

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

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

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Motion	Patent Owner's Revised Motion to Amend
Opp.	Petitioner's Opposition to Patent Owner's Revised Motion to Amend

EXHIBIT LIST

Exhibit No.	Description
2012	Deposition transcript of Dr. Alfred Ducharme on July 13, 2020
2013	Oxford American Dictionary – definitions of engage and mate
2014	The American Heritage Dictionary – definitions of engage and mate
2015	Airspacemag.com – A Brief History of Quadrotors
2016	Declaration of Dr. Charles Reinholtz dated July 17, 2020
2017	Pages from https://thesmithfam.org/blog/2006/10/17/rc-plane-prop-saver/
2018	Pages from https://web.archive.org/web/20070301204327/https://thesmithfam.org/blog/2006/10/17/rc-plane-prop-saver/
2019	U.S. Patent No. 9,677,564
2020	Pages from https://twistedhobbys.com/prop-saver-bands-installation-tool/

I. The Revised Substitute Claims Would Not Have Been Obvious

A. Sasaki does not disclose the Engagement Limitation

Petitioner’s grounds continue to rely on the false premise that threaded blade connection mechanisms are mistake-proof. Opp. at 2, 20 (“...the combination maintains the “mistake-proof” design of the prior art (i.e., by having directional threading)...”) (emphasis added). “Mistake-proof” refers to ensuring that the blades can only be installed on the correct driveshaft. Ex. 2012 at 32:10-24.

Conventional threaded blade connection mechanisms are not mistake-proof. Dr. Reinholtz demonstrated that on a UAV that utilizes a conventional screw-on type blade attachment mechanism, a rotor blade can be screwed onto the wrong driveshaft. Ex. 2001 ¶¶ 52-54; Ex. 2016 at 20). Petitioner’s expert concedes this point. Ex. 2012 at 16:8-17:13.

The mistake-proof feature is embodied in the Revised Substitute Claims, which depend from claim 1, in what the parties have referred to as the Engagement Limitation. Ex. 2001 at ¶¶ 42-43; Ex. 2012 at 51:24-52:13 (Dr. Ducharme confirming that the revised amended claims include the “mistake-proof” feature.) The Engagement Limitation requires a lock mechanism that prevents the engagement of a clockwise (“CW”) rotor blade with a counterclockwise (“CCW”)

lock mechanism and vice versa.¹ With a conventional threaded attachment mechanism, when a blade is screwed onto the wrong driveshaft, the blade becomes engaged in the lock mechanism. Ex. 2016 at ¶¶ 20-24.

Petitioner's expert asserts that with a conventional threaded mechanism, when a blade is screwed onto the wrong driveshaft, the blade is not engaged in the lock mechanism because the threads are not engaged. Ex. 2012 at 20:20-24. Petitioner's rationale is that when a blade is misthreaded, the "metal threads on the shaft lock portion are likely carving out new notches in the blade lock portion." Ex. 1028 at ¶ 49. 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. Ex. 2016 at ¶ 20-24. This position relies on an improper construction of the Engagement Limitation.

Intent of the UAV designer is not a part of the Engagement Limitation, and it should not be imported into the claims. The Engagement Limitation requires that

¹ In a previous IPR involving the '184 patent, Petitioner asserted that the Engagement Limitation required the engagement of lugs and notches. IPR2019-00343, Paper No. 22 at p. 6. Patent Owner disagreed. IPR2019-00343, Paper No. 26 at pp. 2-3. Petitioner's expert now concedes that the Engagement Limitation does not require the engagement of lugs and notches. Ex. 2012 at 57:4-59:9, 29:12-32:9.

the UAV prevent the engagement of a CW rotor blade with a CCW lock mechanism and vice versa. Petitioner has acknowledged that “engagement” means the mating of two components. IPR2019-00343, Paper 39 (Record of Oral Hearing) at 51:6-7. The plain meaning of “mate” is to “connect or be connected mechanically.” Ex. 2016 at ¶ 24; Exs. 2013 and 2014. Dictionary definitions of the word engage include “establish a meaningful contact or connection with” and “to become meshed or interlocked.” *Id.* These definitions include the type of connection between threads when a blade is screwed onto the wrong driveshaft. As described by Dr. Reinholtz, when a blade is screwed onto the wrong driveshaft, the threads on the blade mate or interlock with the threads on the driveshaft. Ex. 2016 at 20, 23-24. The mechanical connection created between the threads is what attaches the blade to the driveshaft. Ex. 2016 at 23. Petitioner’s argument was already rejected in another proceeding:

DJI argues that the term “engagement” used in limitation 1[h] requires that the blades be properly affixed to their corresponding rotor. ... This argument is not persuasive. Engagement does not require a blade to be affixed per factory instructions. Rather, a rotor blade is engaged when a user can twist the threads on the improper shaft such that the blade will not fall off.

Ex. 2011 at p. 4, fn 28.

Accordingly, the Sasaki design does not prevent the engagement of a CW rotor blade with a CCW lock mechanism and vice versa, and Sasaki does not disclose the Engagement Limitation. For this reason alone, Petitioner’s grounds fail.

B. A POSA would not be motivated to combine Sasaki with Sokn

Sasaki criticizes UAV connection mechanisms that lead to overtightening. Ex. 1006 at 2:9-16, 3:32-36; Ex. 2001 at ¶¶ 48-49. Dr. Reinholtz demonstrated in detail how the proposed combination of Sasaki and Sokn would lead to overtightening of the rotor blade. Ex. 2001 at ¶¶ 67-69; Ex. 2007 ¶¶ 28-30. In its opposition, Petitioner baldly asserts that Dr. Reinholtz's explanation is based on "nothing more than speculation." Opp. at 17. To the contrary, Dr. Reinholtz explained in great detail how the proposed Sokn-based design would lead to overtightening. Using Petitioner's own drawing of its proposed combination, Dr. Reinholtz explains in step-by-step detail how the interaction of stops 45 and the face of ring 19 will lead to overtightening. Ex. 2001 at ¶¶ 67-68. Petitioner presents no argument or evidence that refutes this analysis. Opp at. 17-18. Instead, it repeats its unconvincing argument that because "stop members" in Sokn include the word "stop," they must prevent overtightening. But Dr. Reinholtz explained in great detail how the "stops" in Sokn, which abut axially, do not prevent overtightening. Ex. 2007 at ¶¶ 28-30, Ex. 2016 at ¶ 27. Petitioner has not rebutted this testimony. Because Sasaki criticizes connection mechanisms that lead to overtightening, Sasaki teaches away from the proposed combination of Sasaki and Sokn, which would lead to overtightening. Even if the statements in Sasaki do not rise to the level of a teaching away, they significantly undercut any alleged motivation to combine.

In a last effort to save its argument, Petitioner asserts that radial stops, which could prevent overtightening, were well-known. Opp. at 18. But Sokn does not disclose radial stops. Thus, Petitioner implies that a POSA would further modify its combination to achieve the invention. This is a hindsight attempt to reconstruct the patent claims based on a selective picking and choosing of features of the prior art and alleged knowledge of a POSA. It is also an attempt that requires a POSA to be motivated to look to Sokn in the first place, which a POSA would not do.

Petitioner asserts that Sasaki's teaching toward non-directionally specific lock mechanisms is not relevant to motivation to combine. Opp. at 15. This is incorrect as a matter of law. *Polaris Indus., Inc. v. Arctic Cat, Inc.*, 882 F.3d 1056, 1069 (Fed. Cir. 2018) ("But even if a reference is not found to teach away, its statements regarding preferences are relevant to a finding regarding whether a skilled artisan would be motivated to combine that reference with another reference."). The Revised Substitute Claims require directionally specific lock mechanisms, and Sasaki teaches towards a design that is not directionally specific. Ex. 2001 at ¶¶ 48, 49, 59. This undercuts Petitioner's motivation to combine arguments along with Patent Owner's other reasons.

Petitioner's remaining arguments on motivation to combine amount to dissecting each reason provided by Patent Owner, and urging the Board to separately discard them without considering them as a whole. Opp. at 14-18; *In re Chu*, 66 F.3d

292, 299 (Fed. Cir. 1995) (“[O]bviousness is determined by the totality of the record.”) For example, Sasaki provides no explicit motivation to obtain mistake-proof, directionally specific, or partial-rotation lock mechanisms. Petitioner would have the Board discard this fact because a motivation need not come explicitly from the prior art. Opp. at 15. But Petitioner cannot deny that its arguments on motivation to combine would be stronger if Sasaki provided an explicit motivation. Petitioner is asserting that a UAV designer would combine Sasaki, a reference that criticizes overtightening and teaches towards non-directionally specific lock mechanisms, with a connection mechanism from a clothes dryer reference that does not teach directionally specific lock mechanisms, where the connection would still lead to overtightening, and from a field where there would be no consideration for easy detachment. And Petitioner’s alleged motivation comes not from the prior art that forms its grounds of unpatentability, but from expert assertions that there was a need for the claimed features of the ’184 patent. Ex. 2010 at A.2, p. 26; Ex. 1003 at ¶ 100.

C. A Sasaki/Sokn combination would not render the Revised Substitute Claims unpatentable

Even if a POSA were to combine Sasaki and Sokn as suggested by Petitioner, the connection mechanism would still be a threaded connection mechanism. Ex. 2001 at ¶ 68; Ex. 2007 ¶ 39; Ex. 1003 at ¶ 101, 106-107 (Sokn uses a “threaded coupling”). As previously explained, Dr. Reinholtz demonstrated that it was possible to screw a threaded rotor blade onto the wrong driveshaft. Ex. 2001 ¶¶ 52-

54. As a result, the proposed combination of Sasaki and Sokn would not disclose the Engagement Limitation for the same reasons as previously explained with respect to Sasaki. Petitioner has put forth no evidence to establish otherwise.

D. A POSA would not be motivated to combine Sasaki with any of Philistine, EP067, or Obrist

The Revised Substitute claims require directionally specific, CW and CCW lock mechanisms with different configurations such that a CW rotor blade cannot be engaged with a CCW driveshaft, and vice versa. Petitioner asserts that a POSA would be motivated to combine Sasaki with three different references (Philistine, EP067, and Obrist), none of which relate to UAVs, that disclose twist-lock mechanisms. Petitioner's arguments are flawed. First, its assertions on motivation are based on the false premise that Sasaki is mistake-proof. Opp. at 20 ("while **maintaining** the well-known 'mistake-proof' design.") (emphasis added). As previously established, Sasaki is not mistake-proof. Second, none of Philistine, EP067, or Obrist disclose multiple configurations of their connections mechanisms that could be used for the purposes of achieving directionally specific lock mechanisms. Ex. 2007 ¶¶ 19-23. Further, as previously established, Sasaki teaches towards non-directionally specific lock mechanisms, and this teaching is relevant to motivation to combine. *Polaris Indus., Inc.*, 882 F.3d at 1069. Thus, a POSA would not be motivated to look to Philistine, EP067, or Obrist to achieve directionally specific lock mechanisms. As with the Sokn combination, Petitioner's alleged

motivation to achieve mistake-proof lock mechanisms comes not from the references themselves, but rather from expert assertions of a need to improve upon the limitations of Sasaki to achieve error proof connection mechanisms. Ex. 2010 at Appendix A.2, p. 26; Ex. 1003 at ¶ 100. But to the extent this need existed, as explained below, it was long-felt, which demonstrates that it was not obvious to a POSA to look to references in other fields that disclosed single-configuration lock mechanisms to create CW and CCW's UAV lock mechanisms that are mistake-proof and that have the quick-twist feature.

E. A combination of Sasaki with any of Philistine, EP067, or Obrist would not render the Revised Substitute Claims unpatentable

As previously noted, none of Philistine, EP067, or Obrist disclose multiple configurations of their connection mechanisms that could be used for the purposes of achieving directionally specific lock mechanisms. Ex. 2007 ¶¶ 19-23. Thus, even if Sasaki were combined with any of those references, the result would be a UAV with a single configuration for its rotor blade lock mechanism. In other words, the UAV would not have CW and CCW lock mechanisms that prevent the engagement of a CW rotor blade with a CCW lock mechanism (and vice versa) as required in revised claims 12 and 13. Ex. 2007 ¶¶ 40-42. Petitioner tries to solve this problem by asserting that a POSA would use mirrored versions of the connection mechanisms in the secondary references. Ex. 1030 at ¶ 38. But these alleged mirrored versions are not found in Philistine, EP067, or Obrist. Ex. 2007 ¶ 40-42. Petitioner's expert

imagines them in a hindsight reconstruction of the challenged claims. This exact argument was already rejected in another proceeding. Ex. 2011, p. 5, fn. 29. Petitioner has failed to establish that the combination of Sasaki with Philistine, EP067, or Obrist would render the Revised Substitute claims unpatentable.

F. Long Felt Need

The evidence shows that a need for a fast, simple, and mistake-proof rotor attachment mechanism has existed in the UAV industry for a long time. Petitioner argues that a POSA's motivations at the time of invention in 2013 are irrelevant to a long-felt need stemming from the 1991 Sasaki reference. Opp. at 24. This argument misses the point. As an initial matter, none of Petitioner's prior art references identify a need for a fast and mistake-proof UAV rotor attachment mechanism (Ex. 2016, ¶ 27), so Petitioner could not and did not rely on those references to establish a POSA's motivations. Instead, Petitioner relied on expert testimony to assert those motivations. *Id.*; *see also* Ex. 1003, ¶¶ 106-114; Ex. 2010 at Appendix A.2, p. 26.

But that testimony illustrates precisely why a need for a fast and mistake-proof rotor attachment mechanism existed for several decades prior to 2013. As Dr. Ducharme explained, it is critically important for a multi-rotor aircraft to have counter-rotating propellers (rotors), and for those rotors to be attached to the correct driveshafts, because an incorrectly attached rotor will produce a downward force rather than upward lift. Ex. 1003, ¶ 45; Ex. 2012, 37:8-38:3; *see also* Ex. 2016, ¶ 28.

And Dr. Ducharme further admits that a POSA would have been aware of the importance of correct rotor attachment ever since the very first multi-rotor aircraft were built and tested in the early 20th century. Ex. 2012, 38:4-24. So to the extent the need existed in 2013 (as alleged by Petitioner), it necessarily existed as far back as quad-rotors were available. Ex. 2016, ¶ 28. In other words, either there was no need, and thus no motivation, or there was a need, and it was long-felt.

The multi-rotor UAV industry had existed for several decades prior to the time of invention in 2013. For example, a quadcopter called the Draganflyer was introduced in 1999, and an earlier quadcopter was introduced in Japan “a full decade before the Draganflyer,” in the late 1980’s. Ex. 2015; Ex. 2016, ¶ 30. A POSA would have recognized that a need for a fast and mistake-proof rotor attachment mechanism existed for these and other multi-rotor UAVs in the 1980’s, 1990’s, and 2000’s. Ex. 2016, ¶ 30. Further, quadcopters like these were targeted towards consumers and other casual users, so it would have been especially important for these UAVs to have mistake-proof, fast, and simple rotor blade connection mechanisms. Ex. 2016 at ¶ 30.²

² Dr. Ducharme asserts that Microdrones resolved the long-felt need for a fast and mistake-proof connection mechanism. Ex. 1030 at ¶ 50. First, Microdrones has not been established as prior art in this proceeding. Second, Microdrones illustrates a

Dr. Ducharme testified during his deposition that the “start” of multi-rotor UAVs was 2010, because (in his view) 2010 was the year when these kinds of aircraft became “prevalent.” Ex. 2012, 36:1-19. This is incorrect for several reasons. First, Dr. Ducharme admitted that his understanding of the industry and the “prevalence” of UAVs was colored by his own experience because he started his company in 2010. *Id.* at 42:24-44:1. Second, Dr. Ducharme revealed that his perception was based partly on a premise that modern drones are somehow distinct from the vehicle shown in Sasaki (dated 1989) because Sasaki calls that vehicle a “flying toy.” *Id.* at 44:2-13. This distinction has no merit or relevance in the context of long-felt need. Dr. Ducharme admitted in his next answer that the vehicle shown in Sasaki is, in fact, a UAV (*id.* at 44:14-45:1), and his first declaration explicitly states that “although Sasaki describes its apparatus as a ‘flying toy,’ a POSITA

different kind of rotor attachment mechanism that did not resolve this long-felt need in the UAV industry. The prop saver design in Microdrones is not mistake-proof; indeed, an illustration in the manual prominently shows how it is possible to secure a rotor to the wrong driveshaft. Ex. 1016, p. 27; Ex. 2009, ¶¶ 60-61. Furthermore, the prop saver design shown in Microdrones, which requires stretching an o-ring over the rotor blade (see Ex. 2017, 2019, 2020), was neither fast nor easy to use. *See* Ex. 2009, ¶ 29, 32. Third, Microdrones does not disclose the partial rotation feature.

would have recognized that Sasaki’s apparatus is a UAV, specifically a quadcopter.” Ex. 1003 at ¶ 93. Accordingly, Dr. Ducharme’s testimony regarding the alleged “start” of the multi-rotor UAV industry in 2010 should not be given any weight. The evidence described above makes clear that the UAV industry, and the long-felt need for a fast, simple, and mistake-proof rotor attachment mechanism, existed for several decades prior to 2013.

Finally, there is a clear nexus between this long-felt need in the UAV industry and the invention in revised claims 12 and 13. As Patent Owner explained in its revised motion to amend, claims 12 and 13 require lock mechanisms that engage by “partial rotation,” which makes them faster and simpler than threaded mechanisms that require several full rotations to attach a rotor. Motion, p. 23. During his deposition, Dr. Ducharme agreed that an attachment mechanism that only requires a partial rotation was more convenient than a threaded mechanism. Ex. 2012, 40:6-41:10. In addition, these claims cover an attachment mechanism that is mistake-proof because they require a lock mechanism that prevents engagement of a blade with the wrong lock mechanism. *See supra* Section I.A; *see also* Ex. 2016, ¶ 19.

II. The Amendments Do Not Broaden the Scope of the Claims

Revised substitute claims 12 and 13 do not broaden the scope of claims 3 and 4. *See* Motion at 2-4. The Board’s preliminary finding that the amendment narrows the scope of the claims is correct.

Respectfully submitted,

Date: July 17, 2020

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e), the undersigned certifies service of **PATENT OWNER'S REPLY TO PETITIONER'S OPPOSITION TO PATENT OWNER'S REVISED MOTION TO AMEND** on the counsel of record for the Petitioners by filing this document through the PTAB E2E system as well as delivering an electronic copy to the following email address:

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