**UNITED STATES PATENT AND TRADEMARK OFFICE**

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**BEFORE THE PATENT TRIAL AND APPEAL BOARD**

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INTEX RECREATION CORP.
Petitioner

v.

BESTWAY INFLATABLES & MATERIALS CORP.
Patent Owner

U.S. Patent No. 10,687,633
Filing Date: Sept. 29, 2016
Issue Date: June 23, 2020
Title: Inflatable Bed

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Case IPR2023-00486

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# PETITION FOR *INTER PARTES* REVIEW UNDER 35 U.S.C. §§ 311–319 AND 37 C.F.R. § 42.100 *ET SEQ.*

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# I. INTRODUCTION

Intex Recreation Corp. ("Petitioner") respectfully requests *inter partes* review ("IPR") of claims 1, 2, 16, 19, and 20 (the "Challenged Claims") of U.S. Patent No. 10,687,633 ("the '633 Patent") (Ex. 1001).

# II. MANDATORY NOTICES (37 C.F.R. § 42.8)

## A. Real Party-in-Interest

Petitioner is the real party-in-interest for this petition, as are the following entities: Intex Development Company Ltd., Intex Industries (Xiamen) Co., Ltd., and Intex Marketing Ltd.

## B. Related Matters

The '633 Patent is presently asserted by Patent Owner against Petitioner in *Bestway (USA), Inc. et al. v. Intex Recreation Corp. et al.*, No. 2:22-cv-00406 (C.D. Cal.) (the "District Court Litigation"), filed January 19, 2022 and served on Petitioner on April 28, 2022. The District Court Litigation was stayed on January 18, 2023, pending Petitioner's IPRs. (Ex. 1057.)

On June 22, 2020, Patent Owner filed U.S. Patent Appl. No. 16/907,893 (the "Continuation Application" (Ex. 1055)), which is a continuation of the '633 Patent and remains pending.[1]

[1] The prior art and arguments presented in this Petition have not been disclosed to nor considered by the Examiner in the Continuation Application.

As explained in Petitioner's Notice of Ranking and Explanation filed herewith, Petitioner is concurrently filing an IPR petition challenging the Challenged Claims based on different grounds, as well as two IPR petitions challenging other claims of the '633 Patent.

Petitioner is not aware of any other judicial or administrative matter that would affect, or be affected by, a decision in this proceeding.

### C. Counsel and Service Information

Pursuant to 37 C.F.R. §§ 42.8(b)(3) and 42.10(a), Petitioner hereby identifies its lead and backup counsel as follows:

| **Lead Counsel** | **Back-Up Counsel** |
|---|---|
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Please address all correspondence to the lead counsel at the address shown above. Petitioner also consents to electronic service to all of the email addresses shown above. Pursuant to 37 C.F.R. § 42.10(b), a Power of Attorney accompanies this Petition.

## III. PAYMENT OF FEES (37 C.F.R. § 42.103)

Petitioner requests review of 5 claims. Petitioner authorizes the Commissioner to charge the $19,000 request fee, $22,500 post-institution fee, and any additional required fees to Deposit Account No. 02-0390.

## IV. GROUNDS FOR STANDING (37 C.F.R. § 42.104(A))

Petitioner certifies that the '633 Patent is available for IPR and that Petitioner is not barred or estopped from challenging the '633 Patent claims on the Grounds identified in this Petition.

## V. PRECISE RELIEF REQUESTED AND GROUNDS RAISED

Petitioner respectfully requests cancellation of the Challenged Claims based on the following Grounds:

| Ground | Claims | Statutory Basis | Reference(s) |
|---|---|---|---|
| 1. | 1-2 | §103 | JPU-1-1974-034811 ("Aoki") (Ex. 1004, 1005) |
| 2. | 1-2, 16 | §103 | Aoki in view of U.S. Patent No. 8,562,773 ("Lin '773") (Ex. 1009) |
| 3. | 16 | §103 | Aoki in view of Lin '773 and U.S. Patent Publication No. 2015/0335164 ("Liu") (Ex. 1015) |

| | | | |
|---|---|---|---|
| 4. | 19, 20 | §103 | Aoki in view of Lin '773 and U.S. Patent No. 7,269,866 ("Liu '866") (Ex. 1011) |

The '633 Patent issued on June 23, 2020 from U.S. Patent Application No. 15/280,513 ("the '513 Application"), filed on September 29, 2016. (Ex. 1001, Title Page, (21), (22), (45).) The '513 Application claims the benefit of Chinese Patent Application Nos. CN 201610020533 and CN 201620031074U, both of which were filed on January 13, 2016. (*Id.*, Title Page, (30).) Petitioner assumes January 13, 2016 as the priority date ("Priority Date") for the purposes of this Petition.

Aoki issued on June 28, 1972 (Ex. 1005, Title Page); Lin '773 issued on October 22, 2013 (Ex. 1009, Title Page, (45)); Liu was published on November 26, 2015 (Ex. 1015, Title Page, (43)); and Liu '866 issued on September 18, 2007 (Ex. 1011, Title Page, (45)). Therefore, all four references are prior art under 35 U.S.C. §102(a)(1) and (2).

## VI. THE '633 PATENT

### A. Overview

The '633 Patent is directed 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, 1:12-15.) The '633 Patent recognizes that inflatable beds, typically comprising "a top sheet, a bottom

sheet, and a side wall coupled to the top sheet and the bottom sheet to form an inflatable air chamber," were known in the art. (*Id.*, 1:27-32.) The '633 Patent further recognizes that internal tensioning structures "coupled to the top sheet and the bottom sheet" and "disposed in the air chamber" were also used "so as to form a shape having a certain height and a substantially flat upper surface for people to lie on." (*Id.*, 1:32-36.)

The '633 Patent notes that particularly for "larger height" inflatable beds (i.e., those higher up off the floor), the side walls "are susceptible to bulge and deform, affecting the appearance of the inflatable beds" and "result[ing] in the decay of air pressure in the air chamber, such that the inflatable beds and inflatable mattresses are softened, reducing the comfort of the inflatable beds." (*Id.*, 1:37-46.) In addition, the '633 Patent notes that prior art "large height" inflatable beds also had "a defect in its stability," such that "[w]hen a user lies on or seats near the edge of the inflatable beds," they are "susceptible to roll over." (*Id.*, 1:60-65.) The '633 Patent further notes that attempts to solve these problems by arranging a middle sheet between the top sheet and the bottom sheet have been unsuccessful, and moreover required additional materials and more complicated manufacturing processes. (*Id.*, 1:47-59.)

Accordingly, the '633 Patent identifies "[t]he technical problem to be solved by the present invention" as "overcom[ing] 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 in the prior art." (Ex. 1001, 2:7-12.)

As illustrated in annotated Figure 6 below, the '633 Patent discloses an inflatable bed 10 that includes a top sheet 11 (in blue), a bottom sheet 12 (uncolored), at least one side wall 13 (in green), first tensioning structures 14 (in yellow), a second tensioning structure 15 (in red), a third tensioning structure 16 (in orange), and a built-in air pump 20 (in purple):

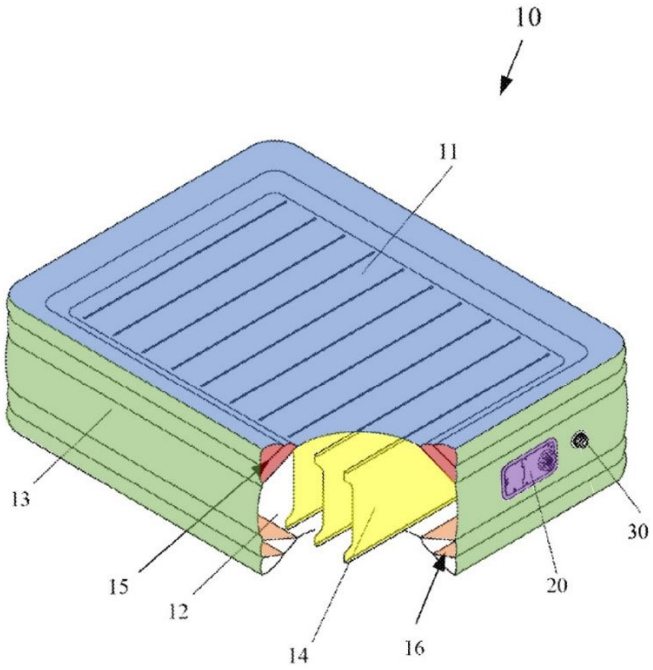



Fig. 6

(Ex. 1001, 6:18-22, 6:47-49, 8:27-31; Fig. 6.) The first tensioning structure 14 (yellow) is coupled to the top sheet 11 and bottom sheet 12 to "limit[] the respective upward and downward bulging of the top sheet 11 and the bottom sheet

12[.]" (*Id.*, 6:28-35.) The second tensioning structure 15 (red) "is configured to limit the upward and lateral bulging of the top sheet 11 and the side wall 13 after said air chamber is inflated." (*Id.*, 6:52-55.) The third tensioning structure 16 (orange) "is configured to limit the respective downward and lateral bulging of the bottom sheet 12 and the side wall 13 after said air chamber is inflated." (*Id.*, 6:60-63.)

### B. Relevant File History

#### 1. April 25, 2019 Restriction Requirement and Response

On April 25, 2019, the Examiner issued a Restriction Requirement, concluding that the pending claims were directed to seven patentably distinct species: (I) Figures 5-8; (II) Figures 9-11; (III) Figures 12-15; (IV) Figures 16-18; (V) Figures 19-20; (VI) Figure 21; (VII) Figures 22-24. (Ex. 1003, 236-241.) The Examiner stated that Figures 1-4 "appear to be generic to all species," but that "no claims appear to be generic." (*Id.* at 238.) On June 25, 2019, Patent Owner filed a response and elected to prosecute claims "directed to Species I as represented by Figures 5-8." (*Id.*, 336.) Patent Owner stated that the election was "made without traverse," and withdrew the remaining pending claims. (*Id.*)

#### 2. Non-Patent Literature Filed by Patent Owner from European Patent Office Opposition Proceeding

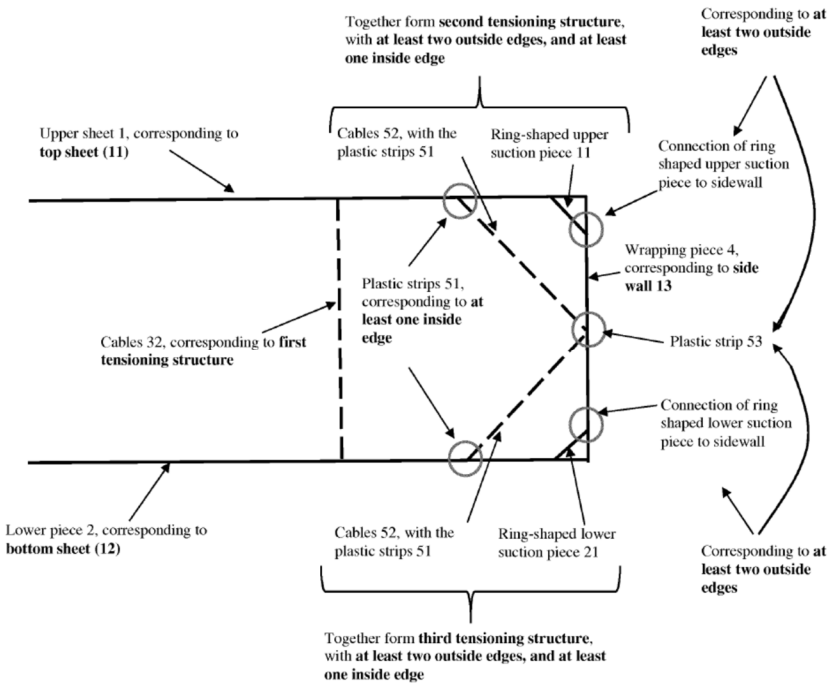
Separately from prosecution of the '513 Application, on June 17, 2019, Petitioner filed a Notice of Opposition in the European Patent Office ("EPO")

against a related European patent assigned to Patent Owner, EP 3192401 ("the EP '401 Patent"). (Ex. 1038, 500-519.) The EP '401 Patent claims priority to the same Chinese applications as the '513 Application, and generally has the same disclosure and claims as the '513 Application. (*Id.*, 22-41.) In its Notice of Opposition, Petitioner included, *inter alia*, a schematic explaining disclosures in one prior art reference (Chinese Patent No. CN203137719 ("Lin") (Exs. 1006, 1007)) in support of Petitioner's invalidity arguments. (*Id.*, 504-505.)

On August 28, 2019, Patent Owner submitted Petitioner's Notice of Opposition as part of an Information Disclosure Statement in the prosecution file of the '513 Application. (Ex. 1003, 341, 343.)

### 3. October 8, 2019 Non-Final Rejection and Response

On October 8, 2019, the Examiner issued a non-final rejection in which he rejected pending claims 1-6, 13-16, 23, 24, 32, 33, 37, and 38 as being anticipated by Lin. (*Id.*, 441, 443-447.) In support, the Examiner stated that he "agree[d] with the sectional view Figure provided in [Petitioner's] Notice of Opposition," reproduced below:




(*Id.*, 444.)[2]

The Examiner also rejected pending claims 34-36, 39, and 40—generally corresponding to issued claims 14-16, 19, and 20—as being obvious over Lin in view of the Examiner's Official Notice regarding the knowledge and skill of a POSA. (*Id.*, 448-450.)

On January 8, 2020, Patent Owner amended claim 1 to add the following limitation:

[2] During prosecution of the Continuation Application, the Examiner again indicated that he agreed with this Figure as representing Lin's disclosure. (Ex. 1055, 169-74.)

> 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
>
> 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 couple to said bottom sheet.

(*Id.*, Ex 1003, 474-475, 484.) Patent Owner argued that the amendment to claim 1 served to overcome the rejections of the dependent claims, without amendment to those claims. (Ex. 1003, 485-486.)

On February 20, 2020, the Examiner issued a Notice of Allowance without explanation. (*Id.*, 489-491.)

## VII. LEVEL OF ORDINARY SKILL IN THE ART

### A. Background and State of the Art

#### 1. Inflatable Beds and Tensioning Structures

It was well known as of the Priority Date that inflatable beds typically comprised basic features such as a top sheet and bottom sheet connected at their outer edges to four side walls to form an air chamber inside. (*See, e.g.*, Ex. 1001, 1:27-32; Ex. 1007, [0021]; Ex. 1010, 4:4-21; Ex. 1002, ¶35.) It was also well known before the Priority Date that inflatable beds would comprise means for inflation and deflation such as air pumps and/or air valves through which air may

pass into and out of the air chamber. (*See, e.g.*, Ex. 1011, 3:38-44; Ex. 1012, 1:16-27; Ex. 1013, ¶[0051]; Ex. 1002, ¶36.)

It was also long known that tensioning structures should be used in inflatable beds to join the top, bottom, and side surfaces of the bed together internally, thus preventing such surfaces from expanding away from each other and taking on a rounded or balloon shape. (*See, e.g.*, Ex. 1015, ¶[0006]; Ex. 1024, 1:50-67; Ex. 1002, ¶37.) For example, it was well known before the Priority Date that tensioning structures should be coupled to the underside of the top sheet and the topside of the bottom sheet to prevent the top sheet and bottom sheet from taking on a rounded shape as the bed is inflated. (*See, e.g.*, Ex. 1001, 1:32-36; Ex. 1013, ¶¶[0009], [0068]-[0069]; Ex. 1014, ¶[0005]; Ex. 1015, ¶[0040]; Ex. 1025, 3:35-49; Ex. 1026, 5:39-51; Ex. 1027, ¶[0041]; Ex. 1002, ¶38.)

It was also well known before the Priority Date that tensioning structures should be disposed in the air chamber at an oblique, or diagonal, orientation to join the top sheet with the side walls, and to join the bottom sheet with the side walls, and thus prevent those surfaces from overly expanding away from each other as the mattress is inflated. (*See, e.g.*, Ex. 1011, 2:18-31, 3:45-4:5; Ex. 1013, ¶¶[0068]-[0069], Fig. 9; Fig. 8; Ex. 1025, 1:30-33, 2:53-67, Fig. 3; Ex. 1028, 4:63-5:21, Fig. 7; Ex. 1029, ¶¶[0039]-[0040], Figs. 8B, 8C; Ex. 1002, ¶¶39-44.)

### 2. Known Problems with Larger Inflatable Beds

Before the Priority Date, it was recognized in the art that "large height" or "multi-layer" inflatable beds presented a number of problems. (Ex. 1002, ¶¶45-50.) First, it was known that the larger size of such inflatable beds exacerbated the problems of ballooning or bulging of the outer surfaces. (*See, e.g.*, Ex. 1001, 1:37-41; Ex. 1005, 1; Ex. 1007, [0003]; Ex. 1010, 2:6-17; Ex. 1014, ¶¶[0008]-[0010]; Ex. 1002, ¶47.) Second, it was known that the larger height of such inflatable beds also led to instability of the bed, which could cause the bed to roll over or a user to fall off the bed. (*See* Ex. 1001, 1:60-65; Ex. 1005, 2; Ex. 1026, 1:48-52; Ex. 1030, 2:39-49; Ex. 1002, ¶48.) Third, it was recognized that attempts to solve these problems, such as by including a middle layer between the top and bottom sheets or providing a stabilizing tube around the periphery of the inflatable bed, presented a number of disadvantages such as increased materials and costs and unappealing aesthetics. (*See* Ex. 1001, 1:47-2:3; Ex. 1007, ¶¶[0003]-[0005]; Ex. 1011, 1:20-55; Ex. 1031, 1:30-35; Ex. 1002, ¶¶49-50.)

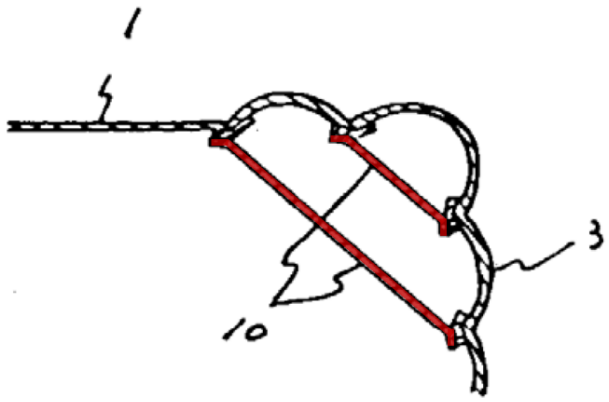
### 3. Use of Multiple Tensioning Structures Connecting the Top and Bottom Sheets to the Side Walls of Larger-Height Inflatable Beds

By the Priority Date, it was recognized that the above-described issues could be addressed by providing sufficient tensioning structures in the air chamber of the inflatable bed, including multiple diagonally oriented tensioning structures coupled

to the top and side walls of the mattress, and the bottom and side walls of the mattress, respectively. (Ex. 1002, ¶¶51-56.)

For example, Aoki discloses providing multiple "diagonal bracing hanging sheets (10)" at each corner of the air mattress. (Ex. 1005, 2-4.) As shown in annotated Figure 4 below, Aoki discloses that "[j]ust one diagonal bracing hanging sheet (10) for each corner is insufficient, and it is desirable for two or more diagonal bracing hanging sheets (10) to be placed there":

FIG. 4




(*Id.*, 4, Fig. 4.) Aoki teaches that use of multiple diagonal bracing hanging sheets at each corner of the inflatable bed prevents bulging of the outer surfaces, enhances stability, and prevents users from falling off the bed. (*Id.*, 4-5; Ex. 1002, ¶¶52-53.)

As another example and as shown in the annotated Figure 9 below, U.S. Patent Publication No. 2013/0145560 to Chen (Ex. 1013) discloses an air mattress comprising an air chamber with "a first peripheral strip 150a" (red) connected

between the top and side walls, and "a second peripheral strip 190" (orange) connected between the bottom and side walls:

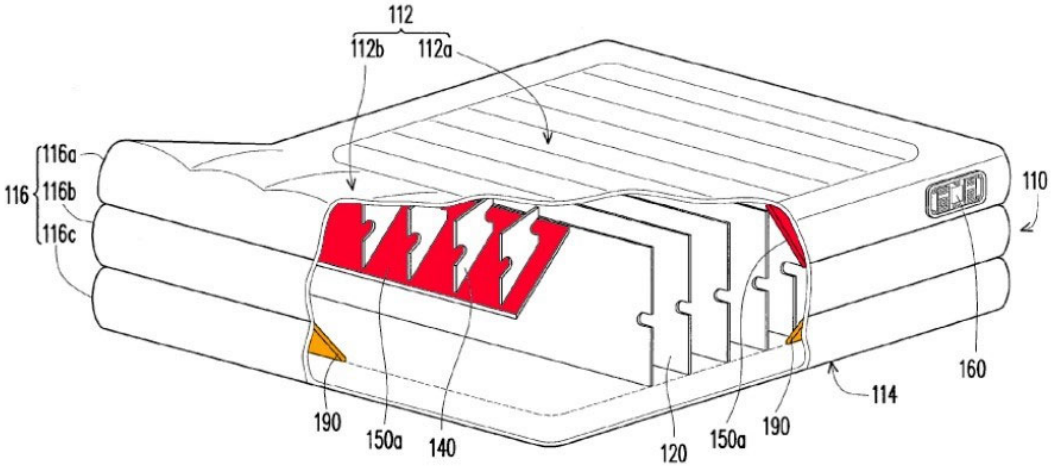



FIG. 9

(Ex. 1013, ¶¶[0068]-[0069], Fig. 9; Ex. 1002, ¶54.) Chen discloses that the "quantity of the peripheral strip with different heights connected to the side wall is not limited," and that "when more than one peripheral strip is used to respectively surround the side wall and connected to positions of different height, then the air mattress having the side wall with more-than-three-layered structure can easily be formed." (Ex. 1013, ¶¶[0067], [0072].)

As another example and as shown in annotated Figure 3 below, U.S. Patent Publication No. 2006/0265810 to Wu (Ex. 1014) discloses an upper pull band (12) (red) joined to the top and side walls of an inflatable mattress, and a lower pull band (12) (orange) joined to the bottom and side walls of the mattress:

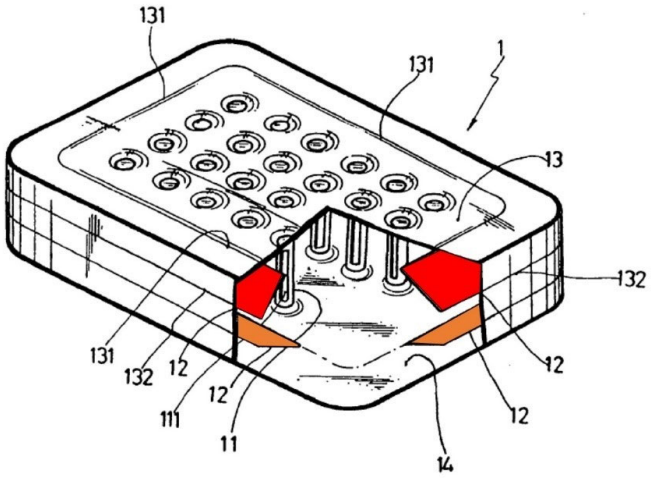



FIG.3

(Ex. 1014, ¶[0027], Fig. 3; Ex. 1002, ¶55.) Wu further discloses that using "two or more" components, including pull bands, "may also find a useful application in other types of methods" of solving the problem of deformation of the corners of the mattress. (Ex. 1014, ¶[0028].)

As another example and as shown in annotated Figures 5 and 6 below, Metzger discloses an air mattress comprising "at least one side support beam 25" (red and orange) that "extend[s] in the lengthwise direction of at least one of the mattress side panels, or along each one of the side panels of the air mattress":

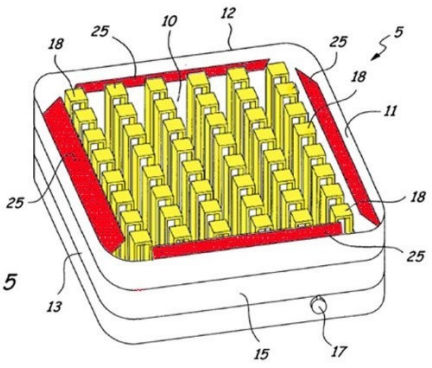



FIG. 5

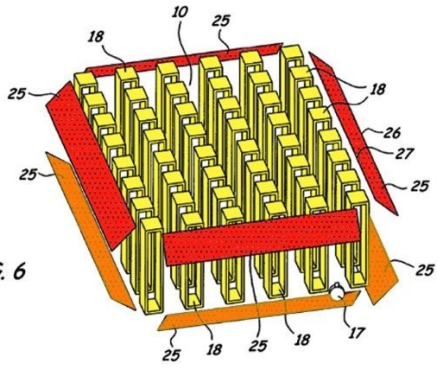



FIG. 6

(Ex. 1010, 5:27-30, Figs. 5, 6.) Metzger teaches that multiple side support beams could be used to accomplish this purpose. (*Id.*, 5:41-51, 6:10-14, 6:44-47, 8:59-60, 10:3-8; Ex. 1002, ¶56.)

#### 4. Use of Lightweight Materials for Tensioning Structures

It was further known in the art before the Priority Date that it would be advantageous to make tensioning structures with lighter materials, such as plastic strips disposed on either side of a panel of mesh, threads, or fibers, to minimize costs, weight, and volume of inflatable beds. (Ex. 1002, ¶57; Ex. 1009, 1:20-22, 1:53-2:20, 6:50-7:25, 8:30-9:5, 9:52-55; Ex. 1015, ¶¶[0003], [0006]-[0010], [0034], [0061]; Ex. 1040, ¶¶[0036], [0038]-[0039], [0056].)

### B. Qualifications of a POSA

A POSA as of the Priority Date would have had at least:

- A bachelor's degree in mechanical engineering, or an equivalent field; or
- An associate's degree in mechanical engineering, or an equivalent field, and two years of practical experience in inflatable product design.

(Ex. 1002, ¶¶30-31.) More education can supplement practical experience and vice versa. (*Id.*, ¶32.)

## VIII. CLAIM CONSTRUCTION

The Board applies the claim construction standard set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). For any claim term not

addressed below, this Petition applies the ordinary and customary meaning as it would have been understood by a POSA.

**A. "air holes"**

Claim 2 of the '633 patent recites that the second tensioning structure and third tensioning structure "are respectively provided with a plurality of ***air holes***, through which an airflow passage is formed in said air chamber." (Ex. 1001, 12:66-13:3 (emphasis added).) A POSA would have understood "air holes" as recited in claim 2 in accordance with its plain and ordinary meaning, that is, "openings through which air may flow." (Ex. 1002, ¶¶77-81.) A POSA would also have understood that this would include gaps in a tensioning structure where individual constituent parts of the structure are not joined, allowing fluid communication throughout the cavity. (*Id.* ¶¶79-80.)

First, neither the claims nor specification of the '633 Patent give any special or narrow meaning to "air holes." No claims other than claim 2 recite the term, and the specification generally mirrors the claim language without any further description or limitation. (Ex. 1001, 2:45-48, 7:41-50, 9:16-22, 10:39-44, 12:36-14:41.) Moreover, the specification confirms that gaps in between constituent parts of the second or third tensioning structure fall within the scope of the term. The specification discloses that the second tensioning structure "comprises at least two first I-beams 151" and the third tensioning structure "comprises at least two

second I-beams 161." (*Id.*, 6:64-7:7.) The specification goes on to state that the at least two first I-beams 151 and the at least two second I-beams each "as a whole are of a continuous annular structure or a segmental annular structure." (*Id.*, 7:41-45.) The specification then discloses that the at least two first I-beams 151 "are provided with air holes 154, and an airflow passage is formed in said air chamber through the air holes 154," and the at least two second I-beams 161 "are provided with air holes 164, and an airflow passage is formed in said air chamber through the air holes 164 (***as shown in FIGS. 7 and 8***)." (*Id.*, 7:45-50 (emphasis added).)

As shown below, Figure 7 depicts air holes 164 as openings in the two second I-beams 161, and Figure 8 depicts the I-beams as comprising eight separate I-beams which are not joined at the corners of the annular structure:

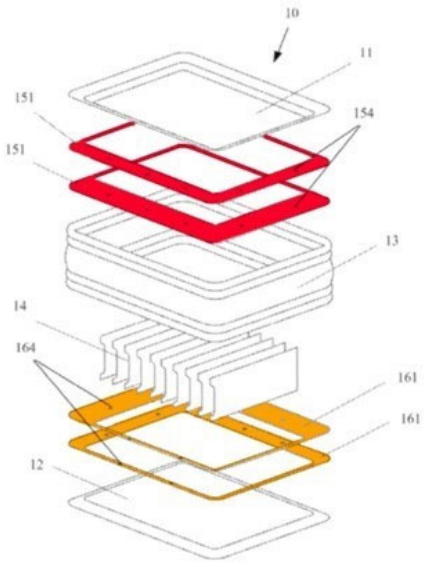



Fig. 7

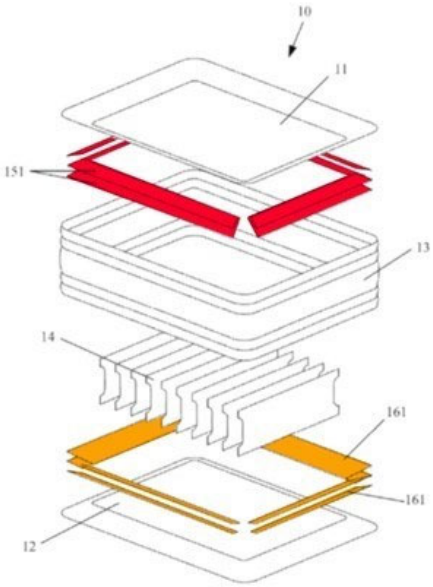



Fig. 8

(*Id.*, Figs. 7, 8; *see also id.*, 9:12-22, Figs. 10 and 11.) Thus, the specification confirms that both of these structures would fall within the scope of claim 2's recitation of second and third tensioning structures provided with a plurality of "air holes."

Finally, "openings through which air may flow" accords with the plain and ordinary meaning of "hole." (Ex. 1035, 3 (defining "hole" as "an opening through something"; "an area where something is missing").)

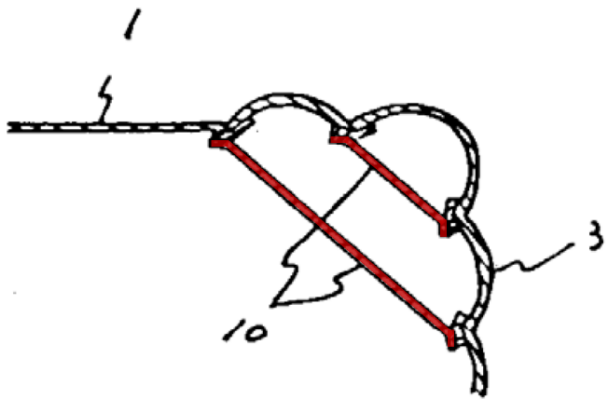
## IX. SUMMARY OF THE PRIOR ART

### A. Aoki

Aoki is directed to a "box-shaped air mattress." (Ex. 1005, Title Page, 1-2.) Aoki identifies a number of problems with existing air mattress designs that use "vertical hanging sheets" adhered between the top and bottom sheets. First, Aoki notes that "when air is inserted, the sides of the box-shaped air mattress become rounder on the outside than the inside." (*Id.*, 1-2.) As a result, "the air mattress may become unstable, making it difficult to sit on and wobble, thus increasing the likelihood that people lying on it will fall off." (*Id.*, 2.) Aoki notes that "[t]his tendency becomes greater the higher the sides become." (*Id.*)

To address these problems, Aoki discloses using two or more diagonal bracing hanging sheets for each corner of the air mattress, as shown in annotated Figure 4 below:

FIG. 4




(*Id.*, Fig. 4.) Aoki discloses that use of multiple diagonal bracing hanging sheets in this way addresses the known problems regarding larger air mattresses identified above. (*Id.*, 3-5; Ex. 1002, ¶¶85-86.)

Aoki is in the same field as the '633 Patent because Aoki relates to inflatable mattresses and the components of such mattresses. (*Id.*, 1-2.) Aoki is pertinent to the problems the '633 Patent purportedly addresses because Aoki is directed to preventing bulging, increasing stability, and improving aesthetics of larger height air mattresses. (*Id.*, 1-2, 4-5.) Aoki therefore is analogous art to the '633 Patent.

**B. Lin '773**

Lin '773 is directed to an improved internal tensioning structure for use in inflatable products such as inflatable beds. (Ex. 1009, Abstract, 1:20-2:20.) Lin '773 recognizes that internal tensioning structures disposed in the chamber of an inflatable bed to "give shape to the bed as internal pressure increases, thereby preventing the inflatable bed from expanding evenly on all sides in the manner of a

balloon," were well-known in the art. (*Id.*, 1:38-52; *see also* 1:28-37.) However, Lin '773 notes that conventional inflatable beds use tensioning structures "made of PVC sheets with a sufficient thickness to ensure spreading of force and concomitant reductions in stress in the product material," which "contribute[s] to increased weight of the inflatable product" and "increases the compressed/folded volume of the deflated inflatable structure." (*Id.,* 1:53-2:4.)

To address these problems, Lin '773 discloses a tensioning structure that is "lightweight and occup[ies] minimal volume when the device is deflated and packed away, while also functioning as a strong and durable internal support upon inflation and use of the inflatable device." (*Id.,* 6:50-56.)

In particular, Lin '773 discloses a tensioning structure that "utilizes thin and flexible string- or wire-like strands which join two areas of fabric to one another." (*Id.,* 6:57-59.) Thus, in one exemplary embodiment, Lin '773 discloses tensioning structures comprising a "plurality of substantially parallel strands 32" (yellow) that are captured between two weld strips 31 (red) at the top and bottom of the strands:

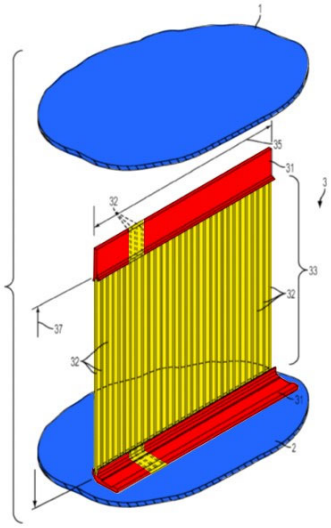


FIG. 1

(*Id.*, 7:17-22, 12:22-31, Fig. 1.) The weld strips, in turn, are welded to an "upper material 1" and "lower material 2," such as the top and bottom sheets (blue) of an inflatable bed, as shown above and further in annotated Figure 3 below:

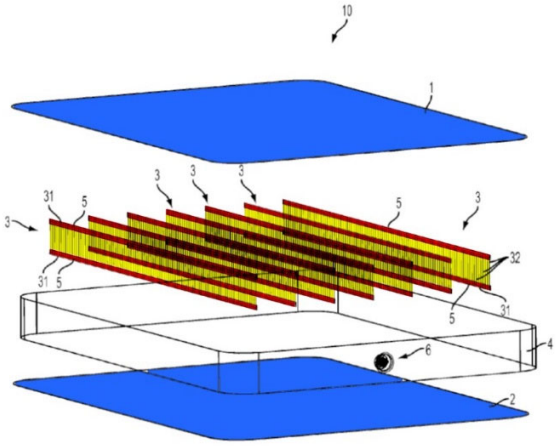


FIG. 3

(*Id.*, 7:22-25, 7:53-66, Fig. 3.)

Lin '773 teaches that using these tensioning structures in an inflatable bed "achieves high tensile strength while promoting light weight and low packed volume of the finished inflatable product." (*Id.*, 9:52-55; *see also id.*, 6:52-56;

10:19-20; 16:17-31.) In addition, Lin '773 teaches that the use of these tensioning structures reduces costs as compared to prior art tensioning structures. (*Id.*, 1:20-22; 8:67-9:1; 18:25-27.)

Lin '773 is in the same field as the '633 Patent because Lin '773 relates to inflatable beds and internal tensioning structures used in such beds. (*Id.*, Abstract, 1:20-22, 2:8-20, 6:50-56.) Lin '773 is pertinent to the problems the '633 Patent purportedly addresses because Lin '773 is directed to preventing the outward expansion of the outside surfaces of an inflatable bed as the bed is inflated. (*Id.*, 1:38-52, 7:16-25, 8:47-55.) Lin '773 therefore is analogous art to the '633 Patent.

**C. Liu**

Liu is directed to tensioning structures utilized in inflatable products such as air beds. (Ex. 1015, ¶¶[0003], [0006], [0010].) Liu notes that existing tensioning structures "are typically made of plastic or PVC sheets with a sufficient thickness to ensure that external loads are spread and concomitant tensile stresses are reduced in the product material," which "contributes to increased weight of the inflatable product" and "increases the compressed/folded volume of the deflated inflatable structure." (*Id.*, ¶[0008].) To address these problems, Liu discloses tensioning structures comprised of "open cell or mesh material" (yellow) and that are "firmly connected at their ends to adjacent fabric by an intermediate material, such as a strip of plastic" (red), as shown in annotated Figures 1 and 2 below:

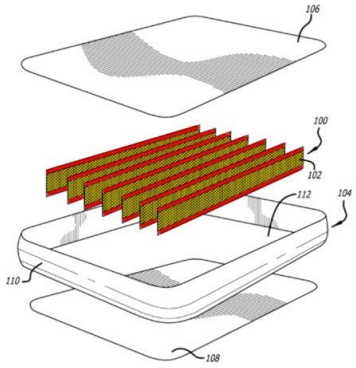
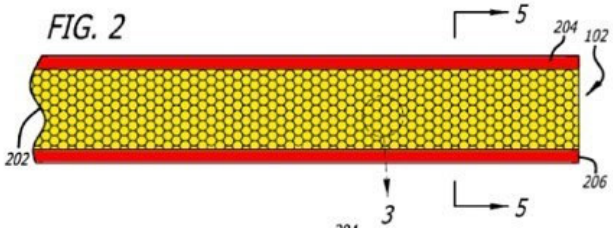



FIG. 1




(*Id.*, ¶¶[0035], [0040], Figs. 1, 2.)

Liu is in the same field as the ’633 Patent because Liu relates to inflatable mattresses and the components of such mattresses. (*Id.*, ¶¶[0003], [0037]-[0040].) Liu is pertinent to the problems the ’633 Patent purportedly addresses because Liu is directed to preventing the outward expansion of air mattresses during use, including multiple-layer air mattresses. (*Id.*, ¶¶[0009]-[0010], [0039]-[0040], [0063].) Liu therefore is analogous art to the ’633 Patent.

**D. Liu ’866**

Liu ’866 recognizes that raised-height airbeds had known stability issues, which could lead to users falling off the bed. (Ex. 1011, 1:13-19.) While Liu ’866 notes attempts in the prior art to address these issues with external stability structures, Liu ’866 identifies several drawbacks to these beds, including (1) the potential for a user to tread onto the stability structure and fall; (2) decreased production efficiency and increased production costs due to their complicated structure; and (3) an undesirable appearance. (*Id.*, 1:13-55; Figs. 4-7).

To address these problems, Liu '866 discloses the use of "oblique extending strip[s]" welded to the bottom sheet and side walls of a large-height air mattress. (*Id.*, 3:14-18.) For example, as shown in annotated Figure 8 below, Liu '866 discloses an embodiment in which "a plurality of oblique extending strips 8 [orange], for example, four oblique extending strips, two ends of which are not connected with each other, are provided around the periphery of [a] second set of extending strips 7 [yellow] in the lower air-chamber B":

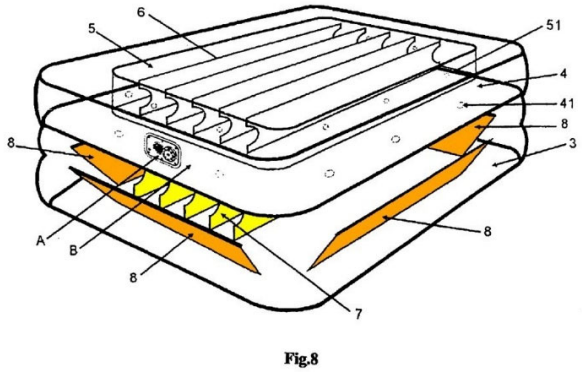



Fig.8

(*Id.*, 3:45-4:5; Fig. 8.) Liu '866 discloses that use of the oblique extending strips enhances the stability of the air bed and prevents potential injury, while providing "a simple structure, lower production costs, and a very beautiful appearance." (*Id.*, 2:18-31.)

Liu '866 is in the same field as the '633 Patent because Liu '866 relates to inflatable mattresses and the components of such mattresses. (*Id.*, 1:6-8, 1:59-2:31.) Liu '866 is pertinent to the problems the '633 Patent purportedly addresses because Liu '866 is directed to addressing drawbacks with respect to stability, roll

over, and aesthetics in larger-height air mattresses. (*Id.*, 1:44-55, 2:18-31, 3:29-38.) Liu '866 therefore is analogous art to the '633 Patent.

## X. DETAILED EXPLANATION OF GROUNDS

### A. Ground 1: Aoki Renders Obvious Claims 1 and 2 of the '633 Patent

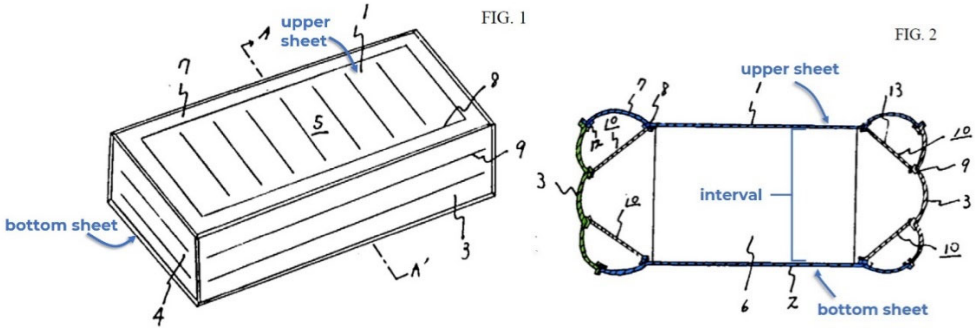
#### 1. Claim 1

##### *a. An inflatable bed, comprising:*

To the extent the preamble is limiting, Aoki discloses this feature. (Ex. 1005, Title Page, 1-4, Fig. 1; Ex. 1002, ¶129.) For example, Aoki discloses a "box-shaped air mattress (5)," into which "air is inserted" so that it is "full of air." (*Id.*, Ex. 1005,1, 3-4.)

##### *b. a top sheet and a bottom sheet disposed vertically at an interval;*

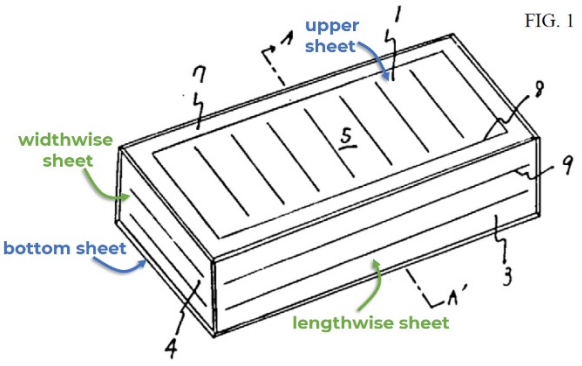
Aoki discloses this limitation. (Ex. 1005, 2, 3, Figs. 1, 2; Ex. 1002, ¶129.) Aoki discloses that the box-shaped air mattress is comprised of an "upper sheet (1)" and "bottom sheet (2)" disposed vertically at an interval, as shown in the annotated Figures 1 and 2 below:

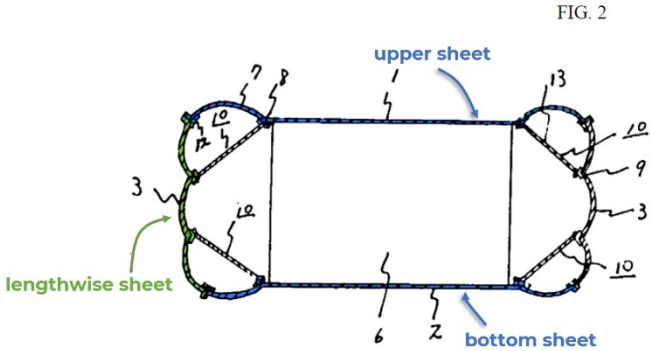


(Ex. 1005, 2, 3, Figs. 1, 2.)

***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***

Aoki discloses this limitation. (Ex. 1005, 3, 5, Figs. 1, 2; Ex. 1002, ¶129.) Aoki discloses that the upper sheet (1) and the bottom sheet (2) are joined "at an approximate 90-degree angle" to lengthwise sheets (3) and widthwise sheets (4) (which constitute side walls) to form the air mattress, and that air pressure is maintained inside the air mattress. (Ex. 1005, 3, 5.) As shown in annotated Figures 1 and 2 below, upper edges of the lengthwise and widthwise sheets (green) are thus coupled to outer edges of the upper sheet (blue); lower edges of the lengthwise and widthwise sheets are coupled to outer edges of the bottom sheet (blue); and an air chamber is formed between the upper sheet, bottom sheet, lengthwise sheets, and widthwise sheets:




(Ex. 1005, Figs. 1, 2.)

***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***

Aoki discloses this limitation. (Ex. 1005, 1-2, 4-5, Figs. 1, 2; Ex. 1002, ¶130.) As shown in annotated Figures 1 and 2 below, Aoki discloses "vertical hanging sheets (6)" (yellow) that are "adhered" or sewn to the upper and bottom sheets with "sufficient adhesive power," thereby (1) preventing the upper and bottom sheets from "swell[ing] and form[ing] an arch"; (2) "allaying concerns about [a user] falling off" the mattress; and (3) improving design aesthetics by "placing an accent on the surface of the box-shaped air mattress":

FIG. 1

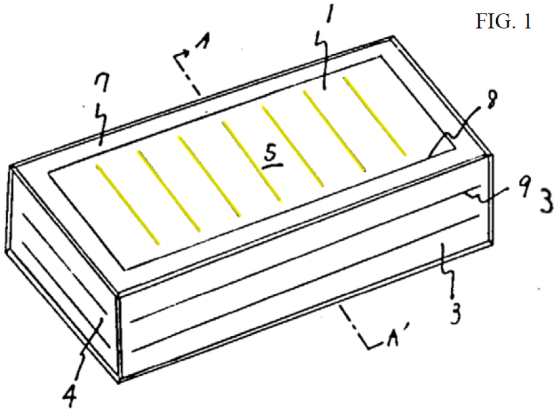
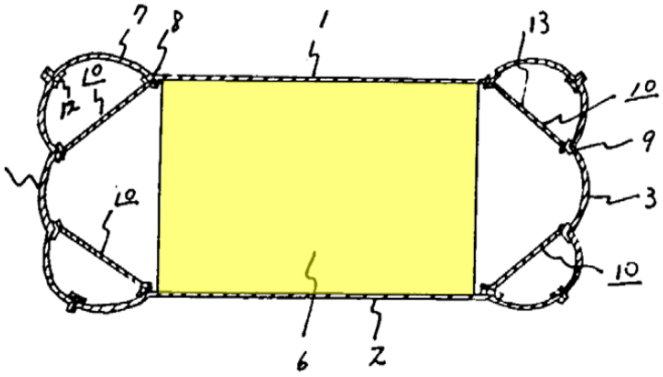


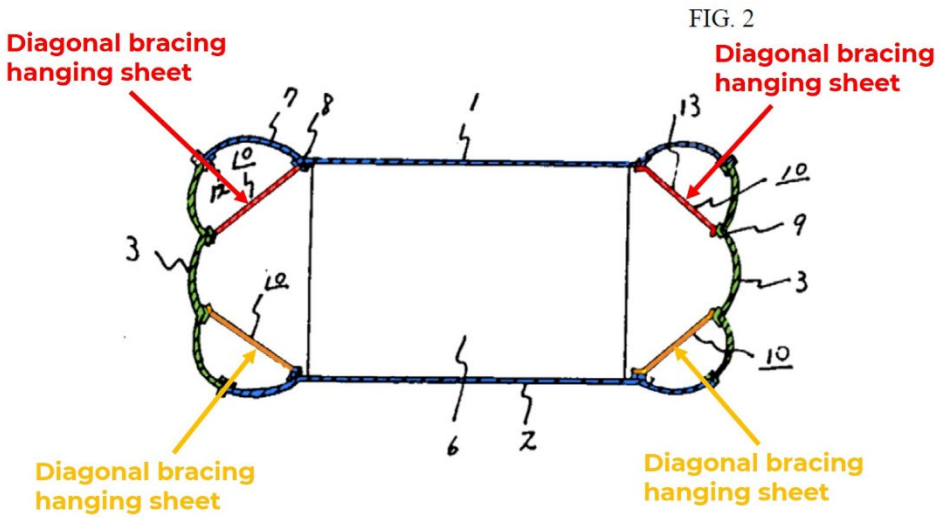

FIG. 2




(*Id.*, 2-5, Figs. 1, 2.)

***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;***

Aoki discloses this limitation. (Ex. 1005, 2-5, Figs. 2-4; Ex. 1002, ¶131-139.) Aoki discloses a number of "diagonal bracing hanging sheets (10)," which are individually adhered between the upper sheet and side walls (lengthwise and widthwise sheets), and between the bottom sheet and side walls, respectively. (Ex. 1005, 2, 4.) This is partially reflected in annotated Figure 2 below, which is a cross-section of the air mattress showing four diagonal bracing hanging sheets disposed in a longitudinal direction of the lengthwise sheets (side walls): two (in red) adhered between the upper sheet and lengthwise sheets, and two (in orange) adhered between the bottom sheet and lengthwise sheets:

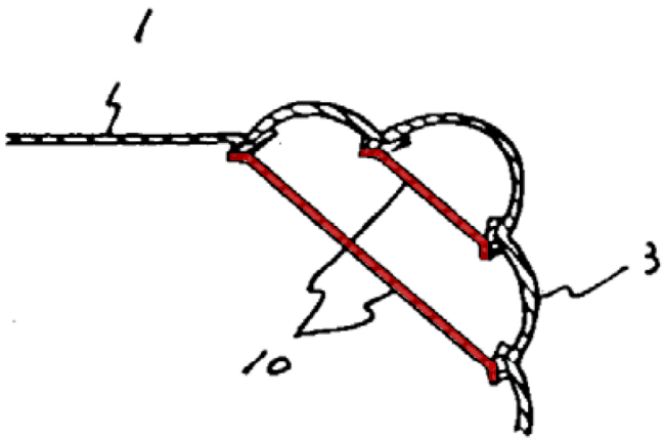



(Ex. 1005, Fig. 2.)

Aoki discloses that the diagonal bracing hanging sheets (10) have "adhesive positions (8) and (9)," and the upper sheet, bottom sheet, and lengthwise and widthwise sheets have "adhesive site[s]" or "adhesion sites" (11) and (11'). (*Id.*, 2, 3.) Aoki further discloses that the diagonal bracing hanging sheets (10) are comprised of "intermediate materials" (the main portion of the diagonal bracing hanging sheets, in between the adhesive positions (8) and (9)) which are adhered or sewn to the adhesive sites (11) and (11') of the upper, bottom, lengthwise, and widthwise sheets, respectively. (*Id.*, 3-4, Fig. 3.) In this way, the intermediate materials and the adhesion sites "will be integrated," and the diagonal bracing hanging sheet "will have sufficient adhesive power … so that the respective surface sheets and hanging sheets will not peel off." (*Id.*, 4.) Thus, Aoki discloses that outside edges of the diagonal bracing hanging sheets are coupled to the outside walls adjacent, and the inside edges of the diagonal bracing hanging sheets are coupled to the top and bottom sheets, respectively. (Ex. 1002, ¶¶132-134.)

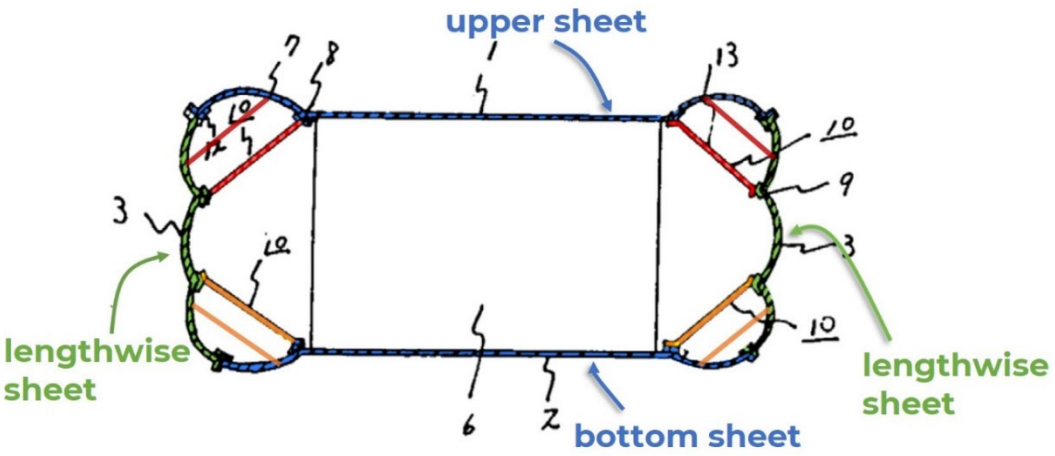
As reflected in annotated Figure 4 below, Aoki further discloses that "just one diagonal bracing hanging sheet (10) for each corner is insufficient, and it is desirable for two or more diagonal bracing hanging sheets (10) to be placed there":

FIG. 4




(Ex. 1005, 4, Fig. 4.) Although Figure 4 only shows one example corner of the air mattress, Aoki discloses that this would be applied to "**each corner**" to maintain an angle that is approximately 90-degrees. (*Id.*, 4-5 (emphasis added).) This results in a structure illustrated by the annotated Figure below, which generally reflects the disclosure of Figure 4 for each corner as shown in Figure 2:

FIG. 2




(Ex. 1002, ¶¶135-136.)

Aoki discloses that use of the diagonal bracing hanging sheets thus addresses known problems regarding large height air mattresses—including bulging of the side walls, lack of stability, and aesthetics—by (a) maintaining the upper sheet, lower sheet, and side walls "at an appropriate 90-degree angle so it is possible to construct a large box-shaped air mattress"; (b) preventing the top, bottom, and side sheet surfaces from "swell[ing] and form[ing] an arch"; (c) "allaying concerns about falling off while lying on it"; and (d) improving design aesthetics by "placing an accent on the surface of the box-shaped air mattress." (Ex. 1005, 1-2, 4-5.)

Although Aoki expressly discloses that two or more diagonal bracing hanging sheets would be applied to "each corner" of the mattress as shown in Figure 4 and as described above, to the extent Figure 4 of Aoki is considered to be a separate embodiment, it would have been obvious to a POSA to apply Figure 4's teaching of multiple diagonal bracing hanging sheets to each corner of the inflatable bed disclosed in Figures 1 and 2. (Ex. 1002, ¶¶137-138.) A POSA would have known that in order to achieve the benefits of Aoki as described above—including maintaining each side of the inflatable bed at an approximate 90-degre angle, preventing swelling of the outer surfaces, preventing a user from falling off, and improving design aesthetics—it would be advantageous to apply multiple diagonal bracing hanging sheets to not only one corner, but to all corners

of the inflatable bed. (*Id.*) Indeed, a POSA would have known that applying multiple diagonal bracing hanging sheets to just one corner would result in the inflatable bed being asymmetric and/or lopsided, which would defeat Aoki's objectives as described above. (*Id.*, ¶138) Thus, a POSA would have been motivated to combine Figure 4's teaching of two or more diagonal bracing hanging sheets to the inflatable bed disclosed in Figures 1 and 2 of Aoki. (*Id.*)

As shown in annotated Figures 2 and 4 below, the diagonal bracing hanging sheets thus constitute a support structure disposed in a longitudinal direction of the side walls, with at least two outside edges of the support structure being coupled to the side wall (lengthwise sheet) adjacent, and at least one inside edge of the support structure being coupled to the upper sheet or bottom sheet adjacent:

FIG. 2

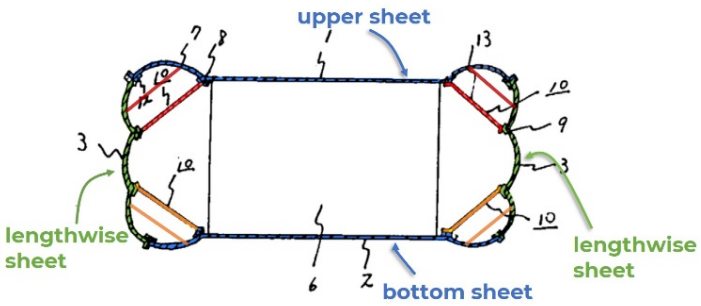
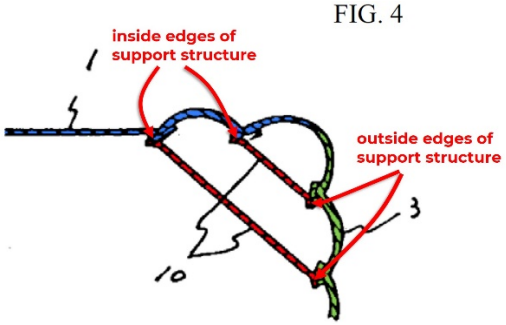



FIG. 4




(*Id.*, Figs. 2, 4; Ex. 1002, ¶139.)

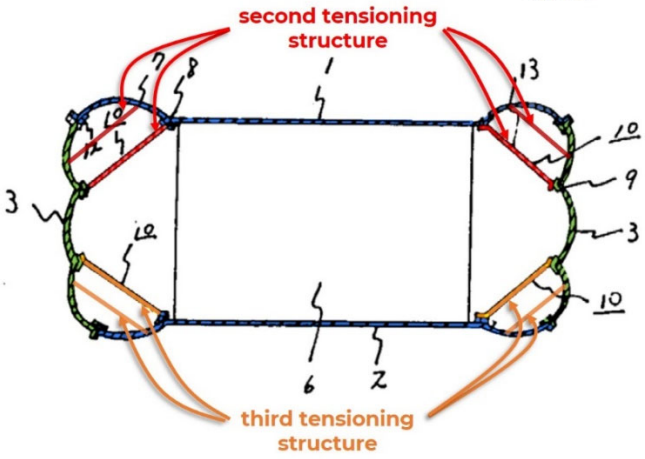
***f. wherein said support structure comprises a second tensioning structure and a third tensioning structure, at least two outside edges of said second tensioning structure are respectively coupled to said at least one side wall, at least one inside edge of said second tensioning structure is coupled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

***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.***

Aoki discloses or suggests these limitations. (Ex. 1005, 2, 4, Figs. 2, 4; Ex. 1002, ¶¶140-142.)[3] As shown in the annotated Figure below, which again reflects the diagonal bracing hanging sheets as shown in Figures 2 and 4, the diagonal bracing hanging sheets adhered between the upper sheet and side walls comprise a second tensioning structure, and the diagonal bracing hanging sheets adhered between the bottom sheet and side walls comprise a third tensioning structure:

[3] While Petitioner believes that Aoki discloses these limitations and anticipates claims 1 and 2 as explained further below, Petitioner asserts this ground under 103 to address any argument that Figure 4 is a separate embodiment as described above.

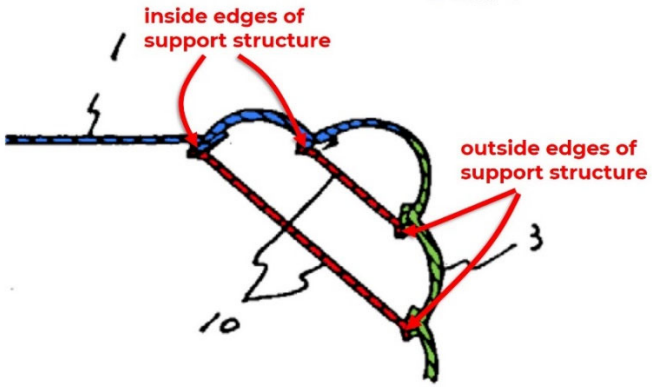
FIG. 2




(Ex. 1002, ¶140; Ex. 1005, Figs. 2 and 4.)

With respect to the diagonal bracing hanging sheets adhered between the upper sheet and side walls (second tensioning structure), as shown below in annotated Figure 4 below, at least two outside edges are respectively coupled to at least one side wall (in this Figure, one of the lengthwise sheets), and at least one inside edge is coupled to the top (upper) sheet:

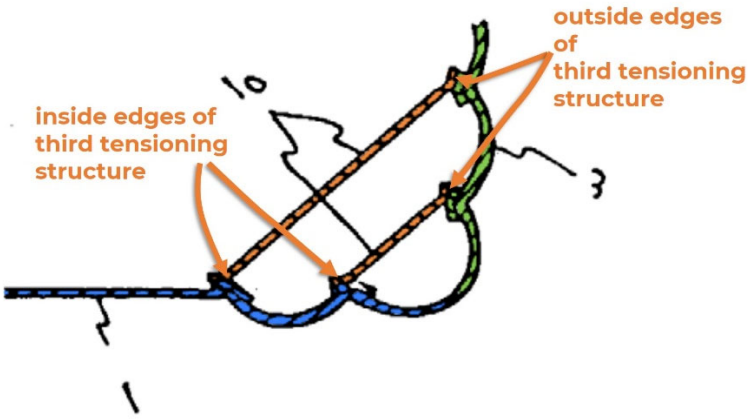
FIG. 4




(Ex. 1005, Fig. 4.)

With respect to the diagonal bracing hanging sheets adhered between the bottom sheet and side walls (third tensioning structure), as shown below in the

annotated Figure below (which is Figure 4 rotated 180 degrees about the X-axis to show the bottom orientation of the air mattress), at least two outside edges are respectively coupled to at least one side wall (in this Figure, one of the lengthwise sheets), and at least one inside edge is coupled to the bottom sheet:




(*Id.*; Ex. 1002, ¶142.)

Aoki therefore discloses or renders obvious all limitations of claim 1 of the '633 Patent. (Ex. 1002, ¶¶129-143.)

**2. Claim 2**

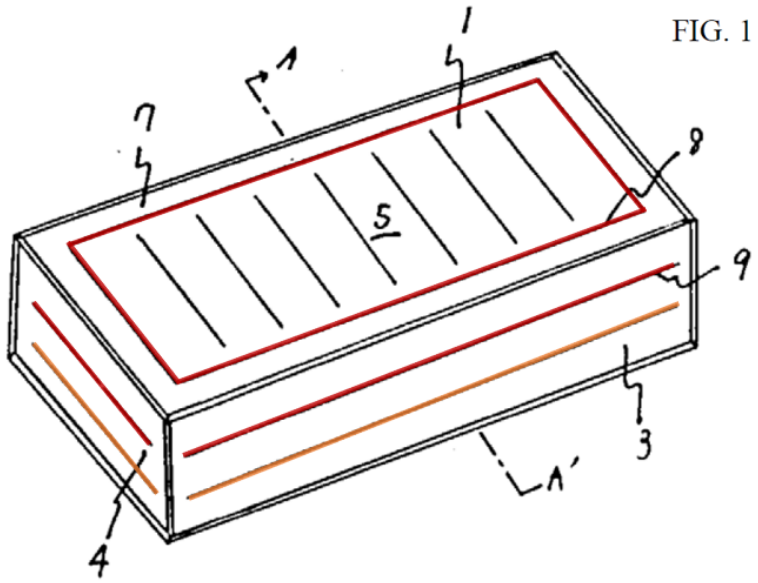
***a. The inflatable bed according to claim 1,***

As discussed above, Aoki discloses or renders obvious all of the limitations of claim 1. (*Supra* §X.A.1.)

***b. wherein said second tensioning structure and said third tensioning structure are respectively provided with a plurality of air holes, through which an airflow passage is formed in said air chamber.***

Aoki discloses this limitation. (Ex. 1005, 4, Figs. 1, 3; Ex. 1002, ¶¶145-146.) As shown in annotated Figure 1 below, Aoki discloses that the diagonal

bracing hanging sheets form depression lines (red for the hanging sheets comprising the second tensioning structure; orange for the hanging sheets comprising the third tensioning structure) at their adhesive positions (8) and (9) when coupled to the top, bottom, lengthwise, and widthwise sheets, and that these depression lines do not span the entire length of these sheets, but rather stop short on either end:




(Ex. 1005, Fig. 1.)

Accordingly, each of the second tensioning and third tensioning structures will have gaps in each corner, through which air may flow within the air chamber. As discussed above, the ’633 Patent identifies such tensioning structures with gaps in each corner (as in Figure 8 below) as providing a plurality of air holes as recited in claim 2:

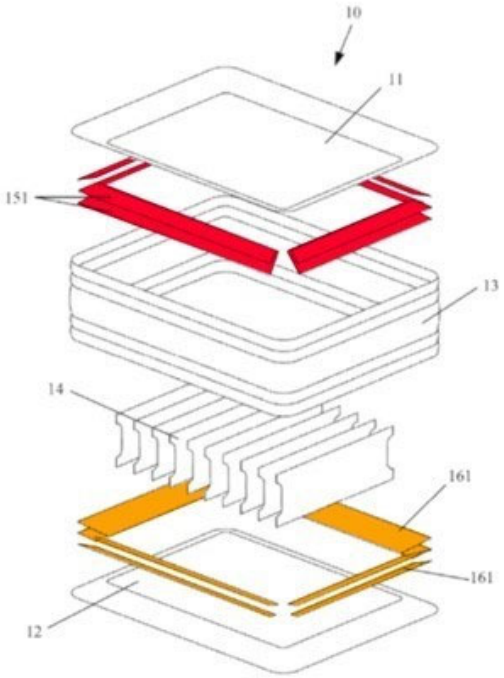



Fig. 8

(*Supra*, §VIII.A; Ex. 1001, 7:41-50, Fig. 8.)

Aoki therefore discloses or suggests all limitations of claim 2 of the '633 Patent. (Ex. 1002, ¶¶144-147.)

### B. Ground 2: Aoki in view of Lin '773 Renders Obvious Claims 1 and 2 of the '633 Patent

#### 1. Claim 1

As discussed above, Aoki discloses or renders obvious all of the limitations of claim 1. (*Supra* §§X.A.1.) However, if the Board believes that Aoki's disclosure that the diagonal bracing hanging sheets are adhered to the outer surfaces at "adhesive positions" of the diagonal hanging bracing sheets and "adhesive sites" of the outer surfaces means that Aoki does not disclose that the

diagonal hanging bracing sheets are "coupled" to the outer surfaces as recited in claim 1, this claim nonetheless would have been obvious over Aoki in view of Lin '773.

Aoki published in 1972. (Ex. 1005, Title Page.) A POSA considering materials for Aoki's tensioning structures in 2016 would have naturally looked to more recent teachings and knowledge in the art regarding suitable and advantageous materials and tensioning structures. (Ex. 1002, ¶188.) As described below, a POSA implementing Aoki would in particular have been motivated to look to Lin '773's teachings of advantageous tensioning structures for use in inflatable beds.

Lin '773 discloses improved tensioning structures that "join two pieces of material that are urged away from one another in use," including sheets comprising a double-layer air mattress. (*Supra*, §IX.B; Ex.1009, 7:9-14, 7:62-8:3.) As shown in annotated Figure 1 below, Lin '773 discloses that its tensioning structures may comprise a "plurality of substantially parallel strands 32" (yellow) that are captured between two weld strips 31 (red) at the top and bottom of the strands:

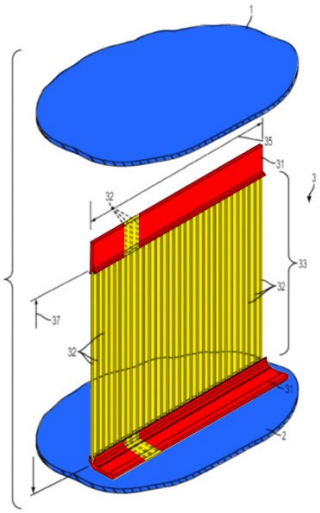


FIG. 1

(Ex. 1009, 7:17-22, 12:22-31, Fig. 1.) The weld strips, in turn, are welded to an "upper material 1" and "lower material 2," such as the top and bottom sheets (blue) of an inflatable bed, as shown above and further in annotated Figure 3 below:

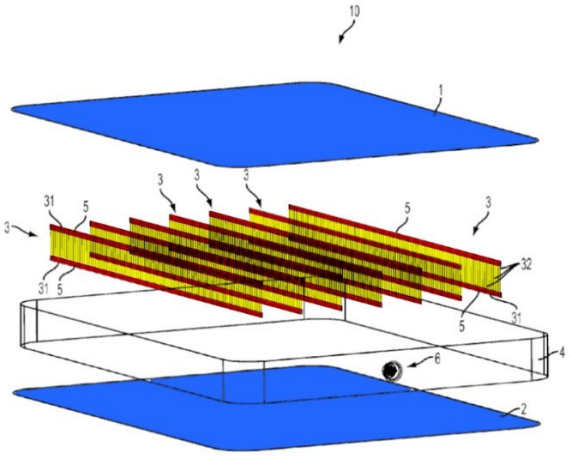


FIG. 3

(*Id.*, 7:22-25, 7:53-66, Fig. 3.)

Lin '773 discloses that its tensioning structures serve to maintain the rectangular shape of the inflatable bed by preventing the surfaces of the bed from urging away from each other and thus taking on the shape of a balloon (*id.*, 1:38-

52, 7:16-25, 8:47-55)—the same problem in the art to which Aoki is addressed (Ex. 1005, 1-2, 4-5). Lin '773 further teaches that its tensioning structures provide numerous advantages over known tensioning structures, including providing high tensile strength while minimizing weight, materials, and costs. (*Supra*, §IX.B; Ex. 1009, 1:20-22; 6:52-56; 8:67-9:1; 9:52-55; 10:19-20; 16:17-31; 18:25-30; Ex. 1002, ¶190.)

A POSA would have thus been motivated to employ Lin '773's tensioning structures as the tensioning structures in Aoki's air mattress, to achieve the advantages disclosed by Lin '773. (Ex. 1002, ¶191.) Aoki does not limit the materials or attachment methods that may be used for its tensioning structures, but rather generally states that the tensioning structures may be sewn or "adhere[d]" to the top sheet, bottom sheet, and side walls. (Ex. 1005, 3.) Lin '773, in turn, discloses advantageous materials, including weld strips and strands, as well as advantageous attachment methods, including welding, to achieve the objective of providing high tensile strength to maintain the shape of an inflatable bed. (Ex. 1009, 11:30-49.) A POSA would have a reasonable expectation of success in using Lin '773's design as a tensioning structure, as use of such materials as tensioning structures was well known before the Priority Date. (Ex. 1002, ¶191; *supra*, §VII.A.4.)

Moreover, a POSA would have known that it would be advantageous to use the same material for both Lin '773's weld strips and Aoki's top sheet, bottom sheet, and side walls to achieve a secure welded connection. (Ex. 1002, ¶192.) A POSA would have known that use of plastic material for the outside surfaces and tensioning structures of Aoki would have been a simple substitution of more modern materials in place of Aoki's hanging sheets. (*Id.*; Ex. 1010, 1:29-44, 6:15-30.) Indeed, Patent Owner's own expert in a prior IPR proceeding testified that "using PVC for the interior and exterior components of a mattress was well-known in the art and in the background knowledge of a PHOSITA" before the Priority Date, and that "using the same material as the top and bottom side of the mattress and the extending parts would ensure that they could be suitably welded together." (Ex. 1043, ¶¶21, 105.) Thus, a POSA would have known that using Lin '773's design for the tensioning structures in Aoki would be a simple substitution of one known element for another, and would have yielded predictable results. (Ex. 1002, ¶192.)

Accordingly, a POSA would have been motivated to use Lin '773's tensioning structures for Aoki's diagonal hanging bracing sheets, and would have known that using the same plastic material for Lin '773's weld strips and the outer surfaces of Aoki would advantageously allow for a secure welded connection between the tensioning structures and outer surfaces. As a result of this welded

connection, the upper end and lower end of Lin '773's tensioning structures serving as Aoki's vertical hanging sheets would be respectively coupled to the top and bottom sheets; the outside edges of Lin '773's tensioning structures serving as Aoki's top diagonal bracing hanging sheets would be coupled to the side wall and the inside edges coupled to the top sheet; and the outside edges of Lin '773's tensioning structures serving as Aoki's bottom diagonal bracing hanging sheets would be coupled to the side wall and the inside edges coupled to the bottom sheet, as recited in claim 1 of the '633 Patent. (Ex. 1002, ¶193.)

Aoki in view of Lin '773 therefore renders obvious claim 1. (Ex. 1002, ¶¶187-194.)

**2. Claim 2**

***a. The inflatable bed according to claim 1,***

As discussed above, Aoki, either individually or in view of Lin '773, discloses or renders obvious all of the limitations of claim 1. (*Supra* §§X.A.1, X.B.1.)

***b. wherein said second tensioning structure and said third tensioning structure are respectively provided with a plurality of air holes, through which an airflow passage is formed in said air chamber.***

Lin '773 discloses this limitation. (Ex. 1009, 7:17-25, 7:53-66, Figs. 1, 3; Ex. 1002, ¶¶196-198.) Lin '773 discloses that its tensioning structures may comprise a "plurality of substantially parallel strands 32" (yellow) that are captured

between two weld strips 31 (red), which are in turn welded to the top and bottom sheets (blue) of an inflatable bed:

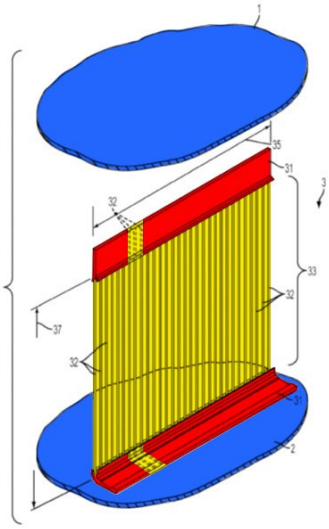


FIG. 1

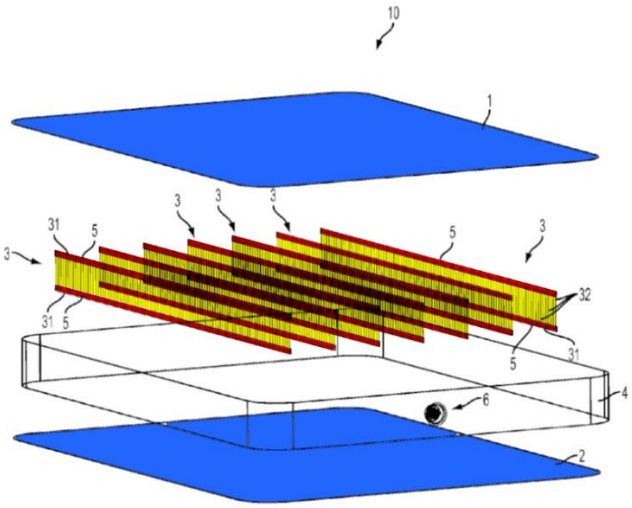


FIG. 3

(Ex. 1009, 7:17-25, 7:53-66, Figs. 1, 3.)

A POSA would have understood the space between each strand of Lin '773's tensioning structure to constitute an opening through which air may flow, as shown in the annotated Figure 1 below:

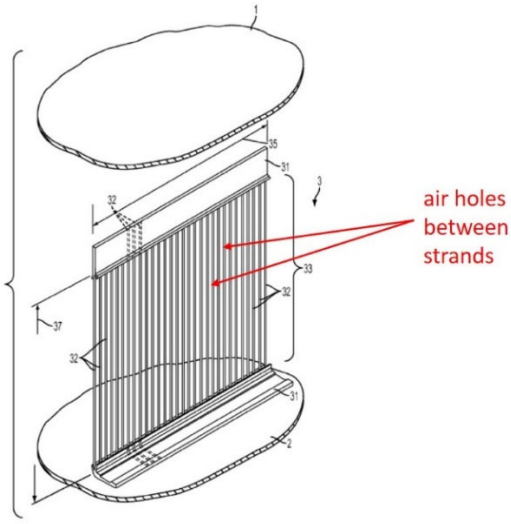
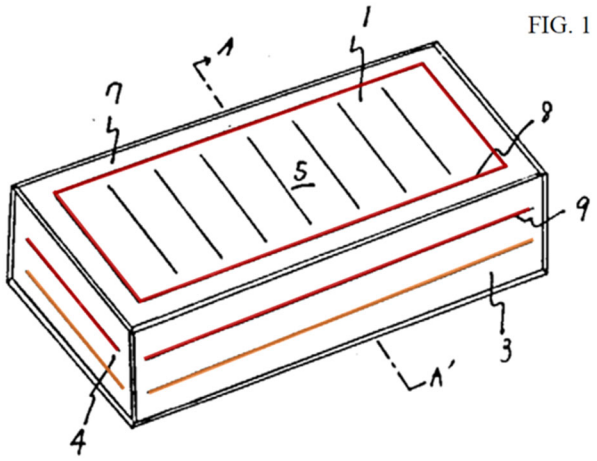



FIG. 1

(*Id.*, Fig. 1; Ex. 1002, ¶198.) Indeed, Lin '773 does not disclose any other means for the air to flow through the air chamber of the bed after entering from the valve on the side wall, and thus a POSA would understand that air would flow through the openings between the strands of Lin '773's tensioning structure to pressurize the air within the chamber. (Ex. 1009, 8:47-55; Ex. 1002, ¶198.) A POSA thus would have understood Lin '773's tensioning structures to be provided with a plurality of air holes through which an airflow passage is formed in the air chamber of the inflatable bed. (Ex. 1002, ¶198; *supra,* §VIII.A; Ex. 1035, 3 (defining "hole" as "an opening through something"; "an area where something is missing").) Indeed, in the EPO proceeding, Patent Owner conceded that the spaces between cables (which Patent Owner equated to "threads") in a tensioning structure "comprises air holes." (Ex. 1038, 570 (claim 2), 575 (claim 32).) Moreover, use of such air holes in tensioning structures was well known in the art. (Ex. 1002, ¶198; Ex. 1011, 3:20-22, 3:38-41, Figs. 2, 8; Ex. 1013, ¶[0068]; Ex. 1014, ¶¶[0023]-[0024], Figs. 5, 7, 8.; Ex. 1025, 3:6-10, Fig. 3; Ex. 1041, 3:55-67, 5:14-30, 5:47-55; Ex. 1015, ¶¶[0041], [0054]; Ex. 1039, 5:45-62, 6:8-11.)

In addition, as shown in annotated Figure 1 below, Aoki discloses that the diagonal bracing hanging sheets form depression lines (red for the hanging sheets comprising the second tensioning structure; orange for the hanging sheets comprising the third tensioning structure) at their adhesive positions (8) and (9)

when coupled to the top, bottom, lengthwise, and widthwise sheets, and that these depression lines do not span the entire length of these sheets, but rather stop short on either end:




(Ex. 1005, Fig. 1.)

Accordingly, when oriented this way in Aoki, Lin ’773’s tensioning structures would have gaps in each corner, through which air may flow within the air chamber. As discussed above, the ’633 Patent identifies such tensioning structures with gaps in each corner (as in Figure 8 below) as providing a plurality of air holes as recited in claim 2:

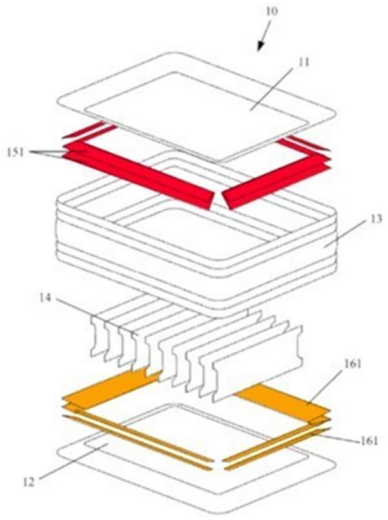



Fig. 8

(*Supra*, §VIII.A; Ex. 1001, 7:41-50, Fig. 8.)

In addition, it was well-known before the Priority Date that tensioning structures of an inflatable bed could allow for airflow passage within the air chamber by one or both of two means: (1) using a continuous strip around the entire periphery of the air chamber, with openings placed in the strip to allow air to flow through; and/or (2) using multiple strip segments that did not extend around the entire periphery of the air chamber, thus leaving gaps in the corners through which air could flow. (Ex. 1002, ¶200; Ex. 1011, 3:12-20 & Fig. 2 (continuous strip with openings), 3:45-4:5 & Fig. 8 (segmental strips leaving gaps in the corners).) A POSA would have known that either was a viable option for providing a tensioning structure, and that there were advantages and disadvantages to both. (Ex. 1002, ¶200.) For example, a POSA would have known that a continuous tensioning structure would provide additional pull strength around all

four corners of the air mattress, thereby preventing potential bulging of the sides and ensuring that the mattress is properly aligned and has more uniform corners. (Ex. 1002, ¶200; Ex. 1014, ¶¶[0007]-[0011], Figs. 3-8.) Conversely, a segmental tensioning structure would typically require less material and weight, and potentially less cost. The choice of which to pursue would be dictated by such factors as availability of materials, manufacturing capabilities, specifications for the air bed, and costs. (Ex. 1002, ¶200.) A POSA would have known that while both options presented trade-offs, either would be obvious to try, and a POSA would have had a reasonable expectation of success with either. (*Id.*) Indeed, the '633 Patent itself discloses both as viable alternatives. (Ex. 1001, 3:56-4:10, 7:41-45, Figs. 7, 8, 10, 11, 14, 15, 17, 18.)

Accordingly, modifying Aoki to employ Lin '773's tensioning structures as the tensioning structures in Aoki's air mattress (*supra*, §X.B.1) would result in a second tensioning structure and third tensioning structure that are respectively provided with a plurality of air holes, through which an airflow passage is formed in said air chamber. (Ex. 1002, ¶¶201.) Aoki in view of Lin '773 therefore renders obvious claim 2 of the '633 Patent. (*Id.*)

### 3. Claim 16

#### *a. The inflatable bed according to claim 1,*

As discussed above, Aoki, either individually or in view of Lin '773, discloses or renders obvious all of the limitations of claim 1. (*Supra* §§X.A.1, X.B.1.)

#### *b. wherein said first tensioning structure is coupled to said top and bottom sheets by means of high-frequency welding; said second tensioning structure is coupled to said top sheet and said side wall by means of high-frequency welding; and said third tensioning structure is coupled to said bottom sheet and said side wall by means of high-frequency welding.*

Lin '773 discloses that its tensioning structure may be manufactured using "a high-frequency welder." (Ex. 1009, 11:11-38, Fig. 7.) Lin '773 further discloses that its tensioning structure may be coupled to the upper and lower material (top and bottom sheets of the inflatable bed) by welding. (*Id.*, 7:16-25, 8:4-29, 8:47-55, Figs. 3, 4.)

As described above, a POSA would have known that it would be advantageous to use the same material for both Lin '773's weld strips and Aoki's top sheet, bottom sheet, and side walls to achieve a secure welded connection. (*Supra*, §X.B.1; Ex. 1002, ¶249.) Thus, a POSA would have been motivated by Lin '773's teachings of using a high-frequency welder to couple Aoki's first,

second, and third tensioning structure to the top sheet, bottom sheet, and side walls, respectively, by means of high-frequency welding. (Ex. 1002, ¶249.)

In addition, a POSA would have known that high-frequency welding was a known method of welding that provided several advantages, including short weld times, simple technique, consistent performance, and relative low cost, among others. (*Id.*; Ex. 1049, 374-375.) Moreover, the process of coupling tensioning structures by means of high-frequency welding was well-known and long employed in the art before the Priority Date. (Ex. 1002, ¶249; Ex. 1026, 4:26-37, 5:39-45; Ex. 1027, ¶¶[0035], [0036], [0041]; Ex. 1034, ¶[0011].) Indeed, the Examiner rejected this claim during prosecution of the '633 Patent on this basis. (Ex. 1003, 448-449.) Patent Owner's Amendment did not address these conclusions. (*Id.*, 484-486.)

Aoki in view of Lin '773 therefore renders obvious claim 16 of the '633 Patent. (Ex. 1002, ¶¶247-251.)

### C. Ground 3: Aoki in view of Lin '773 and Liu Renders Obvious Claim 16 of the '633 Patent

#### 1. Claim 16

##### *a. The inflatable bed according to claim 1,*

As discussed above, Aoki, either individually or in view of Lin '773, discloses or renders obvious all of the limitations of claim 1. (*Supra* §§X.A.1, X.B.1.)

***b. wherein said first tensioning structure is coupled to said top and bottom sheets by means of high-frequency welding; said second tensioning structure is coupled to said top sheet and said side wall by means of high-frequency welding; and said third tensioning structure is coupled to said bottom sheet and said side wall by means of high-frequency welding.***

As described above, Aoki in view of Lin '773 renders obvious claim 16 of the '633 Patent. (*Supra*, §X.B.3.) However, to the extent it would not have been obvious to couple Aoki's tensioning structures by means of high-frequency welding based on the teachings of Lin '773 as described above, it would have been obvious to do so in view of the teachings of Liu.

Liu discloses tensioning structures similar to Lin '773, for use in a multiple-layer air mattress. (*Supra*, §IX.C; Ex.1015, ¶¶[00037]-[0040], [0063].) As shown in annotated Figures 1 and 2 below, Liu discloses that its tensioning structures may comprise two plastic weld strips (red) and a panel "made of a material having fibers that form an open cell mesh construction" (yellow):

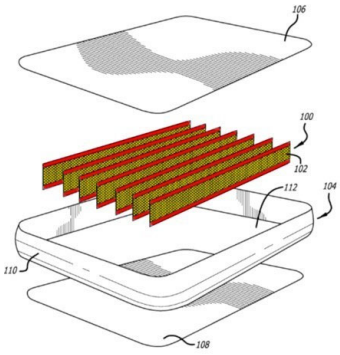
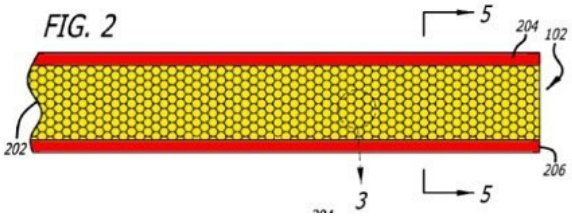



FIG. 1




(Ex. 1015, ¶¶[0037], [0040]; Figs. 1, 2.)

Liu teaches that such tensioning structures could be used to join the top and bottom sheets of a multiple-layer mattress, or "in any application where a lightweight, packable structure is needed to join two pieces of material that are urged away from one another in use." (Ex. 1015, ¶¶[0035]-[0040], [0063].) Liu further discloses that its tensioning structures "prevent over-expansion or 'ballooning' of the mattress" and thereby ensure that the air mattress does not become deformed (*id.*, ¶¶[0009]-[0010], [0040]-[0041], [0054])—the same problem in the art to which Aoki and Lin '773 are addressed (Ex. 1005, 1-2, 4-5; Ex. 1009, 1:38-52, 7:16-25, 8:47-55). Liu further discloses that its tensioning structures may be coupled to the sheets of an inflatable mattress by "RF welding, hot-air coupling, adhering, or other means known in the art." (Ex. 1015, ¶[0054].) A POSA would have understood that RF (radio frequency) welding constitutes high-frequency welding. (Ex. 1002, ¶266; Ex. 1046, 4; Ex. 1049, 17; Ex. 1050, 3.)

Thus, to the extent a POSA would not have understood Lin '773 to teach coupling tensioning structures to the top sheet, bottom sheet, and side walls by means of high-frequency welding, a POSA would have been motivated by Liu's teachings to employ high-frequency welding to couple Lin '773's weld strips to the outer surfaces of Aoki's inflatable bed. (Ex. 1002, ¶267.) Liu is directed to the same problems as Aoki (preventing deforming of large-height inflatable beds), and, like Lin '773, discloses advantageous tensioning structures comprising two

weld strips to achieve this objective. (Ex.1015, ¶¶[0009]-[0010], [00037]-[0041], [0054], [0063].) A POSA thus would have been motivated to look to Liu's teachings regarding advantageous attachment methods for coupling tensioning structures comprising weld strips (as disclosed by Lin '773) to the outer surfaces of an inflatable bed. (Ex. 1002, ¶267.)

In addition and as noted above, a POSA would have known that high-frequency welding was a known method of welding that provided several advantages, and the process of coupling tensioning structures by means of high-frequency welding was well-known and long employed in the art before the Priority Date. (*Supra*, §X.B.3.b; Ex. 1002, ¶267; Ex. 1049, 3; Ex. 1026, 4:26-37, 5:39-46; Ex. 1027, ¶¶[0035], [0036], [0041]; Ex. 1034, ¶[0011].) Indeed, the Examiner rejected this claim during prosecution of the '633 Patent on this basis, and Patent Owner's Amendment did not address these conclusions. (Ex. 1003, 448-449, 484-486.)

Accordingly, the combination of Aoki, Lin '773, and Liu disclose or suggest a first tensioning structure coupled to the top and bottom sheets of an inflatable bed by means of high-frequency welding, a second tensioning structure coupled to the top sheet and side wall by means of high-frequency welding, and a third tensioning structure coupled to the bottom sheet and side wall by means of high-frequency

welding. Aoki in view of Lin '773 and Liu therefore renders obvious claim 16 of the '633 Patent. (Ex. 1002, ¶¶264-269.)

### D. Ground 4: Aoki in view of Lin '773 and Liu '866 Renders Obvious Claims 19 and 20 of the '633 Patent

#### 1. Claim 19

##### *a. The inflatable bed according to claim 1,*

As discussed above, Aoki, either individually or in view of Lin '773, discloses or renders obvious all of the limitations of claim 1. (*Supra* §§X.A.1, X.B.1.)

##### *b. wherein said inflatable bed further comprises 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.*

As shown in annotated Figure 3 below, Liu '866 discloses an air bed that includes: (i) a periphery sheet 1 (green); (ii) a top sheet 2 (blue); (iii) a bottom sheet 3 (blue); and (iv) a middle sheet 4 (light blue):

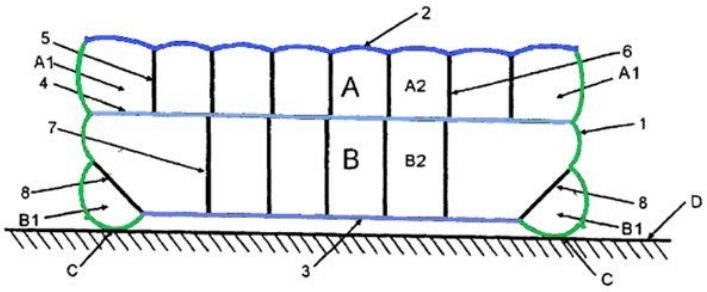



Fig.3

(Ex. 1011, 1:62-64, 2:56-58, Figs. 1-3.) As shown in annotated Figure 8 below,

Liu '866 discloses that the inflatable bed may also include "a plurality of oblique extending strips 8 [orange], for example, four oblique extending strips, two ends of which are not connected with each other," which are provided around the periphery of a set of extending strips 7 (yellow) in the lower air-chamber of the bed:

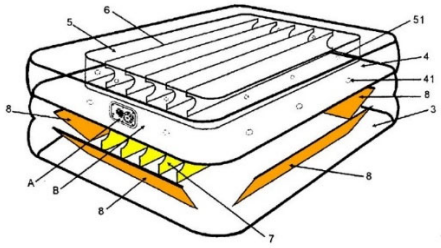


Fig.8

(*Id.*, 3:45-4:5; Fig. 8.) These oblique extending strips 8 (orange) are "welded to periphery sheet 1 around the air bed and bottom sheet 3, respectively." (*Id.*)

Liu '866 further discloses "a built-in electrical air pump or other air pump" for inflating the air chambers of the air bed. (Ex. 1011, 3:38-41.) As shown below in annotated Figure 8, Liu '866 discloses that the air pump (purple) is disposed on a side wall, above an upper edge of the plurality of oblique extending strips (orange):

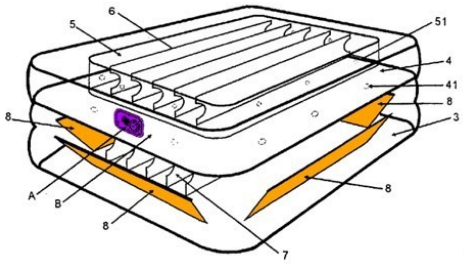


Fig.8

(*Id.*, Fig. 8; *see also* Fig. 2.)

It would have been obvious to combine the air mattress disclosed and suggested by Aoki and Lin '773 with Liu '866's teachings of disposing a built-in air pump on the side wall. Because Aoki is silent as to ways of inflating its air mattress, a POSA would have been motivated to look to the prior art to provide that teaching, knowing that Aoki's air mattress must be inflated in some way. (Ex. 1002, ¶286.) A POSA would have been motivated to look to Liu '866, as it addresses the same problems as Aoki—stability limitations, the potential for users to fall off, and aesthetic concerns in large-height air mattresses. (*Id.*; *compare* Ex. 1005, 1-2, 5, *with* Ex. 1011, 1:44-55, 2:18-31.) Moreover, providing a built-in air pump in an inflatable bed was well-known in the art before the priority date. (*Supra*, §VII.A.1.) A POSA would have known that a built-in air pump provided many advantages over earlier means of inflation, such as manual inflation or external pumps. (Ex. 1002, ¶286.) This included (a) increased time- and labor-efficiency (Ex. 1016, 1:25-28; Ex. 1017, 1:30-40; Ex. 1018, 1:25-33, Fig. 1; Ex. 1019, 1:19; Ex. 1020, Fig. 6, 4:1-15); (b) increased spatial efficiency (Ex. 1019, 4:50-59; Ex. 1021, 2:39-51); (c) increased durability (Ex. 1022, Fig. 1, 1:9-14, 2:123-131, 3:18-22; Ex. 1023, 1:29-31); and (d) improved costs and marketability (Ex. 1017, 1:34-38; Ex. 1018, 1:25-26; Ex. 1020, Fig. 6, 4:1-15). (Ex. 1002, ¶286.) Indeed, the Examiner originally rejected this claim during prosecution, taking Official Notice that "built-in air pumps were well known within the art,"

and finding that it would have been obvious to a POSA "to incorporate a built-in air pump … for the purpose of increasing convenience." (Ex. 1003, 449.) Patent Owner's Amendment did not address these conclusions. (*Id.*, 484-486.)

Moreover, implementing a built-in pump with Aoki would have been well within a POSA's technical grasp as of the Priority Date. (Ex. 1002, ¶287.) Indeed, Patent Owner previously affirmed that implementing pump components into a housing built into an air mattress "would have been well within a POSA's technical grasp" as early as June 2001. (Ex. 1044, 1, 6, 50; Ex. 1045, ¶211.) *See also Intex Recreation Corp. v. Team Worldwide Corp*., 860 F. App'x 717, 723 (Fed. Cir. 2021) (citing petitioner's showing that "numerous references since the late 1800s illustrated prior artisans' intuitive desire to recess pumps to save space" in vacating Board decision that claims directed to a pump "wholly or partially recessed" in an inflatable body were non-obvious).

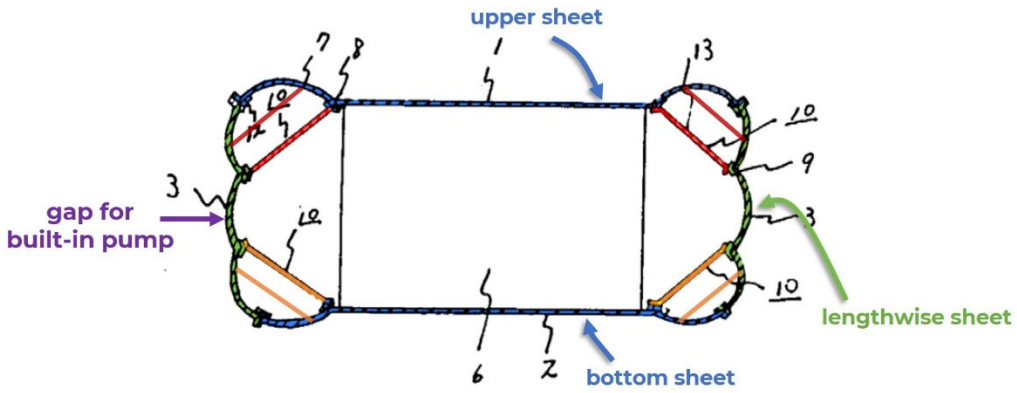
Although Liu '866 does not disclose oblique extending strips coupled to the top sheet and side walls, it would have been obvious to place the built-in pump between the second tensioning structure (upper diagonal bracing hanging sheets) and third tensioning structure (lower diagonal bracing hanging sheets) of Aoki. (Ex. 1002, ¶288.) As an initial matter, the specific location of the pump on the side wall reflects a design choice from among a finite number of options. (*Id*.) It was well-known in the art that placing a built-in air pump in the middle portion of a

side wall, in between two tensioning structures, would provide several advantages, including allowing more space to install the pump, ensuring that the pump was not immediately adjacent to the tensioning structures, and minimizing any interference between the pump and the tensioning structures. (*Id*.) Indeed, such design placement was common as of the Priority Date. (*Id.*; Ex. 1007, Fig. 2; Ex. 1008, 12, 14, 46, 48, 52.) Thus, a POSA would have a reasonable expectation of success in placing the pump in the middle portion of the mattress, between two tensioning structures. (Ex. 1002, ¶288.)

A POSA further would have been motivated by Liu '866's teaching to place the pump above the bottom oblique extending strips to apply that same concept to Aoki. (Ex. 1002, ¶289.) In particular, a POSA would have known that just as placing the pump above diagonal tensioning structures coupled to the side walls and bottom sheet would be beneficial, it would similarly be beneficial to also place the pump below diagonal tensioning structures coupled to the side walls and top sheet. (*Id.*). A POSA would have known that placing the pump between upper and lower diagonal bracing hanging sheets would allow more space to install the pump, ensure that the pump was not immediately adjacent to the tensioning structures, and minimize any interference between the pump and the tensioning structures. (*Id.*) Indeed, as described above and shown again in the annotated Figure below, Aoki discloses at least two tensioning structures connecting the top

sheet and side walls, and at least two tensioning structures connecting the bottom sheet and side walls, at each side of the inflatable bed, with a gap in between the upper and lower tensioning structures:

FIG. 2




(Ex. 1005, 4, Figs. 2, 4.) This would naturally suggest to a POSA to place a built-in pump in the gap between the upper and lower tensioning structures, to achieve the benefits of allowing more space to install the pump, ensuring that the pump was not immediately adjacent to the tensioning structures, and minimizing any interference between the pump and the tensioning structures. (Ex. 1002, ¶289.)

Accordingly, the combination of Aoki, Lin '773, and Liu '866 discloses or suggests an inflatable bed comprising a built-in air pump disposed on the side wall and located between a lower edge of a second tensioning structure and an upper edge of a third tensioning structure for inflating said air chamber. Aoki in view of Lin '773 and Liu '866 therefore renders obvious claim 19 of the '633 Patent. (Ex. 1002, ¶¶281-291.)

**2. Claim 20**

***a. The inflatable bed according to claim 1,***

As discussed above, Aoki, either individually or in view of Lin '773, discloses or renders obvious all of the limitations of claim 1. (*Supra* §§X.A.1, X.B.1.)

***b. wherein said inflatable bed further comprises an air valve, which is disposed on said side wall for the inflation and deflation of said inflatable bed.***

Liu '866 discloses that "the air bed can be filled up with air once for its whole air-chambers from air-valve 10." (Ex. 1011, 3:38-41.) As shown in annotated Figure 1 below, Liu '866 discloses that the air valve 10 (purple) is disposed on the side wall of the inflatable bed:

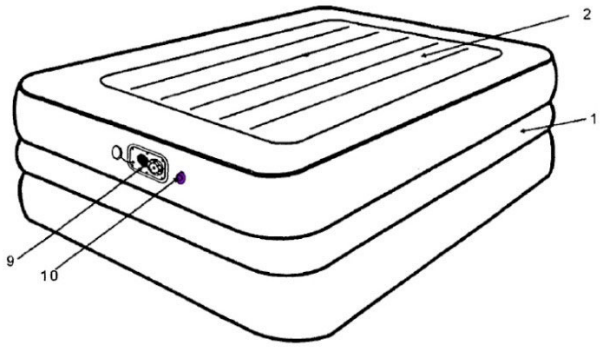



Fig.1

(*Id.*, Fig. 1.)

A POSA would have known that Liu '866's air valve would be used for not only inflation but also deflation of the inflatable bed. (Ex. 1002, ¶294.) First, it was well known in the art that air valves were commonly used for both inflation

and deflation. (*Id.*; Ex. 1036, 5 (defining "air valve" as "for the use, reception, passage, etc., of air or compressed air"); Ex. 1035, 7 (defining "valve" as "any of numerous mechanical devices by which the flow of liquid, gas, or loose material in bulk may be started, stopped, or regulated by a movable part that opens, shuts, or partially obstructs one or more ports or passageways").) Second, Liu '866 describes no other conduit for air to flow out of the air mattress, and so a POSA would understand that the air valve would be used for both inflation and deflation. (Ex. 1002, ¶294.)

It would have been obvious to combine the air mattress disclosed and suggested by Aoki and Lin '773 with Liu '866's teachings of disposing an air valve on the side wall for inflation and deflation of the inflatable mattress. Because Aoki is silent as to ways of inflating or deflating its air mattress, a POSA would have been motivated to look to the prior art to provide that teaching, knowing that Aoki's air mattress must be inflated and deflated in some way. A POSA would have been motivated to look to Liu '866, as it addresses the same problems as Aoki—stability limitations, the potential for users to fall off, and aesthetic concerns in large-height air mattresses. (*Compare* Ex. 1005, 1-2, 5, *with* Ex. 1011, 1:44-55, 2:18-31.) Moreover, providing an air valve on the side wall for inflation and deflation of an inflatable bed was well-known in the art before the priority date. (*Supra*, §VII.A.1.) Indeed, an air valve has been a rudimentary

feature of inflatable products for decades, and implementing an air valve with Aoki would have been well within a POSA's technical grasp. (Ex. 1002, ¶295.) Notably, the Examiner originally rejected this claim during prosecution, taking Official Notice that "air valves, such as the one required in [issued claim 20], are well known within the art," and finding that it would have been obvious to a POSA "to modify Lin with an air valve as required by [issued claim 20] in order to easily facilitate inflation of Lin's mattress, and also allow for deflation so that the mattress may be stored more easily." (Ex. 1003, 450.) Patent Owner's Amendment did not address these conclusions. (*Id.*, 484-486.)

Accordingly, the combination of Aoki, Lin '773, and Liu '866 discloses or suggests an inflatable bed comprising an air valve disposed on the side wall for the inflation and deflation of the inflatable bed. Aoki in view of Lin '773 and Liu '866 therefore renders obvious claim 20 of the '633 Patent. (Ex. 1002, ¶¶292-297.)

## XI. DISCRETIONARY DENIAL IS NOT APPROPRIATE

### A. *Fintiv*

The District Court Litigation is stayed pending resolution of this IPR petition and the other IPR petitions filed by Petitioner. (Ex. 1057.) Accordingly, "it is not necessary to analyze the *Fintiv* factors in detail" and discretionary denial on this basis is unwarranted. *Microsoft Corp. v. Throughputer, Inc.*, IPR2022-00528, Paper 12 at 26 (PTAB Sept. 19, 2022); *see also Apple Inc. v. Fintiv, Inc.*,

IPR2020-00019, Paper 11 at 5–6 (PTAB Mar. 20, 2020) (precedential) ("A district court stay of the litigation pending resolution of the PTAB trial allays concerns about inefficiency and duplication of efforts."); *Lyft, Inc. v. Agis Software Dev. LLC*, IPR2022-00513, Paper 11 at 5-6 (PTAB June 2, 2022) ("Given the strong weight afforded a stay in the *Fintiv* analysis, we decline to exercise our discretion to deny institution under § 314(a) in view of the district court litigation." (quotation marks omitted)); *Precision Planting, LLC v. Deere & Co.*, IPR2019-01052, Paper 19 at 10 (PTAB Jan. 7, 2020) (concluding that district court stay rendered moot the patent owner's argument for discretionary denial).

**B. 35 U.S.C. §325(d)**

Denial under 35 U.S.C. §325(d) would not be appropriate under the two-part test set forth in *Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH*: (1) whether the same or substantially the same prior art or arguments were previously presented to the Office; and (2) whether Petitioner demonstrated that the Office erred in a manner material to the patentability of the challenged claims. IPR2019-01469, Paper 6 at 8-9 (PTAB Feb. 13, 2020) (precedential).

None of Aoki or Liu '866 were ever presented to or considered by the Examiner. (Ex. 1001, Title Page-2, (56); Ex. 1003.) While Liu was cited by the Examiner in support of his conclusion that certain limitations in dependent claims were well known in the art (Ex. 1003, 448, 450), Patent Owner's amendment to

purportedly distinguish over Lin did not address these limitations or rejections based on Liu (*id.*, 484-486.) Thus, the Examiner never considered or adopted any arguments against this application of Liu, and in any event, Liu is presented in the Petition in combination with Aoki and Lin '773, which combination was not considered by the Examiner during prosecution.

Similarly, while the publication (US2013/0228268) that published from the application that issued as Lin '773 was cited in a reference sheet by the Examiner (Ex. 1003, 452), this publication was not substantively discussed or applied by the Examiner during prosecution, and in any event, the combination of Aoki and Lin '773 was never considered by the Examiner. Thus, the first prong of *Advanced Bionics* is not satisfied with respect to Liu or Lin '773. *See, e.g.*, *Thorne Research, Inc. v. Trustees of Dartmouth College*, IPR2021-00491, Paper 18 at 8 (PTAB Aug. 12, 2021) ("The fact that one piece of art from the combination was previously presented and/or argued to the Office alone is insufficient to satisfy the first prong of *Advanced Bionics* two-part test…."); *Halliburton Energy Servs. v. U.S. Well Servs.*, IPR2021-01036, Paper 12 at 18-20 (PTAB Jan. 19, 2022); *Teradata Corp. v. SAP SE*, IPR2020-00943, Paper 12 at 23-24 (PTAB Nov. 25, 2020).

## XII. CONCLUSION

For the foregoing reasons, Petitioner respectfully requests that IPR of claims 1, 2, 16, 19, and 20 of the '633 Patent be instituted and that these claims be determined to be unpatentable.

FAEGRE DRINKER BIDDLE & REATH

Dated: January 21, 2023

By: /R. Trevor Carter/
R. Trevor Carter
Reg. No. 40,549

## TYPE-VOLUME CERTIFICATION

Pursuant to 37 C.F.R. §42.24(d), Petitioner hereby certifies that this Petition for *Inter Partes* Review complies with the type-volume limitation of 37 C.F.R. §42.24(a). This Petition contains 11,401 words, excluding the parts of the Petition exempted by 37 C.F.R. §42.24(a), as calculated by Microsoft Word 2010, the word processing system used in its preparation.

FAEGRE DRINKER BIDDLE & REATH

Dated: January 21, 2023

By: /R. Trevor Carter/
R. Trevor Carter
Reg. No. 40,549

## CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §42.105, I hereby certify that on January 21, 2023, I caused a true and correct copy of this Petition for *Inter Partes* Review in connection with U.S. Patent No. 10,687,633 and Exhibits 1001 – 1057 to be served via email and electronic file transfer to the following:

Dickinson Wright PLLC
John S. Artz (jsartz@dickinsonwright.com)
Steven A. Caloiaro (scaloiaro@dickinsonwright.com)

The above listed attorney of record for Patent Owner agreed to accept service of the petition and exhibits electronically.

FAEGRE DRINKER BIDDLE & REATH

Dated: January 21, 2023

By: /R. Trevor Carter/
R. Trevor Carter
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