

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTEX RECREATION CORP.,
Petitioner,

v.

BESTWAY INFLATABLES & MATERIALS CORP.,
Patent Owner.

IPR2023-00486
Patent 10,687,633 B2

Before BARRY L. GROSSMAN, KIMBERLY McGRAW, and
RICHARD H. MARSCHALL, *Administrative Patent Judges*.

McGRAW, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

Intex Recreation Corp. (“Petitioner”) filed a Petition (Paper 1, “Pet.”) requesting an *inter partes* review of claims 1, 2, 16, 19, and 20 of U.S. Patent No. 10,687,633 B2 (Ex. 1001, “the ’633 patent”). Petitioner also filed a Ranking and Explanation of Material Differences Between Petitions to address its four concurrently filed petitions (IPR2023–00486 through IPR2023-00489) challenging claims of the ’633 patent. Paper 3. Bestway Inflatables and Material Corp. (“Patent Owner”) filed a Preliminary Response. Paper 8 (“Prelim. Resp.”). With our authorization (Paper 9), Petitioner then filed a Reply (Paper 10, “Reply”) to respond to Patent Owner’s Preliminary Response, to which Patent Owner filed a Sur-Reply to Petitioner’s Reply. Paper 11 (“Sur-Reply”).

We have authority to determine whether to institute an *inter partes* review. 35 U.S.C. § 314(b); 37 C.F.R. § 42.4(a). The standard for instituting an *inter partes* review is set forth in 35 U.S.C. § 314(a), which provides that an *inter partes* review may not be instituted unless “there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” Applying this standard, we institute an *inter partes* review of all challenged claims of the ’633 patent on the grounds asserted in the Petition. *PGS Geophysical AS v. Iancu*, 891 F.3d 1354, 1360 (Fed. Cir. 2018) (stating that a decision to institute is “a simple yes-or-no institution choice respecting a petition, embracing all challenges included in the petition”).

II. BACKGROUND

A. Related Matters

The parties identify *Bestway (USA), Inc. et al. v. Intex Recreation Corp. et al.*, No. 2:22-cv-00406 (C.D. Cal.) (the “District Court Proceeding”) as a related matter involving the ’633 patent. Pet. 1; Paper 6 (Patent Owner’s Mandatory Notice), 2.¹ In addition, the parties identify IPR2023-00487, IPR2023-00488, and IPR2023-00489, which also challenge claims of ’633 patent, as well as pending U.S. Patent Appl. No. 16/907,893, which is a continuation of the application that became the ’633 patent, as related matters. Pet. 1; Paper 6, 2.

B. Real Parties-in-Interest

Petitioner identifies itself, Intex Development Company Ltd., Intex Industries (Xiamen) Co., Ltd., and Intex Marketing Ltd. as real parties-in-interest. Pet. 1. Patent Owner identifies itself, Bestway (USA), Inc., Bestway Global Holding, Inc., and Bestway (Hong Kong) International, Ltd. as real parties-in-interest. Paper 6, 2.

C. Overview of the ’633 patent

The ’633 patent, titled “Inflatable Bed,” “relates to inflatable beds or inflatable mattresses, and more specifically, to an inflatable bed, the structure of which is configured to limit the outward bulging or deformation of a side wall.” Ex. 1001, code (54), 1:12–15. The ’633 patent discloses that prior art inflatable beds or mattresses having a larger height can experience side wall bulging and deforming, which affects appearance and

¹ Patent Owner’s Mandatory Notice filed in accordance with 37 C.F.R. § 42.8 does not include page numbers. Paper 6. We consider the title page as page 1 and then proceed from there in numerical order.

may result in decay of air pressure and softening that reduces comfort. *Id.* at 1:37–46. The '633 patent also discloses that these prior art inflatable beds or mattresses also have a stability issue in which the bed may roll over as a user sits or lies near the edge. *Id.* at 1:60–65. According to the '633 patent, “[t]he technical problem to be solved by the present invention to provide an inflatable bed, in order to overcome the defects of easy occurrence of bulging and deformation of the side walls of the inflatable beds and inflatable mattresses, poor stability of the inflatable beds and inflatable mattresses, and susceptibility of roll-over.” *Id.* at 2:7–12.

Figure 6 of the '633 patent, reproduced below, is a partial section view of an inflatable bed according to a first embodiment. *Id.* at 5:13–15.

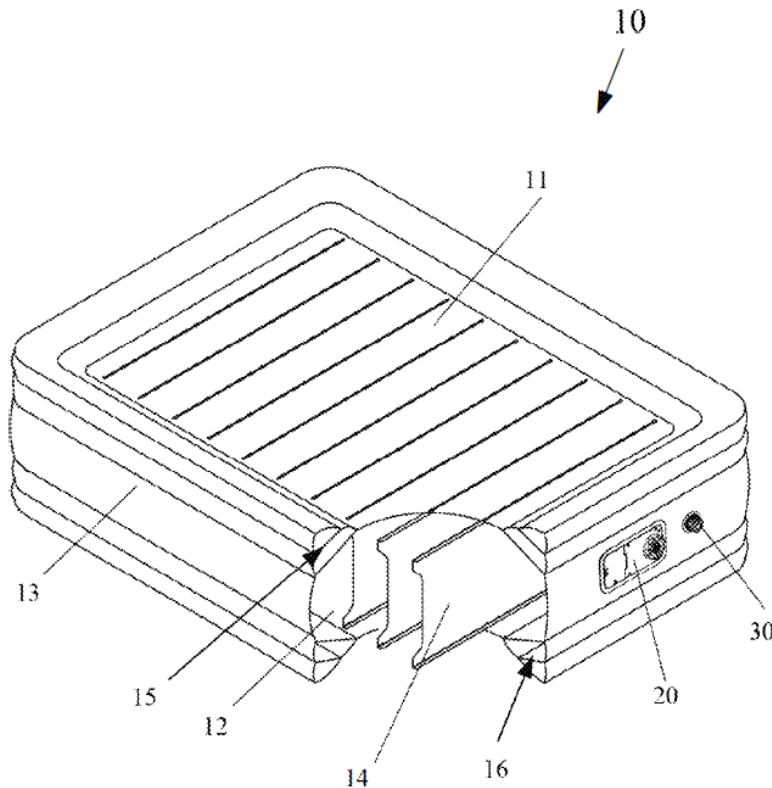


Fig. 6

Figure 6 of the '633 patent depicts inflatable bed 10 including top sheet 11, bottom sheet 12, at least one side wall 13, and at least one first tensioning structure 14. *Id.* at 6:18–22. An upper edge of sidewall 13 is coupled to an outer edge of top sheet 11 and a lower edge of sidewall 13 is coupled to an outer edge of bottom sheet 12. *Id.* at 6:22–26. An air chamber is formed between the top sheet 11, bottom sheet 12, and side wall 13. *Id.* at 6:26–28. First tensioning structure 14 includes upper and lower ends that are coupled to top sheet 11 and lower sheet 12, respectively. *Id.* at 6:28–31. According to the '633 patent, first tensioning structure 14 limits upward and downward bulging of top sheet 11 and bottom sheet 12 after the air chamber is inflated. *Id.* at 6:31–35. Inflatable bed 10 also includes a support structure comprising second tensioning structure 15 and third tensioning structure 16. *Id.* at 6:47–48. Second tensioning structure 15 is coupled to side wall 13 and top sheet 11 to limit lateral bulging of top sheet 11 and side wall 13 after the air chamber is inflated. *Id.* at 6:49–55. Similarly, third tensioning structure 16 is coupled to side wall 13 and bottom sheet 12 to limit lateral bulging of bottom sheet 12 and side wall 13. *Id.* at 6:56–63.

D. The Challenged Claims

Petitioner challenges claims 1, 2, 16, 19, and 20 of the '633 patent. Pet. 1. Claim 1 is the only independent claim and is reproduced below with bracketed lettering added for reference convenience.

- 1.[a] An inflatable bed, comprising:
 - [b] a top sheet and a bottom sheet disposed vertically at an interval;
 - [c] at least one side wall, an upper edge of said side wall being coupled to an outer edge of said top sheet, a lower edge of said side wall being coupled to an outer edge of said bottom

sheet, an air chamber formed between said top sheet, said bottom sheet and said side wall;

[d] at least one first tensioning structure disposed in said air chamber, an upper end and a lower end of said first tensioning structure being respectively coupled to said top sheet and said bottom sheet; and

[e] at least one support structure disposed in said air chamber, said support structure being disposed in a longitudinal direction of at least one of said side walls, at least two outside edges of said support structure being respectively coupled to the side wall adjacent, at least one inside edge of said support structure being coupled to the top sheet or bottom sheet adjacent;

[f] wherein said support structure comprises a second tensioning structure and a third tensioning structure, at least two outside edges of said second tensioning structure are respectively coupled to said at least one side wall, at least one inside edge of said second tensioning structure is coupled to said top sheet; and

[g] wherein at least two outside edges of said third tensioning structure are respectively coupled to said at least one side wall, at least one inside edge of said third tensioning structure is coupled to said bottom sheet.

Ex. 1001, 12:37–65.

E. Asserted Grounds of Unpatentability

Petitioner contends claims 1, 2, 16, 19, and 20 of the '633 patent are unpatentable on the following grounds. Pet. 3–4.

Claim(s) Challenged	35 U.S.C. §	Reference(s)
1–2	103 ²	Aoki ³
1–2, 16	103	Aoki, Lin ’773 ⁴
16	103	Aoki, Lin ’773, Liu ⁵
19, 20	103	Aoki, Lin ’773, Lin ’866 ⁶

Pet. 3–4. In support of its unpatentability arguments, Petitioner relies on the declaration of Bernhard Kuchel. Ex. 1002 (“Kuchel Declaration”).

F. Overview of Asserted Art

1. Aoki

Aoki is a Japanese patent application that “relates to a highly stable box-shaped air mattress structure.” Ex. 1005, 2.⁷ Aoki discloses a “box-shaped air mattress in which a vertical hanging sheet between the upper and bottom sheet of the box-shaped air mattress, as well as diagonal bracing hanging sheets between the upper and lengthwise sheets, bottom and lengthwise sheets, upper and widthwise sheets, and the bottom and widthwise sheets, respectively.” *Id.*

Figure 1 of Aoki, reproduced below, shows an embodiment of a box-shaped air mattress. *Id.* at 6.

² The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), amended 35 U.S.C. § 103 effective March 16, 2013. Because the application giving rise to the ’633 patent was filed after that date, with no benefit claim prior to that date, the AIA version of § 103 applies. See Ex. 1001, (60).

³ JPU-1-1974-034811, dated June 28, 1972 (Japanese language document (Ex. 1004); English translation (Ex. 1005, “Aoki”).

⁴ US 8,562,773 B2, issued Oct. 22, 2013 (Ex. 1009, “Lin ’773”).

⁵ US 2015/0335164 A1, published Nov. 26, 2015 (Ex. 1015, “Liu”).

⁶ US 7,269,866 B2, issued Sept. 18, 2007 (Ex. 1011, “Liu ’866”).

⁷ We cite to the exhibit page numbers added by Petitioner to the English language version (Ex. 1005).

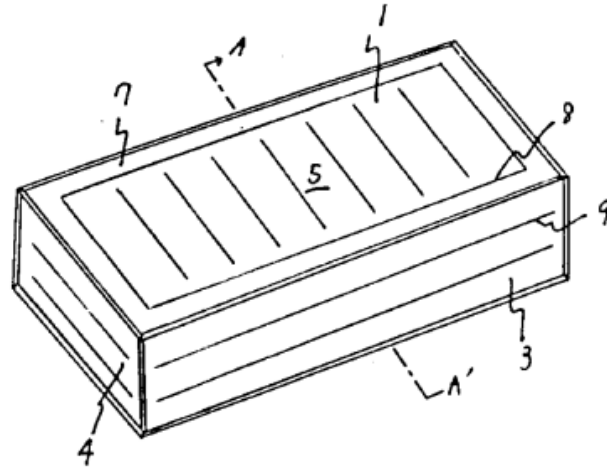


Figure 1 of Aoki depicts box-shaped air mattress 5 including upper sheet 1, bottom sheet 2 (not shown), peripheral areas 7, lengthwise sheet 3, and widthwise sheet 4. *Id.* at 3. Multiple vertical hanging sheets 6 (labelling not shown) are located between the upper and lower sheets. *Id.*

Figure 2 of Aoki, reproduced below, is a cross-section view of box-shaped air mattress 5 shown in Figure 1 along line A–A'. *Id.* at 6.

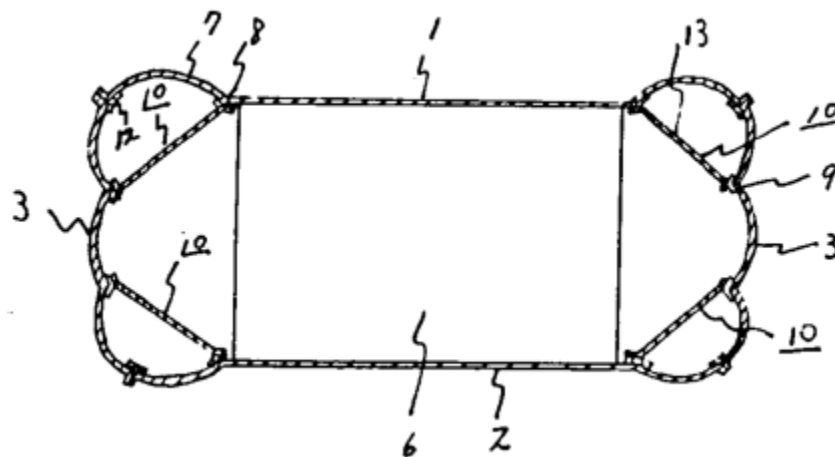


Figure 2 of Aoki depicts vertical hanging sheet 6 placed in between upper sheet 1 and lower sheet 2. *Id.* at 3. Each diagonal bracing hanging sheet 10 adheres to one of lengthwise sheets 3 and one of upper sheet 1 and lower sheet 2. *See id.* Diagonal bracing sheets 10 tense to maintain an almost perpendicular relationship between upper and lower sheets 1 and 2 and

lengthwise and widthwise sheets 3 and 4. *Id.* at 4. Aoki also discloses that, for large box-shaped air mattresses, two or more diagonal bracing sheets 10 may be used in each corner to the air mattress. *Id.* at 5, Fig. 4.

2. *Lin '773*

Lin '773, titled “Method of Producing an Internal Tensioning Structure Useable with Inflatable Devices,” relates “to an inflatable product structure which is light in weight and low in cost.” Ex. 1009, code (54), 1:20–22. Lin '773 discloses an internal tensioning structure for inflatable products that maintains a desired geometric arrangement of inflatable surfaces. *Id.* at 2:8–13.

Figure 1 of Lin '773, reproduced below, is an exploded perspective view of a tensioning structure according to one embodiment. *Id.* at 5:4–6.

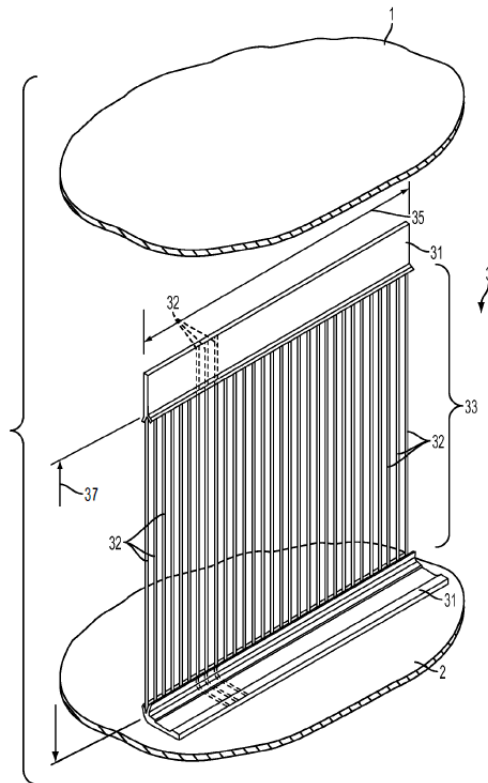


FIG. 1

Figure 1 of Lin '773 depicts tensioning structure 3 for joining upper material 1 and lower material 2. *Id.* at 7:16–22. Tensioning structure 3 includes upper and lower weld strips 31, which are connected by a plurality of substantially-parallel strands 32 and are welded to upper material 1 and lower material 2. *Id.* at 7:16–25.

3. *Liu*

Liu, titled “Internal Supports for Inflatable Products,” relates “to an inflatable product incorporating a durable tensioning structure that is light in weight and low in cost.” Ex. 1015, code (54), ¶ 3. Liu discloses a tensioning structure that spans the gap between sheets of an inflatable product. *Id.* ¶ 11.

Figure 1 of Liu, reproduced below, is an exploded perspective view of an exemplary air mattress incorporating a tensioning structure. *Id.* ¶ 21.

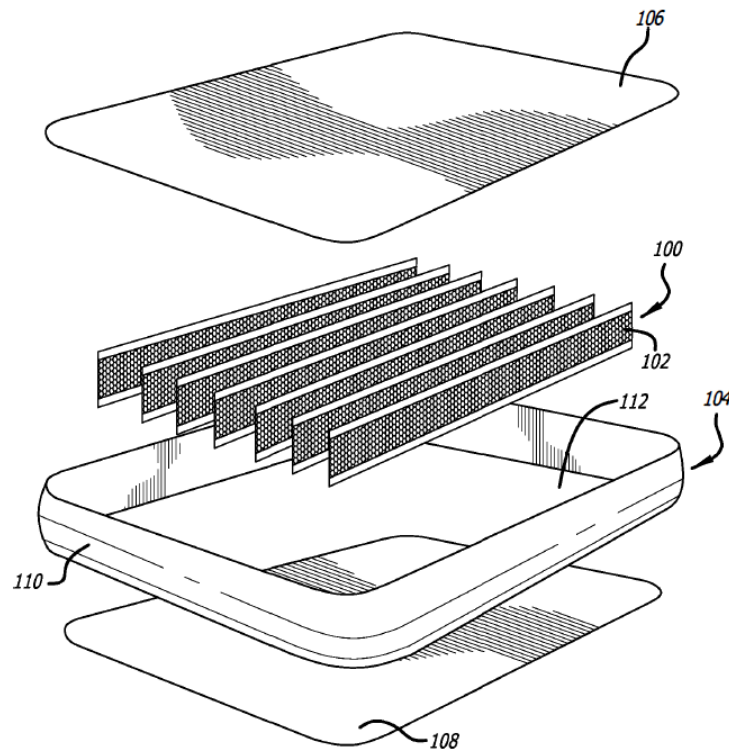


FIG. 1

Figure 1 of Liu depicts inflatable air mattress 104 including top sheet 106 and bottom sheet 108, and flexible sidewall 110, which are peripherally-welded to form inflatable chamber 112. *Id.* ¶ 37. Tensioning structures 100 within inflatable chamber 112 may include one or more I-beam support structures 102 attached to the inner surfaces of top sheet 106 and bottom sheet 108. *Id.* Liu also discloses the use of “RF welding, hot-air coupling, adhering, or other means known in the art” to attach tensioning structures to the top and bottom sheets. *Id.* ¶ 54.

4. *Liu ’866*

Liu ’866, titled “Air bed with Stable Supporting Structure,” relates “to an air bed with a stable supporting structure.” Ex. 1011, code (54), 1:7–8. Liu ’866 discloses that an object of the invention is to “provide an air bed that has satisfactory stability, a simple structure, and a very beautiful appearance.” *Id.* at 1:60–62.

Figure 2 of Liu ’866, reproduced below, is a diagram showing the internal structure an air bed according to one embodiment. *Id.* at 2:37–38.

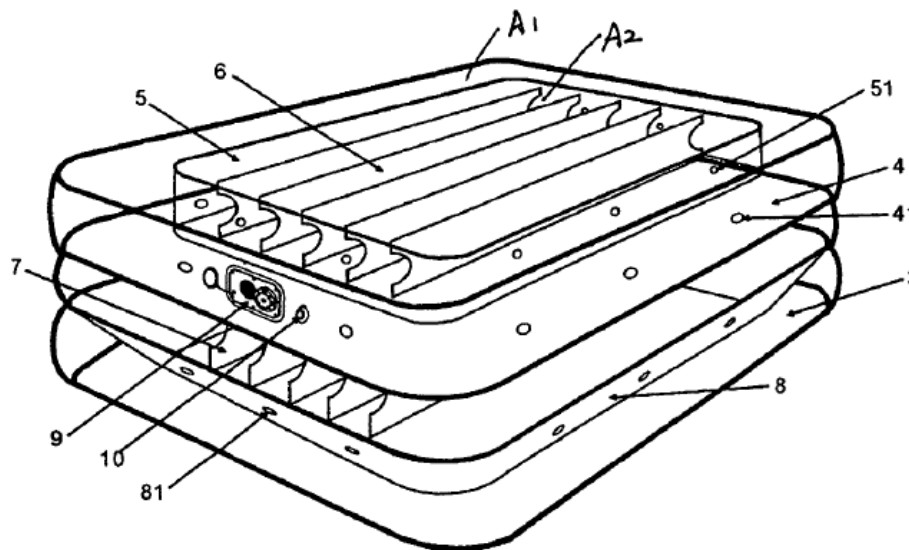


Fig.2

Figure 2 of Liu '866 depicts an air bed comprising periphery sheet 1, top sheet 2, bottom sheet 3, and middle sheet 4. *Id.* at 2:56–58. The upper edge of periphery sheet 1 is welded to top sheet 2, the lower edge of periphery sheet 1 is welded to bottom sheet 3, and middle sheet 4 is welded to the middle portion of periphery sheet 1 to create upper and lower air chambers. *Id.* at 2:58–64. Liu also discloses a built-in electric air pump used to inflate the air chambers. *Id.* at 3:38–41.

III. ANALYSIS

A. Discretion under 35 U.S.C. § 314(a) Due to Parallel Petitions

Petitioner filed four petitions challenging the patentability of claims of the '633 patent. The instant petition challenges claims 1, 2, 16, 19, and 20, which are the same claims at issue in the related District Court Proceeding, and relies on Aoki and other references. Paper 3, 1–2. The petition in IPR2023-00487 also challenges these same claims, but relies on Lin and other references. *Id.*

The remaining claims of the '633 that were not asserted in the District Court proceeding, namely claims 3–11 and 17⁸, are challenged in both IPR2023-00488 and IPR2023-00489. *Id.* The petition in IPR2023-00488 relies on Aoki and other references while the petition in IPR223-00489 relies on Lin and other references. *Id.*

Petitioner requests that we institute in all four IPRs, but that we consider the Petition in this proceeding first. Paper 3, 1. Patent Owner argues Petitioner has not shown justification for four petitions. Prelim.

⁸⁸ Petitioner does not challenge claim 18, contending that the claim is indefinite and indefiniteness cannot be resolved in an IPR. Pet. 2 n.1,

Resp. 1–14. Patent Owner requests that the we exercise our discretion under 35 U.S.C. § 314(a) to institute no more than one of the four petitions. *Id.* at 2.

Because Petitioner ranked this Petition first and Patent Owner does not object to this ranking, we decline to exercise our discretion to deny institution under 35 U.S.C. § 314(a) in this proceeding based on the filing of additional petitions challenging the same patent. In separate decisions, we address the petitions filed in IPR2023-00487, IPR2023-00488, and IPR2023-00489.

B. Claim Construction

We apply the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. § 282(b), including construing the claim accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history. 37 C.F.R. § 42.100(b) (2020). Under this standard, claim terms are given their ordinary and customary meaning as would have been understood by a person of ordinary skill in the art at the time of the invention and in the context of the entire patent disclosure. *Philips v. AWH Corp.*, 415 F.3d 1303, 1312–14 (Fed. Cir. 2005) (en banc). Only terms that are in controversy need to be construed, and then only to the extent necessary to resolve the controversy. *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999); *see also Nidec Motor Corp. v. Zhongshan Board Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (applying *Vivid Techs.* in the context of an *inter partes* review).

1. “*air holes*”

Claim 2 requires that the second and third tensioning structures have a “plurality of air holes through which an airflow passage is formed in said air chamber.” Ex. 1001, 12:66–13:3. Petitioner asserts a person of ordinary skill in the art (a “POSITA”) would construe “air holes” in accordance with its plain and ordinary meaning as “openings through which air may flow.” Pet. 17 (citing Ex. 1002 ¶¶ 77–81); Pet. 19 (citing Ex. 1035 (Merriam-Webster Dictionary), 3 (defining “hole” as “an opening through something” and “an area where something is missing”)). Petitioner further asserts that a POSITA would understand that airholes “would include gaps in a tensioning structure where individual constituent parts of the structure are not joined, allowing communication throughout the cavity.” Pet. 17 (citing Ex. 1002 ¶¶ 79–80).

Petitioner also points to, *inter alia*, Figures 7 and 8 of the ’633 patent, shown below, with Petitioner’s color annotations added. Pet. 18 (citing Ex. 1001, 9:12–22, Figs. 7, 8, 10, 11).

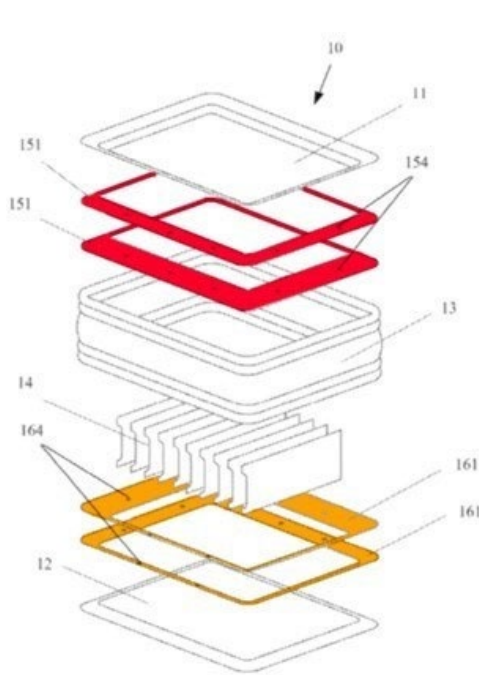


Fig. 7

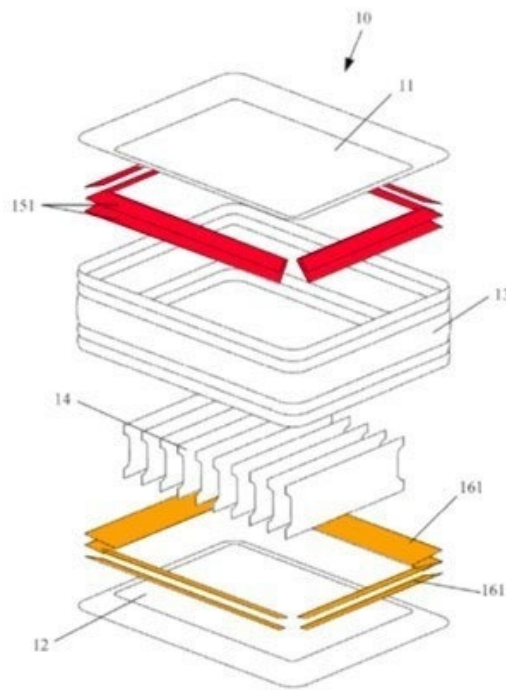


Fig. 8

Figure 7 (left) is an exploded view of a first embodiment of the inflatable bed disclosed in the '633 patent, depicting two I-beams 151 (red) having air holes 154 and two I-beams 161 (orange) having air holes 164. *See* Ex. 1001, 5:16–17; 7:41–50. Figure 8 (right) is a second exploded view of the first embodiment of the inflatable bed disclosed in the '633 patent, depicting I-beams 151 (red) and I-beams 164 (orange). Ex. 1001, 5:18–19.

It appears that Petitioner asserts the gaps shown in the corners of the I-beams 151 (red) and 161 (orange) of Figure 8 of the '633 patent are “air holes” as properly construed. *See* Pet. 17–19. Petitioner notes that the '633 Patent Specification states that the I-beams (151, 161) are provided with air holes (154, 164) and that “an airflow passage is formed in said air chamber through the air holes 164 (as shown in FIGS. 7 and 8).” Pet. 18 (quoting Ex. 1001, 7:45–50). Petitioner also notes that Figure 7 depicts I-beams 161 (which are joined in the corners) having air holes 164, while Figure 8 depicts

I-beams 161 “as comprising eight separate I-beams which are not joined at the corners.” Pet. 18–19 (citing Ex. 1001, Figs. 7, 8, 9:12–22); *see also* Pet. 37 (stating that gaps in the corner of tensioning structures are “air holes” through which air may flow within the air chamber). Petitioner thus concludes that the Specification confirms that both the structure shown in Figure 7 and that in Figure 8 would fall within the scope of claim 2’s recitation of second and third tensioning structures provides with a plurality of “air holes.” Pet. 19.

Patent Owner does not dispute Petitioner’s construction of air holes at this stage of the proceeding.

For the purposes of this Decision, we accept Petitioner’s undisputed construction of air holes. The parties are invited to address this construction during trial if they so choose.

We also determine that no other claim terms need to be construed to resolve any controversies in dispute. *See Nidec Motor Corp.*, 868 F.3d at 1017 (stating only those claim terms that are in controversy need to be construed, and only to the extent necessary to resolve the controversy). We note that our ultimate interpretation of the claims will be based on the complete record at the end of trial.

C. Level of Skill in the Art

Petitioner asserts that a POSITA would have “at least: [a] bachelor’s degree in mechanical engineering, or an equivalent field; or [a]n associate’s degree in mechanical engineering, or an equivalent field, and two years of practical experience in inflatable product design.” Pet. 16 (citing Ex. 1002 ¶¶ 30–31) (bullet symbols omitted). Petitioner asserts that “[m]ore

education can supplement practical experience and vice versa.” *Id.* (citing Ex. 1002 ¶ 32).

Patent Owner does not dispute Petitioner’s definition of a POSITA. *See generally* Prelim. Resp. We adopt Petitioner’s definition of a POSITA, except that we delete the qualifier “at least” to eliminate vagueness as to the appropriate level of education or experience. The qualifier expands the range without an upper bound (e.g., encompassing a Ph.D. degree and beyond) and thus does not meaningfully indicate the level of ordinary skill in the art. This definition of a person of ordinary skill in the art is supported by the testimony of Mr. Kuchel and appears to be commensurate with the level of ordinary skill as reflected in the prior art and the ’633 patent. *See* Ex. 1002 ¶¶ 31–32.

D. Legal Principles

An invention is not patentable under 35 U.S.C. § 103 “if the differences between the subject matter sought to be patented 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.” 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 skill in the art; and, (4) where in evidence, so-called secondary considerations, including commercial success, long-felt but unsolved needs, and failure of others.⁹ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

⁹ At this stage of the proceeding, neither party has directed us to evidence of such secondary considerations.

When evaluating a combination of teachings, we must also “determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007) (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

E. Asserted Unpatentability of Claims 1 and 2 over Aoki (Ground 1)

Petitioner contends that independent claim 1 and dependent claim 2 are unpatentable under 35 U.S.C. § 103 over Aoki. Pet. 26–38. Patent Owner does not address the merits of the Petition in its Preliminary Response. *See* Prelim. Resp. 8–31. For the reasons set forth below, we determine Petitioner has shown a reasonable likelihood that claims 1 and 2 are unpatentable over Aoki.

1. Claim 1

a) An inflatable bed, comprising:

Petitioner asserts that Aoki’s box-shaped air mattress constitutes an inflatable bed as recited in the preamble. Pet. 26 (citing Ex. 1005, 2, 3, Figs. 1, 2; Ex. 1002 ¶ 129). Patent Owner does not dispute Petitioner’s assertions at this stage of the proceeding. *See generally* Prelim. Resp. We have reviewed Petitioner’s arguments and evidence and determine that Petitioner sufficiently shows that Aoki teaches an inflatable bed as recited in the preamble.¹⁰

¹⁰ Because Petitioner sufficiently shows Aoki teaches the subject matter recited in the preamble, we do not determine whether the preamble is limiting.

b) a top sheet and a bottom sheet disposed vertically at an interval;

Petitioner asserts that Aoki teaches the top and bottom sheet recited in claim element 1[b]. Pet. 26. Petitioner asserts Aoki's Figures 1 and 2 depict a top sheet (i.e., upper sheet 1) and a bottom sheet (i.e., bottom sheet 2) that are disposed vertically at an angle. Pet. 26 (citing Ex. 1005, 2, 3, Figs. 1, 2; Ex. 1002 ¶ 129). Patent Owner does not dispute Petitioner's assertions at this stage of the proceeding. *See generally* Prelim. Resp. We have reviewed Petitioner's arguments and evidence and determine that Petitioner sufficiently shows that Aoki teaches at top and bottom sheet recited in claim element 1[b].

c) at least one side wall, an upper edge of said side wall being coupled to an outer edge of said top sheet, a lower edge of said side wall being coupled to an outer edge of said bottom sheet, an air chamber formed between said top sheet, said bottom sheet and said side wall; and

Petitioner asserts that Aoki teaches the limitations of claim element 1[c]. Pet. 27–28. Petitioner asserts that Aoki's annotated Figures 1 and 2, shown below, depict at least one side wall (i.e., lengthwise sheets 3 and widthwise sheets 4, both labelled in green) having an upper edge and a lower edge. Pet. 27 (citing Ex. 1005, 3, 5, Figs. 1, 5; Ex. 1002 ¶ 129).

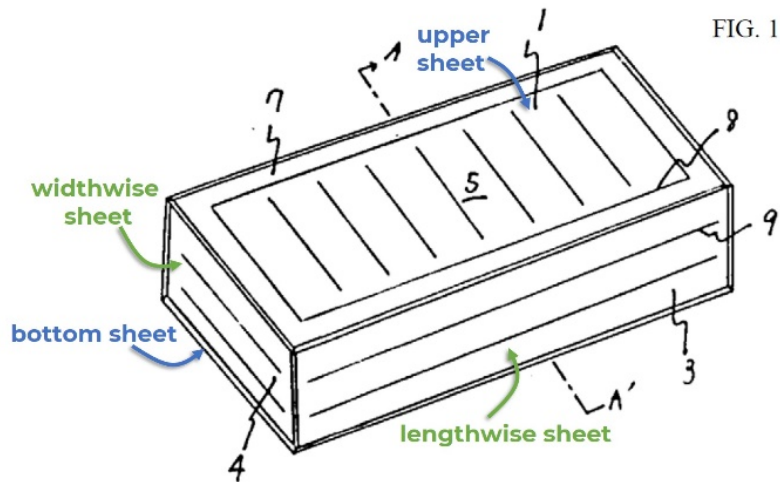


FIG. 1

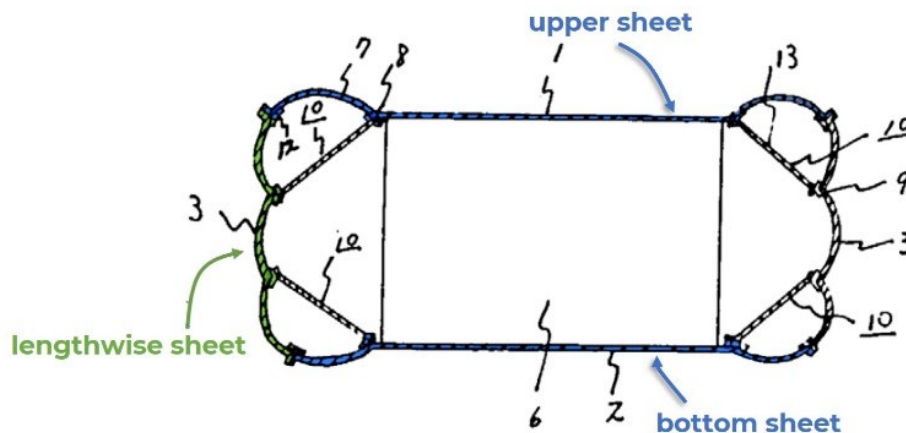


FIG. 2

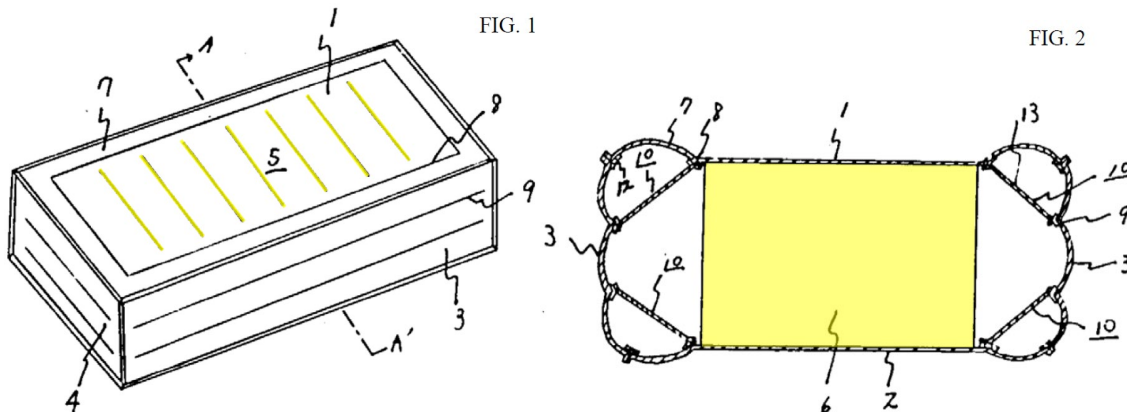
Aoki's Figure 1 (top) is an oblique drawing of an air mattress, with green and blue coloring and labeling of the top, bottom, and lengthwise sheets added by Petitioner. Aoki's Figure 2 (bottom) is a magnification of the cross-section of the A-A' line of the air mattress of Figure 1, with green and blue coloring and labeling of the top, bottom, and lengthwise sheets added by Petitioner. Ex. 1005, 6; Pet. 27.

Petitioner also asserts that the upper edges of the lengthwise and widthwise sheets (green) are coupled to the outer edges of the upper sheet 1 (blue) and that the lower edges of the lengthwise and widthwise sheets (green) are coupled to the outer edges of the bottom sheet 2 (blue). Pet. 27. Petitioner also asserts that an air chamber is formed between the upper sheet, bottom sheet, lengthwise sheets, and widthwise sheets. *Id.*

Patent Owner does not dispute Petitioner’s assertions at this stage of the proceeding. *See generally* Prelim. Resp. We have reviewed Petitioner’s arguments and evidence and determine that Petitioner sufficiently shows that Aoki teaches the limitations of claim element 1[c].

d) at least one first tensioning structure disposed in said air chamber, an upper end and a lower end of said first tensioning structure being respectively coupled to said top sheet and said bottom sheet; and

Petitioner asserts that Aoki teaches the first tensioning structure recited in claim element 1[d]. Petitioner asserts that the vertical hanging sheets 6 (yellow) shown in Figs 1 and 2 below are each a “first tensioning structure” that is disposed in the air chamber of the mattress. Pet. 28.



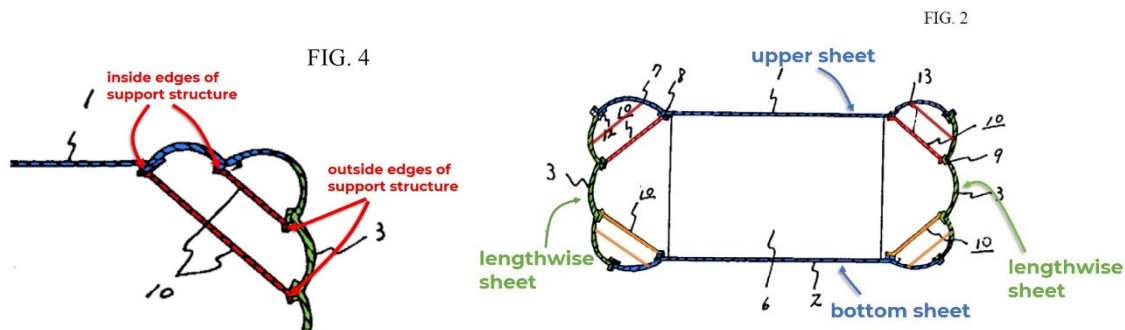
Aoki's Figure 1 (left) is an oblique drawing of an air mattress, with yellow coloring of the vertical hanging sheets 6 added by Petitioner; Aoki's Figure 2 (right) is a magnification of the cross-section of the A-A' line of the air mattress of Figure 1, with yellow coloring of the vertical hanging sheet 6 added by Petitioner. Ex. 1005, 6; Pet. 27.

Petitioner further asserts that the upper and lower ends of the hanging sheets are “adhered” or “sewn to” (i.e., coupled to) the respective upper and bottom sheets with ‘sufficient adhesive power’” to, *inter alia*, prevent the upper and bottom sheets from swelling and forming an arch. *Id.* (citing Ex. 1005, Figs. 1, 2).

Patent Owner does not dispute Petitioner's assertions at this stage of the proceeding. *See generally* Prelim. Resp. We have reviewed Petitioner's arguments and evidence and determine that Petitioner sufficiently shows that Aoki teaches the tensioning structures as recited in claim element 1[d].

e) at least one support structure disposed in said air chamber, said support structure being disposed in a longitudinal direction of at least one of said side walls, at least two outside edges of said support structure being respectively coupled to the side wall adjacent, at least one inside edge of said support structure being coupled to the top sheet or bottom sheet adjacent;

Petitioner asserts that Aoki's diagonal bracing hanging sheets 10, shown in Aoki's Figures 2 and 4 below, with Petitioner's annotations added, constitute the support structure recited in claim element 1[e]. Pet. 29–33.



Aoki's Figure 4 (left) is a cross section of an air mattress depicting two diagonal bracing hanging sheets 10, with Petitioner's annotations, including coloring and labeling of the inside and outside edges of support structure, added. Ex. 1005, 6; Pet. 33. Aoki's Figure 2 (right) is an oblique drawing of an air mattress depicting multiple diagonal bracing hanging sheets 10 (red and orange) with Petitioner's annotations added, including coloring, the adding of additional diagonal bracing hanging sheets, and labeling of upper sheet 1 and bottom sheet 2. Ex. 1005, 6; Pet. 31.

For example, Petitioner asserts that Aoki's Figures 2 and 4 show two outside edges of a support structure (i.e., the outside edges of the two diagonal bracing hanging sheets 10 (red)) adhered or coupled to a side wall

(i.e., a lengthwise sheet 3 (green)) and at least one inside edge is coupled to the adjacent top or bottom sheet (i.e., upper sheet 1 or bottom sheet 2(blue)). Pet. 33 (citing Ex. 1005, Fig. 4; Ex. 1002 ¶ 139).

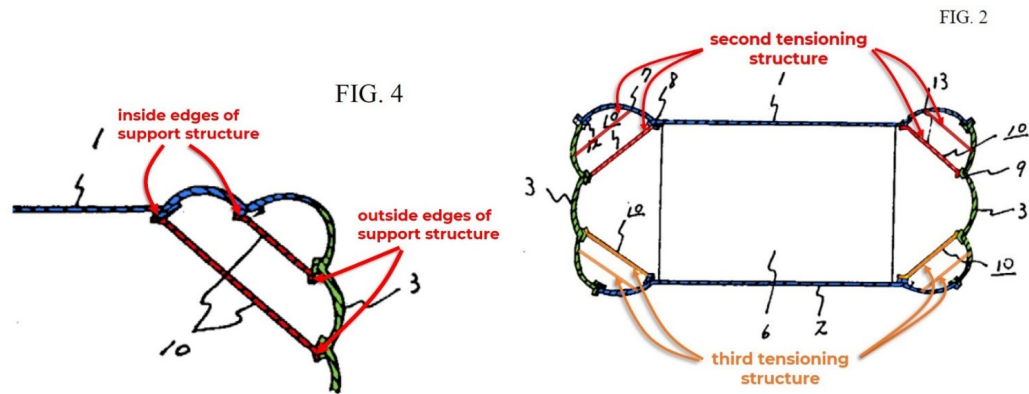
Petitioner also asserts that Aoki's teaching that the diagonal hanging sheets are "adhered or sewn to" adhesive sites on the upper, bottom, and side sheets satisfies the "coupled to" requirements of claim element 1[e]. Pet. 30 (citing Ex. 1002 ¶¶ 132–134; Ex. 1005, 2–4, Fig. 3).

Patent Owner does not dispute Petitioner's assertions at this stage of the proceeding. *See generally* Prelim. Resp. We have reviewed Petitioner's arguments and evidence and determine that Petitioner sufficiently shows that Aoki teaches the support structure recited in claim element 1[a].

- f) wherein said support structure comprises a second tensioning structure and a third tensioning structure, at least two outside edges of said second tensioning structure are respectively coupled to said at least one side wall, at least one inside edge of said second tensioning structure is coupled to said top sheet; and*
- g) wherein at least two outside edges of said third tensioning structure are respectively coupled to said at least one side wall, at least one inside edge of said third tensioning structure is coupled to said bottom sheet.*

Petitioner asserts that Aoki diagonal bracing hanging sheets 10, which are shown in Aoki's Figures 2 and 4¹¹ below, with Petitioner's annotations added, satisfy the limitations regarding the second and third tensioning structures recited in claim elements 1[f] and 1[g]. Pet. 34–36.

¹¹ Petitioner adds the second diagonal bracing hanging sheets shown in Aoki Figure 4 to Aoki's Figure 2. Pet. 34 n.3; Ex. 1002 ¶¶ 135–136 (stating Aoki teaches that additional hanging sheets may be placed in each corner).



Aoki's Figure 4 (left) is a cross section of an air mattress depicting two diagonal bracing hanging sheets 10, with Petitioner's annotations, including coloring and labeling of the inside and outside edges of support structure, added. Ex. 1005, 6; Pet. 35. Aoki's Figure 2 (right) is an oblique drawing of an air mattress depicting multiple diagonal bracing hanging sheets 10 (red and orange) with Petitioner's annotations, including coloring, labeling of the second and third tensioning structures, and additional diagonal bracing hanging sheets added to the second and third tensioning structures. Pet. 35; Ex. 1005, 6.

For example, Petitioner asserts that Aoki's s 2 and 4 show two outside edges of the second tensioning structure (i.e., the outside edges of the two diagonal bracing hanging sheets (red)) adhered or coupled to a side wall (i.e., a lengthwise sheet 3 (green)) and at least one inside edge is coupled to the top sheet (i.e., upper sheet 1 (blue)). Pet. 34–35 (citing Ex. 1005, Fig. 4). Similarly, Petitioner asserts that Aoki's Figure 4 shows two outside edges of the third tensioning structure (i.e., the outside edges of the two diagonal bracing hanging sheets (orange)) adhered or coupled to a side wall (i.e., a lengthwise sheet 3 (green)) and at least one inside edge is coupled to bottom sheet 1 (blue)). Pet. 35–36 (citing Ex. 1005, Fig. 4; Ex. 1002 ¶ 142); *see also* Ex. 1002 ¶ 140 n.3 (stating that the second and third tensioning structures are each comprised of multiple diagonal bracing hanging sheets).

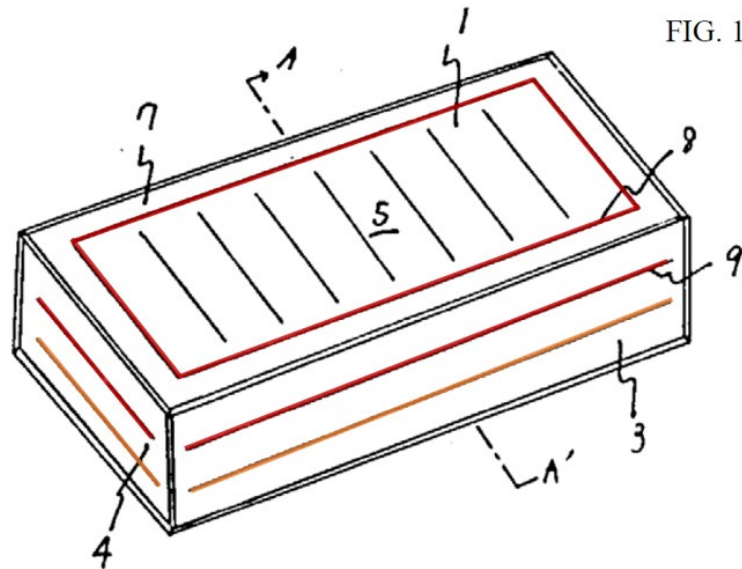
Patent Owner does not dispute Petitioner's assertions at this stage of the proceeding. *See generally* Prelim. Resp. We have reviewed Petitioner's

arguments and evidence and determine that Petitioner sufficiently shows that Aoki teaches the second and third tensioning structures as recited in claim element 1[f].

2. *Claim 2*

Petitioner contends that Aoki teaches the limitations of claim 2, which requires that the second and third tensioning structures “are respectively provided with a plurality of air holes through which an airflow passage is formed in said air chamber.” Pet. 36–38. Petitioner defines “air holes” as “openings through which air may flow.” Pet. 17 (citing Ex. 1002 ¶¶ 77–81). Petitioner further states that the term “air holes” includes “gaps in a tensioning structure where individual constituent parts of the structure are not joined, allowing fluid communication throughout the cavity.” *Id.* (citing Ex. 1002 ¶¶ 79–80).

Petitioner asserts that Aoki’s second tensioning structures (i.e., the red diagonal bracing hanging sheets) and the third tensioning structures (i.e., the orange diagonal bracing hanging sheets) shown in annotated Figure 1 below form “depression lines” that do not span the entire length of these sheets. Pet. 37.



Thus, Petitioner asserts, that each of the second and third tensioning structures will have gaps in each corner (i.e., air holes), through which air may flow within the chamber. *Id.*

Patent Owner does not dispute Petitioner's assertions or claim constructions at this stage of the proceeding. *See generally* Prelim. Resp. We have reviewed Petitioner's arguments and evidence and determine that Petitioner sufficiently shows that Aoki teaches the limitations recited in claim 2.

F. Asserted Unpatentability of Claims 1, 2, and 16 over Aoki and Lin '733 (Ground 2)

Petitioner asserts that claims 1, 2, and 16 are unpatentable over Aoki and Lin '733. Pet. 38–50 (citing, *inter alia*, Ex. 1002 ¶¶ 187–194).

As noted above, claim element 1[e] requires that the support structure be “coupled” to the side wall, top sheet, or bottom sheet and claim elements 1[f] and [g] requires that the second and third tensioning structures of the support structure be coupled to the side wall, top sheet, or bottom sheet. Petitioner asserts that to the extent that Aoki does not teach these limitations, that Lin '733 does. Pet. 38–39. Petitioner asserts that Lin '733's

“tensioning structures,” shown in Figure 1 below, are used to “join two pieces of material” such as the upper and lower sheets of an air mattress. Pet. 39 (citing Ex. 1009, 7:9–14, 7:62–8:3). A tensioning structure of Lin Figure 1, with Petitioner’s color annotations added, is shown below.

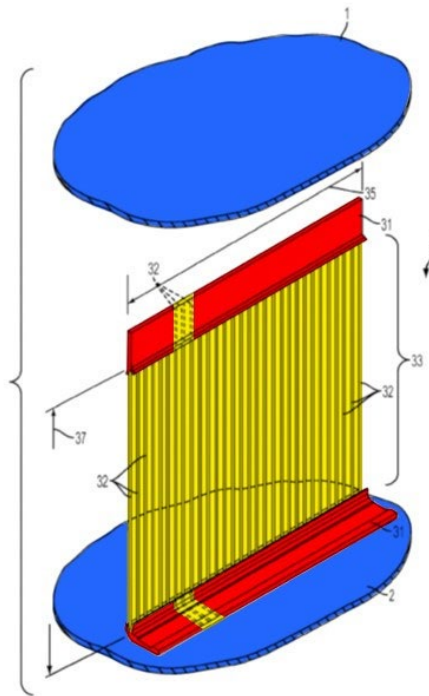


FIG. 1

3

Lin '733's Figure 1 above, with Petitioner's color annotations added, shows tensioning structure 3 having a plurality of substantially parallel strands 32 (yellow) and upper and lower weld strips 31 (red). Ex 1009, 7:17–22.

Petitioner states that the weld strips (red) are welded to material, such as the top and bottom sheets (blue) of an inflatable bed. Pet. 40 (citing Ex. 1009, 7:22–25, 7:53–66, Fig. 3). Petitioner asserts that it would have been obvious for a POSITA to use Lin '733's tensioning structures for Aoki's diagonal hanging sheets. Pet. 42. Petitioner also asserts that it would have been obvious for a POSITA to use the same plastic material for Lin '773's weld strips and the outer surfaces of Aoki to allow for a secure welded connection and to provide high tensile strength. Pet. 41–43 (citing,

inter alia, Ex. 1009, 11:30–49; Ex. 1002 ¶¶ 187–194). Petitioner also asserts that Lin ’773 teaches use of the well-known “high-frequency welding” process used to couple the tensioning structures to top, bottom, or side sheets as required by claim 16. Pet. 49–50 (citing Ex. 1009, 7:16–25, 8:4–29, 8:47–55, 11:11–38, Figs. 3, 4, 7; Ex. 1002 ¶ 249; Ex. 1026, 4:26–37, 5:39–45; Ex. 1027 ¶¶ 35, 36, 14; Ex. 1034 ¶ 11; Ex. 1003, 448–449).

Petitioner also asserts that the space between each strand of Lin ’773’s tensioning structures constitutes an “air hole” (i.e., an opening through which air may flow) as required by claim 2. Pet. 43–44 (citing, *inter alia*, Ex. 1009, 8:47–55, Fig. 1; Ex. 1002 ¶ 198); *see also* Pet. 45 (stating Patent Owner admitted spaces between cables in a tensioning structure “comprises air holes” and citing Ex. 1038, 570 (claim 3), 575 (claim 32). Petitioner contends that it would have been obvious to modify Aoki to employ Lin ’773’s tension structures as the second and third tensioning structures to meet the limitations of claim 2. Pet. 48 (citing Ex. 1002 ¶ 201). Petitioner also asserts that the use of air holes in tensioning structures was well known in the art. *See* Pet. 45 (citing Ex. 1002 ¶ 198; Ex. 1011, 3:20–22, 3:38–41, Figs. 2, 8; Ex. 1013 ¶ 68; Ex. 1014, ¶¶ 23–24, Figs. 5, 7, 8; Ex. 1025, 3:6–10, Fig. 3; Ex. 1041, 3:55–67, 5:14–30, 5:47–55; Ex. 1015 ¶¶ 41, 54; Ex. 1039, 5:45–62, 6:8–11).

Patent Owner does not dispute Petitioner’s contentions at this stage of the proceeding. *See generally* Prelim. Resp. We have reviewed Petitioner’s arguments and evidence and determine Petitioner has sufficiently shown the combined teachings of Aoki and Lin ’733 teach the subject matter recited in claims 1, 2, and 16 and has articulated sufficient reasoning with rational underpinning for combining the references. *See* Pet.

30–33. Accordingly, based on the record before us, Petitioner has demonstrated a reasonable likelihood of prevailing on its assertion that claims 1, 2, and 16 are unpatentable over Aoki and Lin ’733.

G. Asserted Unpatentability of Claim 16 over Aoki, Lin ’773, and Liu (Ground 3)

As noted above, Petitioner asserts that claim 16 is unpatentable over Aoki and Lin ’733. Petitioner further asserts that to the extent it would not have been obvious to couple Aoki’s tension structures by means of high-frequency welding based on Lin ’733’s teachings, that it would have been obvious to do so in view of Liu. Pet. 50–54. Petitioner asserts that to the extent that a POSITA would not have understood Lin ’733 to teach coupling tensioning structures to the top sheet, bottom sheet, and side walls by means of high-frequency welding, that a POSITA would have been motivated by Liu’s teachings of coupling its tensioning structures to the top and bottom sheets of an inflatable mattress using RF (radio frequency) welding, a high-frequency welding. Pet. 52 (citing, *inter alia*, Ex. 1002 ¶ 267; Ex. 1015 ¶ 35–40, 54, 63; Ex. 1002 ¶ 266). Petitioner asserts that Liu teaches advantages method for coupling the weld strips of tension structures to an inflatable bed. Pet. 53 (citing Ex. 1002 ¶ 267). Petitioner further asserts that high-frequency welding was a well-known method of coupling tensioning structures with known advantages. Pet. 53 (citing, *inter alia*, Ex. 1002 ¶ 267).

Patent Owner does not dispute Petitioner’s contentions at this stage of the proceeding. *See generally* Prelim. Resp. We have reviewed Petitioner’s arguments and evidence and determine Petitioner has sufficiently shown the combined teachings of Aoki, Lin ’733, and Liu teach the subject matter recited in claim 16 and has articulated sufficient reasoning with rational

underpinning for combining the references. *See* Pet. 50–54. Accordingly, based on the record before us, Petitioner has demonstrated a reasonable likelihood of prevailing on its assertion that claims 16 is unpatentable over Aoki, Lin ’733, and Liu.

H. Asserted Unpatentability of Claims 19 and 20 over Aoki and Liu ’866 (Ground 4)

Claim 19 depends from claim 1 and further requires a “built-in air pump, which is disposed on said side wall and is located between a lower edge of said second tensioning structure and an upper edge of said third tensioning structure for inflating said air chamber.” Claim 20 depends from claim 1 and further requires “an air valve, which is disposed on said side wall and is located between a lower edge of said second tensioning structure and an upper edge of said third tensioning structure for inflating said air chamber.” Petitioner asserts that Liu ’866 teaches the air pump recited in claim 19 and the air valve recited in claim 20. Pet. 54–62 (citing, *inter alia*, Ex. 1011, 3:38–41, Figs. 2, 8). Petitioner asserts that it would have been obvious to add Lui ’866’s air pump 9 and air valve 10 as a way more quickly and efficiently inflate and deflate Aoki’s air mattress, noting that built-in air pumps and air-valves were well known in the art. Pet. 55–57, 60–62 (citing, *inter alia*, Ex. 1002 ¶¶ 286, 295). Petitioner also asserts that it would have been obvious to locate the air pump as recited in claim 19 as a design choice from a finite number of options, and that a POSITA would have a reasonable expectation of success in placing the pump and in the middle portion of the mattress, between two tensioning structures. Pet. 57–58 (citing, *inter alia*, Ex. 1002 ¶ 288). Petitioner also asserts a POSITA would have known that placing the pump between the upper and lower diagonal bracing hanging

sheets would beneficially allow more space to install the pump. Pet. 58–59 (citing Ex. 1002 ¶ 289).

Patent Owner does not dispute Petitioner’s contentions at this stage of the proceeding. *See generally* Prelim. Resp. We have reviewed Petitioner’s arguments and evidence and determine Petitioner has sufficiently shown the combined teachings of Aoki, Lin ’733, and Liu teach the subject matter recited in claim 16 and has articulated sufficient reasoning with rational underpinning for combining the references. *See* Pet. 50–54. Accordingly, based on the record before us, Petitioner has demonstrated a reasonable likelihood of prevailing on its assertion that claims 16 is unpatentable over Aoki, Lin ’733, and Liu.

IV. CONCLUSION

For the reasons set forth above, we determine that Petitioner has demonstrated a reasonable likelihood of prevailing with respect to at least one challenged claim of the ’633 patent. Thus, we institute an *inter partes* review on all challenged claims and on all grounds presented.

At this stage of the proceeding, the Board has not made a final determination as to the patentability of any challenged claim or of any underlying factual and legal issues, including claim construction.

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that an *inter partes* review is instituted on each of the grounds asserted in the Petition; and

FURTHER ORDERED that, pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial, which shall commence on the entry date of this decision.

IPR2023-00486
Patent 10,687,633 B2

For PETITIONER:

R. Trevor Carter
Andrew M. McCoy
Reid E. Dodge
FAEGRE DRINKER BIDDLE & REATH LLP
trevor.carter@faegredrinker.com
andrew.mccoy.ptab@faegredrinker.com
reiddodgeptab@faegredrinker.com

For PATENT OWNER:

John S. Artz
Michael D. Saunders
DICKINSON WRIGHT PLLC
jsartz@dickinsonwright.com
msaunders@dickinson-wright.com