

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
U.S. Patent No. 9,260,184

**PETITIONER'S OPPOSITION TO
PATENT OWNER'S REVISED MOTION TO AMEND**

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EXHIBIT LIST

DJI Exhibit No.	Description
1001	U.S. Patent 9,260,184 to Olm <i>et al</i>
1002	U.S. Patent 9,260,184 File History
1003	Declaration of Dr. Alfred Ducharme
1004	Curriculum Vitae of Dr. Alfred Ducharme
1005	JP Unexamined Utility Model Application Publication H06-17511 to Ryoichi Sasaki
1006	English Language Translation of H06-17511 and Certification of Translation
1007	U.S. Patent No. 5,133,617 to Sokn
1008	U.S. Patent No. 8,052,081 to Olm
1009	Design and Construction of a Quadrotor-type Unmanned Aerial Vehicle: Preliminary Results” by Sa
1010	Design of a Four Rotor Hovering Vehicle by Nice
1011	The JAviator Quadrotor – An Aerial Software Testbed by Trummer
1012	U.S. Patent No. 135,655 to Miller <i>et al.</i>
1013	U.S. Patent No. 821,534 to Perkins
1014	Contra Rotating Propeller Drive System User Guide
1015	KitchenAid – Hand Mixer Instructions
1016	User Manual for the Microdrones md4-200, Version 2.2
1017	U.S. Patent No. 2,470,517 to Obrist
1018	European Patent Application EP 0 921 067 to Peter Muller
1019	IPR2019-00343, Patent Owner Preliminary Response, Paper 6
1020	American Heritage Dictionary
1021	McGraw-Hill Dictionary of Scientific and Technical Terms, Fifth Edition
1022	The New Oxford American Dictionary, Second Edition
1023	Webster’s Ninth New Collegiate Dictionary
1024	Transcript of deposition of Dr. Charles Reinholtz in <i>SZ DJI Technology Co., Ltd. v. Autel Robotics USA LLC</i> , PTAB proceeding nos. IPR2019-00343, IPR2019-00014, IPR2019-00016 (Nov. 15, 2019)

DJI Exhibit No.	Description
1025	Transcript of hearing before the International Trade Commission, <i>In the Matter of: Certain Unmanned Aerial Vehicles And Components Thereof</i> , 337-TA-1133 (Oct. 23, 2019)
1026	U.S. Patent 6,929,226 to Philistine
1027	Transcript of Deposition of Dr. Charles Reinholtz (Apr. 3, 2020)
1028	Second Declaration of Dr. Alfred Ducharme
1029	Transcript of Second Deposition of Dr. Charles Reinholtz (June 16, 2020)
1030	Third Declaration of Dr. Alfred Ducharme
1031	Final Written Decision in IPR2019-00343 against U.S. Patent 9,260,184 (May 21, 2020)
1032	U.S. Patent 4,477,228 to Duffy et al. (“Duffy”)

The Board's Preliminary Guidance ("PG") found a reasonable likelihood that Patent Owner's ("PO's") amended claims 12 and 13 are obvious. In a Revised Motion to Amend ("RMA"), PO offers nothing new to support patentability of the substitute claims and nothing in the revised claims distinguishes them from the prior art. Petitioner first demonstrates that the revised claims would have been obvious and then demonstrates that PO's arguments lack merit. The Board should deny the RMA because the claims are not patentable over Sasaki in combination with numerous prior art twist-lock coupling mechanisms.

I. The revised substitute claims would have been obvious to a POSITA.

The original combination of Sasaki and Sokn, presented in the Petition, renders claims 12 and 13 obvious. In addition, the substitute claims are also unpatentable in view of Philistine, Obrist, and EP067.

A. The combination of Sasaki and Sokn renders claims 12-13 obvious.

The Petition established that the combination of Sasaki and Sokn discloses the limitations of independent claim 1 and original claims 3 and 4. PO did not challenge the grounds of unpatentability against original claims 3 and 4, making its motion to amend non-contingent. (RMA, p. 1.) 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. *Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-01129, Paper 15 at *4 (PTAB Feb. 25, 2019) (precedential)

("[T]he Board determines whether substitute claims are unpatentable by a preponderance of the evidence based on the entirety of the record.").

1. A POSITA would have been motivated to combine Sasaki and Sokn.

The Petition presented numerous reasons why a POSITA would have combined Sasaki and Sokn, resulting in a system that renders claims 3-4 obvious. (Pet., pp. 32-38.) For example, the Petition explained that the combination maintains the "mistake-proof" design of the prior art (i.e., by having directional threading) without suffering from overtightening like the continuously threaded coupling mechanism disclosed in Sasaki. (Pet., p. 36; DJI-1003, ¶111.) The Petition further explained that Sokn's connection mechanism provides increased design flexibility by allowing for use with a wider range of aircraft (including larger UAVs) than Sasaki's continuously threaded connection, improves usability because "a user can assemble and disassemble the propellers with only ½ turn as compared with 3-4 turns," and has "improved mechanical alignments." (Pet., pp. 36-38.)

Since institution, the record has continued to support the combination. Before the '184 patent, a POSITA would have understood the benefits of having removable blades on a UAV. (DJI-1027, 33:10-24; DJI-1030, ¶37.) A POSITA would have understood the benefits of having a quick and secure way of attaching blades. (DJI-1027, 35:12-36:4; DJI-1030, ¶37.) A POSITA also would have known the dangers of installing a blade on the wrong driveshaft. (DJI-1027, 36:5-37:14;

DJI-1030, ¶37.) A POSITA would have known of prior art approaches that keyed the blade to the proper driveshaft (Pet., pp. 16-18) or used directional rotation to ensure proper installation (Pet., pp. 18-20; DJI-1030, ¶37). And a POSITA, looking at Sasaki, would have been motivated to improve the threaded design while maintaining the mistake-proofing feature. (DJI-1029, 103:15-19; DJI-1030, ¶37.)

A POSITA would have looked outside of the field of UAVs to improve the prior art threaded mechanism disclosed in Sasaki. (DJI-1030, ¶38.) Specifically, a POSITA would have looked to the prior art for ways of quickly and easily attaching and detaching two objects by hand. (*Id.*) In that search, the POSITA would have looked for mechanisms having a directional or keyed aspect that would help prevent installation of the blade on the wrong driveshaft, and that would remain installed while the motor spins. (*Id.*) A POSITA would not need to limit this search to prior art that explicitly disclosed both clockwise and counterclockwise rotating mechanisms because a POSITA can easily design one from the other using a mirrored design. (*Id.*; DJI-1029, 53:19-22.) A POSITA also would not limit its search to prior art mechanisms that have already been deployed in rotating systems because a POSITA would have been able to make simple design choices, such as materials, size adjustments, and surface area adjustments, to apply previous designs to a rotating system. (DJI-1030, ¶38; Pet., pp. 32-34; DJI-1003, ¶108.)

The POSITA would have easily found Sokn, which the USPTO classified in

the category 403: Joints and Connections. (Sokn, Face [52].) Within the category of Joints and Connections, the USPTO categorized Sokn as 403/349 (Interfitted members/Bayonet joint), 403/348 (Interfitted members/Lugged member, rotary engagement), and 403/343 (Screw or Cam). These classifications are well within the scope of the art that a POSITA would have searched. (DJI-1030, ¶39.) For example, during prosecution, the Examiner found and applied U.S. Patent 4,477,288 to Duffy, which is classified in (among others) 403/359, under the Joints and Connections/Interfitted members subclass. (DJI-1032, Face [52]; *see* DJI-1002, pp. 91-94.) The Examiner also found U.S. Patent 1,400,032 to Daniel, also classified in the Joints and Connections class. (DJI-1002, p. 103.)

The Petition explained that a POSITA would have been motivated to use Sokn's mechanism such that a clockwise blade would be mounted with counterclockwise rotation, and a counterclockwise blade would be mounted with clockwise rotation. (Pet., pp. 34-35; DJI-1003, ¶109.) This motivation is based on the prior art threaded design in Sasaki and the POSITA's knowledge that such a design would prevent inadvertent disassembly during operation. (Pet., pp. 34-35; DJI-1003, ¶109.) A POSITA would have easily been able to design such directional mechanisms by mirroring Sokn's design—taking into account the error in Sokn discussed below. (DJI-1030, ¶40; Ex. 2007, ¶39.)

A POSITA would have been motivated to combine Sasaki and Sokn. The

next sections show that this combination renders substitute claims 12-13 obvious.

2. The combination renders claim 12 obvious.

The combination of Sasaki and Sokn discloses a “*blade lock portion of the clockwise lock mechanism [that] is configured to engage with the shaft lock portion of the clockwise lock mechanism by partial counterclockwise rotation*” (substitute claim 12). (DJI-1030, ¶¶29-30; DJI-1028, ¶37.) 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. (Pet., pp. 26-36; DJI-1003, ¶¶93-110.) Sasaki discloses that directional threaded coupling mechanisms were known and used in UAVs, but had limitations, including overtightening. (Pet., pp. 28-29.) Sokn’s coupling mechanism solves these and other problems by using both a plurality of thread segments and stop members that resist further rotation after installation and only require a 90° rotation. (Pet., p. 36.)

In the combined coupling mechanism, Sokn’s ring assembly (first engagement portion 35) (the claimed “*shaft lock portion*”), scaled for use with Sasaki’s UAV, includes openings between thread segments defining notches. (Pet., pp. 32-34, 47-50.) Sokn’s socket (stop members 45 and second engagement portion 47) (the claimed “*blade lock portion*”), scaled for use with Sasaki’s UAV, includes protruding thread segments constituting lugs configured to engage the notches of the shaft lock portion. (*Id.*) In the combined coupling mechanism, the blade lock

portion is configured to engage the shaft lock portion (e.g., the lugs of the blade lock portion engage the notches of the shaft lock portion) by rotating the blade lock portion with respect to the shaft lock portion. (Pet., pp. 50-51.) This rotation releasably attaches the blade to the driveshaft. (Pet., pp. 44-46; DJI-1028, ¶37.)

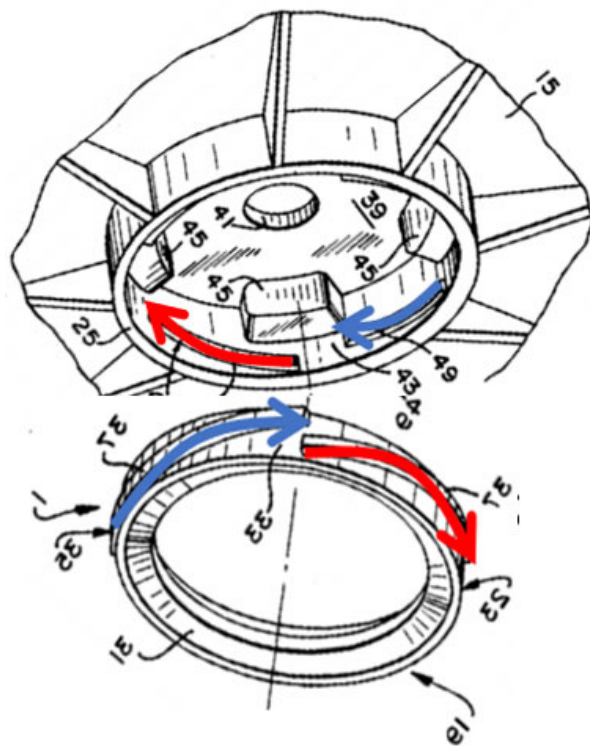
The Petition explains that the blade lock portion of the combined coupling mechanism is configured to engage the

shaft lock portion by **partial** rotation because of its multi-thread and stop member design. (Pet., pp. 32, 36-37, 50-51.) Sokn's ring assembly design preferably has "four segments 37 . . . equally spaced at 90° from each other around surface 33." (Sokn, 3:32-34.)

The socket has "four corresponding thread segments 49 . . . [that] are equal-

ly and circumferentially spaced 90° around surface 43." (Sokn, 3:49-52.) There-

fore, the blade lock portion of the combined coupling mechanism is configured to engage by partial (90°) rotation—one quarter of a full rotation—to releasably attach the blade. (Sokn, 3:57-60; Pet., p. 32 ("During the mounting process, ring assembly 19 is rotated 90°."); DJI-1003, ¶105; DJI-1028, ¶37.) As shown in annotat-



ed Figure 3 above,¹ the 90° rotation results in each of the multiple threads on the blade lock portion engaging their respective slots on the shaft lock portion. (DJI-1028, ¶37.) This allows for faster installation and deinstallation than a conventionally-threaded mechanism. (DJI-1028, ¶37.)

The 90° rotation of coupling mechanism of the combined system constitutes “partial rotation,” based on PO’s definition of the term, because it is less than a full 360° rotation. (DJI-1028, ¶37; DJI-1027, 127:1-3.) In fact, the lock mechanism in the ’184 specification uses a 90° rotation, like the coupling mechanism of Sokn. (DJI-1028, ¶37.) Accordingly, based on the arguments in the Petition and the above, the combination of Sasaki and Sokn renders claim 12 obvious.

3. The combination renders claim 13 obvious.

PO’s claim 13 adds a limitation to address antecedent basis issues of original claim 4: “*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.*” (RMA, p. 27.) The coupling mechanism of the

¹ Figure 3 contains an error that is readily apparent to a POSITA in that the threading of the ring does not match the assembly. Both Dr. Reinholtz and Dr. Du-charme acknowledge this mistake, which a POSITA would recognize is easily fixed by reversing one of the threads. (DJI-1028, ¶¶33-35; DJI-1027, 167:1-16.)

combined system of Sasaki and Sokn has a counterclockwise lock mechanism with a shaft lock portion attached to the second driveshaft and a blade lock portion attached to the counterclockwise rotor blade. (Pet., pp. 34-36, 50-51.)

PO's claim 13 further amends original claim 4 to recite that "*blade lock portion of the counterclockwise lock mechanism is configured to engage with the shaft lock portion of the counterclockwise lock mechanism by partial clockwise rotation.*" (RMA, p. 27.) This limitation is identical to the proposed amendment of claim 12 except that it applies to the **counterclockwise** lock mechanism and therefore recites partial **clockwise** rotation. The combination of Sasaki and Sokn discloses a counterclockwise lock mechanism where the blade lock portion is rotated clockwise to releasably attach the counterclockwise blade to the second driveshaft. (Pet., pp. 34-36.) Sasaki teaches a directional threading where blades designed to rotate in different directions are installed with opposite directions of rotation. (Pet., pp. 34-36; DJI-1006, 2:5-8.) Using opposite-threaded blades 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. (Pet., pp. 34-36; DJI-1014, p. 3; DJI-1003, ¶¶54-57, 64; DJI-1027, 37:1-13.) As shown in the previous section, this combination results in a blade lock portion configured to engage the shaft lock portion by partial rotation. (DJI-1028, ¶¶37-41.) Accordingly, the combination renders claim 13 obvious.

B. PO's patentability arguments lack merit.

PO makes no attempt to distinguish revised substitute claims 12 and 13 from the prior art based on its new amendments. (DJI-1029, 45:24-46:7.) Instead, PO argues that the references in isolation do not teach either the “engagement” limitation; or “clockwise and counterclockwise UAV blade lock mechanisms that are configured to engage by partial rotation of a blade lock portion with respect to a shaft lock portion” limitation of claim 1. (RMA, pp. 13-16.) PO also contends that a POSITA would not have been motivated to combine Sasaki and Sokn. PO's arguments are inaccurate and contrary to law.

1. PO's construction for the “engagement” limitation is improper.

Claims 12 and 13 each depend from claim 1, which recites that “*the clockwise rotor blade is engageable only with the clockwise lock mechanism and cannot be engaged in the counterclockwise lock mechanism*” (the “engagement limitation”). PO argues that the “engagement limitation” of claim 1 requires preventing a rotor blade from being **attached** to the wrong drive. (RMA, pp. 9-11.) PO's construction is improper because it rewrites the plain language of the claim and is unsupported by the intrinsic record.

PO is collaterally estopped from this claim construction position. The Board has previously rejected the same construction of the same limitation of the same claim of the '184 patent. (*See* DJI-1031, pp. 15-19.) In a Final Written Decision

finding claims 1, 2, 5-9, and 11 of the '184 patent obvious, the Board “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.” (DJI-1031, p. 18.)

The Board has applied issue preclusion against patent owners on issues previously litigated and decided by the Board. *See Rimfrost AS v. Aker Biomarine Antarctic AS*, IPR2018-01178, Paper 34, at *31-34 (PTAB Jan. 13, 2020) (applying issue preclusion to patent owner’s arguments about teaching away); *Webpower, Inc. v. Wag Acquisition, LLC*, IPR2016-01239, Paper 21, at *27-28 (PTAB Dec. 26, 2017) (applying issue preclusion to patent owner’s arguments about a missing limitation in the prior art). The Board should apply issue preclusion here, because the construction of the engagement limitation was “an issue of fact or law [that] [was] actually litigated and determined by a valid and final judgment, and the determination [was] essential to the judgment.” *B & B Hardware, Inc. v. Hargis Industries, Inc.*, 135 S. Ct. 1293, 1303 (2015). Therefore, the Board’s determination was “conclusive in a subsequent action between the parties.” *Id.*

If the Board does not find issue preclusion, it should again reject PO’s construction because it reads the “engage” out of the claim, replacing it with “attach.” The claims use both “attach” and “engage” and therefore intentionally distinguish “attachment” from “engagement.” *Amgen Inc. v. Sandoz Inc.*, 923 F.3d 1023, 1031

(Fed. Cir. 2019) (“[D]ifferent claim terms are presumed to have different meanings.”). There are many ways to attach one thing to another. (DJI-1028, ¶28.)

Claim 1, however, recites that the “*clockwise rotor blade is releasably **attached** to the first driveshaft by **engagement** in a clockwise lock mechanism.*” By making each blade **engageable** only with the correct lock mechanism, the claims do not prevent **attachment** by some other means—e.g., mounting by duct tape or other attachment that does not require **engagement**.

2. PO’s missing limitation arguments ignore how a POSITA would have actually combined Sasaki and Sokn.

PO generally contends that “neither of the prior art references . . . disclose clockwise and counterclockwise UAV blade lock mechanisms that are configured to engage by partial rotation of a blade lock portion with respect to a shaft lock portion.” (RMA, p. 12.) This argument improperly attacks the references individually, as the Board already noted. (PG, pp. 6-7.) It also does not reflect the actual claim language, which does not recite a “UAV blade lock mechanism.” PO’s missing limitation arguments do not address the actual combination.

Petitioner addresses PO’s Sasaki arguments first. PO argues that because Sasaki teaches a continuous threaded coupling mechanism requiring several full rotations, Sasaki fails to disclose “clockwise and counterclockwise UAV blade lock mechanisms that are configured to engage by partial rotation of a blade lock por-

tion with respect to a shaft lock portion.” (RMA, p. 14.) However, the Petition relies on **Sokn’s** segmented threaded coupling mechanism, which results in partial rotation. (*See also* Pet., pp. 50-51 (discussing fractional rotation).)

PO next argues that Sasaki does not disclose the “*engagement*” limitation of claim 1 under PO’s improper construction. (RMA, p. 15.) Specifically, PO contends that Sasaki’s “conventional screw-on type blade attachment mechanism does not prevent the attachment of a blade on the wrong drive,” relying on a video of its expert forcing a blade from a UAV utilizing a conventional screw-on attachment mechanism onto the wrong driveshaft. (RMA, p. 15.) PO’s argument is irrelevant because the Petition does not rely on a conventional screw-on attachment coupling mechanism. (Pet., pp. 44-47.) PO’s argument further fails on its merits because it relies on an improper construction for the “*engagement*” limitation. When a blade is forced onto the driveshaft and the threads are “stripped”, the blade is not, and cannot be, “engaged” with the lock mechanism. (DJI-1028, ¶49.) Rather, the metal threads on the shaft lock portion are likely carving out new notches in the blade lock portion. (*Id.*)

Turning to Sokn, PO argues that Sokn does not disclose UAVs or UAV rotor blades or lock mechanisms that depend on direction of rotation. (RMA, p. 16.) PO’s argument is irrelevant because the instituted ground explicitly relies on Sasaki for this teaching. (Pet., pp. 34-35.) PO further contends that there is “no consid-

eration in Sokn for creating an attachment mechanism where rotor blades can be easily detached for transport or storage.” (RMA, p. 15.) This is not a claim limitation, but again, the combination discloses a coupling mechanism permitting rotor blades to be easily detached. Sokn’s coupling mechanism, integrating with Sasaki’s UAV, requires only a quarter turn to attach and detach a blade to a driveshaft—it is as easy for a user to detach as the coupling mechanism disclosed in the ’184 patent. (DJI-1028, ¶46.)

PO further argues that “even if Sasaki and Sokn were combined, it would not lead to clockwise and counterclockwise lock mechanisms.” (RMA, p. 21.) This argument ignores the combination in the Petition, which explicitly details a POSITA’s motivations for modifying Sokn according to the directional threading taught by Sasaki. (Pet., pp. 34-35.) PO does not dispute these motivations (*see* RMA, p. 14 (it would be “untenable” to *not* use directional threading), and Dr. Reinholtz emphasized that a POSITA looking at Sasaki would have been motivated to create a lock mechanism that maintained mistake-proofing. (DJI-1029, 103:15-19.)

3. PO’s arguments against a motivation to combine have no merit.

In arguing patentability of its substitute claims, PO presents four different theories why a POSITA would not have combined Sasaki and Sokn: (1) Sasaki lacks an explicit motivation to combine; (2) Sasaki teaches away from the proposed combination; (3) Sokn is non-analogous art; and (4) a POSITA would not

have combined Sasaki and Sokn. None of PO's theories have merit.

In **Theory 1**, PO argues that there is no explicit motivation in Sasaki for a lock mechanism that depends on rotational direction or engages with partial rotation. (RMA, p. 16.) PO's argument is contrary to the law. A "motivation to combine may 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." *Zup LLC v. Nash Manufacturing, Inc.*, 896 F.3d 1365, 1371 (Fed. Cir. 2018). Furthermore, this motivation was well-known to a POSITA. (Pet., p. 16-20; DJI-1003, ¶¶45, 49-66, 100, 111; DJI-1027, 37:1-14; DJI-1028, ¶43.)

In **Theory 2**, PO argues that Sasaki teaches away from directionally-specific lock mechanisms because it addressed issues (including the overtightening problem) with the prior art with a design not dependent on the direction of rotation. (RMA, p. 16.) PO misapplies the law.

A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant. A reference does not teach away, however, **if it merely expresses a general preference for an alternative invention but does not 'criticize, discredit, or other-**

wise discourage’ investigation into the invention claimed.

DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc., 567 F.3d 1314, 1327 (Fed. Cir. 2009) (emphasis added). Sasaki never disparages directionally-specific lock mechanisms per se; rather, its design improves perceived issues with previous designs. Sasaki’s nondirectional solution does not teach away from all directional solutions, e.g., directional solutions that do not have similar issues such as the instituted combination of Sasaki and Sokn. (DJI-1027, 151:18-153:5 (Sasaki solves other problems unrelated to directionality); DJI-1028, ¶44.) Sasaki therefore does not teach away from the combination.

PO hedges by arguing that Sasaki’s teachings are “relevant” to the question of motivation to combine even if they are not a teaching away because they “discourage the use of directionally specific lock mechanism.” (RMA, pp. 16-17.) But that is the standard for teaching away: “A reference may be said to teach away when a person of ordinary skill, upon reading the reference, **would be discouraged from following the path set out in the reference . . .**” *DePuy Spine*, 567 F.3d at 1327 (emphasis added). Thus, PO’s case for relevance through discouragement is a backdoor teaching-away argument. The Board should reject this argument.

In **Theory 3**, PO argues that a POSITA would not look to Sokn when designing an attachment mechanism for UAV blades because Sokn is in “a different field than UAVs.” (RMA, p. 17.) However, PO’s argument is contrary to the law.

If a reference is not within the field of the inventor's endeavor, "we proceed to determine whether the reference is reasonably pertinent to the particular problem with which the inventor was involved." *In re Deminski*, 796 F.2d 436, 442 (Fed. Cir. 1986). PO never alleges that Sokn is not reasonably pertinent to the coupling mechanism addressed by the '184 patent. As shown above in Section I.A.1, Sokn is reasonably pertinent as a connector of components. And as established in the Petition (p. 38), Sokn's coupling mechanism is reasonably pertinent because it provides a secure coupling mechanism with precise mechanical alignment. (DJI-1003, ¶114.) See *In re ICON Health and Fitness*, 496 F.3d 1374, 1380 (Fed. Cir. 2007) (finding that a folding bed reference was reasonably pertinent to a treadmill with a folding base); *In re Paulsen*, 30 F.3d 1475, 1481-82 (Fed. Cir. 1994) (finding that references employing hinges, latches and springs are reasonably pertinent to a latch mechanism for a portable computer). Additionally, Dr. Reinholtz's POSITA definition requires experience with generic coupling mechanisms and is not limited to the field of UAVs. (Ex. 2001, ¶28.)

In **Theory 4**, PO presents three alleged reasons why a POSITA would not have been motivated to combine Sasaki and Sokn. PO first argues that a POSITA would not look to Sokn when designing a "twist-lock mechanism" because Sokn does not discuss disassembly and its electric motor does not require easy disassembly. (RMA, p. 17.) PO speculates that a user would likely not need to detach

the blade fan mount, but fails to explain why Sokn's coupling mechanism is not actually easy to detach. (*Id.*) Petitioner's expert explains, contrary to PO's implication, that Sokn's coupling mechanism is easy to detach, regardless of whether ease of detachment was required by its specific application. (DJI-1028, ¶¶45-46.)

Second, PO argues a POSITA would not look to Sokn to "achieve directionally specific lock mechanisms" because Sokn does not discuss different directional configurations. (RMA, pp. 17-18.) However, Sasaki explicitly teaches directionally specific lock mechanisms and the instituted ground relies on "the teachings of Sasaki regarding directionality of threading" for this motivation. (Pet., pp. 34-35.) Contrary to PO's mischaracterizations, Petitioner explained that Sokn's engagement portions and stop members can be configured to provide a predetermined orientation for engagement and interlock. (Pet., p. 34.) This teaching would have motivated a POSITA to orient the threads in the combined system for directional engagement. (Pet., pp. 34-35.)

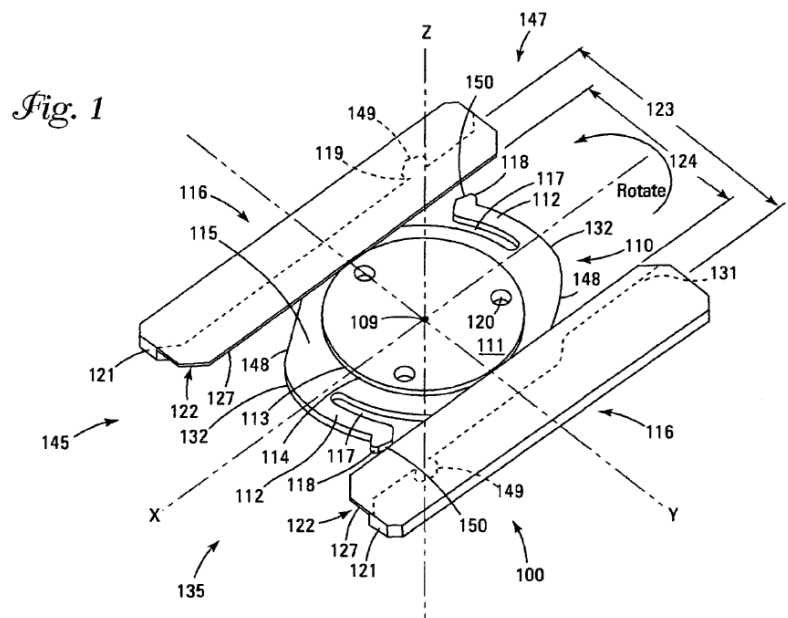
Third, PO argues that Sokn's lock mechanism would not solve the overtightening problem described in Sasaki because it is similar to the nut component of the prior art and similar to a jar lid. PO argues that all mechanisms requiring frictional contact will be susceptible to overtightening but has no corroborating evidence. PO's argument is based on nothing more than speculation and should be disregarded. Nevertheless, these arguments have no merit. Unlike Sasaki's nut or a jar lid,

Sokn has four separate stops and four separate thread segments on both portions of the mechanism. (DJI-1030, ¶41.) The use of the term “stop members” informs a POSITA that they stop rotation. (DJI-1007, 3:40-42; DJI-1003, ¶109; DJI-1028, ¶48.) Nevertheless, the use of radial stops to prevent overtightening was well known to a POSITA, including in EP067. (DJI-1029, 67:7-25; DJI-1030, ¶¶37, 42.) PO further argues that a POSITA would not use a resilient mounting in a UAV application, but again offers no corroborating evidence. (RMA, p. 20.) Accordingly, PO’s technical arguments against combination are baseless.

C. Directional lock mechanisms using partial rotation were well-known.

Sokn is not the only prior art reference using partial rotation, with lugs and notches, to install one component onto another component. (See Pet., pp. 13-20.) Such mechanisms were known for over a century. (Pet., pp. 13-16; DJI-1027, 96:6-15.)

One example is U.S. Patent 6,929,226 to Philistine (DJI-1026), which discloses a “twist lock mount for quick mounting and positioning a device to a support.” (DJI-1026, Abstract.) Philistine’s system is not application-specific, but rather allows



“secure attachment and detachment of a variety of devices to various surfaces.”

(DJI-1026, 1:10-14.) 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.” (DJI-1026, 2:33-44.) The mounting member 110 slides into the channel 123 and securely locks in place with a 90° (*id.*, 4:24-27) 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. (DJI-1026, Figure 2, 2:33-44; 3:10-22; *see also* Figure 1.) The mechanism is not susceptible to overtightening because “mounting member 110 is locked into position and will resist further rotation in the counterclockwise direction.” (DJI-1026, 4:27-29; DJI-1028, ¶51.)

Similarly, U.S. Patent No. 2,470,517 to Obrist (“Obrist”) and EP 0921067 (“EP067”) each describes a directional “twist-lock” mechanism for a propeller. (*See* Pet., pp. 19-20; DJI-1017; DJI-1018.) Obrist describes a directional twist-lock coupling mechanism for a variable-pitch marine propeller. (DJI-1003, ¶59.) Obrist’s design includes lugs that are introduced through recesses 8, and the blade root is turned about 90° for engagement and installation. (DJI-1017, 2:44-54; DJI-1028, ¶52.) EP067 describes a directional coupling mechanism for use with propeller assemblies. (DJI-1003, ¶61.) For mounting a 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 engaged beneath the claws.” (EP067, ¶8.)

Both Obrist and EP067 explain that the force in rotation of the propeller maintains the lugs in position. (*See* Pet., pp. 19-20; DJI-1017, 2:55-3:4; DJI-1018, ¶11.) Although the forces are different with the UAV connection, a POSITA 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. (DJI-1028, ¶56.) For example, a POSITA would have been motivated to modify Sasaki to include two radially-opposite cutouts between which radial projections are disposed and to locate stops 6 at different positions based on the rotation of the propeller. (*Id.*, ¶62.)

A POSITA would have been motivated to use Philistine or Obrist or EP067 to mount a UAV blade onto a driveshaft for several reasons. First, the mechanisms of Philistine, Obrist, and EP067 each solves the overtightening problem of Sasaki’s prior art threads while maintaining the well-known “mistake-proof” design. (DJI-1028, ¶57.) Second, the mechanism allows for easy installation and de-installation while being secure enough for “harsh environments where extreme vibration and shock loading is expected.” (DJI-1026, 1:25-28; DJI-1028, ¶57.) 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. (DJI-1028, ¶57.) Obrist and EP067 are analogous art because each re-

lates to coupling a blade to a rotating member. (DJI-1028, ¶57.)

The Petition showed that Sasaki discloses the preamble and the UAV structure components recited in limitations [1A]-[1D], and PO does not dispute those teachings. (Pet., pp. 39-43.) The combined system of Sasaki and Philistine also teaches the lock mechanism limitations of claim 1 in a similar manner as the combination of Sasaki and Sokn. (DJI-1028, ¶59.) In the combination, 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.*) As shown in Figure 1, Philistine's mounting plate is attached by rotating it counterclockwise relative to the receiving member. (*Id.*) It can be detached by rotating in the opposite direction. (DJI-1026, 2:44-49.) This embodiment is the "*clockwise lock mechanism*" of claim 1. (DJI-1029, 72:9-20.) Based on the directionally-threaded design of Sasaki's prior art and the well-known mistake-proof design goal of directional or keyed attachment mechanisms for UAV blades, a POSITA would have been motivated to mirror the design of Philistine's Figure 1 embodiment to form a "*counterclockwise lock mechanism*" for blades that spin counterclockwise. (DJI-1028, ¶59; DJI-1027, 37:1-14.) For example, Philistine's lock mechanism is uninstalled with a rotational force in the opposite direction of the force used for installation, so a mirrored design would be necessary to keep the mechanism engaged when applying it to UAV blades rotat-

ing in different directions. (DJI-1028, ¶59.) Such a design would mirror Figures 1 and 2, with the lugs and notches being on opposite sides of their respective components, and it would lock with clockwise rotation. (*Id.*; DJI-1029, 80:14-22.)

PO argues that Philistine discloses a “twist-lock mount for a blower motor” and does not relate to UAVs. (RMA, pp. 21-22.) But Philistine discloses that its twist-lock 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.” (DJI-1026, 5:31-36 (emphasis added).) The USPTO also classified Philistine under classifications 248/222.52 (Supports/Bracket and mount interlocked by rotational motion), which is one area a POSITA would have searched for prior art. (DJI-1030, ¶46.) PO also argues that Philistine does not explicitly disclose a “mirror image,” but does not dispute the motivations and knowledge of a POSITA in making such a mirror image when combining Philistine with Sasaki. (RMA, p. 22.)

When applied to blade attachments of a UAV such as Sasaki’s, Obrist and EP067 would also form a “*clockwise*” and “*counterclockwise lock mechanism*” for similar reasons, each locking with rotation in the opposite direction. (DJI-1028, ¶¶59-62.) For 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*.” (*Id.*, ¶62.)

The combined system results in the blade being “releasably attached” to the driveshaft because each reference’s teaching that its mechanism is detachable. (DJI-1028, ¶60.) Each is releasably attached by engagement of the blade (the blade lock portion) with the lock mechanism, as recited in claim 1. Moreover, the blade lock portions are keyed such that they can engage only with their corresponding lock mechanism—i.e., lugs of a counterclockwise blade will not engage with the notches of the clockwise lock mechanism. For example, as shown in Figs. 1 and 2 of Philistine, the blade lock portion includes lugs that engage with notches on the corresponding shaft lock portion. Moreover, the blade lock portion is configured to engage by partial rotation (“one-quarter turn”) for clockwise and counterclockwise mechanisms. (DJI-1026, 4:24-27.) The mechanisms of Obrist and EP067 would also releasably attach the blades to the driveshaft by engagement, with lugs engaging notches, via partial rotation of the blade lock portion. (DJI-1028, ¶61; DJI-1029, 83:18-84:5 (EP067), 87:12-88:11, 93:7-11 (Obrist).)

PO’s arguments against combining Sasaki with Philistine, EP067, and Obrist fail for the same reasons as its Sokn arguments. (*See* RMA, p. 22 (“For reasons similar to those associated with Sokn, a POSA would not be motivated to combine Sasaki with any of Philistine, EP067, or Obrist.”).) The combination of Sasaki with

Philistine, Obrist or EP067 renders claims 12 and 13 obvious. (DJI-1028, ¶¶50-62.)

D. PO fails to show a long-felt unmet need.

PO argues that the '184 patent met a long-felt need because of a POSITA's motivation to combine the 1991 Sasaki reference with various other references. (RMA, p. 23.) However, such a need is not judged by the date of the prior art. *Iron Grip Barbell Co., Inc. v. USA Sports, Inc.*, 392 F.3d 1317, 1324-25 (Fed. Cir. 2004) (mere passage of time does not show long-felt need). Moreover, a POSITA's motivations at the time of the alleged invention (i.e., 2013) are irrelevant to a long-felt need stemming from the 1991 Sasaki reference. Nevertheless, PO's scant discussion of the claims fails to show any nexus. (DJI-1031, p. 46; DJI-1030, ¶50.) PO is precluded from this argument in relation to claim 1 because the Board has already found that there was no such long-felt need. (DJI-1031, pp. 44-46.)

II. The amendments broaden the scope of the claims.

Original claims 3 and 4 are mixed apparatus/method claims, each requiring the step of rotating the blade lock portion: "*blade lock portion of the [] lock mechanism is rotated.*" PO's amendment removes this requirement and replaces it with a broader requirement that the blade lock portion be "*configured to engage by partial [] rotation.*" (RMA, p. 27.) Claims 12 and 13 improperly enlarge the scope of claims 3 and 4 because they no longer require that the blade lock portion "is rotated." As PO's expert concedes, claim 12 encompasses systems where the blade lock

portion is “*configured*” to rotate, but is not rotated. (DJI-1027, 117:21-119:18.)

These systems would not infringe canceled claim 3’s requirement that the blade lock portion “*is rotated*,” rendering claim 12 broader than claim 3. *In re Cuozzo Speed Techs., LLC*, 793 F.3d 1268, 1283 (Fed. Cir. 2015) (“[A] claim is broader in scope than the original claims if it contains within its scope any conceivable apparatus or process which would not have infringed the original patent.”).

The Board preliminarily found that the amendment narrows the scope of claims 3-4 because they contain substantially similar limitations relating to rotation. (PG, pp. 4-5.) But the unclaimed “structural requirements” added by being “*configured*” to rotate are not substantially similar than an explicit recitation that the blade lock portion “*is rotated*” because the structural requirements do not require actual rotation. By removing the required user step of rotating the blade lock portion and replacing it with structure capable of allowing a user to perform the step, PO improperly broadened the scope of the claim.

Claim 13 depends from claim 12 and therefore inherits a broader scope than original claim 4. Additionally, like claim 12, claim 13 removes claim 4’s requirement that the blade lock portion “*is rotated*.” (Mot., pp. 2-4.) Claim 13 is therefore broader than claim 4 for the same reasons that claim 12 is broader than claim 3.

III. Conclusion.

For the above reasons, the Board should deny the Motion to Amend.

Respectfully submitted,

/Steven W. Peters/

Steven W. Peters, Reg. No. 73,193
Counsel for Petitioner

KING & SPALDING LLP
1700 Pennsylvania Avenue N.W.
Washington, DC 20006-4707
(202) 737-0500

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CERTIFICATE OF SERVICE

The undersigned hereby certifies that the foregoing **PETITIONER'S
OPPOSITION TO PATENT OWNER'S REVISED MOTION TO AMEND
UNDER 37 C.F.R. § 42.121** and associated exhibits were served via electronic
mail on June 26, 2020, in their entirety on the following:

Timothy C. Bickham
STEPTOE & JOHNSON LLP
1330 Connecticut Avenue, NW
Washington, DC 20036
Tel: (202) 429-5517
Fax: (202) 429-3902
tbickham@steptoe.com
Autel-DJI-IPR@steptoe.com

/Steven W. Peters/

Steven W. Peters
Reg. No. 73,193
Counsel for Petitioner

KING & SPALDING LLP
1700 Pennsylvania Avenue N.W.
Washington, DC 20006-4707
(202) 737-0500

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