 6:37–40, 7:32–36, 7:43–47; Ex. 1024 ¶ 183). Abbott argues "[t]he capacitor plates form a capacitive 'sensor,' in the same way that the '670 patent's 'capacitive sensor' is a sensor." Pet. 38 (citing Ex. 1001, 7:26–41; Ex. 1024 ¶ 186). Abbott argues that Petersen discloses its capacitive pressure sensor is responsive to physiological parameter as claimed because, as shown in Figure 1B, external pressure 118 deflects membrane 108 along with upper capacitor plate 106 thereby varying capacitance value and resonant frequency. Pet. 38–40 (citing Ex. 1006, 7:43–48; Ex. 1024 ¶¶ 188–189).

Abbott argues that Petersen discloses a plurality of conductive paths electrically connecting said integrated inductor with said sensor [1e]. Pet. 40 (citing Ex. 1006, code (57), 7:40–42; Ex. 1024 ¶ 190). Abbott argues Figure 1A of Petersen, as annotated by Abbott, illustrates a first conductive path connecting lower capacitor plate 104 (blue) with the inner ring of integrated inductor coil 110 (red). Pet. 41–42 (citing Ex. 1024 ¶ 192). Again referring to Figure 1A, Abbott argues Petersen discloses a second conductive path electrically connecting upper plate capacitor 106 to integrated inductor 110 via lower and upper contact points 112, 114, respectively. Pet. 42–43 (citing Ex. 1024 ¶ 193). Abbott further argues the two conductive paths are shown by Petersen in Figure 5. Pet. 44 (citing Ex. 1006, 8:25–31, 8:45–56; Ex. 1024 ¶ 194). Also with respect to Figure 5, Abbott contends "Petersen teaches that the integrated inductor (limitation [1c] above), capacitor pressure sensor 116 (limitation [1d] above) and conductive paths (limitation [1e] above) together define an LC tank resonator" [1f]. Pet. 44–45 (citing Ex. 1006, code (57), 7:40–42; Ex. 1024 ¶¶ 194–195).

Our review of Petersen's description of an "implantable miniaturized pressure sensor" is consistent with Abbott's analysis detailed above. *See, e.g.* Ex. 1006, Abstract, 6:29–57, 7:30–59, Figs. 1A–D. We also determine on the facts and evidence before us at this early stage of the proceeding that the structure and function of Petersen's components and overall described implantable pressure sensor forming a resonant LC circuit are commensurate with the elements of claim 1. Petersen, for example, specifically describes forming an integrated inductor and capacitor, i.e. "at least one sensor," as called for in claim 1, using "a silicon Micro Electro Mechanical System (MEMS) approach." Ex. 1006, 7:30–32, *see also id.* at 6:30–32 (Petersen describes that "[p]ressure sensor 100 comprises a lower capacitor plate 104, an upper capacitor plate 106, and an inductor 110."). According to Dr. Allen, whose testimony is unrebutted at this point in the proceeding, Petersen's resonant LC circuit necessarily has at least two conductive paths "because, as was typical in pre-2001 LC resonant circuits, one end of the inductor is connected to the capacitor's upper plate, and the other end is connected to the lower plate." Ex. 1024 ¶ 190. On this record, we credit Dr. Allen's testimony and Abbott's evidence and explanations as persuasive of a reasonable likelihood as to the anticipation of claim 1 by Petersen.

3. Analysis of Claims 2–4, 21, 26, and 31

We have considered also Abbott's arguments and evidence concerning dependent claims 2–4, 21, 26, and 31, and we are persuaded of a reasonable likelihood of Abbott's prevailing as to them as well. *See* Pet. 46–58. For the above reasons, and based on the record before us, Abbott establishes a reasonable likelihood of prevailing on the ground that claims 2–4, 21, 26, and 31 are anticipated by Petersen under 35 U.S.C. § 102(e).

C. Claims 26 and 27 — Alleged obviousness by Petersen and Renaud

Abbott asserts that the subject of matter of claims 26 and 27 would have been obvious over Petersen and Renaud. Pet. 3. Abbott has established a reasonable likelihood of prevailing on its assertion that the subject matter of claims 26 and 27 would have been obvious for the reasons explained below.

1. Renaud

Renaud discloses a capacitive pressure measurement sensor including a mobile electrode and fixed electrode. Ex. 1011, code (57). Figure 2, reproduced below as annotated by Abbott, depicts a sectional view of Renaud's sensor.

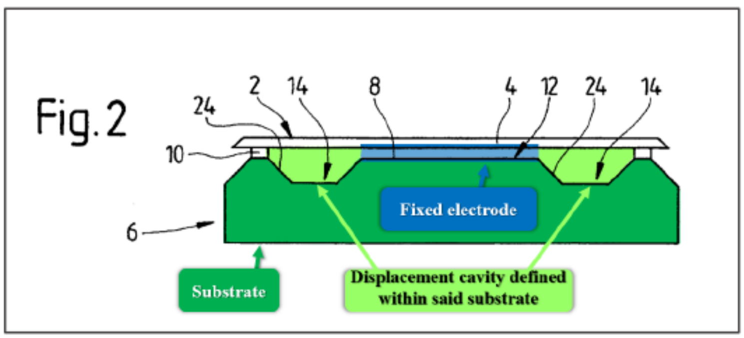

Figure 2 of Renaud, above, as annotated by Abbott shows sensor 1 including mobile electrode 4 on membrane 2 and fixed electrode 8 on substrate 6. *Id.* at 3:56–61, 4:5; Pet. 62. "[C]onnecting frame 10 . . . creates a dielectric space between . . . mobile electrode 4 and . . . fixed electrode 8 and thus forms a conventional measuring capacitor. Ex. 1011, 4:1–4. Membrane 2 and substrate 6 form define chamber 12. *Id.* at 4:4–12. "The sensor also comprises . . . reference volume 14 in contact with . . . chamber 12 to reduce the pressure of the gas contained in . . . chamber 12 which result from the degassing which occurs during the manufacturing of . . . sensor 1." *Id.* at 4:13–16.

2. Analysis of dependent claims 26 and 27

Abbott argues with respect to claim 26 that Peterson discloses "a displacement cavity" in communication with the capacitive sensor's chamber as recited in dependent claim 26. Pet. 51–54 (citing Ex. 1006, Fig. 1B, 7:43–45; Ex. 1024 ¶¶ 213–214, 216–218). Claim 27, which depends from claim 26, recites the additional limitation that "said displacement cavity is defined within said substrate." Ex. 1001, 16:6–7. Abbott argues that to the extent Petersen does not expressly differentiate the gap, or space, between the fixed and moveable electrodes relative to the overall chamber volume, i.e. "a displacement cavity," surrounding the inductor and capacitor, Renaud does so. Pet. 55.

Abbott argues that Renaud explains "a 'known solution' to mitigate problems caused by residual gas was to create a larger 'reference volume' (i.e., displacement cavity)." Pet. 55. Abbott contends that a person of ordinary skill in the art would have been motivated to combine Petersen and Renaud because Renaud explains specifically the solution of using a displacement cavity, referred to as "a 'reference volume' that decreases the pressure of the residual gas by increasing the total volume." *Id.* at 63. Dr. Allen testifies that a person of ordinary skill in the art would have understood that "Renaud teaches that by etching the displacement cavity as 'a groove running around the fixed electrode,' the cavity can be made larger without increasing the size of the device as a whole." Ex. 1024 ¶ 235 (citing Ex. 1011, 2:53–55).

We have considered Abbott's arguments and evidence and are persuaded of a reasonable likelihood of Abbott's prevailing as to claims 26 and 27, as well. *See* Pet. 51–54, 59–66. Based on the record before us, that is currently without opposition from ISS, Abbott establishes a reasonable likelihood of prevailing on the ground of unpatentability of claims 26 and 27 as obvious over Petersen and Renaud under 35 U.S.C. § 103.

D. Claims 1–4, 21, 31 — Alleged anticipation by Park

Abbott asserts that claims 1–4, 21, and 31 were anticipated by Park under 35 U.S.C. § 102(b). Pet. 3. Abbott has established a reasonable likelihood of prevailing on its assertion that claims 1–4, 21, and 31 were anticipated for the reasons explained below.

1. Park

Abbott asserts that Park was published and publicly available in the Japanese Journal of Applied Physics 7124 in December of 1998, and therefore qualifies as prior art. Pet. 67 (citing Declaration of Dr. Ingrid Hsieh-Yee ¶¶ 35–44 (Ex. 1022)). Dr. Hsieh-Yee explains that based on experience and customary practices, as well as the records and April 10, 1999 date stamp of the Library of Congress, "Park, is an authentic document and would have been available to the public no later than April 17, 1999." Ex. 1022 ¶ 44. On this record, and with no evidence to the contrary, we find that Abbott has made a sufficient showing for purposes of institution that Park qualifies as prior art. *See Hulu, LLC v. Sound View Innovations, LLC*, IPR2018-01039 (PTAB Dec. 20, 2019) (Paper 29) (holding that under 35 U.S.C. § 311(b), for purposes of institution, a petitioner must show a reasonable likelihood that an asserted reference qualifies as a printed publication) (Precedential Opinion Panel decision). Abbott also notes that "Park is identified on the cover of the ’670 patent and in the specification . . . but it was not discussed by the examiner." Pet. 67.

Park describes "an integrated inductor-capacitor (LC) resonator structure fabricated using bulk micromachining and anodic bonding technologies." Ex. 1008, 7124. Park discloses "[i]n this resonator structure, pressure change monitored by a capacitive pressure sensor results in the change of resonance frequency. The resonance frequency shift is detected by inductive coupling from an external transmission coil; therefore, pressure can be monitored remotely using the passive LC resonator." *Id.* Park discloses the LC resonator may be used for remote pressure monitoring as required in biomedical applications, e.g., to wirelessly measure intraocular, cardiovascular, and brain pressures. *Id.*

Park's micromachined LC resonant pressure sensor is illustrated in Figure 1, reproduced below.

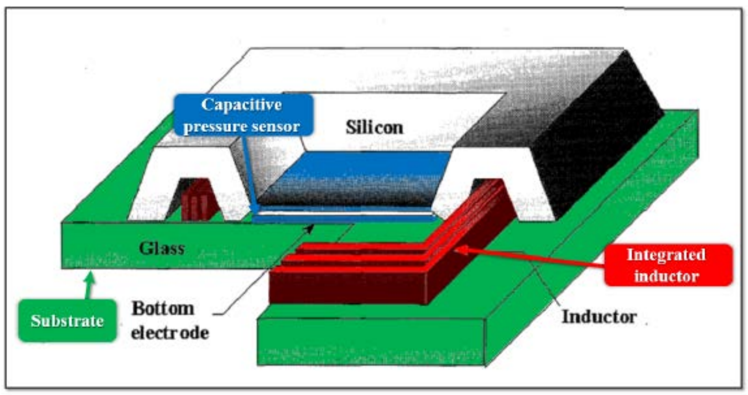

Figure 1 of Park, above, as annotated by Abbott depicts a capacitive pressure sensor including a silicon membrane and a metal electrode on a glass substrate. *Id.*; Pet. 68. "The inductor is fabricated on the glass by Cu-electroplating." Ex. 1008, 7124. A thick silicon layer connects the inductor to the capacitor electrode. *Id.* Park explains that "[t]his is a fully integrated LC resonant structure without any hybrid components and does not require any special packaging process." *Id.*

Abbott provides annotations on Park's Figure 8(b), reproduced below, to illustrate the conductive paths between the inductor and capacitive sensor electrode.

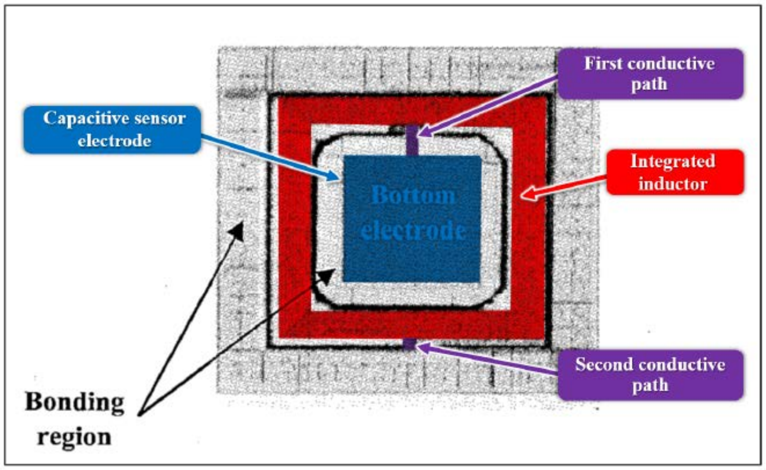

Figure 8(b) of Park, above, as annotated by Abbott is a micrograph of the fabricated LC resonator. Ex. 1008, 7127; Pet. 75. In Figure 8(b), the inductor is hermetically sealed by the silicon wafer and the capacitive pressure sensor is formed at the center. Ex. 1008, 7127.

The measurement system used to remotely monitor pressure changes using the pressure sensor is illustrated in Figure 10, reproduced below.

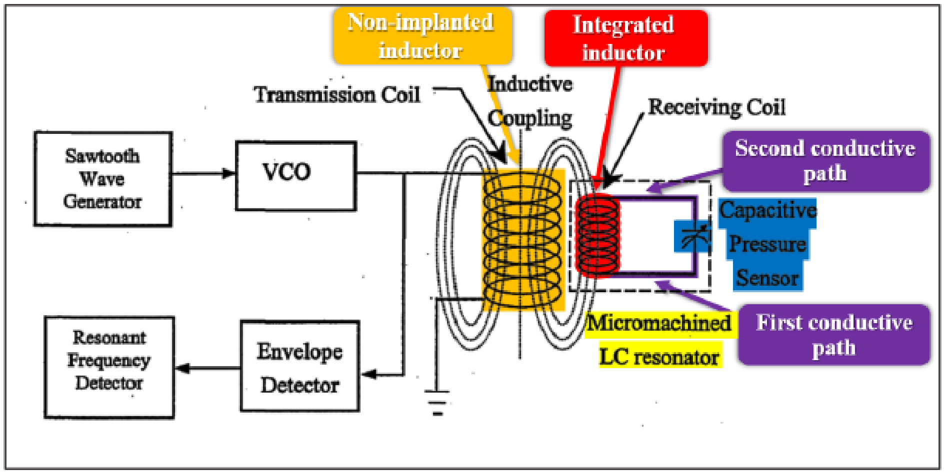

Figure 10 of Park, above, as annotated by Abbott shows a schematic view of the measurement system. *Id.* at 7127–7128; Pet. 69. The schematic includes a receiving coil connected to a capacitive pressure sensor. Ex. 1008, 7127–7128.

2. Claim 1

Addressing the sensor device recited in claim 1, Abbott argues that Park provides a pressure sensor for biomedical applications, e.g., measuring intraocular pressure [1pre]. Pet. 70–72 (citing Ex. 1008, 7124; Ex. 1024 ¶¶ 241–242). The pressure sensor is fabricated by bulk micromachining [1a]. Pet. 70–72. Abbott argues that "[b]ecause all of the components of the LC resonant circuit are fabricated using micromachining techniques, and the fabricated device includes electrical components (an integrated inductor and capacitive sensor) and mechanical movement (a deformable silicon diaphragm), Park's sensing device is a "micro electromechanical system (MEMS)." *Id.* at 71–72 (citing Ex. 1008, 7125–7126; Ex 1024 ¶¶ 244–245).

Referring to Figure 1, above, Abbott asserts Park discloses glass substrate [1b] with "fully integrated" inductor [1c] fabricated on the glass substrate. *Id.* at 72–74 (citing Ex. 1008, 7124, 7125, 7128; Ex. 1024 ¶¶ 246–248). With respect to limitation [1d], Abbott asserts that Park discloses monitoring pressure change using a capacitive pressure sensor formed by a silicon membrane and a metal electrode on the glass substrate. *Id.* at 75–77 (citing Ex. 1008, 7124, Fig. 1; Ex. 1024 ¶¶ 251–253).

Addressing the plurality of conductive paths [1e], Abbott argues "Park discloses this limitation, describing an integrated inductor and capacitive sensor that are electrically connected in parallel (thus using a plurality of conductive paths) to form an LC resonant circuit." *Id.* at 77 (citing Ex. 1024 ¶ 254). Referring to annotated Figure 8(b) of Park, Abbott argues "a first conductive path electrically connects the bottom electrode of the sensor with the inner turn of the integrated inductor," and "a second conductive path . . . that electrically connects the outer turn of the integrated inductor with the silicon diaphragm of the capacitive pressure sensor." *Id.* at 77–78 (citing

Ex. 1008, 7124, Fig. 8(b); Ex. 1024 ¶¶ 255–256). Abbott argues Park discloses the two conductive paths connecting the inductor in parallel with the capacitive pressure sensor in annotated Figure 10, above. *Id.* at 78–79 (citing Ex. 1008, Fig. 10; Ex. 1024 ¶ 254). Abbott further argues Park discloses that "its integrated inductor (limitation [1c] above), capacitive sensor (limitation [1d] above), and plurality of conductive paths (limitation [1e] above) together define an 'integrated inductor-capacitor (LC) resonator structure.'" *Id.* at 79 (citing Ex. 1008, 7124, 7128, Figs. 1, 4, 8, 10; Ex. 1024 ¶ 257).

Our review of Park's description of an implantable biomedical remote pressure sensor is consistent with Abbott's analysis detailed above. *See, e.g.*, Ex. 1008, Figs. 1, 10. We also determine on the facts and evidence before us at this stage of the proceeding that the structure and function of Park's components and overall described implantable pressure sensor as an LC resonator circuit appears to meet the elements of claim 1. Park describes forming a pressure sensor on a glass substrate including "the integration of a capacitive pressure sensor and an inductor on the same chip." Ex. 1008, 7124. According to Dr. Allen, whose testimony is unrebutted at this point in the proceeding, Park's resonant LC resonant pressure sensor circuit includes at least two conductive paths where the inner and outer coils of the inductor are respectively connected to the opposing electrodes of the capacitive sensor. Ex. 1024 ¶¶ 254–256 (citing Ex. 1008, Figs. 8(b), 10).

On this record, we credit Dr. Allen's testimony and Abbott's evidence and explanations as persuasive of a reasonable likelihood as to the anticipation of claim 1 by Park.

3. Analysis of Claims 2–4, 21, and 31

We have considered also Abbott's arguments and evidence concerning dependent claims 2–4, 21, and 31, and we are persuaded of a reasonable likelihood of Abbott's prevailing as to them as well. *See* Pet. 79–84. For the above reasons, and based on the record before us, Abbott establishes a reasonable likelihood of prevailing on the ground that claims 2–4, 21, and 31 are anticipated by Park under 35 U.S.C. § 102(b).

E. Claims 26 and 27 — Alleged obviousness by Park and Renaud

Abbott concedes that Park does not expressly disclose "a displacement cavity" in communication with the capacitive sensor's chamber as recited in dependent claim 26 or that, "said displacement cavity is defined within said substrate" as in claim 27. Pet. 85 (citing Ex. 1008, Fig. 4(f); Ex. 1024 ¶ 273). Abbott argues, however, that it would have been obvious to a person of ordinary skill in the art to add a displacement cavity as taught by Renaud. Pet. 86.

Abbott argues that like Park, Renaud uses a capacitive sensor defining a chamber between a fixed, and a moving, electrode. *Id.* Abbott relies on Dr. Allen's testimony that it was a known problem in 1994 that for micromachined capacitive pressure sensors, "residual gas in the chamber occurs '[i]n the course of manufacture' and causes the sensor not to provide an 'exact reading of the absolute pressure,' affecting the 'stability and/or the reproductibility [sic] of the readings' of the sensor." Ex. 1024 ¶ 282 (citing Ex. 1011, 1:50–60) (alteration in original). Dr. Allen states that Renaud makes clear that "in 1994, the use of a displacement cavity or 'reference volume' was a known solution for that problem." *Id.* ¶ 283. Dr. Allen explains further that, "a reference volume, for example, increases pressure sensitivity by reducing the effects of residual gasses that would be present in the air gap of Park's capacitive pressure sensor." *Id.* (citing Ex. 1011, 1:53–65; Ex. 1008, 7126). Dr. Allen testifies that a person of ordinary skill in the art would have understood this problem, and been motivated, also to add Renaud's displacement cavity to a micromachined capacitive sensor as described in Park to achieve the additional benefit of "increasing temperature stability (*i.e.*, a given change in temperature will have a smaller effect on internal pressure)." *Id.* Further, Dr. Allen testifies that a person of ordinary skill in the art would have formed the displacement cavity as taught by Renaud "etched as a groove within the substrate because, compared with other possible displacement cavities, it provides a further benefit of 'reducing the size of the active part of the measuring capacitator without reducing the sensitivity of the sensor.'" *Id.* ¶ 286 (citing Ex. 1011, 2:56–60).

We have considered Abbott's arguments and evidence and are persuaded of a reasonable likelihood of Abbott's prevailing as to claims 26 and 27, as well. *See* Pet. 84–89. Based on the record before us, that is without input or opposition from ISS, Abbott establishes a reasonable likelihood of prevailing on the ground of unpatentability of claims 26 and 27 as obvious over Park and Renaud under 35 U.S.C. § 103.

IV. SUMMARY

For the reasons expressed above, we determine that Abbott has demonstrated a reasonable likelihood of showing that claims 1–4, 21, 26, 27, 31, are unpatentable. In accordance with *SAS* and the Director's guidance, we institute a trial on all challenged claims and all asserted grounds of unpatentability.

Our factual findings and determinations at this stage of the proceeding are preliminary, and based on the evidentiary record developed thus far.

This is not a final decision as to the patentability of claims for which *inter partes* review is instituted. Our final decision will be based on the record as fully developed during trial.

V. ORDER

For the reasons given, it is

ORDERED that *inter partes* review of the ’670 patent is hereby instituted as to claims 1–4, 21, 26, 27, and 31 on the following grounds.

1. Claims 1–4, 21, 26, and 31 as anticipated by Petersen;
2. Claims 26 and 27 as obvious over Petersen and Renaud;
3. Claims 1–4, 21, and 31 as anticipated by Park; and
4. Claims 26 and 27 as obvious over Park and Renaud.

FURTHER ORDERED that no ground other than those specifically granted above is authorized for the *inter partes* review; and

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial on the grounds of unpatentability authorized above; the trial commences on the entry date of this decision.

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