
BEFORE THE PATENT TRIAL AND APPEAL BOARD

HESAI TECHNOLOGY CO., LTD.
Petitioner

v.

OUSTER, INC.,
Patent Owner

Patent No. 11,287,515
Inter Partes Review No. 2023-01422

PATENT OWNER PRELIMINARY RESPONSE

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Statement of Material Facts in Dispute

Petitioner did not submit a statement of material facts in its Petition.

Accordingly, no response is due pursuant to 37 C.F.R. § 42.23(a), and no facts are admitted.

I. INTRODUCTION

Ouster, Inc. (“Ouster” or “Patent Owner”) respectfully submits this Preliminary Response to the Petition for *Inter Partes* Review filed by Hesai Technology Co., Ltd. (“Hesai” or “Petitioner”) challenging Claims 1-2, 4-9, 11-14, 16-17, 19-25 of U.S. Patent No. 11,287,515 (“the ’515 Patent” or “the challenged patent”). Each of Petitioner’s grounds is legally deficient for the reasons identified below. Institution should be denied.

The Petitioner clearly recognizes Ouster as the leader of cutting edge of LIDAR technology. Each of the Grounds Petitioner asserts cite as the primary reference a patent publication listing the same first-named inventor as the ’515 Patent: Angus Pacala, Ouster’s CEO and Co-Founder. The Petition asserts, in essence, that the claimed invention of the ’515 Patent is obvious because Mr. Pacala had previously invented it. However, Hesai’s efforts to create a hindsight-driven reconstruction of the claimed invention using an array of disparate, and often conflicting, disclosures picked from the prior art fails for numerous reasons.

First, Hesai’s obviousness positions are legally deficient because the prior art fails to disclose or suggest features required by the three challenged independent claims (1, 14 and 22) including, at least:

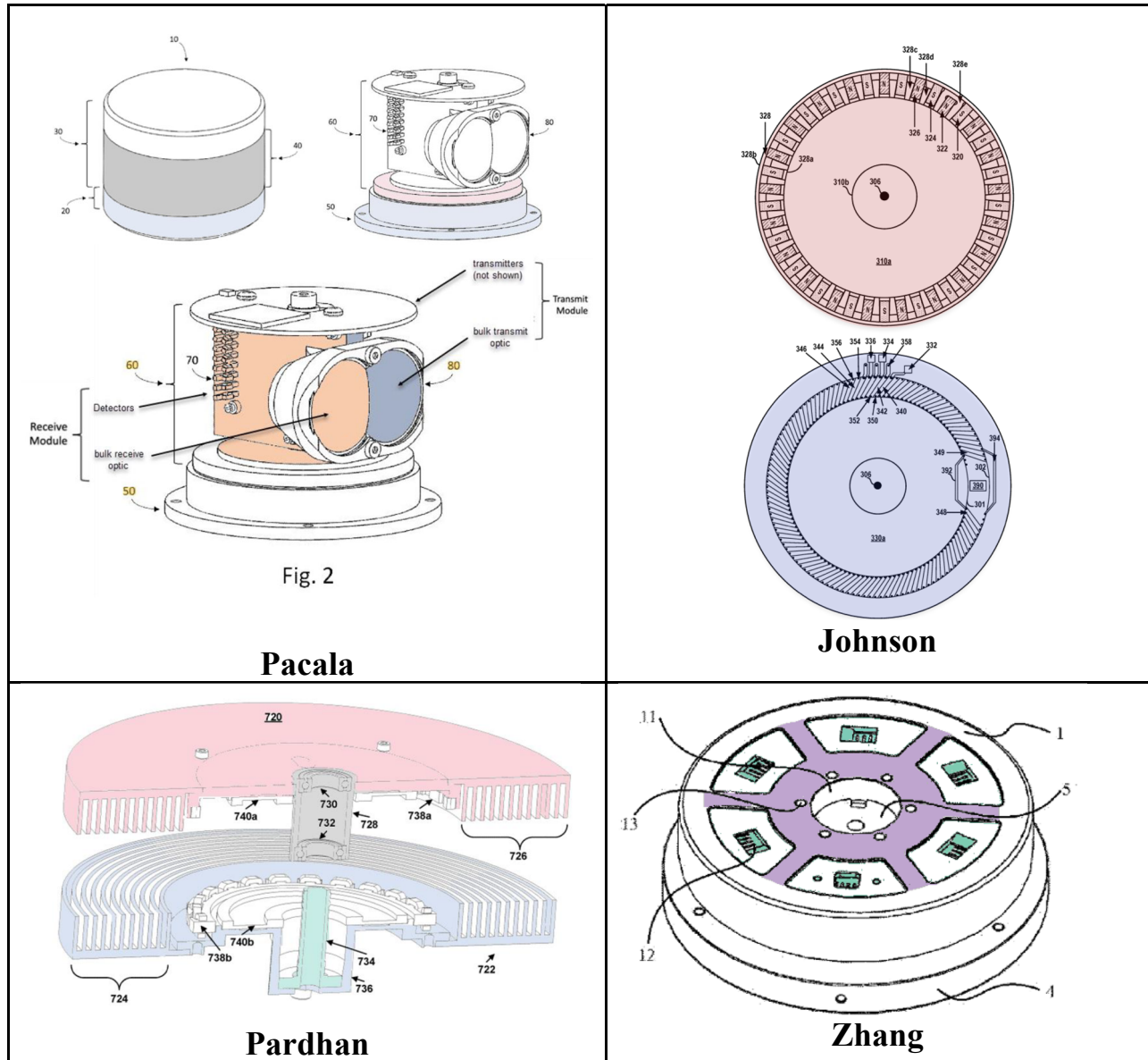
- “a plurality of stator elements arranged annularly about the axis of rotation, each of the plurality of stator elements including a coil” (*see* Sections VI.A.ii and VI.C.ii *infra*);
- “a support component comprising a sleeve ... and a plurality of arms extending away from the sleeve” (*see* Sections VI.A.iii and VI.C.iii *infra*);
- four distinct circuit boards configured so that, for example, the fourth circuit board is “coupled to the upper surface of the support component” (*see* Sections VI.A.iv¹ and VI.C.iv *infra*); and
- “a wireless power transformer integrated directly onto the stator and rotor circuit boards” wherein, for example, a first transformer coil is “positioned *outside* an outer perimeter of the plurality of stator elements” (*see* Sections VI.A.v and VI.C.v *infra*).

Second, even if such features were found in the prior art references, no logical motivation exists for combining the references in the manner proposed. All

¹ Independent claim 22—first challenged in Ground 6—recites, *inter alia*, elements of claims 4 and 17 that depend from independent claims 1 or 14, respectfully. As a result, some elements of independent claim 22 are first addressed with reference to dependent claims 4 and 17 as part of Grounds 1 and 2.

nine Grounds of the Petition include a combination of Pacala (or Pacala-2017) as the primary reference and, at least, Johnson, Pardhan, and Zhang as secondary references. While each of Grounds 1-9 combines no fewer than four, and as many as eight prior art references, the Petition fails to identify a coherent, consistent motivation to combine the teachings of these references with one another. Instead, contrary to the legal requirements for establishing obviousness, Petitioner's arguments amount to no more than an attempt to reconstruct the claimed invention with the benefit of hindsight by cherry picking select features of various prior art references without consideration of the reference and the claimed invention when taken "as a whole." *See e.g., In re Glatt Air Techs., Inc.*, 630 F.3d 1026, 1029 (Fed. Cir. 2011).

A brief visual summary of Petitioner's alleged obvious combination of select features of Pacala, Johnson, Pardhan, and Zhang as set forth in Ground 1 is provided below, with the relied upon features of each reference colored as in the Petition.



Not only does a combination of these four references fail to disclose or suggest each and every limitation of the challenged claims, but the only possible motivation for such a combination is Petitioner's desire to reconstruct the claimed invention. Hindsight as motivation, however, falls well short of what is required by

law. *Ruiz v. A.B. Chance Co.*, 357 F.3d 1270, 1275 (Fed. Cir. 2004) (“The ‘as a whole’ instruction in title 35 prevents evaluation of the invention part by part” and “[w]ithout this important requirement, an obviousness assessment might 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.”).

Third, the Petition fails to address that in many instances, the references actually teach away from any alleged motivation to combine features. For example, a POSITA—whom the Petition assumes is concerned about size and weight—starting with the LIDAR of Pacala (or Pacala-2017) might, according to Petitioner’s expert, look to Johnson’s design based on its purportedly compact design. But if compactness was a design goal, surely that POSITA would not then negate that perceived benefit by placing the compact design within Pardhan’s voluminous support structure that includes fins extending from a rotor plate to transfer heat away from the LIDAR device, as Petitioner urges the Board to accept (Petition at 15, 31, 53). *See* Section VI.A.ii *infra*. In the face of the need to find the “support component” claim element, Petitioner ignores the contrary disclosures of Johnson and Pardhan. In summary, Petitioner impermissibly uses the challenged claims as a roadmap, picking and choosing discrete portions of each disclosure

without consideration for the prior art references as a whole, ignoring where the references teach away from their combination, and without clearly addressing how a POSITA at the time of the claimed invention would have been motivated to combine the references.

Petitioner’s reliance on impermissible hindsight, and its disregard of direct teaching away by select references, is further highlighted by the Petitioner’s argument that it would have been obvious to then place an *additional* PCB—not taught in Johnson or Pardhan—*between* the heat generating LIDAR and the heat dissipating rotor plate with fins of Pardhan. *See* Claim 22[e.iii] (“...a fourth circuit board coupled to the upper surface of the support component...”). Petitioner offers no rational explanation for why a POSITA relying on Pardhan’s finned rotor plate to cool Pacala’s LIDAR would disrupt the thermal coupling between the LIDAR and its heat sink by placing a circuit board between the two components. Nor can it. This modification would “destroy the basic objective” of Pardhan and thus cannot have been obvious. *See Trivascular, Inc. v. Samuels*, 812 F.3d 1056, 1068 (Fed. Cir. 2016); *see also* Section VI.C.iv *infra*.

Finally, as explained in Section VI.G below, the Petition also fails to meet its burden to show a POSITA would have had a reasonable expectation of success in combining the references to meet the limitations of the claimed invention. The

Petition does not address the readily apparent difficulties in combining the references arising from their contradictory teachings and merely makes conclusory statements about a POSITA's "reasonable expectation of success in combining these references using basic engineering principles." *E.g.*, Petition at 66.

In view of the foregoing, the Petition fails to demonstrate that there is a reasonable likelihood that at least 1 of challenged claims 1-2, 4-9, 11-14, 16-17, 19-25 of the '515 Patent is unpatentable. Institution should be denied.

II. BACKGROUND

The '515 Patent sought to improve on rotating LIDAR systems for autonomous vehicles, which are "technologically complex," "costly to manufacture," and involve "a conglomeration of different internal sub-systems, each of which can be in itself quite complex." Ex. 1001 at 1:44-53. It discloses rotating LIDAR systems including "design features that enable the systems to be manufactured cheaply enough and with sufficient reliability and to have a small enough footprint to be adopted for use in mass-market automobiles." *Id.* at 3:44-47. The '515 Patent's systems also have a "more compact form factor and much simplified assembly process than spinning LIDAR systems that employ a separate electric motor module." *Id.* at 16:29-33. This is because, for example, "electronic and optical components of the LIDAR system can be mounted directly to one or

more boards of the rotary actuator” while “these same boards include electric motor components integrated into one or more surfaces.” *See id.* at 12:8-33; *see also id.* at 12:44-60. The “highly integrated architecture” of the claimed invention “enables a highly compact configuration for the internal mechanical elements and circuitry” to the point that some embodiments can have “an overall volume that is similar to or smaller than that of a coffee mug.” *Id.* at 25:23-31.

The ’515 Patent teaches a light ranging device along with upper and lower circuit board assemblies in which the upper board assembly rotates with respect to the lower board assembly around an axis that is perpendicular to the board assemblies. *Id.* at 26:19-40. Each of the upper and lower board assemblies includes at least two planar circuit boards arranged in a parallel relationship with one another. *Id.* at 26:41-43, 32:62-33:19, 34:26-50.

An electric rotary motor can be integrated directly onto these circuit boards. *Id.* at 30:5-9. One aspect of this configuration pertinent to the Petition and depicted in Fig. 6D (reproduced below) is that a circuit board of the lower board assembly includes a plurality of stator elements 644(i) each of which includes a solenoid coil 644a wound around a core 644b of magnetic material. Ex. 1001 at 30:24-29. Wireless power transmitter 648 in the form of a circular loop antenna (e.g., a single

turn or multi-turn coil) is likewise placed on the circuit board outside of the plurality of stator elements. *Id.* at 31:21-48; Fig. 6D.

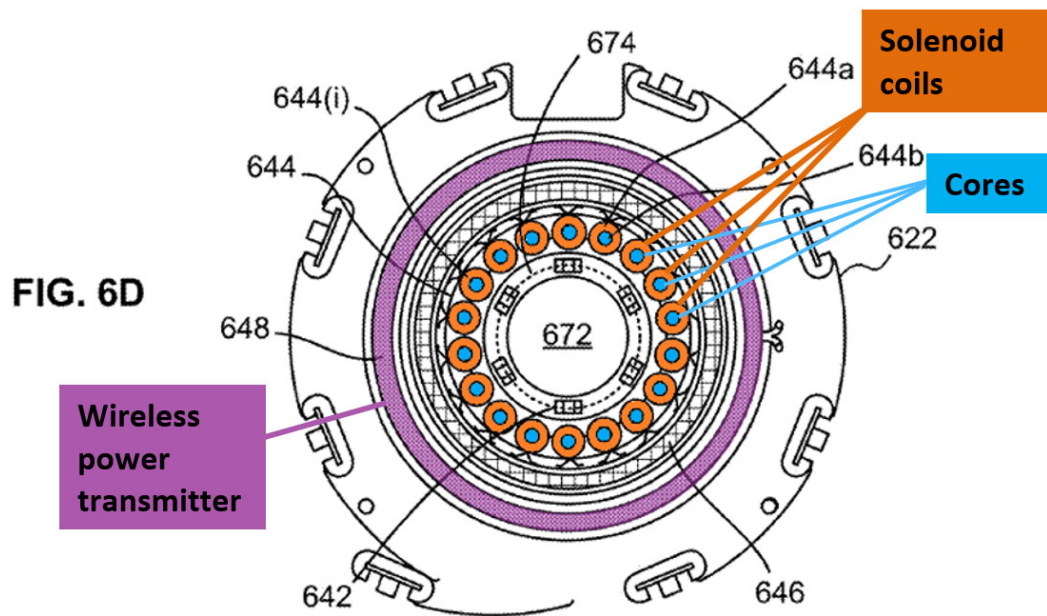


Fig. 8A (reproduced below) is an exploded view diagram showing an upper circuit board assembly 810 utilizing a two-board configuration (*e.g.*, a rotor board 850 and control board 840) arranged above the stator. Ex. 1001 at 34:37-44. As depicted in Figs. 8A and 8B, the rotor board 850 includes a bearing housing 865 that fits over shaft 715 so that rotor board 850 can rotate relative to the stator assembly. *Id.* at 34:51-60.

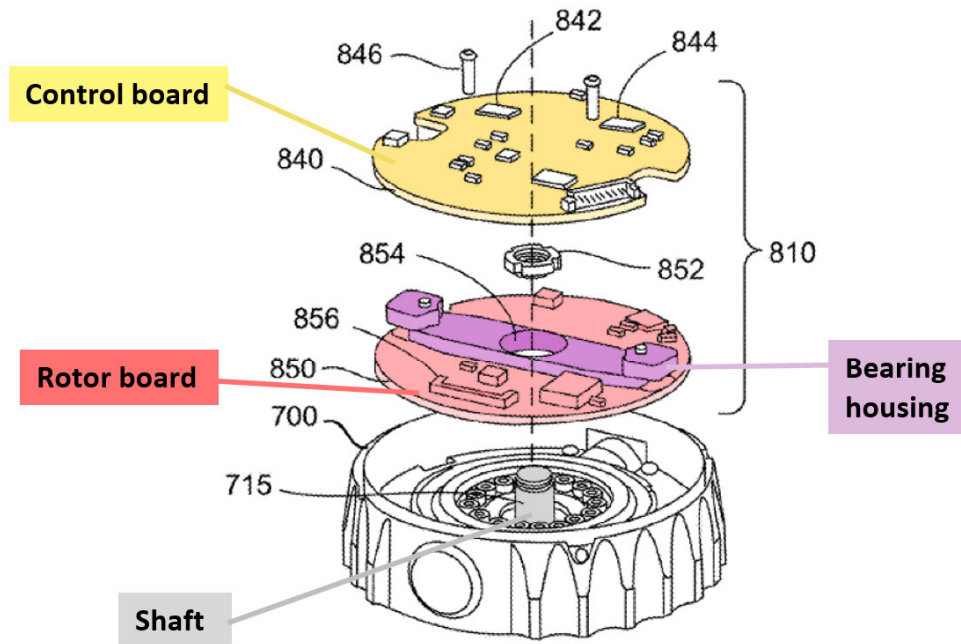


FIG. 8A

III. PERSON OF ORDINARY SKILL IN THE ART

A person of ordinary skill in the art (POSITA) is a hypothetical person presumed to be aware of all pertinent art, to think along with conventional wisdom in the art, and to have ordinary creativity. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 407-09, 420-21 (2007). For the limited purpose of this Preliminary Response, Patent Owner adopts Petitioner’s definition of a POSITA as having an undergraduate degree in mechanical engineering or electrical engineering, and two to three years of experience with electro-optical and electro-mechanical devices or systems. Petition at 9.

IV. CLAIM CONSTRUCTION

A. Applicable Law

Claims are ordinarily given their “ordinary and customary meaning,” which 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.” *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312-13, 1315 (Fed. Cir. 2005) (citation omitted). To construe a claim term, the PTAB should look to “the words of the claims themselves, the remainder of the specification, the prosecution history, and extrinsic evidence concerning relevant scientific principles, the meaning of technical terms, and the state of the art.” *Id.* at 1314 (citation omitted). “A patent’s specification, together with its prosecution history, constitutes intrinsic evidence to which the PTAB gives priority when it construes claims.” *Knowles Elecs. LLC v. Cirrus Logic, Inc.*, 883 F.3d 1358, 1361-62 (Fed. Cir. 2018) (footnote omitted).

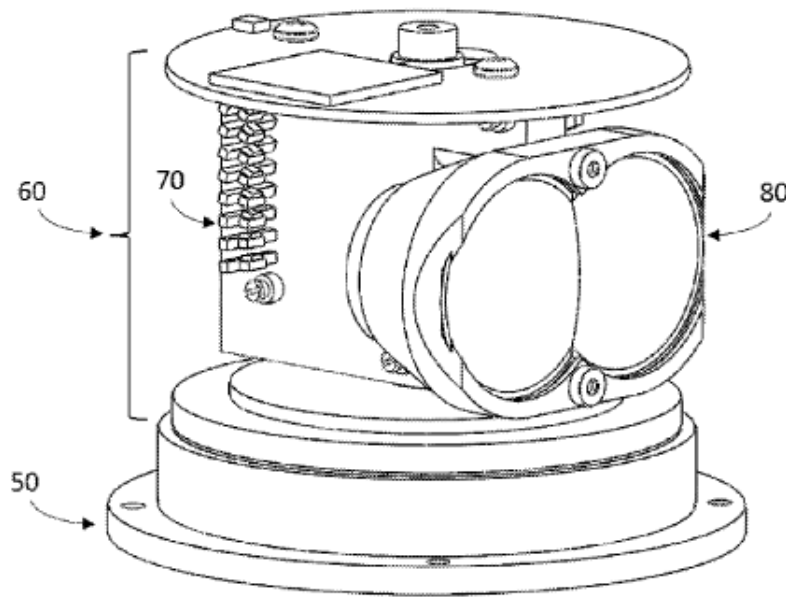
For purposes of this preliminary response, Patent Owner agrees with Petitioner that no formal constructions are necessary.

V. THE PRIOR ART

A. Pacala (Ex. 1004)

U.S. Patent Pub. No. 2014/0211194 (Pacala, Ex. 1004) provides a high-level description of a rotating LIDAR sensor that “contains a motor and distributed

electronics, and a spinning turret **60** that contains optoelectronic components **70** (including optical transmitters and receivers), collimation and focusing lenses **80** and distributed electronics.” Ex. 1004 at [0013]. The sensor is shown in Pacala’s Fig. 2:



Ex. 1004 at Fig. 2. Most of the remaining description of Pacala is dedicated to discussing signal processing circuits with a brief note that the disclosed circuits can be “implemented with discrete integrated circuits (ICs), in the form of FPGA logic, as part of an application-specific integrated circuit (ASIC), or integrated into the pixels of a detector array (e.g., Single-Photon Avalanche Diode [SPAD] array.” *Id.* at [0014].

B. Johnson (Ex. 1005)

U.S. Patent No. 10,790,077 (Johnson, Ex. 1005) discloses a “Device and Methods for an Electromagnetic Coil.” Ex. 1005 at Title. Johnson explains its single “electromagnetic coil may include multiple coil windings in a coaxial relative arrangement about a shared core region.” *Id.* at 3:3-5. The Petition relies specifically upon Johnson’s electromagnetic coil shown in Figs. 3C-3D as the stator in a rotary joint built into a multilayer PCB. *See* Petition at 32-33.

Fig. 3C is a cross section view showing “electrically conductive material(s) (e.g., tracks, traces, copper, etc.) patterned along a first layer of the PCB;” likewise Fig. 3D shows “electrically conductive material(s) patterned along a second layer of the PCB.” Ex. 1005 at 12:11-17; Figs. 3C-3D. Johnson explains that conductive paths utilizing conductive material from each of the two layers and the interconnect between the two layers form the “toroidal coil windings” of Johnson’s electromagnetic coil. *Id.* at 13:26-34. These coil windings “extend around axis 306 and about a substantially ring-shaped core region inside the first coil winding.” *Id.*

For example, a “first toroidal coil winding” may include “in this order: structure 340 [in Fig. 3C’s layer], interconnect 350 [extending between Figs. 3C and 3D], structure 360 [in Fig. 3D’s layer], interconnect 354 [extending between Figs. 3C and 3D], structure 344 [in Fig. 3C’s layer], etc. through structure 364 [in

Fig. 3D's layer].” *Id.* at 13:24-40, 16:26-34. Detailed views of Johnson’s Figs. 3C and 3D have been reproduced below with blue annotations identifying the conductive elements belonging to the “first toroidal coil winding” and red annotations identifying the conductive elements of a “second toroidal coil winding” (described at Ex. 1005 at 13:37-40) where the exemplar interconnects 350, 352, 354, 356 common to both Figs. 3C and 3D have been annotated green.

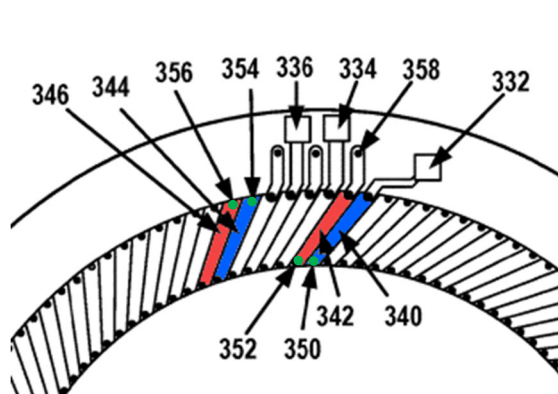


Fig. 3C (detail)

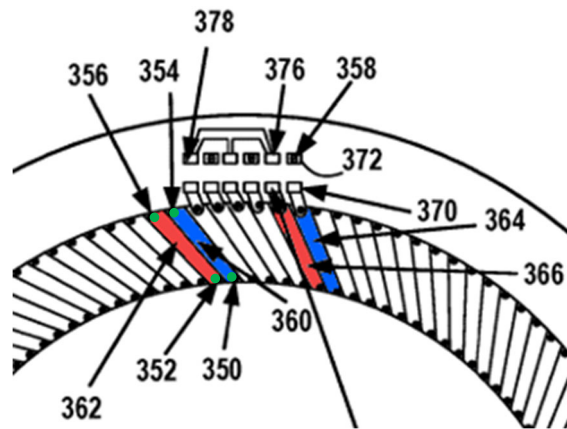


Fig. 3D (detail)

An annotated version of Johnson’s Fig. 3C is reproduced below (to the left) with all conductive structures of Johnson’s first toroidal coil winding colored blue, and the structures of Fig. 3D overlaid onto those of Fig. 3C to better illustrate one full toroidal coil winding. Below, on the right, an annotated version of Johnson’s Fig. 3D further color codes the other four toroidal coil windings to better illustrate how Johnson’s single coil with multiple interleaved windings is formed.

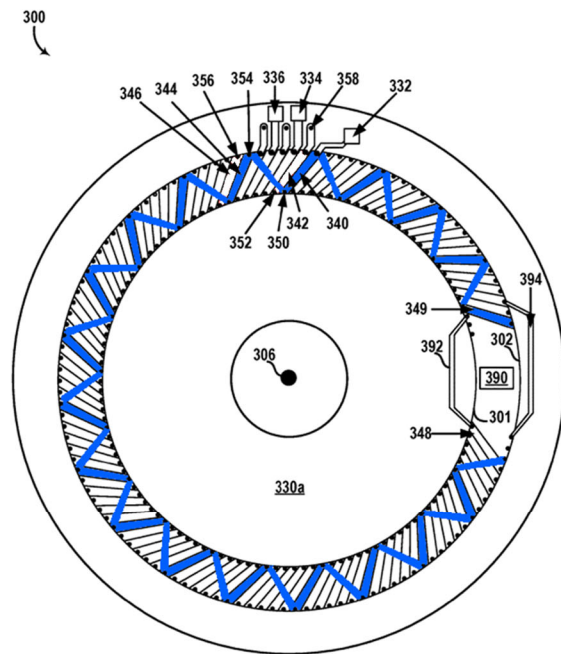


FIG. 3C

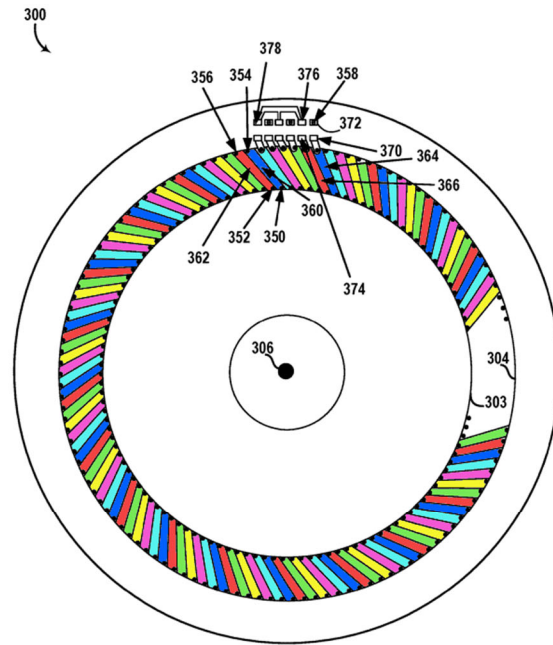
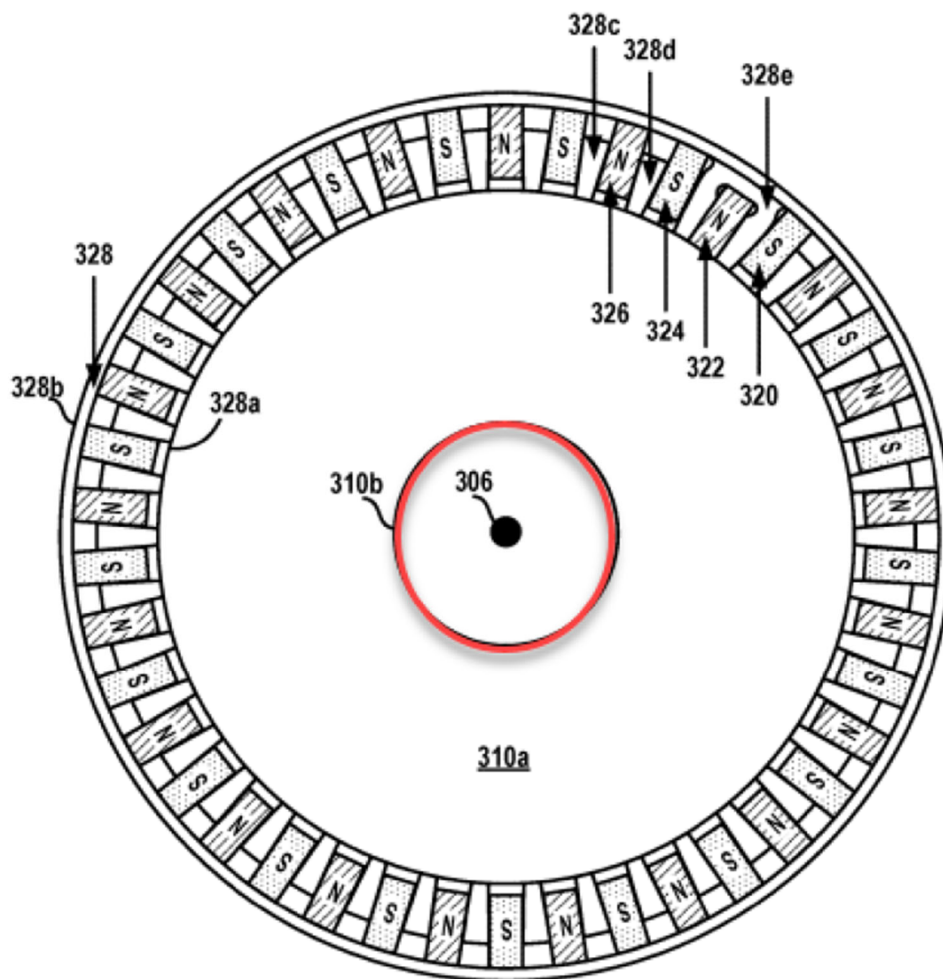


FIG. 3D

Whereas the '515 Patent teaches multiple separate coils each of which comprises a plurality of coil windings extending about each coil's own separate magnetic core (see Ex. 1001 at Fig. 6D), all the "interleaved toroidal coil windings" of Johnson's single electromagnetic coil are wound about a common "shared core region around axis 306." See Ex. 1005 at 13:41-50. Johnson's shared core region within its coil is in the shape of a ring between circles 301 and 302 of Fig. 3C; it may be the middle layers of a PCB and may comprise either dielectric material or a conductive "magnetic core that enhances the stator-platform magnetic field therein." *Id.* at 13:30-14:10.

The Petition asserts Johnson's arrangement "provides a 'compact' design." Petition at 11 (citing Ex. 1045, 4:1-6). However, Johnson explains its compact design carries significant drawbacks. "[I]n some scenarios, adjacent coil windings may be unintentionally (e.g., due to a defect or a manufacturing error, etc.) electrically coupled (e.g., shorted) at locations other than the terminals (e.g., ends) of the respective coil windings," and "testing each coil winding separately may be technically challenging." Ex. 1005 at 3:9-24. Additionally, Johnson's design results in "interference from the stator-platform magnetic field of the coil windings" that affect any other electronic components in the vicinity. *See id.* at 15:1-7.

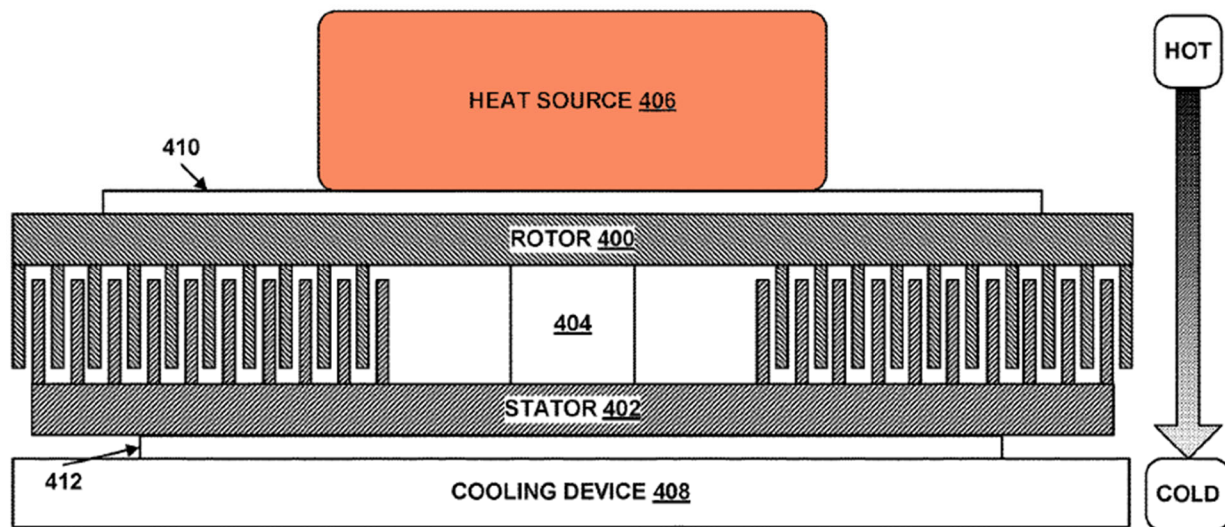
Johnson further describes, with reference to Fig. 3B (reproduced below with annotations from Petition at 50), an annular transformer coil "arranged around edge 310 b" of its rotor, with "a magnetic core (not shown) extending through the center gap to guide a magnetic flux generated by a similar transformer coil (not shown) of platform 330." Ex. 1005 at 11:51-60.



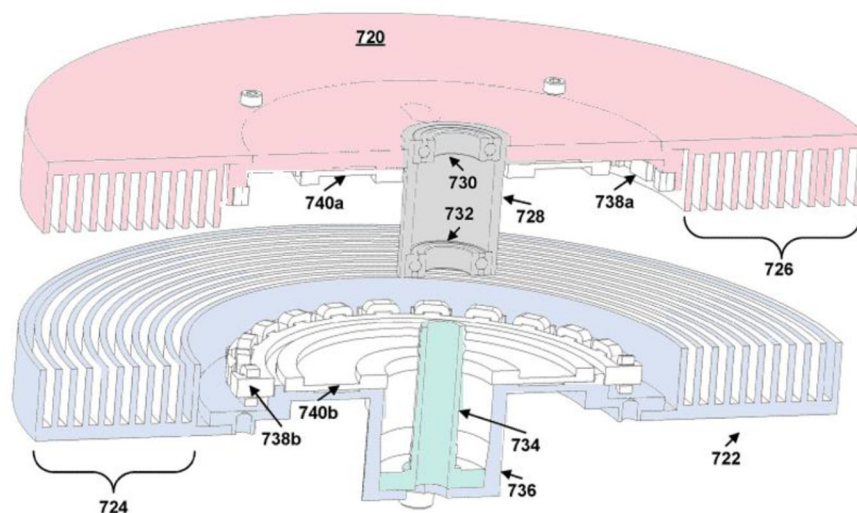
Whereas the claimed invention of the '515 Patent requires wireless power transmitter 648 and receiver 348 “positioned at the outermost region of the boards 622 and 612,” Johnson places its transformer coil in the center region around inner edge 310b as shown in Figs. 3B-3D, and positions the rotor and stator elements—not the transformer coils—at the outermost region of its two boards. *Compare* Ex. 1001 at 31:20-48, Figs. 6A-6E to Ex. 1005 at 11:51-60, Figs. 3B-3D.

C. Pardhan (Ex. 1006)

U.S. Patent No. 10,749,308 (Pardhan, Ex. 1006), entitled “Thermal Rotary Link,” discloses a “thermal rotary link is configured to transfer heat between two or more devices, systems, or objects in rotational motion with respect to one another,” including specifically a rotor and stator. Ex. 1006 at 1:27-34. In contrast to the ’515 Patent, which teaches a compact LIDAR system utilizing VCSELs “much less powerful than the lasers used in [then] currently available LIDAR sensors” (Ex. 1001 at 13:56-58), Pardhan’s LIDAR serves as an exemplar “heat source” in need of cooling. Ex. 1006 at 17:5-9. In particular, Pardhan describes how its “thermal rotary link may be used to transfer heat from a heat source such as a rotating LIDAR device to a cooling device” through the rotor and stator as depicted in Pardhan’s Fig. 4 (reproduced below). *Id.* at 4:39-53, 17:1-7, 18:60-63.



Pardhan explains “[t]he inability to dissipate heat at a sufficient rate may stem from, for example, a density with which the electrical and optical components of the LIDAR device are packaged inside the LIDAR device housing.” Ex. 1006 at 4:54-5:7. Accordingly, Pardhan discloses expanded rotor and stator plates (720, 722), each including an array of concentric fins (726, 724) so that “[h]eat may be transferred from the fins of the rotor to fins of the stator by way of an air gap separating adjacent fins.” *Id.* at 4:39-44, 20:40-50, Fig. 7B. As explained in the Petition, “[t]he rotor plate 720 (along with its fins) may be manufactured as ‘one piece’ that is made from a ‘metallic material with high thermal conductivity’ so as to transfer heat away from the LiDAR device.” Petition at 15 (citing Ex. 1006 at 18:6-19). This is depicted in Pardhan’s Fig. 7B (as annotated in the Petition at 15 and reproduced below).



D. Zhang (Ex. 1007)

WO Publication 2018/201567 (Zhang, Ex. 1007) discloses a “rotating structure for a laser radar” where the rotating structure “employs a design based on a hollow shaft having a large diameter, and portions of the stator (4) and rotor (1) form the hollow shaft, thus leaving enough space in the middle to accommodate a signal transmission structure and an electrical energy transmission structure.” Ex. 1007 at Abstract at 2-3. As depicted in Zhang’s Fig. 2 (reproduced below), the “rotor (1) is in the shape of a cylinder” and the stator (4) “encloses the motor coil 2.” *Id.* at 7. The “first coupling coil (5)” of the electrical power transmission system is likewise “cylindrical” and internal to the rotating structure. *Id.* at 8.

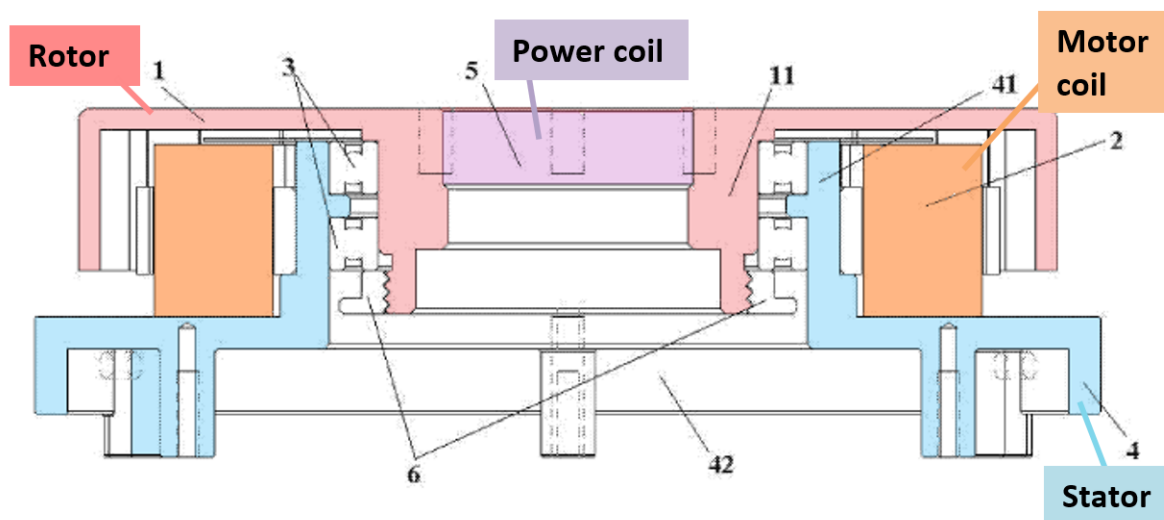


Figure 2

Zhang further teaches “at least one hollowed-out heat dissipation hole (12) is configured on the end face of the rotor (1),” so that “the heat generated during the

operation of the rotating structure inside it can be released in time, increasing the operating life of the rotating structure” as depicted in Fig. 1 (reproduced below with arrows depicting heat being released from the rotating structure). Ex. 1007 at 9. The “heat dissipation module is configured on the end face of the rotor (1), and the heat dissipation module is a fan structure (not marked) formed through the thinning of the end face of rotor.” *Id.*

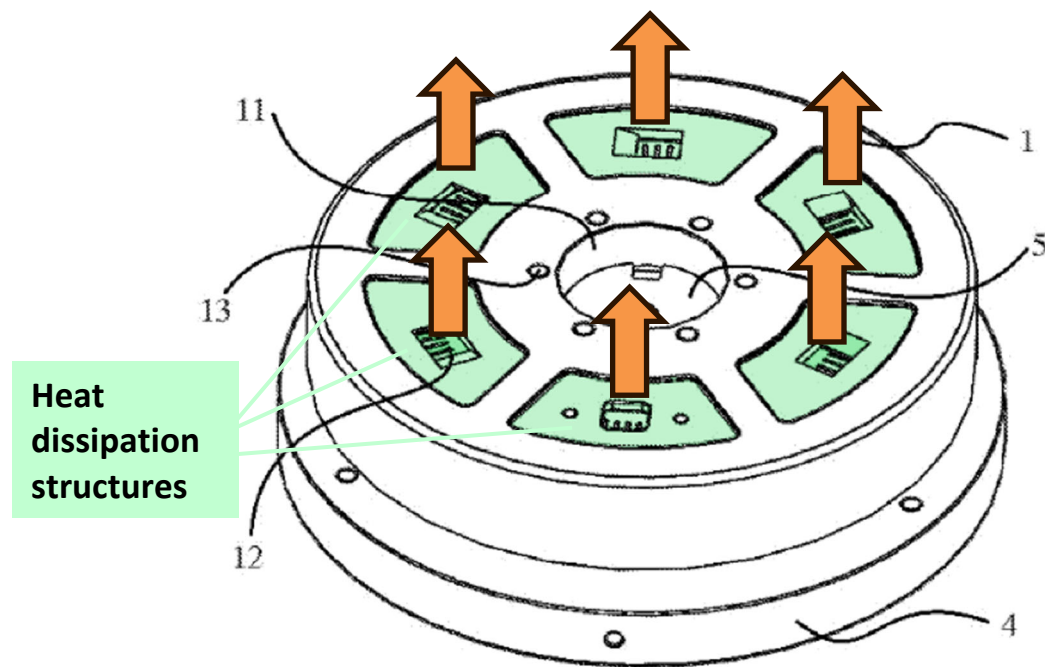


Figure 1

E. Pacala-2017 (Ex. 1013)

U.S. Patent Pub. No. 2017/0289524 (Pacala, Ex. 1013) describes one- and two-dimensional optical systems. *See* Ex. 1013 at [0016] (explaining “the one-dimensional optical system 100 (the ‘system’) functions as an image sensor that,

when rotated about an axis parallel to a column of apertures, collects three-dimensional distance data of a volume occupied by the system.”); *see also id.* at [0057] (describing a second “two-dimensional” system using a “grid array of channels”).

F. Other References

Petitioner secondarily cites Cai (Ex. 1008), Hall (Ex. 1009), Spector (Ex. 1010), Droz (Ex. 1011), and Yan (Ex. 1012). In light of the inadequacy of Petitioner’s primary references, detailed description of these secondary references here would serve no purpose. Cai and Yan are discussed below as appropriate.

VI. THE GROUNDS PRESENTED IN THE PETITION DO NOT RENDER THE CHALLENGED CLAIMS OBVIOUS

All nine Grounds of the Petition include a combination of Pacala (or Pacala-2017) as the primary reference and, at least, Johnson, Pardhan, and Zhang as secondary references. However, at least Johnson and Zhang fail to disclose or suggest elements of the three independent claims (1, 14, and 22) for which the Petition relies upon them. Moreover, the Petition’s purported motivations to combine Pacala (or Pacala-2017), Johnson, Pardhan, and Zhang are inconsistent and conclusory. Johnson, Pardhan, and Zhang teach away from combination with one another and teach away from the claimed invention. Yet Petitioner and its expert fail to acknowledge or address the readily apparent difficulties in combining

the references to achieve the claimed invention. In addition, to the extent these references disclose select features of the claimed invention, Petitioner simply cherry picks features from each reference and argues for the combination of these particular features with no motivation beyond that of reconstructing the claimed invention with the benefit of hindsight, and while ignoring how references teach away from the purported combinations. For purposes of this preliminary response, Ouster has selected and addressed only a small subset of example issues sufficient to show the Petition should not be instituted.²

A. Ground 1: Pacala, in view of Johnson, Pardhan, and Zhang fail to render any of claims 1-2, 4-9, 11, 14, 16-17, 19 unpatentable

Ground 1 fails because Petitioner cannot provide an adequate motivation to combine Johnson and Pardhan. The desirable feature of Johnson is the compact design. This is in direct contrast to the large rotor and stator support structures defining the bulky Pardhan design. Even accepting *arguendo* that a POSITA starting with Pacala would be motivated to use Johnson's rotor and stator to obtain

² By making certain arguments in this Preliminary Response under 35 U.S.C. § 314, Ouster does not waive the right to present additional arguments should the Board institute *inter partes* review proceedings, including arguments that one or more references relied on in the Petition are not prior art to the '515 Patent.

the benefit of its compact design (despite its drawbacks), the POSITA would not then subsequently integrate Johnson's compact rotor and stator into the intentionally voluminous design of Pardhan having fins extending vertically on both the rotor and stator elements, as that would negate the perceived benefit of utilizing Johnson's compact design in the first place. But that is exactly what the Petition proposes.

Similarly, even if Zhang *had* disclosed³ a plurality of arms extending away from the sleeve by way of its heat dissipation structures, the proposed combination of Pardhan and Zhang would destroy the basic objective of those heat dissipation structures: cooling the rotor and stator to increase the operating life of those mechanical components.

Ground 1 also fails to make a *prima facie* showing that the claimed combination of Pacala, in view of Johnson, Pardhan, and Zhang discloses or suggests each and every limitation of independent claims 1 and 14. For example:

- Johnson does not disclose the claim elements 1(g) and 14(h) requiring "a plurality of stator elements." While each of the claimed stator elements must include a coil, not merely multiple coil

³ It did not.

windings, Johnson instead teaches a single coil wound around a single core. Therefore, Johnson neither discloses nor suggests the required plurality of stator elements of the claimed invention.

- Claim 1 additionally requires each stator element include its own magnetic core, which Johnson also does not teach or suggest.
- Claim elements (1(e) and 14(e)) requiring “a support component ... comprising a sleeve fitted over the shaft and a plurality of arms extending away from the sleeve” are not disclosed by the combination of Pardhan’s “hollow shaft 728” with the disclosure of Zhang at least because Zhang does not teach or suggest arms extending away from a sleeve.

Finally, each of dependent claims 4 and 17 recites features also found in independent claim 22. Those arguments with respect to claims 4 and 17 (and thereby also independent claim 22) similarly fail because the Petition’s reliance on Johnson for these features is misplaced.⁴ With respect to claim 4’s (and claim 22’s) recitation of four circuit boards, the Petition contends Johnson, by itself, renders this feature obvious under numerous theories. Johnson, however, discloses only two PCBs (a rotor PCB and a stator PCB) and does not teach or suggest adding

⁴ Ground 1’s arguments for claims 4 and 17 are re-used for claim 22 in Ground 6.

two more. With respect to dependent claim 17's (and claim 22's) recitation that the transformer coils are integrated onto the claimed circuit boards and positioned *outside* an outer perimeter of the rotor and stator elements, the Petition contends a POSITA would modify Johnson's transformer coils positioned *inside* the alleged rotor and stator elements to instead be moved to *outside* those elements so that the claim is met. This argument fails on its face for multiple reasons, (i) it is contrary to Johnson's express disclosure, (ii) there is no room on Johnson's PCB for the claimed coils outside the alleged rotor and stator elements, (iii) increasing the size of the PCBs would be contrary to Johnson's compact design, which is the proffered motivation to combine Johnson and Pacala in the first place, and (iv) there is also no room for this modification within the proposed combination with Pardhan because of the need for the rotor and stator fins to cool the LIDAR.

For at least these reasons, Petitioner fails to show a reasonable likelihood of success as to Ground 1 and the Petition for *inter partes* review should be denied.

i. Petitioner fails to provide an adequate motivation to combine the “compact” design of Johnson with the support structures of Pardhan

As described further below (Section VI.A.ii-iii), Petitioner's proposed combination of references in Ground 1 fails to disclose or suggest each and every limitation of independent claims 1 and 14 in Ground 1. Even if *arguendo* each

claim limitation was present in the identified references, the Petition has failed—as it must given the respective disclosures—to articulate a coherent and consistent motivation to combine the select references. Specifically, the Petition fails to provide an adequate motivation to use Johnson with Pardhan at least because Johnson’s desirable “compact” design is in direct contrast to the large rotor and stator support structures defining the bulky Pardhan design. As a preliminary matter, the Petition contends “Johnson implements the motor as components that are mounted onto the rotor-stator platform in order to provide a compact design.” Petition at 11. The Petition asserts a POSITA, starting with the LIDAR of Pacala, would have been motivated to “improve[] Pacala by providing ‘a more compact design and/or efficient use of space.’” *Id.* at 51-52. As noted above, however, Johnson expressly discloses significant drawbacks to its compact design. *See* Ex. 1005 at 15:1-7, 3:9-24.

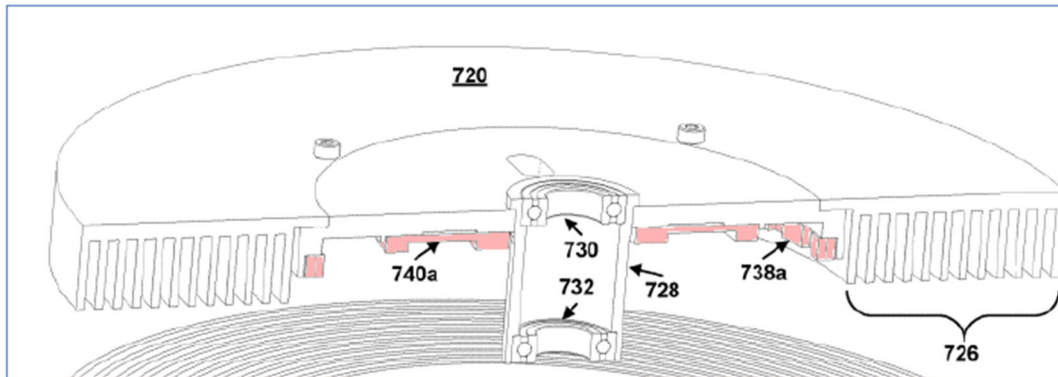
Even accepting *arguendo* that a POSITA starting with Pacala would be motivated to use Johnson’s rotor and stator to obtain the benefit of its compact design (despite its drawbacks), the POSITA would not then subsequently integrate Johnson’s compact rotor and stator into the intentionally voluminous design of Pardhan having, *inter alia*, fins extending vertically on both the rotor and stator

elements, as that would negate the perceived benefit of utilizing Johnson's compact design in the first place. But that is exactly what the Petition proposes.

The Petition asserts Pardhan's "rotor plate 720 (along with its fins) may be manufactured as 'one piece' that is made from a 'metallic material with high thermal conductivity' so as to transfer heat away from the LiDAR device." Petition at 15. The Petition then asserts a "POSITA would have been motivated to implement Pardhan's support component with Johnson's rotor circuit board" to "avoid overheating" and "improve heat dissipation." *Id.* at 30, 53.

The Petition is correct that Pardhan is directed to the transfer of excessive heat away from the LIDAR sensor. It includes vertically oriented fins extending from both the rotor and stator to provide such heat transfer. Ex. 1006 at 18:60-19:6. This achieves a voluminous design that avoids placing heat generating electrical components too densely. *Id.* at 4:63-67. However, it also directly negates the compact design Petitioner alleges to be central to the motivation to combine Pacala and Johnson. Moreover, even though the Petitioner's rationale for combining the motor from Johnson with the LIDAR system of Pacala hinges on the compactness of Johnson's design, the Petition asserts that Johnson's rotor PCB would then be utilized merely as "an intermediary circuit board" for rotor elements within

Pardhan's support component as shown below in the annotated figure from the Petition (at 31) where the proposed location of Johnson's rotor is highlighted red:



Johnson's compact design, which is the sole motivation for incorporating its rotor and stator assemblies into the system, loses its relevance and utility within the much larger structure of Pardhan. This incongruity not only diminishes the asserted benefit of compactness but also illustrates the lack of any logical underpinning of the proposed combination of Pacala, Johnson *and* Pardhan.

Petitioner's reliance on *Wavetronix LLC v. Smart Microwave Sensors GmbH*, 746 F. App'x 984, 987, 991 (Fed. Cir. 2018), does not address this deficiency. Petition at 51. In *Wavetronix*, the primary reference expressly stated the potential for generating a signal of "any desired type," thereby implicitly suggesting the inclusion of additional details, such as those found in the secondary reference on digital signals, specifically. *Id.* at 991 (citation omitted). There is no comparable disclosure in Pacala. Moreover, *Wavetronix* does not give petitioners

carte blanche to pick-and-choose *conflicting* teachings and structures from multiple designs. That is not the law. *KSR* requires, at a minimum, “articulated reasoning with some rational underpinning” to support a prior art combination. *KSR*, 550 U.S. at 418 (*quoting In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). The Petition provides the opposite: its proposed motivation to combine both Johnson *and* Pardhan with Pacala is contradictory and irrational. Assuming—as the Petition contends—that a POSITA would utilize Pardhan’s support component “thereby allowing the device to avoid[] overheating” (Petition at 30), then there is no motivation to use Johnson’s PCB rotor and stator as it provides no benefit within Pardhan’s larger design.

The Petition does not even attempt to address this obvious flaw in its logic. Petitioner’s expert likewise overlooks and fails to address the mistake.

The only reason for combining Pacala, Johnson and Pardhan is improper hindsight reconstruction of the claimed invention. *W.L. Gore & Assocs., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1552 (Fed. Cir. 1983); *see also In re Glatt Air Techs., Inc.*, 630 F.3d at 1029 (holding that a claimed invention itself must be evaluated “as a whole”); *see also Ruiz v. A.B. Chance Co.*, 357 F.3d 1270, 1275 (Fed. Cir. 2004) (“The ‘as a whole’ instruction in title 35 prevents evaluation of the invention part by part” and “[w]ithout this important requirement, an obviousness

assessment might 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.”). As the Petition has failed to demonstrate an adequate, or indeed any rational motivation to combine Johnson and Pardhan, *inter partes* review should not be instituted.

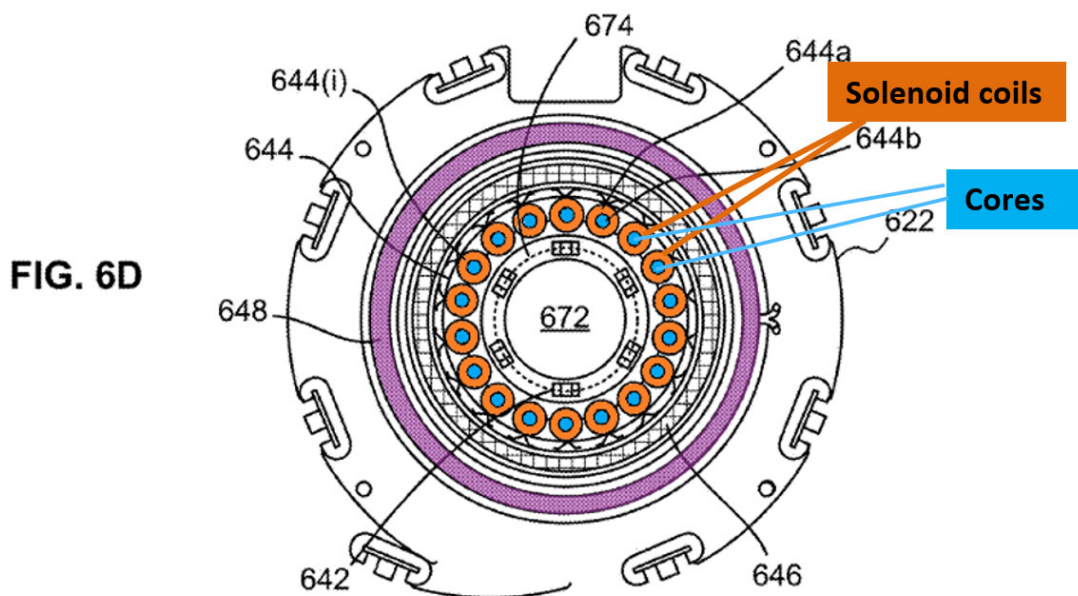
ii. Petitioner’s proposed combination does not disclose or render obvious the required “plurality of stator elements” of elements 1(g) and 14(h)

Claim element 1(g) recites “a plurality of stator elements arranged annularly about the axis of rotation, each of the plurality of stator elements including a coil wound around a magnetic core.” The Petition at 36-37 (and 31-33) relies on Johnson as disclosing element 1(g). Johnson discloses its single “electromagnetic coil may include multiple coil windings (e.g., coil-shaped wires, etc.) that extend around a core area (e.g., ‘magnetic axis’) at the center of the coil.” Ex. 1005 at 1:21-36, Fig. 1, 4:56-5:7. The Petition relies on Johnson’s embodiment where “a ‘ring shaped’ core may be disposed in the middle layer of platform 330 ‘between the conductive structures of Figs. 3C and 3D’” as meeting element 1(g). Petition at 37. This is erroneous for several reasons.

First, Johnson’s disclosure of a single coil wound around a single, ring-shaped core does not teach or suggest claim element 1(g), which requires a

plurality of stator elements *each* including a coil wound around a magnetic core—consistent with the '515 Patent's written description. *See* Ex. 1001 at 30:15-35.

The '515 Patent teaches and claims “an annular arrangement of multiple stator elements 644(i)” where “[e]ach stator element 644(i) can include a solenoid coil 644a wound around a core 644b of magnetic material.” *Id.* at 30:15-26. Fig. 6D of the '515 Patent (reproduced below) shows, as an example, eighteen (18) individual stator elements 644(i), each including a coil wound around a magnetic core (*i.e.*, 18 coils and 18 cores). *Id.* at 30:30-35. Although the claim is not limited to any particular number of stator elements, each including a coil wound around a magnetic core, the claim requires there must be more than one (*i.e.*, a plurality). This is not disclosed or suggested by Johnson's single coil, single core design.



Second, the Petition incorrectly assumes that because Johnson’s single coil includes a plurality of coil *windings*, the “plurality of stator elements” limitation is disclosed. However, as explained by Johnson itself, a single coil includes multiple coil windings, and the claim language plainly requires *each* stator element includes a *coil*—not merely a coil *winding*. *See e.g.*, Ex. 1005 at 1:21-36 (“the electromagnetic coil may include multiple coil windings.”)

Third, even assuming, *arguendo*, Johnson’s disclosure of multiple coil windings could somehow be considered a “plurality of stator elements each including a coil,” Johnson’s coil windings are interleaved with one another and not “arranged annularly about the axis of rotation” (*i.e.*, “evenly spaced apart from each other” in a ring) as required by claim element 1(g). *See* Ex. 1001 at 30:29-35. Moreover, claim element 1(g) requires each stator element to include its own magnetic core, and Johnson indisputably discloses a single ring-shaped core. *See* Petition at 37 (citing Ex. 1005 at 14:1-10, 5:41-56).

For all of above-listed reasons, Johnson fails to disclose or suggest element 1(g).

Claim element 14(h) similarly recites “...a plurality of stator elements arranged annularly about the axis of rotation, each of the plurality of stator elements including a coil.” This is the same claim language as element 1(g) except

that claim 14 does not expressly require each of the plurality of stator elements to include a magnetic core. The Petition (at 31-33) also relies on Johnson as disclosing element 14(h) for the same reasons as set forth for element 1(g). Johnson, however, fails to disclose or suggest claim element 14(h) for the same reasons it fails to disclose or suggest element 1(g) as set forth in detail above.

On this record, Petitioner has failed to make a *prima facie* showing of obviousness with respect to the claim elements (1(g) and 14(h)) requiring a plurality of stator elements arranged annularly about the axis of rotation, each of the plurality of stator elements including a coil. Thus, *inter partes* review should not be instituted.

iii. Petitioner’s proposed combination does not disclose or render obvious the required “plurality of arms extending away from the sleeve”

Ground 1 also fails to make a *prima facie* showing of obviousness with respect to the claim elements (1(e) and 14(e)) requiring “a support component ... comprising a sleeve fitted over the shaft and a plurality of arms extending away from the sleeve.” The Petition identifies Pardhan’s “hollow shaft 728” as the claimed sleeve. Petition at 24-25. In order to satisfy claim elements 1(e) and 14(e), the Petition asserts a POSITA would have combined Pardhan’s shaft 728 with

“Zhang’s arms on the upper surface of the support component to prevent overheating.” Petition at 27.

Zhang, however, does not teach or suggest a plurality of arms extending away from a sleeve. The only support for the Petition’s contrary contention is its selective coloring of Zhang’s Fig. 1 to make it appear as though arms are present. In fact, Zhang teaches “heat dissipation” modules that are “configured on the end face of the rotor (1)” and “formed through the thinning of the end face of rotor” as depicted in Zhang’s Fig 1 (reproduced and annotated below to show heat dissipating from Zhang’s rotating structure). Ex. 1007 at 9.

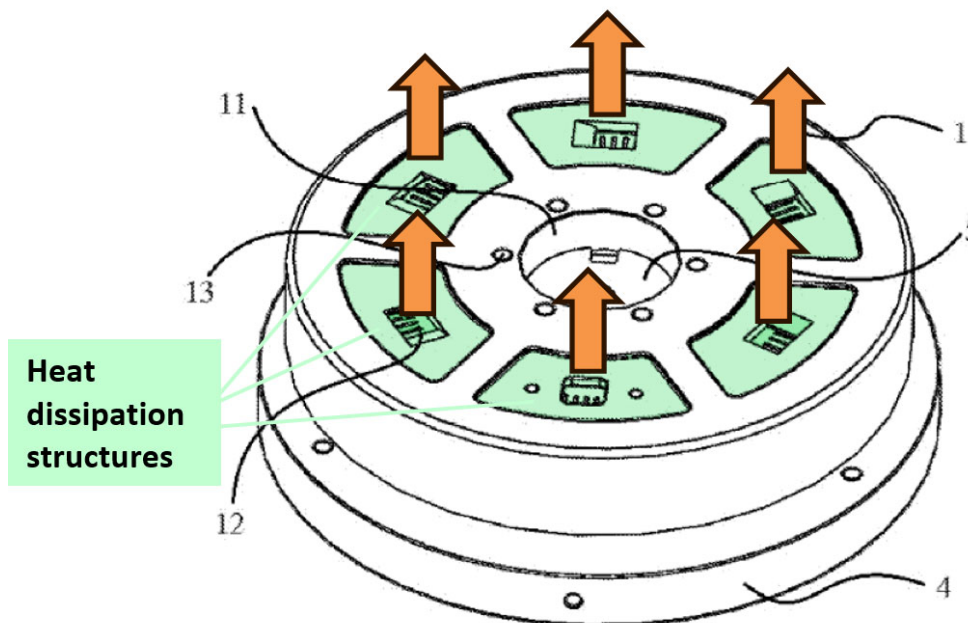
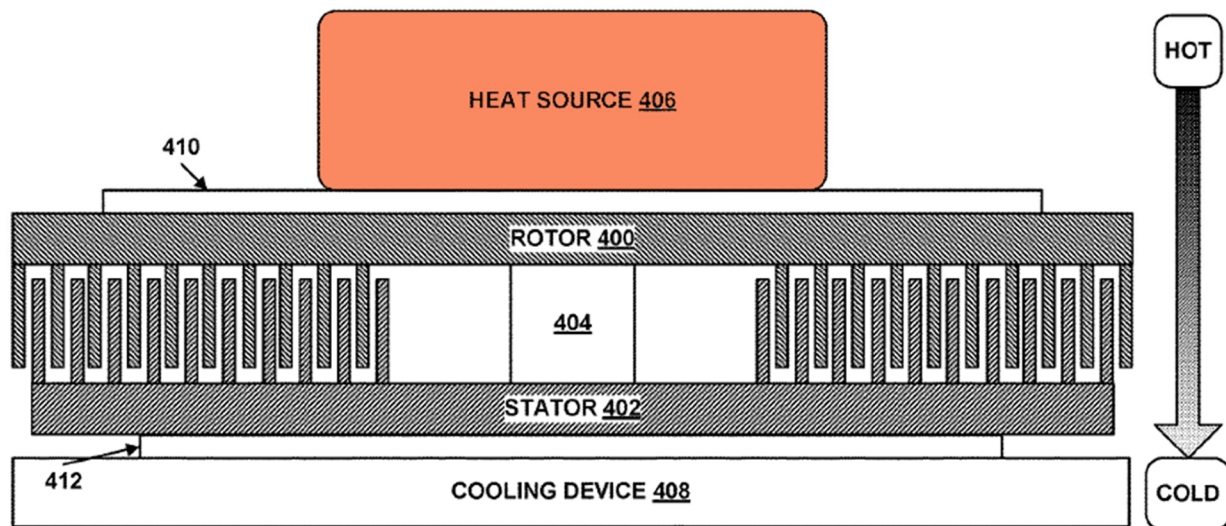


Figure 1

Moreover, even accepting *arguendo* that Zhang’s heat dissipation structures inherently result in a “plurality of arms extending away from the sleeve,” Zhang teaches away from using such structures within the Pacala, Johnson, Pardhan combination. Zhang’s heat dissipation structures are provided so heat produced inside the rotating structure (e.g. from the rotor and stator) “can be released,” thus “increasing the operating life of the rotating structure.” Ex. 1007 at 9. Pardhan, in contrast, teaches using the rotor and stator as a heat sink to pull heat produced outside to the rotor and stator, specifically from the LIDAR device. *See e.g.*, Ex. 1006 at Fig. 4.



The Petition’s proposed combination “transfers excess heat away from the LiDAR sensor, thereby allowing the device to avoid[] overheating.” Petition at 30.

However, as depicted in Pardhan's Fig. 4 (reproduced above), the LIDAR "heat source" in the proposed combination would be above Zhang's dissipation structures on the face of the rotor, prevent them from "releas[ing]" the heat from inside the rotor and stator in order to "increase[e] the operating life of the rotating structure" and thus "destroy the basic objective" of Zhang's heat dissipation structures. *Trivascular*, 812 F.3d at 1068. Thus, Zhang teaches away from the proposed combination with Pardhan. *Id.* at 1069.

iv. Petitioner's proposed combination does not disclose or render obvious the required four circuit boards

Independent claim 22 recites four circuit boards as does dependent claim 4. The Petition first addresses this limitation in terms of dependent claim 4 and Ground 1. The Petition contends Johnson, by itself, renders these four circuit boards obvious under numerous theories. Johnson, however, discloses only two PCBs (a rotor PCB and a stator PCB) and does not teach or suggest adding two more.

Claim 4 requires "a third circuit board fixedly coupled to the base ... and disposed between the enclosure base and the stator circuit board" as well as "a fourth circuit board coupled to rotate with the rotor circuit board between the

enclosure top and the rotor circuit board.”⁵ Johnson describes implementing each of its rotor and its stator using a printed circuit board. It does not describe the use of additional third and fourth circuit boards. The Petition nevertheless alleges Johnson discloses the “third circuit board” in the form of “the bottom layer of the PCB (on the bottom side of the stator platform)” as opposed to the top layer of the PCB, which the Petition contends would be the claimed “stator circuit board.” Petition at 41. The claim language, however, calls for separate circuit boards, not opposing faces of the same circuit board.

The Petition further alleges the claimed “rotor circuit board is an ‘outer layer of a circuit board’ on the bottom side (310a) of the rotor platform” and “Johnson’s disclosure of an ‘outer layer’ ... at least render[s] obvious an ‘inner’ layer of the

⁵ Independent claim 22 similarly requires four circuit boards (*i.e.*, claim elements 22(d.i), 22(d.ii), 22(e.ii) and 22(e.iii)). The Petition addresses claim 22’s four circuit boards by, in part, incorporating its Ground 1 discussion, and this response likewise addresses this limitation first in terms of Ground 1. *See e.g.*, Petition at 90 & n.3 (citing “Section IX.E.1(g)” for 22(e.ii) and correctly noting “[t]he “third circuit board” of claim 22 corresponds to the ‘rotor circuit board’ of claims 1 and 14.”)

circuit board on which additional electronics may be mounted.” Petition at 41. Johnson, however, does not disclose *any* “inner” layer of the “circuit board” forming the bottom side of the rotor platform *nor* any need for one. Because Johnson discloses an inner layer for the stator platform but not for the rotor platform, the skilled artisan would conclude that the rotor platform did not need an inner layer. Johnson knew how to discuss an inner layer if one was required. Johnson naturally also does not provide any disclosure of the need for any “additional electronics” or other components to be mounted on this undisclosed inner layer.

The Petition goes out on a limb in first attempting to argue that opposing faces of a single PCB, a “layer,” each constitute a separate “circuit board”—contrary to the plain language of the claim. On this shaky ground, Petitioner contends Johnson discloses the claimed “third circuit board,” and then stretches further still to argue that an additional “layer”—that Johnson plainly does not disclose for the rotor—would constitute the claimed “fourth circuit board.”

Worse yet is the Petition’s alternative argument that it would have been obvious to implement Johnson’s multi-layer PCB as multiple single-layer PCBs due to the drawbacks of multi-layer PCBs. *See* Petition at 42. To assert the independent claims are met, the Petition expressly relies on Johnson’s teachings of

toroidal coil windings formed in two separate layers of a single multi-layer PCB (depicted in Johnson's 3C and 3D) that are bridged by interconnect elements such as 350, 352, 354 and 356 as explained above. *See* Petition at 31-33, 36-37. Thus, the Petition's proposed modification of Johnson to meet the third and fourth circuit board elements of claim 4 would mean that element 1(g) is no longer met, so claim 4 would still not be rendered obvious by the proposed modified system since it could not possibly be "[t]he light ranging system of claim 1." Moreover, this alternative argument is inapplicable to the "fourth circuit board" since Johnson only discloses the use of multi-layer PCBs in relation to the stator and not the rotor.

For Ground 1, this results in failure to show dependent claim 4 is obvious. As discussed below, the same error is repeated again in Ground 6 for independent claim 22.

v. Petitioner's proposed combination does not disclose or render obvious the required first and second transformer coils "positioned outside an outer perimeter" of the plurality of stator elements and rotor assembly annular arrangement

Independent claim 22 recites transformer coils integrated onto the claimed circuit boards and positioned outside an outer perimeter of the rotor and stator

elements. Like the four circuit boards discussed above, the Petition first addresses this limitation in terms of dependent claim 17 and Grounds 1 and 2.

Claim 17 requires a “wireless power transformer comprising a first annular transformer coil . . . positioned outside an outer perimeter of the plurality of stator elements” and a “second transformer coil . . . positioned outside an outer perimeter of the rotor assembly annular arrangement.” The Petition contends this is disclosed by Johnson. *See* Petition at 48-51. It is, however, undisputed that Johnson discloses a wireless transformer coil positioned *inside* an outer perimeter of what the Petition contends are the plurality of stator elements and the annular arrangement of magnetic poles in the rotor assembly. *See id.* at 50 (admitting Johnson’s “Figures 3B-3C illustrate the transformer coils on the inside of the stator and rotor elements”). The Petition nevertheless asserts it would have been obvious to position transformer coils outside of the stator and rotor elements as one of a limited number of obvious design choices and because Johnson states “[o]ther configurations are possible.” *Id.* at 50-51. But there is no room for Johnson’s transformer coils to be positioned outside of its stator and rotor elements because those elements are expressly placed at the outermost portion of the rotor and stator platforms. *See* Johnson’s Figs. 3B and 3C (reproduced below).

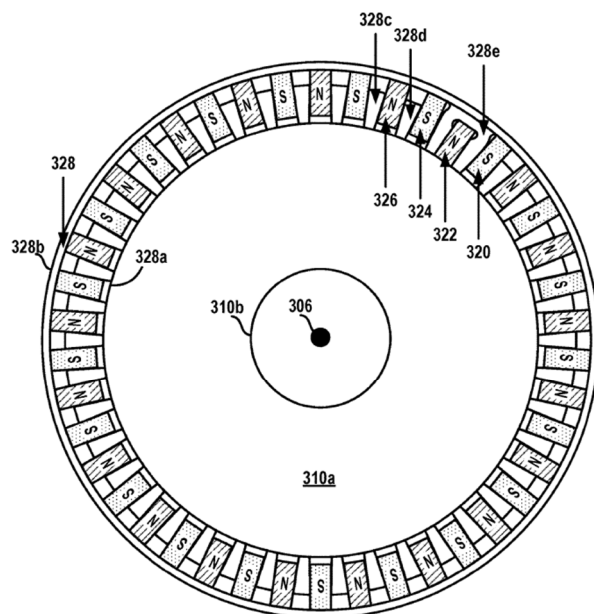


FIG. 3B

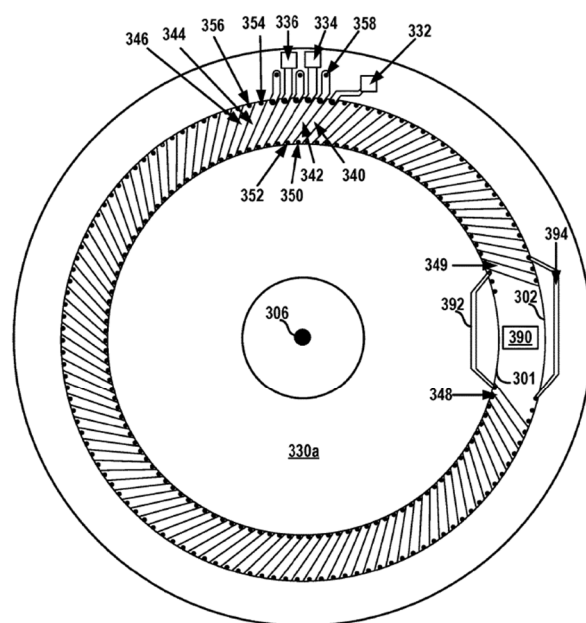


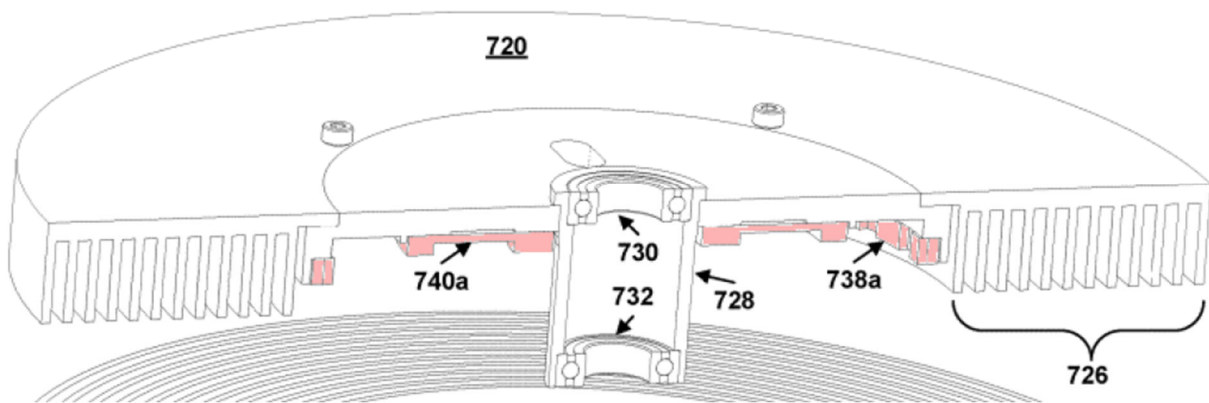
FIG. 3C

Johnson's transformer coils are placed inside of its rotor and stator elements because that is the space made available for them within Johnson's intentionally compact design. Expanding the size of the rotor and stator platforms to accommodate transformer coils *outside* of Johnson's rotor and stator elements would run counter to Johnson's compact design and undercut the very reason the Petition contends a POSITA using Pacala's LIDAR would have chosen Johnson in the first place. *See* Petition at 21.

Moreover, in the proposed combination of Johnson and Pardhan, the Petition asserts Pardhan's support component is used because it "transfers excess heat away

from the LiDAR sensor, thereby allowing the device to avoid[] overheating.”

Petition at 30. The Petition explains “Pardhan itself teaches that the rotor elements (e.g., magnets 738a and transform windings 740a) should be positioned in th[e] arrangement ... shown below” where the transform windings 740a are *inside* of the rotor elements 738a and there is no room for them to be positioned outside due to Pardhan’s fins 726, which are necessary “to avoid[] overheating.” *Id.*; *see also id.* at 53 (describing the motivation to utilize Pardhan’s “support component which includes a rotor plate 720 (with fins)”).



Thus, the Petition admits that Pardhan, like Johnson, teaches away from positioning transformer coils *outside* of the rotor and stator elements as required by the claimed invention. *See, e.g., Polaris Indus., Inc. v. Arctic Cat, Inc.*, 882 F.3d 1056, 1067-70, 1069 n.4 (Fed. Cir. 2018) (vacating, and remanding, obviousness finding where Board “failed to consider that “[m]erely stating that a particular

placement of an element is a design choice does not make it obvious” and mandating Board perform a teaching away analysis on remand to determine whether a reference’s “stated desire for a low center of gravity” “criticize[d], discredit[ed], or otherwise discourage[d]” the proposed modification to “raise the . . . center of gravity”) (first alteration in original) (citations omitted).

Accordingly, the Petitioner has failed to make a *prima facie* showing of obviousness with respect to claim 17 and Ground 1. The same error is repeated in Ground 6 for independent claim 22.

vi. Ground 1 fails to show any of the challenged claims are obvious

Although the Petition makes additional errors in its analysis of the challenged claims under Ground 1, the above identified failures show clearly that the Petition does not demonstrate a reasonable likelihood that Petitioner will prevail with respect to any of claims 1-2, 4-9, 11, 14, 16-17, 19 under Ground 1.

B. Grounds 2-5 fail to render any of the dependent claims unpatentable

Grounds 2-5 use the same combination of Pacala, Johnson, Pardhan, and Zhang as set forth in Ground 1 with further modifications addressing certain dependent claims. *See* Petition at 59, 65, 68, 72-73, 76-77, 79-80. Grounds 2-5 challenge claims depending from claims 1 and 14. Because Ouster’s arguments in

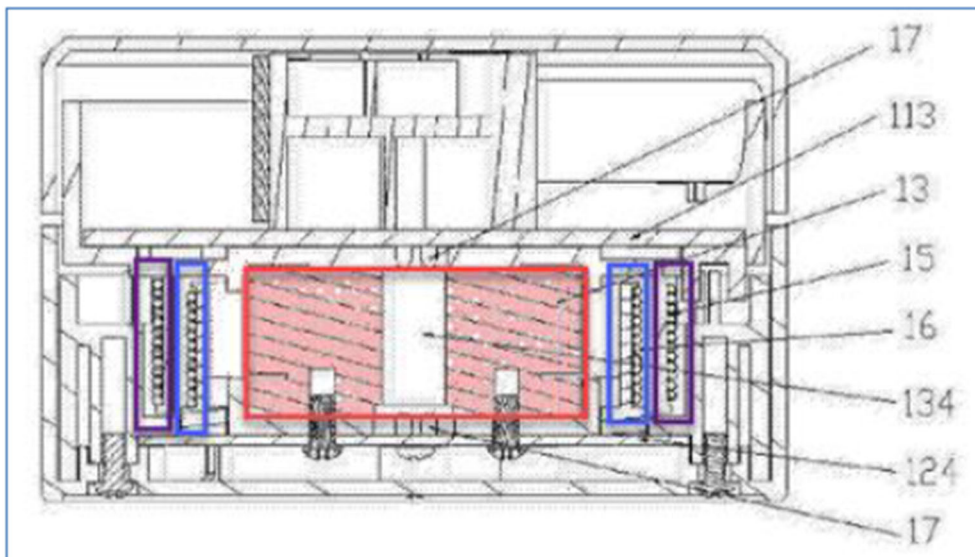
Sections VI.A *supra* show that each of independent claims 1, 14 are non-obvious, these dependent claims are also nonobvious. *See e.g., In re Fritch*, 972 F.2d 1260, 1266 (Fed. Cir. 1992) (“Dependent claims are nonobvious if the . . . claims from which they depend are nonobvious.”)

Additionally, Grounds 2-5 further fail because of a lack of motivation to combine the additional references with the combination of Ground 1 and because those references do not teach or suggest the limitations for which the Petition relies upon. As one non-limiting example, the Petition fails to show, in Ground 2, how Cai rectifies the defects of Ground 1 as to claim 17.

As explained above, claim 17—like independent claim 22—requires “a wireless power transformer integrated directly onto the stator and rotor circuit boards, the wireless power transformer comprising a first annular transformer coil disposed on a surface of the stator circuit board and a second annular transformer coil disposed on a surface of the rotor circuit board in an opposing relationship with the first annular transformer coil, wherein the first transformer coil is concentric with and positioned outside an outer perimeter of the plurality of stator elements and the second transformer coil is concentric with and positioned outside an outer perimeter of the rotor assembly annular arrangement.”

The Petition asserts that Cai shows transformer coils “outside an outer perimeter” of its motor. This does not change the fact that there is no room in the Johnson-Pardhan combination to move the transformer coils—which both Johnson and Pardhan teach should be in the free space *inside* of the rotor and stator elements—*outside* of those elements. *See* Section VI.A.v *supra*.

Further, as explained in the Petition, Cai’s “Figure 8 . . . shows the [transformer] coils (purple and blue) are outside the motor (red)” as depicted below.



Petition at 64.

The Petition contends “[a] POSITA would have understood that Johnson’s stator and rotor elements are housed in the motor, such that the transformer coils in Cai, when applied to Johnson, would have been concentric with and positioned

outside an outer perimeter of the stator elements and rotor assembly” as shown above. Petition at 65. Claim 17, however, expressly requires “a wireless power transformer integrated directly onto the stator and rotor circuit boards.” It further recites “a first annular transformer coil disposed on a surface of the stator circuit board,” and “a second annular transformer coil disposed on a surface of the rotor circuit board.” Because Cai’s transformer coils are outside an outer perimeter of the motor, they are necessarily outside an outer perimeter of Johnson’s PCBs—which are part of that motor—and cannot be disposed on surfaces of those PCBs as required by the claim.⁶

Accordingly, Cai teaches away from the claimed invention since it teaches placing transformer coils outside of the motor where the stator and rotor circuit boards are located, but claim 17 requires integrating the transformer coils “directly onto the stator and rotor circuit boards” such that one coil is “disposed on a surface

⁶ Johnson’s PCBs are the purported “rotor circuit board” and “stator circuit board.” *See e.g.*, Petition at 21-22, 28-29, 32 (“Figures 3C-3D are layers of Johnson’s stator circuit board. . .”), 33-34 (“Figure 3B of Johnson shows a rotor assembly with magnets mounted concentrically on the rotor circuit board”).

of the stator circuit board” and the other “disposed on a surface of the rotor circuit board.”

For Ground 2, this results in failure to show dependent claim 17 is obvious. As discussed below, the same error is repeated again in Ground 6 for independent claim 22.

C. Ground 6: Pacala, Johnson, Pardhan, Zhang, Droz, and Cai further in view of Yan fail to render claims 22-24 unpatentable

Ground 6 utilizes the same Pacala-Johnson-Pardhan-Zhang combination of Ground 1 but further adds three additional references: Droz, Cai, and Yan to address independent claim 22 and dependent claims 23 and 24. The Petition asserts “[m]ost limitations in claim 22 correspond to those in claims 1 and 14, and are thus rendered obvious by the Ground 1 references” citing “Sections IX.B.1-2” of the Petition. Petition at 83. Accordingly, Ground 6 fails for the same reasons described in Section VI.A above for Ground 1. Additionally, the Petition fails to provide a rational motivation for further combining Ground 1 with Droz, Cai and Yan, and those references fail to teach elements for which the Petition relies upon them. For example, the proposed combination fails to disclose or suggest each of:

- the “plurality of stator elements”
- the “plurality of arms extending away from the sleeve”

- the recited four circuit boards; and
- a “wireless power transformer comprising a first annular transformer coil . . . positioned outside an outer perimeter of the plurality of stator elements” and a “second transformer coil . . . positioned outside an outer perimeter of the rotor assembly annular arrangement.”

For at least these reasons the Petition has failed to show a reasonable likelihood of success at to Ground 6.

i. Petitioner provides inadequate motivation to combine the “compact” design of Johnson with the support structures of Pardhan

Ground 6 relies upon the same purported motivation to combine Pacala, Pardhan, and Johnson cited for Ground 1. *See* Petition at 83-86, 90-91 (citing e.g., Petition at 30-33). This proposed combination is irrational for the reasons explained above in Section VI.A.ii. A POSITA starting with Pacala’s LIDAR would not choose Johnson’s design for its compactness only to irrationally negate that perceived benefit by placing the compact design within Pardhan’s voluminous support structures. Section VI.A.ii *supra*. The only reason for combining Pacala, Johnson and Pardhan is improper hindsight.

ii. Petitioner’s proposed combination does not disclose or render obvious the required “plurality of stator elements” of element 22(d.iii)

Claim element 22(d.iii) recites “a stator assembly comprising a plurality of stator elements arranged about the axis of rotation.” The Petition (at 86) relies upon the same disclosure from Johnson utilized for claim elements 1(g) and 14(h) in Ground 1 as satisfying element 22(d.iii) for Ground 6. For the same reasons described above in Section VI.A.i, Johnson’s plurality of “coil windings” does not teach or suggest element 22(d.iii). Johnson teaches a single toroidal coil with multiple coil windings. While the Petition attempts to map Johnson’s “coil windings” to the “plurality of stator elements,” the language of the claims and specification requires separate coils and cores. Section VI.A.i *supra*. Moreover, Johnson’s coil windings are not “arranged about the axis of rotation” (*i.e.*, “evenly spaced apart from each other” in a ring) as required by claim element 22(d.iii).

Johnson thus fails to disclose or suggest element 22(d.iii).

iii. Petitioner’s proposed combination does not disclose or render obvious the required “plurality of arms extending away from the sleeve” (22(e.i))

Like independent claims 1 and 14, independent claim 22 recites “a plurality of arms extending away from the sleeve.” The Petition relies on the same arguments made for Ground 1 to allege Pardhan and Zhang disclose or suggest this

limitation. *See* Petition at 86-87 (citing Petition Sections IX.E.1(e)-(f)). These arguments fail for the same reasons described in Section VI.A.iii *supra*.

iv. Petitioner’s proposed combination does not disclose or render obvious the four required “circuit boards” of claim 22 (elements 22(d.i), (d.ii), (e.ii), (e.iii))

a. Johnson does not disclose or suggest two circuit boards as part of the stator

Independent claim 22 recites a “stator circuit board assembly comprising . . . a first circuit board [22(d.i)] . . .[and] a second circuit board [22(d.ii)].”

As with Ground 1, the Petition asserts Johnson discloses a stator circuit board assembly comprising a first and second circuit board because it discloses a PCB with multiple layers or because a POSITA would have used two circuit boards in the stator assembly in place of the multilayer PCB. *See* Petition at 85-86. However, as explained in Section VI.A.iv *supra*, (i) a “layer” is not a “circuit board,” (ii) Johnson discloses implementing its stator on, at most, one circuit board (if it can be considered a “circuit” board at all), and (iii) the Petition’s proposal to split Johnson’s multilayer PCB into multiple separate PCBs is inconsistent with its reliance on the interleaved toroidal coil windings built into multiple layers of Johnson’s multilayer PCB to satisfy the “plurality of stator elements” limitation (22(e.iii)). Accordingly, Ground 6 fails to disclose the “first circuit board” and

“second circuit board” of claim 22 for the same reasons described in Section VI.A.iv as to Ground 1.

b. Johnson does not disclose or suggest two circuit boards as part of the rotor

Independent claim 22 further recites a “rotor circuit board assembly comprising . . . a support component having lower and upper surfaces [22(e.i)]. . . a third circuit board coupled to the lower surface of the support component [22(e.ii)] . . .[and] “a fourth circuit board coupled to the upper surface of the support component [22(e.ii)].” The Petition at (90-91) relies on the same argument for Ground 1 to assert Johnson’s “PCB layer in Figure 3B is the claimed ‘third circuit board’” of claim 22.

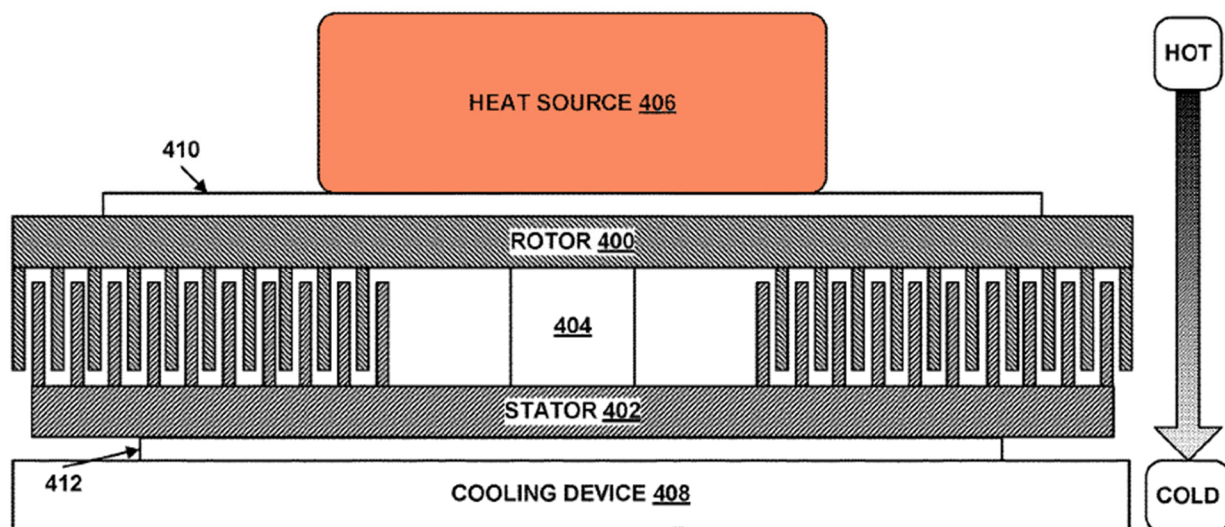
For the claimed “fourth circuit board coupled to the upper surface of the support component [22(e.ii)],” the Petition at (92-93) no longer asserts that different layers of a PCB are different circuit boards but instead asserts that “space on Johnson’s rotor circuit board (Figure 3B) is finite, such that it was obvious to provide additional rotor circuit boards” and that mounting “these additional [untaught] rotor circuit boards” either “above or below the support component” were both obvious. The Petition’s claim that multiple rotor circuit boards were

obvious fails for the same reasons for Ground 6 as described above for Ground 1 in Sections IV.A.iv.

c. There is no motivation to add a fourth circuit board “coupled to the upper surface of the support component” of the proposed combination of Ground 6

Even assuming *arguendo* a POSITA would be motivated to add a “fourth circuit board” specifically to the rotor of the proposed Pacala-Johnson-Pardhan-Zhang combination, the Petition’s proposed placement of that circuit board *above* Pardhan’s support component is irrational; it would render the proposed combination inoperable because sensitive electronics (*i.e.*, the fourth circuit board) would be placed as an intervening component immediately between Pardhan’s heat source (the LIDAR) and heat sink (the rotor and stator). While the Petition relies on Yan’s circuit board as disclosing this limitation, Yan’s circuit board is placed beneath a *low-power* ranging device for an *indoor sweeping robot*. Unlike the vehicular LIDAR of Pardhan, Yan describes no issues with overheating of its sweeping robot. The Petition offers no evidence whatsoever that a skilled artisan would rely on Yan’s placement of components in its sweeping robot to override Pardhan’s thermal configuration for a LIDAR system. The vast differences in those two references are never *acknowledged*, let alone addressed.

Pardhan describes how its “thermal rotary link may be used to transfer heat from a heat source such as a rotating LIDAR device to a cooling device” through the rotor and stator as depicted in Pardhan’s Fig. 4 (reproduced below). Ex. 1006 at 4:39-53, 17:6-7, 18:60-63.



The Petition cites Cai and Yan—neither of which discloses four circuit boards—as evidence that a circuit board *can* be mounted on the top surface of a support component in some designs. Petition at 92-93. But the design of the proposed combination of Ground 6 greatly differs from Cai and Yan—neither of which addresses the anticipated overheating of a LIDAR component.

The Petition expressly asserts a POSITA would have been motivated to use Pardhan’s support component because it “transfers excess heat away from the

LiDAR sensor, thereby allowing the device to avoid[] overheating.” Petition at 86-87 (citing Petition at 30). As shown above, Pardhan expressly teaches placement of “coupling 410” between heat source 406 and rotor 400 in order to “thermally and/or mechanically” couple the two components. Ex. 1006 at 16:55-56. Pardhan thus teaches away from placing a circuit board in that location because doing so would disrupt the heat “flow from heat source 406, through coupling 410, to rotor 400 and fins 500-599 thereof” and prevent the LIDAR device from being “maintained at a stable operating temperature,” which is Pardhan’s primary concern. *Id.* at 18:60-19:6; *see Trivascular*, 812 F.3d at 1068 (finding no motivation to modify the prior art where doing so “would destroy the basic objective” of the prior art); *see also Chemours Co. FC, LLC v. Daikin Indus., Ltd.*, 4 F.4th 1370, 1376-77 (Fed. Cir. 2021), *cert. denied*, 142 S. Ct. 1418 (2022).

In seeking a way to meet the alignment post limitations of claim 22, the Petition landed upon Yan’s circuit board, specifically, as part of the proposed combination of Ground 6. *See e.g.*, Petition at 93. Yan, however, relates to “an automatic sweeping robot” not a vehicular LIDAR system. Ex. 1012 at [0004], [0075]-[0076]. Yan explains that range detecting devices suitable for sweeping robots were disclosed in Shah. *Id.* at [0005] (citing Shah, Ex. 1016). Shah explains that such indoor range detecting devices “exhibit[ed] low power consumption

requirements of 2 W or less.” *E.g.*, Ex. 1016 at [0027]. In contrast, Pardhan explains that “[i]n order to acquire scans with a sufficient resolution or signal-to-noise ratio, the power with which the LIDAR device is operated might need to be above a threshold power level” but that “operating the LIDAR device above the threshold power level may generate excess heat that the LIDAR device might not be able to dissipate at a rate sufficient to maintain the LIDAR device within a safe operating temperature range”—hence the need for Pardhan’s finned rotor plate. *Id.* at 4:54-63. Whereas Yan’s circuit board was capable of being placed directly underneath its low-power range detecting device—one suitable for an indoor sweeping robot—there is no evidence a skilled artisan would adopt the same configuration for a vehicular LIDAR system.

The Petition’s proposed placement of Yan’s putative “fourth circuit board,” in Ground 6, between Pardhan’s LIDAR heat source and heat sink is not merely counterproductive but could lead to a catastrophic failure of the system due to overheating of either the LIDAR or the fourth circuit board itself. *See AstraZeneca AB v. Mylan Pharms. Inc.*, 19 F.4th 1325, 1337-38 (Fed. Cir. 2021) (explaining that a reference teaches away “if a skilled artisan ‘upon reading the reference . . . would be led in a direction divergent from the path that was taken in the claim’”) (citations omitted); *see also Polaris*, 882 F.3d at 1067-70. The Petition fails to

acknowledge or address this blatant design flaw in its proposed combination and thus Petitioner has failed to carry its burden as to obviousness.

Finally, Pardhan teaches away from “a fourth circuit board coupled to the upper surface of the support component” because this would disrupt its cooling system for the LIDAR—the very reason its support component was included in the proposed combination. “An inference of nonobviousness is especially strong where the prior art’s teachings undermine the very reason being proffered as to why a person of ordinary skill would have combined the known elements.” *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1326 (Fed. Cir. 2009). That is the case here with Pardhan’s teachings.

Because Petitioner fails to provide any rational reason to add the claimed fourth circuit board “coupled to the upper surface of the support component” of the proposed combination of Ground 6, Ground 6 fails to render obvious claim 22.

v. Petitioner’s proposed combination does not disclose or render obvious the required first and second transformer coils “positioned outside an outer perimeter” of the plurality of stator elements and rotor assembly annular arrangement

Like claim 17, claim 22 requires a “wireless power transformer comprising a first annular transformer coil . . . positioned outside an outer perimeter of the plurality of stator elements” and a “second transformer coil . . . positioned outside

an outer perimeter of the rotor assembly annular arrangement.” The Petition relies on the same arguments for this element in Ground 6 as it does for claim 17 and Grounds 1 and Ground 2. *See* Petition at 94 (citing “Sections IX.E.11 and X.B.5”). With regards to its Ground 1 arguments, the Petitioner has failed to make a *prima facie* showing of obviousness with respect to claim 22 for the same reasons described in Section VI.A.v *supra* for claim 17.

With regards to its Ground 2 arguments, the Petition’s citation to Cai fails for the same reasons discussed above in Section VI.B *supra*. Accordingly, the Petitioner has failed to make a *prima facie* showing of obviousness with respect to claim 22 for this additional reason.

vi. Petitioner fails to explain any motivation to combine Droz’s stationary LIDAR with the rotary system of Ground 6

Pacala teaches a LIDAR sensor in the context of a “spinning turret.” Ex. 1004 at [0013]. Johnson, Pardhan, and Zhang all, likewise, cover rotary joints. The Petition provides no explanation for why a POSITA would have been motivated to modify the proposed combination of Ground 6 in view of Droz’s teachings regarding stationary (non-rotary) LIDAR or why a POSITA would have had a reasonable expectation of success in making such modifications. On this record,

Petitioner has failed to make a *prima facie* showing of obviousness with respect to claims 22-24 based on Ground 6.

vii. Ground 6 fails to show any of the challenged claims are obvious

Although the Petition makes additional errors in its analysis of the challenged claims under Ground 6, the above identified failures establish the Petitioner failed to demonstrate a reasonable likelihood it will prevail with respect to any of claims 22-24 under Ground 6.

D. Ground 7 fails to render any of the dependent claims unpatentable

Like Grounds 2-5, Ground 7 uses the same combination of Pacala, Johnson, Pardhan, and Zhang as set forth in Ground 1 with further modifications addressing certain dependent claims. *See* Petition at 96. Ground 7 challenges claim 25, which depends from claim 22. Because Ouster’s arguments in Section VI.C *supra* show that independent claim 22 is non-obvious, dependent claim 25 is also non-obvious. *In re Fritch*, 972 F.2d at 1266. Ground 7 thus fails for, at least, the same reasons as Ground 6.

E. Ground 8: Pacala-2017, Johnson, Pardhan, and Zhang fail to render claims 1-2, 4-9, 11-14, 16-17, 19-21 unpatentable

As explained in the Petition, Ground 8 “substitutes Pacala-2017 for Pacala.” Petition at 98. The Petition contends all of the limitations Ouster has discussed

above “are disclosed by the Johnson-Pardhan-Zhang combination in the same manner as was discussed in Ground 1.” *Id.* at 100. The Petition further contends a POSITA would have been motivated to combine Johnson-Pardhan-Zhang for the same reasons as for Ground 1 and contends a POSITA would have been motivated to combine Pacala-2017 for essentially the same reasons as for Pacala in Ground 1. *Id.* at 104-105.

As explained in Section VI.A above, Ground 1 fails to show any of claims 1-2, 4-9, 11-14, 16-17, or 19-21 are unpatentable at least because Ground 1 fails to show either independent claim 1 or 14 is unpatentable as well as for the additional reasons discussed for selected dependent claims. Ouster’s arguments above in Section VI.A apply with equal force to Ground 8 as the Petition identifies no meaningful difference resulting from the substitution of Pacala-2017 for Pacala.

F. Ground 9: Pacala-2017, Johnson, Pardhan, Zhang in further view of Cai and Yan fail to render claims 22-24 unpatentable

As explained in the Petition, Ground 9 “substitutes Pacala-2017 for Pacala and Spector” as used for Grounds 6 and 7. Petition at 105. The Petition contends “Johnson-Pardhan-Zhang-Cai-Yan are combined in the same way as” in Ground 6 but “[t]he combined system is the further modified by integrating the LiDAR device of Pacala-2017, rather than Pacala-Spector.” *Id.* at 105-106. The Petition

contends all the limitations Ouster has discussed above “are disclosed by Johnson, Pardhan, Zhang, Cai and Yan in the same manner as was discussed in Ground 6.” *Id.* at 106. Accordingly, Ground 9 fails to show any of claims 22-24 are rendered unpatentable for the same reasons discussed above in Section VI.C *supra*. Claim 25 depends from claim 22 and is likewise valid because it depends from a valid independent claim. *See, e.g., In re Fritch*, 972 F.2d at 1266.

G. Petitioner Failed to Meet Its Burden to Show a Reasonable Expectation of Success

As explained above, the Petition asserts claimed invention would have been constructed by a POSITA from various disparate prior art disclosures, and/or based on modifying those references using purported common knowledge. The Petition fails to explain how a POSITA would have had a reasonable expectation of success in combining these references (and then further modifying them) to meet the limitations of the claimed invention despite the readily apparent difficulties stemming from their contradictory teachings. *Samsung Elecs. Co., Ltd. v. Elm 3DS Innovations, LLC*, 925 F.3d 1373, 1380-83 (Fed. Cir. 2019) (finding Petitioner failed to establish a reasonable expectation of success in combining one reference’s semiconductor fabrication process with the incompatible dielectric material of

another after “analyzing Petitioners’ obviousness grounds in the way presented in the Petition”).

As explained above, the Petition’s Grounds attempt to combine incompatible references such as Pardhan, which teaches cooling a LIDAR device by transferring heat into and through the rotor and stator, and Zhang which teaches expelling heat generated inside the rotor and stator (*see* Section VI.A.iii), or to modify the proposed combination to place an intervening circuit board between Pardhan’s heat source and heat sink (*see* Section VI.C.iv). The Petition offers no evidence or argument addressing these incompatibilities. Rather, the Petition makes only conclusory contentions that a POSITA would have had a reasonable expectation of success in combining the references of the grounds using “[b]asic electrical engineering designs and principles.” *See* Petition at 18, 51, 55-56, 59, 66, 68, 74, 76, 78, 79, 81, 84, 96, 99, 106.

Petitioner thus failed to meet its burden to show a reasonable expectation of success for any of Grounds 1-9.

VII. CONCLUSION

For the foregoing reasons, Petitioner is unlikely to prevail on any ground with respect to any of the challenged claims. Patent Owner respectfully requests that the Board deny institution of this Petition for *inter partes* review.

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US Patent 11,287,515

Respectfully submitted,

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CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), the undersigned certifies that the foregoing Patent Owner's Preliminary Response contains 11,587 words, as measured by the word-processing system used to prepare this paper. This word count does not include the items excluded by 37 C.F.R. § 42.24 as not counting towards the word limit.

Respectfully submitted,

Dated: December 21, 2023

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CERTIFICATE OF SERVICE

I hereby certify that on December 21, 2023, I caused a true and correct copy of the foregoing Patent Owner's Preliminary Response to be served electronically on Petitioner at the following email addresses:

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