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Paper 33
Date: April 8, 2021

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

DONG GUAN LEAFY WINDOWARE CO. LTD.,
Petitioner,

v.

ANLI SPRING CO., LTD. and
HSIEN-TE HUANG,
Patent Owner.

PGR2020-00001
Patent 10,174,547 B2

Before GEORGE R. HOSKINS, MICHAEL L. WOODS, and SCOTT C. MOORE, *Administrative Patent Judges*.

HOSKINS, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining Some Challenged Claims Unpatentable
Denying Patent Owner's Motion to Amend
35 U.S.C. § 328(a)

I. INTRODUCTION

Dong Guan Leafy Windoware Co. Ltd. ("Petitioner") filed a Petition (Paper 1, "Pet.") pursuant to 35 U.S.C. §§ 321–329 to institute a post-grant review of claims 1–4 of U.S. Patent No. 10,174,547 B2 (Ex. 1001, "the '547 patent"). The Petition asserted nine grounds challenging the patentability of these four claims. *See* Pet. 2–3. Anli Spring Co., Ltd. and Hsien-Te Huang (collectively, "Patent Owner") oppose these challenges.

At the institution stage, we determined it was more likely than not that claims 1–4 were unpatentable based on only two of the Petition's nine grounds. *See, e.g.*, Paper 7 ("Institution Decision" or "Inst. Dec."), 13–14; 35 U.S.C. § 324(a). Therefore, we instituted a trial as to all nine grounds, pursuant to USPTO policy implementing *SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348 (2018) ("*SAS*"). *See* Inst. Dec. 13–14, 53.

Now, upon review of the parties' post-institution arguments and the full evidentiary record, we determine Petitioner *has not shown* by a preponderance of the evidence that claims 1 and 3 are unpatentable under any ground, and *has shown* by a preponderance of the evidence that claims 2 and 4 are unpatentable as indefinite, the only challenge to those claims.

Due to the latter conclusion, we also consider Patent Owner's Contingent Motion to Amend the '547 patent, proposing to replace claims 2 and 4 of the '547 patent with substitute claims 5 and 6. Upon review of the parties' arguments and the full evidentiary record, we *deny* the Motion to Amend, because proposed substitute claims 5 and 6 seek to add new matter to the application leading to the issuance of the '547 patent, and lack written description support in the '547 patent.

II. BACKGROUND

A. Real Parties in Interest and Related Proceedings

Petitioner identifies Dong Guan Leafy Windoware Co. Ltd. as the sole real party in interest for Petitioner. Pet. 1. Patent Owner identifies Anli Spring Co., Ltd. and Hsien-Te Huang as the owners of the '547 patent, and the real parties in interest for Patent Owner. Paper 12, 2. The parties identify *Union Winner Int'l Co. Ltd. v. Hsien-Te Huang, Anli Spring Co., Ltd., and Elegant Windows Inc.*, No. 3:19-cv-2060 (N.D. Tex.), as a matter that might affect, or be affected by, a decision in this proceeding. Pet. 1; Paper 12, 2. This District Court litigation has been dismissed voluntarily by joint stipulation of the parties. *See* Paper 12, 2; *Union Winner*, ECF No. 29 (filed Jan. 27, 2020).

B. The '547 Patent

The '547 patent is directed to a spring motor using a coil spring that can automatically fold back a curtain. Ex. 1001, code (57).

Prosecution of the '547 patent began with the filing of a patent application in Taiwan. *Id.* at code (30); Ex. 2016, 16, 65, 96, 107. As often occurs, the translation of the parent application's disclosure (Ex. 2016, 68–95) into English (*id.* at 27–63) for filing in the United States appears to have included a few awkward translations of technical terms. Our discussion of the '547 patent and claims throughout this Decision remains faithful to the terms used in the '547 patent.

1. Admitted Prior Art to the '547 Patent

The '547 patent illustrates and describes the structure and operation of a prior art curtain set. Ex. 1001, Figs. 1–5, 1:16–3:53, 4:29–38. Figures 2

and 3 illustrate the structure of spring motor 2 for providing a feedback force to the curtain set, and are reproduced below.

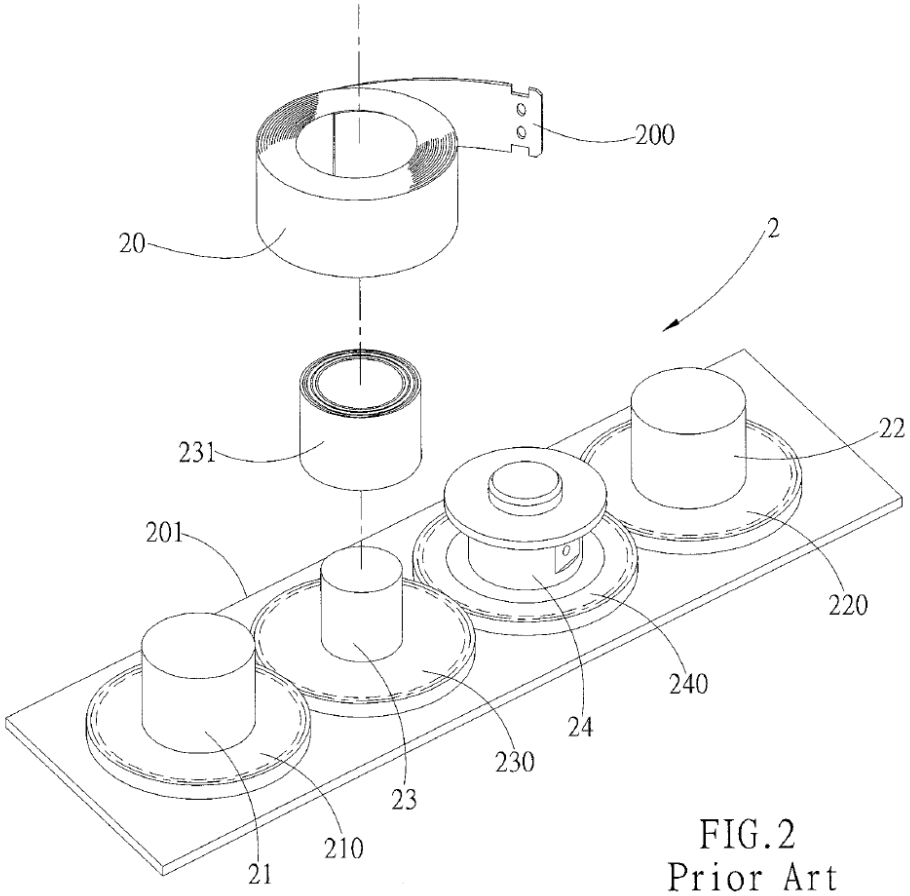

FIG.2
Prior Art

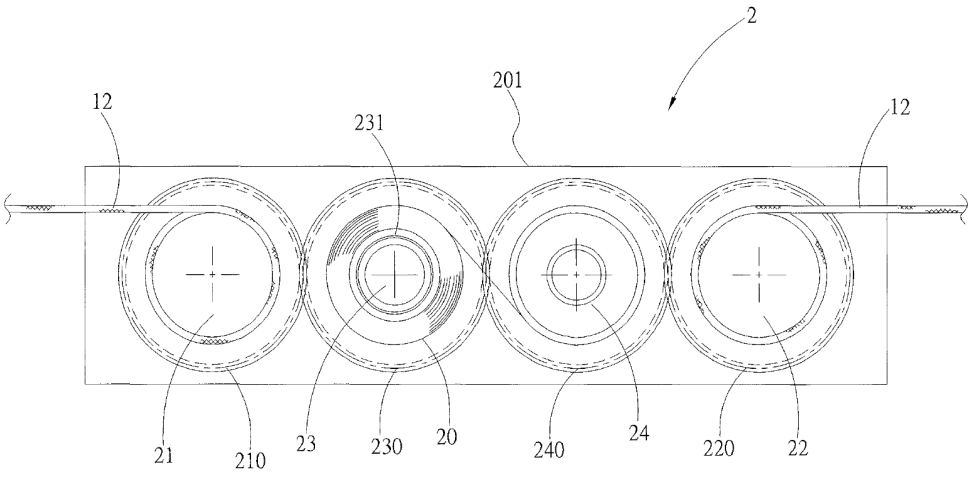

FIG.3
Prior Art

Figure 2 is a three-dimensional structural view, and Figure 3 is a top view, of spring motor 2. *Id.* at 4:31–34. Spring motor 2 applies a feedback force to two pull cords 12, which support a lower beam and curtain pieces supported on the lower beam. *Id.* at Figs. 1 & 4–5 (illustrating spring motor 2, lower beam 14, and curtain 15 with curtain pieces 150), 1:19–29, 2:32–53. Figure 5 illustrates that, as the lower beam moves down away from spring motor 2, more and more curtain pieces are supported by ladder strings rather than the lower beam. *Id.* at Fig. 5, 3:6–19.

When the lower beam is at its uppermost position to support all of the curtain pieces, almost the entire length of equal-torque coil spring 20 is wound on axle 23, with a small portion of spring 20 received on coiling axle 24. *Id.* at Figs. 1 & 3, 1:53–63, 2:3–11. When a user grasps the lower beam and pulls it downward to close the curtain, cords 12 unwind from reel drums 21 and 22. *Id.* at 1:37–40. The resulting rotation of reel drums 21 and 22 causes equal-torque coil spring 20 to unwind from axle 23 and wind on to coiling axle 24, due to the interactions among chainrings 210, 220, 230, and 240. *Id.* at Fig. 3, 1:53–2:6. The user's pulling down of the lower beam thereby stores the energy of equal-torque coil spring 20 as it winds on to coiling axle 24, so the tendency of coil spring 20 to wind back on to axle 23 provides a feedback force that: (a) holds the lower beam and the curtain pieces supported on the lower beam at a height selected by the user, and (b) assists the user to raise the lower beam to open the curtain. *Id.* at 1:17–37, 2:6–17, 2:32–42, 2:54–60, 3:20–30.

Coil spring 20 of the disclosed prior art curtain set 1 is an "equal-torque" spring, meaning the spiral shape of spring 20 "generates an

effective torque curve that is close to being horizontal." *Id.* at 1:30–32, 1:45–52.

2. Invention of the '547 Patent

The claims of the '547 patent (Ex. 1001, 7:62–8:64) differ from the above-described admitted prior art in two principal respects.

First, the '547 patent discloses an unequal-torque coil spring 30, which has "various curvatures in different sections of a reed strip longitudinally" to provide an "unequal feedback torque" in a spring motor. *Id.* at 3:57–4:11, 4:64–5:6, 5:65–6:14 (describing Fig. 11). Figures 6–8 of the '547 patent are reproduced below.

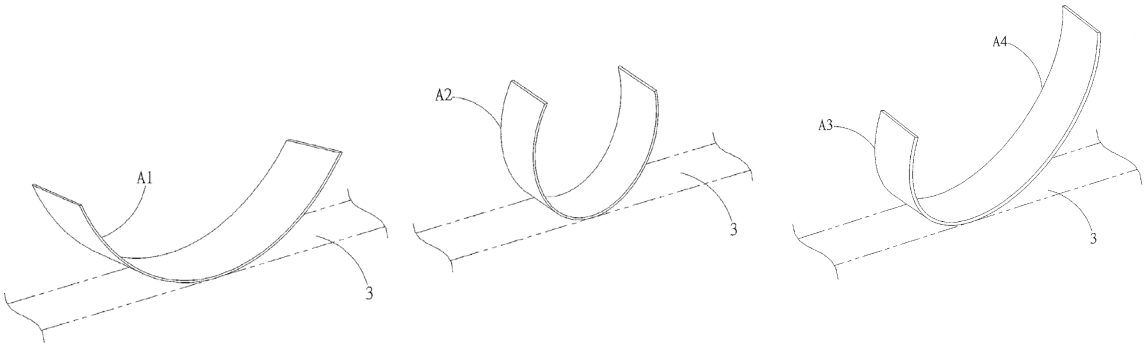

FIG.6 FIG.7 FIG.8

These figures illustrate different sections of reed strip 3 that combine to form unequal-torque coil spring 30, with each section having different curvatures A1, A2, A3, and A4. *Id.* at 5:7–18.

Second, the '547 patent discloses a specific torque profile provided by the different curvatures of unequal-torque coil spring 30. *Id.* at 5:19–41. Figure 12 of the '547 patent is reproduced below.

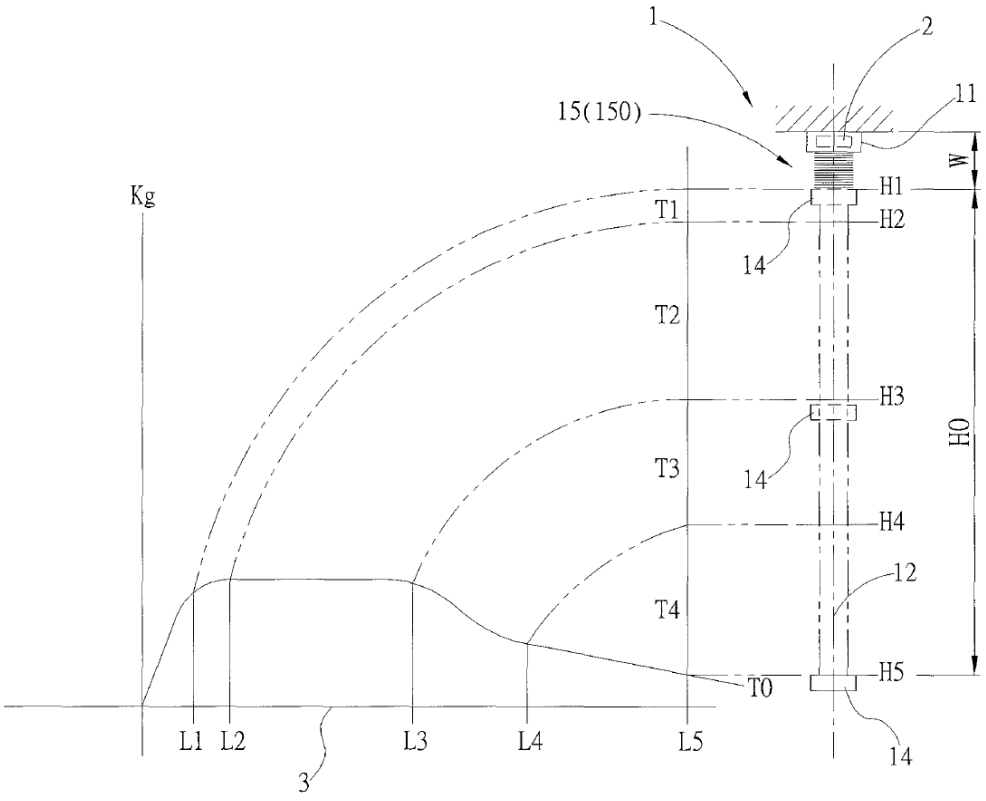

FIG.12

Figure 12 illustrates a "feedback torque curve" (at the left) which "corresponds to the requirements for the curtain folding process in a curtain set [1]" (at the right). *Id.* at 4:55–57, 6:15–16. Figure 12 correlates various lengths L1–L5 of reed strip 3 forming unequal-torque coil spring 30 to various heights H1–H5 of lower beam 14 below spring motor 2 incorporating spring 30. *Id.* at 5:19–41 (Fig. 9), 6:15–19 (Fig. 12). Strip 3 has an initial curvature A0 between the end that is joined to coiling axle 24 (the origin of Figure 12) and a first length L1, generating a suddenly increasing torque TC. *Id.* at 5:19–23, Fig. 9. Strip 3 has a first curvature A1 between first length L1 and second length L2, generating a first torque T1 "of a slowly increasing arc." *Id.* at 5:23–26, 6:27–34, 6:44–51, Fig. 9. Strip 3 has a second curvature A2 between second length L2 and third

length L3, generating a second torque T2 which "is a constant torque which is of a curve extending from a highest torque output of the first torque T1." *Id.* at 5:27–31, 6:35–44, Fig. 9. Strip 3 has a third curvature A3 between third length L3 and fourth length L4, generating a third torque T3 which "is a decreasing torque." *Id.* at 5:31–34, 6:52–54, Fig. 9. Strip 3 has a fourth curvature A4 between fourth length L4 and fifth length L5, generating a fourth torque T4 which is less than the third torque T3. *Id.* at 5:34–38, 6:54–57, Fig. 9.

C. The Challenged Claims of the '547 Patent

All four claims of the '547 patent are challenged in the Petition. *See* Pet. 2–3. Claim 1 illustratively recites, with line breaks and indenting added to improve readability:

> 1. An unequal-torque coil spring, wherein feedback torque is provided in response to requirements of unequal forces at a loading end, comprises
>
> a long strip of reed strip;
>
> the reed strip has different sections longitudinally disposed from a front end to a rear end thereof, and the sections have different curvatures formed by getting coiled and bent inwards to generate different torque;
>
> an exposed end serving as a joining end,
>
> wherein the reed strip has torque distributed as follows:
>
> an increasing torque is implemented between the joining end and a first length,
>
> a first torque that follows the increasing torque and slowly increases is implemented between the first length and a second length,

> a second torque that follows the first torque and is equal to a maximum value of the first torque is implemented between the second length and a third length,
>
> a third torque that follows the second torque and gradually decreases is implemented between the third length and a fourth length, and
>
> a fourth torque that follows a minimum value of the third torque and gradually decreases is implemented between the fourth length and a fifth length.

Ex. 1001, 7:63–8:17 (line breaks and indenting added). Claim 2 depends from claim 1, and adds "wherein the unequal-torque coil spring generates usable feedback torque values with a ratio between 4:1." *Id*. at 8:18–20.

Claim 3 is independent, and recites "[a] spring motor being applied in a curtain set," wherein the motor comprises several elements. *Id*. at 8:21–62. One of the elements is an unequal-torque coil spring, having the same properties recited in claim 1. *Id*. at 8:40–58. Claim 4 depends from claim 3, and adds "wherein the unequal-torque coil spring generates usable feedback torque values with a ratio between 4:1." *Id*. at 8:63–65.

D. The Petition's Grounds of Unpatentability

The Petition presents nine grounds challenging claims 1–4 of the '547 patent, as reflected in the following table. *See* Pet. 2–3.

	Claim(s) Challenged	**35 U.S.C. §**	**Reference(s) / Basis**
1.	1, 3	102(a)(2)	Lin '943[1]

[1] Ex. 1003, US 2011/0277943 A1, published Nov. 17, 2011.

	Claim(s) Challenged	35 U.S.C. §	Reference(s) / Basis
2.	1, 3	103	Lin '943, Yamashita[2]
3.	1, 3	103	Admitted Prior Art[3], Lin '943
4.	1	103	Maeda[4]
5.	3	103	Lin '109[5], Maeda
6.	1	103	Wang Drawing[6]
7.	3	103	Ruggles[7], Wang Drawing
8.	2, 4	112(b)	Indefiniteness
9.	1	102(a)(1)	On Sale Bar (Wang Springs)

E. Witness Testimony

Petitioner relies on the declaration testimony of Mingshao Zhang, Ph.D., in support of the asserted unpatentability of claims 1–4 of the '547 patent (Exhibits 1015 and 1016), and in opposition to the Motion to Amend (Exhibits 1016 and 1017).

Patent Owner relies on the declaration testimony of Glenn. E. Vallee, Ph.D., in opposition to the asserted unpatentability of claims 1–4 of the

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[2] Exs. 1007 (English translation) & 1008 (original), JP S53-113955, published Oct. 4, 1978.

[3] Petitioner cites the '547 patent's Figures 1–5, and written description at column 1, line 16 through column 3, line 44, as admitted prior art. *See* Pet. 41–43.

[4] Exs. 1004 (English translation) & 1005 (original), JP S53-115442, published Oct. 7, 1978.

[5] Ex. 1006, US 2008/0185109 A1, published Aug. 7, 2008.

[6] Exs. 1010 (English translation) & 1011 (original), engineering drawing of a spiral spring by Wei Wang dated Sept. 17, 2015.

[7] Ex. 1009, US 6,289,965 B1, issued Sept. 18, 2001.

'547 patent (Exhibits 2001 and 2020), and in support of the Motion to Amend (Exhibits 2020 and 2021).

The record of this proceeding does not contain any cross-examination of either witness concerning the foregoing declaration testimony.

III. POST-GRANT REVIEW TIMELINESS AND ELIGIBILITY

A. Timeliness of the Petition

A petition for post-grant review of a patent "may only be filed not later than the date that is 9 months after the date of the grant of the patent." 35 U.S.C. § 321(c). In the Institution Decision, we concluded the Petition was filed on October 8, 2019, which was not later than 9 months after the grant of the '547 patent on January 8, 2019, and therefore timely. *See* Inst. Dec. 12. Neither party has challenged that determination during trial, and we maintain it here.

B. Post-Grant Review Eligibility of the '547 Patent

The post-grant review provisions of 35 U.S.C. §§ 321–329 apply to patents subject to the first-inventor-to-file provisions of the Leahy-Smith America Invents Act[8] ("the AIA"). *See* AIA § 6(f)(2)(A). In the Institution Decision, we concluded the earliest potential effective filing date for the '547 patent is March 22, 2016, after the March 16, 2013, effective date of the AIA's first-inventor-to-file provisions. *See* Inst. Dec. 12–13. Neither party has challenged that determination during trial, and we maintain it here.

[8] Pub. L. No. 112-29, 125 Stat. 284 (2011).

IV. CHALLENGES TO THE '547 PATENT (CLAIMS 1–4)

A. Introduction

The Petition asserts Grounds 1–9 challenging the patentability of claims 1–4 in the '547 patent. *See supra* Section II.D (identifying Grounds 1–9).

At the institution stage, we determined it was more likely than not that claims 1–4 were unpatentable based on Ground 2 (obviousness of claims 1 and 3 over Lin '943 and Yamashita) and Ground 8 (indefiniteness of claims 2 and 4). *See* Inst. Dec. 20–24, 33–36. We also determined the preliminary record did not establish it was more likely than not that the '547 patent claims were unpatentable under any one of the other seven Grounds. *See id.* at 24–33, 36–53. We instituted a trial as to all nine Grounds, pursuant to USPTO policy implementing *SAS*. *See id.* at 13–14, 53.

Patent Owner then filed a Patent Owner Response (Paper 17, "PO Resp.") to the Petition. Petitioner filed a Reply (Paper 19, "Reply" or "Pet. Reply") to the Patent Owner Response. Patent Owner filed a Sur-reply (Paper 22, "Sur-reply") to the Reply. We held an oral hearing, for which the transcript was entered into the record (Paper 32, "Tr.").

Petitioner bears the burden of proving unpatentability of the challenged '547 patent claims, and this burden of persuasion never shifts to Patent Owner. *See* 35 U.S.C. § 326(e); *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (applying 35 U.S.C. § 316(e), which employs language identical to § 326(e)).

This Decision is a final written decision under 35 U.S.C. § 328(a) and 37 C.F.R. § 42.73 as to the patentability of claims 1–4 of the '547 patent.

For reasons provided below, we determine Petitioner *has not shown* by a preponderance of the evidence that claims 1 and 3 are unpatentable under any ground, and *has shown* by a preponderance of the evidence that claims 2 and 4 are unpatentable as indefinite.

B. Level of Ordinary Skill in the Art

Petitioner contends a person having ordinary skill in the art pertaining to the '547 patent would possess a bachelor's degree in engineering, with coursework or equivalent experience in mechanical engineering, basic mechanics, engineering mechanics, materials science, and engineering. Pet. 11; Ex. 1015 ¶ 9.

Patent Owner asserts "Petitioner's proposal is inadequate because it ignores that the field of the '547 Patent specifically relates to *torsional spring design* and spring motors relying on torsional springs." PO Resp. 13–14 (emphasis added) (citing Ex. 1001, 1:7–14); Ex. 2001 ¶¶ 44–46. According to Patent Owner, a person having ordinary skill in the art pertaining to the '547 patent would have "at least a bachelor's degree in mechanical engineering, materials engineering, or similar discipline *with course work relating to torsion spring analysis*." PO Resp. 14–15 (emphasis added); Ex. 2001 ¶ 47.

We considered these same arguments at the institution stage, and concluded "the parties agree as to the level of ordinary skill, except that Patent Owner would require education or experience in torsion spring design." Inst. Dec. 11. We found that we would have reached the same decision under either of the parties' definitions, so we did not adopt one over the other. *See id.*

Petitioner does not address the level of ordinary skill in the art in its post-institution arguments. Patent Owner continues to "believe[] its proposed definition is more appropriate," but nonetheless "agrees with the Board that neither party's definition[] of a POSITA affects the outcome and thus applies the Board's position for purposes of this proceeding." PO Resp. 15.

Having reviewed the foregoing arguments, and the full evidentiary record developed during trial, we agree with both parties that a person of ordinary skill in the art would possess at least a bachelor's degree in engineering, with coursework or equivalent experience in mechanical engineering, basic mechanics, engineering mechanics, materials science, and engineering. As to the dispute over whether experience with torsion springs is required, we would reach the same decision as set forth below regardless of whether such experience is required. Therefore, we need not resolve that particular dispute.

C. Claim Construction

We interpret the claims of the '547 patent "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)." 37 C.F.R. § 42.200(b) (2019). This "includ[es] 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." *Id*.

1. "the sections have different curvatures formed by getting coiled and bent inwards to generate different torque"

At the institution stage, the proper construction of the phrase in claims 1 and 3 reciting that "the sections [of the reed strip] have different curvatures formed by getting coiled and bent inwards to generate different torque" was a significantly disputed issue. *See* Inst. Dec. 15–20. Based on the preliminary record, we interpreted claims 1 and 3 to require a reed strip having different sections, wherein each section has a different curvature from the other sections, such that the different sections are capable of generating different torques. *See id.* at 16–17, 19–20. We also determined the process of manufacture recited in the claims, "formed by [the sections] getting coiled and bent inwards," cannot be used to distinguish the claims from the prior art. *See id.* at 17–19, 20.

The Patent Owner Response does not disagree with the foregoing claim construction, and instead "applies" it "for the purposes of discussing the failings of" Lin '943 and Yamashita in Ground 2. PO Resp. 12–13. Petitioner's Reply does not address the foregoing claim construction. Accordingly, both parties have waived any challenge to the claim construction set forth in our Institution Decision. *See, e.g.*, Paper 8, 8 ("Patent Owner is cautioned that any arguments for patentability not raised in the response may be deemed waived.").

Based on the record presented, we discern no reason to depart from our initial claim construction. We, therefore, continue to apply it here.

2. "a second torque that follows the first torque and is equal to a maximum value of the first torque is implemented between the second length and a third length"

Patent Owner contends claims 1 and 3, in reciting the "second torque . . . *is equal to* a maximum value of the first torque" (Ex. 1001, 8:8–11, 8:50–53 (emphasis added)), require the spring to generate a "constant" torque between the second and third lengths. *See* PO Resp. 23–26 (citing Ex. 1001, Figs. 9 & 12, 6:35–52, 8:4–16); Ex. 2001 ¶¶ 53–58; Ex. 2020 ¶¶ 20–24.

Petitioner disagrees. *See* Pet. Reply 3–5; Ex. 1016 ¶¶ 7–9. Petitioner asserts Patent Owner "arbitrarily read[s]" a "constant" limitation into the claims from the '547 patent specification, because the claims do not recite the term "constant" like the '547 patent specification does. Pet. Reply 3–4, 5; Ex. 1016 ¶¶ 7–8. Petitioner also cites Figure 12 of the '547 patent, as showing second torque T2 "apparently decreasing when the travel length approaches L3." Pet. Reply 4–5 (annotating Fig. 12 to identify the portion of the torque curve at issue); *see also* Tr. 9:12–11:8 (during the oral hearing, Petitioner cited Figure 12 as establishing that claims 1 and 3 do *not* require "the second torque has to be a constant torque force *throughout the whole length between*" the second and third lengths, and instead more broadly require only that "there is *one torque value*" between the second and third lengths "that equals to the maximum value of the first torque" (emphases added)). Petitioner concludes from Figure 12 that the '547 patent specification "is not consistent on whether the second torque has to be a 'constant' value." Pet. Reply 4–5.

Petitioner also provides extrinsic evidence. Dr. Zhang testifies: "No matter based on a common sense understanding or what a POSHITA would

perceive, 'equal to' a value does not mean the torque has to stay constant at the exact value." Ex. 1016 ¶ 7; Pet. Reply 4. Dr. Zhang also testifies that "it is infeasible to [construct] a coil spring . . . that can maintain a perfectly unchanging amount of torque," and "[a] reasonable amount of error or deviation is always anticipated." Ex. 1016 ¶ 9; Pet. Reply 4.

Patent Owner replies that "the plain language" of claims 1 and 3 requires the second torque to be a constant torque. Sur-reply 2. Patent Owner points out that all of the other torque sections recited in the claims are expressly required to be *changing* torques, either "increasing" (the increasing torque and the first torque sections) or "decreasing" (the third torque and the fourth torque sections). *Id.* at 2–4 (citing Ex. 1001, 8:4–17); Tr. 25:4–26:15. By contrast, the second torque must be "equal to a single value (e.g., 'the maximum value of the first torque')," that is, be constant. Sur-reply 3–4. In this way, Patent Owner asserts the claims incorporate the "constant" second torque section of the '547 patent specification. *Id.* at 4–5 (citing Ex. 1001, 6:35–44).

Upon review of the foregoing, we agree with Patent Owner's position. Claims 1 and 3 recite that the second torque must be "equal to a maximum value of the first torque." Ex. 1001, 8:8–11, 8:50–53. It is undisputed that there can be *only one* maximum value of the first torque. It is also undisputed that, because the first torque is required to be "slowly increas[ing]," the maximum value of the first torque is found at the second length, where the first torque transitions to the second torque. *Id.* at 8:6–8, 8:48–50. This is illustrated, for example, by Figure 12 of the '547 patent, in which first torque T1 slowly increases to a maximum value found at second length L2, where first torque T1 transitions to second torque T2. *See id.* at

Fig. 12, 5:27–32, 6:35–51. We agree with Patent Owner's argument that, by requiring the second torque to be equal to one (and only one) value, the claims necessarily require the second torque to be constant between the second and third lengths.

Further, the '547 patent specification twice describes the second torque as being "constant." *See id.* at 5:29, 6:35–37. Figure 12 correspondingly illustrates second torque T2 as a line segment extending from second length L2 to third length L3, which is flat (i.e., constant) over a substantial portion of its length. *See id.* at Fig. 12. It is true, as Petitioner points out, that the very tail end of this line segment near third length L3 bends downward slightly. Nonetheless, in light of the claim language and the written description in the '547 patent specification, we conclude the second torque must be constant between the second and third lengths.

Dr. Vallee agrees. *See* Ex. 2001 ¶¶ 16, 43, 55–58; Ex. 2020 ¶¶ 22–24. Dr. Zhang's testimony does not persuade us otherwise. Dr. Zhang offers no support, whether intrinsic evidence or otherwise, for his testimony that "'equal to' a value does not mean the torque has to stay constant at the exact value." Ex. 1016 ¶¶ 7–8. It may very well be, as Dr. Zhang testifies, that it is "infeasible" to construct a coil spring "that can maintain a perfectly unchanging amount of torque," and "[a] reasonable amount of error or deviation is always anticipated." *Id.* ¶ 9. Nonetheless, Patent Owner does not contend that claim 1 requires a perfectly unchanging amount of torque in the second torque section. Indeed, we determine a person of ordinary skill in the art would recognize the limited ability of real-world manufacturing processes to generate a coil spring having a perfectly constant torque at an

acceptable cost, and would accordingly not interpret claim 1 to require such a torque.

Thus, we construe the second torque of claims 1 and 3 to require a constant torque, equal to the maximum value of the first torque, within reasonable manufacturing tolerances.

3. Remaining Claim Terms

We determine no further explicit constructions of any claim terms are needed to resolve the issues presented by the arguments and evidence presented here. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co. Ltd.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (per curiam) (claim terms need to be construed "only to the extent necessary to resolve the controversy") (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

D. Grounds 1, 3–7, and 9: Various Challenges (Claims 1 and 3)

The Petition, in Grounds 1, 3–7, and 9, asserts claims 1 and 3 of the '547 patent are unpatentable under 35 U.S.C. §§ 102(a)(1), 102(a)(2), and 103, based on one or more of Admitted Prior Art, Lin '943, Maeda, Lin '109, Ruggles, the Wang Drawing, and sale of the Wang Springs. *See* Pet. 2–3, 14–31, 40–85, 88–89.

In the Institution Decision, we determined the preliminary record did not establish it was more likely than not that claims 1 and 3 were unpatentable under any one of Grounds 1, 3–7, and 9. *See* Inst. Dec. 24–33 (Ground 1), 36–37 (Ground 3), 38–45 (Ground 4), 46–48 (Ground 5), 48–50 (Ground 6), 50 (Ground 7), 51–53 (Ground 9). In doing so, we cited the

provision in the PTAB Consolidated Trial Practice Guide ("Consolidated Guide")[9] that: "If a trial is instituted, the Board generally will provide analysis of the strengths and weaknesses of all challenges in the petition in order to provide guidance to the parties for the upcoming trial." Inst. Dec. 14 (citing Consolidated Guide, 5–6). According to the Consolidated Guide, this is done to "permit the petitioner, in its reply brief, to address issues discussed in the institution decision." Consolidated Guide, 73.

Concerning Grounds 1, 3–7, and 9, the Patent Owner Response "asserts that the Board's conclusions [in the Institution Decision] are correct for the reasons set forth in the [I]nstitution [D]ecision." PO Resp. 21–22 (Ground 1), 37–38 (Ground 3), 38–39 (Ground 4), 39–40 (Ground 5), 40–41 (Ground 6), 41–42 (Ground 7), 45–46 (Ground 9). Petitioner's Reply does not address any one of Grounds 1, 3–7, and 9. *See, e.g.*, Pet. Reply i (Table of Contents).

When asked about the status of these Grounds during the oral hearing, Petitioner's counsel stated Petitioner is "only arguing" the other Grounds 2 and 8. *See* Tr. 22:23–24:4. On this record, we find Petitioner has abandoned Grounds 1, 3–7, and 9 in this proceeding.

We further determine Petitioner has not proven the unpatentability of claims 1 and 3 under any one of Grounds 1, 3–7, and 9, by a preponderance of the evidence. In this regard, the evidence of record is the same as when we issued the Institution Decision, and we have not discerned anything in the arguments presented during trial to change our view of the evidence. We summarize our findings and conclusions here, and rely on the analysis

[9] Available at https://www.uspto.gov/TrialPracticeGuideConsolidated.

provided in the Institution Decision for support, which Petitioner has not disputed during trial.

As to Grounds 1 and 3, a preponderance of the evidence does not support the Petition's contention that Lin '943 discloses a spring having different sections with "different curvatures . . . to generate different torque" as recited in claims 1 and 3.[10] *See* Inst. Dec. 15–20 (discussing claim construction), 26–27 (discussing Ground 1), 36–37 (discussing Ground 3).

As to Grounds 4 and 5, a preponderance of the evidence does not support the Petition's contention that Maeda's Figure 3(c) illustrates a torque that "slowly increases" approximately between turns 14 and 16 of a spring, as recited in claims 1 and 3. *See* Inst. Dec. 43–45 (discussing Ground 4), 47–48 (discussing Ground 5). Also, even assuming Maeda's Figure 3(c) does disclose such a torque section, a preponderance of the evidence does not support the Petition's contention that it would have been obvious to modify the spring of Maeda's Figure 3(a) to include a slowly increasing torque section between turns 0 and 1. *See id.* at 45.

As to Grounds 6 and 7, a preponderance of the evidence does not support the Petition's contention that the Wang Drawing qualifies as prior

[10] On August 18, 2020, after we instituted trial in the present proceeding on April 20, 2020, a USPTO Memorandum was issued with guidance that binds the Board, limiting a petitioner's use of admitted prior art in IPR proceedings. *See* USPTO Memorandum, "Treatment of Statements of the Applicant in the Challenged Patent in Inter Partes Reviews Under§ 311" (Aug. 18, 2020), available at https://www.uspto.gov/sites/default/files/documents/signed_aapa_guidance_memo.pdf. We need not address whether or how this Memorandum applies to the present PGR proceeding, because Ground 3 fails for reasons that are entirely separate from Petitioner's reliance on Admitted Prior Art in the '547 patent.

art to the '547 patent as a publicly accessible, printed publication. *See id.* at 48–50 (discussing Grounds 6 and 7).

As to Ground 9, because the Wang Spring design was obtained directly or indirectly from a joint inventor of the '547 patent, the sale of the Wang Springs is not prior art by virtue of 35 U.S.C. § 102(b)(1)(A). *See* Inst. Dec. 51–53. Thus, even if we were to find that a preponderance of the evidence supports Petitioner's contentions that the Wang Springs embodied the invention of claim 1, and were on sale under 35 U.S.C. § 102(a)(1) less than one year before the earliest potential effective filing date of the '547 patent, Petitioner's arguments would still fail.

E. Ground 2: Obviousness over Lin '943 and Yamashita (Claims 1 and 3)

Petitioner asserts claims 1 and 3 of the '547 patent are unpatentable under 35 U.S.C. § 103 as having been obvious over Lin '943 and Yamashita. Pet. 2, 31–40. Petitioner cites Dr. Zhang's testimony in support. Ex. 1015 ¶¶ 45–149; Ex. 1016 ¶¶ 6–20. Patent Owner opposes. PO Resp. 22–37. Patent Owner cites Dr. Vallee's testimony in support. Ex. 2001 ¶¶ 50–58, 72–74; Ex. 2020 ¶¶ 15–50.

1. Law of Obviousness

A patent claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). 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, if made available in the record, which is not the case here. *See Graham v. John Deere Co*., 383 U.S. 1, 17–18 (1966).

2. Summary of Lin '943

Lin '943 discloses "[a] window covering [that] includes at least one spring motor." Ex. 1003, code (57). An excerpt from Figure 1, and the entirety of Figure 4, are reproduced below.

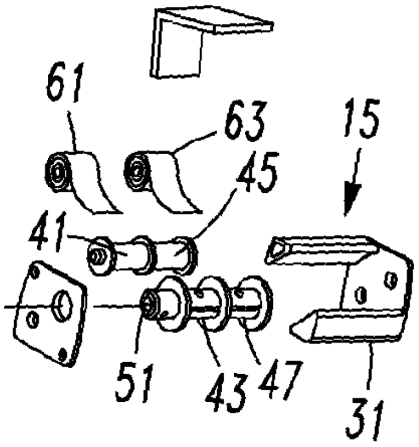


Figure 1 (Excerpt)

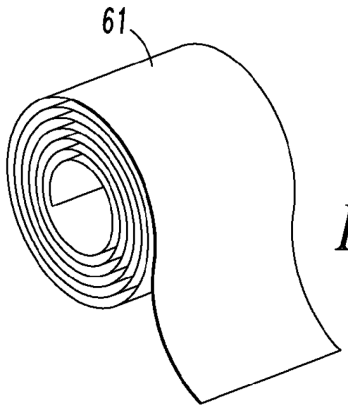


FIG. 4

Figure 4

Figure 1 is an exploded view of spring motor 15, powered by two spring members 61 and 63, for use in connection with window covering 1 (not shown in the excerpt above) via shaft 13 (also not shown in the excerpt above) received in opening 51 of second roller 43. *Id.* at Fig. 1, ¶¶ 28, 36, 41, 44, 45, 50. Figure 4 is a perspective view of spring 61; spring 63 is identical to spring 61. *Id.* ¶¶ 31, 50. Spring 61 is attached between first roller 41 and second roller 43, and spring 63 is attached between third roller 45 and fourth roller 47, each in a substantially similar fashion as the

'547 patent's coil spring 30 is attached between axle 23 and coiling axle 24. *Id.* ¶¶ 48, 50. Springs 61 and 63 are unequal torque springs, as is illustrated in the spring load graph of Figure 6. *Id.* ¶¶ 33, 45, 49–52, 54.

3. Claim 1

Petitioner relies solely on Figure 6 of Lin '943—not Yamashita—as disclosing or suggesting a coil spring having the torque profile recited in claim 1, including the second torque. *See* Pet. 14–18, 20–23 (considering Ground 1, anticipation of claim 1 by Lin '943); *id.* at 31, 33–34, 36–37 (considering Ground 2, obviousness of claim 1 over Lin '943 and Yamashita); Ex. 1015 ¶¶ 45–49, 63–88, 131–133, 140–141; Ex. 1016 ¶¶ 10–20. Patent Owner objects that a preponderance of the evidence does not support Petitioner's contention that Lin '943 discloses a coil spring with the claimed second torque. *See* PO Resp. 27–37; Ex. 2001 ¶¶ 52–58; Ex. 2020 ¶¶ 19, 25–50.

We considered this same dispute at the institution stage, and concluded, based on the record presented at that time, that Petitioner's contention was sufficiently supported to demonstrate it was more likely than not that claim 1 was unpatentable as having been obvious over Lin '943 and Yamashita. *See* Inst. Dec. 27–31 (considering Ground 1), 35 (considering Ground 2). Now, with the benefit of a full evidentiary record, we agree with Patent Owner's argument that a preponderance of the evidence does not support Petitioner's contention.

The Petition pertinently asserts spring 61 of Lin '943 provides "*a second torque* that follows the first torque and *is equal to a maximum value of the first torque* . . . between the second length and a third length," as

claimed. Ex. 1001, 8:8–11 (emphases added); Pet. 15–18, 22, 37 (citing Ex. 1003, Fig. 6, ¶ 52); Ex. 1015 ¶¶ 47–49, 77–80. The Petition relies on the spring load graph depicted in Figure 6 of Lin '943, which Petitioner annotates as reproduced below to illustrate Petitioner's contention. Pet. 17; Ex. 1015 ¶¶ 49, 78.

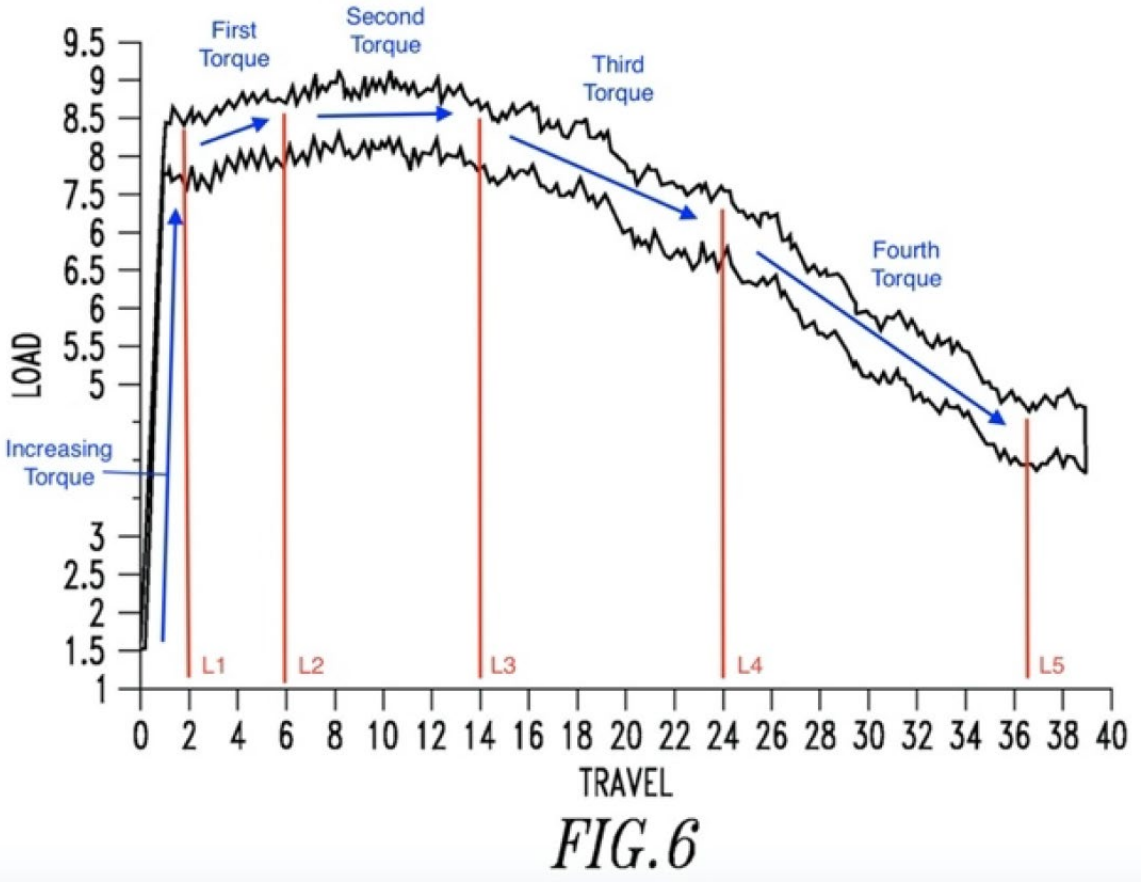


FIG. 6

Figure 6 is a graph illustrating the load applied by spring 61 when window covering material is extended.[11] Ex. 1003 ¶¶ 33, 52. The Petition annotates

[11] Lin '943 does not describe the difference between the upper and lower curves depicted in Figure 6. *See, e.g.*, Ex. 1003 ¶¶ 33, 52. Neither Dr. Zhang nor Dr. Vallee provides a direct opinion on this issue, although Dr. Vallee testifies that, generally speaking, "[m]easurements of force or torque would be recorded as the spring motor was wound or unwound."

Figure 6 to identify where Petitioner contends the graph reflects the torques (in blue) and lengths (in red) of claim 1 to be found in the graph. Pet. 16–17, 22, 37; Ex. 1015 ¶¶ 48–49, 77–79. Thus, the Petition contends the "second torque" is generated between travel lengths 6 and 14 of spring 61. Pet. 16–17, 22, 37; Ex. 1015 ¶¶ 48–49, 77–79.

Patent Owner argues a preponderance of the evidence does not support Petitioner's contention. *See* PO Resp. 22–23, 27–34; Ex. 2001 ¶¶ 52–58, 63–64; Ex. 2020 ¶¶ 19, 25–40. According to Patent Owner, Petitioner's "horizontal, straight blue arrow" annotation in Figure 6 misleadingly suggests the identified second torque between travel lengths 6 and 14 is constant. *See* PO Resp. 27–34; Ex. 2001 ¶¶ 52–57; Ex. 2020 ¶¶ 25–38. In Patent Owner's view, the "significant signal noise" evident in Figure 6 between travel lengths 6 and 14 prevents a person of ordinary skill in the art from finding the torque generated by that section is constant. *See* PO Resp. 32–34; Ex. 2001 ¶ 58; Ex. 2020 ¶¶ 39–40. To make such a finding, Patent Owner insists, requires application of a filter or a data averaging to the raw spring measurement data illustrated in Figure 6 to smooth the data, which Lin '943 does not disclose. *See* PO Resp. 33; Ex. 2001 ¶ 58; Ex. 2020 ¶¶ 39–40.

Patent Owner also annotates Figure 6, as reproduced below, to illustrate Patent Owner's contention as to the torque distribution shown therein. *See* PO Resp. 29; Ex. 2020 ¶ 28.

Ex. 2001 ¶ 58; *id.* ¶ 83 (opining that Ex. 1004, Fig. 3(a), similarly "shows two curves, presumably measurements of torque while the spring is wound and unwound").

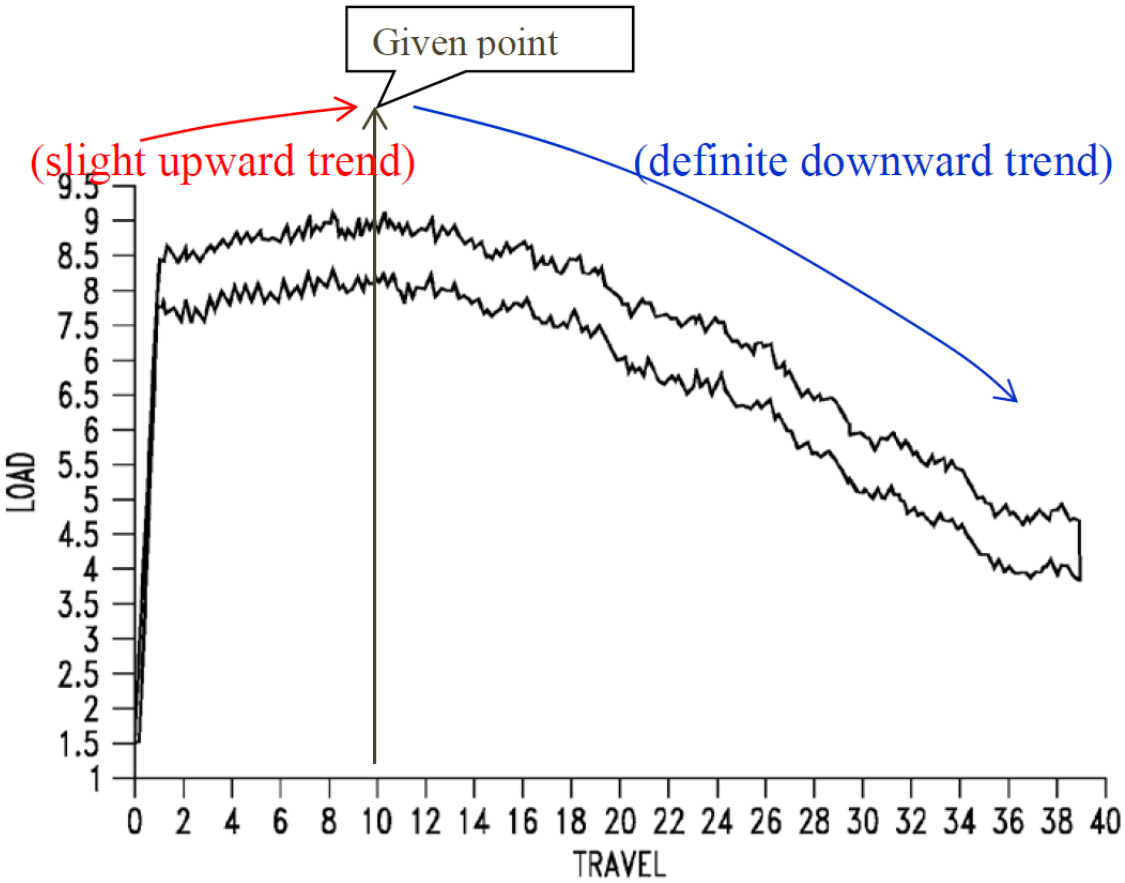


FIG. 6

Thus, as described by Patent Owner, Figure 6 shows a torque distribution having "a slight upward trend" from about travel length 1 to "a given point . . . generally between" travel lengths 8 and 12 (in red), and then "a definite downward trend" from the given point to about travel length 39 (in blue). PO Resp. 27–29; Ex. 2020 ¶¶ 26–29.

Patent Owner further asserts Petitioner's interpretation of what is shown in Figure 6 of Lin '943 is inconsistent with and contradicted by the written description of Lin '943. *See* PO Resp. 27, 34–36; Ex. 2020 ¶¶ 25, 41–48. Patent Owner particularly relies on Lin '943's description of Figure 6 as showing a "*progressively changing* load." Ex. 1003 ¶ 52 (emphasis added); *see* PO Resp. 34; Ex. 2001 ¶¶ 63–64; Ex. 2020 ¶¶ 41–46.

In reply, Petitioner insists "no single maximum torque value or specific 'given point' was measured or depicted" in Figure 6 of Lin '943 between travel lengths 6 and 14. Pet. Reply 6–8. The "more reasonable interpretation," according to Petitioner, is that Figure 6 discloses the claimed second torque, as set forth in the Petition and discussed above. *Id.* at 7, 10; Ex. 1016 ¶¶ 10–14, 17–20.

Petitioner asserts the written description of Lin '943 is not to the contrary. *See* Pet. Reply 12–13; Ex. 1016 ¶¶ 10–14, 17–20. Petitioner acknowledges Lin '943's description of Figure 6 as illustrating a "progressively changing load" (Ex. 1003 ¶ 52), but contends this "does not mean the load asserted must be *constantly changing*." Pet. Reply 12–13 (emphasis added); Ex. 1016 ¶ 18. Instead, according to Petitioner, "a load that is progressively changing describes a load change that happens or develops gradually or in stages step by step," which is shown in Figure 6 of Lin '943. Pet. Reply 12. Dr. Zhang also testifies that "a 'progressively changing load' means the load is not going to stay constant throughout all the regions" of a spring, and instead, "[a] load that varies can stay relatively unchanged in a small region while still considered to be a 'progressively changing load.'" Ex. 1016 ¶ 19; Pet. Reply 12.

Petitioner also asserts Dr. Vallee's testimony that a constant torque cannot be discerned in Figure 6 of Lin '943 between travel lengths 6 and 14, because Lin '943 does not filter out sensor noise, is belied by Dr. Vallee's additional testimony seeking to distinguish claim 1 from Figure 3a of Maeda by "asserting a torque is more likely to be constant over a region after filtering out sensor noises." Pet. Reply 8–10 (citing Ex. 2020 ¶ 29; Ex. 2001 ¶ 84); Ex. 1016 ¶¶ 10–14. Petitioner asserts Dr. Vallee's testimony as a

whole establishes that the torque in Figure 6 of Lin '943 is constant between travel lengths 6 and 14, because the measured torque values at lengths 6 and 14 "are substantially equal" to each other, just like in Figure 3a of Maeda where "the measured torque values at the beginning and end of the asserted region are equal in measurement." Pet. Reply 8–10 (quoting, in part, Ex. 2001 ¶ 84); Ex. 1016 ¶¶ 10–14.

Petitioner next offers "an alternative interpretation of" Figure 6 of Lin '943, which would define the "second torque" section to extend between travel lengths 8 and 12, rather than lengths 6 and 14 as set forth in the Petition. Pet. Reply 10–11 (annotating Fig. 6 to illustrate this alternative interpretation); Ex. 1016 ¶¶ 15–16. With this interpretation, Petitioner asserts, "[i]t is more evident that" the second torque section at travel lengths 8–12 is equal to a "maximum" of the first torque section at lengths 2–8, and is "substantially the same" at its end points 8 and 12. Pet. Reply 10–11; Ex. 1016 ¶¶ 15–16.

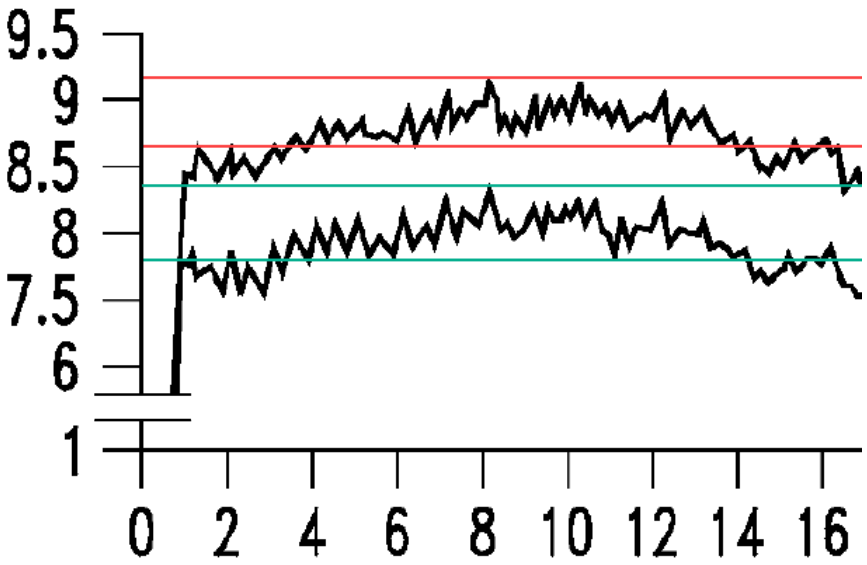
Patent Owner replies that Petitioner's attempt to manufacture an inconsistency in Dr. Vallee's testimony concerning the disclosures in Lin '943 and Maeda is unavailing. Sur-reply 7–8. Patent Owner asserts: "It is not inconsistent for an expert to separately analyze two references and provide a reasoned opinion that the noise in one reference does not permit a constant value region to be identified (Lin '943), while the noise in a second reference can be filtered out, allowing a constant value region to be identified (Maeda)." *Id.* at 8. Such a difference might be justified, for example, by differences in "the amount of noise shown" in the figures of the two references, and "the different illustrated test data." *Id.*

Upon review of the foregoing, we determine a preponderance of the evidence does not support Petitioner's contention that Lin '943 discloses the second torque of claim 1. First, it is clear that only the illustration of Figure 6 might provide such evidentiary support; the written description does not. Petitioner does not identify any teaching or suggestion in Lin '943 that the torque curve depicted in Figure 6 has a constant value between any two points. Petitioner and Dr. Zhang cite only paragraph 52 of Lin '943. *See, e.g.*, Pet. 16; Ex. 1015 ¶ 47. Paragraph 52 of Lin '943 pertinently describes Figure 6 as illustrating that "the load applied by the spring members for maintaining a position of the window covering material [may] progressively increase when the window covering material is raised or progressively decrease when the window covering material is lowered." Ex. 1003 ¶ 52. Further: "Due to the progressively changing load applied to the spring . . . , the spring is able to apply a load to maintain the position of window covering material without providing too much force." *Id.* There is nothing in this disclosure to indicate that the torque provided by the spring between travel lengths 6 and 14 is a constant torque equal to the maximum value of the torque directly preceding length 6, as asserted in the Petition, or that the torque provided by the spring between travel lengths 8 and 12 is a constant torque equal to the maximum value of the torque directly preceding length 8, as asserted in the Reply.

Focusing then on Figure 6 of Lin '943, we discern a significant amount of sensor noise in the two torque curves. It is undisputed that the wiggles in these curves are caused by "sensor noise," resulting from the fact that Figure 6 "depicts test data representative of the measured load values of an actual spring motor being taken under real world conditions using

measurement sensors." Ex. 2001 ¶ 58; Ex. 2020 ¶ 39. Such measurement systems "typically employ a force or torque transducer, a power source, and amplifier and recording device such as an oscilloscope or other data acquisition system," to measure "force or torque . . . as the spring motor [is] wound or unwound." Ex. 2001 ¶ 58. Therefore, "sensor noise" that is inherent in the use of electrical measuring tools "is evident in the constant fluctuation of the force measurements throughout FIG. 6." *Id.* This sensor noise can also be caused by "some mechanical vibration of the spring system as it was loaded." Ex. 2020 ¶ 39.

To illustrate the significance of this noise in Figure 6 of Lin '943, we reproduce the following excerpt of Figure 6, with our annotations:



Here, we have excerpted Figure 6 to focus on the portion that is in dispute—the two torque curves between travel lengths 6 and 14—while maintaining the horizontal and vertical axes' scales. We have added horizontal red lines identifying the vertical axis envelope of sensor data in the top curve between travel lengths 6 and 14 on the horizontal axis, and similar horizontal green lines for the bottom curve. As can be seen, the top curve varies back and

forth between a minimum of about 8.65 kg and a maximum of about 9.65 kg, and the bottom curve varies back and forth between a minimum of about 7.70 kg and a maximum of about 8.70 kg. Thus, both envelopes are about 1 kg wide, which represents an 11–12% variation from the nominal 8–9 kg values being recorded here. Moreover, many of the individual variations exhibit a height that extends 50% or more of their respective vertical axis envelopes.

Given the foregoing variability, we are persuaded by Dr. Vallee's testimony that the sensor noise in Figure 6 makes it impossible to conclude, based solely on the illustration in Figure 6, that the torque provided by the spring between travel lengths 6 and 14, or between lengths 8 and 12, is a constant torque equal to the maximum value of the preceding torque region. *See* Ex. 2001 ¶¶ 56–58; Ex. 2020 ¶¶ 29, 38–40. It might be possible, as Dr. Vallee testifies, to apply a "filtering" process or a "data averaging" process to the raw data illustrated in Figure 6, and thereby discern whether specific sections of the measured spring's travel length exhibit discernable torque trends (e.g., upward, downward, or constant), despite the sensor noise present in the raw data. *See* Ex. 2001 ¶ 58; Ex. 2020 ¶ 38 (stating "a person of ordinary skill in the art would understand that a constant load cannot be determined or recognized [in Figure 6 of Lin '943] unless some filtering was applied to the data"); *id.* ¶ 39. However, Lin '943 only provides the raw data illustration in Figure 6, and does not apply any data processing results from which torque trends might be reliably discerned. *See, e.g.*, Ex. 2020 ¶ 39.

The difficulty in reliably discerning a specific upward, downward, or constant torque trend in Figure 6 of Lin '943 between travel lengths 6 and 14

is demonstrated by the competing interpretations of the illustration offered by Dr. Zhang and Dr. Vallee. Dr. Zhang's two, alternative interpretations are reproduced here.

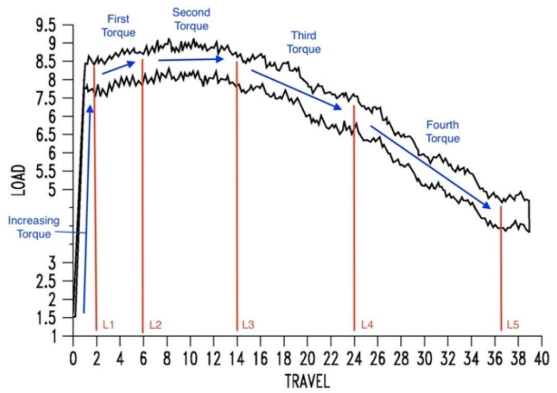


FIG. 6

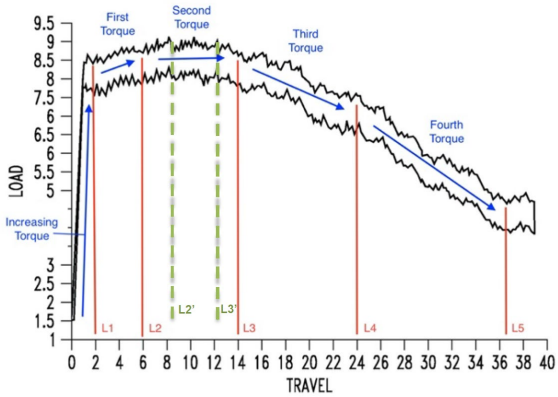


FIG. 6

At the left above is Dr. Zhang's original interpretation of Figure 6 in which the second torque extends between travel lengths 6 and 14, and at the right above is Dr. Zhang's alternative interpretation in which the second torque extends between travel lengths 8 and 12. *See* Ex. 1015 ¶¶ 49, 77–80; Ex. 1016 ¶¶ 15–16. Dr. Vallee's competing interpretation is reproduced here.

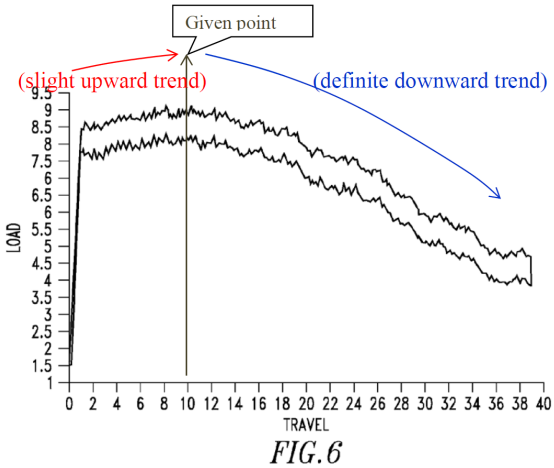


FIG. 6

See Ex. 2020 ¶¶ 27–29. The uncertainty caused by the sensor noise in Figure 6 makes it impossible for us to find, by a preponderance of the

evidence, that any one of these three interpretations of the data is any more likely than the others to describe the actual torque characteristics of the measured spring. Yet further interpretations might also be applied to the illustration of raw data in Figure 6, with equal validity. To resolve this dispute, by a preponderance of the evidence, would require application of a filter or a data averaging to the raw data illustrated in Figure 6 to smooth the data, which has not been done.

We have construed claim 1 to permit deviations from a purely constant second torque, within reasonable manufacturing tolerances. *See supra* § IV.C.2. However, from the foregoing findings, it is apparent that the sensor noise in Figure 6 of Lin '943 is too significant to allow us to apply this construction in any meaningful way.

The lack of clarity of Figure 6 in this regard is further demonstrated by Dr. Zhang's own alternative interpretations, which partially contradict each other. According to Dr. Zhang, the spring region between travel lengths 6 and 8 provides a torque that is both *constant* (his first interpretation, including this region in the second torque) and *slowly increasing* (his second interpretation, including this region in the first torque). *Compare* Ex. 1015 ¶¶ 49, 73–80, *with* Ex. 1016 ¶¶ 15–16. Similarly, according to Dr. Zhang, the spring region between travel lengths 12 and 14 provides a torque that is both *constant* (his first interpretation, including this region in the second torque) and *gradually decreasing* (his second interpretation, including this region in the third torque). *Compare* Ex. 1015 ¶¶ 49, 77–84, *with* Ex. 1016 ¶¶ 15–16.

We are not persuaded by Petitioner's argument that Dr. Vallee's interpretation of Figure 6 of Lin '943 is inconsistent with Dr. Vallee's

interpretation of Figure 3a of Maeda, provided in opposition to Ground 4 in the Petition. Figure 3a of Maeda (Exhibit 1005) is reproduced below.

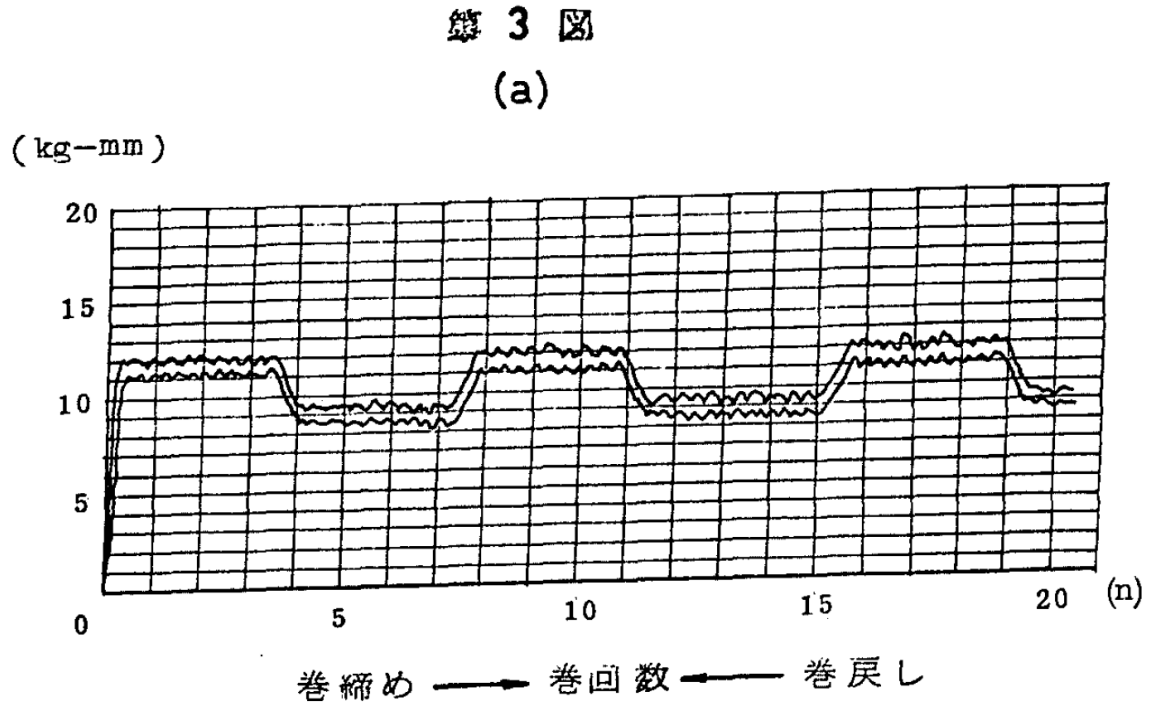


Figure 3(a) of Maeda is a graph illustrating the torque characteristics of a spring. Ex. 1004, 5. According to the Petition, the region of Figure 3(a) between turns 4 and 7 on the horizontal axis corresponds to the fourth torque of claim 1, because it *gradually decreases*. *See* Pet. 56–57, 64. Dr. Vallee disagreed, and testified that Figure 3(a) instead shows that "the torque associated with the beginning of this alleged region (4 turns) is shown as being substantially equal to the torque at the end of this alleged region (7 turns)," so this cannot be a decreasing torque. Ex. 2001 ¶¶ 82–84. Further according to Dr. Vallee: "*It is far more likely that the torque is actually constant over this region* since the upper curve, presumabl[y] measured using the same coil spring, *displays a constant torque* between 4 and 7 turns" as well as "over the next cycle (between 11.5 and 15 turns)."

Id. ¶ 84 (emphases added). Also: "[T]he noise in the measurement signal makes it impossible to conclude that the torque varies in this range." *Id.*

We discern no inconsistency here, for at least two reasons. First, Dr. Vallee equivocates as to whether or not Figure 3(a) of Maeda actually discloses a constant torque between turns 4 and 7. His ultimate opinion, instead, is that the torque in this region cannot be found to be gradually decreasing. Second, Figure 6 of Lin '943 exhibits much more up-and-down sensor noise between travel lengths 6 and 14, than Figure 3a of Maeda exhibits between turns 4 and 7. It is much more difficult to discern a flat line trend in the applicable region of Lin '943, than in the applicable region of Maeda, and this discrepancy justifies different conclusions as to whether these two regions display a constant torque within reasonable manufacturing tolerances.

For the foregoing reasons, we conclude a preponderance of the evidence does not support Petitioner's contention that Lin '943 discloses a second torque that is a constant torque equal to the maximum value of the preceding torque region, as is required by claim 1. Petitioner does not rely on Yamashita to cure this deficiency of Lin '943, so claim 1 has not been proven by a preponderance of the evidence to be unpatentable as having been obvious over Lin '943 and Yamashita.

4. Claim 3

Claim 3 of the '547 patent recites a spring motor comprising a coil spring, using language identical to that used in claim 1. *See* Ex. 1001, 8:21, 8:39–57. As with claim 1 discussed above, Petitioner contends Lin '943 discloses the "second torque" section recited in claim 3. *See* Pet. 30

(considering Ground 1, anticipation of claim 3 by Lin '943), 39 (considering Ground 2, obviousness of claim 3 over Lin '943 and Yamashita). Patent Owner, likewise, presents the same opposition. *See, e.g.*, PO Resp. 37. For the reasons provided above in connection with claim 1, we conclude claim 3 has not been proven by a preponderance of the evidence to be unpatentable as having been obvious over Lin '943 and Yamashita.

F. Ground 8: Indefiniteness (Claims 2 and 4)

Petitioner asserts claims 2 and 4 of the '547 patent are unpatentable under 35 U.S.C. § 112(b) for indefiniteness. Pet. 3, 86–88. Petitioner cites Dr. Zhang's testimony in support. Ex. 1015 ¶¶ 356–360; Ex. 1016 ¶¶ 21–27. Patent Owner opposes. PO Resp. 42–45. Patent Owner cites Dr. Vallee's testimony in support. Ex. 2001 ¶¶ 97–102; Ex. 2020 ¶¶ 69–76.

1. Law of Indefiniteness

In the Institution Decision, we noted both parties had applied the "reasonable certainty" standard of *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898 (2014), when discussing whether claims 2 and 4 are indefinite. *See* Inst. Dec. 22. We then concluded "[t]here is an open issue" as to whether we should apply that standard, or the "clear" standard of *In re Packard*, 751 F.3d 1307, 1313 (Fed. Cir. 2014), in this PGR proceeding. *Id.* (citing *Tinnus Enters., LLC v. Telebrands Corp.*, 733 F. App'x 1011, 1016–18 (Fed. Cir. 2018)).

A USPTO Memorandum has since been issued to end this uncertainty, with "binding agency guidance to govern the Board's implementation of" § 112(b) in PGR proceedings. *See* USPTO Memorandum, "Approach To Indefiniteness Under 35 U.S.C. § 112 In AIA Post-Grant Proceedings"

(Jan. 6, 2021), 1–2.[12] Pursuant to this Memorandum, we apply the "reasonable certainty" standard of *Nautilus* in this Decision. *Id.* at 2–5.

"Under *Nautilus*, a claim of a patent challenged for indefiniteness is unpatentable for indefiniteness if the claim, read in light of the specification delineating the patent, and the prosecution history, fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention." *Id.* at 3 (citing *Nautilus*, 572 U.S. at 901).

2. Claims 2 and 4

Claim 2 depends from claim 1, and recites "the unequal-torque coil spring generates usable feedback torque values with a ratio between 4:1." Ex. 1001, 8:18–20. Claim 4 depends from claim 3, and recites the same limitation as claim 2. *Id*. at 8:63–65.

The '547 patent specification correspondingly discloses one "objective of the present invention is to allow the unequal-torque coil spring to generate usable feedback torque values with a ratio between 4:1." *Id.* at 4:12–14. The '547 patent also describes how a coil spring may be manufactured with five different curvatures A0–A4 along the length of the spring to generate five different torques TC and T1–T4 (*id.* at 5:7–58), then indicates: "A ratio between the above-described torque forces can be set between 4:1" (*id.* at 5:59–60).

Petitioner asserts the term "a ratio between 4:1" in claims 2 and 4 is indefinite, because the '547 patent specification and prosecution history "fail[] to inform those skilled in the art about 'the scope of the invention

[12] Available at https://www.uspto.gov/sites/default/files/documents/IndefinitenessMemo.pdf.

with reasonable certainty.'" Pet. 86 (quoting *Nautilus*, 572 U.S. at 910). In support, Petitioner contends this claim term is not a term of art in the field of the '547 patent, and is not defined in the '547 patent specification. *Id.* at 86–87 (citing Ex. 1001, 5:59–60); Ex. 1015 ¶ 357. Petitioner also contends the '547 patent "is entirely silent regarding which of the five torques [recited in claims 1 and 3] are to be arranged in 'a ratio between 4:1' as a usable feedback torque." Pet. 86–87 (citing Ex. 1001, 5:19–50); Ex. 1015 ¶¶ 357–359. Petitioner concludes "it is inappropriate to simply ascribe *some* meaning to [the '547] patent's claims in the absence of supporting disclosure." Pet. 87–88 (citing *Nautilus*, 572 U.S. at 911).

Patent Owner responds that claims 2 and 4 are not indefinite. PO Resp. 42; Ex. 2001 ¶¶ 97–102; Ex. 2020 ¶¶ 69–76. Patent Owner particularly relies on several passages in the '547 patent specification that Patent Owner describes as "demonstrat[ing] support . . . of features recited in claims 2 and 4." PO Resp. 42–44 (citing Ex. 1001, 2:43–53, 5:34–50, 5:59–64, 6:52–57)[13]; Ex. 2020 ¶¶ 72–73. These passages in the '547 patent, in Patent Owner's view, pertinently disclose that the spring of claims 2 and 4 has "a maximum value at T2" (i.e., the "second torque") and "a minimum or smallest value being at T4" (i.e., the smallest value of the decreasing "fourth torque"). PO Resp. 44–45 (annotating Ex. 1001, Fig. 12, to identify these "Max." and "Min." torques); Ex. 2020 ¶ 74. "Further, the specification describes that the torque forces can be set between 4:1." PO Resp. 44;

[13] Patent Owner actually cites to the portion of Exhibit 2016 (the prosecution history of the '547 patent) corresponding to the original application that led to the issuance of the '547 patent. We identify here the corresponding disclosures in the '547 patent itself.

Ex. 2020 ¶ 74. Patent Owner concludes "a person of ordinary skill in the art would understand that the maximum ratio of torque (e.g., the ratio of the maximum torque at T2 to the minimum torque at T4) is 4:1," so claims 2 and 4 "claim this maximum ratio of torque between the maximum torque at T2 to the minimum torque at T4 is no greater than 4:1," which is not indefinite. PO Resp. 44; Sur-reply 18; Ex. 2020 ¶¶ 75–76.

In reply, Petitioner maintains claims 2 and 4 are indefinite because the claim phrase "a ratio between 4:1" is not reasonably certain. *See* Pet. Reply 13–14; Ex. 1016 ¶¶ 21–27. Petitioner asserts the '547 patent claims and specification, including the passages cited by Patent Owner, fail to describe which of the five torques is being compared in the claimed ratio. *See* Pet. Reply 14. In response to Patent Owner's assertion that the ratio compares the maximum and the minimum torques provided by the spring, Petitioner argues this specific ratio is not identified in the claims, and instead the "usable feedback torque values" in the claims "can be interpreted differently by a person of ordinary skill in the art . . . as comparing any torque generated by the coil spring, and numbers of possible interpretations exist." *Id.* at 15; Ex. 1016 ¶ 22. Petitioner asserts Patent Owner's own witness Dr. Vallee presents "different[]" and "self-contradicting" interpretations of "a ratio between 4:1," in stating: (1) the maximum and minimum torque forces "can be set between 4:1" (Ex. 2020 ¶ 74); and (2) the ratio of the maximum torque to the minimum torque "is 4:1" (*id.* ¶ 75) and "is no greater than 4:1" (*id.* ¶ 76). Pet. Reply 15–16; Ex. 1016 ¶¶ 25–27.

Patent Owner replies that the '547 patent passages cited in the Patent Owner Response describe that the maximum torque T2 and the minimum

torque T4 at length L5 "can be set between 4:1," and a person of ordinary skill in the art "would understand that the maximum ratio of torque (e.g., the ratio of the maximum torque at T2 to the minimum torque at T4) is 4:1." Sur-reply 15–17; Ex. 2020 ¶¶ 74–75. Patent Owner dismisses Petitioner's reliance on testimony from Patent Owner's witness Dr. Vallee as lacking "any support from Petitioner's" witness Dr. Zhang. Sur-reply 15–17.

Upon review of the foregoing, we determine a preponderance of the evidence establishes claims 2 and 4 are indefinite, because the claims and specification of the '547 patent fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention. The first difficulty concerns the claimed *ratio value(s)*. Specifically, the claims recite the "spring generates . . . torque values with *a ratio between*," thereby suggesting a range of ratios is contemplated, but then the claims recite only one ratio, "4:1." Ex. 1001, 8:18–20, 8:63–65 (emphasis added). The problem is thus a matter of missing subject matter, in failing to specify a second end point of a range of ratio values contemplated by the claims (i.e., "between 4:1 and X:Y", or "between X:Y and 4:1"). Because of this, the claims are not reasonably certain under *Nautilus*.

This uncertainty is demonstrated by Patent Owner's confusing argument attempting to describe the claimed ratio value(s). *See* PO Resp. 44. Dr. Vallee describes the claimed ratio value(s) as "between 4:1," "4.1," and "no greater than 4:1." Ex. 2020 ¶¶ 74–76. The best we can make of this argument and testimony is that claims 2 and 4 allegedly require "the maximum ratio . . . is 4:1." PO Resp. 44; Ex. 2020 ¶ 75. This interpretation, however, would alter the claim term "between 4:1," changing it to "no

greater than 4:1." It also has no support in the '547 patent disclosures cited by Patent Owner. *See* Ex. 1001, 2:43–53, 5:34–50, 5:59–64, 6:52–57.

The second difficulty with claims 2 and 4 is that they do not reasonably specify *which two torques* are compared, to have the specified 4:1 ratio relationship. The '547 patent claims and specification first describe five different torques. *See* Ex. 1001, 8:1–17 (claims 1 and 2 recite an increasing torque, and first, second, third, and fourth torques); *id.* at 8:43–57 (claims 3 and 4); *id.* at 5:7–58 (specification describes increasing torque TC and first, second, third, and fourth torques T1–T4). The claims then indicate the spring "*generates usable feedback torque values* with a ratio between 4:1." *Id.* at 8:18–20 & 8:63–65 (emphasis added). The specification, somewhat differently, then indicates "[a] ratio *between the above-described torque forces* can be set between 4:1." *Id.* at 5:59–60 (emphasis added). Neither the claims, nor the specification, specifies which of the five previously-described torques is compared in the 4:1 ratio.

We disagree with Patent Owner's argument that the '547 patent specification informs a person of ordinary skill in the art that the torques to be compared are the maximum and minimum torques of the spring. The '547 patent passages cited by Patent Owner establish only that an unequal-torque spring provides a range of feedback torque values, which necessarily would include a minimum and a maximum of the range. *See* Ex. 1001, 2:43–53, 5:34–50, 5:59–64, 6:52–57. However, there is simply nothing in these passages that correlates the 4:1 ratio to the maximum and minimum torques of the spring. *See id.*

Some support for Patent Owner's position might be found in the claim recitation of comparing "*usable* feedback torque values" of the spring.

Ex. 1001, 8:18–20 & 8:63–66 (emphasis added). However, Patent Owner does not rely on the "usable" claim term in this regard so as show that this term is what ties the claimed ratio to the maximum and minimum torques of the spring. *See* PO Resp. 42–45; Ex. 2001 ¶¶ 97–102; Ex. 2020 ¶¶ 69–76. There is, therefore, no evidence of record that can support a determination that "usable" torques correspond to the maximum and minimum torques of the spring. Similarly, Patent Owner does not rely on the prosecution history of the '547 patent in opposition to Petitioner's contentions of indefiniteness. *See* PO Resp. 42–45.

Patent Owner finally asserts that mechanical systems employing multiple torques are routinely defined by identifying the ratio between the maximum and minimum torques in the system, to provide meaningful boundaries. *See* Sur-reply 18. No evidence is cited to support this contention. *See id.* However, Dr. Vallee provides similar testimony in Exhibit 2021, supporting Patent Owner's position that proposed substitute claims 5 and 6 have written description support in the application that issued as the '547 patent. *See infra* Section V.C.2. Exhibit 2021 was initially proffered on November 20, 2020, with the filing of Patent Owner's Sur-reply concerning issued claims 2 and 4, and Patent Owner's Revised Motion to Amend concerning proposed claims 5 and 6. This filing was untimely as to claims 2 and 4, depriving Petitioner of an opportunity to respond concerning those claims. *See, e.g.*, Consolidated Guide 73 ("The sur-reply may not be accompanied by new evidence other than deposition transcripts of the cross-examination of any reply witness."). We therefore do not consider Exhibit 2021 in connection with claims 2 and 4. Even if we

were to consider it, we would not find it to be persuasive, for reasons similar to the discussion in Section V.C.2 below.

For the foregoing reasons, we conclude a preponderance of the evidence establishes claims 2 and 4 are unpatentable as indefinite under 35 U.S.C. § 112(b).

V. MOTION TO AMEND THE '547 PATENT (PROPOSED CLAIMS 5 AND 6)

A. Introduction

Patent Owner filed a Motion to Amend the '547 patent (Paper 18, "Motion to Amend" or "Mot."), made contingent upon our determining that claims 2 and 4 are unpatentable as indefinite, as we have done above. *See id.* at 3. Petitioner filed an Opposition (Paper 20, "Opp.") to the Motion to Amend.

We issued Preliminary Guidance (Paper 21) regarding the Motion to Amend, pursuant to the Board's pilot program concerning motion to amend practice and procedures.[14] In response, Patent Owner filed a Revised Motion to Amend (Paper 23, "Revised Motion" or "Rev. Mot."), and Petitioner filed an Opposition (Paper 25, "Rev. Opp.") to the Revised Motion. Patent Owner filed a Reply (Paper 29, "Mot. Reply") in support of the Revised Motion, and Petitioner filed a Sur-reply (Paper 30, "Mot. Sur-reply") to the Reply.

[14] *See* Notice Regarding a New Pilot Program Concerning Motion to Amend Practice and Procedures in Trial Proceedings under the America Invents Act before the Patent Trial and Appeal Board, 84 Fed. Reg. 9,497 (Mar. 15, 2019) ("the Notice").

Upon consideration of the foregoing, and for reasons provided below, we *deny* Patent Owner's Motion to Amend, because it seeks to add new matter to the application that was filed as the '547 patent, and, therefore, it lacks written description support in the '547 patent.

B. Proposed Substitute Claims 5 and 6

Patent Owner proposes to amend the '547 patent by adding claims 5 and 6. *See* Mot. 3, 26; Rev. Mot. 2, 26.[15] Claim 5 is proposed as a substitute for existing claim 2, and claim 6 is proposed as a substitute for existing claim 4. *See* Rev. Mot. 26.

We reproduce proposed substitute claim 5 here, with square bracketed verbiage reflecting subject matter omitted from existing claim 2, and underlined verbiage reflecting subject matter added to existing claim 2:

> 5. (Proposed Substitute for Claim 2) The unequal-torque coil spring according to claim 1, wherein the unequal-torque coil spring generates [[usable]] <u>a maximum feedback torque value and a minimum</u> feedback torque value[[s with]]<u>, and</u> a ratio [[between]] <u>of the maximum and the minimum feedback torque values is</u> 4:1.

Rev. Mot. 26; Ex. 1001, 8:18–20. Proposed claim 6 would substitute for existing claim 4 in an identical fashion, maintaining the dependency from claim 3 instead of claim 1. Rev. Mot. 26.

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[15] The Motion and the Revised Motion contain exactly the same set of proposed claims. This runs afoul of the Notice's requirement that "[a] revised MTA includes one or more *new* proposed substitute claims." Notice, 84 Fed. Reg. 9549, 9501 (emphasis added). Nonetheless, in this Decision, we will consider the entirety of the arguments presented in the Motion and the Revised Motion in support of proposed substitute claims 5 and 6.

Thus, proposed substitute claims 5 and 6 make two changes versus existing claims 2 and 4. First, "usable" torque values are replaced by "maximum" and "minimum" torque values. *See, e.g.*, Rev. Mot. 2–3; Opp. 1. Second, the ratio of "torque values" being "between 4:1" is replaced by specifying that the ratio is 4:1 and is calculated as being the ratio between the maximum and minimum torque values. *See, e.g.*, Rev. Mot. 2–3; Opp. 2.

C. Threshold Criteria of 35 U.S.C. § 326(d)(3): Prohibition Against Introducing New Matter

1. Statement of Law

The Motion to Amend "may not . . . introduce new matter." 35 U.S.C. § 326(d)(3).

"*Before considering the patentability* of any substitute claims . . . the Board first must determine *whether the motion to amend meets* the statutory and regulatory requirements" set forth in § 326(d) and 37 C.F.R. § 42.221. *Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-01129, Paper 15 at 4 (PTAB Feb. 25, 2019) (precedential) (emphases added) (considering the *inter partes* review counterpart statute and regulation). This includes the prohibition against new matter in § 326(d)(3). *See Lectrosonics*, at 7–8.

"*[T]he patent owner must satisfy* the Board that the statutory criteria in [35 U.S.C.] § 316(d)(3) are met and that any reasonable procedural obligations imposed by the Director are satisfied." *Aqua Prods., Inc. v. Matal*, 872 F.3d 1290, 1305–06 (Fed. Cir. 2017) (emphasis added) (lead plurality opinion by J. O'Malley) (discussing 35 U.S.C. § 316(d)(3), which employs language identical to § 326(d)(3)); *see also id.* at 1341 ("There is no disagreement that the patent owner bears a burden of production in accordance [with] 35 U.S.C. § 316(d).") (majority opinion by J. Reyna).

Accordingly: "A motion to amend may be denied where . . . [t]he amendment seeks to . . . introduce new subject matter." 37 C.F.R. § 42.221(a)(2)(ii); *see also* Consolidated Guide 69, 71. Further: "A motion to amend claims must . . . set forth . . . [t]he support in the original disclosure of the patent for each claim that is added or amended." 37 C.F.R. § 42.221(b)(1).

The test for new matter is whether the original application's disclosure "reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter." *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc); *see also Senju Pharm. Co. v. Apotex Inc.*, 746 F.3d 1344, 1352 (Fed. Cir. 2014) (citing *Ariad* as providing the test for determining new matter under 35 U.S.C. § 132(a)). We perform "an objective inquiry into the four corners of the specification from the perspective of a person of ordinary skill in the art," to determine whether it demonstrates possession of the claimed subject matter. *Ariad*, 598 F.3d at 1351.

2. Proposed Substitute Claims 5 and 6

Patent Owner asserts proposed substitute claims 5 and 6 do not introduce new matter into the '547 patent. *See* Mot. 5–13; Rev. Mot. 3–10. In support, Patent Owner cites various disclosures of U.S. Patent Application No. 15/439,313 ("the U.S. Application"), which issued as the '547 patent, that Patent Owner contends support the inventions recited in proposed substitute claims 5 and 6. *See* Mot. 5–13 & Rev. Mot. 3–10 (quoting various passages found at Ex. 2016, pgs. 27–63, and adding emphases to identify where Patent Owner contends support for claims 5 and 6 may be found).

Patent Owner additionally relies on disclosure in Taiwan Patent Application No. 105204038 U ("the Taiwan Application"), to which the '547 patent claims priority. *See* Mot. 20–22; Ex. 1001, code (30).

Concerning the limitations found in proposed substitute claims 5 and 6 but not existing claims 2 and 4, Patent Owner contends the U.S. Application "repeatedly describes locations or positions of the reed strip that provide torque values that are maximum and minimum," and "specifically describes that the ratio between the torque forces (e.g., the maximum and the minimum (smallest)) is 4:1." Mot. 20. In support, Patent Owner cites the U.S. Application's Figures 4, 6–10, and 12, and its written description at page 5 (line 15) to page 6 (line 5), page 14 (line 6) to page 15 (line 1), page 15 (lines 9–13), and page 18 (lines 4–8). Mot. 11–13, 17–19 (citing Ex. 2016, 30, 32–34, 36, 47–48, 56–57, 60). Patent Owner, further, provides the following annotations to Figure 12 of the U.S. Application:

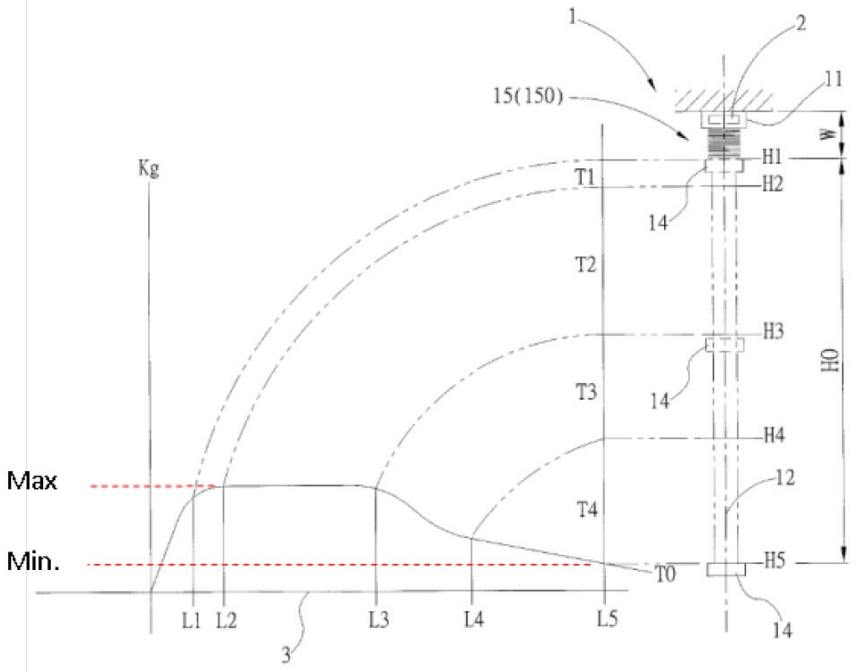

FIG.12

Here, Patent Owner identifies, with dotted red lines, where Patent Owner contends the "Max" and the "Min" torque values are shown in Figure 12 of the U.S. Application. *See* Mot. 13, 19; Rev. Mot. 17. Dr. Vallee provides testimony in support of these contentions. *See* Ex. 2020 ¶¶ 80–87; Ex. 2021 ¶¶ 11–19.

The Revised Motion to Amend adds further declaration testimony from Dr. Vallee in support of the motion. *See* Rev. Mot. 10, 18–25; Ex. 2021 ¶¶ 1, 19, 22–47. Here, Patent Owner contends "*[l]iteral* support of the claim terminology is not required" to demonstrate possession, and instead: "[T]he test requires an objective inquiry into the four corners of the specification **from the perspective of a person of ordinary skill in the art**," and "the **specification must describe an invention understandable to that skilled artisan and show that the inventor actually invented the invention claimed**." Rev. Mot. 19 (citing *Ariad*, 598 F.3d at 1351).

Dr. Vallee focuses on the statement in the U.S. Application that: "A ratio between the above-described torque forces can be set between 4:1." Ex. 2016, 57 (lines 9–10); Ex. 2021 ¶¶ 28–30. This statement, according to Dr. Vallee, demonstrates possession of the subject matter recited in proposed substitute claims 5 and 6, because a person of ordinary skill in the art would have understood that "spring loaded mechanical systems involving multiple torques, which decrease from a maximum torque value to a minimum torque value, are routinely defined by indicating the ratio of maximum and minimum values of the torque that make up the system." Ex. 2021 ¶ 31; Rev. Mot. 20; Mot. Reply 2–6. Dr. Vallee also indicates this is a "routine" practice, done "in order to distinguish the system from other systems." Ex. 2021 ¶ 33; Rev. Mot. 20–21. Dr. Vallee thus disagrees with Dr. Zhang's

testimony that the U.S. Application's reference to a 4:1 torque ratio may refer to torques other than the maximum and minimum torques, because such other torque ratios would "not properly distinguish two systems that may have completely different performance." Ex. 2021 ¶¶ 34–36 (discussing hypothetical systems); Rev. Mot. 21–22.

Dr. Vallee also concludes the U.S. Application's reference to "*[a] ratio between* the above-described torque forces *can be set between 4:1*" (Ex. 2016, 57 (lines 9–10) (emphases added)) "is properly read as 'four to one' in plain English," so "the identified language would be read as 'a ratio between the above-described torque forces can be set between 4 to 1.'" Ex. 2021 ¶¶ 37–41; *id.* ¶¶ 31–32 (providing various definitions of the term "ratio," and citing Exs. 2022 & 2023); Rev. Mot. 22–23. Concerning the double usage of the term "between" in the U.S. Application here, Dr. Vallee concludes "it is common for a person of ordinary skill in the art to understand that use of the word 'between' is being used to denote the upper and lower values of the ratio (e.g., the maximum to minimum ratio)," so *only a single ratio* of 4:1 is identified in the U.S. Application, rather than *a range of ratios* as found in the Preliminary Guidance. Ex. 2021 ¶¶ 40–43 (citing Ex. 2022); Rev. Mot. 23–24; Mot. Reply 6–8.

Dr. Vallee finally testifies that Figure 12 of the U.S. Application, assuming it is drawn to scale along the vertical axis, discloses that the ratio between the maximum torque (i.e., torque T2) and the minimum torque (i.e., torque T4 at length L5) is "0.82:0.21, or 3.9:1; very nearly 4:1 as stated in the specification." Ex. 2021 ¶¶ 43–44; Tr. 49:20–52:16, 58:21–59:6.

Petitioner firstly asserts the limitation "generates a maximum feedback torque value and a minimum feedback torque value" in proposed

substitute claims 5 and 6 is new matter lacking written description support. *See* Opp. 2–4. Petitioner contends the recited "minimum" torque is not disclosed by the U.S. Application, which instead "simply disclose[s] a minimum 'pulling force' or 'load' exists when the lower beam reaches its bottom position," which is "exerted by a user through the pull cord [and] does not necessarily equal to a feedback torque value generated by the coil spring." *Id.* at 4 (citing Ex. 2016, 47–48, 56–57, 60). Petitioner's further view is that the U.S. Application discloses simply that "the fourth torque T4 'gradually decreases,'" and "no minimum value of T4 was identified" in the U.S. Application. *Id.*

Petitioner secondly asserts the limitation "a ratio of the maximum and the minimum feedback torque values is 4:1" in proposed substitute claims 5 and 6 is new matter lacking written description support. *See id.* at 5–6; Rev. Opp. 3–12. In particular, according to Petitioner, the U.S. Application does not "specif[y] any ratio between 'the maximum and the minimum feedback torque values,'" much less the specific 4:1 ratio specified in the claims. Opp. 5. Petitioner asserts the statement in the U.S. Application cited by Dr. Vallee "is unclear about which of 'the above-described torque forces' it refers to, and . . . is silent on . . . any specific maximum or minimum torque forces." *Id.*; Rev. Opp. 4–6. Petitioner also asserts this statement "lacks clarity whether it indeed suggests a range of ratios," or a single ratio as Patent Owner presently asserts. Rev. Opp. 4, 9–11; Ex. 1017 ¶¶ 17–19.

Petitioner further criticizes Dr. Vallee's testimony as being untethered to the disclosure in the U.S. Application, and unsupported by evidence. *See* Rev. Opp. 6–7, 8–9; Mot. Sur-reply 3–4. Petitioner offers competing testimony from Dr. Zhang, who states "[a] ratio between the

above-described torque forces can be set between 4:1," as set forth in the U.S. Application (Ex. 2016, 57 (lines 9–10)), would be interpreted "as the ratio between *any described torque forces* can be set *at any number between 4* (a ratio of 4 to 1) *and 1* (a ratio of 1 to 1)." Ex. 1017 ¶¶ 11, 15–19 (emphases added); Rev. Opp. 7; Mot. Sur-reply 7–9. Dr. Zhang further takes issue with Dr. Vallee's reliance on Figure 12 of the U.S. Application, because the application does not describe the figure as being drawn to scale, and if there is a scale then it could be a non-linear scale such as a logarithmic scale. *See* Ex. 1017 ¶¶ 20–21.

Upon review of the foregoing, we agree with Patent Owner that the U.S. Application demonstrates possession of an "unequal-torque coil spring [that] generates a maximum feedback torque value and a minimum feedback torque value," as recited in proposed substitute claims 5 and 6. For example, the U.S. Application describes "an unequal-torque coil spring . . . which uses a simple method for disposing different curvatures in multiple front and rear sections of a reed strip, so as to *provide a feedback force as multiple levels of torque* in response to actual working requirements from a curtain system." Ex. 2016, 54 (lines 12–17) (emphasis added); *id.* at 36 (Fig. 12, illustrating a variable torque distribution provided in a spring). Thus, the U.S. Application describes an unequal-torque coil spring that provides a range of feedback torque values, which necessarily would include a minimum and maximum of the range. We, further, agree with Patent Owner's annotations to Figure 12 of the U.S. Application, identifying the maximum and minimum feedback torque values provided in that specific example. *See* Mot. 13, 19; Rev. Mot. 17; Paper 21, 9–10.

However, we agree with Petitioner that the U.S. Application does not provide written description support for the limitation "a ratio of the maximum and the minimum feedback torque values is 4:1" in proposed substitute claims 5 and 6. The key sentence of the U.S. Application at issue here is: "A ratio between the above-described torque forces can be set between 4:1." Ex. 2016, 57 (lines 9–10). First, the meaning of this sentence is unclear. Stating that the identified ratio "can be set between" suggests a range of ratios is contemplated, but then only one ratio "4:1" is provided. And even if we were to assume that Patent Owner is correct, and that a person of ordinary skill in the art would understand only one ratio (i.e., 4:1) was contemplated, this would not cure the problem.

Even with that assumption, this sentence of the U.S. Application does not reasonably specify *which two torques* are compared, to have the specified 4:1 ratio between them. The U.S. Application first describes five different torques. *See* Ex. 2016, 55 (line 13) – 57 (line 8) (describing increasing torque TC and first, second, third, and fourth torques T1–T4). The key sentence then refers to "[a] ratio between the above-described torque forces." *Id.* at 57 (lines 9–10). This does not specify which of the five "above-described" torques is compared in the ratio. Just as important, it also does not describe that the compared torques are the maximum and minimum torques of the spring, which are not even mentioned in the "above" disclosure. *See id.* at 55 (line 13) – 57 (line 8). There is simply nothing in this key sentence, or in the other U.S. Application disclosures cited by Patent Owner, that correlates the 4:1 ratio to the maximum and minimum torques of the spring. *See id.* at 30 (Fig. 4), 32–34 (Figs. 6–10),

36 (Fig. 12), 47 (line 15) – 48 (line 5), 56 (line 6) – 57 (line 1), 57 (lines 9–13), 60 (lines 4–8).

Some support for Patent Owner's position might be found in the disclosure of a "spring to generate *usable* feedback torque values with a ratio between 4:1." Ex. 2016, 52 (lines 7–9) (emphasis added). However, Patent Owner does not rely on the "usable" term in this regard so as to show that this term is what ties the 4:1 ratio to the maximum and minimum torques of the spring and, thus, reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter. *See* Mot. 11–13, 17–20; Rev. Mot. 9–10, 14–24; Ex. 2020 ¶¶ 80–87; Ex. 2021 ¶¶ 11–19, 22–47. There is, therefore, no evidence of record that can support a determination that "usable" torques correspond to the maximum and minimum torques of the spring.

Dr. Vallee's testimony on this issue is not persuasive. His extended discussion of mechanical systems incorporating variable torque springs being "routinely defined by" the ratio between the maximum and minimum torques of the spring is largely unsupported by citation to supporting evidence. *See* Ex. 2021 ¶¶ 31–36, 41–42. He does cite Exhibits 2022 and 2023, but these exhibits simply define the term "ratio," and do not contain any discussion of comparing the maximum and minimum torques of an unequal-torque spring. *See id.* ¶¶ 31–32, 42. This lack of evidentiary support, in combination with the lack of disclosure in the U.S. Application comparing the maximum and minimum torques of a spring, makes this particular testimony too conclusory to be persuasive here.

We also agree with Petitioner's argument that a person of ordinary skill in the art would have appreciated that comparing even the intermediate

torques of two variable torque springs, and not just the maximum and minimum torques of the springs, would have been useful in some instances. *See, e.g.*, Rev. Opp. 8–9. This consideration further weakens the link between "the above-described torque forces" in the U.S. Application, and the maximum and minimum torque forces of the spring, specifically, which Dr. Vallee attempts to make.

Moreover, Dr. Vallee's reliance on Figure 12 of the U.S. Application is unavailing. Dr. Vallee does not cite, and we cannot find, any disclosure in the U.S. Application indicating that the vertical axis of Figure 12 applies any particular scale, much less a linear scale specifically. *See* Ex. 2021 ¶¶ 43–44. For example, there is no vertical axis scale provided in Figure 12 itself. *See* Ex. 2016, 36. We, thus, determine that this testimony is not adequately supported. *See, e.g.*, *Nystrom v. Trex Co., Inc.*, 424 F.3d 1136, 1148–49 (Fed. Cir. 2005) (reversing district court judgment of patent invalidity based on software modeling of a Figure in the prior art patent, which was not explicitly made to scale) (citing *Hockerson-Halberstadt, Inc. v. Avia Group Int'l, Inc.*, 222 F.3d 951, 956 (Fed. Cir. 2000) and *In re Wright*, 569 F.2d 1124, 1127 (CCPA 1977)).

We finally address Patent Owner's reliance on the Taiwan Application as demonstrating support for proposed substitute claims 5 and 6. *See* Mot. 20–22, 25; Opp. 6–8. We first considered this issue in our Preliminary Guidance, in which we stated: "We are not aware of any legal authority that would permit Patent Owner here to rely on disclosures found in the Taiwan [A]pplication, but not in the four corners of the U.S. [A]pplication, to satisfy the written description requirement for proposed substitute claims 5 and 6." Paper 21, 5–6; *see also Ariad*, 598 F.3d

at 1351 (the written description test is "an objective inquiry into the four corners of the specification from the perspective of a person of ordinary skill in the art"). The Revised Motion to Amend did not thereafter address the Taiwan Application at all, or in particular, supply a legal theory that would support Patent Owner's reliance on the Taiwan Application here. We, thus, continue to conclude that Patent Owner's reliance on the Taiwan Application's disclosure as demonstrating support for proposed substitute claims 5 and 6 is legally unsound for the same reasons set forth in our Preliminary Guidance. *See* Paper 21, 5–6.

Further, the disclosure of the Taiwan Application cited by Patent Owner in this regard provides: "**In addition, a maximum force and a minimum torque force values are determined according to the size of the curtain set 1, and** a ratio between the above-described torque forces can be set between 4:1." Ex. 2019, 12–13 (emphasis added in bold). Here, the plain text also appears in the U.S. Application, but the bolded text does not. *Compare id.* at 12 (line 17) – 13 (line 8), *with* Ex. 2016, 57 (lines 2–13). Thus, "the above-described torques" in the U.S. Application refers back to torques TC and T1–T4, shown in Figures 9 and 12, rather than maximum and minimum torques as in the Taiwan Application. Ex. 2016, 55 (line 12) – 57 (line 8). This discrepancy between the Taiwan and U.S. Applications demonstrates an intent to disavow the disclosure in the Taiwan Application that was omitted from the U.S. Application—i.e., a description of comparing minimum and maximum torque forces in a ratio of 4:1.

For the foregoing reasons, we *deny* the Motion to Amend, because adding proposed substitute claims 5 and 6 would introduce new matter to the '547 patent.

D. Patentability of Proposed Substitute Claims 5 and 6

We must assess the patentability of Patent Owner's proposed substitute claims 5 and 6 without placing the burden of persuasion on Patent Owner. *See* 35 U.S.C. § 326(d)–(e); *Aqua Prods.*, 872 F.3d at 1328 (construing 35 U.S.C. § 316(e), which employs language identical to § 326(e)); *see also Lectrosonics*, at 3–4. Thus, Petitioner here "bears the burden of proving that the proposed amended claims are unpatentable by a preponderance of the evidence." *Bosch Auto. Serv. Sols., LLC v. Matal*, 878 F.3d 1027, 1040 (Fed. Cir. 2017) (as amended on rehearing, *Bosch Auto. Serv. Sols., LLC v. Iancu*, No. 2015-1928 (Fed. Cir. Mar. 15, 2018) (Order on Petition for Panel Rehearing)); *Lectrosonics*, at 3–4.

Petitioner argues proposed substitute claims 5 and 6 lack written description support in the '547 patent, and are therefore unpatentable under 35 U.S.C. § 112(a), citing its arguments that those claims would add new matter to the U.S. Application. Opp. 2–8; Rev. Opp. 12–13. Patent Owner's opposition, likewise, repeats the same arguments. *See* Rev. Mot. 18–25. The pertinent disclosures of the U.S. Application at issue in the § 326(d) new matter inquiry (Exhibit 2016) are identical to the disclosures of the '547 patent at issue in the present § 112(a) unpatentability inquiry (Exhibit 1001). For the reasons discussed above regarding new matter, and considering all of the evidence and arguments offered by both parties, we conclude a preponderance of the evidence demonstrates proposed substitute claims 5 and 6 are unpatentable as lacking written description support in the '547 patent.

VI. SUMMARY OF CONCLUSIONS

In summary, we determine a preponderance of the evidence does not establish claims 1 and 3 of the '547 patent are unpatentable, but does establish claims 2 and 4 of the '547 patent are unpatentable, as shown in the following table:[16]

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1, 3	102(a)(2)	Lin '943		1, 3
1, 3	103	Lin '943, Yamashita		1, 3
1, 3	103	Admitted Prior Art, Lin '943		1, 3
1	103	Maeda		1
3	103	Lin '109, Maeda		3
1	103	Wang Drawing		1
3	103	Ruggles, Wang Drawing		3

[16] 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).

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
2, 4	112(b)	Indefiniteness	2, 4	
1	102(a)(1)	On Sale Bar (Wang Springs)		1
Overall Outcome			2, 4	1, 3

In addition, we *deny* Patent Owner's Motion to Amend the '547 patent, as shown in the following table:

Motion to Amend Outcome	Claim(s)
Original Claims Cancelled By Amendment	
Substitute Claims Proposed in the Amendment	5, 6
Substitute Claims: Motion to Amend Granted	
Substitute Claims: Motion to Amend Denied	5, 6
Substitute Claims: Not Reached	

VII. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner *has not shown* claims 1 and 3 of the '547 patent are unpatentable by a preponderance of the evidence;

FURTHER ORDERED that Petitioner *has shown* claims 2 and 4 of the '547 patent are unpatentable by a preponderance of the evidence;

FURTHER ORDERED that Patent Owner's Motion to Amend the '547 patent is *denied*; and

FURTHER ORDERED that, because this is a final written decision, parties to this proceeding seeking judicial review of our Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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