

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SZ DJI TECHNOLOGY CO., LTD.,
Petitioner,

v.

AUTEL ROBOTICS USA LLC,
Patent Owner.

IPR2019-00846
Patent 9,260,184 B2

Before ERICA A. FRANKLIN, JENNIFER MEYER CHAGNON, and
AVELYN M. ROSS, *Administrative Patent Judges*.

CHAGNON, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Granting Patent Owner's Non-Contingent Motion to Amend
35 U.S.C. § 318(a)

I. INTRODUCTION

We have jurisdiction to hear this *inter partes* review under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons discussed herein, Patent Owner’s Revised Motion to Amend (Paper 17) is granted.

A. Procedural History

SZ DJI Technology Co., Ltd. (“Petitioner”)¹ filed a Petition for *inter partes* review of claims 3 and 4 of U.S. Patent No. 9,260,184 B2 (Ex. 1001, “the ’184 patent”). Paper 2 (“Pet.”). Petitioner provided a Declaration of Dr. Alfred Ducharme (Ex. 1003) to support its positions. Autel Robotics USA LLC (“Patent Owner”) did not file a Preliminary Response. Pursuant to 35 U.S.C. § 314(a), on September 23, 2019, we instituted *inter partes* review to determine whether claims 3 and 4 of the ’184 patent would have been obvious under 35 U.S.C. § 103 in view of Sasaki² and Sokn.³ See Paper 6 (“Inst. Dec.”).

Subsequent to institution, Patent Owner did not file a Patent Owner Response, but filed a non-contingent Motion to Amend (Paper 10), along with a Declaration of Charles F. Reinholtz, Ph.D. (Ex. 2001) to support its positions. Petitioner filed an Opposition (Paper 15) to Patent Owner’s Motion to Amend, along with a Second Declaration of Dr. Ducharme (Ex. 1028). Pursuant to Patent Owner’s request (Paper 10, 2), we provided

¹ Petitioner identifies DJI Technology Inc.; DJI Europe B.V.; iFlight Technology Company Limited; DJI Japan K.K.; and DJI Research LLC as additional real parties-in-interest to this proceeding. Pet. 1.

² JP Appl. Publ’n No. H06-17511, published January 14, 1991 (Ex. 1005; Ex. 1006 (certified translation)). Citations to Sasaki are to the translation.

³ U.S. Patent No. 5,133,617, issued July 28, 1992 (Ex. 1007).

Preliminary Guidance on Patent Owner’s Motion to Amend. Paper 16. In response, Patent Owner filed a non-contingent Revised Motion to Amend (Paper 17, “Revised Mot. Amend”), along with a Second Declaration of Dr. Reinholtz (Ex. 2007). Petitioner filed an Opposition (Paper 21, “Opp.”) to Patent Owner’s Revised Motion to Amend, along with a Third Declaration of Dr. Ducharme (Ex. 1030). Patent Owner filed a Reply (Paper 25, “Reply”), along with a Third Declaration of Dr. Reinholtz (Ex. 2016), and Petitioner filed a Sur-reply (Paper 29, “Sur-reply”).

An oral hearing was held on August 13, 2020. A transcript of the hearing is included in the record. Paper 32 (“Tr.”).

B. Related Proceedings

The parties identify *SZ DJI Tech. Co. v. Autel Robotics USA LLC*, Case No. 16-706-LPS-CJB (D. Del.); *Certain Unmanned Aerial Vehicles and Components Thereof*, Inv. No. 337-TA-133 (USITC, instituted Sept. 26, 2018) (“the related ITC proceeding”); and IPR2019-00343⁴ as related matters. Pet. 2; Paper 4, 2. In the 343 IPR, we issued a Final Written Decision finding claims 1, 2, 5–9, and 11 of the ’184 patent unpatentable, based on Microdrones,⁵ alone or in combination with various other references not discussed herein. *See SZ DJI Tech. Co. v. Autel Robotics USA LLC*, IPR2019-00343, Paper 40 (PTAB May 21, 2020) (“343 FWD”) (submitted in this proceeding as Ex. 1031).

⁴ We refer to IPR2019-00343 IPR as “the 343 IPR” herein, and any citations to documents in the record of the 343 IPR include a “343” prefix.

⁵ Microdrones User Manual for md4-200 (Version 2.2) (May 2009) (343 Ex. 1004; submitted in this proceeding as Ex. 1016).

C. The '184 Patent

The '184 patent is titled “Compact Unmanned Rotary Aircraft,” was filed on May 14, 2014,⁶ and issued February 16, 2016. Ex. 1001, at codes (22), (45), (54).

Figure 1 of the '184 patent is reproduced below.

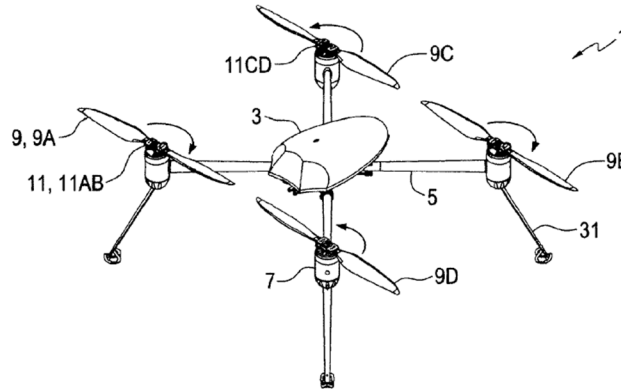


FIG. 1

Figure 1, above, illustrates rotary wing apparatus 1. *Id.* at 2:31–34. Rotary wing apparatus 1 includes body 3 and a plurality of arms 5, each including rotor assembly 7 attached to an outside end thereof. *Id.* at 3:15–18. Each rotor assembly 7 includes “rotor blade 9 releasably attached to a driveshaft by a lock mechanism 11, and a drive . . . rotating the driveshaft.” *Id.* at 3:18–21.

As described in the Background section of the '184 patent, in rotary wing aircraft having “a number of arms extending laterally from the aircraft body, with a rotor assembly on the end of each arm,” torque on the aircraft body, which would cause it to spin undesirably, should be avoided. *Id.* at

⁶ The '184 patent claims priority to Canadian application No. 2815885, filed on May 15, 2013. Ex. 1001, at code (30). Because the application leading to the '184 patent was filed after March 16, 2013, patentability is governed by the Leahy-Smith America Invents Act (“AIA”), Pub L. No. 112-29, 125 Stat. 284 (2011), version of 35 U.S.C. §§ 102 and 103.

1:15–23. One way in which this torque can be avoided is by having the rotors rotate in opposite directions. *See id.* at 1:24–40. Further, “[t]o make the aircraft more compact for storage and transport the rotors can be removed and the arms folded into a side by side orientation.” *Id.* at 1:43–46.

In the embodiment depicted in Figure 1 of the ’184 patent, rotor blades 9A, 9B rotate in a clockwise direction and rotor blades 9C, 9D rotate in a counterclockwise direction. *Id.* at 3:31–37. As described in the ’184 patent, the “rotor blades can be easily detached for transport of storage, and cannot be placed on driveshafts rotating the wrong direction.” *Id.* at 2:16–18. This feature is important because, “in order for the apparatus 1 to operate properly, the rotor blades 9 must be mounted to drive shafts that are rotating in the correct direction.” *Id.* at 3:45–47. In the disclosed embodiments, “clockwise rotor blades 9A, 9B are engageable only with the clockwise lock mechanisms 11AB and cannot be engaged in the counterclockwise lock mechanisms 11CD” and “counterclockwise rotor blades 9C, 9D are engageable only with the counterclockwise lock mechanisms 11CD and cannot be engaged in the clockwise lock mechanisms 11AB.” *Id.* at 3:47–54.

Figures 4 and 5 of the ’184 patent, as shaded and annotated by Petitioner (Pet. 8, 9), are reproduced below.

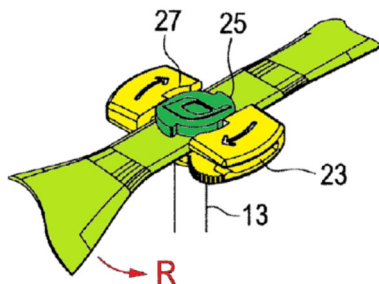


Figure 4

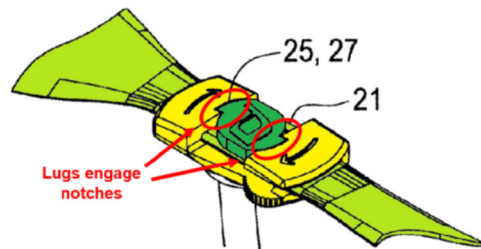


Figure 5

Annotated Figures 4 and 5, above, illustrate schematic perspective views of a clockwise lock mechanism in a “ready for engagement” position and an “engaged and locked” position, respectively. Ex. 1001, 2:41–47. Clockwise lock mechanism comprises shaft lock portion 15A (labeled in Fig. 9, shaded yellow above) attached to the corresponding clockwise rotating driveshaft 13 and blade lock portion 17A (labeled in Fig. 9, shaded dark green above) attached to clockwise rotor blade 9A, 9B (shaded light green above). *Id.* at 3:55–58. Shaft lock portion (yellow) has recess 21, into which blade lock portion (dark green) is dropped. *Id.* at 3:66–4:3. The rotor blade (light green) is then rotated in direction R (opposite the direction of rotation of the rotor blade during operation of the rotary wing aircraft, i.e., here, counterclockwise), “such that the blade 9A slides into slots 23 on each side of the shaft lock portion 15A under the arrows, and lugs 25A on the blade lock portion 17A engage notches 27A defined by the shaft lock portion.” *Id.* at 4:4–16. The counterclockwise lock mechanisms operate in a similar manner, but “with an opposite spin direction.” *See id.* at 3:58–62, 4:16–26, Figs. 6, 7. This configuration prevents clockwise rotor blades 9A, 9B from being installed on the shaft lock portion 15C of a counterclockwise lock mechanism and, similarly, prevents counterclockwise rotor blades 9C, 9D from being installed on the shaft lock portion 15A of a clockwise lock mechanism. *See id.* at 4:27–35, Fig. 8.

D. Proposed Substitute Claims

In its Revised Motion to Amend, Patent Owner proposes to add substitute claims 12 and 13, which depend directly or indirectly from claim 1. Claim 1 of the ’184 patent and the proposed substitute claims are reproduced below. The proposed substitute claims include bracketed,

italicized subject matter indicative of subject matter deleted from challenged claims 3 and 4 and underlined subject matter indicative of subject matter added to challenged claims 12 and 13.

1. A rotary wing aircraft apparatus comprising:
 - a body;
 - a plurality of arms extending laterally from the body, and
 - a rotor assembly attached to an outside end of each arm;

each rotor assembly comprising a rotor blade releasably attached to a driveshaft by a lock mechanism, and a drive rotating the driveshaft;

wherein a first driveshaft rotates in a clockwise direction and a second driveshaft rotates in a counterclockwise direction;

wherein a clockwise rotor blade is releasably attached to the first driveshaft by engagement in a clockwise lock mechanism and generates a vertical lift force when rotated in the clockwise direction, and a counterclockwise rotor blade is releasably attached to the second driveshaft by engagement in a counterclockwise lock mechanism and generates a vertical lift force when rotated in the counterclockwise direction;

wherein the clockwise rotor blade is engageable only with the clockwise lock mechanism and cannot be engaged in the counterclockwise lock mechanism, and the counterclockwise rotor blade is engageable only with the counterclockwise lock mechanism and cannot be engaged in the clockwise lock mechanism; and

wherein the clockwise lock mechanism comprises a shaft lock portion attached to the first driveshaft and a blade lock portion attached to the clockwise rotor blade, the shaft lock portion defining notches configured to engage corresponding lugs on the blade lock portion.

Ex. 1001, 5:35–6:9.

12. The apparatus of claim 1 wherein the blade lock portion of the clockwise lock mechanism is configured to engage with the shaft lock portion of the clockwise lock

mechanism by partial is rotated counterclockwise rotation with respect to the shaft lock portion ~~thereof~~ of the clockwise lock mechanism to releasably attach the clockwise rotor blade to the first driveshaft.

Revised Mot. Amend 27.

13. The apparatus of claim 12 wherein the counterclockwise lock mechanism comprises a shaft lock portion attached to the second driveshaft and a blade lock portion attached to the counterclockwise rotor blade, and wherein the blade lock portion of the counterclockwise lock mechanism is configured to engage with the shaft lock portion of the counterclockwise lock mechanism by partial is rotated clockwise rotation with respect to the shaft lock portion of the counterclockwise lock mechanism ~~thereof~~ to releasably attach the counterclockwise rotor blade to the second driveshaft.

Id.

E. Asserted Grounds of Unpatentability

Petitioner challenges the patentability of proposed substitute claims 12 and 13 on the following grounds:

Claims Challenged	35 U.S.C. §	References/Basis
12, 13	103	Sasaki, Sokn
12, 13	103	Sasaki, Philistine ⁷
12, 13	103	Sasaki, Obrist ⁸
12, 13	103	Sasaki, EP067 ⁹

See Opp. 1–24; Tr. 9:8–11.

⁷ U.S. Patent No. 6,929,226 B1, issued August. 16, 2005 (Ex. 1026).

⁸ U.S. Patent No. 2,470,517, issued May 17, 1949 (Ex. 1017).

⁹ European Patent Appl. No. EP 0 921 067 A2, published June 9, 1999 (Ex. 1018).

II. ANALYSIS

A. *Principles of Law*

In an *inter partes* review, amended claims are not added to a patent as of right, but rather must be proposed as a part of a motion to amend.

35 U.S.C. § 316(d). The Board must assess the patentability of proposed substitute claims “without placing the burden of persuasion on the patent owner.” *Aqua Prods., Inc. v. Matal*, 872 F.3d 1290, 1328 (Fed. Cir. 2017) (en banc); *see also Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-001129, Paper 15 at 3–4 (PTAB Feb. 25, 2019) (precedential). Subsequent to the issuance of *Aqua Products*, the Federal Circuit issued a decision in *Bosch Automotive Service Solutions, LLC v. Matal*, 878 F.3d 1027 (Fed. Cir. 2017) (“*Bosch*”), as well as a follow-up Order amending that decision on rehearing. *See Bosch Auto. Serv. Sols., LLC v. Iancu*, No. 2015-1928 (Fed. Cir. Mar. 15, 2018) (Order on Petition for Panel Rehearing).

In accordance with *Aqua Products*, *Bosch*, and *Lectrosonics*, a patent owner does not bear the burden of persuasion to demonstrate the patentability of the substitute claims presented in the motion to amend. Rather, ordinarily, “the petitioner bears the burden of proving that the proposed amended claims are unpatentable by a preponderance of the evidence.” *Bosch*, 878 F.3d at 1040 (as amended on rehearing); *see Lectrosonics*, Paper 15 at 3–4. In determining whether a petitioner has proven unpatentability of the substitute claims, the Board focuses on “arguments and theories raised by the petitioner in its petition or opposition to the motion to amend.” *Nike, Inc. v. Adidas AG*, 955 F.3d 45, 51 (Fed. Cir. 2020).

Notwithstanding the foregoing, Patent Owner's proposed substitute claims must meet the statutory requirements of 35 U.S.C. § 316(d) and the procedural requirements of 37 C.F.R. § 42.121. *Lectrosonics*, Paper 15 at 4–8. Accordingly, Patent Owner must demonstrate: (1) the amendment proposes a reasonable number of substitute claims; (2) the proposed claims are supported in the original disclosure (and any earlier filed disclosure for which the benefit of filing date is sought); (3) the amendment responds to a ground of unpatentability involved in the trial; and (4) the amendment does not seek to enlarge the scope of the claims of the patent or introduce new subject matter. *See* 35 U.S.C. § 316(d); 37 C.F.R. § 42.121.

As set forth in 35 U.S.C. § 103,

[a] patent for a claimed invention may not be obtained . . . if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains.

The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) objective evidence of nonobviousness.¹⁰

Graham v. John Deere Co., 383 U.S. 1, 17–18 (1966). Consideration of the *Graham* factors “helps inform the ultimate obviousness determination.”

¹⁰ Patent Owner presents evidence and arguments related to long-felt need. *See, e.g.*, Revised Mot. Amend 23. Because we are not persuaded that Petitioner has shown that a person of ordinary skill in the art would have combined Sasaki with any of the other four asserted references to arrive at the invention recited in the proposed substitute claims (*see infra* Section II.E), we do not discuss Patent Owner's objective evidence further in this decision.

Apple Inc. v. Samsung Elecs. Co., 839 F.3d 1034, 1048 (Fed. Cir. 2016) (en banc).

A patent claim “is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007). An obviousness determination requires finding “both ‘that a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success in doing so.’” *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1367–68 (Fed. Cir. 2016) (citation omitted); see *KSR*, 550 U.S. at 418 (For an obviousness analysis, “it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does.”). A motivation to combine the teachings of two references can be “found explicitly or implicitly in market forces; design incentives; the ‘interrelated teachings of multiple patents’; ‘any need or problem known in the field of endeavor at the time of invention and addressed by the patent’; and the background knowledge, creativity, and common sense of the person of ordinary skill.” *Plantronics, Inc. v. Aliph, Inc.*, 724 F.3d 1343, 1354 (Fed. Cir. 2013) (citation omitted).

However, Petitioner cannot satisfy its burden of proving obviousness by employing “mere conclusory statements,” but “must instead articulate specific reasoning, based on evidence of record” to support an obviousness determination. *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380–81 (Fed. Cir. 2016). The “factual inquiry” into the reasons for “combin[ing] references must be thorough and searching, and the need for specificity

pervades.” *In re NuVasive*, 842 F.3d 1376, 1381–82 (Fed. 2016) (internal quotation marks and citations omitted). A determination of obviousness cannot be reached where the record lacks “explanation as to *how* or *why* the references would be combined to produce the claimed invention.”

TriVascular, Inc. v. Samuels, 812 F.3d 1056, 1066 (Fed. Cir. 2016); *see NuVasive*, 842 F.3d at 1382–85; *Magnum Oil*, 829 F.3d at 1380–81. Thus, to prevail Petitioner must explain how the prior art would have rendered the challenged claim unpatentable.

We analyze the asserted grounds of unpatentability in accordance with these principles.

B. Level of Ordinary Skill in the Art

We review the grounds of unpatentability in view of the understanding of a person of ordinary skill in the art at the time of the invention. *Graham*, 383 U.S. at 17. Dr. Ducharme testifies that a person of ordinary skill in the art “would have had at least an undergraduate degree in mechanical engineering, or equivalent education, training, or experience, with at least two years of experience with [Unmanned Aerial Vehicles (UAV)].” Ex. 1003 ¶ 72. Dr. Reinholtz testifies that a person of ordinary skill in the art “would have had a bachelor’s degree in mechanical engineering and at least two years of experience designing mechanisms and mechanical structures of the type used in releasable couplings and locking devices. Additional education could substitute for professional experience and significant work experience could substitute for formal education.” Ex. 2001 ¶ 28.

Dr. Reinholtz acknowledges that he does not view “Dr. Ducharme’s proposed definition as substantially different from [his own].” Ex. 2001

¶ 30. We agree and note that our consideration of the issues presented does not turn on which proposed definition is applied. Dr. Ducharme and Dr. Reinholtz also acknowledge that their respective testimony would remain the same regardless of which of these definitions of a person of ordinary skill in the art is applied. *See* Ex. 1028 ¶ 23; Ex. 2001 ¶ 30. In any event, for purposes of this Final Written Decision, we adopt Petitioner’s description of a person of ordinary skill in the art, while maintaining our prior determination (Inst. Dec. 10) that the prior art reflects the appropriate level of skill at the time of the claimed invention. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

C. Claim Construction

In this *inter partes* review proceeding, claim terms shall be construed using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. [§] 282(b), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent. 37 C.F.R. § 42.100(b) (2019). Further, “[a]ny prior claim construction determination concerning a term of the claim in a civil action, or a proceeding before the International Trade Commission, that is timely made of record in the *inter partes* review proceeding will be considered.”¹¹ *Id.*

¹¹ A claim construction order from the related ITC proceeding is of record in this proceeding. Ex. 2006. Also of record is an excerpt from the public version of the ITC’s Initial Determination, dated March 2, 2020. Ex. 2011. We have reviewed and considered both of these documents for purposes of claim construction in this proceeding.

Under the standard set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–19 (Fed. Cir. 2005) (en banc), claim terms are given their ordinary and customary meaning, as would have been understood by a person of ordinary skill in the art at the time of the invention, in light of the language of the claims, the specification, and the prosecution history of record. *See Thorner v. Sony Comput. Entm’t Am. LLC*, 669 F.3d 1362, 1365–66 (Fed. Cir. 2012). We construe terms only to the extent necessary to resolve the controversy. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

Petitioner proposes constructions for several claim terms, including “lugs” and “notches”; “lock mechanism” / “clockwise lock mechanism” / “counterclockwise lock mechanism”; and “drive.” Pet. 21–25. In our Institution Decision, we construed only the claim terms “lugs” and “notches.” Inst. Dec. 10–13. In its Revised Motion to Amend, Patent Owner proposes construction for the Engagement Limitation.¹² Revised Mot. Amend 9–11. In its Opposition, Petitioner argues that Patent Owner is collaterally estopped from its claim construction position with respect to the Engagement Limitation, based on our construction of this limitation in the Final Written Decision in the 343 IPR. Opp. 9–10. We discuss “lugs” and “notches” and the Engagement Limitation below.

¹² Patent Owner uses the term “Engagement Limitation” to reference the following recitation in claim 1: “the clockwise rotor blade is engageable only with the clockwise lock mechanism and cannot be engaged in the counterclockwise lock mechanism, and the counterclockwise rotor blade is engageable only with the counterclockwise lock mechanism and cannot be engaged in the clockwise lock mechanism.”

1. “lugs” and “notches”

Claim 1 recites, *inter alia*, “the shaft lock portion defining **notches** configured to engage corresponding **lugs** on the blade lock portion.” Ex. 1001, 6:7–9 (emphasis Petitioner’s (Pet. 23)). In the Institution Decision, we construed “lugs” and “notches,” in accordance with Petitioner’s proposal, as “projections” and “indentations,” respectively. *See* Inst. Dec. 12; Pet. 24; Ex. 1003 ¶ 86. The parties do not dispute this construction in their subsequent briefing, and we discern no reason to change this construction based on the complete record of this proceeding. Therefore, we maintain our prior construction for purposes of this Final Written Decision.

2. Engagement Limitation

Claim 1 recites, *inter alia*, that “the clockwise rotor blade is engageable only with the clockwise lock mechanism and cannot be engaged in the counterclockwise lock mechanism, and the counterclockwise rotor blade is engageable only with the counterclockwise lock mechanism and cannot be engaged in the clockwise lock mechanism.” Ex. 1001, 5:53–6:4.

We did not construe the Engagement Limitation in our Institution Decision. *See* Inst. Dec. 10–13. Subsequent to institution in this proceeding, we construed the Engagement Limitation in our Final Written Decision in the related the 343 IPR.¹³ *See* 343 FWD 15–19. We incorporate into this Final Written Decision the discussion and construction of the Engagement Limitation from the Final Written Decision in the 343 IPR

¹³ The Final Written Decision in the 343 IPR issued on May 21, 2020. Both parties had the opportunity to address this construction in subsequent briefing in this proceeding, as well as at the Oral Hearing.

(343 FWD, Section II.C.3)¹⁴; below, we highlight certain aspects of the construction as particularly relevant to this proceeding, and we further discuss the meaning of the phrase “be engaged in” present in the Engagement Limitation.

Here, as in the 343 IPR, Patent Owner contends that the Engagement Limitation, which “prevents the **engagement** of a **rotor blade** with the wrong **lock mechanism**, means that the claimed lock mechanisms prevent a rotor blade from being attached to the wrong drive.” Revised Mot. Amend 9–10 (citing Ex. 2001 ¶¶ 42–44) (emphasis Patent Owner’s).¹⁵ In the 343 IPR, “[w]e agree[d] with Petitioner that the claim recitation that the rotor blade ‘cannot be *engaged* in’ the incorrect lock mechanism does not mean that the rotor blade cannot be *improperly attached*, i.e., simply mounted, to the incorrect rotor, as implicated by Patent Owner’s arguments.” 343 FWD 17 (citing 343 Paper 22, 5–6). We determined that “according to the claimed invention, a proper attachment requires an engagement in the

¹⁴ Ex. 1031.

¹⁵ As noted above, Petitioner asserts that Patent Owner “is collaterally estopped from this claim construction position” because we “previously rejected the same construction of the same limitation of the same claim” in the 343 IPR. Opp. 9–10. Patent Owner acknowledges it made the same arguments in the 343 IPR. See Revised Mot. Amend 10 n.3. We need not decide whether Patent Owner is collaterally estopped from making the arguments that the claims require preventing a rotor blade from being *attached* to the wrong drive because, for the reasons discussed in the 343 Final Written Decision and incorporated herein, those arguments also are unpersuasive here. However, to the extent Petitioner contends that Patent Owner is estopped from making *any* arguments regarding the construction of the Engagement Limitation and the application of the claims to the asserted prior art in this proceeding, we disagree. We note, in particular, that the prior art asserted in this proceeding was not at issue in the Final Written Decision in the 343 IPR.

lock mechanism. Insofar as Patent Owner's position is based upon an attachment that does not include the required engagement, such is not an attachment as described by the claims." *Id.* at 17–18. In particular, "[w]e disagree[d] with Patent Owner that the Engagement Limitation requires prevention of the counterclockwise rotor blade being attached by some other means, such as mounting to the clockwise driveshaft." *Id.* at 18.

Although we disagree with Patent Owner's assertions regarding prevention of all forms of *attachment* generally, the Engagement Limitation, by its plain language, must prevent, for example, the clockwise lock mechanism from "be[ing] *engaged in*" the counterclockwise lock mechanism. Our application of the Engagement Limitation to the prior art in the 343 IPR, however, did not require us to explicitly construe the meaning of the phrase "be engaged in" (i.e., the requirement that the "clockwise rotor blade . . . cannot be *engaged in* the counterclockwise lock mechanism"). *See also* Tr. 33:21–34:1 (Patent Owner's counsel confirming that Patent Owner does not argue that we must change our prior construction, but that we should supplement it with a discussion of "engage"). We, thus, for this proceeding, further discuss the meaning of to "be engaged in" in the context of the proposed substitute claims.

Patent Owner provides evidence of the plain meaning of "engage" in the form of two dictionary definitions. Reply 3. Specifically, these dictionaries defined "engage" as "establish a meaningful contact or connection with" (Ex. 2013, 4) and "to become meshed or interlocked" (Ex. 2014, 4). We cited yet another dictionary definition in our Final Written Decision in the 343 IPR, which defines "engage" as "to come together and interlock." "Engage" Definition, MERRIAM-WEBSTER.COM

(available at <https://www.merriam-webster.com/dictionary/engage>) (cited at 343 FWD 19). Based on these definitions, which evince the plain and ordinary meaning of engage, we construe “be engaged in” as “being interlocked.” *See also* “Interlock” Definition, MERRIAM-WEBSTER.COM (available at <https://www.merriam-webster.com/dictionary/interlock>) (“1: to lock together : UNITE”; “2: to connect so that the motion or operation of any part is constrained by another”). This construction is consistent with the Specification of the ’184 patent. *See* Ex. 1001, 3:63–4:40.

D. Statutory and Regulatory Requirements

As noted above, Patent Owner’s proposed substitute claims must meet the statutory requirements of 35 U.S.C. § 316(d) and the procedural requirements of 37 C.F.R. § 42.121. We address each of these requirements in turn.

1. Reasonable Number of Substitute Claims

A motion to amend must “propose a reasonable number of substitute claims.” 35 U.S.C. § 316(d)(1)(B); *see* 37 C.F.R. § 42.121(a)(3) (“A motion to amend may cancel a challenged claim or propose a reasonable number of substitute claims.”). Patent Owner proposes two substitute claims in place of two challenged claims. Revised Mot. Amend 1, 27. “There is a rebuttable presumption that a reasonable number of substitute claims per challenged claim is one (1) substitute claim.” *Lectrosonics*, Paper 15 at 4; *see* 37 C.F.R. § 42.121(a)(3). Petitioner does not argue otherwise. *See generally* Opp. Therefore, we determine that the amendments propose a reasonable number of substitute claims.

2. Respond to Ground of Unpatentability

“A motion to amend may be denied where . . . [t]he amendment does not respond to a ground of unpatentability involved in the trial.” 37 C.F.R. § 42.121(a)(2)(i). Patent Owner asserts that the proposed substitute claims are patentable over the combination of references that forms the basis of the obviousness ground on which we instituted trial. Revised Mot. Amend 11–21. In particular, Patent Owner asserts that the “partial rotation [feature added to substitute claims 12 and 13] provides the UAV with the convenient twist-lock feature . . . , and is a distinct improvement over conventional threaded screw-on type attachment mechanisms,” such as those disclosed in Sasaki. *Id.* at 11–12 (citing Ex. 2001 ¶¶ 27, 37, 70). Patent Owner further contends that “a [person of ordinary skill in the art] would not be motivated to combine Sasaki with Sokn for numerous reasons, including those related to the ‘partial rotation’ limitation.” *Id.* at 13 (citing Ex. 2007 ¶¶ 24–32, 39). Petitioner does not argue otherwise.¹⁶ *See generally* Opp. We determine

¹⁶ In Petitioner’s Opposition to Patent Owner’s original Motion to Amend, Petitioner argues that Patent Owner’s “Motion is merely a pretext to fix the fatal indefiniteness issues which doomed enforcement of claims 3 and 4 in the ITC.” Paper 15, 3. In our Preliminary Guidance, we determined that Patent Owner’s Motion to Amend responded to the grounds of unpatentability (Paper 16, 4); Petitioner did not repeat these arguments in its Opposition to Patent Owner’s Revised Motion to Amend. We note also that “[37 C.F.R. § 42.121(a)(2)(i)] does not require . . . that every word added to or removed from a claim in a motion to amend be solely for the purpose of overcoming an instituted ground. Additional modifications that address potential 35 U.S.C. § 101 or § 112 issues, for example, are not precluded by rule or statute. Thus, once a proposed claim includes amendments to address a prior art ground in the trial, a patent owner also may include additional limitations to address potential § 101 or § 112 issues, if necessary.” *Lectrosonics*, Paper 15 at 5–6.

that the amended language in the proposed substitute claims is responsive to a ground of unpatentability involved in this trial.

3. Scope of Amended Claims

A motion to amend “may not enlarge the scope of the claims of the patent.” 35 U.S.C. § 316(d)(3); *see* 37 C.F.R. § 42.121(a)(2)(ii) (“A motion to amend may be denied where . . . [t]he amendment seeks to enlarge the scope of the claims of the patent . . .”). Petitioner contends that proposed substitute “[c]laims 12 and 13 improperly enlarge the scope of claims 3 and 4 because they no longer require that the blade lock portion ‘is rotated.’” Opp. 24; *see id.* at 24–25. The requirement of 35 U.S.C. § 316(d)(3), however, is not that a proposed substitute claim cannot enlarge the scope of the claim that it replaces, but that it cannot “enlarge the scope of the claims *of the patent*.” (emphasis added); *see also Lectrosonics*, Paper 15 at 6 (“[A] proposed substitute claim may not remove a feature of the claim in a manner that broadens the scope of the claims *of the challenged patent*.” (emphasis added)). Proposed substitute claims 12 and 13 are dependent claims and, therefore, include all of the limitations of independent claim 1. Thus, they do not enlarge the scope of the claims of the patent such that the proposed substitute claims would encompass apparatuses outside the scope of the original claims. *Cf.* MPEP 1412.03(II) (explaining, in the context of a reissue application,¹⁷ that an amendment that broadens a dependent claim

¹⁷ 35 U.S.C. § 251, which governs pre-AIA reissue applications, includes language similar to the “may not enlarge the scope of the claims of the patent” language in 35 U.S.C. § 316(d)(3). *See* 35 U.S.C. § 251(d) (“No reissued patent shall be granted *enlarging the scope of the claims of the*

does not broaden the scope of the claims of the patent where the independent claim is not broadened).

4. New Matter

A motion to amend “may not . . . introduce new matter.” 35 U.S.C. § 316(d)(3); *see* 37 C.F.R. § 42.121(a)(2)(ii) (“A motion to amend may be denied where . . . [t]he amendment seeks to . . . introduce new subject matter.”). Patent Owner asserts there is support for the proposed substitute claims in the disclosure of U.S. Patent Application No. 14/277,370, which issued as the ’184 patent, as well as in the Canadian priority application No. 2815885.¹⁸ Revised Mot. Amend 4–9 (citing Ex. 2002; Ex. 2003; Ex. 2001 ¶¶ 35–37). Petitioner does not argue otherwise. *See generally* Opp. We have reviewed Patent Owner’s showing and determine that there is support for the proposed substitute claims in the original application.

E. *Patentability of the Proposed Substitute Claims*

Petitioner contends that proposed substitute claims 12 and 13 would have been obvious in view of Sasaki and Sokn, as well as in view of Sasaki combined with Philistine, Obrist, or EP067. For the reasons discussed below, we are not persuaded that Petitioner has established, by a preponderance of the evidence, that proposed substitute claims 12 and 13 would have been obvious in view of any of Petitioner’s asserted combinations of references.

original patent unless applied for within two years from the grant of the original patent.” (emphasis added)).

¹⁸ Patent Owner confirms that “[t]he ’370 application and the ’885 priority application have the same figures and written description.” Revised Mot. Amend 4.

1. Obviousness in View of Sasaki and Sokn

Petitioner contends that claims 12 and 13 would have been obvious in view of Sasaki and Sokn. *See* Pet. 25–51; Opp. 1–8. Patent Owner disagrees. *See* Revised Mot. Amend 11–21. For the reasons discussed below, we are not persuaded by Petitioner’s arguments and evidence in support of its contention that a person of ordinary skill in the art would have combined Sasaki and Sokn to arrive at the claimed invention.

a) Overview of Sasaki

Sasaki is a Japanese Application Publication titled “Propeller for Flying Toy and Fixture Thereof.” Ex. 1006, at code (54). Figure 7 of Sasaki is reproduced below.

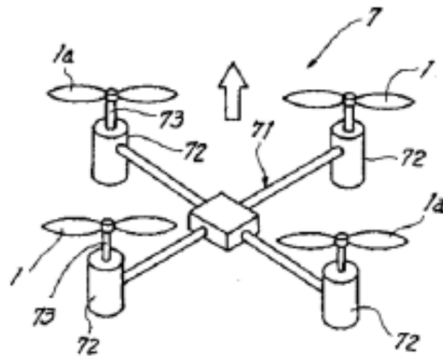


Fig. 7

Figure 7, above, shows flying toy 7. *Id.* at 10:9–11. Flying toy 7 includes body 71, motors 72, rotating shaft 73, and propellers 1, 1a. *Id.* at 4:3–7, 27–29. Propellers 1 rotate in the opposite direction as propellers 1a, so that flying toy 7 can fly. *Id.* at 4:8–14.

Figure 8 of Sasaki is reproduced below.

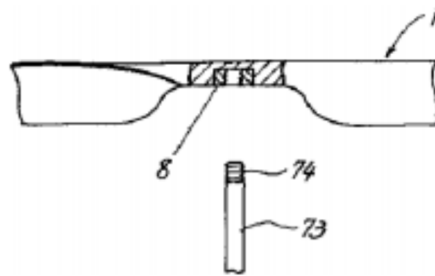


Fig. 8

Figure 8, above, shows a prior art way in which propeller 1 is attached to rotating shaft 73. *Id.* at 1:49–2:4. Nut 8 is buried in the central portion of propeller 1 and is attached to screw shaft 74 at the top end of rotating shaft 73. *Id.* Patent Owner refers to this connection as a “conventional screw-on type blade attachment mechanism.” Revised Mot. Amend 13. Due to rotational forces of the UAV, “it is necessary to manufacture a propeller which rotates right with a left screw, and a propeller which rotates left with a right nut (8) and a rotating shaft (73).” Ex. 1006, 2:5–8. Petitioner refers to this configuration as a “directionally threaded coupling mechanism.” Pet. 28; Ex. 1003 ¶ 96. During rotation of propeller 1, nut 8 and rotating shaft 73 “receive a force in the tightening 10 direction due to the rotation”; this force may cause nut 8 to be “tightened more than necessary,” making it difficult to remove the propeller when needed. Ex. 1006, 2:9–16.

b) Overview of Sokn

Sokn is a U.S. Patent titled “Motor Mount Assembly.” Ex. 1007, at code (54). Sokn relates to “devices for mounting or supporting electric motors.” *Id.* at 1:7–8. Sokn describes that, because “conventional practice usually provides independent support for the housing and motor assembly, it

is very difficult to achieve a precise alignment between the motor and the housing.” *Id.* at 1:29–32.

Figure 3 of Sokn is reproduced below.

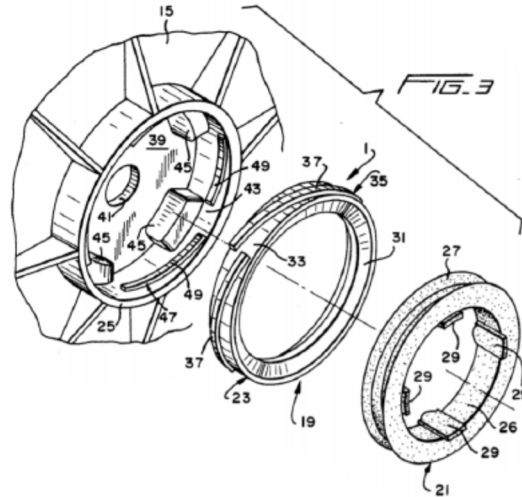


Figure 3, above, shows a partial exploded view of the details of the mounting ring assembly of Sokn.¹⁹ *Id.* at 2:27–30. Motor mount assembly 1 includes internal ring 21, external ring 23, and cylindrical socket 25. *See id.* at 3:4–65. External ring 23 includes “first engagement portion 35 in the form of a raised helical thread defined by a plurality of circumferentially spaced thread segments 37.” *Id.* at 3:29–32. Cylindrical socket 25 includes “second engagement portion 47 having a thread configuration corresponding to that of first engagement portion 35 . . . provided on [inner cylindrical] surface 43 and positioned forwardly of stop members 45.” *Id.* at 3:45–48.

¹⁹ Both Dr. Ducharme and Dr. Reinholtz acknowledge an error in Figure 3 of Sokn, that the threading of the ring does not match the assembly. Opp. 7 n.1 (citing Ex. 1028 ¶¶ 33–35; Ex. 1027, 167:1–16). A person of ordinary skill in the art “would recognize [this] is easily fixed by reversing one of the threads” in the Figure. *Id.*; *see also id.* at 6 (annotated figure showing this correction).

Second engagement “[p]ortion 47 is defined by four corresponding thread segments 49 which extend inwardly from surface 43 and are equally and circumferentially spaced 90° around surface 43.” *Id.* at 3:49–52.

As described in Sokn,

[t]hrough this arrangement, a large and easily alignable target area is established between mounting ring assembly 19 and socket 25 so that ring assembly 19 may be easily aligned and inserted within socket 25. When this is accomplished, rotation of ring assembly 19 90° with respect to socket 25 results in a secure and aligned interlock connection therebetween, as clearly shown in FIG. 4 [not reproduced herein]. In this position, ring assembly 19 is disposed in abutting engagement against stop members 45, thus assuring a secure attachment between ring assembly 19 and socket 25 which will not become accidentally loosened or disconnected during operation of motor 3.

Id. at 3:53–65.

Sokn continues:

It is of course possible to configure first and second engagement portions 35 and 47, and also stop members 45, in order to provide a predetermined orientation for the engagement and interlock connection between ring assembly 19 and socket 24, and also an interference fit therebetween for further assuring precise alignment and a secure direct attachment of motor 3 to housing 15.

Id. at 3:66–4:4. “Thus, the invention resides in an improved motor mount assembly which permits a direct and secure attachment of a motor to an associated housing in order to realize a precise alignment therebetween.” *Id.* at 5:21–24. “This alignment permits a fan blade [driven by the motor and] mounted on the end of shaft 7 to rotate freely within housing 15 and avoid impact therewith during operation of motor 3.” *Id.* at 5:4–7.

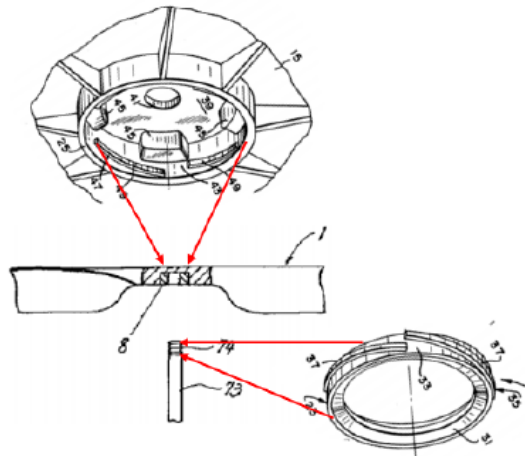
c) Petitioner's Proposed Combination

Petitioner relies on a combination of Sasaki and Sokn as teaching all the elements of the proposed substitute claims. *See* Pet. 25–51; Opp. 1–8. In its Opposition, Petitioner contends that the “Petition established that the combination of Sasaki and Sokn discloses the limitations of independent claim 1 and original claims 3 and 4” and notes that “Petitioner therefore does not repeat its detailed and uncontested ground here but instead highlights how the Petition also establishes that the substitute claims are unpatentable.” Opp. 1. Petitioner also asserts that Patent Owner “does not argue that the amendments impart patentability to the claims, but instead argues that claim 1, invalidated by the PTAB in an earlier IPR, provides patentable subject matter.” Sur-reply 1. We note that the Petition established only a *reasonable likelihood* of showing that original challenged claims 3 and 4 were unpatentable. *See* Paper 6; 35 U.S.C. § 314(a). We also note that the references asserted in this proceeding are not the same as the references asserted in the earlier 343 IPR. Here, Petitioner maintains the burden of showing, by a preponderance of the evidence, that proposed substitute claims 12 and 13 are unpatentable—in view of the references asserted in this proceeding—and those claims include the limitations of independent claim 1. *See Bosch*, 878 F.3d at 1040 (as amended on rehearing) (holding that ordinarily “the petitioner bears the burden of proving that the proposed amended claims are unpatentable by a preponderance of the evidence”); *TriVascular*, 812 F.3d at 1068 (noting that “there is a significant difference between a petitioner’s burden to establish a ‘reasonable likelihood of success’ at institution, and actually proving invalidity by a preponderance of the evidence at trial”).

According to Petitioner, a person of ordinary skill in the art “would have been motivated to replace Sasaki’s directionally-threaded mechanism with a mechanism that does not suffer from the overtightening problem, is easy to use, and maintains the ‘mistake-proofing’^[20] of the prior art.” Pet. 29 (citing Ex. 1003 ¶ 100); *see also* Opp. 3 (“[A person of ordinary skill in the art], looking at Sasaki, would have been motivated to improve the threaded design while maintaining the mistake-proofing feature.” (citing Ex. 1030 ¶ 37)). Petitioner points to Sokn as providing such a connection mechanism. Pet. 29; *see* Opp. 5 (“In the instituted ground, the directional continuously-threaded screw coupling mechanism of Sasaki’s prior art UAV is replaced with the segmented coupling mechanism of Sokn.”).

In Petitioner’s combination, Sasaki’s threaded screw coupling mechanism (screw shaft 74, nut 8, *see* Ex. 1006, Fig. 8) that attaches propellers 1, 1a to rotating shaft 73 of flying toy 7, is replaced by the modified threaded coupling mechanism of Sokn (first engagement portion 35, stop members 45, second engagement portion 47, *see* Ex. 1007, Fig. 3). *See* Pet. 28, 32–33. Petitioner provides an annotated illustration of this proposed combination (*id.* at 33), reproduced below.

²⁰ *See* Pet. 28 (“Because of th[e] directional threading [disclosed in Sasaki], the clockwise propeller cannot be used on the counterclockwise driveshaft and vice versa. That is, Sasaki’s threaded coupling mechanism is ‘mistake-proof.’” (citing Ex. 1003 ¶ 96)).



Combination of Sasaki and Sokn

The figure above illustrates Petitioner’s proposed combination in which nut 8 of Sasaki is replaced by Sokn’s stop members 45 and second engagement portion 47, and screw shaft 74 of Sasaki is replaced by Sokn’s first engagement portion 35. Pet. 32–33. Petitioner provides testimony from Dr. Ducharme that the “scaling of Sokn’s coupling components is a matter of mechanical design well within the capabilities of a [person of ordinary skill in the art].” Ex. 1003 ¶ 108 (cited at Pet. 33–34).

Petitioner further contends that, based on Sokn’s teaching of “provid[ing] a predetermined orientation” for engagement and interlock connection (Ex. 1007, 3:66–4:4) and Sasaki’s teaching of a directionally threaded coupling mechanism (*see* Ex. 1006, 2:5–8), a person of ordinary skill in the art “would have been motivated to orient the thread segments and corresponding notches for the clockwise coupling mechanism of the clockwise propeller in a left helical direction (similar to a left screw)” and, likewise, “to orient the thread segments and corresponding notches for the counterclockwise coupling mechanism of the counterclockwise propeller in a right helical direction (similar to a right screw).” Pet. 34–35 (citing

Ex. 1003 ¶¶ 109, 110). As noted above with respect to Sasaki, “[w]ith this orientation, the rotation force during operation is in the locking direction,” “prevent[ing] disassembly during operation.” *Id.* at 35 (citing Ex. 1003 ¶ 109). According to Petitioner, the stop members of Sokn’s coupling mechanism, however, prevent the overtightening problem present with Sasaki’s threaded screw coupling mechanism “by restricting further rotation.” *Id.*; Ex. 1003 ¶ 109; *see also* Opp. 5 (“Sokn’s coupling mechanism solves [the overtightening problem] by using both a plurality of thread segments and stop members that resist further rotation after installation and only require a 90° rotation.”).

Petitioner provides several reasons a person of ordinary skill in the art would have been motivated to make this proposed modification, including (1) that “Sokn’s coupling mechanism maintains the ‘mistake-proofing’ of Sasaki’s prior art directionally threaded screw fastener without suffering from overtightening” (Pet. 36 (citing Ex. 1003 ¶ 111)); (2) “provid[ing] increased design flexibility,” such as the ability to increase the size of the quadcopter (*id.* (citing Ex. 1003 ¶ 112)); and (3) “improv[ing] useability,” specifically (a) allowing easy alignment and insertion, (b) allowing assembly and disassembly with a half turn as opposed to three-to-four turns, and (c) improved mechanical alignment, reducing cross-threading issues (*id.* at 37 (citing Ex. 1003 ¶ 113)). *See also* Opp. 2 (summarizing these Petition arguments).

d) Discussion

We note several problems with the arguments and theories raised by Petitioner regarding the combination of Sasaki with Sokn, leading us to a conclusion that Petitioner has not shown that a person of ordinary skill in the

art would have combined Sasaki with Sokn to arrive at the proposed substitute claims.

As Patent Owner points out, Petitioner’s reasons for combining the references are premised largely on “*maintaining* the mistake-proofing feature” (Opp. 3 (emphasis added)) of Sasaki. *See, e.g.*, Revised Mot. Amend 15; Reply 1; Ex. 2016 ¶ 26 (“Petitioner’s proposed obviousness combinations are all based on the false premise that Sasaki is mistake-proof.”). For example, Petitioner contends that “[u]sing opposite-threaded blades [as taught in Sasaki] prevents inadvertent disassembly during operation and *achieves the well-known design goal of ‘mistake-proofing’ the lock mechanism so that the wrong blade is not installed on the wrong propeller.*” Opp. 8 (emphasis added) (citing Pet. 34–36; Ex. 1003 ¶¶ 54–57, 64; Ex. 1027, 37:1–13; Ex. 1014, 3). According to Petitioner, “Sasaki teaches a directional threading where blades designed to rotate in different directions are installed with opposite directions of rotation,” and that a person of ordinary skill in the art “would have . . . used [this] directional rotation to ensure proper installation” of the rotor blades. *Id.* at 3, 8 (internal citations omitted); *see also* Ex. 1028 ¶ 41 (“Using opposite-threaded blades achieves the well-known design goal of ‘mistake-proofing’ the lock mechanism so that the wrong blade is not installed on the wrong propeller.”).

Nothing in Sasaki expressly teaches or suggests that the directional threading taught by Sasaki is for ensuring proper installation. *See* Ex. 2001 ¶ 46. Rather, as Patent Owner notes, the directional threading of Sasaki prevents “a loosening effect” during rotation of the blades. *See* Revised Mot. Amend 14 (citing Ex. 2001 ¶ 46). Patent Owner presents evidence,

discussed below, that “the conventional screw-on type blade attachment mechanism does not prevent the attachment of a blade to the wrong drive.” *Id.* at 15. Petitioner contends, however, that this evidence “is irrelevant because the Petition does not rely on a conventional screw-on attachment coupling mechanism.” Opp. 12 (citing Pet. 44–47); *see* Sur-reply 2–3.

We note, however, that Petitioner relies on the disclosure of directional threading in Sasaki to support its assertion that Sasaki is “mistake-proof.” For example, Petitioner contends that “[*b*]ecause of this directional threading, the clockwise propeller [of Sasaki] cannot be used on the counterclockwise driveshaft and vice versa. That is, *Sasaki’s directionally threaded coupling mechanism is ‘mistake-proof.’*” Pet. 28 (citing Ex. 1003 ¶ 96) (emphases added); *see also* Ex. 1003 ¶ 96 (“[W]ith this coupling mechanism [i.e., the directional threading of Sasaki], the user cannot place a propeller on the wrong driveshaft—that is, the coupling mechanism is ‘mistake-proof.’”).

Similarly, Petitioner contends it does not rely on Sasaki as teaching the Engagement Limitation, but instead relies on Sokn as teaching this claim feature. Sur-reply 1; Opp. 12. However, Petitioner’s evidence that Sokn teaches the Engagement Limitation refers back to its discussion of Sasaki. *See, e.g.*, Opp. 13 (noting that “the combination in the Petition . . . explicitly details a [person of ordinary skill in the art’s] motivation for modifying Sokn according to the directional threading taught by Sasaki” (emphasis added)). Petitioner also claims that Dr. Reinholtz “agrees that Sokn ‘probably wouldn’t work’ if someone tried to screw a right-hand threaded ring into a left-hand threaded socket, as is shown in Figure 3 of Sokn.” Sur-reply 1 (quoting Dr. Reinholtz’s deposition testimony, Ex. 1027, 166:22–167:16).

We agree with Patent Owner, however, that a review of this testimony indicates that Dr. Reinholtz was “pointing out the mistake in [Figure 3 of] Sokn. He’s not saying you couldn’t misthread a blade if you used the Sokn threading.” Tr. 36:11–12.

We, thus, address the parties’ dispute regarding whether a blade screwed onto the wrong driveshaft, when using a conventional threaded attachment mechanism (such as that described in Sasaki) is actually “mistake-proof.” Based on the evidence of record, we determine that it is not. Or, in other words, we determine that the conventional threaded attachment mechanism taught by Sasaki does not teach the Engagement Limitation (i.e., it does not prevent the clockwise lock mechanism from “be[ing] engaged in” the counterclockwise lock mechanism).

According to Patent Owner, “the conventional screw-on type blade attachment mechanism does not prevent the attachment of a blade to the wrong drive.” Revised Mot. Amend 15 (citing Ex. 2001 ¶¶ 52–54, 59). Patent Owner contends that “it is relatively easy to attach a blade on the wrong drive on a UAV that utilizes the conventional screw-on type connection mechanism.” *Id.* (citing Ex. 2001 ¶¶ 52–54); *see also* Ex. 2006 (video created by Dr. Reinholtz demonstrating that a blade can be attached to the wrong drive using a screw-on type attachment mechanism). In its Reply, Patent Owner argues, again relying on the testimony of Dr. Reinholtz, that “[w]ith a conventional threaded attachment mechanism, when a blade is screwed onto the wrong driveshaft, the blade becomes engaged in the lock mechanism.” Reply 2 (citing Ex. 2016 ¶¶ 20–24).

Petitioner, on the other hand, relying on the testimony of Dr. Ducharme, contends that “[w]hen a blade is forced onto the driveshaft

and the threads are ‘stripped’, the blade is not, and cannot be, ‘engaged’ with the lock mechanism”; “[r]ather, the metal threads on the shaft lock portion are likely carving out new notches in the blade lock portion.” Opp. 12 (citing Ex. 1028 ¶ 49).

According to Patent Owner, however, the “[i]ntent of the UAV designer is not a part of the Engagement Limitation.” Reply 2; *see id.* (noting that “Petitioner’s position appears to be premised on the incorrect notion that the Engagement Limitation requires the engagement of lock mechanism components in the precise way that is intended by the designer of the UAV”). Patent Owner contends that to “be engaged in,” as properly construed, “include[s] the type of connection between threads when a blade is screwed onto the wrong driveshaft.” *Id.* at 3. As we have construed it, to “be engaged in” merely requires “being interlocked.” *See supra* Section II.C.2. Relying on testimony of Dr. Reinholtz, Patent Owner further contends that “when a blade is screwed onto the wrong driveshaft, the threads on the blade mate or interlock with the threads on the driveshaft.” Reply 3 (citing Ex. 2016 ¶¶ 20, 23–24); *see also* Tr. 31:8–12 (“[A]s Dr. Reinholtz explains [at Ex. 2016 ¶ 23], that when a blade is misthreaded, a mechanical connection is created by engagement between the threads either because threads on the blade are deformed around threads on the shaft or threads on the shaft carved through threads on the blade.”). As shown in Dr. Reinholtz’s video, when the blades are screwed onto the wrong driveshaft, the blade and shaft are locked together (i.e., “interlocked” or “engaged”). Ex. 2006; *see also* Ex. 2001 ¶ 54 (describing the video, and indicating that the incorrectly installed blades “do not fall off” and are “securely attached”).

Dr. Ducharme testifies “this ability to force a propeller on the wrong driveshaft is not an intrinsic feature of all threaded couplings, but relates to the specific materials and thread pitch used in the UAV in Dr. Reinholtz’s video.” Ex. 1028 ¶ 49 (citing Ex. 1027, 161:12–163:11). However, Dr. Reinholtz testifies, “[a]s a practical matter, multirotor UAVs typically use plastic or composite propellers for both the clockwise and counterclockwise blades. Because this material is soft and the driveshafts are much harder metal, it is relatively easy to thread a clockwise rotor blade on a motor shaft intended for a counterclockwise blade, and vice versa.” Ex. 2001 ¶ 52.

We are persuaded by Dr. Reinholtz’s testimony and find that a blade screwed onto the wrong driveshaft of a UAV, when using a conventional threaded attachment mechanism, is *engaged* in the lock mechanism within the meaning of the claims.²¹ We, thus, are not persuaded that Sasaki teaches a “mistake-proof” design.

Because we are not persuaded that Sasaki teaches a “mistake-proof” design, we also are not persuaded by Petitioner’s motivation to combine arguments that are premised on maintaining the alleged “mistake-proof” teachings of Sasaki. Petitioner contends that “the motivation to combine

²¹ Though not dispositive to our analysis here, we also note that Petitioner seems to recognize that two components of a conventional threaded attachment mechanism can be engaged, without being connected as intended. *See* Pet. 37 (“[A]s rotor blades get larger, mounting them using Sasaki’s threaded mechanism would be difficult to achieve without increased potential for ‘crossthreading’ and damaging the mechanism. Cross-threading occurs when two t[h]readed components *are engaged without properly aligning the threads*. The misaligned threads cut into each other and cause irreparable damage.” (emphasis added) (citing Ex. 1003 ¶ 112)).

Sasaki with Sokn . . . is not defeated by Sasaki’s alleged non-disclosure of the engagement limitation.” Sur-reply 3. We disagree. According to Petitioner, “there is no dispute that a [person of ordinary skill in the art] would have been motivated to modify Sasaki in a way that was mistake-proof.” *Id.*; *see id.* at 5–6. However, without any express teaching in Sasaki regarding lock mechanisms that are mistake-proof (or the desirability thereof), we determine that this is an impermissible exercise of hindsight with the claims of the ’184 patent serving as a guide, which is not appropriate for a conclusion of obviousness. *See Otsuka Pharm. Co. v. Sandoz, Inc.*, 678 F.3d 1280, 1296 (Fed. Cir. 2012) (“The inventor’s own path itself never leads to a conclusion of obviousness; that is hindsight.”); *In re NTP, Inc.*, 654 F.3d 1279, 1299 (Fed. Cir. 2011) (“Care must be taken to avoid hindsight reconstruction by using ‘the patent in suit as a guide through the maze of prior art references, combining the right references in the right way so as to achieve the result of the claims in suit.’” (internal citations omitted)); *In re Fritch*, 972 F.2d 1260, 1266 (Fed. Cir. 1992) (“It is impermissible to use the claimed invention as an instruction manual or ‘template’ to piece together the teachings of the prior art so that the claimed invention is obvious.” (internal citations omitted)).

Petitioner’s motivation to combine arguments also rely on an assertion that Sokn’s coupling mechanism solves the overtightening problem discussed in Sasaki. *See* Pet. 35; Opp. 17–18; Sur-reply 7–8. In particular, Petitioner contends that “[t]he stops [of Sokn] prevent overtightening by restricting further rotation.” Pet. 35–36 (citing Ex. 1003 ¶ 109). Dr. Ducharme testifies, without further explanation, that “the stop members prevent any further rotation of ring assembly after installation.” Ex. 1003

¶ 111; *see also* Ex. 1028 ¶ 48 (Dr. Ducharme testifying, again without further explanation, that “[t]he use of the term ‘stop members’ informs a [person of ordinary skill in the art] that they stop rotation.”).

We agree with Dr. Reinholtz that “Sokn never [expressly] suggests that [stop members 45] can or will prevent overtightening.” Ex. 2001 ¶ 68. Dr. Reinholtz testifies that, instead, “[i]n the applications envisioned by Sokn [which do not include further rotation after installation], installation torque can be accurately set to assure a secure connection.” *Id.* Further, Dr. Reinholtz provides detailed testimony rebutting Dr. Ducharme’s unsupported assertion that the stop members of Sokn prevent overtightening. Ex. 2001 ¶¶ 67–69; Ex. 2007 ¶¶ 28–30; *see* Revised Mot. Amend 19–20. In particular, Dr. Reinholtz testifies that “[p]ositive, non-frictional stops require stop elements that abut radially rather than axially.” Ex. 2007 ¶ 28. Dr. Reinholtz explains that “Sokn requires frictional contact between the stops 45 . . . and the resilient ring 21 . . . to terminate rotation.” *Id.* ¶ 29. Dr. Reinholtz recognizes that “[i]t is true that, at a certain applied torque, [Sokn’s stop members] will stop rotation. But it is also true that additional torque will cause additional rotation and that this will result in overtightening up to the point where rotation is stopped.” Ex. 2016 ¶ 27; *see also* Reply 4 (arguing that Petitioner has not rebutted Dr. Reinholtz’s testimony regarding the stop members of Sokn). Petitioner, on the other hand, contends that it “has already rebutted this argument” (Sur-reply 7), pointing to pages 17 to 18 of its Opposition. Here, Petitioner does not rebut Patent Owner’s evidence, but merely argues that Patent Owner “has no corroborating evidence” and that Patent Owner’s position “is based on nothing more than speculation.” Opp. 17; *but see* Ex. 2016 ¶ 27

(Dr. Reinholtz testifying that “it is common sense (and would be clearly understood by a [person of ordinary skill in the art]) that frictional stops such as used in Sokn or a on a jar lid can be overtightened”). It is noteworthy that neither Petitioner nor Dr. Ducharme contends that Sokn’s mechanism cannot be overtightened. *See generally* Opp.; *see also Bosch*, 878 F.3d at 1040 (as amended on rehearing) (holding that ordinarily “the petitioner bears the burden of proving that the proposed amended claims are unpatentable by a preponderance of the evidence”). Further, we agree with Patent Owner that the argument presented in Petitioner’s Sur-reply—that “if Sokn had viewed overtightening to be an issue, it would have placed radial stops [(as illustrated in Figure 5 of Sokn)] in Figure 3” (Sur-reply 8)—is based on hindsight. Tr. 38:18–21.

We find Patent Owner’s arguments and evidence on this point more persuasive, and we are not persuaded that Sokn’s coupling mechanism solves the overtightening problem discussed in Sasaki.

Petitioner provides additional rationales in support of its proposed modifications to Sasaki—to “provide increased design flexibility” and to “improve usability.” Pet. 36–38; Ex. 1003 ¶¶ 112, 113. We are not persuaded that these rationales, alone, are sufficient to support a finding that a person of ordinary skill in the art would have been motivated to modify Sasaki with the connection mechanism of Sokn, as proposed by Petitioner. To rely solely on these general rationales, which are not grounded in what a person of ordinary skill in the art would have gleaned from the teachings of the prior art, would be an impermissible exercise of hindsight with the claims of the ’184 patent serving as a guide. *See Otsuka Pharm.*, 678 F.3d at 1296; *In re NTP, Inc.*, 654 F.3d at 1299; *In re Fritch*, 972 F.2d at 1266.

For these reasons, we not persuaded by Petitioner’s arguments and evidence in support of its contention that a person of ordinary skill in the art would have combined Sasaki with Sokn to arrive at the invention recited in the proposed substitute claims.

2. *Obviousness in View of Sasaki and Philistine, Obrist, or EP067*

Petitioner argues that “mechanisms [using partial rotation, with lugs and notches, to install one component onto another component] were known for over a century.” Opp. 18 (citing Pet. 13–16; Ex. 1027, 96:6–15). In this regard, Petitioner points to three references disclosing such a mechanism—Philistine, Obrist, and EP067—and contends that a person of ordinary skill in the art would have been motivated to combine each of these references with Sasaki to arrive at the invention of the proposed substitute claims. *See id.* at 18–24. Patent Owner argues that “Petitioner has failed to establish that a [person of ordinary skill in the art] would combine these references with Sasaki, or that, even if combined, that they would render the revised substitute claims unpatentable.” Revised Mot. Amend 21.

For the reasons discussed below, we are not persuaded by Petitioner’s arguments and evidence in support of its contention that a person of ordinary skill in the art would have combined Sasaki with any of Philistine, Obrist, or EP067 to arrive at the claimed invention.

a) *Sasaki and Philistine*

Philistine discloses a “twist lock mount for quick mounting and positioning a device to a support.” Ex. 1026, at code (57). Figure 1 of Philistine is reproduced below.

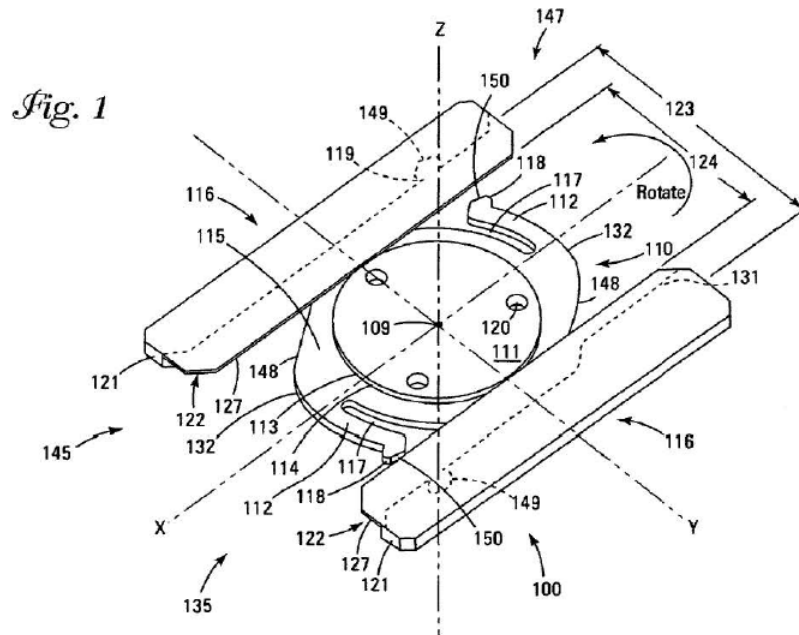


Figure 1, above, shows a top view of one embodiment of the quick release mount of Philistine. *Id.* at 2:14–15. Philistine’s mechanism includes a “mounting member 110 that is secured to or integrated with a device to be mounted, and a receiving member 116 that is secured to or integrated with a mounting surface or support.” *Id.* at 2:33–44. Petitioner describes that “mounting member 110 slides into the channel 123 and securely locks in place with a 90° . . . rotation of the mounting plate relative to the receiving member, engaging ‘lugs 150’ on the mounting plate with notches (‘recesses 119’) on the receiving member.” Opp. 19 (citing Ex. 1026, 2:33–44, 3:10–22, 4:24–27, Figs. 1, 2). According to Petitioner, “[t]he mechanism [of Philistine] is not susceptible to overtightening because ‘mounting

member 110 is locked into position and will resist further rotation in the counterclockwise direction.” *Id.* (citing Ex. 1026, 4:27–29; Ex. 1028 ¶ 51).

Petitioner contends a person of ordinary skill in the art “would have been motivated to use Philistine . . . to mount a UAV blade onto a driveshaft for several reasons.” *Id.* at 20. These reasons include “solv[ing] the overtightening problem of Sasaki’s prior art threads while maintaining the well-known ‘mistake-proof’ design” thereof (*id.* (citing Ex. 1028 ¶ 57)) and that Philistine’s “mechanism allows for easy installation and de-installation while being secure enough for ‘harsh environments where extreme vibration and shock loading is expected’” (*id.* (quoting Ex. 1026, 1:25–28; citing Ex. 1028 ¶ 57)). Petitioner also contends that “Philistine is analogous art to Sasaki because it discloses a general-purpose twist-lock mechanism, which is reasonably pertinent to the problem of attaching a blade to a UAV driveshaft.” *Id.* (citing Ex. 1028 ¶ 57).

We note certain problems with the arguments and theories raised by Petitioner regarding the combination of Sasaki with Philistine, leading us to a conclusion that Petitioner has not shown that a person of ordinary skill in the art would have combined Sasaki with Philistine to arrive at the proposed substitute claims.

According to Petitioner’s combination of Philistine with Sasaki, “Philistine’s mounting plate is attached or integrated onto the blade, forming the ‘*blade lock portion*,’ and Philistine’s receiving member is attached or integrated onto the shaft, forming the ‘*shaft lock portion*.’” *Id.* at 21 (citing Ex. 1028 ¶ 59). We recognize that Philistine discloses that its mounting system “provide[s] simple, ergonomic, easily securable, quickly releasable, low profile, mounting mechanisms for a *variety of equipment, components*

and devices in a number of different working environments.” Ex. 1026, 5:31–36 (emphasis added by Petitioner at Opp. 22). Philistine, however, relates to “*surface mounting* of devices in confined spaces.” See *id.* at 3:5–6 (emphasis added); see also, e.g., *id.* at 6:7–8 (Claim 1 recites a “twist-lock mount for mounting and positioning a device *to a support*.” (emphasis added)). Petitioner does not describe *how* receiving member 116 of Philistine—which includes “channel 123 that is defined by a pair of opposing, parallel guide rails 121 [that] . . . extend longitudinally (in the x direction) and provide inner guide surfaces 125 that make up the walls of channel 123” (Ex. 1026, 2:50–54)—would be “attached or integrated onto the shaft” (Opp. 21) of Sasaki. See *TriVascular*, 812 F.3d at 1066.

Petitioner also argues that a person of ordinary skill in the art “would have been motivated to mirror the design of Philistine’s Figure 1 embodiment” to form the clockwise and counterclockwise lock mechanisms. Opp. 21. Petitioner’s mirror-image arguments, however, are premised, at least in part, on the assertion that the combination “maintain[s] the well-known ‘mistake-proof’ design” of Sasaki” (*id.* at 20). See *id.* at 21–22. We are not persuaded by these arguments for the same reasons discussed above regarding the combination of Sasaki and Sokn. See *supra* Section II.E.1.d; Reply 7 (“Petitioner’s . . . assertions on motivation are based on the false premise that Sasaki is mistake-proof.”). Further, we agree with Patent Owner that Philistine does not “disclose more than one configuration for their connection mechanisms.” Revised Mot. Amend 22. For these reasons, we are not persuaded by Petitioner’s arguments and evidence in support of its contention that a person of ordinary skill in the art would have combined

Sasaki with Philistine to arrive at the invention recited in the proposed substitute claims.

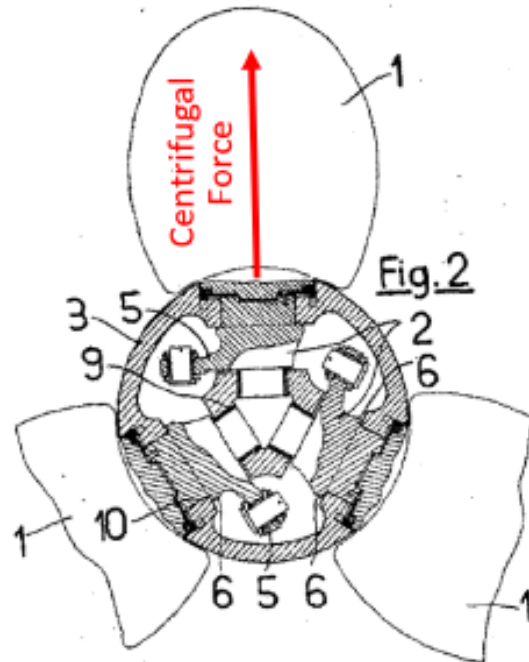
b) Sasaki and Obrist or EP067

The parties' arguments address the combination of Sasaki with Obrist or EP067 together. We, thus, also address these combinations in a single discussion. We note certain problems with the arguments and theories raised by Petitioner regarding the combination of Sasaki with Obrist or EP067, leading us to a conclusion that Petitioner has not shown that a person of ordinary skill in the art would have combined Sasaki with either of Obrist or EP067 to arrive at the proposed substitute claims.

Obrist relates to a "variable-pitch propeller for ships, aircraft and centrifugal machines, provided with cranks for varying the pitch of the propeller blades." Ex. 1017, 1:1–4. As described in Obrist:

The operation of mounting a blade root 2 in the hub is carried out as follows. The root 2 is so positioned (see, for example, Fig. 6) that its bayonet lugs 6 can be introduced through recesses 8. After such introduction and the insertion of the trunnion 9 into the bearing provided therefor near the center of the hub the root and its attached adjusting crank are turned about 90° so that the lugs 6 are displaced from the recesses 8 through which they entered, and engage an arcuate seat formed therefor on the internal face of the hub.

Id. at 2:44–54. "In Obrist, the projections 6 resist radial force, i.e., the centrifugal force, that tries to sling the blade radially outward from the hub as shown in Figure 2 below." Ex. 2007 ¶ 22.



Annotated Figure 2, above, is a sectional view of the variable-pitch ship propeller of Obrist. Ex. 1017, 1:33–38.

EP067 relates to a “variable-pitch propeller.” Ex. 1018, at code (57).

As described therein, the propeller

has angularly displaceable blade support plates (1) which can be rotated about respective radial axes (2). The plates (1) are provided with radially inwardly directed claws (4) which engage in circumferential grooves (11) of bases (7) of the blades (8). The latter have radial projections (12) reaching beneath the claws (4). The resulting bayonet connection simplifies mounting and dismounting of the propeller blades (8) even under water.

Id. “For mounting of a new blade, the base of the new blade is fitted onto the plate so that the claws engage in the cutouts and the blade is then rotated through a fraction of a full revolution about its radial axis until the claws engage in the groove and the projections engage beneath the claws. *Id.* ¶ 8.

As described above, both Obrist and EP067 relate to variable-pitch propellers. Ex. 1017, 1:1–5; Ex. 1018, at code (57); *see also* Revised Mot. Amend 21 (“EP067 and Obrist relate to pitch-control for propeller blades.” (citing Ex. 2007 ¶¶ 20–22)). As Dr. Reinholtz testifies, “propeller blades in EP067 are fixed to the hub, as shown . . . in EP067 Figure 5, and do not rotate around the axis of the driveshaft like a UAV propeller blade.” Ex. 2007 ¶ 20. The configuration of Obrist is similar. *See id.* ¶ 21 (“Obrist . . . , like EP067, relates to pitch control and does not at all relate to clockwise and counterclockwise rotating blades.”).

Dr. Reinholtz testifies, more specifically, that “[t]he boat propeller blades in EP067 are fixed to the hub and rotate only through a fraction of a revolution to adjust the pitch of the blade. In EP067, the axis of the drive motor is perpendicular to the blade.” *Id.* ¶ 36; *see, e.g.*, Ex. 1018 ¶ 17 (“In FIGS. 5 and 6, the hub has been represented at 20, the hub axis at 21 and the pitch-adjustment mechanism has been shown at 22 within the hub for angularly displacing each of the blades 8 about the respective radial axis 2 to vary the pitch of the propeller”), claim 10 (reciting a “variable-pitch boat propeller . . . comprising: a hub provided with a pitch-adjustment mechanism; a plurality of blade-support plates angularly spaced apart on said hub and rotatable about respective radial axes by said mechanism; and respective blade members affixed to said blade-support members”). Because both Obrist and EP067 relate to variable-pitch propellers, the same would apply to Obrist. The propellers of Obrist and EP067 simply have a configuration that is different than the blades of a UAV generally, and of Sasaki more specifically.

In describing the combination of Sasaki with Obrist or EP067, Petitioner asserts that

[f]or example, the portion of the blade foot integrated into the propeller in the combined UAV of Sasaki and EP067 that has cutouts 11 and projections is the “*blade lock portion*.” Projections 12 are “*lugs on the blade lock portion*.” Support plate 1 integrated into the driveshaft in the combined UAV of Sasaki and EP067 is the recited “*shaft lock portion*” and gaps 5 are the recited “*notches*.”

Opp. 22–23 (citing Ex. 1028 ¶ 62). We note, however, that although Petitioner references “the blade foot integrated into the propeller in the combined UAV of Sasaki and EP067” (*Id.* at 22), nowhere does Petitioner describe *how* this combination is implemented. It is not a sufficient explanation for combining with Sasaki that these references relate to propellers. As discussed above, the propellers in Obrist and EP067 are fixed to a hub, and they do not rotate around the axis of the driveshaft like a UAV propeller blade, such as that of Sasaki. *See* Ex. 2007 ¶ 20. Dr. Ducharme does not sufficiently address these differences in his declarations.

Further, Petitioner acknowledges that “the forces are different with the UAV connection,” but asserts that a person of ordinary skill in the art “would understand how to apply the teachings of Obrist and EP067 to the rotational forces experienced by the blades in a UAV, such as Sasaki.”

Opp. 20 (citing Ex. 1028 ¶ 56); *see also* Ex. 2007 ¶ 33 (noting that Dr. Ducharme “fails to demonstrate how these combinations would be implemented”). Petitioner contends that “[b]oth Obrist and EP067 explain that the force in rotation of the propeller maintains the lugs in position.”

Opp. 20 (citing Pet. 19–20; Ex. 1017, 2:55–3:4; Ex. 1018 ¶ 11). The cited portions of Obrist and EP067, however, do not relate to rotational forces

such as those found in a UAV propeller, and Petitioner provides no additional explanation in this regard. For example, Obrist states that “projections 6 act as a lock with regard to the centrifugal forces exerted on the corrected place 1 in that they rest directly against the inner surface of the hub 3.” Ex. 1017, 3:1–4. EP067 states that “hydrodynamic flow forces suffice to prevent rotation of the blade angularly to release the bayonet connection [of the individual propeller blade].” Ex. 1018 ¶ 11. And, as discussed above, the propeller blades in Obrist and EP067 are fixed to the hub and do not rotate around the axis of the driveshaft as in a UAV. *See* Ex. 2007 ¶¶ 20–21. We, thus, are not persuaded that Petitioner has sufficiently described *how* a person of ordinary skill in the art would have implemented the combination of Sasaki and Obrist or EP067. *See TriVascular*, 812 F.3d at 1066.

As to motivation to combine, Petitioner contends a person of ordinary skill in the art “would have been motivated to use . . . Obrist or EP067 to mount a UAV blade onto a driveshaft for several reasons.” Opp. 20. The only reason Petitioner provides that is not specific to Philistine, however, is “solv[ing] the overtightening problem of Sasaki’s prior art threads while maintaining the well-known ‘mistake-proof’ design” of Sasaki. *Id.* (citing Ex. 1028 ¶ 57). As discussed above in our discussion of the combination of Sasaki and Sokn, we do not find these arguments to be persuasive. *See supra* Section II.E.1.d; Reply 7 (“Petitioner’s . . . assertions on motivation are based on the false premise that Sasaki is mistake-proof.”).

For these reasons, we are not persuaded by Petitioner’s arguments and evidence in support of its contention that a person of ordinary skill in the art

would have combined Sasaki with Obrist or EP067 to arrive at the invention recited in the proposed substitute claims.

III. CONCLUSION

Pursuant to Patent Owner's non-contingent request, we cancel claims 3 and 4, and for the reasons set forth above, we grant Patent Owner's motion to amend the '184 patent to add proposed substitute claims 12 and 13, as summarized in the following table:

Motion to Amend Outcome	Claims
Original Claims Cancelled by Amendment	3, 4
Substitute Claims Proposed in the Amendment	12, 13
Substitute Claims: Motion to Amend Granted	12, 13
Substitute Claims: Motion to Amend Denied	
Substitute Claims: Not Reached	

IV. ORDER

Accordingly, it is

ORDERED that Patent Owner's Motion to Amend is *granted* as to its non-contingent request to cancel claims 3 and 4; and

FURTHER ORDERED that Patent Owner's Motion to Amend is *granted* as to substitute claims 12 and 13.

This is a final decision. Parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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