

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.

Case 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*.

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

I. INTRODUCTION

SZ DJI Technology Co., Ltd. (“Petitioner”)¹ filed a Petition for *inter partes* review of claims 3 and 4 (“the challenged claims”) of U.S. Patent No. 9,260,184 B2 (Ex. 1001, “the ’184 patent”). Paper 2 (“Pet.”). Autel Robotics USA LLC (“Patent Owner”) did not file a Preliminary Response.

The standard for instituting an *inter partes* review is set forth in 35 U.S.C. § 314, which provides that an *inter partes* review may be instituted only upon a showing that “there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a) (2012). After considering the Petition and the evidence of record, we determine that Petitioner has demonstrated a reasonable likelihood of prevailing with respect to at least one claim challenged in the Petition. Accordingly, we institute an *inter partes* review of all challenged claims of the ’184 patent, based on all of the grounds identified in the Petition.

The following findings of fact and conclusions of law are not final, but are made for the sole purpose of determining whether Petitioner meets the threshold for initiating review. Any final decision shall be based on the full trial record, including any response timely filed by Patent Owner. Any arguments not raised by Patent Owner in a timely-filed response may be deemed waived.

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.

A. Related Proceedings

The parties identify *SZ DJI Tech. Co. v. Autel Robotics USA LLC*, Case No. 16-706-LPS-CJB (D. Del.) and *Certain Unmanned Aerial Vehicles and Components Thereof*, Inv. No. 337-TA-133 (USITC, instituted Sept. 26, 2018) as related matters. Pet. 2; Paper 4, 2. We previously instituted an *inter partes* review of claims 1, 2, 5–9, and 11 of the ’184 patent.² See *SZ DJI Tech. Co. v. Autel Robotics USA LLC*, IPR2019-00343, Paper 7 (PTAB May 22, 2019) (“IPR2019-00343 Inst. Dec.”).

B. The ’184 Patent

The ’184 patent is titled “Compact Unmanned Rotary Aircraft,” was filed on May 14, 2014³, and issued February 16, 2016. Ex. 1001, at codes (22), (45), (54).

² Patent Owner did not file a preliminary response, and, thus, has not presented any arguments regarding “follow-on” or parallel petitions. See Office Trial Practice Guide July 2019 Update, at 23–28 (referenced at 84 Fed. Reg. 33,925 (July 16, 2019); available at <https://www.uspto.gov/TrialPracticeGuide3>).

³ The ’184 patent claims priority to Canadian application No. 2815885, filed on May 15, 2013. Ex. 1001, at code (30). The specific priority date of the challenged claims currently is not at issue in this proceeding, and we need not make any determination in this regard. 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.

Figure 1 of the '184 patent is reproduced below.

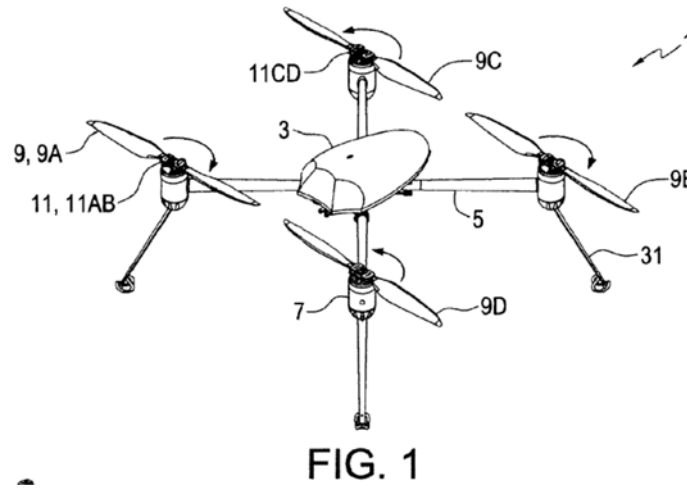


Figure 1 illustrates rotary wing apparatus 1. *Id.* at 2:31–34. Rotary wing apparatus 1 includes body 3 and a plurality of arms 5, each including rotor assembly 7 attached to an outside end thereof. *Id.* at 3:15–18. Each rotor assembly 7 includes “rotor blade 9 releasably attached to a driveshaft by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

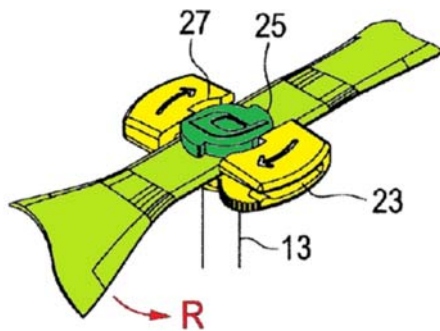


Figure 4

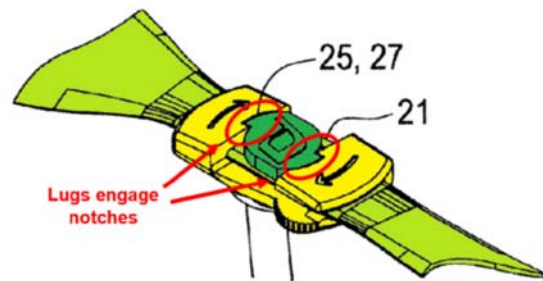


Figure 5

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., 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. *Id.* at 4:27–35, Fig. 8.

C. Challenged Claims

Challenged claim 3 depends from independent claim 1, and challenged claim 4 depends from claim 3. Claims 1, 3, and 4 of the ’184 patent are reproduced below.

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.

3. The apparatus of claim 1 wherein the blade lock portion of the clockwise lock mechanism is rotated counterclockwise with respect to the shaft lock portion thereof to releasably attach the clockwise rotor blade to the first driveshaft.

Id. at 6:18–21.

4. The apparatus of claim 3 wherein the blade lock portion of the counterclockwise lock mechanism is rotated clockwise with respect to the shaft lock portion thereof to releasably attach the counterclockwise rotor blade to the second driveshaft.

Id. at 6:22–26.

D. The Applied References

Petitioner relies on the following references in the asserted ground.

Pet. 3.

Reference	Issue/Publication Date	Exhibit
JP Appl. Publ'n No. H06-17511 ("Sasaki")	Jan. 14, 1991 ⁴	Ex. 1005; Ex. 1006 ⁵
U.S. Patent No. 5,133,617 ("Sokn")	July 28, 1992 ⁶	Ex. 1007

Petitioner also relies on the Declaration of Dr. Alfred Ducharme (Ex. 1003) to support its positions.

E. The Asserted Ground

Petitioner challenges the patentability of claims 3 and 4 on the following ground. See Pet. 3–4, 25–51.

Claims Challenged	Statutory Basis	References
3, 4	§ 103	Sasaki and Sokn

II. ANALYSIS

A. Principles of Law

"In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable." *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed.

⁴ Sasaki is prior art to the challenged claims at least under 35 U.S.C. §§ 102(a)(1), (2). See Pet. 3.

⁵ Petitioner provides the original Japanese language document (Ex. 1005) and a certified translation thereof (Ex. 1006). Citations to Sasaki are to the translation.

⁶ Sokn is prior art to the challenged claims at least under 35 U.S.C. §§ 102(a)(1), (2). See Pet. 3.

Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). This burden of persuasion never shifts to Patent Owner. See *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burden of proof in *inter partes* review).

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.⁷ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). An obviousness analysis “need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007); accord *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1259 (Fed. Cir. 2007). However, Petitioner cannot satisfy its burden of proving obviousness by employing “mere conclusory statements.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016). Instead, Petitioner must articulate a reason

⁷ At this stage of the proceeding, the parties have not asserted or otherwise directed our attention to any objective evidence of non-obviousness.

why a person of ordinary skill in the art would have combined or modified the prior art references. *In re NuVasive, Inc.*, 842 F.3d 1376, 1382 (Fed. Cir. 2016).

We analyze the asserted ground of unpatentability in accordance with these principles to determine whether Petitioner has met its burden to establish a reasonable likelihood of success at trial.

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. Petitioner contends 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 UAVs.” Pet. 20–21 (citing Ex. 1003 ¶ 72). Based on the current record and for the purposes of this Decision, we adopt Petitioner’s proposed description of the person of ordinary skill in the art. Further, we find that the prior art of record reflects the level of skill in the art at the time of the invention. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001). We will make a final determination as to the level of ordinary skill in the art, however, based on the full trial record.

C. Claim Construction

An amendment to 37 C.F.R. § 42.100(b) changing the claim construction standard applies here because the Petition was filed on or after

November 13, 2018,⁸ the effective date of the amendment. *See* Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340 (Oct. 11, 2018). Thus, for this *inter partes* review, 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.”⁹ *Id.*

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).

Petitioner proposes constructions for several claim terms, including “lugs” and “notches”; “lock mechanism” / “clockwise lock mechanism” / “counterclockwise lock mechanism”; and “drive.” Pet. 21–25. For purposes

⁸ The present Petition was filed on March 19, 2019. *See* Paper 3.

⁹ At this stage of the proceeding, no such prior claim construction determination has been made of record.

of this Decision, we determine that only “lugs” and “notches” require construction.¹⁰

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)). Petitioner proposes that “lugs” and “notches” should be construed as “projections” and “indentations,” respectively. Pet. 24; Ex. 1003 ¶ 86; *see also* Ex. 1021, 1177 (defining “lug” as a “projection or head on a metal part to serve as a cap, handle, support, or fitting connection”); Ex. 1020, 806 (defining “lug” as a “handle or projection used as a hold or support” and a “projection that helps provide traction”); Ex. 1022, 1163 (defining “notch” as “an indentation or incision on an edge or surface”). These constructions are consistent with the disclosure in the Specification of the ’184 patent, which does not define any particular configuration for the lugs and notches other than their respective engagement. *See, e.g.*, Ex. 1001, 4:3–8 (“lugs 25A . . . engage notches 27A”), Figs. 5, 10. Accordingly, for purposes of this Decision, we construe “lugs” and “notches,” in accordance with Petitioner’s proposal, as “projections” and “indentations,” respectively.

¹⁰ In related IPR2019-00343, we construed the “lock mechanism” claim terms to clarify that the term “allows ‘components other than those specifically recited in the claims to [help] releasably attach the rotor blades.’” *See* IPR2019-00343 Inst. Dec. 13–16 (quoting IPR2019-00343 Pet. 32). Although we need not construe these terms for purposes of institution here, the parties should address this construction in any subsequent briefing if it affects or is relevant to a party’s arguments in this proceeding.

We note that this claim construction determination is not final and we will revisit the issue based on the full record developed during trial. We encourage the parties to address the construction of these terms in subsequent briefing.

2. Remaining Claim Terms

We have given all remaining claim terms their ordinary and customary meaning, and determine that it is not necessary to explicitly construe any other term or phrase. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co. Ltd.*, 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) (“[W]e need only construe terms ‘that are in controversy, and only to the extent necessary to resolve the controversy.’”)).

D. Asserted Obviousness in View of Sasaki and Sokn

Petitioner asserts that claims 3 and 4 would have been obvious in view of Sasaki and Sokn. Pet. 25–51. We address Petitioner’s contentions below. We emphasize that the following determinations regarding the sufficiency of the Petition are preliminary in nature at this stage of the proceeding.

1. 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.

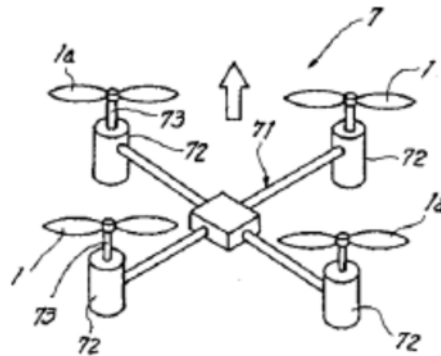


Fig. 7

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.

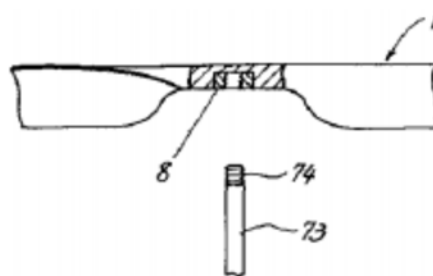


Fig. 8

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.* In this configuration, “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).” *Id.* at 2:5–8. Dr. Ducharme testifies that this direction threading results in a coupling mechanism that is “mistake-proof,” i.e., “the user cannot place a propeller on the wrong driveshaft.” Ex. 1003 ¶ 96; see *id.* ¶¶ 45, 54–55. However, as noted in Sasaki, nut 8 may be “tightened more than necessary” during rotation of propeller 1, making it difficult to remove the propeller when needed. Ex. 1006, 2:9–16.

2. 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. Figure 3 of Sokn is reproduced below.

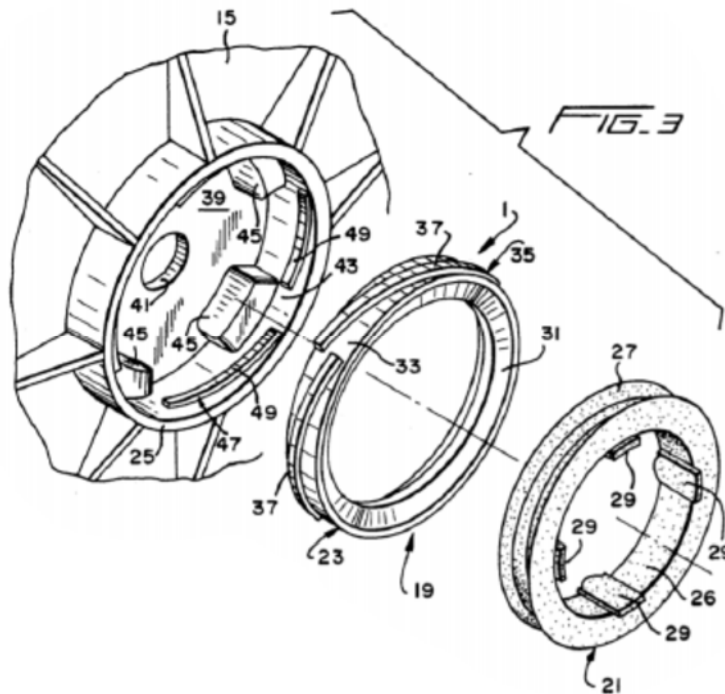


Figure 3, above, shows a partial exploded view of the details of the mounting ring assembly of Sokn. *Id.* at 2:27–30. Motor mount assembly 1 includes internal ring 21, external ring 23, and cylindrical socket 25. *See id.* at 3:4–65. External ring 23 includes “first engagement portion 35 in the form 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. 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.

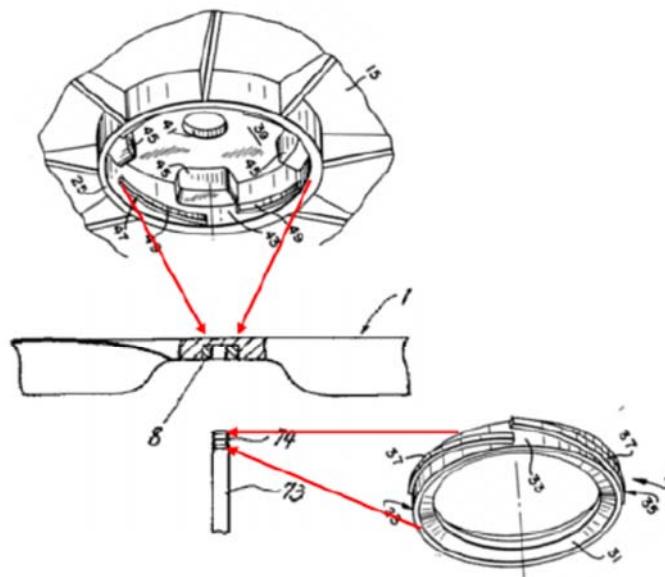
3. Discussion of Petitioner’s Asserted Ground

Challenged claims 3 and 4 depend, directly or indirectly, from independent claim 1, and, thus, include all of the limitations set forth in

claim 1. *See* 37 C.F.R. § 1.75(c). Accordingly, we address Petitioner's contentions as to independent claim 1, before turning to Petitioner's contentions as to challenged claims 3 and 4.

a. Petitioner's Proposed Combination

Petitioner relies on a combination of Sasaki and Sokn as teaching all the elements of the challenged claims. *See* Pet. 25–51. In Petitioner's combination, Sasaki's threaded screw coupling mechanism (screw shaft 74, nut 8, *see* Ex. 1006, Fig. 8), which 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.



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. *Id.* at 32–33. 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’ of the prior art.” *Id.* at 29 (citing Ex. 1003 ¶ 100). 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).

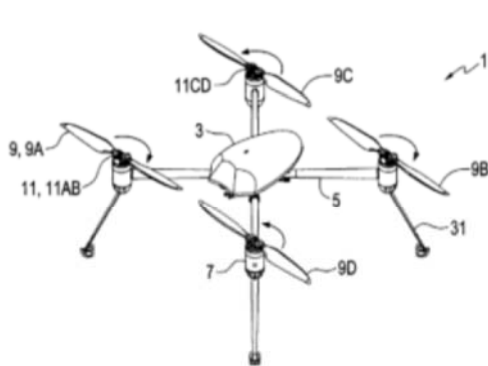
Petitioner further contends that, based on Sokn’s teaching of “provid[ing] a predetermined orientation” for engagement (Ex. 1007, 3:66–4:4) and Sasaki’s teaching of a directionally threaded coupling mechanism (see Ex. 1006, 2:5–8), a person of ordinary skill in the art “would have been motivated to orient 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, “[w]ith this orientation, the rotation force during operation is in the locking direction.” *Id.* (citing Ex. 1003 ¶ 109). The stop members of Sokn’s coupling mechanism, however, prevent the overtightening problem present with Sasaki’s threaded screw coupling mechanism. *Id.*; Ex. 1003 ¶ 109.

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)).

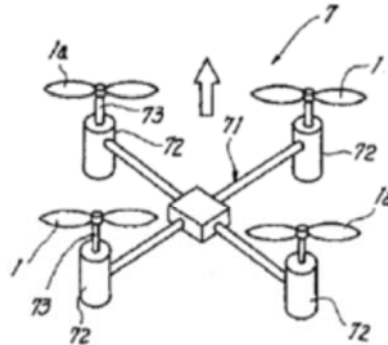
We now turn to Petitioner’s mapping of its proposed combination to the claims.

b. Independent Claim 1

Petitioner provides a side-by-side comparison of Figure 1 of the ’184 patent and Figure 7 of Sasaki (Pet. 39), reproduced below.



'184 Patent, Figure 1



Sasaki, Figure 7

Figure 1 of the ’184 patent and Figure 7 of Sasaki, above, illustrate rotary wing apparatus 1 of the ’184 patent and flying toy 7 of Sasaki, respectively.

Petitioner sets forth in detail how Sasaki discloses a rotary wing aircraft apparatus, as recited in claim 1, including (1) a body; (2) a plurality of arms extending laterally from the body; and (3) a rotor assembly attached to an outside end of each arm; (4) where the rotor assembly includes a drive rotating a drive shaft; (5) where first and second driveshafts rotate in clockwise and counterclockwise directions, respectively; and (6) where rotation of the rotor blades generates a vertical lift force. *Id.* at 39–43, 45–46 (citing Ex. 1006, 4:3–14, 4:27–29, 4:36–39; Ex. 1003 ¶¶ 44–45, 117–21, 123, 126; Ex. 1001, 1:24–31, 3:31–37). At this stage of the proceeding, Petitioner’s contentions as to these limitations are supported by record evidence and do not require further discussion.

Claim 1 also recites that the rotor assembly includes a “rotor blade releasably attached to a driveshaft by a lock mechanism.” Sasaki expressly teaches that “propellers (1) (1a) are each **detachably attached** to a top end of the upward rotating shaft (73) of the motor (72) by a fixture (4).” Pet. 42 (quoting Ex. 1006, 4:27–29). As described above, in Petitioner’s proposed combination, the “‘*rotor assembly*’ . . . includes a coupling mechanism (‘*lock mechanism*’) having two portions—a portion located on the blade in the socket at the central portion of the propeller (‘*blade lock portion*’) and a portion located at the end of the rotating shaft (73) (‘*shaft lock portion*’).” *Id.* “The rotor blade is coupled to the driveshaft by engaging the two portions and rotating the propeller relative to the driveshaft (rotating shaft). The rotor blade is removed from the driveshaft by rotating the propeller in the opposite direction.” *Id.* (citing Ex. 1003 ¶ 122).

Regarding the directionality of the locking mechanisms, Petitioner notes that Sasaki expressly teaches such directionality. *Id.* at 44; Ex. 1006,

2:5–8 (“[I]t 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).”). In Petitioner’s proposed combination, “the thread segments and corresponding notches [of first engagement portion 35 and second engagement portion 47] are oriented in the same direction as the continuous thread of Sasaki” that they replace. Pet. 44 (citing Ex. 1003 ¶¶ 109, 110, 125, 126). Regarding the requirements that the “clockwise rotor blade is engageable only with the clockwise lock mechanism” and that the “counterclockwise rotor blade is engageable only with the counterclockwise lock mechanism,” Petitioner notes that “[b]ecause the combined UAV retains the directional nature of Sasaki’s threading, the clockwise propeller cannot be used on the counterclockwise driveshaft” and, likewise, “the counterclockwise propeller cannot be used on the clockwise driveshaft.” *Id.* at 46–47 (citing Ex. 1003 ¶¶ 127, 128).

Claim 1’s final limitation requires that “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.” In Petitioner’s proposed combination, “screw shaft (74) formed at the top of Sasaki’s rotating shaft (73) is replaced with Sokn’s first engagement portion 35.” Pet. 47 (citing Ex. 1003 ¶ 129). According to Petitioner, “[t]he resulting structure at the end of the rotating shaft (73) is the claimed ‘*shaft lock portion attached to the first driveshaft.*’” *Id.* Further, “Sasaki’s nut buried ‘in the central portion of the propeller (1)’ (socket) is replaced with Sokn’s stop members 45 and second engagement portion 47.” *Id.* at 48 (citing Ex. 1003 ¶ 130). According to Petitioner, “[t]he resulting

structure in the socket of the propeller is the recited ‘*blade lock portion attached to the...rotor blade.*’” *Id.*

First engagement portion 35 (i.e., the claimed shaft lock portion) includes “a plurality of circumferentially spaced thread segments 37 and notches (indentations) defined therebetween.” Pet. 47 (citing Ex. 1003 ¶ 129). Second engagement portion 47 (i.e., the claimed blade lock portion) includes a “plurality of protruding helical thread segments 49 spaced forwardly of stop members 45.” *Id.* at 48 (citing Ex. 1003 ¶ 130). Petitioner relies on the protruding helical thread segments 49 and the indentations between spaced thread segments 37 as teaching the claimed “lugs” and “notches,” respectively. *Id.* at 49–50 (citing Ex. 1003 ¶ 131).

Sokn teaches that the first engagement portion 35 and second engagement portion creates “a large and easily alignable target area . . . 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.” Ex. 1007, 3:53–59. Based on our construction of “lugs” and “notches” as “projections” and “indentations,” respectively, we agree with Petitioner that the proposed combination teaches the recited “notches configured to engage corresponding lugs.”

Based on our review and consideration of the current record, we determine that the information presented at this stage of the proceeding supports sufficiently, for purposes of institution, Petitioner’s assertions as to the disclosures of Sasaki and Sokn with respect to each element of claim 1, and as to the combination of the teachings of the prior art.

c. Challenged Claims 3 and 4

Challenged claims 3 and 4 recite that “the blade lock portion of the clockwise lock mechanism is rotated counterclockwise with respect to the shaft lock portion thereof to releasably attach the clockwise rotor blade to the first driveshaft,” and “the blade lock portion of the counterclockwise lock mechanism is rotated clockwise with respect to the shaft lock portion thereof to releasably attach the counterclockwise rotor blade to the second driveshaft,” respectively. As described above, Petitioner contends that, in the proposed combination, 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. 35 (citing Ex. 1003 ¶¶ 109, 110). In other words, “to couple the clockwise propeller to the clockwise driveshaft, the propeller is twisted in a counterclockwise direction.” *Id.* at 50 (citing Ex. 1003 ¶ 132). Likewise, “[t]o couple the counterclockwise propeller to the base, the propeller is twisted in a clockwise direction.” *Id.* at 51 (citing Ex. 1003 ¶ 133).

Based on our review and consideration of the current record, we determine that Petitioner has established a reasonable likelihood of showing that claims 3 and 4 would have been obvious in view of Sasaki and Sokn. In particular, the information presented at this stage of the proceeding supports sufficiently, for purposes of institution, Petitioner’s assertions as to the

disclosures of the prior art and as to the combination of the teachings thereof.

III. CONCLUSION

For the reasons set forth above, we determine that Petitioner has demonstrated a reasonable likelihood of prevailing with respect to at least one claim of the '184 patent. Thus, we institute an *inter partes* review as set forth in the Order below. Trial shall commence on the entry date of this Decision.

IV. ORDER

Accordingly, it is

ORDERED that pursuant to 35 U.S.C. § 314(a), an *inter partes* review of claims 3 and 4 of U.S. Patent No. 9,260,184 B2 is instituted with respect to all grounds set forth in the Petition; and

FURTHER ORDERED that, pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial, which will commence on the entry date of this Decision.

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