

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTEX RECREATION CORP.,
Petitioner,

v.

BESTWAY (USA), INC.,
Patent Owner.

IPR2019-00454
Patent 7,269,866 B2

Before SCOTT A. DANIELS, BARRY L. GROSSMAN, and
ZHENYU YANG, *Administrative Patent Judges*.

GROSSMAN, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. Background and Summary

Intex Recreation Corp. (“Petitioner”) filed a petition, Paper 1
 (“Petition,” “Pet.,” or “’454 Petition”), to institute an *inter partes* review of

claims 1–4 of U.S. Patent 7,269,866 B2 (the “’866 patent”). Bestway (USA), Inc. (“Patent Owner”) timely filed a Preliminary Response. Paper 6 (“Prelim. Resp.”).

We concluded that Petitioner satisfied the burden, under 35 U.S.C. § 314(a), to show that there was a reasonable likelihood that Petitioner would prevail with respect to at least one of the challenged claims. Accordingly, on behalf of the Director (37 C.F.R. § 42.4(a)), we instituted an *inter partes* review of all the challenged claims, on all the asserted grounds. Paper 7 (“Dec. Inst.”).

Patent Owner filed a Response. Paper 18 (PO Resp.). Petitioner filed a Reply. Paper 26 (“Pet. Reply”). Patent Owner filed a Sur-reply. Paper 31 (“Sur-reply”).

Petitioner submitted 33 exhibits (Exs. 1001–1025, 1027–1034). Petitioner relies, in part, on the Declaration testimony of Bernhard Kuchel (Ex. 1002).

Patent Owner submitted nine exhibits (Exs. 2001–2009). Patent Owner relies, in part, on the Declaration testimony of Dr. John P. Abraham (Ex. 2001).

A hearing was held May 6, 2020. Paper 33 (“Tr.”).

We have jurisdiction under 35 U.S.C. § 6. We enter this Final Written Decision pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73.

Petitioner has the burden of proving unpatentability of a claim by a preponderance of the evidence. 35 U.S.C. § 316(e).

Based on the findings and conclusions below, we determine that Petitioner has proven that claims 1–4 are unpatentable.

B. Real Parties in Interest

Petitioner identifies as real parties-in-interest itself, Intex Development Company Ltd., Intex Industries (Xiamen) Co., Ltd., Intex Marketing Ltd., and Intex Trading Ltd. Pet. 1.

Patent Owner identifies as real parties-in-interest itself, Bestway Global Holdings, Inc., Bestway (Hong Kong) International, Ltd., Bestway Inflatables & Materials Corp., Bestway (Hong Kong) Enterprise Co. Ltd., and Bestway (Nantong) Recreation Corp. Paper 3, 1.

The parties do not dispute the identifications of the real parties-in-interest in this proceeding.

C. Related Matters

Petitioner asserts “[t]here are no judicial or administrative matters that would affect, or be affected by, a decision in the proceeding.” Pet. 1. This is not a correct statement.

Petitioner filed a parallel petition for an *inter partes* review of the ’866 patent on the same day as the Petition in the proceeding before us. *See* IPR2019-00493, Paper 1 (the “’493 IPR Proceeding”); *see also* Patent Owner Mandatory Notice (Paper 3, 1) (disclosing that Petitioner filed “another Petition for Inter Partes Review of U.S. Patent 7,269,866 on December 29, 2018, IPR2019-00493”). The ’493 IPR Proceeding challenged the same patent (the ’866 patent) and the same claims (claims 1–4) based on substantially the same prior art as the Petition in the case before us. *Compare* ’454 Pet. 24–25, *with* ’493 Pet. 24–25.

Our rules require a petitioner, as part of the petition, to “[i]dentify any other judicial or administrative matter that would affect, or be affected by, a decision in the proceeding.” 37 C.F.R. § 42.8(a)(1), (3); (b)(2). A

“proceeding” “means a trial or preliminary proceeding.” *Id.* § 42.2. A “preliminary proceeding” “begins with the filing of a petition for instituting a trial and ends with a written decision as to whether a trial will be instituted.” *Id.*

The ’493 IPR Proceeding was an administrative matter that would affect, or be affected by, a decision in the proceeding before us. It should have been disclosed by Petitioner as a “related matter.” *See id.* § 42.8(b)(2).

The Board exercised its discretion under 35 U.S.C. § 314 to deny institution of review of the ’493 IPR Proceeding. *See* ’493 IPR Proceeding, Paper 7.

Patent Owner disclosed the ’493 IPR Proceeding as a related matter. *See* Patent Owner Mandatory Notice (Paper 3, 1). Patent Owner also disclosed as a related matter litigation between the parties to the IPR proceeding before us. Paper 3, 1 (stating that Patent Owner “filed a complaint against Petitioner Intex Recreation Corp., Intex Trading Ltd., and Intex Industries (Xiamen) Co., Ltd. for infringement of U.S. Patent 7,269,866 on December 15, 2017, Case No. 2:17-cv09030-PSG-JEM, U.S. District Court for the Central District of California – Western Division”). Service was not made until January, 24, 2018. *See* Ex. 3002, 2 (“WHEREAS, pursuant to Fed. R. Civ. P. 4(d), counsel for Plaintiff provided each Defendant, through its counsel, a Notice of Lawsuit and Request to Waive Service of a Summons on January 24, 2018”). This case was dismissed without prejudice on November 14, 2018, based on a stipulated voluntary dismissal. Ex. 3001.

D. Prior Art and Asserted Grounds

Petitioner asserts that claims 1–4 would have been unpatentable on the following grounds:

Claims Challenged	35 U.S.C. §¹	References
1–4	103	Yuan, ² Metzger ³
2, 3	103	Yuan, Metzger, Davis ⁴
1–4	103	Yuan, Hsu, ⁵ Metzger
2, 3	103	Yuan, Hsu, Metzger, Davis
1–4	103	Yuan, Reed ⁶
2, 3	103	Yuan, Reed, Davis

II. THE '866 PATENT

We make the following findings concerning the '866 patent.

The '866 patent discloses an “air bed,” often used for camping or as a spare bed for visitors. Ex. 1001, 1:6–13. According to the '866 patent, an “air bed” differs from an “air mattress” in that it has a greater overall height. *Id.* at 1:13–15. The greater height air bed more closely resembles a box

¹ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 296–07 (2011), took effect on September 16, 2012. The changes to 35 U.S.C. §§ 102 and 103 in the AIA do not apply to any application filed before March 16, 2013. Because the application for the patent at issue in this proceeding has an effective filing date before either of these dates, we refer to the pre-AIA version of the statute.

² U.S. Patent Appl. Publ. No. 2005/0076449 A1, published April 14, 2005, based on an application filed March 31, 2003. Ex. 1019.

³ U.S. Patent 7,089,618 B1, issued August 15, 2006, based on an application filed June 18, 2003. Ex. 1004.

⁴ U.S. Patent Appl. Publ. No. 2005/0132490 A1, published June 23, 2005, based on an application filed December 16, 2004. Ex. 1024.

⁵ U.S. Patent 6,671,910 B2, issued January 6, 2004. Ex. 1009.

⁶ U.S. Patent 2,604,641 issued July 29, 1952. Ex. 1013.

spring and mattress combination in function and height, and is known generally as a “two layer” or a “double height air mattress.” Ex. 1004, 1:45–51; Ex. 1001, 1:13–15. This greater overall height may provide greater comfort and cushioning, but it also provides increased instability. *Id.* An object of the disclosed air bed is to provide an air bed with improved stability. *Id.*; *Id.* at 1:59–62 (“The object of the present invention is to overcome the above drawbacks of the prior art and provide an air bed that has satisfactory stability, a simple structure, and a very beautiful appearance.”).

The disclosed air bed is shown in Figures 1–3 and 8 of the ’866 patent. Figures 4–7 illustrate prior art air beds. Representative figures are shown below comparing the disclosed air bed and the admitted prior art.

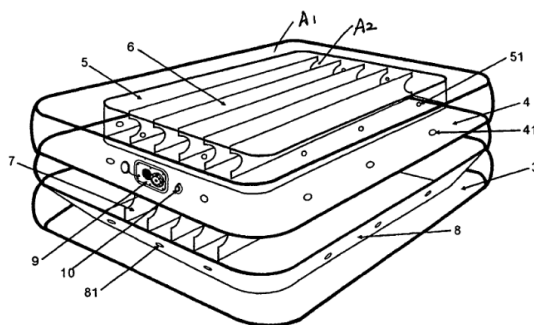


Fig.2

Fig. 2 is a schematic diagram of the internal structure of the disclosed air bed. Ex. 1001, 2:37–38.

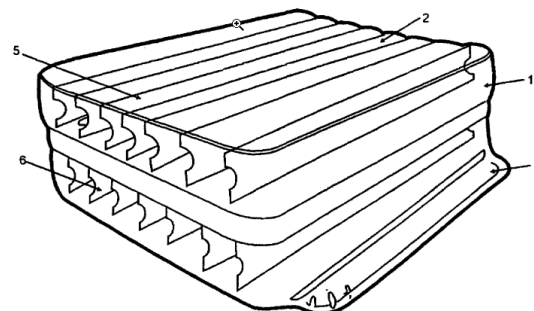


Fig.4 (PRIOR ART)

Fig. 4 is a schematic diagram of the internal structure of the prior art. Ex. 1001, 2:41–42.

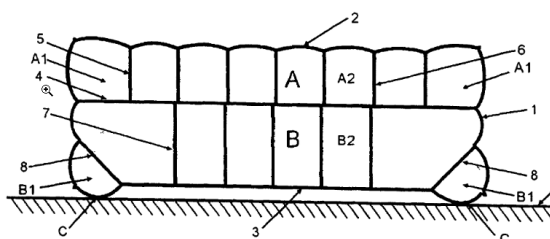


Fig.3

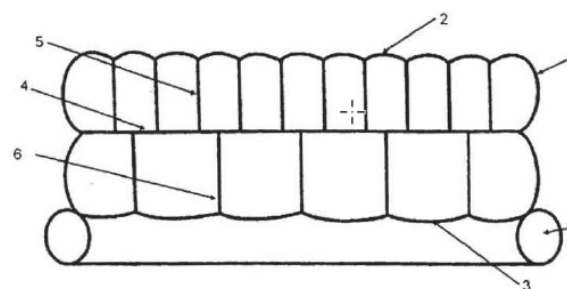


Fig.7 (PRIOR ART)

Fig. 3 is a sectional schematic diagram of the disclosed air bed. Ex. 1001, 2:39–40.

Fig. 7 is a sectional schematic diagram of the prior art. Ex. 1001, 2:46.

Petitioner provides the following annotated Figure 3 from the '866 patent:

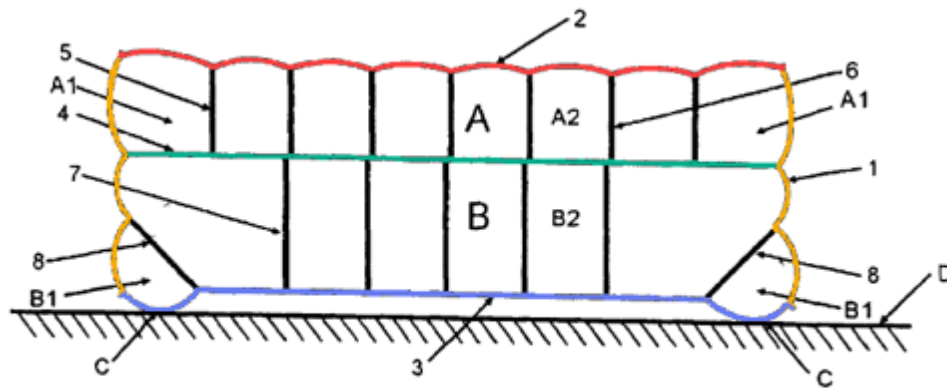


Fig.3

Fig. 3 from the '866 patent annotated by Petitioner. Pet. 4.

As shown in Petitioner's annotated Figure 3, the disclosed air bed includes periphery sheet 1 (orange), top sheet 2 (red), bottom sheet 3 (blue), and a middle sheet 4 (green). Pet. 3–4; Ex. 1001, 2:56–58. The patent does not disclose the material of the “sheets.” Typically, air mattresses and air beds, and hence the sheets, are made from heavy gauge plastics, such as polyvinylchloride and similar materials. Ex. 1004, 1:30–35. In the '866 patent, the upper edge of periphery sheet 1 is welded to the edge of top sheet 2; the lower edge of periphery sheet 1 is welded to the edge of bottom sheet 3; middle sheet 4 is provided between top sheet 2 and bottom sheet 3 and is welded to the middle portion of periphery sheet 1, which separates the air bed into an upper air-chamber A and a lower air-chamber B. Ex. 1001, 2:59–64. There also are a number of individualized air chambers defined by various supports strips 6 and 7. Also as shown in Figure 3 of the '866

patent, “oblique extending strips” 8, separate lower air-chamber B into lower *main* air-chamber B2 and peripheral *auxiliary* air-chamber B1. *Id.* at 3:14–20.

As a result of oblique extending strips 8, lower main air-chamber B2 has a shape of an inverse cone. Ex.1001, 3:23–24. Petitioner provides the following annotation of Figure 3, showing in red outline the disclosed “inverse cone” shape of lower air chamber B2. Pet. 6.

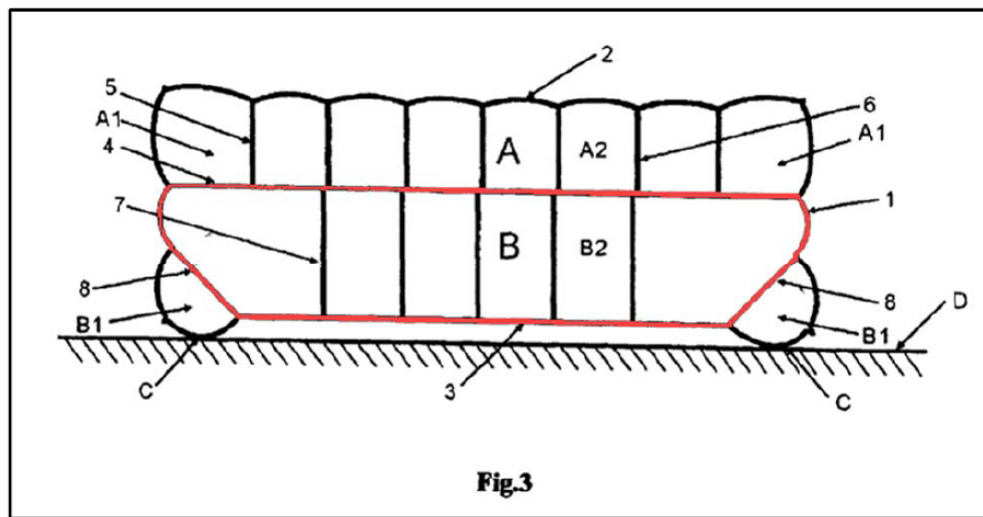


Figure 3 of the '866 patent annotated to outline in red the “inverse cone” shape of lower air chamber B2. Pet. 6.

The inverse cone shape of air-chamber B2 is a significant patentability issue between the parties.

The '866 patent discloses that Figure 3 shows that surface C of peripheral auxiliary air-chamber B1 “is higher than (or extends beyond)”⁷

⁷ The disclosure that surface C of peripheral auxiliary air-chamber B1 is “higher than (or extends beyond)” the surface of bottom sheet 3 of the lower main air-chamber B2 may be an error. It is inconsistent with Figure 3, which shows surface C below, or lower than, the surface of bottom sheet 3. Also, as we discuss below in Section II.B.3, in the Prosecution History of the '866 patent, all references in the original Specification and claims, as

the surface of bottom sheet 3 of the lower main air-chamber B2 to define supporting points around the periphery of the bottom of the air bed at its outer side. Ex. 1001, 3:26–28, 33–37. This results in lower main air-chamber B2 being raised above the floor or other supporting surface D. *Id.* at 3:29–33. According to the ’866 patent, this structure results in improved stability of the air bed. *Id.* at 3:33–38. The “extends beyond” structure of air-chamber B1 also is a significant patentability issue between the parties.

A. Illustrative Claim

Claim 1 is the sole independent claim and is reproduced below.

1. An air bed with a stable supporting structure, comprising a periphery sheet, a top sheet, a bottom sheet, a middle sheet, which separates the air bed into an upper air-chamber and a lower air-chamber, a loop of an outer extending strip provided in the upper air-chamber, which separates the upper air-chamber into a peripheral air-chamber and an upper main air-chamber, and a first set of extending strips, which is provided in the upper main air-chamber and consists of a plurality of parallel extending strips; characterized in that the air bed further comprising a second set of extending strips, which is provided in the lower air-chamber, and which includes a plurality of parallel extending strips, and is welded to the middle sheet and the bottom sheet, and an oblique extending strip, which is provided around the second set of extending strips and is welded to the periphery sheet and the bottom sheet to separate the lower air-chamber into a lower main air-chamber and a peripheral auxiliary air-chamber; and *the lower main air-chamber includes a space which has a shape of an inverse cone* and receives air therein, and an outer surface of the lower main air chamber is *concave* with respect to an outer surface of the peripheral auxiliary air-chamber, *that is, the outer surface of the peripheral*

filed, to “higher than,” except the one cited here, were deleted by amendment.

auxiliary air-chamber extends beyond the bottom sheet of lower main air-chamber.

Ex. 1001, 4:8–31 (emphasis added to identify significant patentability issues between the parties).

B. Claim Construction

The Petition was filed on December 29, 2018. Paper 5. This filing date is after the Patent and Trademark Office implemented a new rule on claim construction adopting the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. § 282(b). *See* Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340 (Oct. 1, 2018) (now codified at 37 C.F.R. pt. 42 (2019)). The claim construction standard used in a civil action under 35 U.S.C. 282(b) is generally referred to as the *Phillips* standard. *See Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). This new rule became effective on November 13, 2018, and applies to all petitions filed on or after the effective date. 83 Fed. Reg. 51,340. Thus, the new claim construction rule applies to this proceeding.

Under the *Phillips* standard, “words of a claim are generally given their ordinary and customary meaning.” *Phillips*, 415 F.3d at 1312. “[T]he ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention.” *Id.* at 1313. “Importantly, the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification.” *Id.* Although claim terms are interpreted in the context of the entire patent, it is improper to import

limitations from the specification into the claims. *Id.* at 1323 (acknowledging “the danger of reading limitations from the specification into the claim”). “[T]he line between construing terms and importing limitations can be discerned with reasonable certainty and predictability if the court’s focus remains on understanding how a person of ordinary skill in the art would understand the claim terms.” *Id.* Usually, the Specification “is dispositive; it is the single best guide to the meaning of a disputed term.” *Continental Circuits LLC v. Intel Corp.*, 915 F.3d 788, 796 (Fed. Cir. 2019) (citing *Phillips* at 1315 (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996))).

In construing the claims, we also look to “extrinsic evidence concerning relevant scientific principles, the meaning of technical terms, and the state of the art.” *Phillips* at 1314 (quoting *Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1116 (Fed. Cir. 2004)).

“[W]e need only construe terms ‘that are in controversy, and only to the extent necessary to resolve the controversy.’” *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co. Ltd.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

Petitioner proposes specific construction for the terms “a periphery sheet” (Pet. 26–27), “a middle sheet” (*id.* at 27–28), and the “Concave Limitation”⁸ (*id.* at 28–32), all in independent claim 1. Petitioner also

⁸ Petitioner defines the Concave Limitation as the following clause in independent claim 1: “an outer surface of the lower main air-chamber is concave with respect to an outer surface of the peripheral auxiliary air-chamber, that is, the outer surface of the peripheral auxiliary air-chamber extends beyond the bottom sheet of the lower main air-chamber.” Pet 28;

proposes a specific construction for the alternative structures defined by the disjunctive “or” in dependent claim 4 (*id.* at 32–33).

Patent Owner proposes specific constructions for the term “air-chamber” in claim 1 (PO Resp. 14–24), and for the same clause Petitioner refers to as the “Concave Limitation” (*id.* at 25–30).

We construe below the term “air chamber” and the Concave Limitation. We determine that an explicit construction of the other claim terms is not necessary for the purposes of determining patentability in this proceeding.

Because the ordinary and customary meaning of a claim term is the meaning that the term would have had to a person of ordinary skill in the art in question at the time of the invention, we first address what is the level of ordinary skill applicable to the ’866 patent.

1. Level of Ordinary Skill

The level of skill in the art is “a prism or lens” through which we view the prior art and the claimed invention. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

Factors pertinent to a determination of the level of ordinary skill in the art include: (1) educational level of the inventor; (2) type of problems encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which innovations are made; (5) sophistication of the technology, and (6) educational level of workers active in the field. *Envtl. Designs, Ltd. v. Union Oil Co.*, 713 F.2d 693, 696–697 (Fed. Cir. 1983) (citing *Orthopedic*

see also Ex. 1001, 4:27–31 (the language of this clause in claim 1 does *not* include the word “the” immediately before the phrase “lower main air-chamber” at the end of the Concave Limitation.)

Equip. Co. v. All Orthopedic Appliances, Inc., 707 F.2d 1376, 1381–82 (Fed. Cir. 1983)). Not all such factors may be present in every case, and one or more of these or other factors may predominate in a particular case. *Id.* Moreover, these factors are not exhaustive but are merely a guide to determining the level of ordinary skill in the art. *Daiichi Sankyo Co. Ltd, Inc. v. Apotex, Inc.*, 501 F.3d 1254, 1256 (Fed. Cir. 2007).

In determining a level of ordinary skill, we also may look to the prior art, which may reflect an appropriate skill level. *Okajima*, 261 F.3d at 1355. Additionally, the Supreme Court informs us that “[a] person of ordinary skill is also a person of ordinary creativity, not an automaton.” *KSR Int’l v. Teleflex Inc.*, 550 U.S. 398, 421 (2007).

Neither party presents a detailed evidentiary showing of factors typically considered in determining the level of ordinary skill.

Petitioner asserts that a person of ordinary skill “would have had either: (1) a bachelor’s degree in mechanical engineering, or an equivalent field; or (2) an associate’s degree in mechanical engineering, or an equivalent field, and two years of practical experience in inflatable product design.” Pet. 11 (citing Ex. 1002 ¶ 27). The cited paragraph from Mr. Kuchel’s Declaration merely repeats Petitioner’s conclusion. Neither Petitioner nor Mr. Kuchel provide any analysis of the factors typically considered in determining the level of ordinary skill. Mr. Kuchel’s conclusory opinion on this issue is entitled to some, but little, probative weight. 37 C.F.R. § 42.65(a).

Neither Patent Owner’s Response nor its Sur-reply assert a proposed level of ordinary skill, nor does Patent Owner comment on Petitioner’s proposed level of skill. We note, however, that Patent Owner’s expert declarant, Dr. Abraham, testifies that he used the same level of skill as did

Mr. Kuchel. *See* Ex. 2001 ¶ 42 (“For the purposes of this Declaration I will use Mr. Kuchel’s proposal.”). Neither Patent Owner’s Response nor its Sur-reply, however, cite to Dr. Abraham’s testimony on the level of ordinary skill. At the hearing in this proceeding, however, Patent Owner stated “we agree” with the level of ordinary skill adopted in the Decision to Institute a trial in this proceeding. Tr. 36:5–10.

There is no evidence before us of the educational level of the inventor; rapidity with which innovations are made; or the educational level of workers active in the field. The technology disclosed and claimed in the ’866 patent is not complex. Simplicity, however, is not inimical to patentability. *In re Oetiker*, 977 F.2d 1443, 1447 (Fed. Cir. 1992); *see also, Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1572 (Fed. Cir. 1987) (stating that the patent system is not foreclosed to those who make simple inventions).

In this case, we determine that the prior art reflects knowledge of inflatable devices and the stability of air beds. *See generally* Exs. 1004, 1009, 1013, 1019, and 1024.

Based on the prior art, Mr. Kuchel’s testimony, and Patent Owner’s statement of agreement, we adopt the level of ordinary skill as stated in our Decision to Institute this proceeding (*see* Dec. Inst. 14–16), which is that a person of ordinary skill in a technology pertinent to the challenged claims would have had either: (1) a bachelor’s degree in mechanical engineering, or an equivalent field; or (2) an associate’s degree in mechanical engineering, or an equivalent field, and two years of practical experience in inflatable product design. A recipient of other academic degrees may qualify as a person of ordinary skill if they have taken coursework or have experience in the pertinent technology. Additional education, such as an advanced degree,

could offset less work experience; additional work experience could offset less education or coursework.

2. *Air Chamber*

Patent Owner proposes that the term air-chamber should be construed because “the meaning of this term is critical to Intex’s [Petitioner’s] interpretation of Yuan and Metzger.” PO Resp. 14. Yuan and Metzger are references applied in asserted Grounds 1–4.

Patent Owner proposes that, “as used in the ’866 Patent and in the field of inflatable beds and mattresses, an ‘air chamber’ should be construed as:”

an enclosed body that is either sealed off completely or sufficiently inhibits air flow such that at least a temporary difference in air pressure may be maintained therein.

PO Resp. 18 (bold and italic font omitted) (citing Ex. 2001 ¶ 77)⁹; *id.* at 24. Thus, Patent Owner proposes a construction that provides two distinct alternatives: (1) “an enclosed body that is . . . sealed off completely” *or* (2) “an enclosed body that . . . sufficiently inhibits air flow such that at least a temporary difference in air pressure may be maintained therein.” *Id.* These two alternatives appear to be mutually exclusive; an air chamber cannot be “sealed off completely” and allow also “air flow.” Neither the proposed claim construction claim nor the Specification provide any guidance on when these alternatives apply.

Patent Owner’s second alternative proposed construction also provides no reference to what the temporary difference in air pressure is

⁹ Exhibit 2001 is the Declaration testimony of Dr. John P. Abraham, Patent Owner’s expert witness.

compared to, such as whether it is a pressure difference compared to atmospheric pressure or a pressure difference compared to a different air-chamber. If it is intended to be a different air-chamber, the second alternative proposed construction does not define which one of the multiple air-chambers is being used for comparison.

Thus, initially, we find that Patent Owner’s proposed construction creates ambiguity, not clarity, in construing the claims.

Petitioner proposes that the term air-chamber should be construed to mean “an area in an inflatable product that is filled with air.” Pet. Reply 8 (*italic font omitted*). Petitioner asserts “this construction is consistent with *both* embodiments of the ’866 Patent (*id.*), the prior art (*id.* at 8–9), and extrinsic evidence of dictionary definitions (*id.* at 9 (citing Ex. 1031) and expert testimony (*id.*).

a) The Claims

We begin with the words of the claims in the ’866 patent. We make the following findings regarding the claims.

The term “air-chamber” appears throughout the claims. Claim 1 refers to “an upper air-chamber and a lower air-chamber.” Ex. 1001, 4:10–11; *see also* Fig. 3 (illustrating upper chamber A and lower chamber B). Claim 1 also states that the “upper air-chamber” is separated into “a peripheral air-chamber and an upper main air-chamber.” *Id.* at 4:11–14; *see also* Fig. 3 (illustrating peripheral air-chamber A1 and upper main air-chamber A2). Additionally, claim 1 states that the lower air-chamber B is separated into “a lower main air-chamber and a peripheral auxiliary air-chamber.” *Id.* at 4:21–25; *see also id.* at Fig. 3 (illustrating peripheral auxiliary air-chamber B1 and lower main air-chamber B2).

Thus, claim 1 includes four distinct air-chambers, an upper peripheral air-chamber (A1), an upper main air-chamber (A2), a lower peripheral auxiliary air-chamber (B1), and a lower main air-chamber (B2). *See id.*, Fig. 3, and related text in the Specification.

We find that the language in claim 1 does not define any specific structure for the recited air-chambers. Each is simply an “air-chamber.” We also do not find any support in claim 1 for construing an air-chamber to be either sealed off completely or to inhibit air flow such that at least a temporary difference in air pressure may be maintained in the air-chamber.

As stated in *Phillips*, the presence of a dependent claim that adds a particular limitation gives rise to a presumption that the limitation in question is not present in the independent claim. 415 F.3d at 1315 (citing *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 910 (Fed.Cir.2004)). Thus, we also look to the dependent claims for guidance.

Dependent claims 2 and 3 add additional structure for the “extending strips” that separate upper air-chamber A and lower air-chamber B into their respective peripheral and main chambers.

For upper air-chamber A, claim 2 states that a plurality of “air-holes” are provided on “the loop of the outer extending strip” that divides upper air-chamber A into peripheral air-chamber A1 and upper main air-chamber A2. *Id.* at 4:32–35; *see also id.* at Fig. 3 (illustrating outer extending strip 5), Fig. 2 (illustrating air holes 51 in outer strip 5).

For lower air-chamber B, claim 3 states that a plurality of “air-holes” are provided on “the oblique extending strip” that divides lower air-chamber B into peripheral auxiliary air-chamber B1 and lower main air-chamber B2. *Id.* at 4:36–39; *see also id.* at Fig. 3 (illustrating oblique extending strip 8), Fig. 2 (illustrating air holes 81 in oblique strip 8).

The Specification states that “air holes” and allow their respective peripheral and main chambers “to communicate.” *E.g., see id.* at 3:7–9, 20–22.

Based on the specific inclusion in claims 2 and 3 of air holes in the outer and oblique extending strips, we find that the outer and oblique extending strips *in claim 1* may, or may not, have air holes. The lack of air holes in the extending strips, however, does not require that the various air-chambers are “sealed off completely.” It merely requires a lack of air holes in the extending strips.¹⁰ We also find that based on our analysis of the dependent claims, there is no structure in independent claim 1 for the claimed air-chambers to inhibit air flow such that at least a temporary difference in air pressure may be maintained in the air-chamber.

Considering the claims, an air-chamber is simply a chamber that can be filled with, and can retain, air.

b) The Specification

We make the following findings regarding the written description disclosure in the Specification.

The term “air-chamber” is used extensively throughout the Specification. *E.g., see* Ex. 1001, Abstract (which uses the term air-chamber 14 times).

In a preferred embodiment (*id.* at 2:53), the Specification states that “[a]ir holes 41 are provided on the middle sheet 4 to communicate upper air-

¹⁰ For example, although not recited in the claims, one embodiment described in the Specification states that “[a]ir holes 41 are provided on the middle sheet 4 to communicate upper air-chamber A with lower air-chamber B.” Ex. 1001, 2:64–66.

chamber A with lower air-chamber B.” *Id.* at 2:64–66. Thus, in this embodiment, air-chambers A and B communicate. The Specification also states that in order to facilitate inflating the entire air-bed, all the air-chambers can be filled from a single air-valve, air-valve 10, via air-holes 41, 51, 81 with a built-in electrical air pump or other air pump. *Id.* at 3:38–41. Air holes 41 have been described above. Air holes 51 are provided on outer extending strip 5 to communicate peripheral air-chamber A1 with upper main air-chamber A2. *Id.* at 3:7–9. Air holes 81 are provided on oblique extending strip 8 to communicate peripheral auxiliary air-chamber B1 with lower main air-chamber B2. Thus, as described in the Specification for this embodiment, the four distinct air-chambers recited in claim 1 are all in communication so that they can all be filled with air from a single air-valve.

In another disclosed embodiment, the Specification states that the air-chambers are designed to be “closed,” so that the air-chambers “will not communicate with each other.” Ex. 1001, 3:38–44. The Specification states:

the air bed can be filled up with air once for its whole air-chambers from air-valve 10 via air-holes 41, 51, 81 with a built-in electrical air pump or other air pump. *The air-chambers may be designed to be closed, so that these separate air-chambers will not communicate with each other,* and they can be inflated one by one from a valve provided in each air-chamber with an air pump.

Id. (emphasis added).

Thus, considering the Specification, the four air-chambers in claim 1 may be connected so they communicate allowing all the chambers to be filled from a single air-valve, or they may be closed so they do not communicate with each other.

We have not been directed to any persuasive evidence in the Specification that supports either of Patent Owner's proposed constructions of the term air-chamber as recited in the claims. Patent Owner's first alternative proposal, that an air-chamber is "an enclosed body that is . . . sealed off completely" (*see* PO Resp. 18) would exclude the disclosed preferred embodiment wherein the four distinct air-chambers recited in claim 1 are all in communication so that they can all be filled with air from a single air-valve. A "claim interpretation that excludes a preferred embodiment from the scope of the claim is rarely, if ever, correct." *Accent Packaging, Inc. v. Leggett & Platt, Inc.*, 707 F.3d 1318, 1326 (Fed. Cir. 2013) (citing *On-Line Techs., Inc. v. Bodenseewerk Perkin-Elmer GmbH*, 386 F.3d 1133, 1138 (Fed.Cir.2004)).

Patent Owner's second alternative proposal, that an air-chamber "sufficiently inhibits air flow such that at least a temporary difference in air pressure may be maintained therein" has no support in the Specification.

c) Prosecution History

We have not been directed to any persuasive evidence in the prosecution history of the '866 patent that relates to the construction of the term air-chamber. The following is the Examiner's statement of the reasons for allowance of the '866 patent:

the prior art of record fails to show or suggest the construction of an air mattress that uses separate upper and lower chambers where the top chamber includes a peripheral air-chamber formed by a loop of material and a bottom chamber that has a peripheral auxiliary air-chamber formed by a oblique extending strip, and in which the lower air chamber includes a space shaped like an inverted cone.

Ex. 1003, 14. These reasons for allowance refer to the loop and oblique extending strip defining the upper and lower peripheral air-chambers, respectively, but otherwise do not specifically inform our construction of the term air-chamber in the claims.

d) Other Evidence

Patent Owner relies extensively on the Declaration testimony of its expert witness, Dr. Abraham (Ex. 2001), for evidentiary support of Patent Owner's proposed alternative constructions of the term air-chamber. *E.g.*, *see* PO Resp. 18 (citing Ex. 2001 ¶ 77) (stating Patent Owner's proposed construction), 19 (citing Ex. 2001 ¶¶ 81–82) (testifying that “air holes can permit a small degree of inhibited air flow. But, when exposed to a compressive force, such as a user sitting or laying down on a portion of the air bed's surface, the chambers are sufficiently separated that at least temporary pressure differences will occur”), 20 (citing Ex. 2001 ¶ 87) (testifying about “inhibited air flow”).

We have considered the testimony of Dr. Abraham and give it no probative weight on the issue of claim construction. There is no support in the claims, written description of the Specification, or prosecution history to support Dr. Abraham's testimony concerning “inhibited air flow” or a temporary pressure differential between chambers when the claimed air-bed is both inflated and being used. A court should discount any expert testimony “that is clearly at odds with the claim construction mandated by the claims themselves, the written description, and the prosecution history, in other words, with the written record of the patent.” *Phillips*, 415 F.3d at 1318; *see also SkinMedica, Inc. v. Histogen Inc.*, 727 F.3d 1187, 1195 (Fed. Cir. 2013) (stating that expert testimony, in particular, is less

reliable because it “is generated at the time of and for the purpose of litigation and thus can suffer from bias that is not present in intrinsic evidence”) (citing *Phillips*, 415 F.3d at 1318). We find that Dr. Abraham’s testimony is clearly at odds with the intrinsic evidence as discussed above.

e) Conclusion Regarding the Term Air-Chamber

Ultimately, the interpretation to be given a term can only be determined and confirmed with a full understanding of what the inventors actually invented and intended to envelop with the claim. The construction that stays true to the claim language and most naturally aligns with the patent’s description of the invention will be, in the end, the correct construction.

Renishaw PLC v. Marposs Societa’ per Azioni, 158 F.3d 1243, 1250 (Fed. Cir. 1998) (cited with approval in *Phillips*, 415 F.3d at 1316).

We conclude that a person of ordinary skill, with the level of education and experience stated in Section II.B.1 of this Decision, would understand from the claims and Specification that the term an air-chamber, as used in the claims of the ’866 patent, means an area of an air-bed that can be filled with, and can retain, air. Based on the evidence discussed above, this is the construction that stays true to the claim language and most naturally aligns with the patent’s description of the invention.

3. Concave Limitation

As stated above, and repeated here for convenient reference, the Concave Limitation identified by Petitioner (*see* Pet. 28) is the following clause in claim 1:

an outer surface of the lower main air chamber is concave with respect to an outer surface of the peripheral auxiliary air-chamber, that is, the outer surface of the peripheral auxiliary air-chamber extends beyond the bottom sheet of lower main air-chamber.

Pet. 28; *see also* Ex. 1001, 4:27–31 (showing the Concave Limitation in the context of claim 1 of the '866 patent). Patent Owner refers to this clause as the “‘Concave’ Element.” PO Resp. 25. For consistency, we will use the label first identified by Petitioner, Concave Limitation.

a) Petitioner’s Construction

Petitioner argues that the Concave Limitation “is inconsistent and confusing” and, as a result, claims 1–4 “are indefinite.” Pet. 28; *see also id.* at 29–32 (further explaining Petitioner’s indefiniteness argument). Petitioner also argues that “[t]o the extent the Concave Limitation can be construed, it has multiple possible meanings.” *Id.* at 31.

An *inter partes* review is limited to statutory grounds under 35 U.S.C. § 102 and/or § 103, and only on the basis of prior art consisting of patents or printed publications. *See* 35 U.S.C. § 311(b). Whether a claim is indefinite under 35 U.S.C. § 112 “is not the inquiry in an *inter partes* review, in which the Board may not hold a challenged claim of a patent indefinite.” *Cochlear Bone Anchored Sols. AB v. Oticon Med. AB*, 2020 WL 2503475, at *8 (Fed. Cir. May 15, 2020) (citing 35 U.S.C. § 311(b)). If the meaning of a claim term “is entirely unknown, the claim cannot be compared to the prior art for purposes of an invalidity analysis, and so that analysis cannot be conducted.” *Id.*

Petitioner also provides a specific construction of the Concave Limitation and applies the cited references against the Concave Limitation. Petitioner asserts that the Concave Limitation may be construed as “the outer surface of the peripheral auxiliary air-chamber extends beyond the bottom sheet of the lower main air-chamber.” Pet. 32 (“[w]hen so limited, a POSA [person of ordinary skill in the art] would understand the plain and ordinary

meaning of these terms, which also comport with the '866 Patent's specification"); *see also id.* at 59–61 (applying this construction to the Concave Limitation in claim 1).

We determine that Petitioner's specific asserted claim construction satisfies the requirement of 37 C.F.R. § 104(b)(3) that the Petition identify Petitioner's position as to how the challenged claims should be construed.

To fully understand Petitioner's proposed claim construction, however, we discuss Petitioner's "multiple possible meanings" of the Concave Limitation (Pet. 31).

Petitioner parses the Concave Limitation into a "description portion" and a "definition portion." Pet. 29.

According to Petitioner, the "description portion" is "the first half of" [the Concave Limitation], which requires "an outer surface" of the lower main air-chamber B2 to be "concave" with respect to "an outer surface" of the peripheral auxiliary chamber B1. *Id.*; *see also* Ex. 1001, 3:18–20, 4:27–29, and Fig. 3 (describing, claiming, and illustrating peripheral auxiliary air-chamber B1 and lower main air-chamber B2).

According to Petitioner, the "definition portion" is "everything after the 'that is' clause" (Ex. 1001, 4:29), which is the phrase "the outer surface of the peripheral auxiliary air-chamber extends beyond the bottom sheet of lower main air-chamber." Pet. 29; *see also* Ex. 1001, 4:29–31. As we discuss below, claim 1 was amended during prosecution to specifically add the "extends beyond" phrase to replace the phrase "is higher than." *See* Ex. 1003, 24.

Proper claim construction demands interpretation of the entire claim in context, not a single element in isolation. *Pause Tech., LLC v. TiVo, Inc.*, 419 F.3d 1326, 1331 (Fed. Cir. 2005) (citing *Hockerson–Halberstadt, Inc. v.*

Converse Inc., 183 F.3d 1369, 1374 (Fed.Cir.1999)). While certain terms may be at the center of the claim construction debate, the context of the surrounding words of the claim also must be considered in determining the ordinary and customary meaning of those terms. *ACTV, Inc. v. Walt Disney Co.*, 346 F.3d 1082, 1088 (Fed. Cir. 2003). Thus, we construe the entirety of the Concave Limitation.

Petitioner also refers to the “Bestway Construction,” which is based on Patent Owner’s first amended infringement contentions in the related litigation cited in Section 1.C, “Related Matters,” of this Decision. Pet. 31 (citing Ex. 1025, 10). In making these infringement contentions, Patent Owner stated its contentions were made “[w]ithout being bound by any particular claim construction at this stage of the litigation” (Ex. 1025, 3) and noted that the District Court “has not yet construed the meaning of the claims of the ’866 Patent” (*id.* at 2). Patent Owner stated it “reserves all rights to amend, supplement, and/or modify its Contentions after the claims have been construed by the Court” (*id.*). That case was dismissed without prejudice on November 14, 2018, based on a stipulated voluntary dismissal. Ex. 3001. The claims were not construed by the District Court. We do not regard the infringement contentions in the District Court as a claim construction proposed by Patent Owner in the proceeding before us.

b) Patent Owner’s Construction

Patent Owner argues Petitioner’s various claim constructions are wrong (PO Resp. 25–30) and concludes “the existing language sufficiently conveys how to determine if a ‘concave’ shape is present in a potentially infringing product, and thus requires no additional construction” (*id.* at 30 (citing Ex. 2001 ¶ 114)). We disagree.

“The claim is a statutory requirement, prescribed for the very purpose of making the patentee define precisely what his invention is; and it is unjust to the public, as well as an evasion of the law, to construe it in a manner different from the plain import of its terms.” *White v. Dunbar*, 119 U.S. 47, 52 (1886). A clear understanding of the Concave Limitation is essential to the patentability issues before us. Accordingly, a specific claim construction is required to resolve the dispute presented by the parties.

Notwithstanding Patent Owner’s assertion that the claim “requires no additional construction” (PO Resp. 30), Patent Owner, in fact, provides several arguments providing a specific construction.

First, Patent Owner asserts that the Specification and the language of claim 1 “make clear that the word ‘concave’ is used to describe the *overall spatial relationship* between *surfaces*—specifically, the outer surfaces of the lower main chamber and the lower peripheral chamber.” PO Resp. 25. The Concave Limitation being construed includes 41 words, not just the word “concave.” As stated above, proper claim construction demands interpretation of the entire claim in context, not a single word or element in isolation. *Pause Tech*, 419 F.3d at 1331.

Second, Patent Owner also asserts that a person of ordinary skill would have understood “from the specification as well as the drawings that both the word ‘concave’ and the phrase ‘extends beyond’ are describing the same spatial relationship.” PO Resp. 25, n.10, (citing Ex. 2001 ¶¶ 110–111); *see also id.* at 30 (stating Patent Owner’s position that “the language of claim 1 already describes what ‘concave’ means in the context of the ’866 Patent”). We agree, as explained below in our analysis of the claim language, that claim 1 itself defines the meaning of the Concave Limitation.

Third, Patent Owner asserts that “when one surface is ‘concave’ relative to another, the latter surface necessarily ‘extends beyond’ the former, and the direction in which this surface ‘extends’ is at least vertical because that is what the word ‘concave’ denotes.” PO Resp. 25, n.10, (citing Ex. 2001 ¶ 112). Dr. Abraham testifies, trying to explain the asserted “vertical” extension of the “concave” surface, that “without the word ‘concave’ clarifying that the lower peripheral chamber is disposed *vertically downward* from the lower main chamber, it appears that Intex [Petitioner] would interpret the phrase ‘extend beyond’ to mean that the lower peripheral chamber extends *horizontally* past the lower main chamber.” Ex. 2001 ¶ 113. Dr. Abraham concludes that “the ’866 patent teaches against such a structure,” but cites no evidence supporting this conclusion. *Id.*

Fourth, counsel for Patent Owner argued that, as shown in Figure 3, and under the ordinary meaning of concave, which is having an outline or surface that curves inward like the interior of a circle or sphere (*see* Ex. 1033), “the bottom surface 3 is curved inwardly with respect to C which they [sic, is to] say that C extends beyond the bottom surface 3.” Tr. 43:13–18. We have not been directed to any persuasive evidence supporting that argument that bottom surface 3 is curved. We note that in Figure 3 of the ’866 patent, specifically cited in this argument (*id.* at 43:13), bottom surface 3 is a straight line; it is not curved inwardly.¹¹

Fifth, counsel for Patent Owner also argued that the “novel solution that is in this patent,” is, in part, that the oblique strip allowed the peripheral

¹¹ We recognize that “it is well settled that the drawings of patent applications are not necessarily scale or working drawings.” *In re Nash*, 230 F.2d 428, 431 (CCPA 1956). We merely address the argument made about is shown in Figure 3.

auxiliary air-chamber to be “moved underneath the bed” and in so doing “raised the middle of the bottom surface off the ground.” Tr. 38:12–21, *see also id.* at 48:11–15 (“what the novelty of the 866 patent was they introduced this oblique depending strip which allowed you to take the support structure that unquestionably provided stability and it moved it underneath the bed”). By “underneath the bed,” Patent Owner means that the peripheral auxiliary air-chamber B1 was within the periphery or “footprint” of the air-bed. *See* PO Resp. 8 (describing the lateral extent of prior art stabilizing rings outside the perimeter of the air bed as increasing the “footprint” and creating a “tripping hazard”); Tr. 46:11–21 (asserting that prior solutions put the supporting structures “outside the footprint of the bed,” which created tripping issues, whereas in “the invention of the 866 patent . . . they’ve moved it inside the footprint so it’s no longer a tripping hazard,” and concluding “[t]hat’s the uniqueness and novelty of the 866 patent”). As we discuss below, there is no evidence supporting a claim construction that requires the auxiliary air-chamber to be “moved underneath the bed” or inside the footprint of the bed.

Sixth, Patent Owner argues that “the air bed [in the ’866 patent] is deliberately designed such that, *when inflated*, the lower peripheral chamber B1 extends downward beyond the lower surface of the main chamber B2.” PO Resp. 11. Dr. Abraham’s analysis also is limited to “when the bed is inflated.” *E.g., see* Ex. 2001, ¶ 111 (“when the air bed is inflated, the lower peripheral chamber B1 extends downward beyond the lower surface of the main chamber B2”), ¶ 54 (“when it is inflated, the lower peripheral chamber B1 extends downward”). The claims do not refer to an “inflated” structure; they refer to an “air bed.” The Specification uses the word “inflated” only once, and in the context of inflating with an air pump an embodiment with

closed air-chambers. Ex. 1001, 3:41–44 (“The air-chambers may be designed to be closed, so that these separate air-chambers will not communicate with each other, and they can be inflated one by one from a valve provided in each air-chamber with an air pump.”).

Related to its “inflated” argument, Patent Owner also asserts

a POSA would understand that the concave’ shape at the bottom of the ’866 Patent’s air bed is not something that arises by accident, through unspecified degrees of ‘ballooning’ in the material, but is rather *deliberately created* [emphasis in original] by the provision of a distinct, *sufficiently pressurized* [emphasis added] lower peripheral chamber that is positioned in such a way that it can lift up the lower main chamber.

PO Resp. 45 (citing Ex. 2001 ¶ 150). As we discuss below, neither the claims, Specification, nor prosecution history mention the need for a “sufficiently pressurized” lower peripheral air-chamber to create the claimed concave relationship, nor is there any language in the intrinsic evidence that informs a person of ordinary skill what pressure is “sufficient.” The claims do not refer to a “sufficiently pressured” structure; they refer to an “air bed.”

Seventh, another specific construction proposed by Patent Owner is that “the *entire outer surface* of the lower main chamber is lifted up, or is ‘concave,’ relative to the *surface* of the lower peripheral chamber, such that the lower main chamber can be slightly lifted off the ground.” PO Resp. 27; *see also* Tr. 53:11–12 (counsel for Patent Owner arguing that “the concavity requires that the entire surface [of the lower air-chamber], or substantially the entire surface be raised.”). Patent Owner does not quantify the amount of lift required to be “slightly lifted” off the ground. Moreover, as we explain below, the claims do not recite any “lift,” slight or otherwise, off the ground. Nor do the claims require that the entire outer surface is lifted. Patent Owner also acknowledged that the admitted prior art, such as shown

in Figure 7 of the '866 patent, achieves “stability” and “does so by raising it [the lower mattress] off the ground.” Tr. 56:17–20.

If any of these various argued constructions were intended to be a substantive limitation of the *claimed* invention, the inventor could have added it to the claims (1) during prosecution of the application that matured into the '866 patent, (2) through a reissue application, or (3) through a motion to amend in this proceeding. None of these options were pursued.

To resolve the claim construction dispute between the parties, we turn to the intrinsic and other evidence.

c) The Claims

We make the following findings regarding the claims.

The claim language at issue in the Concave Limitation, with reference numerals from the Specification and drawings added, is:

an outer surface of the lower main air chamber [B2] is concave with respect to an outer surface of the peripheral auxiliary air-chamber [B1], that is, the outer surface of the peripheral auxiliary air-chamber [B1] extends beyond the bottom sheet [3] of lower main air-chamber [B2].

Ex. 1001, 4:27–31 (reference numerals and letters added). The dispute between the parties focuses on the word “concave” and the phrase “extends beyond.”

Figure 3, shown below, illustrates the claimed elements in their inflated configuration.

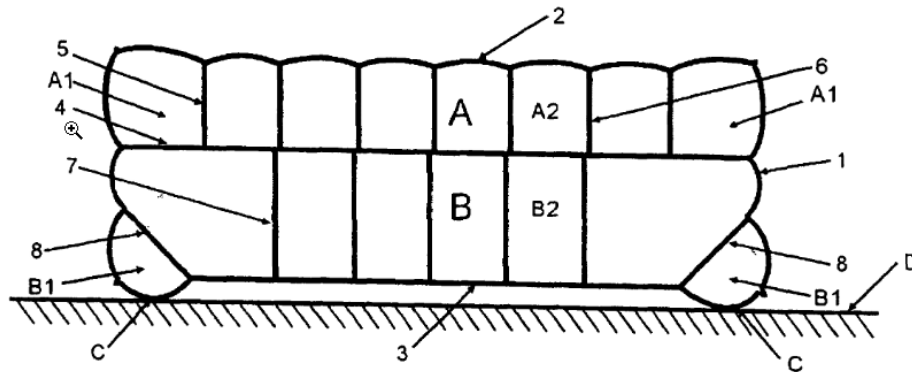


Fig.3

Fig. 3 is a sectional schematic diagram of the disclosed air bed. Ex. 1001, 2:39–40.

As shown, the outer surface of lower main air chamber B2 is defined by bottom sheet 3. This outer surface is claimed as being “concave” relative to an outer surface (unnumbered in Fig. 3) of peripheral auxiliary air-chamber B1. It is clear, however, that bottom sheet 3 in Figure 3 is *not* a surface that “curves inward” (*see* Ex. 1033); it is shown as a straight line.

In claim 1, the claim language itself defines specifically what it means by the recited “concave” relationship with the words following the phrase “that is” (*see* Ex. 3003, 2, 3).¹² The claim itself thus defines the “concave” relationship to mean “the outer surface of the peripheral auxiliary air-chamber [B1] *extends beyond* the bottom sheet [3] of lower main air-chamber [B2].” Ex. 1001, 4:29–31 (emphasis and reference numerals added).

¹² We discuss extrinsic evidence, such as dictionaries, below. For specific context in our analysis of the claims, however, we note here that the phrase “that is” is defined as: “To explain more clearly; “in other words;” “to be precise;” “for example;” and “to be more accurate.” *See* Ex. 3003, 2, 3.

Patent Owner agrees with this construction. *See* PO Resp. 30 (asserting that “the language of claim 1 already describes what ‘concave’ means in the context of the ’866 Patent,” which is that “the ‘outer surface of the peripheral auxiliary air-chamber extend[s] beyond the bottom sheet of the lower main chamber.’”).

As shown in Figure 3, peripheral auxiliary air-chamber B1 extends *lower* or vertically beyond bottom sheet 3 of lower main air-chamber B2. In this way, when inflated properly, “surface C of peripheral auxiliary air-chamber B1 supports the air bed when it contacts supporting surface D.” *See* Ex. 1001, 3:31–33. As also shown in Figure 3, because chamber B1 extends vertically lower than bottom sheet 3, bottom sheet 3 is “raised” above supporting surface D. *Id.* at 3:30–31.

Claim 1 also requires lower main air-chamber B2 to include “a space which has a shape of an inverse cone.” Ex. 1001, 4:25–26. Additionally, because peripheral auxiliary air-chamber B1 is positioned around the periphery of lower main air-chamber B2 to define supporting points C of the air bed at its outer side (*id.* at 3:35–37), peripheral auxiliary air-chamber B1 also extends laterally beyond bottom sheet 3 of lower main air-chamber B2, as shown in Figure 3.

Claim 1 does not distinguish whether air-chamber B1 extends beyond vertically or extends beyond laterally from bottom sheet 3. Claim 1 requires only that air-chamber B1 “extends beyond” bottom sheet 3.

Patent Owner agrees that “concave” means “extends beyond.” *E.g.*, PO Resp. 30 (stating that “the language of claim 1 already describes what ‘concave’ means in the context of the ’866 Patent,” which is that “the ‘outer surface of the peripheral auxiliary air-chamber extend[s] beyond the bottom sheet of the lower main chamber.’”).

Thus, the '866 patent provides a specific definition in claim 1 of the meaning of “concave.” Here, the claims, not the Specification, and Patent Owner’s candid admission, reveal a special definition given to the claim term “concave.” When the patentee acts as its own lexicographer, that definition governs. *See Phillips*, 415 F.3d. at 1316.

Nonetheless, Patent Owner now asserts various more limited meanings of the term “extends beyond,” which we have summarized above. There is no support *in the claims* for Patent Owner’s arguments that: “concave” denotes a “vertical” extension (PO Resp. 25, n.10); “bottom surface 3 is curved inwardly with respect to [point] C [on peripheral auxiliary air-chamber B1] (Tr. 43:13–18); peripheral auxiliary air-chamber is “moved underneath the bed;” (Tr. 38:12–21); the air-bed must be inflated and “sufficiently pressurized” to obtain the argued construction (PO Resp. 45); or “the *entire outer surface* of the lower main chamber is lifted up” (PO Resp. 27–28).

Accordingly, considering the claim language and the definition of “concave” provided in claim 1, and Patent Owner’s admissions, the Concave Limitation means that the outer surface of the peripheral auxiliary air-chamber extends either vertically and/or laterally beyond the bottom sheet of the lower main chamber.

d) The Specification

We make the following findings concerning the written description in the Specification.

The Specification states the following advantages of the disclosed invention:

The oblique extending strip provided in the lower air-chamber creates a peripheral auxiliary air-chamber from the lower air-

chamber while it raises the lower main air-chamber, such that *the surface of the peripheral auxiliary air-chamber*, which is an outer loop, *extends beyond the lower main air-chamber, to contact ground*.

Ex. 1001, 2:18–25 (emphasis added). The emphasized words from the Specification are nearly identical to the definition of “concave” included in claim 1 and discussed above. The Specification also discloses that “[u]nder the action of second set of extending strips 7 and oblique extending strip 8, lower main air-chamber 82 is *raised*, so that surface C of peripheral auxiliary air-chamber B1 supports the air bed when it contacts supporting surface D.” *Id.* at 3:29–33 (emphasis added). Patent Owner, however, chose not to include in the claims any reference to the lower main air-chamber being raised above the ground or other supporting surface.

Patent Owner acknowledged in the Specification that air beds that had a lower air-chamber raised above the ground were well-known. Patent Owner illustrated one prior known air bed in Figures 6 and 7 in the ’866 patent, reproduced below.

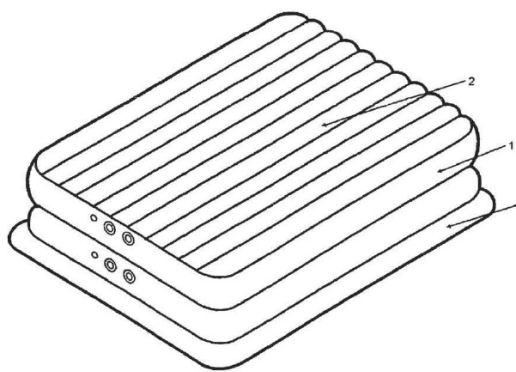


Fig. 6 (PRIOR ART)

Fig. 6 is a perspective view of a prior art air bed. Ex. 1001, 2:44–45

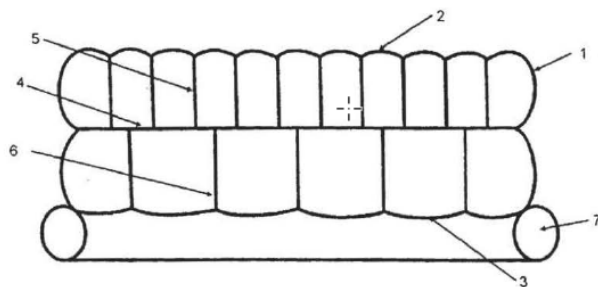


Fig. 7 (PRIOR ART)

Fig. 7 is a sectional schematic diagram of the Fig. 6 prior art air bed. Ex. 1001, 2:46

The Specification of the ’866 patent acknowledges that stabilizing ring 7, in the Figures 6 and 7 prior art, is a separate air-chamber and is at the

bottom of the air bed. Ex. 1001, 1:31–40. The periphery of the stabilizing ring 7 in this prior art is “larger than the lower air-chamber; therefore, the stability of the air bed is increased by provision of the stabilizing ring 7.” *Id.* at 1:40–43. Thus, as shown clearly in Figure 7, the larger stabilizing ring 7 extends beyond bottom sheet 3, which results in bottom sheet 3 being raised above the floor or other supporting surface (unnumbered).¹³ We recognize that the Figure 6/7 prior art does not include a lower main air-chamber having a shape of an inverse cone, nor does it have oblique extending strips, as required by claim 1. It does, however, have a stabilizing ring 7 that extends both vertically and laterally beyond bottom sheet 3.

The Specification also discloses that the outer surface of lower main air-chamber B2 “is concave with respect to the outer surface of the loop of the peripheral auxiliary air-chamber B1, that is, surface C of peripheral auxiliary air-chamber B1 is *higher*¹⁴ than (or extends beyond) the surface of bottom sheet 3 of the lower main air-chamber B2.” Ex. 1001, 3:24–29 (emphasis added). The “extends beyond” phrase is identical to the claim language.

¹³ We note that Figure 7 in the ’866 patent, illustrating prior art, is substantially identical to Figure 6 in U.S. Patent No. 6,671,910 (Ex. 1009, Hsu) assigned to Petitioner. *See* Ex. 1009, 1.

¹⁴ The disclosure that surface C of peripheral auxiliary air-chamber B1 is “higher than (or extends beyond)” the surface of bottom sheet 3 of the lower main air-chamber B2 is inconsistent with Figure 3, which shows surface C below, or lower than, the surface of bottom sheet 3. Also, as we discuss in the next section on Prosecution History, all references in the original Specification and claims, as filed, to “higher than,” except the one cited here, were deleted by amendment. *See e.g.*, Ex. 1003, 24 (amendment of claim 1)

Although the written description describes (*e.g.*, Ex. 1001, 3:29–33), and Figure 3 in the '866 patent illustrates, that lower main air-chamber B2 is raised, so that surface C of peripheral auxiliary air-chamber B1 supports the air bed when it contacts supporting surface D, there is no persuasive evidence to which we have been directed that requires the disclosed, but unclaimed, structural details from the Specification be read into the properly construed claims.

For example, the Specification also discloses that increased stabilization can be obtained *without* raising the lower main air-chamber above a supporting surface. As shown and described in the admitted prior art in Figures 4 and 5, shown below, “one or more air stabilizing bars 8” are provided around the periphery at the bottom of the air bed to increase stability of the air-bed. *Id.* at 1:20–30. The Figures 4 and 5 prior art achieves this stability *without* raising the bottom of air bed off the supporting surface by stabilizing bars 8 extending laterally from the bottom of the air bed.

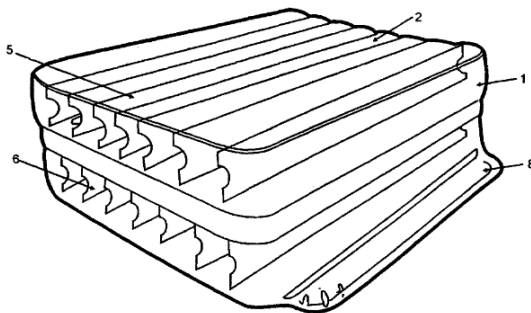


Fig.4 (PRIOR ART)

Fig. 4 is a schematic diagram of the internal structure of a prior art air bed. Ex. 1001, 2:41–42.

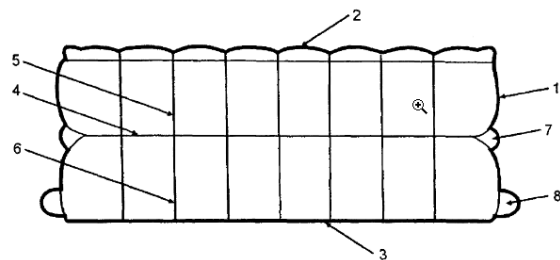


Fig.5 (PRIOR ART)

Fig. 5 is a sectional schematic diagram of Fig. 4. Ex. 1001, 2:43.

“We acknowledge the difficulty in drawing the ‘fine line between construing the claims in light of the specification and improperly importing a

limitation from the specification into the claims.” *Cont’l Circuits LLC v. Intel Corp.*, 915 F.3d 788, 797 (Fed. Cir.2019) (quoting *Retractable Techs., Inc. v. Becton, Dickinson & Co.*, 653 F.3d 1296, 1305 (Fed. Cir. 2011)). Here, we draw the line in favor of the claim language and Patent Owner’s assertions in this proceeding (*see e.g.*, PO Resp. 25, n.10 (asserting that a person of ordinary skill would have understood “from the specification as well as the drawings that both the word ‘concave’ and the phrase ‘extends beyond’ are describing the same spatial relationship”). *See Allen Eng’g Corp. v. Bartell Indus., Inc.*, 299 F.3d 1336, 1349 (Fed.Cir.2002) (“It is not our function to rewrite claims to preserve their validity.”). Where, as here, the claim is susceptible to only one reasonable construction, we must construe the claims based on the patentee’s version of the claim as he himself drafted it. *Process Control Corp. v. HydReclaim Corp.*, 190 F.3d 1350, 1357 (Fed. Cir. 1999). Thus, “we construe the claim as written, not as the patentees wish they had written it.” *Chef America, Inc. v. Lamb-Weston, Inc.*, 358 F. 3d 1371, 1374 (Fed. Cir. 2004).

Accordingly, considering the Specification, and consistent with our analysis of the claims, the Concave Limitation means that the outer surface of the peripheral auxiliary air-chamber extends either vertically and/or laterally beyond the bottom sheet of the lower main chamber.

e) Prosecution History

We make the following findings regarding the prosecution history of the ’866 patent. Exhibit 1003 is an excerpt from the prosecution history.

(1) Initial Office Action

In an Office Action mailed on January 16, 2007, the Examiner rejected claims 1–4 “under 35 U.S.C. 112, second paragraph, as being

indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.” Ex. 1003, 48–51. The Examiner stated, “[t]he claims contain many instances of grammatical and typographical errors which should be corrected.” *Id.* at 49. The Examiner also stated “[c]laims 1-4 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action.” *Id.* at 50. The Examiner also stated that “[t]he prior art made of record and not relied upon is considered pertinent to applicant's disclosure . . . [because the prior art] show stacked multicompartment air mattresses with expanded bases.” *Id.* Metzger (Ex. 1004) and Hsu (Ex. 1009), exhibits in the proceeding before us, were among the patents identified by the Examiner as being “of particular interest.” *Id.*

(2) Amendment

In an Amendment filed on April 13, 2007, the applicant submitted a substitute Specification and claims (“marked up version”) (*id.* at 36–43), a substitute Specification and claims (“clean version”) (*id.* at 28–34), and “Remarks” by the attorney representing the applicant (*id.* at 26–27).

The marked-up version of claim 1 is reproduced below.

1. An air bed with a stable supporting structure, comprising a periphery sheet, a top sheet, a bottom sheet, a middle sheet, which separates ~~[[an]]the~~ air bed into an upper air-chamber and a lower air-chamber, a loop of an outer extending strip provided in the upper air-chamber, which separates the upper air-chamber into a peripheral air-chamber and an upper main air-chamber, and a first set of extending strips, which is provided in the upper main air-chamber and consists of a plurality of parallel extending strips; characterized in that the air bed ~~with a stable supporting structure~~ further comprising a second set of extending strips, which is provided in the lower air-chamber, and which includes a plurality of parallel extending strips, and is welded ~~with~~ to the middle sheet and the bottom sheet, and an oblique extending strip, which is provided around the second set of extending strips and is welded ~~with~~ to the periphery sheet and the bottom sheet to separate the lower air-chamber into a lower main air-chamber and a peripheral auxiliary air-chamber; and the lower main air-chamber ~~[[is]]includes~~ a space which has a shape of an inverse cone and receives air therein, and ~~[[its]]an~~ outer surface of the lower main air chamber is concave with respect to ~~the~~ an outer surface of the peripheral auxiliary air-chamber, that is, the outer surface of the peripheral auxiliary air-chamber ~~is higher than~~ extends beyond the surface of the bottom sheet of lower main air-chamber.

Ex. 1003, 24. As shown in amended claim 1 in the Concave Limitation, the applicant deleted the phrase “is higher than” from the claim and added in its place the phrase “extends beyond.” Ex. 1003, 24. The applicant made similar changes in the Specification, that is, deleting the phrase “higher than” and adding in its place the phrase “extends beyond.” *See id.* at 21, 25. In one instance, the applicant deleted the phrase “higher than” where the phrase “extends beyond” was already in the Specification. *Id.* at 20. These amendments to the claims and the Specification replaced the word “higher,”

which suggests a vertical dimension or vertical spatial relationship¹⁵ with the broader, more generic phrase “extends beyond,” which is *not* limited to a vertical spatial relationship.

There is only one instance in the amendment where the applicant did not delete the phrase “higher than” in the Specification. In this one instance, however, immediately after the phrase “higher than,” the applicant added the parenthetical “(or extends beyond).” Ex. 1003, 22. This one instance of the phrase “higher than” remains in the patent. *See* Ex. 1001, 3:27–28.

There is no substantive explanation in the Remarks accompanying the amendment as to why the applicant made these change other than to address “the Office’s concerns” under § 112. *Id.* at 8.

The amendment to claim 1, and to the Specification, replacing “higher than” with “extends beyond,” suggests a clear indication that the applicant did *not* intend to limit the claimed “concave” spatial relationship to a vertical extension. *See* PO Resp. 25, n.10 (asserting that the word “concave” denotes a relationship that is “at least vertical.”). Claim 1, as amended, does not distinguish whether peripheral auxiliary air-chamber B1 extends beyond vertically or extends beyond laterally from bottom sheet 3.

At the hearing, Counsel for Patent Owner argued, without reference to any supporting evidence, that:

In every instance where the phrase ‘extends beyond’ which is the language that appears in the claim, in every instance where ‘extends beyond’ we can agree it’s referring to a vertical displacement. We think we’ve clarified that where it says higher than it’s still referring to a vertical displacement where it contacts

¹⁵ *See* Ex. 3005 a dictionary definition of “higher” as “having a great or considerable extent or reach upward or vertically.”

the ground, but regardless everywhere ‘extends beyond’ is used it’s referring to a vertical displacement.

Tr. 45:15–20. We have not been directed to any persuasive evidence that the phrase “extends beyond” is a synonym for “vertical displacement” or the phrase “higher than.”

(3) Reasons for Allowance

The following is the Examiner's statement of the reasons for allowing application claims 1–4 to issue as a patent:

the prior art of record fails to show or suggest the construction of an air mattress that uses separate upper and lower chambers where the top chamber includes a peripheral air-chamber formed by a loop of material and a bottom chamber that has a peripheral auxiliary air-chamber formed by a oblique extending strip, and in which the lower air chamber includes a space shaped like an inverted cone.

Ex. 1003, 14. The Reasons for Allowance refer to “a peripheral auxiliary air-chamber formed by a[n] oblique extending strip” and a “lower air chamber [that] includes a space shaped like an inverted cone.” *Id.* We note that the inverted, or inverse, cone shape is defined in part by the oblique extending strip. *See* Ex. 1001, 3:22–24, Fig. 3. Patent Owner agrees with the Examiner. *See* Tr. 38:12–13 (“The novel solution that is in this patent is this oblique strip”), 56:17–25 (asserting that the admitted prior art in Figure 7 of the ’866 patent achieves stability and “does so by raising it [the lower mattress] off the ground,” it does not disclose “oblique depending strips” or an “inverse cone lower chamber,” which “moves the supporting chamber under the bed but it does so in a way that changes the footprint”).

The structure of a peripheral auxiliary air-chamber that “extends beyond” the bottom sheet of the lower main air-chamber was *not* mentioned as a reason for allowance. The structure of a lower main air chamber raised

above a supporting surface was *not* mentioned as a reason for allowance. The structure of a peripheral chamber moved underneath the bed was *not* mentioned as a reason for allowance. There is no persuasive evidence to which we have been directed that supports including these additional limitations in the properly construed claims.

In reviewing the intrinsic record to construe the claims, we strive to capture the scope of the actual invention, rather than strictly limit the scope of claims to disclosed embodiments or allow the claim language to become divorced from what the specification conveys is the invention. *Phillips*, 415 F.3d at 1323–24. On this record, we determine that the totality of the intrinsic evidence supports a construction of the Concave Limitation to mean that the outer surface of the peripheral auxiliary air-chamber extends either vertically and/or laterally beyond the bottom sheet of the lower main chamber.

f) Other Evidence

The parties each rely on expert testimony, which we have discussed throughout this claim construction section. Petitioner also cites a dictionary definition (Ex. 1033) and a prior patent (Ex. 1006) as evidence of what the Concave Limitation in the '866 patent means. This extrinsic evidence has minimal probative weight.

Consistent with our analysis above, the dictionary definition of the phrase “that is” is defined as: “To explain more clearly”; “in other words;” “to be precise;” “for example;” and “to be more accurate.” *See* Ex. 3003, 2, 3. We determine that this phrase serves its defined role in claim 1. The words *after* the phrase “that is” in the Concave Limitation explain more clearly what is meant by the words *before* the phrase “that is.”

g) Conclusion

We conclude that a person of ordinary skill, with the level of education and experience stated in Section II.B.1 of this Decision, would understand from the claims, the Specification, the prosecution history, and other evidence that the Concave Limitation, as used in the claims of the '866 patent, means that the outer surface of the peripheral auxiliary air-chamber extends either vertically and/or laterally beyond the bottom sheet of the lower main chamber. Based on the evidence discussed above, this is the construction that stays true to the claim language and most naturally aligns with the patent's description of the invention.

III. ANALYSIS

Patent Owner recognizes that Petitioner "raises six distinct grounds to challenge the validity of the '866 Patent," but asserts that "these grounds may be distilled to essentially two categories based on the references cited: (1) arguments relying on the combination of Yuan and Metzger (Grounds 1–4) and (2) arguments relying on the combination of Yuan and Reed (Grounds 5–6)." PO Resp. 1. All six grounds are based on § 103. We agree with this grouping and, to avoid redundancy, will follow it in our analysis.

A. Legal Standards

Section 103(a) forbids issuance of a patent when "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." *KSR*, 550 U.S. at 406. The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences

between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when available, evidence such as commercial success, long felt but unsolved needs, and failure of others. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966); *see KSR*, 550 U.S. at 407 (“While the sequence of these questions might be reordered in any particular case, the [Graham] factors continue to define the inquiry that controls.”). The Court in *Graham* explained that these factual inquiries promote “uniformity and definiteness,” for “[w]hat is obvious is not a question upon which there is likely to be uniformity of thought in every given factual context.” 383 U.S. at 18.

The Supreme Court made clear that we apply “an expansive and flexible approach” to the question of obviousness. *KSR*, 550 U.S. at 415. Whether a patent claiming the combination of prior art elements would have been obvious is determined by whether the improvement is more than the predictable use of prior art elements according to their established functions. *Id.* at 417. To reach this conclusion, however, it is not enough to show merely that the prior art includes separate references covering each separate limitation in a challenged claim. *Unigene Labs., Inc. v. Apotex, Inc.*, 655 F.3d 1352, 1360 (Fed. Cir. 2011). Rather, obviousness additionally requires that a person of ordinary skill at the time of the invention “would have selected and combined those prior art elements in the normal course of research and development to yield the claimed invention.” *Id.*; *see also Orexo AB v. Actavis Elizabeth LLC*, 903 F.3d 1265, 1273 (Fed. Cir. 2018) (“The question is not whether the various references separately taught components of the ’330 Patent formulation, but whether the prior art suggested the selection and combination achieved by the ’330 inventors.”).

Moreover, in determining the differences between the prior art and the claims, the question under 35 U.S.C. § 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. *Litton Indus. Prods., Inc. v. Solid State Sys. Corp.*, 755 F.2d 158, 164 (Fed. Cir. 1985) (“It is elementary that the claimed invention must be considered as a whole in deciding the question of obviousness.” (citation omitted)); *see also Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1537 (Fed. Cir. 1983) (“[T]he question under 35 U.S.C. § 103 is not whether the differences themselves would have been obvious. Consideration of differences, like each of the findings set forth in *Graham*, is but an aid in reaching the ultimate determination of whether the claimed invention as a whole would have been obvious.” (citation omitted)).

“A reference must be considered for everything it teaches by way of technology and is not limited to the particular invention it is describing and attempting to protect.” *EWP Corp. v. Reliance Universal Inc.*, 755 F.2d 898, 907 (Fed. Cir. 1985).

As a factfinder, we also must be aware “of the distortion caused by hindsight bias and must be cautious of arguments reliant upon *ex post* reasoning.” *KSR*, 550 U.S. at 421. This does not deny us, however, “recourse to common sense” or to that which the prior art teaches. *Id.*

Against this general background, we consider the references, other evidence, and arguments on which the parties rely.

B. Yuan and Metzger (Grounds 1–4)

1. Scope and Content of the Prior Art

We make the following findings of fact concerning the prior art.

a) Admitted Prior Art

The written description of the '866 patent acknowledges that air beds in general are well-known. *E.g., see* Ex. 1001, 1:20–43. The '866 patent also provides drawings of two prior art air beds in Figures 4 and 5, and in Figures 6 and 7. Figures 5 and 7 are reproduced below.

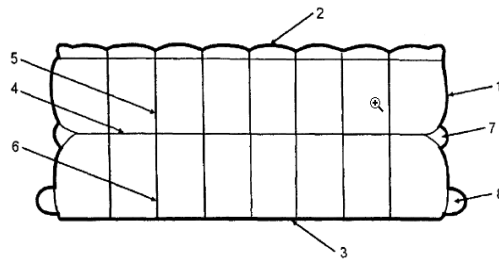


Fig. 5 (PRIOR ART)

Fig. 5 is a sectional schematic diagram of Fig. 4. Ex. 1001, 2:43.

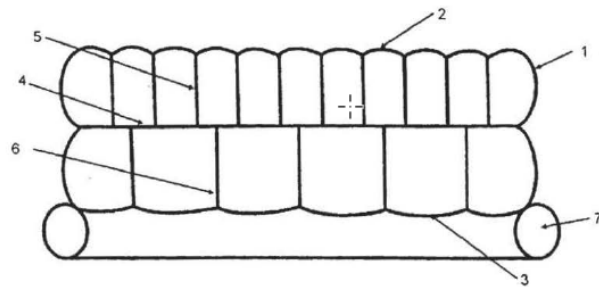


Fig. 7 (PRIOR ART)

Fig. 7 is a sectional schematic diagram of the Fig. 6 prior art air bed. Ex. 1001, 2:46

As described in the '866 patent, the Figure 4/5 prior art discloses periphery sheet 1, top sheet 2, bottom sheet 3, middle sheet 4, parallel extending strip set 5 of upper air-chamber, parallel extending strip set 6 of lower air-chamber, and one or more air stabilizing bars 8 provided around the periphery at the bottom of the air bed. Ex. 1001, 1:20–28. As shown, stabilizing bars 8 extend laterally beyond bottom sheet 3. The stated benefit of this prior art structure is increased surface area, dispersed weight, and greater stability, which result in “the possibility of turning over is decreased.” *Id.* at 1:28–30.

As also described in the '866 patent, the Figure 6/7 prior art has a similar structure, including periphery sheet 1, top sheet 2, bottom sheet 3, middle sheet 4, parallel extending strips 5 in the upper air-chamber, and parallel extending strips 6 in the lower air-chamber. Ex. 1001, 1:31–35. The Figure 6/7 prior art also includes stabilizing ring 7 provided at the

bottom of the air bed. *Id.* at 1:38–40. The “periphery of the stabilizing ring 7 is larger than the lower air-chamber; therefore, the stability of the air bed is increased by provision of the stabilizing ring 7.” *Id.* at 40–43. As shown in Figure 7, stabilizing ring 7 extends both laterally and downwardly from bottom sheet 6.

The prior art acknowledged in Figures 4–7 would have been known to a person of ordinary skill in the relevant technology. *Standard Oil Co. v. Am. Cyanamid Co.*, 774 F.2d 448, 454 (Fed. Cir. 1985) (A person having ordinary skill in the art “is presumed to be aware of all the pertinent prior art.”).

b) Yuan (Ex. 1019)

Figure 5 from Yuan is reproduced below.

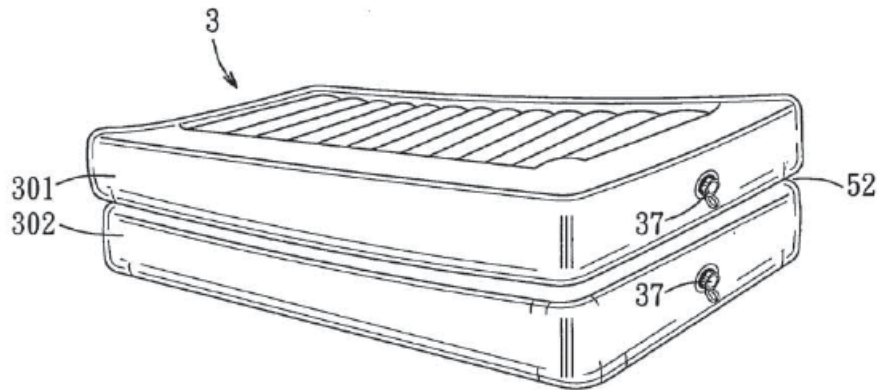


FIG. 5

Fig. 5 is a perspective view of an air bed.

As shown in Figure 5, Yuan discloses an inflatable mattress that includes upper and lower mattress bodies 301, 302 that are securely superimposed upon each other. Ex. 1019 ¶ [45]. Each of the upper and lower mattress bodies 301, 302 has a box-like shape, and is formed from a heat-sealable and flexible material. *Id.*

Upper mattress body 301 includes upper and lower sheets 31, 32. Ex. 1019 ¶ [46], Fig. 6. Interconnecting strip 33 is connected to the peripheries of upper and lower sheets 31, 32 to form an upper air chamber. *Id.* A plurality of bracing strips 34 and a bracing interconnecting strip 35 are disposed in the upper air chamber to keep the box-like shape of upper mattress body 301 after inflation. *Id.* Each of bracing strips 34 and bracing interconnecting strip 35 are connected to upper and lower sheets 31, 32. *Id.*

The structure of lower mattress 302 is the same as mattress 301. *Id.* at [47], Fig. 7. Figure 7 from Yuan is reproduced below.

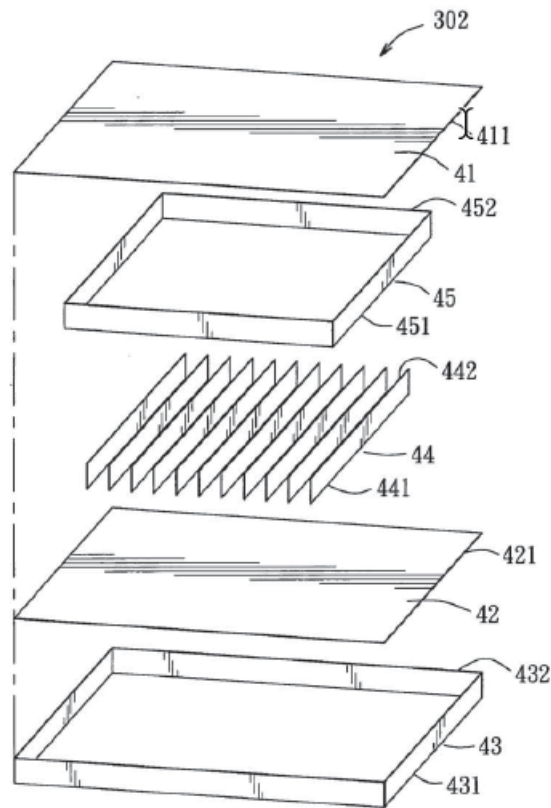


FIG. 7

Fig. 7 is an exploded perspective view of lower mattress body 302.

Lower mattress body 302 includes upper and lower sheets 41, 42. *Id.* Interconnecting strip 43 is connected to the peripheries of upper and lower

sheets 41, 42 to form a lower air chamber. *Id.* A plurality of bracing strips 44 and a bracing interconnecting strip 45 are disposed in the lower air chamber to keep the box-like shape of lower mattress body 302 after inflation. *Id.* Each of bracing strips 44 and bracing interconnecting strip 45 are connected to upper and lower sheets 41, 42. *Id.* Interconnecting strip 43 defines the outer periphery of the lower air chamber (*see id.* at Fig. 13), whereas *bracing* interconnecting strip 45 is located internally and defines the periphery of bracing strips 44 (*e.g., see id.* Fig. 15).

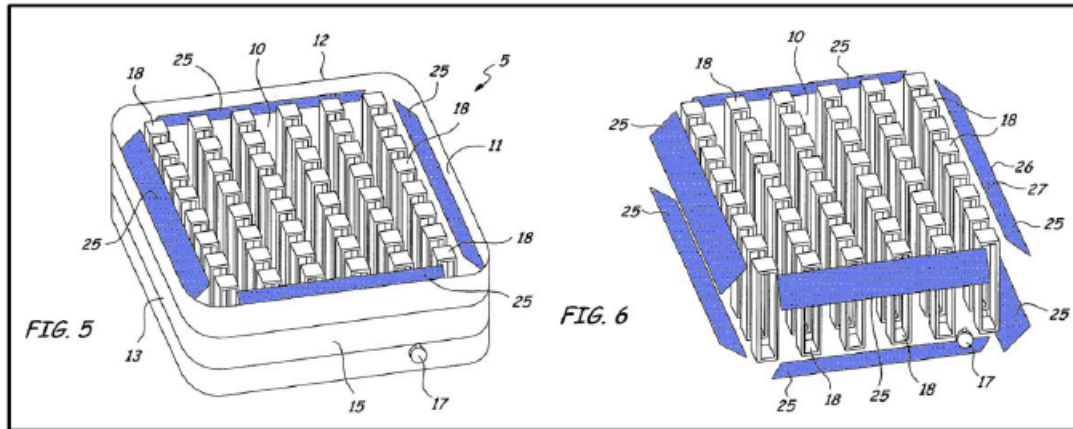
As shown in Figure 13, first lower sheet 32 and second upper sheet 41 are interconnected at joint line 51. *Id.* at [57].

There is no dispute between the parties that, similar to the Figures 4–7 prior art air beds disclosed in the '866 patent, Yuan discloses a “conventional air bed.” *See* Ex. 1001, 1:20–43 (describing the components of a “conventional air bed”). Petitioner acknowledges that Yuan’s lower air chamber interconnecting strip 45 is not oblique, as required in claim 1. Pet. 44. As discussed below, Petitioner relies on Metzger (Ex. 1004) for the disclosure of the oblique connecting strip.

c) Metzger (Ex. 1004)

Metzger also discloses a “double height” air bed having a single air chamber constructed to limit the expansion or deformation during use. Ex. 1004, 1:7–8, 4:52–58. Metzger’s single air chamber permits coils 18 to extend continuously between the top and bottom surface panels of the mattress. *Id.* at 5:8–11.

Figures 5 and 6 from Metzger, annotated by Petitioner (Pet. 48), are reproduced below.



Figs. 5 and 6 from Metzger, annotated by Petitioner, are cutaway perspective views of an air mattress revealing side support beams 25 shown in blue.

As shown in Figures 5–7, the mattress disclosed in Metzger may include one or more side support beams 25, which extend in the lengthwise direction along the side panels of the air mattress. Ex. 1004, 5:27–30.

Figure 7 from Metzger is reproduced below.

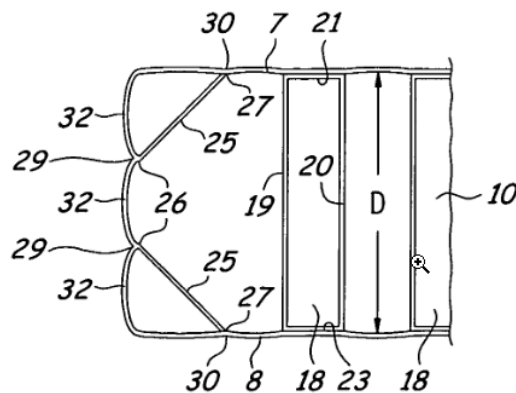


Fig. 7 from Metzger is a partial cross-sectioned elevational view of the disclosed air mattress.

As shown in Figure 7, each side support beam 25 has first edge 26 attached to a side panel of the mattress along weld or connection line 29, and spaced second edge 27 attached to either first panel 7 or second panel 8 along a second weld or connection line 30. *Id.* at 5:27–35. The purpose of side support beams 25 is to “limit the outward expansion of the side panel(s)

of the air mattress to which the side support beams are affixed.” Ex. 1004, 5:52–56. Metzger discloses that the edges of side support beams 25 define three separate side panel segments 32 of approximate equal width extending across the side panel of the mattress “for more uniformly distributing the mattress loading across the face of the side panel(s).” *Id.* at 5:66–6:5.

2. Differences Between the Claimed Subject Matter and the Prior Art

Regarding independent claim 1, Patent Owner disputes that the cited references disclose or suggest the “oblique” strip or the Concave Limitation. *E.g.*, PO Resp. 36–46. Patent Owner also disputes whether a person of ordinary skill would have been motivated to combine the references as proposed by Petitioner. *E.g.*, *see*, PO Resp. 30–31 (“a POSA would not be motivated to combine these two references at the outset, because Metzger explicitly teaches against doing so”).

Petitioner acknowledges that Yuan’s extending strip 45 is not oblique/oriented at an angle or welded to the periphery sheet. Pet. 44. Petitioner relies on Metzger for the claimed “oblique” strip. *Id.*

3. Analysis of Claim 1

Petitioner provides a clause-by-clause analysis specifying where, in Petitioner’s view, Yuan or Metzger disclose each element of the claim. *See, e.g.*, Pet. 36–61. Throughout its analysis, the Petition also includes supporting citations to Mr. Kuchel’s declaration. *See, e.g., id.* at 37 (citing “Decl. [Ex. 1002] ¶ 203”). For many clauses, Petitioner uses annotated figures to illustrate exactly where, in Petitioner’s view, the cited reference discloses a claim element. *See, e.g., id.* at 39 (including an annotated illustration of Yuan’s Figure 13 identifying precisely where, in Petitioner’s

view, Yuan discloses the claimed “upper air chamber” and the claimed “lower air chamber”).

The Petition not only discusses the scope and content of each of Yuan and Metzger, but also identifies differences between the claimed subject matter and the prior art. *Id.* at 44 (stating that Yuan’s second extending strip is not oblique, but that Metzger discloses an oblique extending strip).

Petitioner asserts specifically that Yuan as modified by Metzger satisfies the Concave Limitation in that the outer surface of the peripheral auxiliary air chamber extends beyond the bottom sheet of the lower main air-chamber. Pet. 56–61. Petitioner asserts two alternative theories for its argument: (1) based on the Bestway Construction of the Concave Limitation (*id.* at 56–58); or (2) based on the “definition portion” of the Concave Limitation as the claim construction of the Concave Limitation (*id.* at 59–61). *See also id.* at 32 (stating an “alternative way to possibly interpret the Concave Limitation is to limit it to the definition portion.”), 56 (asserting the Concave Limitation is met “applying either the Bestway Construction or the alternative construction proposed by Petitioners for this limitation”).

First, Petitioner relies on the so-called Bestway Construction of the Concave Limitation to assert that Yuan as modified by Metzger “satisfies this limitation.” Pet. 56–57. We addressed the Bestway Construction in our claim construction analysis. Petitioner’s so-called “Bestway Construction” is based on Patent Owner’s first amended infringement contentions in the related litigation cited in Section 1.C, “Related Matters,” of this Decision. *See* Pet. 31 (citing Ex. 1025, 10). As stated in our claim construction analysis, we do not regard the infringement contentions in the District Court as a claim construction proposed by Patent Owner in the proceeding before us. Moreover, we do not adopt the so-called Bestway Construction as the

construction of the Concave Limitation in this *inter partes* review proceeding. Thus, there is no basis in fact or law for Petitioner's assertion of unpatentability based on the Bestway Construction.

We address below the issues disputed by the parties applying the claim construction adopted in this Decision.

a) Oblique Extending Sheet/Concave Limitation

We address together the two disputed structural features recited in claim 1, the oblique extending sheet and the Concave Limitation, because they are inextricably related. It is the structure of the oblique extending sheet that defines the claimed “shape of an inverse cone” for the lower main air-chamber, which in turn allows the peripheral auxiliary air-chamber to extend beyond the bottom sheet of the lower main air-chamber.

As described above in our summary of the '866 patent, as a result of oblique extending strips 8, lower main air-chamber B2 has a shape of an inverse cone. Ex. 1001, 3:23–24, Fig. 3. Petitioner provides (Pet. 6) the following annotation of Figure 3, showing in red outline the disclosed, and claimed (*see id.* at 4:25–26), “inverse cone” shape of lower air chamber B2.

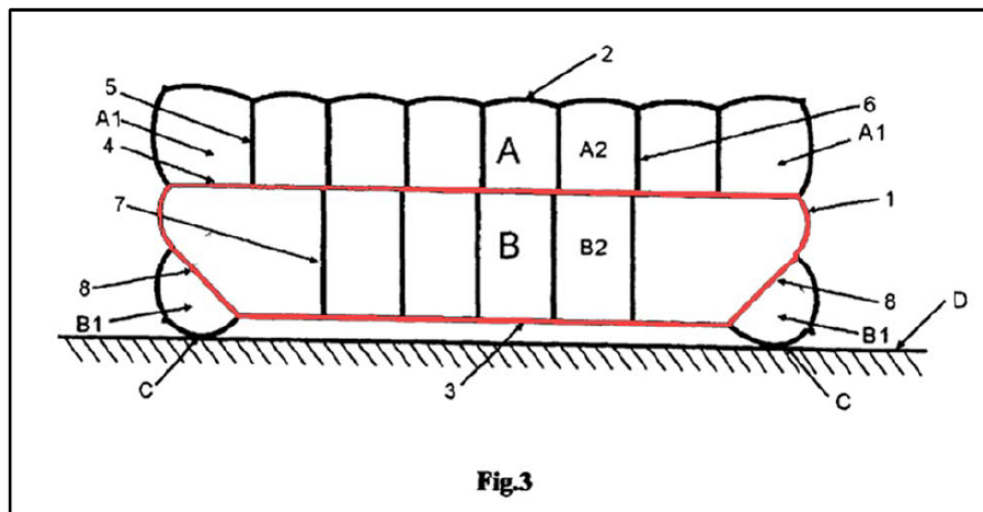
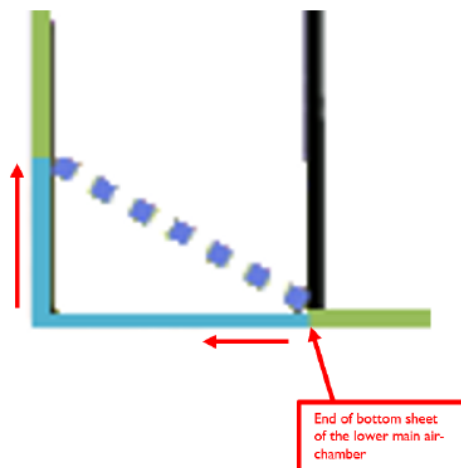


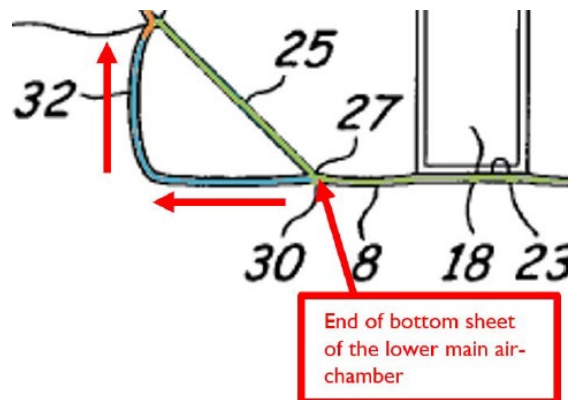
Figure 3 of the '866 patent annotated by Petitioner (Pet. 6) to outline in red the “inverse cone” shape of lower air chamber B2.

The inwardly slanting walls of oblique extending strip 8 define the claimed inverse cone shape of lower main air chamber B2, as shown in annotated Figure 3. Surface C of peripheral auxiliary air-chamber B1, which engages the floor, ground, or other supporting surface D, extends laterally and vertically downward beyond bottom sheet 3 of lower main air chamber B2.

Petitioner asserts that this claimed structure is disclosed by Yuan as modified by Metzger. Pet. 59 (“to the extent the Concave Limitation is limited to the ‘definition portion’—i.e., that it means ‘the outer surface of the peripheral auxiliary air-chamber extends beyond the bottom sheet of the lower main air-chamber,’ Yuan as modified by Metzger satisfied this limitation” (citing Ex. 1002 ¶ 254)). Petitioner provides (Pet. 60–61) the following annotated figures to illustrate its argument.



Petitioner's annotated illustration of Yuan modified by Metzger. Pet. 60.



Petitioner's annotated Fig. 7 from Metzger. Pet. 61.

The figure above on the left is an excerpt from Figure 13 in Yuan illustrating Petitioner's argument of the structure resulting from modifying

Yuan's bracing strip 43 as suggested by Metzger's oblique support beams 25. According to Petitioner, as shown in this illustration, "an outer surface of the peripheral chamber (blue) extends beyond the bottom sheet of the lower main air-chamber (green)." Pet. 59. In the figure above on the right, Petitioner applies these same annotations to Figure 7 from Metzger.

We agree that the peripheral air-chamber created by Yuan modified with Metzger extends laterally beyond the bottom sheet of the lower main air-chamber.

b) Motivation to Combine

To establish a claimed invention would have been obvious under § 103, it is not enough "to merely demonstrate that elements of the claimed invention were independently known in the prior art. Often, every element of a claimed invention can be found in the prior art." *Metalcraft of Mayville, Inc. v. The Toro Co.*, 848 F.3d 1358, 1367 (Fed. Cir. 2017) (citations omitted). "The question is not whether the various references separately taught components of the [patented invention], but whether the prior art suggested the selection and combination achieved by the . . . inventors." *Orexo*, 903 F.3d at 1273. As stated in *KSR*,

[A] patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art. . . . This is so because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known.

KSR, 550 U.S. 418–419.

Petitioner relies on Figure 7 of Metzger to assert that Metzger discloses that its side support beam 25 forms an outer surface of the lower

main air-chamber that is concave, as recited in claim 1, with respect to an outer surface of the peripheral auxiliary air-chamber. Pet. 59–61.

Petitioner also explains why a person of ordinary skill would have been motivated to modify Yuan with the oblique extending strip of Metzger. According to Petitioner, Metzger discloses oblique side support beams 25. Pet. 47. The purpose of Metzger’s oblique side strips is to “limit the outward expansion of the side panel(s) of the air mattress to which the side support beams are affixed.” Ex. 1004, 5:52-56. In so doing, Metzger’s oblique extending strips “provide strength and stability.” *Id.* (citing “Decl. [Ex. 1002] ¶ 225”). Petitioner asserts that the rationale for the proposed modification is to provide better stability. *Id.* at 51. Petitioner also asserts that “a POSA would have known that using an oblique orientation for the stability structure was a well-known design option having various advantages—including added strength—and would have predictably yielded an air mattress with a stable supporting structure.” *Id.* at 52.

Patent Owner asserts that the proposed combination of Yuan and Metzger is based on hindsight. *E.g. see* PO Resp. 2. Patent Owner argues “hindsight appears to be the only explanation for how these references could be combined, because Metzger explicitly teaches away from doing so. Indeed, the defining feature of Metzger is that it provides ‘a double height air mattress that may use a single internal air chamber.’” *Id.*; *see also id.* at 5 (“the explanation for combining Yuan with either Metzger or Reed comes down to hindsight. . . . [**R**]ead in its entirety, [Metzger] actually **teach away** from the proposed combinations.”); *see also* Sur-reply 1–2 (“Metzger explicitly teaches away from the proposed combination with Yuan in two ways”).

“A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant.” *In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994). The Court in *Gurley*, however, further explained its holding: “*The degree of teaching away will of course depend on the particular facts*; in general, a reference will teach away if it suggests that the line of development flowing from the reference’s disclosure is *unlikely to be productive* of the result sought by the applicant.” *Gurley*, 27 F.3d at 553 (emphases added). While Metzger is concerned with the stability of a “two-high” or “double-height” single-chamber air bed (Ex. 1004, 4:52–54), there is no persuasive evidence to which we have been directed that Metzger states or suggests that the oblique support beams in Metzger will not also control sidewall expansion or deflection of an air bed having two air-chambers. In fact, Metzger suggests the opposite.

The problem Metzger seeks to solve is the need “for an improved double height air mattress better adapted for controlling or limiting the expansion or deflection of the mattress sidewall, or sidewalls, during usage.” Ex. 1004, 2:48–51. Metzger discloses:

Another problem that arises with the use of the known air mattresses, and *especially with the double height or two layer air mattresses*, is the expansion of the mattress sidewall extended between the top face and the bottom face of the mattress. As known, when a person lays on the mattress a load is introduced which increases the pressure of the air trapped within the mattress, which pressurized air acts on and seeks to expand or deflect the sidewall of the mattress. *This expansion needs to be limited so that the mattress holds its shape and will support the user in a comfortable sleeping position* more akin to that of a conventional coil and spring mattress.

Ex. 1004, 2:6–17 (emphases added). Metzger recognizes expressly that “two layer air mattresses,” as recited in the claims of the ’866 patent, have the same sidewall expansion problem Metzger seeks to solve. Metzger does not suggest that the combination of Metzger and Yuan is “unlikely to be productive” of the claimed invention. Thus, Metzger’s preferred embodiment of a single chamber air bed does not teach *away* from using oblique support beams in a two chamber air bed as claimed in the ’866 patent; it teaches *toward* a preferred arrangement in a single chamber air mattress.

Moreover, *KSR* informs us that “if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.” *KSR*, 550 U.S. 417.

In *KSR*, the patented invention was a mechanism for combining an electronic sensor with an adjustable automobile pedal so the pedal’s position can be transmitted to a computer that controls the throttle in the vehicle’s engine. *KSR*, 550 U.S., at 406. The patented invention represented a transition to computers in cars to control engine operation. *Id.* at 407–408. With this transition, a traditional mechanical link in the gas pedal would not work because an electronic sensor is necessary to translate the mechanical operation into digital data the computer can understand. *Id.* at 408. The patented invention attached the sensor to a support member, which allowed the sensor to remain in a fixed position while the driver adjusts the pedal. *Id.* at 411. The patent asserted that its adjustable electronic pedal provided a “simplified vehicle control pedal assembly that is less expensive, and which uses fewer parts and is easier to package within the vehicle.” *Id.* at 410.

The prior art in *KSR*, the Asano reference, disclosed that to prevent the wires connecting the sensor to the computer from chafing and wearing out, and to avoid grime and damage from the driver's foot, the sensor should be put on a fixed part of the pedal assembly rather than in or on the pedal's footpad. *KSR*, 550 U.S. 409, 420. Asano's primary purpose, however, was solving a "constant ratio problem." *Id.* at 420.

The Supreme Court held that regardless of Asano's primary purpose, "the design provided an obvious example of an adjustable pedal with a fixed pivot point; and the prior art was replete with patents indicating that a fixed pivot point was an ideal mount for a sensor." *Id.* The Court concluded that "[t]he idea that a designer hoping to make an adjustable electronic pedal would ignore Asano because Asano was designed to solve the constant ratio problem makes little sense." *Id.* at 420–421. In reaching this conclusion, the Court noted that "[a] person of ordinary skill is also a person of ordinary creativity, not an automaton." *Id.* at 421. In *KSR*, the level of ordinary skill was "an undergraduate degree in mechanical engineering (or an equivalent amount of industry experience) [and] familiarity with pedal control systems for vehicles." *Id.* at 412–413. This is similar to the level of ordinary skill adopted in this proceeding. *See* Section II.B.1.

The analysis and conclusion in *KSR* applies equally to the evidence in the proceeding before us. A degreed mechanical engineer with practical experience in inflatable product design would have understood that Metzger's oblique side wall used in a single chamber air bed would also help control sidewall expansion in a two chamber air bed, such as Yuan. The idea that a designer hoping to control sidewall expansion in a two-chamber air bed would ignore Metzger because Metzger's preferred embodiment is in the context of a single chamber air bed "makes little sense," just as it did in

KSR. Here, as in *KSR*, the improvement is no more than “the predictable use of prior art elements according to their established functions.” *KSR*, 550 U.S. at 417.

4. *Analysis of Claims 2 and 3*

Claim 2 depends from claim 1 and adds the additional limitation that “a plurality of air-holes are provided on the loop of the outer extending strip provided in said upper air-chamber.” Ex. 1001, 4:32–35. Claim 2 concerns only the upper air-chamber. The ’866 patent discloses that “[a]ir holes 51 are provided on outer extending strip 5 to communicate peripheral air-chamber A1 with upper main air-chamber A2.” *Id.* at 3:7–9.

Claim 3, dependent from claim 1, also refers to air holes. It adds the limitation that “a plurality of air-holes are provided on the oblique extending strip provided in said lower air-chamber.” *Id.* at 4:36–39. The ’866 patent discloses that “[a]ir holes 81 are provided on oblique extending strip 8 to communicate peripheral auxiliary air-chamber B1 with lower main air-chamber B2.” *Id.* at 3:20–22.

The function of air holes 51 and 81 are to allow the air bed to be filled with air from a single air-valve 10. *Id.* at 3:38–41.

Petitioner acknowledges that “Yuan did not explicitly disclose a plurality of air-holes ‘provided on the loop of the outer extending strip’ in Yuan—i.e., the first bracing interconnecting strip 35” in Yuan’s upper chamber in upper mattress 301. Pet. 61. Petitioner asserts, however, that a person of ordinary skill “would have understood that such air-holes were necessarily provided; otherwise, Yuan’s airbed would not have functioned as an inflatable article as intended.” *Id.* at 61–62 (citing Ex. 1002 ¶ 257). Mr. Kuchel testifies that a plurality of small air holes would have been preferred

over a single large air hole because the plurality of small holes would have create less localized weakness in Yuan's strip 35, thus preserving the ability of strip to function as intended, *i.e.*, to function as a tensioning member. Ex. 1002 ¶ 257. Mr. Kuchel also testifies that the need for air holes is supported by the single air valve 37 in the upper chamber. *Id.* at ¶ 258.

Petitioner makes a similar argument for claim 3. Pet. 63–64 (citing Ex. 1002 ¶ 260–261).

Patent Owner argues that air holes are not the only way that Yuan's mattress might be inflated, “as other methods are well-known in the art.” PO Resp. 47 (citing Ex. 2001 ¶ 157. Patent Owner argues that providing “small slits” is an alternative to “air holes.” *Id.*

Neither the claims nor the Specification of the '866 patent provide any specific size or shape to the claimed “air holes.” The ordinary and customary meaning of “hole” is “an opening through something; gap; aperture.” Ex. 3004. In the context of the '866 patent, there is no structural or functional difference between the claimed “hole” and a slit, gap, or other opening that allows air to pass from one chamber to an adjacent chamber. Patent Owner acknowledges that air holes are not the only way that Yuan's mattress might be inflated, because “other methods are well-known in the art.” PO Resp. 47.

It is clear that Yuan discloses separate air valves 37 for the upper and lower mattresses of the air bed. Ex. 1019 ¶¶ [55], [56]; *see also* Fig. 5 (illustrating valves 37 in each of upper and lower mattresses 301, 302).

Based on the prior art of record and Mr. Kuchel's testimony, we determine that in order to inflate the chambers in each of mattresses 301, 302 from the single valve 37 provided on each mattress, the various chambers necessarily must be connected by holes, openings, gaps, or

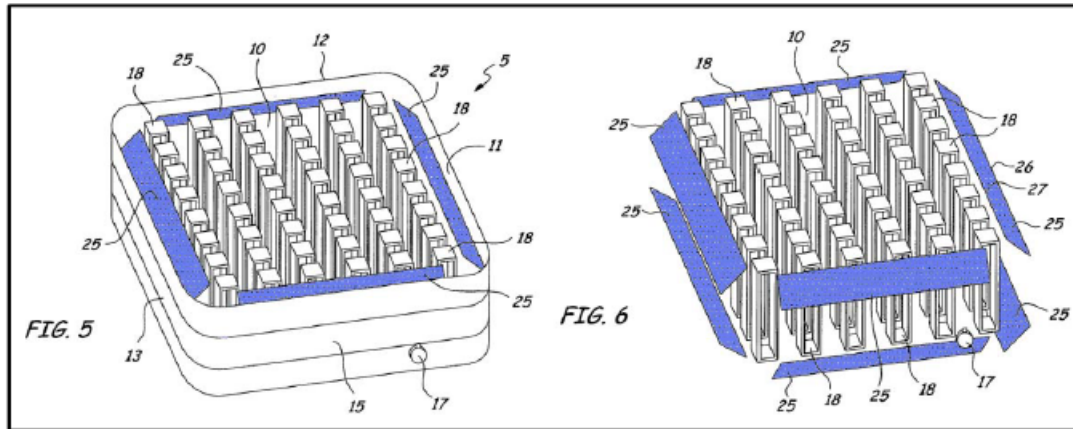
apertures. Accordingly, claims 2 and 3 would have been obvious to a degreed mechanical engineer with experience in inflatable product design, and hence, unpatentable, based on Yuan and Metzger.

5. *Analysis of Claim 4*

Claim 4 depends from claim 1. It relates to the oblique strip and provides two alternatives to the claimed structure. Claim 4 states that the oblique extending strip either (1) “becomes a loop, provided around the periphery of a second set of extending strips,” *or* (2) is “a plurality of oblique extending strips, which are not connected with each other at two ends of each, [and] are provided around the periphery of the second set of extending strips.” Ex. 1001, 4:40–46. *See Wasica Fin. GmbH v. Cont’l Auto. Sys., Inc.*, 853 F.3d 1272, 1280 (Fed. Cir. 2017) (“Using the disjunctive ‘or’ as in ‘numbers or symbols’ designates numbers and symbols as distinct alternatives to one another.”).

Petitioner asserts that Yuan as modified by Metzger results in an outer extending strip in the lower main air-chamber that is oblique and in the shape of a loop, as discussed above. Pet. 64. Patent Owner does not address specifically the merits of Petitioner’s assertion against claim 4.

Figures 5 and 6 from Metzger, annotated by Petitioner (Pet. 48), are reproduced below.



Figs. 5 and 6 from Metzger, annotated by Petitioner, are cutaway perspective views of an air mattress revealing side support beams 25 shown in blue.

As shown in Figures 5–7, the mattress disclosed in Metzger may include one or more oblique side support beams 25, which extend in the lengthwise direction along the side panels of the air mattress. Ex. 1004, 5:27–30. We determine that Metzger clearly discloses the alternative limitations recited in claim 4. Based on our analysis above in claim 1, we determine that it would have been obvious to use the oblique side support beams 25 from Metzger in the air bed of Yuan.

C. Ground 2

In its Ground 2 (*see e.g.*, Pet.25), addressing patentability of claims 2 and 3, Petitioner relies on Davis (Ex. 1024) to establish that air holes were well-known, and would have been obvious to use in an air bed based on Yuan and Metzger. Pet. 64–69.¹⁶ In Ground 2 (and Grounds 4, and 6), Petitioner relies on Davis “*to the extent the Board finds that Yuan did not necessarily have a plurality of air-holes located on its loop of outer extending strip located in its upper chamber or in its oblique extending strip*

¹⁶ Petitioner also relies on Davis in Grounds 4 and 6, discussed below.

located in the lower chamber.” *E.g.*, Pet. 64 (emphasis added). Thus, this is a contingent ground. As discussed above, we have find that Yuan necessarily included air holes. Accordingly, we need not address the merits of a contingent finding of fact we have not made.

D. Grounds 3 and 4

In Grounds 3 and 4, Petitioner relies on Hsu (Ex. 1009) as a contingent ground based on a construction of the claimed middle sheet, which we have not adopted. *See* Pet. 69–70 (stating “*to the extent* the Board departs from the standard claim construction” and “*if* the Board imparts such a meaning to “a middle sheet”) (emphasis added). Accordingly, we need not address the merits of these contingent grounds based on a claim construction we have not adopted.

E. Yuan and Reed (Grounds 5–6)

In Ground 5, Petitioner asserts claims 1–4 would have been obvious based on Yuan and Reed. Pet. 79–94. Yuan has been discussed above.

Reed (Ex. 1013) discloses an inflatable mattress having a plurality of separate layers adapted to be inflated to different pressures in order to provide the maximum comfort possible and to simulate the resiliency of a conventional mattress and springs. Ex. 1013, 2:58–65. The pressures are set according to the wishes of the individual user. *Id.* at 60–61.

Figure 3 from Reed, annotated by Petitioner (Pet. 82), is reproduced below.

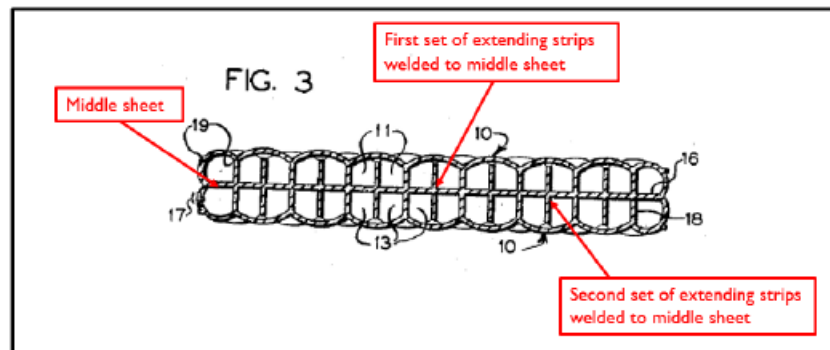


Fig. 3 from Reed, annotated by Petitioner,
is a sectional view of the inflatable mattress in Fig. 1.

The disclosed mattress includes upper and lower walls 10, side walls 12, and end walls 14. An intermediate or inner horizontal dividing wall 16 is provided substantially midway between exterior walls 10, thus providing superimposed independent layers or portions 11 and 13, defined by horizontal walls 10, side and end walls 12 and 14, and common intermediate wall 16. Ex. 1013, 2:27–39. Suitable connecting means such as lateral or longitudinal ties or partitions 18 may be integral with or joined by suitable means to intermediate wall 16 and to horizontal exterior walls 10.

Id. at 2:48–51. Partitions 18 extend completely across the independent layers of the mattress. *Id.* at 2:55–56. Partitions 18 are attached so that sufficient support may be provided for the horizontal walls and so that there may be adequate communication of air to all parts of independent layers 13 and 15 of the mattress. *Id.* at 2:56–61.

Figure 5 from Reed, annotated by Petitioner (Pet. 86), is reproduced below.

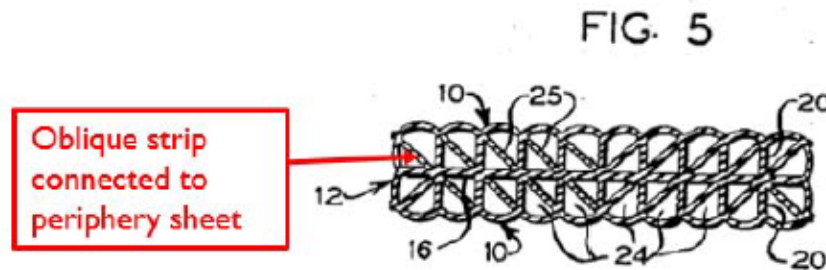


Fig. 5 from Reed, annotated by Petitioner, is a sectional view of a modified embodiment having diagonal connecting strips.

In Figure 5, transverse or diagonal strips or partitions 25 are provided for additional strength and support. Ex. 1013, 3:73–4:7.

1. Claim 1

Petitioner asserts that a person of ordinary skill would have been motivated¹⁷ by the teachings in Reed to modify Yuan’s second bracing interconnecting strip 45 to make it oblique and, in turn, to connect it to the periphery sheet in Yuan. Pet. 85 (citing Ex. 1002 ¶ 337).

Petitioner asserts that “[o]nce the oblique extending strip teaching from Reed is applied to Yuan, the resulting structure would have satisfied the Concave Limitation for the same reasons as discussed in Ground 1 with respect to Metzger. Pet. 90 (citing Ex. 1002 ¶¶ 349–355). Petitioner also provides the following annotated Figure 13 from Yuan to illustrate the structure from the combined references.

¹⁷ Based in the context of the entirety of the Petition, we understand Petitioner to assert that it would have been “obvious” to modify Yuan with the oblique strips 25 of Reed, in accordance with the asserted basis of unpatentability under § 103.

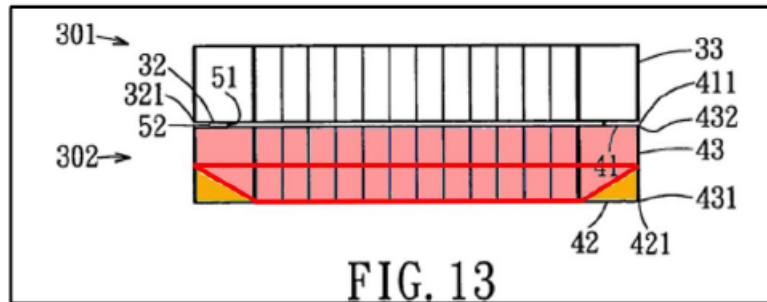


Fig. 13 from Yuan, annotated by Petitioner (Pet. 91), illustrating the resulting structure from combining Yuan and Reed.

As shown in Petitioner’s annotated Figure 13, Yuan, as modified with the disclosure of Reed, results in an a space with the “shape of an inverse cone” as recited in claim 1.

Petitioner also provides (Pet. 92) the following annotated Figure 13 from Yuan illustrating how the combined structure results in a peripheral auxiliary air chamber that “extends beyond” the bottom sheet of the lower main air-chamber.

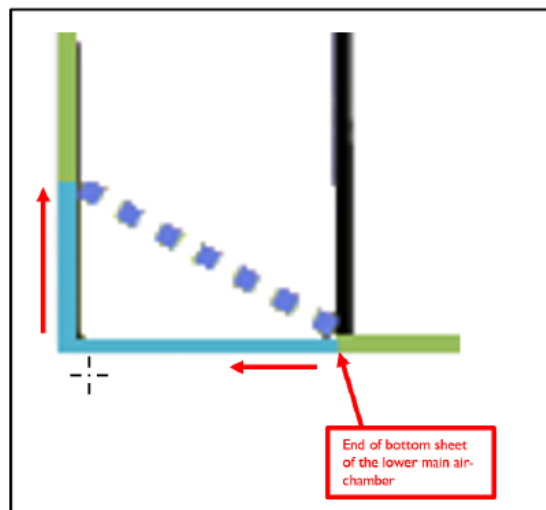


Fig. 13 from Yuan annotated by Petitioner (Pet. 92).

Petitioner’s rationale for why a person of ordinary skill would have gleaned from Reed the oblique strips 25 of Reed to add to Yuan is the same as discussed above in Ground 1 based on Yuan and Metzger. Reed’s

oblique strips 25 provide increased stability, less bulging, and reduced deformation to Yuan's air bed. Pet. 87–90 (citing Ex. 1002 ¶¶ 340–348).

Patent Owner argues “there is no reason to combine Yuan with Reed, and less reason still to modify Reed in the manner Intex suggests in order to match the '866 Patent.” PO Resp. 55. According to Patent Owner, Reed's teachings relate to an early, single-height mattress, and thus “a POSA would not be motivated to look to Reed to develop an internal supporting system for a more advanced double-height mattress. *Id.* at 57 (citing Ex. 2001 ¶ 184). We disagree for the same reasons discussed above in Section III.B.3.(b), Ground 1, discussing the reasons why a person of ordinary skill would have combined the oblique strip from a single chamber air bed like Metzger with a double chamber air bed like Yuan. Both types of air beds suffer from the same stability issues. Following our analysis of the holding in *KSR*, we reach the same conclusion here as we did in Ground 1. The idea that a designer hoping to control sidewall expansion in a two-chamber air bed would ignore Reed because Reed's preferred embodiment is in the context of a single chamber air bed “makes little sense,” just as the arguments did in *KSR*. Here, as in *KSR*, the improvement is no more than “the predictable use of prior art elements according to their established functions.” *KSR*, 550 U.S. at 417.

2. *Claims 2 and 3*

The same analysis in Ground 1 explaining why Yuan as modified by Metzger has the air holes recited in claim 1 applies equally to Grounds 5 and 6.

3. *Claim 4*

Petitioner asserts that Yuan as modified by Reed results in an outer extending strip in the lower main air-chamber that is oblique and in the shape of a loop. Pet. 94 (citing Ex. 1002 ¶ 365). Mr. Kuchel testifies that Yuan's outer extending loop is in the shape of a loop, which is one of the alternatives in claim 4. Ex. 1002 ¶ 365. He further testifies that a person of ordinary skill would have made Yuan's entire loop oblique as suggested by Reed. *Id.* Mr. Kuchel testifies that just the outer sidewall would be oblique because of the need to control sidewall expansion. Ex. 2002, 130:16–23 (“And so, once that concept is there, and you say, oh, I can hold my side wall more effectively and create a more stable bed with an oblique tensioning member . . . So I need to control my walls. And to control my walls I look at Reed...”).

Patent Owner disagrees with this analysis. PO Resp. 60–61 (citing Ex. 2001 ¶ 195).

Reed's oblique strips provide “additional strength.” Ex. 1013, 4:1. A degreed mechanical engineer with experience in inflatable product design would have adapted these oblique strips to the area in Yuan in need of additional strength, which is the peripheral walls. Accordingly, we determine claim 4 would have been obvious based on Yuan and Reed.

Our analysis of Ground 6, adding Davis as an additional reference for claims 2 and 3, is the same as stated for Grounds 2 and 4. We need not reach Ground 6 because it is based on a contingency that has not been established.

IV. CONCLUSION

Based on the claim constructions adopted in this Decision, and the evidence as discussed above, we determine that Petitioner has established by a preponderance of the evidence that Claims 1–4 are unpatentable.¹⁸

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner has shown by a preponderance of the evidence that claims 1–4 are not patentable based on Yuan and Metzger;

FURTHER ORDERED that Petitioner has shown by a preponderance of the evidence that claims 1–4 are not patentable based on Yuan and Reed; and

FURTHER ORDERED that contingent Grounds 2, 3, 4 and 6 are moot.

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

In summary:

Claims	35 U.S.C. §	Basis	Claims Shown Unpatentable	Claims Not shown Unpatentable
1–4	103	Yuan, Metzger	1–4	
2, 3	103	Yuan, Metzger, Davis		
1–4	103	Yuan, Hsu, Metzger		
2, 3	103	Yuan, Hsu, Metzger, Davis		
1–4	103	Yuan, Reed	1–4	
2, 3	103	Yuan, Reed, Davis		
Overall Outcome			1–4	

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