

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 No. IPR2019-00846
Patent No. 9,260,184

THIRD DECLARATION OF DR. CHARLES F. REINHOLTZ

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I, Charles F. Reinholtz, declare as follows:

I. INTRODUCTION

1. I have been retained as an expert in this matter by counsel for Patent Owner Autel Robotics USA LLC (“Autel”). I have been asked to investigate and opine on the validity/patentability of claims of U.S. Patent No. 9,260,184 (“184 patent”) (Ex. 1001) in the above captioned *inter partes* review (“IPR”), in view of the Petition filed by Petitioner SZ DJI Technology Co., Ltd. (“DJI”).

2. On January 10, 2020, I submitted a declaration in this IPR (“First Declaration”) (Ex. 2001) that sets forth my opinions relating to the validity/patentability of substitute claims 12 and 13 as set forth in Autel’s Motion to Amend dated January 10, 2020.

3. On May 15, 2020, I submitted a second declaration in this IPR (“Second Declaration”) (Ex. 2007) that sets forth my opinions relating to the validity/patentability of revised substitute claims 12 and 13 as set forth in Autel’s Revised Motion to Amend dated May 15, 2020.

4. This declaration supplements my First and Second Declarations, and is in response to Petitioner’s Opposition to Autel’s Revised Motion to Amend (dated June 26, 2020) and the third declaration of Dr. Alfred Ducharme, which is Exhibit 1030. I understand that my curriculum vitae has been submitted into the record of this proceeding as an attachment to my First Declaration (Ex. 2001).

5. In preparing this Declaration, I have reviewed the following documents:

- the '184 patent (Ex. 1001);
- my First and Second Declarations and documents cited therein;
- the Declarations of Dr. Ducharme (Exs. 1003, 1028, and 1030) and documents cited therein;
- Petitioner's Opposition to Autel's Revised Motion to Amend (dated June 26, 2020) and documents cited therein;
- transcript of the deposition of Dr. Ducharme, dated July 13, 2020 (Ex. 2012); and
- all other documents cited in this declaration.

II. BACKGROUND AND QUALIFICATIONS

6. My qualifications and professional experience are described in my Curriculum Vitae, which was provided as an attachment to Exhibit 2001. Exhibit 2001 provides a summary of my qualifications and professional experience.

7. I am being compensated for my time in connection with this IPR at my standard consulting rate, which is \$400 per hour. My compensation is not dependent in any way upon the outcome of this matter.

III. RELEVANT LEGAL STANDARDS

A. Anticipation

8. I understand that a patent claim is unpatentable and invalid if the claim is anticipated. I understand that anticipation occurs when a single piece of prior art describes every element of the claimed invention, either expressly or inherently, arranged in the same way as in the claim. I understand that, for inherent anticipation, it is required that the missing descriptive material is necessarily present in the prior art.

B. Obviousness

9. I understand that a patent claim is unpatentable and invalid if the subject matter of the claim as a whole would have been obvious to a person of ordinary skill in the art at the time of the invention at issue. I understand that obviousness may be shown by considering more than one item of prior art. I understand that the following factors should be evaluated to determine whether the claimed subject matter is obvious: (1) the scope and content of the prior art; (2) the difference or differences, if any, between each claim of the patent and the prior art; and (3) the level of ordinary skill in the art at the time the patent was filed.

10. I understand that “objective indicia of non-obviousness,” also known as “secondary considerations,” are also to be considered when assessing obviousness if present including: commercial success; long-felt but unresolved needs; failure of others to solve the problem that the inventors solved; unexpected results; copying of the invention by others; and industry recognition or expressions of disbelief by

experts in the field of the claimed invention. I understand that any of these factors provide objective evidence that a claimed invention was not obvious at the time of its invention. I also understand that objective indicia of non-obviousness must be commensurate in scope with the claimed subject matter. I also understand that there must be a nexus between the secondary considerations and the claimed invention.

11. I understand that the test of obviousness is whether the claimed invention, as a whole, would have been obvious to one of ordinary skill in the art as of the date of the invention in light of the prior art.

12. I understand that a claim is not proved obvious merely by demonstrating that each of the elements was independently known in the prior art. I understand that most, if not all, inventions rely on building blocks long since uncovered, and claimed discoveries, almost of necessity will likely be combinations of what is already known. I understand that it is important to identify whether a reason existed at the time of the invention that would have prompted a person of ordinary skill in the art in the relevant field to combine the known elements in the way the claimed invention does. I understand that the use of hindsight must be avoided when considering whether the alleged invention would have been obvious to the person of ordinary skill in the art. In assessing obviousness, I have been instructed to consider the distortion caused by hindsight bias, guard against slipping into the use of hindsight, be cautious of arguments that rely upon after-the-fact

reasoning, and avoid the temptation to read into the prior art the teachings of the invention in issue.

C. Claim Construction

13. I have been asked to review the claims, and ascertain the meaning of the claims, from the perspective of a person of ordinary skill in the art at the time of the invention. Unless otherwise set forth herein, I have accorded the claim language its plain and ordinary meaning to a person of ordinary skill at the time of the invention.

14. I have been informed that in this IPR proceeding the claims are to be given their plain and ordinary meaning as understood by a POSITA at the time of the invention in light of relevant intrinsic (patent specification and file history) and extrinsic evidence. Accordingly, I have applied that claim construction standard in my analysis herein.

D. Description of a Person of Ordinary Skill in the Art

15. For this declaration, I have applied the same standard for a person of ordinary skill in the art “POSITA” at the time of the invention of the ’184 patent that I applied in my First and Second Declarations. A POSITA would have had a bachelor’s degree in mechanical engineering and at least two years of experience designing mechanisms and mechanical structures of the type used in releasable couplings and locking devices. Additional education could substitute for

professional experience and significant work experience could substitute for formal education.

16. I have reviewed the definition for a POSITA provided by Dr. Ducharme (Ex. 1003 at ¶ 72), and in the Claim Construction Order issued by the Chief Administrative Law Judge in ITC Investigation No. 337-TA-1133 (Ex. 2004 at 6). I do not view either definition as substantially different from mine, and my opinions stated herein would remain the same regardless of whether my, Dr. Ducharme's, or the ITC's POSITA definition were applied.

17. I understand that, for purposes of this Report, the time of invention of the '184 Patent is assumed to be May 15, 2013 (*i.e.*, the priority date) for the '184 patent. For the purposes of my analysis, I have used May 15, 2013 as the relevant date.

IV. Claim Construction

A. Engagement Limitation

18. The parties have referred to the following limitation of Claim 1 of the '184 Patent as the Engagement Limitation: “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.”

19. I understand that the Board has issued a Final Written Decision in IPR2019-00343, which has been submitted in this proceeding as Exhibit 1031. In its decision, the Board declined to adopt the specific language proposed by Patent Owner that included the word “attached” based on the reasoning that an attachment that does not include the “required engagement” is not covered by the Engagement Limitation. (Ex. 1031 at 17-18). I agree that an attachment that does not include the required engagement is not covered by the Engagement Limitation. The Engagement Limitation requires engagement (and the prevention of the engagement) between the blade and the lock mechanism, and the Board affirmed this point in its decision:

Claim 1 recites that the rotor blade is “releasably attached” to the driveshaft by the lock mechanism (Ex. 1001, 5:39–40), that the attachment is accomplished by “engagement in a . . . lock mechanism” (id. at 5:45–47), and that, e.g., the “clockwise rotor blade is engageable only with the clockwise lock mechanism and cannot be engaged in the counterclockwise lock mechanism” (id. at 5:53–6:1).

Ex. 1031 at 17. Thus, as I have previously opined, this claim limitation does not require the engagement of lugs and notches. (Ex. 2009 at ¶ 73). It is my understanding that Dr. Ducharme conceded this point during his deposition. (Ex. 2012 at 57:4-59-10).

20. Although Petitioner now agrees that the Engagement Limitation does not require the engagement of lugs and notches, it appears that there is still a dispute over the construction of the limitation. In my First Declaration, I described and

demonstrated how it was possible, using a UAV that utilizes a conventional screw-on type blade attachment mechanism, to screw a left-threaded blade onto a right-threaded driveshaft, and vice versa. (Ex. 2001 at ¶¶ 52-54). Because of this, it was my opinion, and it is still my opinion, that a UAV that utilizes a conventional screw-on type blade attachment mechanism does not meet the Engagement Limitation. As previously discussed, in order to satisfy the Engagement Limitation, the blade attachment mechanism must prevent the engagement of a clockwise (“CW”) rotor blade with a counterclockwise (“CCW”) lock mechanism and vice versa. *Id.* at ¶ 44. With a conventional screw-on blade attachment mechanism, when a blade is screwed onto the wrong driveshaft (as I demonstrated in paragraph 54 of my First Declaration), the blade is engaged in the lock mechanism. The threads of the blade become mated or interlocked with the threads of the driveshaft, such that mechanical forces created by the engagement secure the blade to the driveshaft.

21. During his deposition, Dr. Ducharme asserted that with a conventional screw-on blade attachment 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 20:4-24). I disagree.

22. Dr. Ducharme stated in his second declaration that when a blade is screwed onto the wrong driveshaft, the “metal threads on the shaft lock portion are likely carving out new notches in the blade lock portion.” (Ex. 1028 at ¶ 49). I agree

that this is one possible result when a blade is screwed onto the wrong driveshaft, but other results are possible depending on the shaft and blade material properties, the interface diameter, the size and style of the threads and the particular forces and torques being applied. For example, the threads on most carbonated drink bottles can be misthreaded to securely couple the lid to the bottle without damaging the threads. In this case, the segmented threads deform elastically, and no new threads are “carved” into either the lid or the bottle as Dr. Ducharme insists. Dr. Ducharme conceded in his deposition that deformation of this type was possible. (Ex. 2012 at 14:20-15:8). The photograph below shows the undamaged threads of such a lid and bottle after I misthreaded them three times.



23. Whenever a UAV threaded connection is misthreaded such that a right-handed thread is screwed onto left-handed thread or vice versa, whether threads are carved (as Dr. Ducharme asserts) or deformed, in each instance, the threads of the blade become mated or interlocked with the threads of the driveshaft, such that mechanical forces created by the engagement secure the blade to the driveshaft. It is these mechanical forces caused by the thread engagement that secure the blade to the driveshaft. Dr. Ducharme acknowledged that when a blade is misthreaded, the forces that secure the blade to the shaft are “really just the forces of deformation of the softer material on the harder material.”

24. Dr. Ducharme’s opinion appears to be premised on the notion that the Engagement Limitation requires the mating of lock mechanism components in the precise way that is intended by the designer of the UAV. In other words, the designer of a screw-on type of blade connection mechanism intends for right-handed threads on a blade to engage with right-handed threads on a driveshaft, and for left-handed threads on a blade to engage with left-handed threads on a driveshaft. But intent of the designer is not a part of the Engagement Limitation. It merely requires that the lock mechanism components prevent the engagement of a clockwise (“CW”) rotor blade with a counterclockwise (“CCW”) lock mechanism and vice versa. Petitioner has stated that “engagement” means the mating of two components. IPR2019-00343, Paper 39 (Record of Oral Hearing) at 51:6-7. Dictionary definitions of the word

“mate” include “connect or be connected mechanically” and “to join closely or combine.” (Exs. 2013 and 2014). Dictionary definitions of the word engage include “establish a meaningful contact or connection with” and “to become meshed or interlocked.” (Exs. 2013 and 2014). Dr. Ducharme described engagement as “the meeting of two interlocking mechanical parts.” (Ex. 2012 at 21). These definitions do not exclude the type of connection that occurs between threads when a blade is screwed onto the wrong driveshaft. As described above, when a blade is screwed onto the wrong driveshaft, the threads on the blade mate or interlock with the threads on the driveshaft, and these threads are a part of the lock mechanism. Although the threads may not be mating or interlocking in the same fashion as when a blade is screwed on the correct driveshaft, they are nonetheless mating or interlocking. Thus, when a blade is screwed onto the wrong driveshaft on a UAV that uses a conventional screw-on lock mechanism, the blade is engaged in the lock mechanism. For this reason, a conventional screw-on lock mechanism does not satisfy the Engagement Limitation.

V. OBVIOUSNESS

25. I have previously explained why the combination of Sasaki with any of Sokn, Philistine, EP067, or Obrist would not render the Revised Proposed Claims or the Proposed Claims obvious. (Ex. 2007 at ¶¶ 24-42; Ex. 2001 at ¶¶ 58-71). I do not repeat these discussions but maintain that these reasons support the conclusion

that the Revised Proposed Claims would not be obvious in view of the prior art combinations relied on by Petitioner.

26. As explained above, the conventional screw-on lock mechanism, like the one disclosed in Sasaki, does not disclose the Engagement Limitation. In other words, the threaded connection design in Sasaki is not mistake-proof. As I demonstrated, it is possible to mistakenly screw a blade onto the wrong driveshaft using such a connection. (Ex. 2001 at ¶¶ 52-54). Petitioner’s proposed obviousness combinations are all based on the false premise that Sasaki is mistake-proof. (Ex. 1003 at ¶ 100; Ex. 1028 at ¶ 42; Ex. 1030 at ¶ 38).

27. In my previous declarations, I provided a detailed analysis using Sokn’s Figure 4 to explain why and how the motor mount assembly in Sokn can be tightened with increasing torque, and how this will cause the same frictional “overtightening” problem inherent in the screw-on type rotor blades. (Ex. 2001 at ¶¶ 67-69; Ex. 2007 ¶¶ 28-30). Rather than addressing the substance of my analysis, Petitioners argue that my analogy of overtightening a jar lid when describing Sokn’s mechanism is based on “nothing more than speculation,” and should be disregarded. I believe it is common sense (and would be clearly understood by a POSITA) that frictional stops such as used in Sokn or a on a jar lid can be overtightened. Dr. Ducharme and Petitioner do not contend that Sokn’s mechanism cannot be overtightened. Rather, they make the oblique argument that, because Sokn calls

portions of housing member “stops,” they must stop rotation. Petitioner’s Opposition to Patent Owner’s Revised Motion to Amend, p. 18. It is true that, at a certain applied torque, they will stop rotation. But it is also true that additional torque will cause additional rotation and that this will result in overtightening up to the point where rotation is stopped. Dr. Ducharme and Petitioner do not argue otherwise.

28. On the issue of long-felt need, Dr. Ducharme asserts that his statements about a need for simpler, faster, and mistake-proof rotor blades were about a POSITA’s motivations in 2013, and do not demonstrate a need prior to that date. I disagree. There is nothing in Sasaki, Sokn, EP067, Philistine, or Obrist identifying a need for mistake-proof blade connections. To demonstrate the need, Petitioner relies on expert assertions and the well understood principle that installing a rotor blade on the wrong driveshaft will cause that rotor blade to produce a downward thrust as opposed to the vertical lift required to fly the aircraft. (Ex. 2010 at p. 3 (“In general, a POSITA would have understood the need to overcome the limitations of Sasaki to ensure simpler, more reliable, less error prone, and faster ways of attaching and detaching the propellers of a UAV.”); Ex. 1003 at ¶ 45). Dr. Ducharme conceded that people of skill in the art would have been aware of this concept since the very first multi-rotor aircraft made at the turn of the century. (Ex. 2012 at 36-38). Multi-rotor aircraft have indeed been around since the early 1900s. (Ex. 1011

at pp. 18-19). Thus, the need that forms the basis for DJI’s alleged motivation to combine has been in existence for many decades.

29. During his deposition, Dr. Ducharme testified that the “start” of multi-rotor aircraft in his mind was 2010 when multi-rotor aircraft became “prevalent.” (Ex. 2012 at 34). Dr. Ducharme admitted that his understanding was colored by his own experience, which involved starting his own company in 2010 that made commercial flight controllers. (Ex. 2012 at 43). Dr. Ducharme’s testimony also appears to be colored by a distinction between modern drones and what Sasaki called a “flying toy.” (Ex. 2012 at 43-44). I disagree that such a distinction should apply in the context of long-felt need. The vehicle in Sasaki is undoubtedly a UAV, as admitted by Dr. Ducharme. (Ex. 2012 at 44).

30. I disagree that 2010 was the start of the UAV industry. A quadcopter called the Draganflyer was sold as early as 1999 (Ex. 2015; Ex. 1011 at pp. 26-27) and a quadcopter called the Keyence GyroSaucer was introduced in Japan “a full decade before the Draganflyer.” (Ex. 2015).¹ Accordingly, the modern UAV

¹ Exhibit 2015 is an article located at the following website: <https://www.airspacemag.com/daily-planet/brief-history-quadrotors-180963372/>. This is the website for the *Air & Space/Smithsonian* magazine, which is published by the Smithsonian Institution’s National Air and Space Museum and would be familiar to a POSITA. Exhibit 2015 contains a link (embedded in the phrase

industry started long before 2010, and based on Dr. Ducharme’s testimony, a POSITA at all times would have been aware of the need for mistake-proofing propeller blade attachment. Furthermore, quadcopter UAVs such as the Draganflyer and the Keyence GyroSaucer were targeted toward consumers and other casual users, so it would have been especially important for these UAVs to have a mechanism that not just discouraged, but physically prevented, a rotor from being attached to the wrong driveshaft, while also being fast, simple, and easy to use.

VI. CONCLUSION

31. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Date: 17 July 2020

A handwritten signature in black ink, appearing to read 'C. F. Reinholtz', is written over a horizontal line.

“Keyence GyroSaucer II E-570”) to the following YouTube video, which depicts the Japanese quadcopter referenced in the article, and has the title “KEYENCE GyroSaucer TVCM 1991”:

<https://www.youtube.com/watch?v=CEjNej4JXUE>.