

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.

IPR2019-00343
Patent 9,260,184 B2

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

CHAGNON, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

We have jurisdiction to hear this *inter partes* review under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons discussed herein, we determine that SZ DJI Technology Co., Ltd. (“Petitioner”)¹ has shown, by a preponderance of the evidence, that claims 1, 2, 5–9, and 11 (“the challenged claims”) of U.S. Patent No. 9,260,184 B2 (Ex. 1001, “the ’184 patent”) are unpatentable.

A. Procedural History

Petitioner filed a Petition for *inter partes* review of claims 1, 2, 5–9, and 11 of the ’184 patent. Paper 2 (“Pet.”). Petitioner provided a Declaration of Dr. Alfred Ducharme (Ex. 1003) to support its positions. Autel Robotics USA LLC (“Patent Owner”) filed a Preliminary Response (Paper 6). Pursuant to 35 U.S.C. § 314(a), on May 22, 2019, *inter partes* review was instituted on the following grounds:

whether claims 1 and 2 are anticipated under 35 U.S.C. § 102 as anticipated by Microdrones²;

whether claims 1 and 2 would have been obvious under 35 U.S.C. § 103 in view of Microdrones;

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

² Microdrones User Manual for md4-200 (Version 2.2) (May 2009) (Ex. 1004). Patent Owner challenges the prior art status of Microdrones. We address this argument below (*infra* Section II.D.2).

whether claims 5 and 6 would have been obvious under 35 U.S.C. § 103 in view of Microdrones and Wang³;

whether claims 5 and 7 would have been obvious under 35 U.S.C. § 103 in view of Microdrones and LotusRC⁴;

whether claim 8 would have been obvious under 35 U.S.C. § 103 in view of Microdrones, LotusRC, and Slanker⁵;

whether claim 9 would have been obvious under 35 U.S.C. § 103 in view of Microdrones, LotusRC, and Wang; and

whether claim 11 would have been obvious under 35 U.S.C. § 103 in view of Microdrones and Olm.⁶

³ U.S. Patent Appl. Pub. No. 2014/0263823 A1, published Sept. 18, 2014 (Ex. 1006). Petitioner contends that Wang is available as prior art as of January 20, 2013, i.e., the filing date of the Chinese application to which Wang claims priority. Pet. 5–8; *see* 35 U.S.C. §§ 102(a)(2), 102(d)(2), 119(b). Petitioner provides explanations, supported by testimony of Dr. Ducharme, to show the claims of Wang are supported and enabled by the disclosures of the Chinese application. Pet. 5–8; Ex. 1003 ¶ 49. Patent Owner does not contest the prior art status of Wang. *See generally* PO Resp.; Sur-reply. We find Wang to be available as prior art to the challenged claims. *See* Paper 8 (Scheduling Order), 7 (“Patent Owner is cautioned that any arguments for patentability not raised in the response may be deemed waived.”).

⁴ Alibaba.com webpage featuring “LOTUSRC RC UFO T1000 with GPS RC Quadcopter” (Ex. 1008). Petitioner provides evidence that the LotusRC website was publicly accessible at least as early as February 27, 2013. Pet. 8–10; Ex. 1009. Patent Owner does not contest the prior art status of LotusRC. *See generally* PO Resp.; Sur-reply. We find LotusRC to be available as prior art to the challenged claims under 35 U.S.C. § 102(a)(1). *See* Paper 8, 7.

⁵ U.S. Patent Appl. Pub. No. 2015/0203192 A1, published July 23, 2015 (Ex. 1010). Slanker was filed on May 2, 2013, and is prior art to the challenged claims at least under 35 U.S.C. § 102(a)(2). *See* Pet. 10.

⁶ U.S. Patent No. 8,052,081 B2, issued Nov. 8, 2011 (Ex. 1011). Olm is prior art to the challenged claims under 35 U.S.C. § 102(a)(1) and (2). *See* Pet. 10.

See Paper 7 (“Inst. Dec.”).

Subsequent to institution, Patent Owner filed a Patent Owner Response (Paper 13, “PO Resp.”), along with a Declaration of Charles F. Reinholtz, Ph.D. (Ex. 2010) to support its positions. Petitioner filed a Reply (Paper 22, “Pet. Reply”) to the Patent Owner Response, along with a Reply Declaration of Dr. Ducharme (Ex. 1032), and Patent Owner filed a Sur-Reply (Paper 26, “Sur-Reply”). Pursuant to our authorization (*see* Paper 30), Patent Owner also filed a Supplemental Information Submission (Paper 32, “PO Supp. Info. Br.”),⁷ to which Petitioner filed a Reply (Paper 34, “Pet. Supp. Info. Reply”).

An oral hearing was held on February 19, 2020. A transcript of the hearing is included in the record. Paper 39 (“Tr.”).

B. Related Proceedings

The parties identify *SZ DJI Tech. Co. v. Autel Robotics USA LLC*, Case No. 1:18-cv-00378-GMS (D. Del.) and *Certain Unmanned Aerial Vehicles and Components Thereof*, Inv. No. 337-TA-1133 (USITC, instituted Sept. 26, 2018) (“the related ITC proceeding”) as related matters. Pet. 1; Paper 5, 2. Petitioner also filed a petition for *inter partes* review, challenging claims 3 and 4 the ’184 patent; *inter partes* review was instituted in that proceeding on September 23, 2019. Paper 12, 2; *see SZ DJI Tech. Co. v. Autel Robotics USA LLC*, IPR2019-00846, Paper 6 (PTAB Sept. 23, 2019).

⁷ The Supplemental Information includes two exhibits containing testimony of Dr. Juan Alonso (Ex. 2012) and Dr. Reinholz (Ex. 2013) during a related International Trade Commission proceeding.

C. The '184 Patent

The '184 patent is titled “Compact Unmanned Rotary Aircraft,” was filed on May 14, 2014,⁸ and issued February 16, 2016. Ex. 1001, at codes (22), (45), (54).

Figure 1 of the '184 patent is reproduced below.

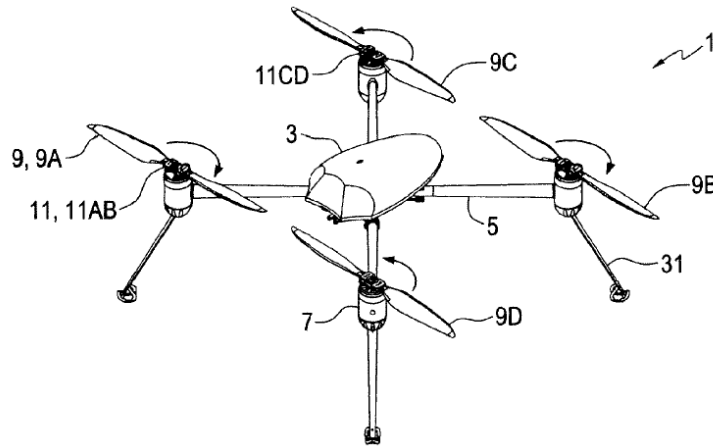


FIG. 1

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

As described in the Background section of the '184 patent, in rotary wing aircraft having “a number of arms extending laterally from the aircraft

⁸ The '184 patent claims priority to Canadian application No. 2815885, filed on May 15, 2013. Ex. 1001, at code (30). Because the application leading to the '184 patent was filed after March 16, 2013, patentability is governed by the Leahy-Smith America Invents Act (“AIA”), Pub L. No. 112-29, 125 Stat. 284 (2011), version of 35 U.S.C. §§ 102 and 103.

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 drive shafts that are rotating in the correct direction.” *Id.* at 3:45–47. In the disclosed embodiments, “clockwise rotor blades 9A, 9B are engageable only with the clockwise lock mechanisms 11AB and cannot be engaged in the counterclockwise lock mechanisms 11CD” and “counterclockwise rotor blades 9C, 9D are engageable only with the counterclockwise lock mechanisms 11CD and cannot be engaged in the clockwise lock mechanisms 11AB.” *Id.* at 3:47–54.

Figures 4 and 5 of the '184 patent, as shaded and annotated by Petitioner (Pet. 21, 22), are reproduced below.

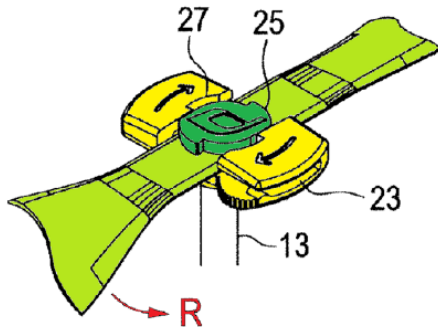


Figure 4

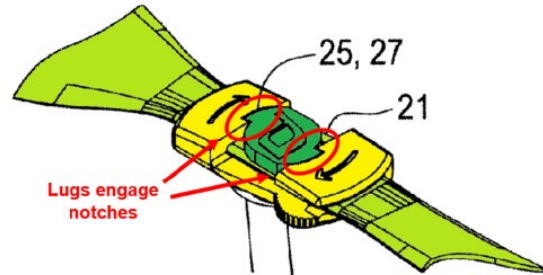


Figure 5

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

being installed on the shaft lock portion 15C of a counterclockwise lock mechanism, and similarly prevents counterclockwise rotor blades 9C, 9D from being installed on the shaft lock portion 15A of a clockwise lock mechanism. *See id.* at 4:27–35, Fig. 8.

D. Illustrative Claims

Of the challenged claims, claim 1 is independent and claims 2, 5–9, and 11 depend therefrom. Claims 1 and 2 of the '184 patent are reproduced below, and are illustrative of the challenged claims.

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.

2. The apparatus of claim 1 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, the blade lock portion comprising lugs with a configuration that is different than a configuration of the lugs on the blade lock portion of the clockwise lock mechanism.

Id. at 6:10–16.

II. ANALYSIS

A. *Principles of Law*

To prevail in its challenges to the patentability of the claims, Petitioner must demonstrate by a preponderance of the evidence that the challenged claims are unpatentable. 35 U.S.C. § 316(e). “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. 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).

To establish anticipation, each and every element in a claim, arranged as recited in the claim, must be found in a single prior art reference.

See Net MoneyIN, Inc. v. VeriSign, Inc., 545 F.3d 1359, 1369 (Fed. Cir. 2008); *Karsten Mfg. Corp. v. Cleveland Golf Co.*, 242 F.3d 1376, 1383 (Fed. Cir. 2001). Although the elements must be arranged or combined in the same way as in the claim, “the reference need not satisfy an *ipsissimis verbis* test,” i.e., identity of terminology is not required. *In re Gleave*, 560 F.3d 1331, 1334 (Fed. Cir. 2009); *accord In re Bond*, 910 F.2d 831, 832 (Fed. Cir. 1990). Further, to be anticipating, a prior art reference must be enabling and must describe the claimed invention sufficiently to have placed it in possession of a person of ordinary skill in the field of the invention. *Helifix Ltd. v. Blok-Lok, Ltd.*, 208 F.3d 1339, 1346 (Fed. Cir. 2000); *In re Paulsen*, 30 F.3d 1475, 1479 (Fed. Cir. 1994).

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. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). Consideration of the *Graham* factors “helps inform the ultimate obviousness determination.” *Apple Inc. v. Samsung Elecs. Co.*, 839 F.3d 1034, 1048 (Fed. Cir. 2016) (en banc).

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,” but “must instead articulate specific reasoning, based on evidence of record” to support an obviousness determination. *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380–81 (Fed. Cir. 2016). Petitioner also must articulate a reason why a person of ordinary skill in the art would have combined the prior art references. *In re NuVasive*, 842 F.3d 1376, 1382 (Fed. 2016).

At this final stage, we determine whether a preponderance of the evidence of record shows that the challenged claims would have been rendered obvious in view of the asserted prior art. We analyze the asserted grounds of unpatentability in accordance with these principles.

B. Level of Ordinary Skill in the Art

We review the grounds of unpatentability in view of the understanding of a person of ordinary skill in the art at the time of the invention. *Graham*, 383 U.S. at 17. 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. 29; *see* Ex. 1003 ¶ 17. Patent Owner contends that a person of ordinary skill in the art “would have had a bachelor’s degree in mechanical engineering and at least two years of experience designing mechanisms and mechanical structures of the type used in releasable couplings and locking devices. Additional education

could substitute for professional experience and significant work experience could substitute for formal education.” PO Resp. 13; *see* Ex. 2010 ¶ 35.

Patent Owner acknowledges that its proposed “definition is substantially similar to the definition offered by Petitioner.” PO Resp. 14. We agree and note that our consideration of the issues presented does not turn on which proposed definition is applied. In any event, for purposes of this Final Written Decision, we adopt Petitioner’s description of a person of ordinary skill in the art, while maintaining our prior determination (Inst. Dec. 12) that the prior art reflects the appropriate level of skill at the time of the claimed invention. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

C. Claim Construction

In this *inter partes* review proceeding, claim terms shall be construed using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. [§] 282(b), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent. *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, 51,340, 51,358 (Oct. 11, 2018) (amending 37 C.F.R. § 42.100(b) effective November 13, 2018) (now codified at 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). We construe terms only to the extent necessary to resolve the controversy. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

Petitioner proposes constructions for several claim terms, including “lugs” and “notches”; “lock mechanism”; and “drive.” Pet. 30–33. Patent Owner proposes constructions for “lock mechanism”; “shaft lock portion” and “blade lock portion”; and the Engagement Limitation.¹⁰ PO Resp. 18–25. In its Reply, Petitioner opposes each of Patent Owner’s proposed

⁹ A claim construction order from the related ITC proceeding is of record in this proceeding. *See* Ex. 2006. We have reviewed and considered the ITC claim construction order. We note that the ITC claim construction order does not include construction of any of the contested limitations at issue in this proceeding, and we do not discuss it further herein.

¹⁰ The parties use the term “Engagement Limitation” to reference the following recitation in claim 1: “the clockwise rotor blade is engageable only with the clockwise lock mechanism and cannot be engaged in the counterclockwise lock mechanism, and the counterclockwise rotor blade is engageable only with the counterclockwise lock mechanism and cannot be engaged in the clockwise lock mechanism.”

constructions. *See* Pet. Reply 1–7. We discuss each of these contested limitations below.

1. “lock mechanism”

Claim 1 recites, *inter alia*, that “each rotor assembly compris[es] a rotor blade releasably attached to a driveshaft by a lock mechanism.” Ex. 1001, 5:39–40. Claim 1 further recites that “the clockwise lock mechanism comprises a shaft lock portion . . . and a blade lock portion.” *Id.* at 6:5–7. Similar limitations for the counterclockwise lock mechanism are recited in dependent claim 2. *Id.* at 6:10–13.

In our Institution Decision, we discussed the construction of “lock mechanism.” *See* Inst. Dec. 13–16. We did not provide an express construction of the term, except to clarify that the recited “lock mechanism” “allows ‘components other than those specifically recited in the claims to [help] releasably attach the rotor blades.’” *Id.* at 16 (quoting Pet. 32). In its Patent Owner Response, Patent Owner indicates that it “does not dispute that the claimed lock mechanism may include other components.” PO Resp. 19. Patent Owner contends that the “lock mechanism” should be further construed as “an apparatus that secures the rotor blade to the driveshaft and prevents the release of the rotor blade during operation.” *Id.* at 20 (citing Ex. 2010 ¶ 51). In its Sur-reply, however, Patent Owner indicates that it “is no longer pursuing its assertions regarding the ‘lock mechanism’ claim term.” Sur-reply 1. Thus, we understand Patent Owner does not dispute our earlier construction of the term. Accordingly, for purposes of this Final Written Decision, we maintain our prior construction of “lock mechanism.”

2. “shaft lock portion” and “blade lock portion”

Claim 1 recites, *inter alia*, 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.” Ex. 1001, 6:5–9. Patent Owner contends that “the shaft lock portion and blade lock portion together perform the function of locking the blade to the drive, and a [person of ordinary skill in the art] would understand that the shaft lock portion and the blade lock portion . . . must perform a locking function.” PO Resp. 20–21 (citing Ex. 2:58–62, 4:23–26, 4:19–40, Figs. 9, 10). According to Patent Owner, “[t]he locking function of the lock mechanism is accomplished by the interaction of the shaft lock portion and blade lock portion.” PO Resp. 21.

We disagree with Patent Owner’s proposal. Instead, we agree with Petitioner that “[t]his limitation is clear on its face. The blade lock portion is a portion of the lock mechanism attached to the rotor blade and the shaft lock portion is a portion of the lock mechanism attached to the driveshaft.” Pet. Reply 4. We, therefore, do not adopt Patent Owner’s proposal insofar as it attributes the locking functionality of the lock mechanism *only* to the “shaft lock portion” and “blade lock portion.”

3. Engagement Limitation

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

Patent Owner contends that this limitation “means that a clockwise rotor blade cannot be attached to a counterclockwise driveshaft and that [a] counterclockwise rotor blade cannot be attached to a clockwise driveshaft.” PO Resp. 22 (citing Ex. 2010 ¶¶ 68–69). More specifically, Patent Owner contends that a person of ordinary skill in the art “would understand the engagement limitation to mean that a user is unable to attach the wrong blade to the wrong driveshaft.” *Id.* at 23 (citing Ex. 2010 ¶ 69).

Patent Owner’s arguments are premised on the contention that “one of the novel features of the rotor blade attachment mechanism of the ’184 patent is that it prevents a user from attaching the wrong rotor blade to the wrong drive.” *Id.* at 22; *see id.* at 11, 22–25. In distinguishing the claims from Petitioner’s asserted prior art (i.e., Microdrones), Patent Owner argues that “Microdrones clearly shows that a blade can be attached to the wrong rotor.”¹¹ *Id.* at 23 (citing Ex. 1004, Fig. 25).

Petitioner agrees that “the disclosed lock mechanism prevents[, for example,] the clockwise rotor blade from being *improperly* attached to the counterclockwise driveshaft” (Pet. 23) (emphasis added), however Petitioner contends that the prevention occurs “because the lugs on the blade lock portion of the clockwise rotor blade do not align with and thus cannot engage the oppositely configured notches of the counterclockwise shaft lock portion” (*id.*). *See* Ex. 1001, Fig. 8. Petitioner asserts that because “the clockwise shaft lock portion has notches that are configured differently from the notches on the counterclockwise shaft lock portion, the notches of the clockwise shaft lock portion will not engage the lugs on a rotor blade that is

¹¹ We discuss this contention in more detail below (*infra* Section II.D.3.b)(3)).

configured to engage the notches on the counterclockwise shaft lock portion, and vice versa.” Pet. 19; *see* Ex. 1001, Figs. 7, 10. Petitioner and Dr. Ducharme describe this configuration as the corresponding notches and lugs being “keyed” to each other. *See, e.g.*, Pet. 15–16 (“What the ’184 patent alleges to be an invention is a lock mechanism that keys the correct rotor blades to the correct driveshafts, to prevent clockwise rotor blades from being attached to counterclockwise driveshafts, and vice versa.”); Ex. 1003 ¶ 22; Tr. 15:3–7 (Petitioner’s counsel arguing that “this limitation is directed to the concept of keying or fool-proofing the components. In other words, the clockwise rotor blade is keyed for the clockwise drive shaft, and the counterclockwise rotor blade is keyed for the counterclockwise drive shaft and lock mechanism. And this limitation is clear from the context and its use in the claim.”).

We agree with Petitioner that the claim recitation that the rotor blade “cannot be *engaged* in” the incorrect lock mechanism does not mean that the rotor blade cannot be *improperly attached*, i.e., simply mounted, to the incorrect rotor, as implicated by Patent Owner’s arguments. *See* Pet. Reply 5–6. 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). In other words, according to the claimed invention, a proper attachment requires an engagement in the lock mechanism. Insofar as Patent Owner’s position is based upon an attachment that does not include the required engagement, such is not an attachment as

described by the claims. To recognize that distinction, we refer to the claims as reciting an attachment by engagement and Patent Owner's reference to an "attachment" as some other type of attachment by mounting.

As noted, Patent Owner argues that the Engagement Limitation means that a rotor blade cannot be *attached*, i.e., by mounting, to the incorrect driveshaft. *See also* Pet. Reply 19 (Patent Owner presents a "position that the [lock] mechanisms must 'prevent' misplacement such that if a blade can somehow be attached [i.e., mounted] to the wrong driveshaft, even if not fully mounted, it fails to meet the 'engagement limitation.'"). The plain language of the claim, however, requires that "counterclockwise rotor blade is *engageable* only with the counterclockwise lock mechanism and cannot be engaged in the clockwise lock mechanism." We disagree 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.¹² Instead, based upon language of the claim, we determine that it is possible for a rotor blade to be simply mounted to a driveshaft without being *engaged in* the lock mechanism. *See* "Attach" Definition, MERRIAM-WEBSTER.COM (available at <https://www.merriam->

¹² Patent Owner argues that "Petitioner's expert [in the related ITC proceeding] conceded that the meaning of the Engagement Limitation is that it 'prevents the engagement of a blade to the wrong rotor.' The testimony confirms Patent Owner's position." PO Supp. Info. Br. 3 (citing Ex. 2012, 279:18–281:1). We do not find this testimony to be inconsistent with our construction of the Engagement Limitation, which distinguishes between attachment by engagement, as required by the claims, and other forms of attachment, for example, by mounting. *See also* Pet. Supp. Info. Reply 1 (noting that Dr. Alonso "explicitly declined to use the word 'attach' [in the referenced testimony] and emphasized the claim's use of the word 'engage.'").

webster.com/dictionary/attach) (4: “to make fast (as by tying or gluing)”); “Engage” Definition, MERRIAM-WEBSTER.COM (available at <https://www.merriam-webster.com/dictionary/engage>) (4: “to come together and interlock”).

D. Asserted Anticipation by Microdrones

Petitioner asserts that claims 1 and 2 are anticipated by Microdrones.¹³ Pet. 33–60. Patent Owner alleges that Petitioner fails to establish that Microdrones qualifies as a printed publication. *See* PO Resp. 25–41. Patent Owner also asserts that Microdrones does not disclose various features of independent claim 1. *Id.* at 41–48.

¹³ Petitioner also asserts that claims 1 and 2 would have been obvious in view of Microdrones. Pet. 60–62. Petitioner presents this ground as an alternative “[i]n the unlikely event that the Board determines that the claimed lock mechanisms each must consist of **only** (i) a shaft lock portion and (ii) a blade lock portion.” *Id.* at 61. As discussed above, we do not determine that claim 1 is limited in this manner. *See* Section II.C.1. We, thus, do not address Petitioner’s asserted ground of obviousness based on Microdrones.

1. Overview of Microdrones

Microdrones is a User Manual for the Microdrones md4-200 drone. Ex. 1004, Cover. An annotated version of Figure 18 of Microdrones, as provided by Petitioner (Pet. 27), is reproduced below.



figure 18: md4-200, ready for take off

Annotated Figure 18, above, shows the md4-200, with parts labeled by Petitioner. Pet. 27 (citing Ex. 1004, 22¹⁴ (original, non-annotated version)). The md4-200 includes “four rotors, two of which turn clockwise and the other two counter clockwise.” Ex. 1004, 27.

¹⁴ Citations to Microdrones (Ex. 1004) are to the original pagination of the document.

Figure 25 of Microdrones is reproduced below.



figure 25: mounting the rotor blades

Figure 25, above, shows steps of assembling the rotors of the md4-200. *Id.* at 27. “Each rotor has two knobs on its bottom of the centre bar which are matched by two holds in the rotor mounting plate.” *Id.* Microdrones describes that “[t]o avoid accidental misplacement [of the clockwise and counter clockwise rotors], both directions of turning use individual distances between these knobs.” *Id.* Microdrones instructs to “[m]ake sure that the

centre bar is level with the top of the mounting plate before you proceed.”
Id. Once mounted, the “rotors are secured by two O-rings of rubber.” *Id.*

2. Availability of Microdrones as Prior Art

Petitioner asserts that Microdrones is a prior art printed publication under 35 U.S.C. § 102(a)(1). Pet. 3–5; Pet. Reply 8–13. Patent Owner opposes. PO Resp. 25–41; Sur-reply 5–11. “In an [*inter partes* review], the petitioner bears the burden of establishing by a preponderance of the evidence that a particular document is a printed publication.” *Nobel Biocare Servs. AG v. Instradent USA, Inc.*, 903 F.3d 1365, 1375 (Fed. Cir. 2018) (citing *Medtronic, Inc. v. Barry*, 891, F.3d 1368, 1380 (Fed. Cir. 2018)). Thus, as an initial matter, we must determine whether Petitioner has shown by a preponderance of the evidence that Microdrones is available as prior art to the ’184 patent.

a) *Relevant Case Law*

The determination of whether a reference qualifies as a “printed publication” is a legal conclusion based on underlying factual findings. *See Nobel*, 903 F.3d at 1375 (citing *Jazz Pharm., Inc. v. Amneal Pharm., LLC*, 895 F.3d 1347, 1356 (Fed. Cir. 2018)). The underlying factual findings include whether the reference was publicly accessible. *Id.* (citing *In re NTP, Inc.*, 654 F.3d 1279, 1296 (Fed. Cir. 2011)). “A reference will be considered publicly accessible if it was ‘disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art exercising reasonable diligence[] can locate it.’” *Blue Calypso, LLC v. Groupon, Inc.*, 815 F.3d 1331, 1348 (Fed. Cir. 2016) (quoting *Kyocera*

Wireless Corp. v. Int’l Trade Comm’n, 545 F.3d 1340, 1350 (Fed. Cir. 2008)).

The Federal Circuit “ha[s] interpreted § 102 broadly, finding that even relatively obscure documents qualify as prior art so long as the relevant public has a means of accessing them.” *GoPro, Inc. v. Contour IP Holding LLC*, 908 F.3d 690, 693 (Fed. Cir. 2018) (citing *Jazz Pharm., Inc. v. Amneal Pharm., LLC*, 895 F.3d 1347, 1354–60 (Fed. Cir. 2018)). Further, according to the Federal Circuit, “[a]ccessibility goes to the issue of whether interested members of the relevant public *could obtain the information if they wanted to*’ and ‘[i]f accessibility is proved, there is *no requirement* to show that particular members of the public *actually received* the information.’” *Id.* (emphases added) (quoting *Constant v. Advanced Micro-Devices, Inc.*, 848 F.2d 1560, 1569 (Fed. Cir. 1988)).

b) Evidence Presented and Factual Findings

Petitioner presents the testimony of Mr. Alan Stevens (Ex. 1016) to support its assertion that Microdrones was publicly accessible.¹⁵ *See* Pet. 3–

¹⁵ Petitioner additionally submits, with its Reply, the Declaration of Mr. Jonathon Sales (Ex. 1026) from the related ITC investigation. *See* Pet. Reply 13. Petitioner, however, does not discuss or present arguments related to this declaration, other than to state that Mr. Sales testifies that he “similarly purchased a Microdrones UAV and received the Microdrones manual” and that his testimony “further supports public accessibility for interested persons who learned about and received the manual in conjunction with their interest in the Microdrones product.” *Id.* “A brief must make all arguments accessible to the judges, rather than ask them to play archeologist with the record.” *DeSilva v. DiLeonardi*, 181 F.3d 865, 866–67 (7th Cir. 1999); *see also* 37 C.F.R. § 42.22(a)(2) (2018) (Petitioner must “includ[e] a detailed explanation of the significance of the evidence including material facts”). Further, “[a]rguments must not be incorporated by reference from

4. Patent Owner did not depose Mr. Stevens. *See* Pet. Reply 8; Tr. 7:24–25. Thus, his testimony is uncontroverted, and we find his testimony to be credible. We adopt the following portions of his testimony as factual findings herein.

Mr. Stevens “ha[s] over 30 years of experience as an Aerospace Systems & Support Consultant.” Ex. 1016 ¶ 3. “During 15 of these years [he] focused on assisting customers [in] develop[ing] critical aviation equipment based products,” and “[o]ver the past 9 years [he] ha[s] been interested and active in the drone and UAV community, and ha[s] been involved in developing commercial remotely piloted system experiences.” *Id.* We, thus, determine that Mr. Stevens is a member of the relevant public interested in UAVs.

Mr. Stevens ordered a Microdrones mdPRO kit — which included the md4-200 drone — from MW Power Microdrones (UK) Ltd., the UK distributor of Microdrones products, in April 2009. Ex. 1016 ¶ 5; *see also id.* ¶ 6 (Ex. 1016, at Ex. C; Ex. 1016, at Ex. D (purchase order)); Pet. 3. Mr. Stevens testifies that no “special license, government authorization, or other evidence of training or experience” was required to make the purchase.

one document into another document.” 37 C.F.R. § 42.6(a)(3) (2018). We do not consider the details of Mr. Sales’ testimony presented in Exhibit 1026 because Petitioner does not present an explanation of the evidence presented in the declaration, and we consider it to be an inappropriate incorporation by reference of a declaration into a brief. *See also* Sur-reply 10 (arguing that “Petitioner merely cites the declaration in its reply brief and alleges, without further explanation, that it supports public accessibility”). We, thus, need not address Patent Owner’s arguments that Mr. Sales’ testimony “exceeds the scope of a proper reply.” *See* Sur-reply 10.

Ex. 1016 ¶ 5. This fact evinces the availability of the kit for purchase by the general public.

Mr. Stevens picked up his mdPRO kit on May 21, 2009. Ex. 1016 ¶ 9; Pet. 4. Mr. Stevens' kit included "the md4-200 rotary aircraft, as well as a video camera, still camera, and rugged laptop." Ex. 1016 ¶ 9; Pet. 4. The serial number of the md4-200 UAV he received was #429. Ex. 1016 ¶ 9. The rugged laptop Mr. Stevens received contained a PDF copy of the Microdrones md4-200 User Manual (Version 2.2) (attached to Mr. Stevens' declaration as Exhibit G). Ex. 1016 ¶¶ 9–10; Pet. 4. Further, Mr. Stevens testifies that "[a]t no time was [he] asked or under an obligation to keep the md4-200 User Manual confidential." Ex. 1016 ¶ 9; *see* Pet. 4.

We make the following additional factual findings regarding the Microdrones document itself. Microdrones bears certain indicia of a public facing document. Microdrones includes a copyright notation of "copyright microdrones GmbH, 2004-2007." *See, e.g.*, Ex. 1004, 5; Pet. 3; *see also* Ex. 1004, 11 (indicating a date of "at present, 2007"). It is titled "USER MANUAL" and includes contact information for the company. Ex. 1004, Front Cover, Back Cover; *see C.R. Bard, Inc. v. AngioDynamics, Inc.*, 748 F. App'x. 1009, 1014 (Fed. Cir. 2018) (indicating that the inclusion of "phone numbers for customer and technical service departments within [company] as well as contact information for various [company] offices . . . suggest[] that the publication served as a reference guide for . . . professionals outside of [the company]"). Further, as noted by Petitioner, it "includ[es] detailed instructions for beginners on [operation of the drone, e.g.,] takeoff, flight, and landing," also indicating an intent for public distribution. Pet. Reply 12 (citing Ex. 1004, 85–93). Microdrones also does

not include any express indication that the document is confidential. *See generally* Ex. 1004.

Petitioner also provides 2009-era copies of portions of the microdrones.co.uk website (Ex. 1017) and the mwpower.co.uk website (Ex. 1021). Exhibit 1017 indicates that the mdPro kit was advertised online as available for purchase as of at least February 27, 2009. *See* Pet. 3–4. Likewise, Exhibit 1021 indicates the availability of the Microdrones md4-200 drone as of at least April 30, 2009. *See id.* These documents evince that the md4-200 was publicly advertised at least four years before the priority date of the '184 patent. Mr. Stevens testifies that he recalls viewing “the same or similar . . . webpage[s]” (Ex. 1016 ¶¶ 4, 5) “to obtain information about the md4-200 and MW Power” (*id.* ¶ 4 (citing Ex. 1016, Ex. A (same as Ex. 1021))) and “when [he] located and researched Microdrones” (Ex. 1016 ¶ 5 (citing Ex. 1016, Ex. B (same as Ex. 1017))).

c) Discussion

Patent Owner contends that Petitioner has not established that Microdrones was publicly accessible before the May 15, 2013, critical date of the '184 patent, and thus has not met its burden to prove that Microdrones is a printed publication. PO Resp. 25. We have reviewed the parties' arguments and evidence presented, and, for the reasons discussed below and in view of the factual findings set forth above, determine that Petitioner has met its burden to show that Microdrones is a printed publication.

Patent Owner argues that “Petitioner does not rely on any documents or testimony from Microdrones GmbH, the supposed publisher of Microdrones, to prove that reference was ‘publicly accessible.’” PO Resp. 26. Patent Owner contends that absent such evidence from Microdrones

GmbH, Mr. Stevens' testimony is insufficient to prove public accessibility. *See id.* at 27. We address Patent Owner's specific arguments in turn.

Patent Owner argues that availability of the product does not prove the manual was "publicly accessible." *See id.* at 27–28. Patent Owner contends that Petitioner attempts to conflate the public availability of the md4-200 product with the "public accessibility" of Microdrones. *Id.* Petitioner, however, provides uncontroverted testimonial evidence that at least one customer (i.e., Mr. Stevens) actually received Microdrones with purchase of the product on May 21, 2009. Ex. 1016 ¶¶ 5, 9.

Patent Owner argues that inclusion of the manual with Mr. Stevens' purchase does not prove "public accessibility," concluding that "Petitioner's evidence lacks traditional indicia of 'public accessibility' required to prove Microdrones is a 'printed publication'" (PO Resp. 35). *See id.* at 28–37.

Patent Owner first argues that the copyright notice on Microdrones does not establish that the document was publicly accessible. *Id.* at 29. Although we agree with Patent Owner that the copyright notice is not itself sufficient to establish public accessibility, we do not agree that "it is of no consequence" (*id.* at 28). *See Hulu, LLC v. Sound View Innovations, LLC*, IPR2018-01039, Paper 29 at 17–18 (PTAB Dec. 20, 2019) (precedential) (holding that the "the indicia on the face of a reference, such as printed dates and stamps, are considered as part of the totality of the evidence" relating to public accessibility) (citing *Nobel*, 903 F.3d at 1377 ("Although the ABT Catalog's date is not dispositive of the date of public accessibility, its date is relevant evidence that supports the Board's finding of public accessibility at the March 2003 IDS Conference."))).

Patent Owner next argues that “there is no evidence that the Microdrones reference . . . itself was marketed or mentioned on the [Microdrones company] website, let alone made available for electronic download over the internet.” PO Resp. 29. We disagree that the user manual must be specifically mentioned on the website in order to show public accessibility. There is evidence in the record that the md4-200 was marketed publicly and that at least one customer *actually received* the manual with a purchase of the product on May 21, 2009. Ex. 1016 ¶¶ 5, 9.

Patent Owner next argues that “Petitioner presents no corroborating documents or testimony of the Manufacturer . . . concerning the routine business practices of the Manufacturer regarding user manuals such as Microdrones.” PO Resp. 30. Patent Owner also argues that there is no evidence that the version of Microdrones received by Mr. Stevens “was the same manual (or version) provided to other purchasers of other md4-200 ‘kits’” (*id.* at 32) or that “potential customers or non-customers could locate or access Microdrones by, for example, requesting a copy from the Manufacturer” (*id.*).

Petitioner contends that “Mr. Stevens’ testimony confirms that it was the manufacturer’s practice to publicly distribute md4-200 manuals.” Pet. 4 (citing Ex. 1016 ¶¶ 9–12). We agree with Patent Owner that “Mr. Stevens does not testify about the business practices of the Manufacturer.” PO Resp. 31. However, Mr. Stevens’ testimony is sufficient to show that he purchased an md4-200 drone and that he actually received a copy of Microdrones with his purchase. *Cf. In re Enhanced Sec. Research, LLC*, 739 F.3d 1347, 1365 (Fed. Cir. 2014) (O’Malley, J., dissenting) (criticizing the lack of evidence

that any sales of the product associated with the manual at issue ever occurred prior to the critical date).

Patent Owner also argues that the “high cost of the md4-200 ‘kits’ weighs against finding Microdrones was ‘publicly accessible.’” PO Resp. 33. However, Patent Owner has not supported that argument with evidence. We do not find that the price of the md4-200 would have dissuaded interested persons from purchasing the drone. *See, e.g.*, Ex. 1031, 78:18–80:3, 86:13–89:11 (Dr. Reinholtz testifying that interested persons regularly spend thousands of dollars on drones); Pet. Reply 13. Nor do we find that the price of the drone would have prevented interested persons from accessing Microdrones.

Patent Owner argues that Mr. Stevens’ testimony regarding the online group for drone operators does not provide sufficient information about the forum or the manual received from the other operator to prove public accessibility. PO Resp. 33–35. We do not rely on this testimony for purposes of this Final Written Decision.

Finally, Patent Owner argues that the Board has previously found no public accessibility in similar circumstances. *See* PO Resp. 37–41. Petitioner disagrees. Pet. Reply 9–13.

Patent Owner cites *ASM IP Holding B.V., v. Kokusai Elec. Corp.*, IPR2019-00369, Paper 8 (PTAB June 27, 2019), arguing that there the “Board reasoned that the Petitioner’s reliance on availability of the P20-h *product*, . . . was insufficient” to show public accessibility. PO Resp. 38–39 (citing *ASM*, Paper 8 at 15–16). We agree with Petitioner (Pet. Reply 9–10), however, that in *ASM* there was no testimony from interested persons who had received the manual with the product. Here, on the other hand,

Mr. Stevens testified that he received the user manual with his purchase of the md4-200 kit. Further distinguishing *ASM*, the manual there also was subject to restrictions prohibiting its reproduction or further dissemination. *See ASM*, Paper 8 at 19 (a “statement [on the document] requiring ‘the express written permission of [the company]’ for reproduction and transmission weighs against a finding that [the document] was publicly accessible”). Here, there are no such restrictions on Microdrones. *See* Ex. 1016 ¶ 9.

Patent Owner further cites *Nautilus, Inc. v. Icon Health & Fitness Inc.*, IPR2017-01363, Paper 33 (PTAB Nov. 28, 2018) and *VMAC Global Techs., Inc. v. Vanair Mfg., Inc.*, IPR2018-00670, Paper 9 (PTAB Aug. 10, 2018). PO Resp. 39–40. These cases also are distinguishable. As discussed in the Institution Decision (*see* Inst. Dec. 22; Pet. Reply 9), in *VMAC*, Petitioner’s entire showing in the Petition on the printed publication issue consisted of the statement “VMAC Owner’s Manual is a printed publication with a date prior to August 17, 2006 and is prior art under 35 U.S.C. § 102 et seq.” *VMAC*, Paper 9 at 11 (quoting *VMAC* Pet. 16); *see also id.* (“Beyond this conclusory assertion, Petitioner provides no additional analysis in the Petition to demonstrate that the VMAC Owner’s Manual is prior art.”). Similarly, in *Nautilus*, Petitioner merely asserted without further explanation that “Six-Pak was published October 7, 2008 and available online thereafter, making it prior art under §§ 102(a) and (b). Authentication and proof of the public accessibility of Six-Pak through the Wayback Machine appears in the Affidavit of Christopher Butler.” *Nautilus*, Paper 33 at 10–11 (quoting *Nautilus* Pet. 12); *see also id.* at 16–17 (“What we find lacking is evidence that persons interested in exercise equipment knew of the TuffStuff website

or would have been able to locate it through reasonable diligence. . . . There is also no evidence in the record that persons interested in exercise machines knew of either the Six-Pack trainer or TuffStuff as a source of exercise equipment, such that they would have had reason to search the internet for information about TuffStuff or Six-Pak.”). Here, on the other hand, Petitioner provides explanation and argument in the Petition, citing to Mr. Stevens’ declaration as support. *See* Pet. 3–5. Also, in *VMAC*, the panel relied on evidence that the owner’s manual at issue included express language that the manual may not be reproduced without permission. *See VMAC*, Paper 9 at 12–14. Here, on the other hand, we have Mr. Stevens’ unchallenged testimony that there was no obligation of confidentiality with respect to Microdrones. *See* Ex. 1016 ¶ 9; *see* Pet. 4. Further, Mr. Stevens’ testimony in this proceeding fills the gaps identified by the panel in *Nautilus*. *See* Ex. 1016 ¶¶ 4–5.

Petitioner alleges, on the other hand, that the Board has found public accessibility under circumstances similar to those found here, citing *Ex parte MobileMedia Ideas LLC*, Case No. 2014-004550, 2014 WL 2758463 (PTAB June 16, 2014) and *Caterpillar Inc. v. Wirtgen America, Inc.*, IPR2017-02187, Paper 42 (PTAB May 21, 2019). Pet. Reply 11–12. We agree, for the reasons Petitioner sets forth in the Reply. *See id.* *MobileMedia* is particularly informative in that the Board determined that a mobile phone manual was publicly accessible based on an undisputed declaration from a single customer who purchased the phone and received the manual. *MobileMedia*, at *3–4; *cf. Ex parte Grill-López*, Appeal No. 2018-006082 (PTAB Jan. 31, 2020) (precedential) (determining that the

burden for establishing that a reference is a printed publication is different in examination than in an *inter partes* review proceeding).

We also determine that the Federal Circuit’s decision in *In re Enhanced Security Research, LLC*, 739 F.3d 1347 (Fed. Cir. 2014) is informative. In *Enhanced Security*, the Federal Circuit determined that substantial evidence supported the Board’s finding that a manual associated with a software product was publicly accessible based on the manual’s inscription date, a declaration explaining that the product was “sold to or installed for approximately a dozen customers,” and evidence of the product’s advertisements published during the relevant timeframe. 739 F.3d at 1354–55. Here, instead of a declaration from the manufacturer, we have evidence of actual sales of the product and receipt by a customer of the corresponding product manual. *Cf. Enhanced Sec.*, 739 F.3d at 1365 (O’Malley J., dissenting) (criticizing the lack of evidence that any sales ever occurred prior to the critical date).

Accordingly, we determine that Petitioner has shown, by a preponderance of the evidence, that Microdrones includes inscription dates well before the priority date of the ’184 patent, bears certain other indicia of a public facing document as discussed above, and was distributed via sale of the md4-200 drone to at least one customer, with no obligations of confidentiality. Therefore, we conclude that Microdrones qualifies as a prior art printed publication.

3. Analysis of Petitioner's Asserted Anticipation Ground

a) Uncontested Limitations of Claim 1

Petitioner provides a side-by-side comparison of Figure 18 of Microdrones and Figure 1 of the '184 patent (Pet. 34), reproduced below.

Microdrones, Figure 18

2.1.2 The md4-200



figure 18: md4-200, ready for take off

'184 patent, Figure 1

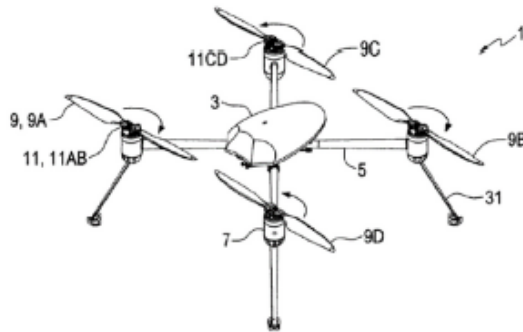


Figure 18 of Microdrones and Figure 1 of the '184 patent, above, illustrate the md4-200 drone and rotary wing apparatus 1 of the '184 patent, respectively. Petitioner sets forth in detail how Microdrones discloses a rotary wing aircraft apparatus, as recited in claim 1, including (1) a body; (2) a plurality 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. Pet. 34–36, 41–43, 46–47 (citing Ex. 1004, 7–8, 9, 27–28, 48, Figs. 3, 5, 7, 8, 18, 22, 25; Ex. 1003 ¶¶ 82–89, 98–102).

These limitations describe the basic structure of a UAV. *See, e.g.*, Ex. 1001, 1:18–28 (Background of the '184 patent describing “[o]ne popular configuration [of UAV] includes a number of arms extending laterally from

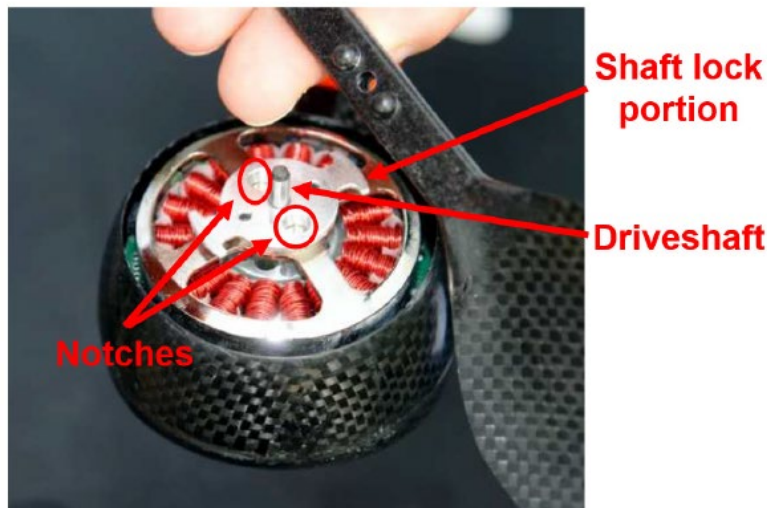
the aircraft body, with a rotor assembly on the end of each arm. . . . Where the rotor assemblies have a single rotor, torque on the body from the rotational motion of the rotors is avoided by having the rotors rotate in opposite directions. The vertical lift is the same, but the torque imparted by rotation in one direction is cancelled out by the rotation in the opposite direction.”); Tr. 5:12–16 (Petitioner’s counsel arguing that “there’s no dispute between the parties that the Microdrones prior art discloses each of the first four limitations of the claim which is the basic structure of a UAV which the patent itself admits was known.”). Patent Owner does not dispute Petitioner’s contentions as to Microdrones’ disclosure of these limitations. *See generally* PO Resp. After reviewing the parties’ briefing and the evidence of record, we are persuaded by Petitioner’s arguments and supporting evidence for the undisputed limitations of claim 1. Accordingly, we determine that Petitioner has established by a preponderance of the evidence that each of the limitations of claim 1 not challenged by Patent Owner is disclosed by Microdrones. *See In re NuVasive*, 841 F.3d 966, 974 (Fed. Cir. 2016) (explaining that the Board need not make specific findings as to claim limitations that Patent Owner does not dispute are disclosed in the prior art).

b) Contested Limitations of Claim 1

Claim 1 also recites that the rotor assembly includes a “rotor blade releasably attached to a driveshaft by a lock mechanism,” and includes further details regarding the lock mechanism in the final three “wherein” clauses of the claim (*see supra* Section I.D). Petitioner provides annotated versions of excerpts of Figure 25 of Microdrones to explain its contentions

with respect to the claimed “lock mechanism” (Pet. 38, 39), two of which are reproduced below.

Microdrones, Figure 25 (partial, annotated)



Microdrones, Figure 25 (partial, annotated)



Annotated Figure 25 of Microdrones, above, shows a step in the rotor assembly process. Pet. 38, 39 (annotating Ex. 1004, 27). Petitioner relies on the rotor mounting plate of Microdrones as disclosing the claimed shaft lock portion. *Id.* at 38 (citing Ex. 1004, 27). The rotor mounting plate includes holds (i.e., indentations), which Petitioner contends correspond to the

claimed notches. *Id.* (citing Ex. 1004, 27). Petitioner further relies on a portion of the rotor blade having knobs/projections as disclosing the claimed blade lock portion and lugs. *Id.* at 39 (citing Ex. 1004, 27). According to Petitioner, “Microdrones explains that the knobs/projections (*i.e.*, claimed lugs) on the rotor blades engage the notches in the rotor mounting plate (*i.e.*, shaft lock portion)” with a tight fit. *Id.* at 39–40 (citing Ex. 1004, 27; Ex. 1003 ¶¶ 91–94); *see also* Tr. 13:24–14:2 (Petitioner’s counsel: “Patent Owner implies in their briefing that Microdrones’ knobs only rest in the holds. But even a cursory review of Microdrones shows this is not the case. You can see that the holds are deep recesses and the knobs fit into these recesses. In fact, Microdrones describes the fit between the knobs and holds, and they describe it as being tight.”). Petitioner further relies on “two rubber O-rings and corresponding hooks on the rotor mounting plate for coupling to the O-rings,” as part of the claimed lock mechanism that “enables the rotor blade to be releasably attached to the driveshaft.” Pet. 40 (citing Ex. 1004, 27, Fig. 25). According to Petitioner, the “two rubber O-rings [] complete the connection between the blade and the rotor.” *Id.* at 41 (citing Ex. 1004, 27). Petitioner contends “[t]he combination of the knobs (*i.e.*, lugs), holds (*i.e.*, notches), O-rings, and hooks together lock each blade to its corresponding driveshaft. Microdrones’ rotor blades may then be released . . . by removing the rubber O-rings and disengaging the projecting lugs from the notches on the rotor mounting plate.” *Id.* (citing Ex. 1003 ¶¶ 95–97); *see also id.* at 51–58 (citing Ex. 1004, 27, Figs. 18, 25; Ex. 1003 ¶¶ 116–125) (describing in more detail how Microdrones’ holds and knobs correspond to the notches and lugs, respectively, of claim 1); *see also* Tr. 14:17–20 (Petitioner’s counsel: “When the knobs are engaged into the

holds, and the blade is engaged, you can see that [] there's no movement in the lateral direction. They perform the function of helping lock in the lateral direction to restrict lateral movement.”); Ex. 1003 ¶ 94; Ex. 1032 ¶¶ 29–30.

With respect to the claim 1 requirement of a “clockwise lock mechanism” and a “counterclockwise lock mechanism,” Petitioner notes that “Microdrones discloses that the lock mechanisms are keyed to either the clockwise blade or the counterclockwise blade, so as to prevent the clockwise blade from being attached to the counterclockwise driveshaft, and vice versa.” Pet. 44 (citing Ex. 1003 ¶¶ 103–104). Microdrones teaches that “[t]o avoid accidental misplacement, both directions of turning use individual distances between these knobs,” (Ex. 1004, 27), or in other words “the distance between the lugs on the center bar of the blade and the matching notches on the rotor mounting plate [of the clockwise lock mechanism] is unique and different from the distance between these components of the counterclockwise lock mechanism” (Pet. 46). Petitioner contends this arrangement of the knobs and holds in Microdrones meets the Engagement Limitation of claim 1, which requires the clockwise rotor blade is engageable only with the clockwise lock mechanism and the counterclockwise rotor blade is engageable only with the counterclockwise lock mechanism. *Id.* at 48–51 (citing Ex. 1004, 27, Fig. 25; Ex. 1003 ¶¶ 111–113).

We now address Patent Owner’s contentions regarding the claimed lock mechanism and the details thereof.

(1) “lock mechanism”

Claim 1 recites “each rotor assembly compris[es] a rotor blade releasably attached to a driveshaft by a lock mechanism.” Ex. 1001, 5:39–

40. Patent Owner contends that “the claimed lock mechanism must secure the rotor blade to the driveshaft and prevent the release of the rotor blade during operation,” and that Microdrones does not disclose this feature. PO Resp. 41–42; Ex. 2010 ¶¶ 29–32, 59, 64. Patent Owner’s arguments are premised on its proposed claim construction, which we have not adopted. *See supra* Section II.C.1. Further, as noted previously, Patent Owner indicates that it “is no longer pursuing its assertions regarding the ‘lock mechanism’ claim term.” Sur-reply 1.

After reviewing the parties’ briefing and evidence of record, we are persuaded by Petitioner’s arguments and supporting evidence, discussed above, regarding this limitation of claim 1. In particular, we are persuaded by Petitioner’s contention that the combination of Microdrones’ portion of the rotor blade (with knobs), rotor mounting plate (with holds), O-rings, and hooks disclose the claimed “lock mechanism” that “releasably attache[s]” the rotor assembly to the rotor blade.

(2) “shaft lock portion” and “blade lock portion”

Claim 1 recites 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.” Ex. 1001, 6:5–9. Patent Owner contends that the claimed “shaft lock portion and blade lock portions must perform a locking function,” and that Microdrones does not disclose this feature. PO Resp. 42–44; Ex. 2010 ¶¶ 65–67. Patent Owner’s arguments are premised on its proposed claim construction, which we have not adopted. *See supra* Section II.C.2.

After reviewing the parties’ briefing and evidence of record, we are persuaded by Petitioner’s arguments and supporting evidence, discussed above, regarding this limitation of claim 1. In particular, we are persuaded by Petitioner’s contention that Microdrones’ rotor mounting plate (including holds—i.e., “notches”) and center portion of the rotor blade (including knobs—i.e., “lugs”), respectively, disclose the claimed “shaft lock portion” and “blade lock portion.” Further, as described above, Microdrones’ holds are configured to engage corresponding knobs, as required by the claim.

(3) Engagement Limitation

Claim 1 recites that “the clockwise rotor blade is engageable only with the clockwise lock mechanism and cannot be engaged in the counterclockwise lock mechanism, and the counterclockwise rotor blade is engageable only with the counterclockwise lock mechanism and cannot be engaged in the clockwise lock mechanism.” Ex. 1001, 5:53–6:4. Patent Owner contends that the Engagement Limitation “means that a clockwise rotor blade cannot be attached [i.e., mounted] to a counterclockwise driveshaft and that [a] counterclockwise rotor blade cannot be attached to a clockwise driveshaft,” and that Microdrones does not disclose this feature. PO Resp. 44–47; Ex. 2010 ¶¶ 60–61, 68–74. Patent Owner’s arguments are premised on its proposed claim construction, which we have not adopted. *See supra* Section II.C.3.

After reviewing the parties’ briefing and evidence of record, we are persuaded by Petitioner’s arguments and supporting evidence, discussed above, regarding this limitation of claim 1. In particular, we are persuaded by Petitioner’s contention that Microdrones’ arrangement of the knobs and holds having “individual distances” between them for the clockwise versus

counterclockwise rotors discloses the Engagement Limitation. *See* Ex. 1004, 27; Pet. 46. Patent Owner contends that the portion of Figure 25 of Microdrones including the red “X” illustrates an example where a “blade is attached to the wrong drive.” PO Resp. 45. Even if Patent Owner’s contention in this regard is correct,¹⁶ however, it does not support Patent Owner’s position with respect to Microdrones’ disclosure of the Engagement Limitation as we have construed it. In other words, even if this figure shows the rotor blade as being “attached” to the driveshaft via the installation of the O-ring (*see* PO Resp. 45), this figure does not show the rotor blade being engaged with the lock mechanism (i.e., the rotor mounting plate, including the holds). Thus, even if this figure illustrates an incorrect rotor blade on the drive shaft, this figure does not show the blade being *engaged* with the incorrect lock mechanism, because the knobs are not fully received in the notches on the mounting plate (*see* Pet. 49–50).

¹⁶ The parties disagree as to what the red X portion of Figure 25 discloses. *See* Pet. Reply 20–21 (“The [red X portion of Figure 25] is ambiguous as to whether it depicts a blade not engaged in the driveshaft due to, e.g., ridges on the knobs, incomplete insertion by the user, or a blade on the incorrect driveshaft.”) (citing Ex. 1031, 150:1–154:9). Patent Owner contends the distinction does not matter. *See* Tr. 40:3–9 (Patent Owner’s counsel arguing that “even if the red X picture was showing the situation where it is the correct blade that just isn’t getting down into those holes because of the ridges, we also know from the Microdrones reference that this is what it would look like if you did put the wrong blade on, right, because you would try to set that blade on the wrong drive. The holes wouldn’t go all the way down. You’d have space in between and then you’d stretch the O-rings over. So you can install the wrong blade.”). We need not resolve this question, however, based on our construction of the Engagement Limitation because Patent Owner’s assertions are not persuasive under either party’s interpretation of the Figure.

Patent Owner argues that “Petitioner confuses the Engagement Limitation with a different and separate limitation of claim 1 that requires the engagement of notches on the shaft lock portion with lugs on the blade lock portion.” PO Sur-reply 2; *see* PO Resp. 24, 45 (“[T]he engagement limitation does not require the notches on a mounting plate to fully receive the knobs on the blade.”). Patent Owner contends that Petitioner’s arguments attempt to import the lug/notch limitations into this element of the claim. PO Sur-reply 2–3. Although, Patent Owner argues that “You don’t have to have lugs and notches for a lock mechanism” (Tr. 32:3–4), in Petitioner’s mapping of Microdrones to the claim, the knobs and holds comprise a portion of the lock mechanism, and thus must be engaged for engagement of the lock mechanism. This is consistent with the preferred embodiments described in the ’184 patent, in which the rotor blade is described as being engaged with the lock mechanism when the lugs and notches are engaged. *See* Ex. 1001, 3:63–4:8, Figs. 4, 5.

Patent Owner also argues that “a [person of ordinary skill in the art] would not conclude, based on the Microdrones figures showing the misplaced blade, that the knobs on the blade are not engaged with the notches on the mounting plate.” PO Resp. 46. Microdrones, however, expressly teaches that “[t]o avoid accidental misplacement [of the clockwise and counter clockwise rotors], both directions of turning use individual distances between these knobs.” Ex. 1004, 27. Contrary to Patent Owner’s assertion, we disagree that knobs and holds having different distances therebetween can be engaged, or that the relevant portion of Figure 25 even arguably shows such engagement. *See also* Pet. Reply 21 (“It would defeat [Microdrones’ stated goal of ‘avoid[ing] accidental misplacement’] for

Microdrones’ individual distances to be set such that the knobs of a rotor blade could be engaged with the holds of the wrong driveshaft.”).

(4) “clockwise lock mechanism” and
“counterclockwise lock mechanism”

Patent Owner argues that “Microdrones does not disclose lock mechanisms that are specific to the direction of the drives (i.e., a clockwise lock mechanism or a counterclockwise lock mechanism).” PO Resp. 47–48; Ex. 2010 ¶ 75. Patent Owner’s arguments in this regard are premised on its arguments that “the knobs and holds of Microdrones do not perform a locking function” and that “Microdrones does not prevent accidental misplacement of the rotor blades.” PO Resp. 47–48. These arguments, in turn, are based on Patent Owner’s claim construction arguments, which are not persuasive, as discussed above. *See supra* Sections II.C.2, II.C.3.

After reviewing the parties’ briefing and evidence of record, we are persuaded by Petitioner’s arguments and supporting evidence, discussed above, regarding this limitation of claim 1. In particular, we are persuaded by Petitioner’s contention that Microdrones’ arrangement of the knobs and holds having “individual distances” between them for the clockwise versus counterclockwise rotors discloses this limitation. *See* Ex. 1004, 27; Pet. 46.

c) Conclusion as to Claim 1

For the reasons discussed above, and based on the record before us, we determine that Petitioner has established by a preponderance of the evidence that claim 1 is anticipated by Microdrones.

d) Dependent Claim 2

Claim 2 depends from claim 1 and further recites, *inter alia* “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, the blade lock portion comprising lugs with a configuration that is different than a configuration of the lugs on the blade lock portion of the clockwise lock mechanism.” Ex. 1001, 6:10–16.

Petitioner relies on the same features of Microdrones discussed above with respect to claim 1 as disclosing the recited shaft lock portion and blade lock portion. *See* Pet. 59 (citing Ex. 1003 ¶ 128). Petitioner further contends the arrangement of the knobs and holds in Microdrones, discussed above with respect to claim 1, meets the limitation of claim 2, which recites that the lugs on the counterclockwise lock mechanism have a “configuration that is different than” that of the lugs on the clockwise lock mechanism. *Id.* at 59–60 (citing Ex. 1003 ¶¶ 129–130).

Patent Owner does not dispute Petitioner’s contentions as to Microdrones’ disclosure of these limitations. *See* PO Resp. 48. After reviewing the parties’ briefing and the evidence of record, we are persuaded by Petitioner’s arguments and supporting evidence for claim 2. Accordingly, we determine that Petitioner has established by a preponderance of the evidence that each of the limitations of claim 2 is disclosed by Microdrones. *See In re NuVasive*, 841 F.3d at 974. Based on the record before us, we determine that Petitioner has established by a preponderance of the evidence that claim 2 is anticipated by Microdrones.

E. Asserted Obviousness of Claims 5–9 and 11 in view of Microdrones Combined with Various Other References

Petitioner contends that claims 5 and 6 would have been obvious in view of Microdrones and Wang (Pet. 62–66); that claims 5 and 7 would have been obvious in view of Microdrones and LotusRC (*id.* at 66–73); that claim 8 would have been obvious in view of Microdrones, LotusRC, and Slanker (*id.* at 73–79); that claim 9 would have been obvious in view of Microdrones, LotusRC, and Wang (*id.* at 79–81); and that claim 11 would have been obvious in view of Microdrones and Olm (*id.* at 81–84). *See also* Pet. Reply 23–29. Patent Owner opposes, arguing that a person of ordinary skill in the art would not be motivated to combine the references as asserted by Petitioner, and presenting evidence of secondary considerations. *See* PO Resp. 50–59; Sur-reply 16–18.

1. Patent Owner’s Secondary Considerations Arguments

Patent Owner’s contentions regarding secondary considerations of non-obviousness apply to each of the obviousness grounds asserted by Petitioner. We address these contentions prior to discussing the parties’ arguments specific to each of the obviousness grounds.

Patent Owner asserts that evidence of long-felt need in the industry supports a finding of non-obviousness. PO Resp. 58–59. In particular, without further explanation, Patent Owner asserts that a person of ordinary skill in the art “would have understood the need [for rotor blade attachment mechanisms that can be quickly and easily detached and prevent the misplacement of rotor blades], since as early as the Sasaki reference,”¹⁷

¹⁷ JP Appl. Publ’n No. H06-17511 (“Sasaki”) (Ex. 2001).

which has an application date of May 31, 1989. *Id.* (citing Ex. 2010 ¶ 95; Ex. 2009, App. A2, p.26). Patent Owner asserts further that the “length of time between that recognized need and the inventions in the ’184 patent, which has a priority date of May 15, 2013, represents a long-felt need in the industry.” *Id.* at 59 (citing Ex. 2010 ¶ 95).

Based upon our consideration of the arguments and the evidence, we find that Patent Owner’s assertion that the challenged claims have satisfied a long-felt need for rotor blade attachment mechanisms that can be quickly and easily detached and prevent the misplacement of rotor blades is unsupported. To begin, we do not find that Patent Owner’s assertion regarding the filing date of Sasaki demonstrates that any long-felt need existed in the art as a whole regarding rotor blade attachment mechanisms. *See Iron Grip Barbell Co. v. USA Sports, Inc.*, 392 F.3d 1317, 1325 (Fed. Cir. 2004) (“[T]he mere passage of time without the claimed invention is not evidence of nonobviousness.”). Nor has Patent Owner explained how that information might establish that such a need existed.

Further, even if such a long-felt need had been established, in order to accord substantial weight to secondary considerations in an obviousness analysis, “the evidence of secondary considerations must have a ‘nexus’ to the claims, *i.e.*, there must be ‘a legally and factually sufficient connection’ between the evidence and the patented invention.” *Henny Penny Corp. v. Frymaster LLC*, 938 F.3d 1324, 1332 (Fed. Cir. 2019) (quoting *Demaco Corp. v. F. Von Langsdorff Licensing Ltd.*, 851 F.2d 1387, 1392 (Fed. Cir. 1988)). “The patentee bears the burden of showing that a nexus exists.” *WMS Gaming Inc. v. Int’l Game Tech.*, 184 F.3d 1339, 1359 (Fed. Cir. 1999). Patent Owner has not demonstrated sufficiently that the challenged

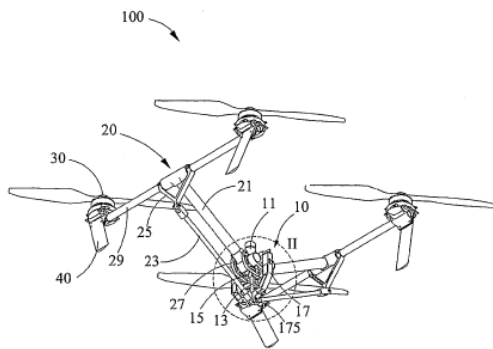
claims met any alleged long-felt need by demonstrating such a nexus to the claims. Indeed, upon careful inspection, we note that the Patent Owner does not even assert as much in the Patent Owner Response. Rather, Patent Owner's argument begins and ends with a discussion of a "long-felt need," without any further assertion or evidence that the challenged claims *met* that alleged need. *See* PO Resp. 58–59; *see also* Pet. Reply 29 (Patent Owner "makes no attempt to show a nexus with the claims.").

Accordingly, we find that the arguments and evidence submitted do not demonstrate that the challenged claims satisfied a long-felt need and we give this argument and evidence little to no weight in our consideration of the *Graham* factors for each of the following asserted obviousness grounds.

2. *Obviousness in View of Microdrones and Wang*

Petitioner contends that claims 5 and 6 would have been obvious in view of Microdrones and Wang. *See* Pet. 62–66; Ex. 1003 ¶¶ 137–147. Claim 5 depends from claim 1 and recites that "each rotor assembly comprises a leg extending downward from a bottom portion of the rotor assembly to support the apparatus on a ground surface." Ex. 1001, 6:27–30. Claim 6 depends from claim 5 and recites that "the leg slopes downward and away from the body." *Id.* at 6:31–32.

Wang relates to UAVs, and in particular to “a transformable aerial vehicle.” Ex. 1006 ¶ 4; *see id.* ¶¶ 2–3, 8. Figures 1 and 4 of Wang are reproduced below.



in the art would have been motivated “to simply attach the legs to the bottom of each of Microdrones’ rotor assemblies, as taught by Wang” to “allow for a wider support base and ensure more stability for a UAV when landing on a variety of surfaces, particularly ones with differing evenness, compositions and textures.” Pet. 65–66; Ex. 1003 ¶¶ 144–146. Petitioner further contends that replacing the legs of Microdrones with those of Wang would be a “simple substitution of one known element for another to obtain an improved and predictable result,” and that a person of ordinary skill in the art would have “a reasonable expectation of success because the only modification required to Microdrones’ [UAV] would be to alter the design of the legs.” Pet. 65–66; Ex. 1003 ¶ 143; *see also KSR*, 550 U.S. at 416–417.

Patent Owner does not contest Petitioner’s contentions with respect to the disclosure of Wang regarding claims 5 and 6. *See* PO Resp. 50–53. After reviewing the parties’ briefing and evidence of record, we are persuaded by Petitioner’s arguments and supporting evidence for claims 5 and 6. Accordingly, we determine that Petitioner has established by a preponderance of the evidence that each of the limitations of claims 5 and 6 is taught by the combination of Microdrones and Wang. *See In re NuVasive*, 841 F.3d at 974.

Patent Owner asserts, however, that a person of ordinary skill in the art would not have been motivated to combine Microdrones and Wang. *See* PO Resp. 50–53; Ex. 2010 ¶¶ 82–83. According to Patent Owner, the benefits cited by Petitioner for modifying Microdrones (i.e., a wider support base and more stability) can be achieved “without attaching the legs to the rotor assembly and without angling the leg downward and away.” PO Resp.

50–51 (citing Ex. 2010 ¶ 82). We agree with Petitioner, however, that “[t]he existence of other ways to modify Microdrones does not mitigate the motivation to combine with Wang.” Pet. Reply 25 (citing *Novartis Pharms. Corp. v. West-Ward Pharms. Int’l*, 923 F.3d 1051, 1059 (Fed. Cir. 2019) (“[O]ur case law does not require that a particular combination must be the preferred, or the most desirable, combination described in the prior art in order to provide motivation for the current invention.”)).

Patent Owner also argues that Microdrones uses skids, rather than legs, as landing gear, and that the “legs of Wang are incompatible with [Microdrones’] landing gear.” PO Resp. 51. In particular, Patent Owner contends that “skids are designed to allow the UAV to land and take off with forward motion,” whereas “the UAV [of Wang] is designed to land and take off with straight vertical motion and is unable to land or take off while moving forward.” *Id.* at 51–52 (citing Ex. 2010 ¶ 82)). In Reply, Petitioner notes that Microdrones does not teach that forward motion is required when landing or taking off, and in fact describes the Microdrones aircraft performing vertical takeoff and landing. Pet. 23–25; Ex. 1032 ¶¶ 39–42; Ex. 1004, 4 (describing “Quadrocopter[s]” as “vertical take off and landing” vehicles), 85–87 & 93 (providing takeoff and landing guidance for the operator, showing the aircraft performing vertical takeoff and landing). We find Petitioner’s position to be supported by a preponderance of the evidence, and determine that a person of ordinary skill in the art would not have been dissuaded from replacing Microdrones’ skids with the legs of Wang.

For these reasons, we are not persuaded by Patent Owner’s arguments and determine that Petitioner has shown sufficiently that one of ordinary

skill in the art would have been motivated to combine the teachings of Microdrones and Wang, and would have had a reasonable expectation of success in doing so. Accordingly, we find that Petitioner has shown, by a preponderance of the evidence, that claims 5 and 6 would have been obvious in view of Microdrones and Wang.

3. Obviousness in View of Microdrones and LotusRC

Petitioner contends that claims 5 and 7 would have been obvious in view of Microdrones and LotusRC. *See* Pet. 66–73; Ex. 1003 ¶¶ 148–162. As noted above, claim 5 depends from claim 1 and recites that “each rotor assembly comprises a leg extending downward from a bottom portion of the rotor assembly to support the apparatus on a ground surface.” Ex. 1001, 6:27–30. Claim 7 depends from claim 1 and recites that “each leg is pivotally attached to the bottom portion of the rotor assembly such that the leg is movable from a stored position, where the leg extends laterally from the rotor assembly along the arm supporting the rotor assembly, to an operating position where the leg extends downward from the rotor assembly.” *Id.* at 6:33–38.

LotusRC describes a “Radio Control Toy” “RC UFO T1000” quadcopter. Ex. 1008, 1. A figure showing the T1000 quadcopter of LotusRC is reproduced below.



Ex. 1008, 2. The figure above illustrates the T1000 quadcopter. *Id.* As seen in the figure, and confirmed by Dr. Ducharme, the T1000 quadcopter includes *inter alia* propeller assemblies (i.e., a rotor blade and drive rotating a driveshaft), and legs extending downward from the rotor assemblies. *Id.*; see Pet. 67; Ex. 1003 ¶¶ 149–150.

Additional figures showing the T1000 quadcopter of LotusRC are reproduced below.



Pet. 69; *see* Ex. 1008, 4. The figures above, as annotated by Petitioner, illustrate that the T1000 quadcopter includes “legs that are ‘pivotally attached,’” respectively showing the T1000 quadcopter in an “operating position” with the legs extending downward from the rotor assemblies and in a “stored position” where the arms swing up and extend along the arm. *See* Pet. 68–70; Ex. 1003 ¶¶ 152–154.

According to Petitioner, a person of ordinary skill in the art “would have been motivated to combine [Microdrones and LotusRC] because the compact design of the apparatus disclosed by LotusRC, both during flight and for storage, are [sic] advantageous to the manufacturing and sale of UAVs.” Pet. 71; Ex. 1003 ¶ 157. Petitioner contends that “reducing the size . . . of transporting a UAV . . . was an important design consideration,” and that LotusRC reduces the size “by disclosing legs that pivot and retract into a ‘stored’ position.” Pet. 71; Ex. 1003 ¶¶ 157–158. Petitioner further contends that “[m]odifying Microdrones to include LotusRC’s landing gear would be well within [a person of ordinary skill in the art’s] skill and would not require undue experimentation,” because it was a “routine combination” and using the landing gear of LotusRC on a UAV “had already been achieved by LotusRC.” Pet. 72–73; Ex. 1003 ¶¶ 161–162.

Patent Owner does not contest Petitioner’s contentions with respect to the disclosure of LotusRC regarding claims 5 and 7. *See* PO Resp. 53–54. After reviewing the parties’ briefing and evidence of record, we are persuaded by Petitioner’s arguments and supporting evidence for claims 5 and 7. Accordingly, we determine that Petitioner has established by a preponderance of the evidence that each of the limitations of claims 5 and 7

is taught by the combination of Microdrones and LotusRC. *See In re NuVasive*, 841 F.3d at 974.

Patent Owner asserts, however, that a person of ordinary skill in the art would not have been motivated to combine Microdrones and LotusRC, referring back to the arguments presented with respect to the combination of Microdrones and Wang. *See* PO Resp. 53–54; Ex. 2010 ¶¶ 82–85.

Petitioner also relies on the same arguments in its Reply. *See* Pet. Reply 23–26; Ex. 1032 ¶¶ 39–42. For the same reasons discussed above (Section II.E.2), we are not persuaded by Patent Owner’s arguments and determine that Petitioner has shown sufficiently that one of ordinary skill in the art would have been motivated to combine the teachings of Microdrones and LotusRC, and would have had a reasonable expectation of success in doing so. Accordingly, we find that Petitioner has shown, by a preponderance of the evidence, that claims 5 and 7 would have been obvious in view of Microdrones and LotusRC.

4. *Obviousness in View of Microdrones, LotusRC, and Slanker*

Petitioner contends that claim 8 would have been obvious in view of Microdrones, LotusRC, and Slanker. *See* Pet. 73–79; Ex. 1003 ¶¶ 163–177. Claim 8 depends from claim 7 and further recites “a bias element urging the leg toward the stored position, and a latch operative to lock the leg in the operating position.” Ex. 1001, 6:40–42.

According to Petitioner, “[c]laim 8 recites nothing more than conventional retractable landing gear components.” Pet. 74; Ex. 1003 ¶ 164. Petitioner points to Slanker as disclosing such a retractable landing gear. Pet. 74; *see* Ex. 1003 ¶¶ 164–169. Slanker relates to a “landing gear

actuation system.” Ex. 1010, at code (57). The landing gear described in Slanker includes “a spring system configured to counterbalance the weight of the landing gear and/or assist the motive force system in moving the landing gear from a first position to a second position.” Ex. 1010 ¶ 3; Pet. 74–75. Slanker further describes that the spring system may be “biased to retract landing gear 180,” or in other words, to “move landing gear 180 from a deployed position to a stowed position.” Ex. 1010 ¶ 31; *see id.* ¶¶ 28–29 (“spring system 150 . . . may be biased towards the retracted or deployed position . . . [and] may translate its [] energy to assist the landing gear 180 being moved from the deployed position to the stowed position.”); Pet. 75. Slanker also describes “locking mechanism 146 [that] retain[s] landing gear 180 in its deployed position.” Ex. 1010 ¶ 64; Pet. 75.

According to Petitioner, “a [person of ordinary skill in the art] would have been motivated to look to common aircraft landing gear when designing an aircraft such as the Microdrones or LotusRC UAVs.” Pet. 74; Ex. 1003 ¶ 164. In particular, Petitioner contends that a person of ordinary skill in the art “would be motivated to modify the Microdrones-LotusRC UAV in view of Slanker so that each arm and leg included, at or near the leg pivot point, a scaled version of Slanker’s spring system,” in order to provide the benefits of Slanker’s retractable landing gear, as well as to the details of landing gear design not provided in Microdrones and LotusRC. *See* Pet. 76–78; Ex. 1003 ¶¶ 172, 175. Finally, Petitioner contends that the modification “would merely involve an installment of a known landing gear to yield predictable results.” Pet. 79; Ex. 1003 ¶ 176.

Patent Owner does not contest Petitioner’s contentions with respect to the disclosure of Slanker regarding claim 8. *See* PO Resp. 54–55. After

reviewing the parties' briefing and evidence of record, we are persuaded by Petitioner's arguments and supporting evidence for claim 8. Accordingly, we determine that Petitioner has established by a preponderance of the evidence that each of the limitations of claim 8 is taught by the combination of Microdrones, LotusRC, and Slanker. *See In re NuVasive*, 841 F.3d at 974.

Patent Owner asserts, however, that “a [person of ordinary skill in the art] would not look to Slanker when designing the landing gear for a UAV,” such as that described in Microdrones and LotusRC. *See* PO Resp. 54–55; Ex. 2010 ¶¶ 83, 87. Patent Owner notes that Slanker's landing gear is designed for a commercial aircraft and is extremely heavy, and that Slanker discloses an “active system that uses actuators” to raise and lower the landing gear as opposed to a “passive system that allows the legs to be folded for storage” as described in the '184 patent. PO Resp. 54–55 (citing Ex. 1010 ¶¶ 2, 3; Ex. 1001, 5:13–14).

We agree with Petitioner, however, that Slanker is analogous art. *See* Pet. 77–78; Ex. 1003 ¶¶ 171–174; Pet. Reply 26–27; *see also In re Clay*, 966 F.2d 656, 658–659 (Fed. Cir. 1992) (“Two criteria have evolved for determining whether prior art is analogous: (1) whether the art is from the same field of endeavor, regardless of the problem addressed, and (2) if the reference is not within the field of the inventor's endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved.”). Slanker, Microdrones, LotusRC, and the '184 patent all relate to aircraft. We also agree that “Slanker is at least reasonably pertinent to the problem of how to design foldable landing gear for an aircraft.” Pet. 78. Further, the test for obviousness is not whether the

features of Slanker may be bodily incorporated into the Microdrones-LotusRC UAV. *MCM Portfolio LLC v. Hewlett-Packard Co.*, 812 F.3d 1284, 1294 (Fed. Cir. 2015); *see* Pet. Reply 27. Petitioner provides persuasive evidence that a person of ordinary skill in the art would have been motivated to use the spring system landing gear taught by Slanker with the Microdrones-LotusRC UAV, by using a scaled version of Slanker’s system, and that a person of ordinary skill in the art would have had a reasonable expectation of success in doing so.

For these reasons, we are not persuaded by Patent Owner’s arguments and determine that Petitioner has shown sufficiently that one of ordinary skill in the art would have been motivated to combine the teachings of Slanker with Microdrones and LotusRC, and would have had a reasonable expectation of success in doing so. Accordingly, we find that Petitioner has shown, by a preponderance of the evidence, that claim 8 would have been obvious in view of Microdrones, LotusRC, and Slanker.

5. *Obviousness in View of Microdrones, LotusRC, and Wang*

Petitioner contends that claim 9 would have been obvious in view of Microdrones, LotusRC, and Wang. *See* Pet. 79–81; Ex. 1003 ¶¶ 178–183. Claim 9 depends from claim 7 and recites that “the leg slopes downward and away from the body when in the operating position.” Ex. 1001, 6:43–44.

As discussed above with respect to claim 6 (*supra* Section II.E.2), the support members of Wang “slope[] downward and away from” central body 10. *See* Ex. 1003 ¶ 141, Fig. 4; Pet. 80. Petitioner further contends that designing LotusRC’s landing legs in the Microdrones-LotusRC UAV to slope away from the rotor assembly as taught by Wang, “would be a simple

substitution of one known element for another to obtain an improved and/or predictable result (*e.g.*, a wider, sturdier base with a lower center of gravity for safe landing)” and a person of ordinary skill in the art would have a reasonable expectation of success because “the modification . . . simply require[s] a slight modification to the legs to be sloped away from the rotor assemblies.” Pet. 81; Ex. 1003 ¶¶ 179–182; *see also KSR*, 550 U.S. at 416–417.

Patent Owner does not contest Petitioner’s contentions with respect to the disclosures of Wang regarding claim 9. *See* PO Resp. 55–56. After reviewing the parties’ briefing and evidence of record, we are persuaded by Petitioner’s arguments and supporting evidence for claim 9. Accordingly, we determine that Petitioner has established by a preponderance of the evidence that each of the limitations of claim 9 is taught by the combination of Microdrones, LotusRC, and Wang. *See In re NuVasive*, 841 F.3d at 974.

Patent Owner asserts, however, that a person of ordinary skill in the art would not have been motivated to combine Microdrones, LotusRC, and Wang, referring back to the arguments presented with respect to the combinations of Microdrones and Wang and Microdrones and LotusRC. *See* PO Resp. 55–56; Ex. 2010 ¶ 90. Petitioner also relies on the same arguments in its Reply. *See* Pet. Reply 23–26; Ex. 1032 ¶¶ 39–42. For the same reasons discussed above (Sections II.E.2), we are not persuaded by Patent Owner’s arguments and determine that Petitioner has shown sufficiently that one of ordinary skill in the art would have been motivated to combine the teachings of Microdrones, LotusRC, and Wang, and would have had a reasonable expectation of success in doing so. Accordingly, we find that Petitioner has shown, by a preponderance of the evidence, that

claim 9 would have been obvious in view of Microdrones, LotusRC, and Wang.

6. Obviousness in View of Microdrones and Olm

Petitioner contends that claim 11 would have been obvious in view of Microdrones and Olm. *See* Pet. 81–84; Ex. 1003 ¶¶ 184–189. Claim 11 depends from claim 1 and recites that “the arms are movably attached to the body such that the arms can be moved from a flying position, where the arms extend forward and rearward laterally outward from the body such that the arms are substantially equally spaced, to a folded stored position where at least one arm is substantially aligned with and adjacent to another arm.” Ex. 1001, 6:47–53.

Olm relates to “rotary wing aircraft apparatus,” where, among other features, “the arms can be pivoted from a flying position, where the arms extend laterally outward to a folded position where the arms are positioned substantially parallel and adjacent to each other.” Ex. 1011, at code (57). Petitioner provides side-by-side figures comparing the aircraft of Olm with the aircraft of the ’184 patent, both in the “flying position” and in the “folded stored position.” *See* Pet. 82–83; Ex. 1003 ¶ 184.

Petitioner’s comparison of the two aircraft in the “flying position” is reproduced below (Pet. 82; Ex. 1003 ¶ 185):

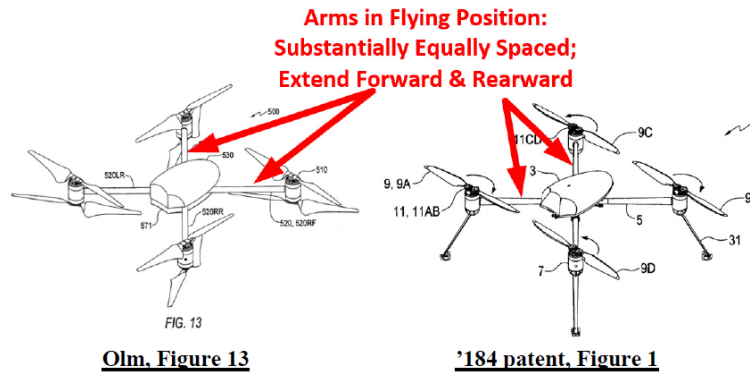


Figure 13 of Olm and Figure 1 of the '184 patent, above, illustrate the aircraft of the respective disclosures with arms in a “flying position.” Ex. 1011, 6:26–34 (“Each arm 520 is positioned approximately ninety degrees around a central axis . . . when the aircraft is in a flying position as illustrated in FIG[. 13.”); Ex. 1001, 3:26 (“[T]he arms 5 can be moved from a flying position illustrated in FIG. 1.”).

Petitioner’s comparison of the two aircraft in the “folded stored position” is reproduced below (Pet. 83; Ex. 1003 ¶ 186):

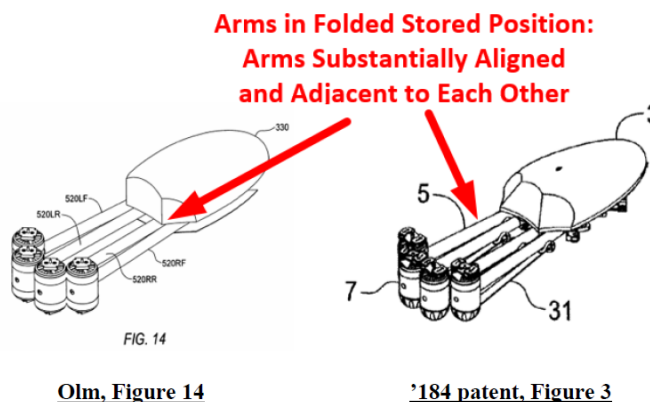


Figure 14 of Olm and Figure 3 of the '184 patent, above, illustrate the aircraft of the respective disclosures with arms in a “folded stored position.” Ex. 1011, 6:34–45 (“[A]ll arms 520 are pivotally attached to the body 530

such that the . . . front arms 520RF, 520LF can be pivoted . . . [to be] substantially parallel to and adjacent to the rear arms.”); Ex. 1001, 3:28–29 (“FIG. 3 [shows] [] the arms [being] generally aligned with and adjacent to each other.”).

According to Petitioner, a person of ordinary skill in the art “would simply substitute the pivotable arm attachment system disclosed by Olm for the immovable Microdrones arms,” in order to “make it easier for a user to transport and store a UAV” because the “adjustable and movable arms [of Olm] advantageously reduce its storage and transportation size.” Pet. 84; Ex. 1003 ¶ 189. Dr. Ducharme testifies that this “change that would be within a [person of ordinary skill in the art’s] skill and would give a [person of ordinary skill in the art] a reasonable expectation of success.” Ex. 1003 ¶ 189; *see* Pet. 84.

Patent Owner does not contest Petitioner’s contentions with respect to the disclosure of Olm regarding claim 11. *See* PO Resp. 56–58. After reviewing the parties’ briefing and evidence of record, we are persuaded by Petitioner’s arguments and supporting evidence for claim 11. Accordingly, we determine that Petitioner has established by a preponderance of the evidence that each of the limitations of claim 11 is taught by the combination of Microdrones and Olm. *See In re NuVasive*, 841 F.3d at 974.

Patent Owner asserts, however, that a person of ordinary skill in the art would not have been motivated to combine Microdrones and Olm. *See* PO Resp. 56–58; Ex. 2010 ¶¶ 91–94. In particular, Patent Owner contends that “Petitioner does not explain how a [person of ordinary skill in the art] would modify the structure of Microdrones to include pivoting arms without losing the strength and weight advantages inherent in the [integrally formed

legs] design of Microdrones.” PO Resp. 57; Ex. 2010 ¶¶ 92–93. Patent Owner also flags other “significant design challenges” of Petitioner’s proposed combination. PO Resp. 57–58; Ex. 2010 ¶¶ 93–94.

We agree with Petitioner, however, that Olm illustrates mounting the arms “between the bottom of the body and a bottom plate [], allowing the arms to fold without the outer contours of the body interfering,” which addresses the concerns highlighted by Patent Owner’s “design challenges” (PO Resp. 57). *See* Pet. Reply 28 (citing Ex. 1032 ¶¶ 46–48; Ex. 1011, Figs. 15, 15A, 16, 16A); *see also* Tr. 24:7–10 (Petitioner’s counsel explaining “we’re not just making the Microdrones arms movable, we’re taking that whole attachment system disclosed in Olm and incorporating that into Microdrones.”). We agree with Petitioner that the proposed combination is a simple substitution of one known element for another to obtain an improved and predictable result. *See KSR*, 550 U.S. at 416–417.

For these reasons, we are not persuaded by Patent Owner’s arguments and determine that Petitioner has shown sufficiently that one of ordinary skill in the art would have been motivated to combine the teachings of Microdrones and Olm, and would have had a reasonable expectation of success in doing so. Accordingly, we find that Petitioner has shown, by a preponderance of the evidence, that claim 11 would have been obvious in view of Microdrones and Olm.

III. CONCLUSION¹⁸

For the reasons set forth above, we determine that Petitioner has established by a preponderance of the evidence that claims 1, 2, 5–9, and 11 of the '184 patent are unpatentable.

In summary:

Claims	35 U.S.C. §	Reference(s)	Claims Shown Unpatentable	Claims Not shown Unpatentable
1, 2	102	Microdrones	1, 2	
1, 2	103	Microdrones ¹⁹		
5, 6	103	Microdrones, Wang	5, 6	
5, 7	103	Microdrones, LotusRC	5, 7	
8	103	Microdrones, LotusRC, Slanker	8	
9	103	Microdrones, LotusRC, Wang	9	
11	103	Microdrones, Olm	11	
Overall Outcome			1, 2, 5–9, 11	

¹⁸ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

¹⁹ As explained above, we do not reach Petitioner's alternative ground of obviousness of claims 1 and 2 based on Microdrones, because it is premised on a claim construction position that we do not adopt.

IV. ORDER

Accordingly, it is

ORDERED that claims 1, 2, 5–9, and 11 of U.S. Patent No. 9,260,184 B2 have been shown to be unpatentable.

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

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