

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

HENDRICKSON USA L.L.C., GREAT DANE L.L.C., and
QUEST GLOBAL, INC.,
Petitioners,

v.

TRANS TECHNOLOGIES COMPANY,
Patent Owner.

Case IPR2017-01510
Patent 7,669,465 B2

Before KEN B. BARRETT, JEFFREY A. STEPHENS, and
GARTH D. BAER, *Administrative Patent Judges*.

STEPHENS, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

I. INTRODUCTION

A. *Background*

Hendrickson USA L.L.C., Great Dane L.L.C., and Quest Global, Inc. (“Petitioners”) filed a Petition requesting *inter partes* review of claims 1, 8–10, and 12–17 (“challenged claims”) of U.S. Patent No. 7,669,465 B2 (Ex. 1001, “‘465 patent”). Paper 2 (“Pet.”). Trans Technologies Company (“Patent Owner”) filed a Preliminary Response. Paper 6 (“Prelim. Resp.”). On December 4, 2017, the Board instituted trial to review patentability of the challenged claims on one of the three grounds presented in the Petition. Paper 7 (“Inst. Dec.”). After the decision in *SAS Institute Inc. v. Iancu*, 138 S. Ct. 1348 (2018), the Board also instituted trial on the remaining two grounds presented in the Petition. Paper 35.

Subsequent to institution, Patent Owner filed a Patent Owner Response (Papers 41, 42, “PO Resp.”),¹ Petitioners filed a Reply (Paper 46, “Pet. Reply”), Patent Owner filed a Sur Reply (Papers 50, 51, “PO Sur Reply”),² and Petitioners filed a Response to Patent Owner’s Sur Reply

¹ Patent Owner filed two versions of the Patent Owner Response: Paper 42, to which access is restricted to the parties and the Board; and Paper 41, a publicly available, redacted version of Paper 42. Patent Owner’s Response, which is labeled “Revised” as filed, superseded previous versions of the Patent Owner Response.

² Patent Owner filed two versions of the Patent Owner Sur Reply: Paper 51, to which access is restricted to the parties and the Board; and Paper 50, a publicly available, redacted version of Paper 51.

(Paper 52, “Pet. Resp. to Sur Reply”). Patent Owner filed a Motion to Exclude (Paper 53, “Mot. Exclude”), Petitioners filed an Opposition to Patent Owner’s Motion (Paper 54, “Opp.”), and Patent Owner filed a Reply (Paper 56, “PO Reply to Mot. Exclude”).³ The parties also filed joint Motions to Seal in connection with Patent Owner’s Response and Patent Owner’s Sur Reply. Paper 40; Paper 49. At the request of the parties, the Board entered its Standing Protective Order in this proceeding. Paper 33; Ex. 3001.

On September 5, 2018, we held an oral hearing. Paper 57.

We have jurisdiction under 35 U.S.C. § 6, and we issue this Final Written Decision under 35 U.S.C. § 318(a). For the reasons that follow, we determine that Petitioners have demonstrated that claims 1, 8–10, and 12–17 of the ’465 patent are unpatentable under 35 U.S.C. § 103(a) by a preponderance of the evidence.

B. Related Matters

The parties indicate that Patent Owner asserted the ’465 patent against Petitioners in *Trans Technologies Company v. Hendrickson USA L.L.C. et al.*, No. 1:16-cv-01778-AT (N.D. Ga). Pet. 3; Paper 4, 1.

³ Petitioners filed objections under 37 C.F.R. § 42.64(b)(1) (Paper 45), but did not preserve the objections with the filing of a motion to exclude under § 42.64(c).

C. *The '465 Patent*

The '465 patent relates to maintaining correct air pressure in tractor-trailer tires. Ex. 1001, col. 1, ll. 21–22. The background explains that tires in most trailers normally operate at approximately 100 pounds per square inch (“psi”), but that “traveling through hot climates such as the Arizona desert can cause the pressure in the tires to increase to dangerous levels increasing likelihood of a blow-out or other catastrophic failure.” *Id.*, col. 1, ll. 33–37. Tires for long haul trailers will also experience a gradual pressure loss, which can accelerate tire wear. *See id.*, col. 1, ll. 42–44. The '465 patent describes maintaining correct air pressure by keeping it within adjustable predetermined values, such as 100 and 110 psi. *Id.*, col. 2, ll. 56–59.

Figure 3 of the '465 patent is reproduced below.

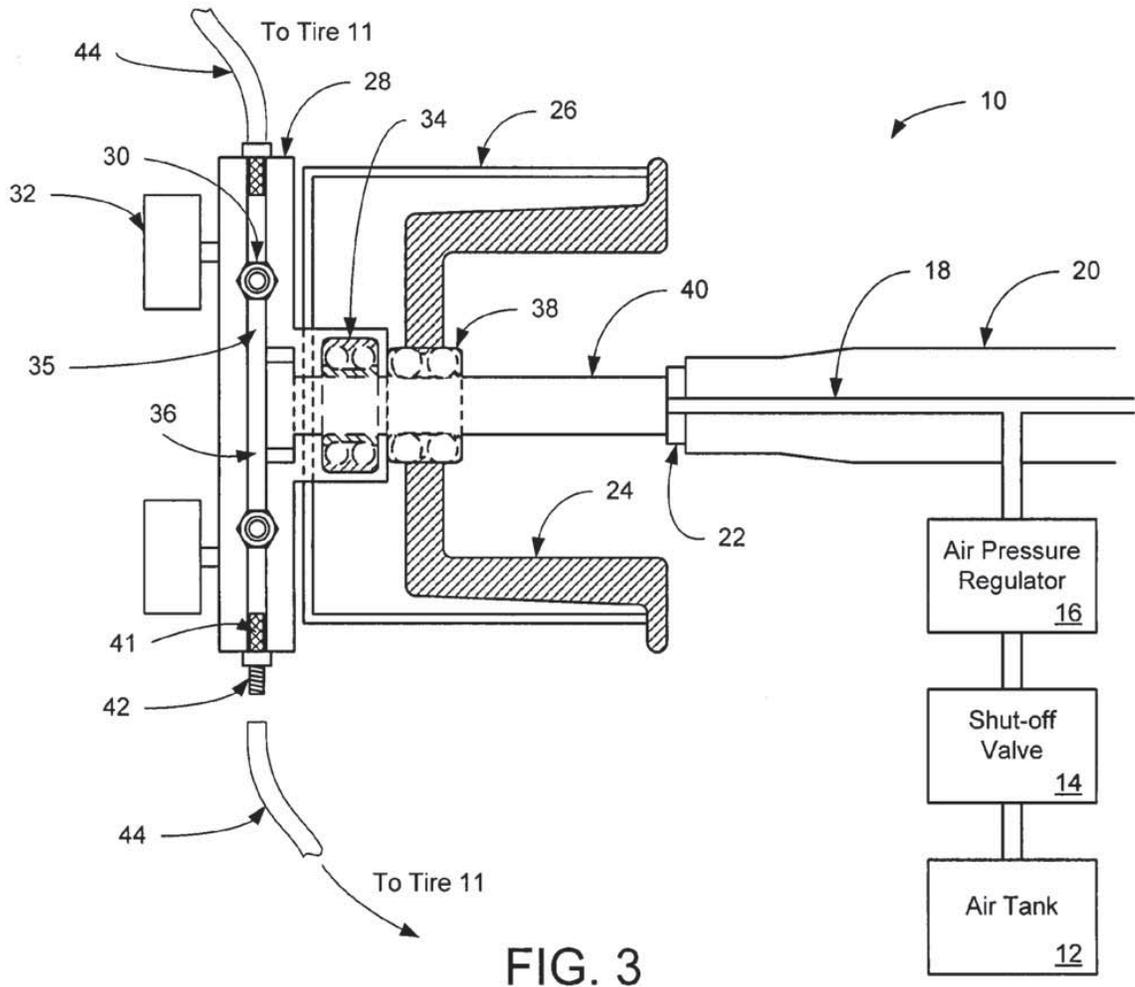


Figure 3 is a cut-away view of the tire inflation system described in the '465 patent, showing the system in relation to axle 20 and hub cap 24.

Air pressure flows to the tires from pressurized air tank 12, with shutoff valve 14 and regulator 16 between the tank and the tires. *Id.*, col. 3, ll. 18–21. The air flows from the tank through air line 18, which extends through axle 20 of the trailer. *Id.*, col. 3, ll. 29–30. Air line 18 extends to air shaft 40, which extends through hub cap 24 and into rotary air chamber 28 attached to hub cap 24. *Id.*, col. 3, ll. 30–32. Rotary air chamber 28 is

attached to air hoses 44 that allow air from the air shaft 40 to pass through the chamber and into the hose connected to a specific tire. *Id.*, col. 4, ll. 29–33.

Check valves 41 are used to allow air to flow into the tires when the tire air pressure drops below the desired pressure set by the regulator. *Id.*, col. 4, ll. 2–5. Each check valve is designed to close off air leaving the tire if the check valve detects an increased flow rate, and in this way can prevent air from flowing from a good tire to one that has catastrophically failed. *Id.*, col. 4, ll. 2–10. Pressure relief valves 30 release air pressure from their corresponding tires when the tire air pressure exceeds a preset upper limit. *Id.*, col. 3, ll. 11–14.

D. Illustrative Claims

Challenged claims 1 and 12 of the '465 patent are independent. Claims 1 and 12 are illustrative of the claimed subject matter and are reproduced below with bracketed numbering added to identify claim limitations that follow:

1. A system for continuously maintaining air pressure in tires, comprising:

[1.1a] a rotary air chamber secured to a hub cap [1.1b] wherein the rotary air chamber includes a plurality of check valves, [1.1c] each check valve configured to inject air into a corresponding tire when tire air pressure drops below a first adjustable preset value, and [1.1d] a plurality of relief valves, each relief valve configured to release air from a corresponding tire when tire air pressure rises above a second adjustable preset value;

[1.2] an air shaft extending through the hub cap and into the rotary air chamber;

[1.3] an air line attached to the air shaft, so that the air line passes through an axle and injects air into the air shaft; and

[1.4] ball bearings affixed between the air shaft and the hub cap, so that the rotary air chamber rotates with the wheel.

12. A system for air injection into a tire, comprising:

[12.1] means for causing air to flow through an air line within an axle;

[12.2] means for injecting the air into the tire when tire pressure drops below a first preset value; and

[12.3] means for releasing air from the tire when tire pressure rises above a second preset value.

Ex. 1001, col. 5, ll. 23–38, col. 6, ll. 29–35.

E. Asserted Grounds of Unpatentability

Petitioners assert the following grounds of unpatentability:

References	Basis⁴	Claims challenged
Bland ⁵ and Parker ⁶	§ 103(a)	1, 8–10, and 12–17
Stech ⁷ and Loewe et al. ⁸	§ 103(a)	1, 8–10, and 12–17
White et al. ⁹ and Schultz ¹⁰	§ 103(a)	1, 8–10, and 12–17

II. DISCUSSION

A. Principles of Law

“In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review

⁴ Because the claims at issue have a filing date prior to March 16, 2013, the effective date of the Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), we apply the pre-AIA version of 35 U.S.C. § 103.

⁵ US 4,387,931, issued June 14, 1983. Ex. 1003.

⁶ US 2,317,636, issued Apr. 27, 1943. Ex. 1006.

⁷ US 5,287,906, issued Feb. 22, 1994. Ex. 1004.

⁸ US 5,325,902, issued July 5, 1994 (“Loewe”). Ex. 1007.

⁹ US 7,273,082 B2, issued Sept. 25, 2007 (filed Apr. 19, 2004) (“White”). Ex. 1005.

¹⁰ US 4,678,017, issued July 7, 1987. Ex. 1008.

petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”). This burden never shifts to Patent Owner. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burden of proof in *inter partes* reviews).

A claim is unpatentable under 35 U.S.C. § 103(a) if “the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) objective evidence of nonobviousness, i.e., secondary considerations. *See Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17–18 (1966). In an *inter partes* review, obviousness must be proven by a preponderance of the evidence. *See* 35 U.S.C. § 316(e).

B. Level of Ordinary Skill in the Art

Patent Owner’s Declarant, Gerry McCann, adopts the same level of ordinary skill in the art as Petitioners’ Declarant, Lee A. Swanger, Ph.D., P.E., namely “someone who has a bachelor’s degree in mechanical technology, mechanical engineering, or equivalent experience, and who had working knowledge of the incorporation of pressure regulators, check valves, and pressure relief valves to accomplish desired features of

pneumatic systems.” Ex. 2008 ¶ 16 (Declaration of Gerry McCann, “McCann Declaration”); Ex. 1002 ¶ 13 (Declaration of Lee A. Swanger, Ph.D., P.E., “Swanger Declaration”). We adopt the description of the level of ordinary skill in the art agreed upon by the parties’ declarants.

C. Claim Construction

We interpret claims of an unexpired patent using the broadest reasonable construction in light of the specification of the patent in which they appear. *See* 37 C.F.R. § 42.100(b) (2016). In applying the broadest reasonable construction, claim terms generally are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *See In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

The parties offer proposed constructions for some terms recited in claims 1 and 12. Pet. 18–21; PO Resp. 13–18. We need not reach these issues because express construction of these terms is not necessary to resolve the dispute between the parties in this case.

D. Asserted Obviousness over Bland and Parker

Petitioners contend claims 1, 8–10, and 12–17 of the ’465 patent are unpatentable under 35 U.S.C. § 103(a) over Bland and Parker. Pet. 27–39.

1. Claim 1

Petitioners provide explanations to account for all of the claim limitations required by claim 1, and reasons one of ordinary skill in the art would have combined teachings of Bland and Parker with a reasonable

expectation of success, citing Dr. Swanger's Declaration in support. Pet. 27–38; Ex. 1002.

a. Teachings of Bland and Parker

Petitioners assert that Bland teaches all limitations of claim 1 except for element 1.1d, i.e., a “plurality of relief valves, each relief valve configured to release air from a corresponding tire when tire air pressure rises above a second adjustable preset value.” Pet. 27. As to the preamble of claim 1, Petitioners rely on “Bland’s disclosure of ‘an improved tire inflation system for maintaining a plurality of tires on a vehicle at predetermined uniform pressures.’” Pet. 27 (quoting Ex. 1003, col. 1, ll. 42–44). Petitioners contend that Bland’s adapter 14 is a “rotary air chamber” as claimed because it is secured to the hub cap 74, rotates with the wheel, and includes an air chamber that accepts compressed air from the regulator and distributes it to the tires via additional air lines. *Id.* (citing Ex. 1003, col. 4, ll. 27–34, col. 4, ll. 51–60, col. 5, ll. 6–12, col. 5, ll. 33–65, Figs. 6–7; Ex. 1002 ¶ 43). Petitioners contend Bland’s adapter 14 includes the claimed check valves (element 1.1b), and that the check valves have a preset adjustable value from the regulator, as recited in claim element 1.1c. *Id.* at 28 (citing Ex. 1003, col. 3, ll. 35–43, col. 5, ll. 39–65, col. 6, ll. 31–32, Figs. 6–9; Ex. 1002 ¶¶ 46, 48). Petitioners argue Bland includes an air shaft (claim element 1.2) in the form of sleeve 81 and air lines (claim element 1.3) that pass through the axles and connect to the air shaft. *Id.* (citing Ex. 1003, col. 4, ll. 16–50, ll. 67–68, col. 5, ll. 55–65, Figs. 2–3). Petitioners also contend that one of ordinary skill in the art would have recognized the use of

ball bearings at Bland's seal 76, 85 between the air shaft and the hub cap to form a rotatable seal. *Id.* at 29–30 (citing Ex. 1003, col. 4, ll. 32–43, Fig. 6; Ex. 1002 ¶¶ 53–54; Ex. 1006 (Parker), col. 2, ll. 8–24, Fig. 2).

Having reviewed Bland's teachings, we determine Petitioners have shown by a preponderance of evidence that Bland teaches or suggests all elements except the relief valves recited in claim 1.

Petitioners' assertion that Parker teaches relief valves also has support in the evidence. Pet. 31. In particular, Parker teaches the use of relief valves that "may be of any well known construction." Ex. 1006 at 2, col. a, l. 48. "The relief valves . . . are adapted to relieve the tires of air in case of over-inflation, and may be adjusted so as to function as relief valves in accordance with a predetermined air pressure existing in the tires." *Id.* at 2, col. a, ll. 52–56. Petitioners have shown by a preponderance of evidence that Parker teaches or suggests relief valves for relieving tires of air in case of over-inflation.

b. Reasons for Combining Bland and Parker

Petitioners contend one of ordinary skill in the art would have wanted to use a relief valve such as that taught in Parker with Bland's inflation system in order to take advantage of well-known benefits of properly inflated tires, including improvements in economy and safety, mileage, tire wear, traction, and riding comfort. Pet. 31 (citing Section IV.A of Petition; Ex. 1002 ¶¶ 15, 56–59). Petitioners cite background art, including

Webster,¹¹ to establish that one of ordinary skill in the art would have understood that tires may become over- or under-inflated while in use:

[V]ery wide pressure fluctuations can occur in the tires, depending upon the speed of the vehicle, atmospheric temperature, and so forth so that the air pressure may increase or decrease to undesirable levels which causes excessive wear on the tire or even danger of blow out.

Ex. 1009, col. 1, ll. 28–33 (cited at Pet. 5). Petitioners contend that Parker “reveals that the conventional manner to achieve tire deflation and prevent over-inflation was to use a relief valve to release air.” Pet. 31. Petitioners contend the use of Parker’s relief valve in Bland is, therefore, a highly predictable application of well-known technologies with well-known benefits. *Id.* at 30. Petitioners argue one of skill in the art would have had a high expectation of success in combining the tire inflation system of Bland with the relief valve structure of Parker because relief valve structures were well known and standard components were readily available. Pet. 32–33. Petitioners contend Parker’s relief valves could be directly inserted into Bland’s tire inflation system by unscrewing the service valves 88 and 90 from the rotary air chamber and screwing in relief valves. Pet. 32–33 (citing Ex. 1002 ¶ 58).

Patent Owner argues that “even if one were to modify Bland to add the relief valve of Parker, such system would only have one preset-target value, not the two values required by the 465 patent.” PO Resp. 43. It is, however, evident from the Petition and supporting Swanger Declaration that

¹¹ US 2,693,841, issued Nov. 9, 1954. Ex. 1009.

Petitioners contend one of ordinary skill in the art would have used the relief valve to set a maximum pressure in Bland's system above the minimum set by Bland's regulator. The Petition's reliance on Parker's teaching to "relieve the tires of air in case of over-inflation" indicates the purpose is to set a maximum, not merely to provide the ability to lower tire pressure when travelling, for example, over certain terrain. *See* Pet. 31. Moreover, Dr. Swanger's Declaration expressly states that the combination of teachings from Bland and Parker results in:

- (7) adjustable relief valves in the rotary air chamber to allow excess pressure that may build up in a tire to be relieved; and
- (8) the preset value of the relief valves will be adjusted to be above the setting of the pressure regulator to provide an acceptable range of pressure within the tires.

Ex. 1002 ¶ 55. Use of Parker's relief valve in this way is also consistent with the apparent reasons discussed above for using the pressure relief valve in Bland, including to avoid over-inflation caused by something other than the regulator, such as a change in temperature. We also agree with Petitioners that "[Patent Owner's] experts further confirmed that a POSITA would have recognized the benefit of setting different setpoints for inflation and deflation to avoid problems, such as continuous cycling." Pet. Reply 6 (citing Ex. 1096, 135:18–139:14; Ex. 1098, 97:9–98:24, 103:9–104:23).

Patent Owner argues one of ordinary skill in the art would not have had reason to modify an inflation-only system with a relief valve. PO Resp. 26–42. Patent Owner presents these arguments under nine headings it asserts are applicable to all of the challenged grounds presented by the Petition. *Id.* Patent Owner then presents additional reasons specific to each

of the challenged grounds of unpatentability. *Id.* at 42–46. We address in turn each argument applicable to the combination of Bland and Parker.

(1) Hendrickson’s Conduct

First, Patent Owner argues Petitioner Hendrickson’s own conduct belies Petitioners’ contention that one of ordinary skill in the art would have been motivated to combine the references. PO Resp. 26–27. Patent Owner questions why Hendrickson did not teach deflation capability in a patent application it filed in 2004 or add deflation capability to its tire inflation system first sold in 2008 if it was obvious to do so. *Id.*

Petitioners argue Hendrickson’s independent development supports obviousness. Pet. Reply 15–17.

Hendrickson’s conduct does not control whether the claimed invention would have been obvious to the hypothetical person of ordinary skill in the art. *See KSR*, 550 U.S. at 406 (stating the obviousness analysis set forth in *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1 (1966), “is objective”); *Norgren Inc. v. Int’l Trade Comm’n*, 699 F.3d 1317, 1327 (Fed. Cir. 2012) (“The correct analysis is whether it would have been obvious to the hypothetical person of ordinary skill in the art, not whether it was obvious to Wolfe personally.”).

(2) White and Stech File Histories

Second, Patent Owner argues the file histories of White and Stech undercut Petitioners’ alleged motivation to combine the relief valves of the

secondary references (i.e., Parker, Loewe, or Schultz) with the primary inflation-only references (i.e., Bland, Stech, or White). PO Resp. 27–30.¹²

The White patent belongs to Petitioner Hendrickson, and during prosecution the applicants argued that an inflate/deflate system taught in a prior art reference to Le Chatelier was not material to the inflation-only system recited in the claims in Hendrickson’s application. Ex. 2053, 93–94; *see* PO Resp. 27–28. Patent Owner contends “Petitioners should be estopped to take a contrary position when trying to invalidate the 465 Patent,” and cites a Board decision in a reexamination appeal that discusses the Federal Circuit’s application of judicial estoppel in *Minnesota Mining & Manufacturing Co. v. Chemque, Inc.*, 303 F.3d 1294 (Fed. Cir. 2002). PO Resp. 29.

Stech is not alleged to be assigned to any of the Petitioners, but Patent Owner contends the applicant in Stech argued against examiner rejections based on a combination of inflation-only systems and military systems that could inflate or deflate the tires for different terrain. PO Resp. 29. Stech’s claims were rejected based on Bland and Webster, and based on Bland and Schultz. Ex. 2055, 46, 65; *see* PO Resp. 29. The applicant argued Schultz related to varying pressure for on-road or off-road conditions, and that

¹² Petitioners contend Patent Owner’s argument goes beyond the agreed scope of Patent Owner’s Response, which was revised after the Board instituted on the two additional grounds not included in the Institution Decision. Pet. Reply 17 n.5. Because Patent Owner’s argument is not specific to the ground based on Bland and Parker, and in the interest of fairness, we consider the argument’s effect on all grounds.

“[b]ecause of the different operation and desired results between Applicant’s system, Bland and Schultz, it is respectfully submitted that there is no teaching nor could Bland be modified to include the valve of Schultz.” Ex. 2055, 75. Patent Owner argues “the logic and analysis of the applicants in White and Stech are equally applicable here and negate Petitioners’ hindsight effort to manufacture a case of obviousness.” PO Resp. 30.

Petitioners argue “White’s file history statements are inapposite because they concerned a markedly different claimed invention and combination of prior art,” and that the examiner rejected White’s argument, finding it “not persuasive.” Pet. Reply 17 (citing Ex. 2053, 46, 61–62, 93–94). As to Stech, Petitioners argue the Petition proposes to add a relief valve at the location of Stech’s service valves 88 and 89, and the discussion during prosecution related to other elements. *Id.* at 19. “These statements from unrelated file histories about different claims cannot support [Patent Owner],” Petitioners contend. *Id.*

Patent Owner’s arguments about White and Stech show that arguments similar to those being made by Patent Owner here have been made, but are not evidence that one of ordinary skill in the art would not have wanted to use a relief valve as taught in Parker to avoid over-inflation in Bland’s system. There are also several reasons why Patent Owner’s arguments about judicial estoppel fail to undermine Petitioners’ reasoning as to why one of ordinary skill in the art would have combined Bland and Parker in the manner claimed. First, Patent Owner’s estoppel argument at most would affect Petitioner Hendrickson, and, as noted by Petitioners, Pet.

Reply 18–19, Patent Owner has not provided a theory under which the remaining Petitioners would be estopped from arguing that a system with a relief valve (e.g., Parker) would be deemed irrelevant to an inflation-only system (e.g., Bland). In addition, Patent Owner does not cite authority indicating that judicial estoppel applies in an *inter partes* review. Even if judicial estoppel could apply, we agree with Petitioners that the examiner did not accept the relevant arguments presented during prosecution of White. *See* Pet. Reply 18.¹³

(3) Hendrickson’s Patents

Third, Patent Owner argues “Hendrickson’s own patents covering inflation/deflation systems (e.g., TMP) confirm that Hendrickson believed in

¹³ Hendrickson presented its arguments in response to the rejection of claims 1 and 22 of the White application as anticipated by Le Chatelier. *See* Ex. 2053, 92–94. The Examiner rejected the arguments in the next office action and maintained the anticipation rejection. *Id.* at 57–58 (maintaining rejection despite claim amendments), 61–62 (explaining that Le Chatelier meets the limitations of the claims even if it has the additional feature of allowing deflation). The applicant canceled claim 22 and amended claim 1 to recite that “whereby over-inflation of the tire generally is prevented by said method steps.” *See id.* at 33, 47–48. The examiner allowed claim 1 based on the determination that Le Chatelier (1) did not disclose a step-up procedure of air bursts and (2) allowed over-inflation by including a pressure relief valve to release excess air pressure. *Id.* at 24. The examiner, therefore, accepted the applicant’s argument that Le Chatelier did not disclose air bursts and did not disclose use of the inflation mechanism to prevent over-inflation of the tire, as recited in claim 1, and did not indicate any acceptance of the argument that Le Chatelier was not material to the claims.

2010, after the filing of the 465 Patent, that adding deflation capability to an inflation-only system for a commercial trailer was inventive.” PO Resp. 30.¹⁴ Hendrickson’s ’633 patent,¹⁵ for example, states that “there is a need in the art for a tire inflation system that overcomes the disadvantages of the prior art by providing control of the conditions under which deflation occurs,” and does this by providing, among other things, “a constant pressure system that is capable of deflation.” Ex. 2030, col. 4, l. 60 – col. 5, l. 1. The ’704 patent¹⁶ states that one objective “is to provide a tire inflation system that is a constant-pressure tire inflation system that is capable of deflation.” Ex. 2031, col. 4, ll. 41–43.

Although we consider the statements cited by Patent Owner from Hendrickson’s patents, they are not dispositive. Hendrickson’s patents contain statements about other objectives and advantages, and the statements do not definitively establish Hendrickson’s subjective belief that adding deflation to an inflation-only system was novel or non-obviousness at the time the applications were filed. In addition, as noted above, the subjective belief expressed in Hendrickson’s patent applications does not control whether the hypothetical person of ordinary skill in the art would have had reason to combine Bland and Parker. *See KSR*, 550 U.S. at 406 (“The analysis is objective”); *Norgren*, 699 F.3d at 1327 (“The correct

¹⁴ “TMP” refers to Hendrickson’s “TIREMAAX PRO” system with inflation and deflation capabilities.

¹⁵ US 8,973,633 B2, filed July 29, 2011.

¹⁶ US 9,132,704 B2, filed July 29, 2011.

analysis is whether it would have been obvious to the hypothetical person of ordinary skill in the art, not whether it was obvious to Wolfe personally.”). We consider the objective reasoning and evidence offered by Petitioners on this question, considering that Petitioner Hendrickson apparently believed that adding deflation capability to an inflation system was noteworthy even after the filing of the ’465 patent.

(4) Webster

Fourth, Patent Owner argues “Webster does not provide sufficient reasons to modify the primary prior art references in this proceeding.” PO Resp. 32. Patent Owner contends that Webster, like other military tire inflation systems, is responsive to user input, does not automatically respond to changes in tire pressure, and teaches user input “based on perceived changes in the terrain, not environmental factors that cause pressure fluctuations.” *Id.* “To the extent that Webster encourages a POSITA to address overinflation (which should be limited to the context of multi-terrain vehicles),” argues Patent Owner, “it does so using manual control, not preset values.” *Id.* Patent Owner asserts that, for these reasons, Webster teaches away from the claims of the ’465 patent. *Id.*

Because “Webster does not criticize, discredit, or discourage automatic deflation,” and Patent Owner has not explained how it does, we agree with Petitioners that Webster does not teach away from claim 1 of the ’465 patent. Pet. Reply 11. We also disagree with Patent Owner that Webster’s teachings are limited to the context of multi-terrain vehicles. As

pointed out in the Board’s Institution Decision, Inst. Dec. 13, Webster shows that it was known that tires may become over- or under-inflated while in use:

[V]ery wide pressure fluctuations can occur in the tires, depending upon the speed of the vehicle, atmospheric temperature, and so forth so that the air pressure may increase or decrease to undesirable levels which causes excessive wear on the tire or even danger of blow out.

Ex. 1009, col. 1, ll. 28–33 (cited at Pet. 5). This statement follows a sentence referring to “intercity buses and the like,” along with military vehicles. *Id.*, col. 1, ll. 23–24; *see also id.*, col. 1, ll. 16–17 (referring to “tires of vehicles, such as automobiles, trucks, buses and the like”).

Following the statement about natural pressure fluctuations while in use, Webster also mentions the necessity of quickly reducing pressure of tires on military vehicles to accommodate terrain such as soft mud or snow and increasing the pressure when driving onto a harder surface. *Id.*, col. 1, ll. 33–38. Webster explains that “[u]nder any of these conditions, it would be very desirable to be able either to supply air to a partially deflated tire or to partially deflate the over-inflated tire, as required, without stopping the vehicle.” *Id.*, col. 1, ll. 38–42 (emphasis added). Given that Webster specifically references multi-terrain military vehicles along with other more general considerations applicable to all vehicles, one of ordinary skill in the art would not interpret Webster as applying only to multi-terrain vehicles. We find that Webster supports that one of ordinary skill in the art would have been motivated to add components to an inflate-only system that would allow a user to, without stopping the vehicle, partially deflate a tire that has become over-inflated due to environmental conditions.

(5) Impact of Operating Conditions

Fifth, Patent Owner argues that, despite Webster’s teachings, “the interplay of temperature, operating conditions, and tire pressure is far more complex and less understood than Petitioners suggest.” PO Resp. 33. “Webster oversimplifies the problem,” Patent Owner contends, “and does not demonstrate how a POSITA would have understood overinflation at the time of invention.” *Id.* Patent Owner acknowledges that “[a]t least as early as [the] 1950s, it was common knowledge that temperature fluctuations and vehicle speed impact tire pressure, thereby causing undesirable tire conditions.” *Id.* Patent Owner argues, however, that “the prior art reflected no awareness of greater factors that could exacerbate overinflation including: (1) the use of automatic inflation; and (2) the introduction of single-wide tires.” *Id.* Patent Owner discusses these factors, and concludes from this discussion that “the mere knowledge that temperature fluctuations can negatively impact tire pressure in theory is insufficient to motivate a POSITA to address overinflation in a[n inflation-only] system such as Bland, Stech, or White using a relief valve.” *Id.* at 36.

Patent Owner relies on a chart from a Hendrickson brochure to argue that the use of automatic inflation is a significant cause of over-inflation, that ambient temperature has less of an effect on tire pressure than the introduction of an inflation-only system, and that unawareness of this issue in the prior art demonstrates non-obviousness. *Id.* at 33–35. The chart, however, confirms Webster’s teaching that temperature changes can cause over-inflation.

Hendrickson's chart compares example tire pressure during one year for a trailer with (1) no automatic inflation system (shown with blue curve and triangle markers), (2) an inflate-only system (shown with red curve and box markers), and (3) Hendrickson's TIREMAAX PRO ("TMP") system (shown with green curve and "X" markers), which has inflation and deflation capabilities. Ex. 2032, 4. The trailer is in Dallas, Texas, except for a single trip to Northern US / Canada in January. *Id.* With no automatic inflation system (blue curve), the tire pressure decreases as ambient temperature decreases from August to January. *Id.* From January to August, the tire pressure remains the same or slightly decreases despite increases in average high ambient temperatures, which Patent Owner explains is due to slow leaks in the tires. *Id.*; PO Resp. 34–35. With an inflate-only system (red curve), the tire pressure remains at 100 psi from August to January (the system maintains pressure despite the decrease in average ambient temperature by topping off with air), but jumps to near 120 psi upon returning to Dallas from the trip north in January. *See* Ex. 2032, 4. It is evident that this over-inflation is caused by the air being topped off to 100 psi during "exposure to an ambient temperature of -30 degrees Fahrenheit" further north, and the subsequent expansion of air due to "extreme ambient temperature change" upon returning to Dallas with an average high above 40 degrees Fahrenheit. Ex. 2032, 4. The over-inflation persists for many months (in Dallas) and decreases only slightly. *Id.*

Patent Owner argues that nothing in the prior art discusses or predicts that the greatest degree of over-inflation would occur in the coldest month or

that over-inflation would only occur in the inflate-only system. PO Resp. 35. Petitioners respond that “Hendrickson’s test data in no way contradicts the common knowledge in the art that higher temperature increases tire pressure,” and highlight that the chart relates to “a single January round trip of an inflate-only system from Texas to Canada.” Pet. Reply 13.

Patent Owner’s observations result directly from the design of the chart in Hendrickson’s brochure, are not surprising or complex, and do not tend to show non-obviousness. The greatest degree of over-inflation naturally occurs when the trailer with properly inflated tires is subject to an extreme temperature increase over a short period in moving from a cold climate to a warmer one, which, as the text surrounding the chart explains, occurred in January. Ex. 2032, 4. This could have happened in any month. Over-inflation also only occurs in the inflate-only system because the chart begins in August, which is the warmest month, and results in a maximum pressure at that time for tires without an inflation system. If no air is added and the temperature never exceeds the initial temperature, no over-inflation will occur. On the other hand, if air is constantly added to prevent the pressure from going under 100 psi, as in the inflate-only system, then variations in pressure due to temperature changes will likely result in over-inflation. These are basic engineering principles that are entirely consistent with Webster’s teachings.

Patent Owner also argues that “[c]omparing the blue curve to the red curve, it is apparent that ambient temperature has less of an effect on tire pressure than the introduction of an inflation-only system.” PO Resp. 35.

Patent Owner overstates the conclusion. The over-inflation in February is caused by heating the air in a tire that is already fully pressurized. It is a combination of the change in temperature and the inflation of the tire by the inflate-only system. Patent Owner does not explain how one or the other may be judged to have a greater effect. Indeed, comparing the inflate-only system pressure to the pressure without an inflation system, we see that the tire also experiences a large decrease in pressure as the ambient air cools from August to January. To the extent Patent Owner means only that ambient temperature alone does not cause over-inflation in the chart but the inflation system causes over-inflation, this is a result of the chosen parameters of the chart and a natural and unsurprising result, as discussed above. Thus, although the chart shows an inflation-only system may exacerbate the problem of over-inflation in some circumstances, it does not detract from Webster's teaching that it is desirable to partially deflate a tire that has become over-inflated due to environmental conditions.

As to the introduction of "single-wide tires," Patent Owner argues "[t]he prior art . . . failed to appreciate that the size and dimension of the tire significantly affect the degree to which it is susceptible to overinflation." PO Resp. 35. To illustrate this point, Patent Owner refers to Michelin's "One X" tire, released in 2000. *Id.* (citing Ex. 2042, 1). Patent Owner states that "[t]hrough at least 2006, the sensitivity of single-wide tires to overinflation was not well understood in the commercial trucking industry," and that, ultimately, "Hendrickson's observations regarding the sensitivity of single-wide tires to overinflation in part led it to develop its own competing

TMP system” with deflation capabilities. *Id.* at 35–36 (citing Ex. 2011, 27:11–28:11). Patent Owner again concludes, with support from its declarant, Dr. T. Kim Parnell, that “the mere knowledge that temperature fluctuations can negatively impact tire pressure in theory is insufficient to motivate a POSITA to address overinflation in a[n inflation-only] system such as Bland, Stech, or White using a relief valve.” *Id.* at 36 (citing Ex. 2034 ¶ 91).

We find that although additional factors such as the introduction of single-wide tires may have increased the motivation of one of ordinary skill in the art to address over-inflation, Patent Owner’s arguments and evidence do not contradict other evidence, such as the portions of Webster discussed above, that some motivation already existed. The introduction of single-wide tires may even explain in part why deflation was not added to commercial trucking inflation systems previously, as it may have caused market demand to reach a level where deflation capability became more commercially attractive. An obvious device that would be considered a luxury does not, however, become non-obvious when market forces and other design incentives prompt its development or adaptation from other fields of endeavor. *See KSR*, 550 U.S. at 417 (“When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability.”).

(6) Transportation Industry

Sixth, Patent Owner argues that, “at the time of invention, the transportation industry’s focus was devoted to solving tire underinflation, not overinflation.” PO Resp. 36 (citing Ex. 2034 ¶ 85). The evidence relied on by Patent Owner indicates over-inflation was known to lead to excessive wear, but was not considered a significant safety hazard and was less common than under-inflated tires. *See id.* at 36–39 (citing Exs. 2018, 2026–29, 2034).

Petitioners argue the safety hazard of under-inflation would not have discouraged the transportation industry from addressing over-inflation also, and that the two issues were considered together. Pet. Reply 14. Petitioners note a 2003 report for the Federal Motor Carrier Safety Administration, *id.*, which states that “[b]oth over and under-inflation change a tire’s footprint thus affecting tire traction and leading to irregular wear,” Ex. 1092, 21. Petitioners also point to a comment to the rules implementing the Transportation Recall Enhancement, Accountability, and Documentation (TREAD) Act, which “noted that monitoring high pressure is ‘as important as monitoring low pressure.’” Pet. Reply 14 (quoting Ex. 2026, 175).

As noted, the evidence relied on by Patent Owner indicates over-inflation was known to lead to excessive wear, but was not considered a significant safety hazard. *See, e.g.*, Ex. 2027, 37 (“Over-inflated tires also lead to excessive wear, but will not be addressed for the following reasons. First, over-inflation is not known to be a significant safety issue . . .”).

Nonetheless, the evidence does not undermine, and is consistent with, Webster's recognition of over-inflation as a problem.

(7) Tire Design

Seventh, Patent Owner argues that although “[i]t was well known that variations in temperature and speed can negatively affect tire pressures,” tires are designed to address a wide range of operating conditions, including heating up during operation. PO Resp. 39–40. Dr. Parnell testifies that tires have a “cold tire pressure setting,” Ex. 2056 ¶ 12, and Patent Owner states that “tires are necessarily designed for a pressure range bracketed around this pressure setting,” PO Resp. 40. Therefore, Patent Owner concludes, “to suggest that a concern for overinflation would lead to the use of a relief valve completely overlooks the historic solution of relying on tires to handle pressure fluctuations.” *Id.* (citing Ex. 2056 ¶ 11). As an example, Patent Owner points to a prior patent described by Dr. Parnell as teaching a tire designed to handle an over-inflation condition. *Id.* (citing Ex. 2056 ¶ 12).

Petitioners argue “no evidence exists that a POSITA would focus solely on tire design to address over-inflation.” Pet. Reply 14. “Instead of considering only tire design,” contend Petitioners, “a POSITA would necessarily consider all design options in addressing existing problems.” *Id.* at 15.

Although not expressly presented as an argument that the prior art teaches away from the use of a pressure relief valve to prevent over-inflation, that is the essence of Patent Owner's argument. “The prior art's mere disclosure of more than one alternative,” however, “does not constitute

a teaching away from any of these alternatives because such disclosure does not criticize, discredit, or otherwise discourage the solution claimed” *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004). Here, the existence of tires designed to handle some pressure fluctuations or even counteract over-inflation does not criticize, discredit, or otherwise discourage pursuing other options such as deflating a tire that has become over-inflated.

As Patent Owner acknowledges, one of ordinary skill in the art would have known that a tire is designed only for a certain pressure range. PO Resp. 40. One of ordinary skill in the art, therefore, would have had reason to prevent tire pressure from exceeding that range, i.e., from becoming “over-inflated.” If one of ordinary skill in the art would have understood that over-inflation due to environmental conditions is possible, then a tire’s ability to withstand a range of pressures also does not undermine the motivation to pursue other options for preventing over-inflation. As we have noted, at least the Webster reference teaches that factors such as driving speed and atmospheric temperature can cause “very wide pressure fluctuations . . . so that the air pressure may increase or decrease to undesirable levels which causes excessive wear on the tire or even danger of blow out.” Ex. 1009, col. 1, ll. 28–33.¹⁷ Parker teaches a relatively simple

¹⁷ Patent Owner’s declarant, Dr. Parnell, was also asked whether “over-inflation caused by changes in temperature [was] a well understood problem in the art before the ’465 patent.” Ex. 1099, 325:17–19. Dr. Parnell replied:

Well, it’s certainly understood that increases in temperature cause increases in tire pressure. And yeah, depending on where

yet automatic mechanism for preventing over-inflation, namely “relief valves . . . of any well known construction,” which are “adapted to relieve the tires of air in case of over-inflation.” Ex. 1006, at 2, col. a, ll. 47–48, 53–54. We find one of skill in the art would not have ignored this solution merely because tires were designed to withstand some pressure fluctuation.

(8) Manual Pressure Relief

Eighth, Patent Owner argues one of ordinary skill in the art would not have been motivated to add a relief valve when mechanisms to guard against over-inflation already existed, including valve stems that allow operators to manually remove tire pressure by depressing a pin in the valve stem. PO Resp. 41. Patent Owner notes that “truck drivers are required to manually check for proper tire pressure,” and cites evidence that “explains how truck drivers gauge each tire’s pressure and manually adjust it up or down based on the gauge’s reading.” *Id.* (citing Exs. 2004, 2052, 2056, 1004). Patent Owner’s evidence includes the Stech prior art reference, which Patent Owner states “teaches the use of test valve stems to release air in the context of a[n inflation-only] system.” *Id.*

Petitioners respond, asserting that the evidence relied on shows one of ordinary skill in the art “would have had clear reason to improve the manual test valve stem to be an automatic relief valve.” Pet. Reply 15.

you start out with, that may be higher than your desired pressure level.

Id., 325:20–24.

As with Patent Owner’s arguments regarding tire design, the presence of other mechanisms for addressing the problem of over-inflation does not mean one of ordinary skill in the art would have had no reason to use other substitutes. That is particularly true here, where the use of pressure relief valves automates an activity that previously was to be performed manually. “[I]t is well settled that it is not ‘invention’ to broadly provide a mechanical or automatic means to replace manual activity which has accomplished the same result.” *In re Venner*, 262 F.2d 91, 95 (CCPA 1958). The motivation as described in Webster reinforces this idea in this context by expressing that “it would be very desirable to be able either to supply air to a partially deflated tire or to partially deflate the over-inflated tire, as required, *without stopping the vehicle.*” Ex. 1009, col. 1, ll. 39–42 (emphasis added).

(9) Risks of Adding a Relief Valve

Ninth, Patent Owner argues one of ordinary skill in the art would have recognized that inclusion of a relief valve would have drawbacks, and that “[t]he risk of adding a relief valve would not motivate a POSITA to make the purported change, particularly when the POSITA would have believed that overinflation was not a serious problem and that preexisting mechanisms counteracted overinflation.” PO Resp. 41–42. The drawbacks identified by Patent Owner include that “adding a deflation mechanism is more expensive and less efficient than an inflate-only system,” *id.* at 41 (citing Ex. 2053, 94; Ex. 1011, 1:61–2:41), and that “a relief valve is a potential failure point that can cripple the system if it [is] defective,” *id.* (citing Ex. 2056 ¶¶ 6, 13).

Petitioners respond, asserting that one of ordinary skill in the art “would have had clear reason to improve the manual test valve stem to be an automatic relief valve, even in light of design tradeoffs.” Pet. Reply 15. Petitioners point out that one of Patent Owner’s declarants “acknowledged a POSITA’s appreciation that all components are potential failure points, and that there are ‘always design and reliability sorts of tradeoffs.’” *Id.* at 8 (citing Ex. 1099, 332:5–334:3).

Patent Owner’s evidence does not tend to show that one of ordinary skill in the art would have considered any potential drawback to adding a relief valve to Bland’s system to outweigh the benefits obtained. Patent Owner cites Goodell,¹⁸ PO Resp. 41, which states that prior art systems for automatically regulating the pressure in vehicular tires “were not cost effective,” Ex. 1011, col. 2, ll. 14–15. Goodell explains that it would be desirable to modify existing military vehicles to include an automatic tire inflation system, but “many of the prior art approaches are specifically designed for a particular application and cannot easily be incorporated into conventionally used military vehicles.” *Id.*, col. 2, ll. 17–22. Thus, Goodell does not discourage deflation, but points to a desire to improve designs that could be retrofitted on existing vehicles. Goodell also states that “the complexity of the prior art approaches with their relatively large number of components materially increases the likelihood of malfunctions,” *id.*, col. 2, ll. 24–26, but there is no indication this statement was directed to or would

¹⁸ US 4,418,737, issued Dec. 6, 1983. Ex. 1011.

be true of adding a relief valve to an inflation-only system. Indeed, Goodell's solution still allows for automatic inflation and deflation of the tires. *Id.*, col. 2, ll. 54–60.

Patent Owner relies on paragraphs 6 and 13 of the Supplemental Declaration of Dr. Parnell to support the assertion that “a relief valve is a potential failure point that can cripple the system if it [is] defective.” PO Resp. 41. Paragraph 6 does not contain any additional explanation and is entitled to little weight. *See* Ex. 2056 ¶ 6. Paragraph 13 states as an example that “if the relief valve is defective or damaged during use, it creates an opening for air to escape the system.” *Id.* ¶ 13. There is no indication of the likelihood of failure in general, but, specific to the combination of Stech and Loewe, Dr. Parnell concludes that substituting Stech's test valves for relief valves “would lead to rapidly spinning relief valves (high velocity) that are highly susceptible to damage in the case of road debris or other hazard.” *Id.* Petitioners respond that the pressure gauge components in the '465 patent would have the same supposed risks and drawbacks, and that “locating Loewe's relief valve at Stech's test valve location (rather than farther from Loewe's hubcap axis of rotation at the wheel rim) would reduce the damage risk.” Pet. Reply 8 (citing Ex. 1099, 333:3–334:3, 337:23–338:5, 340:11–25).

Although any component may potentially be a point of failure, Petitioners have identified reasons one of skill in the art would have included a relief valve in a tire inflation system such as Bland's to relieve pressure above the upper end of the pressure range, and the evidence does

not show that potential failure of the relief valve would have been a significant design consideration in that circumstance.

(10) *Patent Owner Arguments Specific to Bland and Parker*

Patent Owner argues neither Bland nor Parker recognizes over-inflation caused by ambient conditions to be a problem. PO Resp. 42. As discussed above, however, one of ordinary skill in the art would have been aware of this problem as evidenced, for example, by Webster. As to background references “that mention ambient conditions affecting tire pressure (e.g., Webster),” Patent Owner argues these references “fail to appreciate keeping tire pressure within a predefined range of acceptable tire pressures during operation.” *Id.* at 42. Again, however, Patent Owner’s argument focuses on specific art rather than considering the knowledge of one of ordinary skill in the art, which Patent Owner admits would have included the understanding that “tires are necessarily designed for a pressure range bracketed around [the cold tire] pressure setting.” *Id.* at 40.

Patent Owner argues Parker’s relief valves are necessary because otherwise the tires would become over-inflated from the continuous air injection, and, thus, “Parker merely would motivate a POSITA to use a relief valve to control the air supply from pumping too much air into the tire.” *Id.* at 42–43. “Bland already prevents its air supply from overinflating the tires through the use of a central regulator valve,” by which Patent Owner concludes that “Parker adds no additional teachings that would lead a POSITA to modify Bland with the addition of Parker’s relief valve.” *Id.* at 43. Patent Owner also contends that “even if one were to modify Bland to

add the relief valve of Parker, such system would only have one preset-target value, not the two values required by the 465 patent.” *Id.*

Patent Owner’s contentions focus on the specific context in which Parker’s relief valve is used, and do not address the broader context in which one of ordinary skill in the art would have viewed Parker’s teachings. The recognition that tires may become overinflated not only from supplying too much pressure from a pump or air tank, but also from conditions such as vehicle speed and atmospheric temperature, *see* Ex. 1009, col. 1, ll. 28–33, would have motivated one of ordinary skill in the art to provide some escape for the excess air, even if minimum pressure is maintained via a regulator and check valve. For the reasons discussed, we are persuaded that one of ordinary skill in the art would have recognized that Parker’s relief valves “adapted to relieve the tires of air in case of over-inflation” were well-suited to address this problem. Ex. 1006 at 2, col. a, ll. 53–54. And the desire to avoid “over-inflation” is also the reason that one of ordinary skill in the art would have set the relief valve to a pressure above that of the minimum pressure of the regulator, in addition to the recognition that different setpoints avoid problems such as continuous cycling. Pet. Reply 6 (citing Ex. 1096, 135:18–139:14; Ex. 1098, 97:9–98:24, 103:9–104:23).

For the foregoing reasons, we are persuaded Petitioners have established by a preponderance of the evidence that one of ordinary skill would have had reason to combine teachings from Bland and Parker in the manner claimed in claim 1 of the ’465 patent, and would have had a reasonable expectation of success in doing so.

c. Objective Indicia of Non-Obviousness of Claim 1

Patent Owner argues “there is abundant objective evidence of non-obviousness” that is necessary to consider to avoid hindsight bias. PO Resp. 46–47. We consider this evidence in order to appropriately weigh it in light of the other factors before reaching our ultimate conclusion regarding obviousness. *WBIP, LLC v. Kohler Co.*, 829 F.3d 1317, 1328 (Fed. Cir. 2016) (“A determination of whether a patent claim is invalid as obvious under § 103 requires consideration of all four *Graham* factors, and it is error to reach a conclusion of obviousness until all those factors are considered.”).

*(1) Patent Owner’s Contentions Not Tied to
Recognized Objective Factors*

Patent Owner contends “[t]here can be no more cogent, objective evidence” than certain decisions and arguments made by Petitioner Hendrickson. PO Resp. 47. The activities identified by Patent Owner include:

Hendrickson’s decision to develop its own *TIS: Inflation-Only* systems that intentionally avoid the claimed relief valves prior to the invention of the 465 Patent while presumably having knowledge of relief valves and inflate/deflate capabilities; Hendrickson’s arguments that the inflation/deflation system of the *TIS: Military* system in Le Chatelier was immaterial to the *TIS: Inflation-Only* system of White; and Hendrickson’s arguments to the Patent Office, after the 465 Patent, regarding the purported novelty of the 633/704 patents based in large part on the addition of deflation capability.

Id. These activities formed the basis for several arguments of Patent Owner challenging Petitioners’ evidence of a motivation to combine prior art references, as discussed above. Patent Owner does not explain how these

activities also constitute objective evidence or secondary considerations in support of non-obviousness, and does not cite authority looking to similar activities as objective indicia of non-obviousness. Even if these activities could be considered as part of some unidentified objective factor in support of non-obviousness, Patent Owner also has not shown the requisite nexus to the specific subject matter of any particular claim, as the activities relate only generally to deflation capability of a tire inflation system. Therefore, we do not consider the identified activities beyond our discussion of them previously in connection with Patent Owner's arguments challenging the motivation to combine teachings from the prior art.

(2) Commercial Success

Patent Owner argues commercial success based on sales of Petitioner Hendrickson's TMP inflation system. PO Resp. 48–56.

(a) Nexus

Patent Owner contends that Hendrickson's TMP installed on a trailer embodies at least *claim 12* of the '465 patent and, therefore, "a nexus should be presumed." PO Resp. 51–52 (citing *Demaco Corp. v. F. Von Langsdorff Licensing Ltd.*, 851 F.2d 1387, 1392 (Fed. Cir. 1988)). Patent Owner provides analysis of TMP with respect to the limitations of *claim 12*, with citations to the TMP manual (Ex. 2002) and the Declaration of Dr. Parnell (Ex. 2034). *See* PO Resp. 49–51.

Patent Owner does not map the limitations of *claim 1* to the TMP system. Although not addressed directly in its briefs with respect to claim 1, Patent Owner's declarant, Dr. Parnell, appears to agree with Petitioners that

TMP's relief valves are not included in the rotary air chamber, as recited in claim 1. *Compare* Ex. 2034 ¶ 109 (“I note that claim 1, unlike claim 12, requires a specific location for the relief valve. . . . As noted above, TMP has a relief valve located at a central controller, which is away from the TMP's rotary air chamber.”), *with* Pet. Reply 25 (“TMP, moreover, has a unique system-wide controller design that does not use check and relief valves inside a rotary air chamber, as in the '465 patent. (Ex. 2002, 9-10, 24-25, 48-52.)”).

Patent Owner takes the position that, if TMP embodies claim 12 of the '465 patent, a nexus may be presumed to the other claims of the patent also. *Id.* at 48 (“Secondary evidence of nonobviousness is also applicable to the other claims of the 465 Patent.”). For support, Patent Owner cites *Rambus Inc. v. Rea*, 731 F.3d 1248, 1256–57 (Fed. Cir. 2013), which states that “[o]bjective evidence of nonobviousness need only be ‘reasonably commensurate with the scope of the claims,’ and we do not require a patentee to produce objective evidence of nonobviousness for every potential embodiment of the claim” (quoting *In re Kao*, 639 F.3d 1057, 1068 (Fed. Cir. 2011)). Patent Owner's quote from *Rambus* does not support the contention that Patent Owner need not show TMP falls within the scope of claim 1 of the '465 patent in order for evidence of commercial success of TMP to be (1) entitled to a presumption of nexus to claim 1, or (2) reasonably commensurate with the scope of claim 1.

As to nexus, “there is a presumption of nexus for objective considerations when the patentee shows that the asserted objective evidence

is tied to a specific product and that product *is the invention* disclosed and *claimed in the patent.*” *WBIP*, 829 F.3d at 1329 (internal quotation omitted) (emphasis added); *see Polaris Indus., Inc. v. Arctic Cat, Inc.*, 882 F.3d 1056, 1071–72 (Fed. Cir. 2018) (applying presumption of nexus in *inter partes* review). We agree with Petitioners that the presumption of nexus, like the obviousness analysis as a whole, must be evaluated on a claim-by-claim basis. *See* Pet. Reply 22 n.6 (citing *DyStar Textilfarben GmbH v. C.H. Patrick Co.*, 464 F.3d 1356, 1372 (Fed. Cir. 2006)). Absent evidence and argument from Patent Owner as to how Hendrickson’s TMP product falls within the scope of claim 1 of the ’465 patent, Patent Owner is not entitled to a presumption of nexus to claim 1.

The Federal Circuit’s “reasonably commensurate” test does not mean the alleged commercially successful product need not at least fall within the scope of the claim at issue. In *Kao*, which is cited by *Rambus*, the Federal Circuit explains that “[e]vidence of secondary considerations must be reasonably commensurate with the scope of the claims.” *Kao*, 639 F.3d at 1068.¹⁹ *Kao* explains further:

This does not mean that an applicant is required to test every embodiment within the scope of his or her claims. If an applicant demonstrates that an embodiment has an unexpected result and provides an adequate basis to support the conclusion that *other embodiments falling within the claim* will behave in the same manner, this will generally establish that the evidence is

¹⁹ We note that this discussion is separate from the court’s discussion of nexus, which *Kao* describes as “a more fundamental requirement that must be met before secondary considerations can carry the day.” *Id.*

commensurate with scope of the claims.
Id. (emphasis added). Thus, the “reasonably commensurate” requirement allows for objective evidence relating to a particular product falling within the scope of a broader claim to nonetheless be considered as objective evidence of non-obviousness of the claim as a whole, under some circumstances. This was the case in *Rambus*, where the court found error in the Board’s determination that evidence relating to high-speed memory systems was not commensurate with claims that did not recite a specific clock speed. *Rambus*, 731 F.3d at 1257. *Rambus*, however, still recognized that the evidence must relate to a product that falls within the scope of the claim at issue. *See id.* (“[W]e do not require a patentee to produce objective evidence of nonobviousness for every potential *embodiment of the claim.*” (emphasis added)). Patent Owner does not allege that TMP is an embodiment of claim 1.

For the foregoing reasons, a presumption of nexus, i.e., a presumption that any commercial success of the TMP product results from the invention claimed in claim 1, is not warranted here.

Patent Owner also argues “[t]he nexus in this case involves the releasing means of claim 12 in the context of the claims and its connection with Hendrickson’s efforts to commercialize a product that puts the automatic deflation feature at center stage of its trailer [tire inflation system].” PO Resp. 52. In support, Patent Owner discusses evidence that “Hendrickson’s marketing focuses on the deflation aspect of TMP as the feature that allegedly sets it apart from conventional systems,” and that this

feature distinguishes TMP from Hendrickson's Tiremaax CP system. *Id.* at 52–53.

Petitioners argue that “[a]ny purported nexus between TMP and claim 12 vanishes . . . because other factors contributed to TMP sales.” Petitioners cite TMP’s “distinct, patented advantage, for example, of equalizing and balancing pressure across all trailer wheels to help reduce friction and maximize tire life.” Pet. Reply 25 (citing Ex. 2031, Title, col. 30, ll. 54–55, col. 32, ll. 54–56; Ex. 2032, 3). Petitioners also contend TMP has (1) a unique system-wide controller design that does not use check and relief valves inside a rotary air chamber, and (2) a hubcap with integrated air passages and connections. *Id.* at 25–26. Petitioners also argue Hendrickson’s overall industry position had an effect on TMP sales, as evidenced by (1) a third-party comment²⁰ that Hendrickson is “a leading global manufacturer of suspensions and axles,” Ex. 2014, 5, and (2) Hendrickson’s vertical integration, which “allows it to manufacture and sell suspensions with numerous additional features, of which TMP is only one, allowing customers to purchase suspensions, tire-inflation systems, and other features in one integrated suspension package.” Pet. Reply 26 (citation omitted).

²⁰ The comment was made in a Frost & Sullivan document explaining why Hendrickson was awarded the Frost & Sullivan 2012 Technology Innovation Award in Trailer Automatic Tire Inflation Systems. The Frost & Sullivan award is discussed further below in evaluating Patent Owner’s evidence of industry praise.

Patent Owner is correct that Hendrickson touted TMP's deflation capability, including in its product FAQ (Ex. 2037) and statements made to the public (Ex. 2046). This evidence tends to show that Hendrickson hoped customers would buy TMP at least in part for its deflation capability, but is not as strong as evidence that customers actually bought TMP for this reason.

TMP's deflation capability and Hendrickson's advertisement of it also do not show that TMP falls within the scope of claim 1. Even if TMP were within the scope of claim 1, however, we agree with Petitioners that additional considerations likely accounted for some success of TMP, thus discounting the effect attributable to deflation capability. Patent Owner contends that "listing unclaimed features does not rebut the nexus," PO Sur Reply 4, but the evidence shows more than this. As Petitioners note, "the marketing materials on which [Patent Owner] relies tout the TMP's equalizing/balancing feature." Pet. Resp. to Sur Reply 4. One brochure, which describes TMP as "revolutionary" and "unique to the trailer industry," lists what Hendrickson appears to consider the three main functions of TMP: controlling pressure by inflating low tires, equalizing pressure across all wheel positions, and relieving pressure from over-inflated tires. Ex. 2032, 2. Thus, to the extent Hendrickson's own marketing may be relied on to show a connection between sales of TMP and deflation capability, there is also a connection to TMP's ability to equalize pressure of all wheels. *See also* Ex. 2045, 1–2 (describing both deflation and equalization capability in a press release); Ex. 1098, 255:10–13 (Deposition of Dr. Parnell) (answering that he

is not familiar with any commercially available inflate-only systems that allow pressure to balance between the tires and flow between the tires). We also find the evidence tends to show Hendrickson likely sold some TMP systems on the basis of its reputation as “a leading global manufacturer of suspensions and axles” and the ability to add TMP as an option to these other products. *See* Ex. 2014, 5.

For the foregoing reasons, without showing that TMP is within the scope of claim 1, Patent Owner has not shown a nexus between the evidence of commercial success of Hendrickson’s TMP product and claim 1 of the ’465 patent. Even if TMP were within the scope of claim 1, other considerations that likely account for some sales of TMP weaken the connection to deflation capability of the system. For completeness, we also review Patent Owner’s evidence of commercial success to determine the weight we would give it were it determined there is a nexus to the subject matter of claim 1.

(b) Evidence of Commercial Success

Patent Owner contends that Hendrickson admits TMP was and is commercially successful. PO Resp. 53. Patent Owner cites testimony of Matt Wilson, deposed in litigation as a corporate representative of Hendrickson, who agreed that TMP was considered a “commercial success,” and was more commercially successful than “Tiremaax CP,” Hendrickson’s earlier-released product that did not have deflation capability. *Id.* at 53–54 (citing Ex. 2011, 146:12–147:20).

Patent Owner also cites sales data showing the number of TMP units sold compared to Tiremaax CP from January 2011 to April 2013, and argues the data “shows the conversion of Tiremaax CP to TMP over time.” PO Resp. 54–55. “This is particularly important,” argues Patent Owner, “because it demonstrates that TMP customers had an option for Tiremaax CP but opted for the system with deflation capability in spite of the greater cost.” *Id.* at 55. Patent Owner presents evidence of profit margins on the two products and calculates approximate revenue and profit from sales of TMP from 2011 to 2013. *Id.* at 56. Patent Owner also cites testimony confirming that unit sales in 2015 were considerably higher. *Id.* (citing Ex. 2011, 145:25–146:11).

Petitioners do not dispute the accuracy of the evidence and calculations cited by Patent Owner, but argue the evidence does not show commercial success of the TMP system. Pet. Reply 24–27; Pet. Resp. to Sur Reply 4–5. Petitioners argue that “absent market share data, [Patent Owner’s] analysis of TMP’s gross sales data is simply not meaningful evidence of commercial success.” Pet. Reply 24 (internal quotation omitted). In support, Petitioners cite a Board decision and two Federal Circuit decisions, *In re Huang*, 100 F.3d 135, 140 (Fed. Cir. 1996) (“[E]vidence related solely to the number of units sold provides a very weak showing of commercial success, if any.”), and *In re Applied Materials, Inc.*, 692 F.3d 1289, 1300 (Fed. Cir. 2012) (“[T]he number of units sold without evidence of the market share is only weak evidence of commercial success . . .”). Patent Owner responds that TMP sales show “substantial

growth in sales within a new market” because “TMP achieved a virtual monopoly” in the market for inflate/deflate tire inflation systems. PO Sur Reply 4–5.

To provide context for the sales data relied on by Patent Owner, Petitioners argue “[Patent Owner] claims a 2011-13 TMP sales increase of over 1000 units, but Hendrickson’s non-accused 2008-2011 TIREMAAX® CP sales increased similarly while directly competing with the T-RAC,” which was Patent Owner’s commercial product. Pet. Resp. to Sur Reply 5 (citing Ex. 2016, 2). Petitioners also argue “there is no evidence TMP achieved a ‘virtual monopoly,’ because the relevant market includes inflate-only systems sold by others.” Pet. Resp. to Sur Reply 5 (citing Ex. 1098, 253:24–254:2; Ex. 1092, 92–95). Petitioners contend Patent Owner “also failed to consider other competitors’ products (Ex. 1098, 235:5–12, Ex. 2035, 2) and did not evaluate revenues, costs, or profits of TMP, CP, or T-RAC (Ex. 1098, 235:24–237:18).” Pet. Resp. to Sur Reply 5.

We agree with Petitioners that TMP unit sales data provides a weak showing of commercial success. Although Patent Owner contends TMP achieved a “virtual monopoly” in a “new market,” the evidence is not sufficient to show that a tire inflation system with deflation capability is sold in a definable market separate from, for example, the market including inflate-only systems. Patent Owner’s own presentation of the sales data indicates that TMP and Hendrickson’s inflate-only system compete with each other to some degree. *See* PO Resp. 54–55.

We disagree, however, with Petitioners' contention that Patent Owner did not evaluate revenues, costs, or profits of TMP. Patent Owner calculated revenue and profit for a portion of the TMP sales. PO Resp. 56. Although these figures also lack context in terms of the broader market of competing tire inflation systems, the profit figure in particular indicates some commercial success of TMP.

Petitioners argue the T-RAC system, which Patent Owner alleges is its commercial embodiment of the '465 patent,²¹ was a commercial failure and “destroys any possible nexus for commercial success and non-obviousness.” Pet. Reply 20; *see* Pet. Resp. to Sur Reply 5. Petitioners contend “T-RAC sales began declining just two years after its introduction and fully two years before the 2008 recession.” Pet. Reply 20 (citing Ex. 2009 ¶ 17; Ex. 1095, 173:16–174:8). Petitioners also argue Patent Owner “cannot credibly blame this failure on the economy (*see* Resp. 57–58), because, in contrast, Hendrickson's TIREMAAX® CP sales, with inflate-only capability, continued to increase during the recession years of 2008–11.” *Id.* at 21 (citing Ex. 2016, 2).

Petitioners' evidence of the lack of success of Patent Owner's T-RAC system supports Petitioners' contention that success of Hendrickson's TMP system is due to factors other than embodying one or more claims of the '465 patent. Overall, the evidence does not weigh strongly in favor of commercial success related to the claimed features of the '465 patent.

²¹ PO Resp. 57.

(3) Industry Praise

“Evidence that the industry praised a claimed invention or a product which embodies the patent claims weighs against an assertion that the same claim would have been obvious.” *WBIP*, 829 F.3d at 1334. Patent Owner argues the industry praised its commercial tire inflation system, T-RAC, as well as Hendrickson’s TMP. PO Resp. 57–60. We review the evidence and the nexus to claim 1 for each product.

(a) Industry Praise of T-RAC

Patent Owner contends T-RAC is “the inventors’ commercial embodiment of the 465 Patent.” *Id.* at 57 (citing Ex. 2009). Patent Owner supports this assertion with the Declaration of John Charles Becker, who is listed as a co-inventor on the ’465 patent. Ex. 2009. Mr. Becker testifies that T-RAC as installed in a trailer system “falls within and is one embodiment of at least claims 1 and 12 of the 465 Patent.” *Id.* ¶ 9.

Petitioners do not dispute that T-RAC falls within the scope of claims 1 and 12 of the ’465 patent. *See* Pet. Reply 27–28. Although Patent Owner concedes that T-RAC is a tire inflation system that must be installed on a trailer in order to include all limitations of claim 1, the claim is directed to the tire inflation system rather than the trailer as a whole. Accordingly, we presume a nexus between industry praise of T-RAC and the subject matter of claim 1. *See Polaris*, 882 F.3d at 1073 (“Because the evidence submitted by Polaris demonstrates these vehicles are ‘the invention disclosed and claimed in the patent,’ we presume that any commercial success of these

products is due to the patented invention.” (quoting *J.T. Eaton & Co. v. Atl. Paste & Glue Co.*, 106 F.3d 1563, 1571 (Fed. Cir. 1997))).

Patent Owner submits three declarations of customers who purchased T-RAC, and describes them accurately as follows:

For instance, Darrin Short, a customer of T-RAC explained in a letter dated 2013 (prior to the underlying lawsuit) that he has seen “amazing results on tire life” and that the tire cost savings “easily pay for itself in a few weeks.” (Ex. 2009, ¶15, Exhibit E; Declaration of Darrin Short (Ex. 2041)). Jim Smith, President of Georgia Southern Transportation, used T-RAC on 25 trailers, touted savings of \$15,000 based on tire tread life, and said “I think anyone who uses [T-RAC] will require it on their future purchases.” (Ex. 2009, ¶14, Exhibit F). Larry Skinner of Vesco Specialized Carriers stated, “We put the most extreme tests on these TRACs. If they’ll work for us, they’ll work for anybody.” (*Id.*, ¶14, Exhibit G; Declaration of Larry Skinner (Ex. 2040)).

PO Resp. 57. Patent Owner also cites two articles published by TruckingInfo, which state that T-RAC’s ability to vent excess pressure is a unique feature. *Id.* at 57–58 (citing Ex. 2033, 4; Ex. 2001, 3).

Petitioners argue (1) Patent Owner is relying on self-serving statements that are not reliable, (2) it is widespread industry praise and recognition that constitutes meaningful evidence of non-obviousness, not isolated examples of praise, (3) praise lacks a nexus when evidence of praise only addresses the products at a high level, (4) Patent Owner’s customers acknowledged that their T-RAC testimonials did not reflect the views of the industry, and (5) the testimonials are questionable. Pet. Reply 27–28. We address each of these arguments in turn, followed by our findings as to the

strength of the evidence presented by Patent Owner in view of the arguments made by Petitioners.

First, we do not agree with Petitioners that Patent Owner is relying on its own self-serving statements. Petitioners argue Patent Owner relies on “the declaration of its own alleged inventor, Mr. Becker,” its own product literature, and the two articles, which quote Mr. Becker. *Id.* at 27. Although Patent Owner cites Exhibit 2009, which is Mr. Becker’s declaration, each of the customer testimonials is attached as an exhibit to Mr. Becker’s declaration. *See* PO Resp. 57 (citing Ex. 2009 ¶ 14, which refers to Exhibits E, F, and G to Mr. Becker’s declaration). Two of these exhibits appear to be Patent Owner’s product literature, but there is no indication the quotes attributed to customers are inaccurate. *See* Ex. 2009, 41, 43. It is unclear the extent to which the testimonials were solicited by Patent Owner. As to the TruckingInfo articles, although one quotes Mr. Becker, the statement in the article highlighted by Patent Owner as praise is not attributed to Mr. Becker. *See* PO Resp. 57–58; Ex. 2033, 4.

Second, we do not reject Patent Owner’s evidence of praise for not being sufficiently widespread. Rather, the extent to which the industry, and particularly those of ordinary skill in the art or any peers or competitors of Patent Owner, praised T-RAC, affects the weight we give the praise. Here, the praise of three customers is of limited value, but the articles describing the features of T-RAC and other inflation systems appear to be more of an objective assessment of how those in industry may evaluate the competing systems. *See* Exs. 2001, 2033.

Third, because we have presumed a nexus based on Patent Owner's assertion that T-RAC embodies claims 1 and 12 of the '465 patent, and Petitioners have not argued T-RAC does not embody the claims, Petitioners' contention that a nexus is lacking merely because the praise relates to the products at a high level is insufficient to rebut the presumed nexus.

Fourth, we find it unremarkable that two of Patent Owner's customers admitted in deposition that their testimonials were not intended to reflect the sentiments of the trucking industry as a whole. *See* Ex. 1101, 92:19–93:8; Ex. 1100, 122:1–123:15. The customers did not make any assertions to the contrary, and their statements speak for themselves. Again, the extent to which the industry, and particularly any competitors of Patent Owner, praised T-RAC, affects the weight we give the praise. We agree with Petitioners that the praise of the three customers is not the type of praise that would receive substantial weight as industry praise. Thus, we consider Patent Owner's evidence of customer praise, but give it little weight.

Fifth, Petitioners have shown that two of the testimonials may be questioned to some degree. Mr. Skinner testified that he was given shares in Patent Owner for allowing his statements to be used in Patent Owner's product literature. Ex. 1101, 63:2–64:22; *see* Pet. Reply 28. This fact casts some doubt on the degree to which Mr. Skinner's praise of T-RAC may have been influenced by the possibility of compensation. Petitioners also elicited testimony from Mr. Short indicating that his boss did not want to buy any additional T-RAC systems because "his numbers didn't show an

improvement or savings.” Ex. 1100, 115:10–22. This disagreement within the same company undermines Mr. Short’s praise.

For the reasons discussed above, we find the three customers’ praise of T-RAC to be entitled to little weight as industry praise. The two TruckingInfo articles describing T-RAC appear to come from a stronger source as objective evidence, but the praise in these articles is limited, describing T-RAC’s deflation feature as “unique,” Ex. 2033, 4, and as “the only system that relieved excess pressure” until the release of Hendrickson’s TMP system, Ex. 2001, 3. Thus, Patent Owner’s evidence of industry praise of T-RAC is weak.

(b) Industry Praise of TMP

Patent Owner argues “the claimed deflation capability in the context of the TMP, has received substantial industry praise,” including in Petitioner Hendrickson’s marketing materials, by Petitioner Great Dane, and in Hendrickson’s receipt of the 2012 Frost & Sullivan Technology Innovation Award. PO Resp. 58–60. Petitioners do not specifically address these arguments, but relatedly argue Patent Owner has not shown TMP embodies claims 1 or 12 of the ’465 patent and that sales of TMP resulted from features not claimed in the ’465 patent. Pet. Reply 22–27.

As with the alleged commercial success of TMP, Patent Owner has not shown that any industry praise of TMP results from, or may be presumed to result from, the invention claimed in claim 1 of the ’465 patent because Patent Owner has not shown that TMP falls within, or is the invention claimed in, claim 1.

If TMP were within the scope of claim 1, Hendrickson's statements in marketing materials touting the TMP's deflation capability would weigh in favor of non-obviousness. "Industry participants, especially competitors, are not likely to praise an obvious advance over the known art." *WBIP*, 829 F.3d at 1334.

As noted above in our discussion of TMP's commercial success, however, Hendrickson also touted other features of the TMP that are not claimed in the '465 patent, such as the ability to balance pressures in the tires. For example, a TMP brochure prominently claims "INFLATION ALONE IS NOT ENOUGH," Ex. 2032, 1, but it is evident from the brochure that Hendrickson considered the solution to be a system that includes deflation capability as well as the ability to equalize pressure across all wheel positions, *id.* at 2. The 2010 press release and Hendrickson's advertisement in a Great Dane publication, both quoted by Patent Owner, PO Resp. 59, similarly describe both deflation and balancing as important. *See* Ex. 2046; Ex. 2047, 9. The prominence of the balancing feature, which is not discussed in the '465 patent, would weaken any nexus to claim 1, because deflation alone would not account for Hendrickson's description of its TMP system as a "solution," Ex. 2047, 9, or as "revolutionary," Ex. 2032, 2.

The award to Hendrickson from the business consulting firm Frost & Sullivan would also weigh in favor of non-obviousness of claim 1 of the '465 patent if the TMP product were within the scope of the claim. Patent Owner notes in particular Frost & Sullivan's description of TMP as

combining all the typical benefits of an automatic inflation system “with the added functional capability of automatically deflating over-inflated tires,” which “has certainly helped a relatively new product gain awareness in becoming a mainstream option in the commercial trucking industry.” Ex. 2014, 6–7. Although this statement is not particularly strong praise, the award itself and the description’s focus on the deflation capability of TMP constitute evidence of industry praise.

d. Conclusion – Claim 1 Unpatentable over Bland and Parker

As discussed above, we find Bland teaches all elements of claim 1 except for relief valves. One of ordinary skill in the art would have understood that Bland’s tires may become over-inflated due to such factors as atmospheric pressure, as evidenced, for example, by Webster. Parker suggests using relief valves in case of over-inflation. Thus, one of ordinary skill in the art would have had reason to incorporate relief valves such as those taught in Parker in order to relieve pressure that exceeds the maximum desirable pressure in the tires.

Patent Owner’s objective evidence relating to Hendrickson’s TMP product lacks adequate nexus to claim 1 because Patent Owner has not alleged in this proceeding that the product falls within the scope of claim 1. On the other hand, we have presumed a nexus to Patent Owner’s T-RAC system, but the praise of T-RAC by three customers and the weak praise in two TruckingInfo articles is entitled to little weight for the reasons given. Weighing all of the factors discussed herein, we conclude that evidence of

obviousness outweighs that of non-obviousness, and claim 1 is unpatentable under 35 U.S.C. § 103(a) in view of the teachings of Bland and Parker.

We note that our conclusion would not change even if Patent Owner had shown Hendrickson's TMP system fell within the scope of claim 1 because we do not consider the evidence of commercial success and industry praise of TMP, along with the industry praise of T-RAC, to outweigh the evidence that one of ordinary skill in the art had straightforward reasons for using Parker's relief valves in Bland in the manner recited in claim 1. As to commercial success, we credit Petitioners' evidence weakening any presumed nexus between claim 1 of the '465 patent and commercial success of TMP, and Patent Owner provides little context for evaluation of the sales of TMP or profits therefrom. There is some evidence of industry praise of TMP, though the nexus to claim 1 is weakened in some instances by Hendrickson's touting of additional features not claimed in the '465 patent. Still, Hendrickson's marketing materials and the Frost & Sullivan Award discussing deflation capability would constitute industry praise weighing in favor of non-obviousness if TMP were within the scope of claim 1, but not to a sufficient extent to outweigh what we view as strong evidence of obviousness.

2. Claim 12

Independent claim 12 recites "means for causing air to flow through an air line within an axle," "means for injecting the air into the tire when tire pressure drops below a first preset value," and "means for releasing air from the tire when tire pressure rises above a second preset value. Ex. 1001, col.

6, ll. 29–35. Petitioners identify structure in the description of the '465 patent that corresponds to these limitations. Pet. 22–26. Petitioners argue claim 12's "means for causing air to flow through an air line within an axle" (element 12.1) is taught by Bland's air tank, air line conduits through the hollow axles, and air shaft sleeve; claim 12's "means for injecting the air into the tire when tire pressure drops below a first preset value" (element 12.2) is taught by Bland's regulator, rotary air chamber adapter, and check valves; and claim 12's "means for releasing air from the tire when tire pressure rises above a second preset value" (element 12.3) is taught by Parker's relief valve incorporated into Bland's rotary air chamber for the reasons discussed above for claim 1. *Id.* at 38–39 (citing, e.g., Ex. 1003, col. 3, ll. 8–14, ll. 33–59, col. 4, ll. 16–50, col. 5, ll. 39–65, Figs. 1–3 & 6–9; Ex. 1002 ¶¶ 71, 73).

Patent Owner challenges Petitioners' proposed constructions of the "means for injecting" and "means for releasing" recited in claim 12, but notes that "[a] number of these constructions are most pertinent to the secondary indicia/nexus requirement issues regarding whether T-RAC and TMP are embodiments of one or more claims of the 465 Patent." PO Resp. 13–18.

Even under Patent Owner's proposed constructions of claim 12's means-plus-function terms, Bland and Parker disclose the same structure disclosed in the '465 patent corresponding to the claimed functions. Bland teaches all elements of claim 12 except the means for releasing air from the tire, and that Parker teaches relief valves. For the same reasons as claim 1,

we are persuaded that one of ordinary skill in the art would have had reason to use relief valves as taught in Parker in Bland's rotary air chamber to release air from the tire when tire pressure rises above a second preset value, as recited in claim 12, and would have had a reasonable expectation of success in doing so.

Patent Owner argues objective evidence of commercial success of TMP and industry praise of TMP and T-RAC weigh in favor of non-obviousness. PO Resp. 48–60; PO Sur Reply 1–5. In contrast to claim 1, Patent Owner asserts that Hendrickson's TMP system, as installed on a trailer, is the invention of claim 12 of the '465 patent, and that a nexus is thus presumed between commercial success of TMP and claim 12. PO Resp. 48–51; PO Sur Reply 1–4. Petitioners, on the other hand, argue Patent Owner's allegations are insufficient to prove that TMP embodies claim 12. Pet. Reply 22–24; Pet. Resp. to Sur Reply 1–4. For the same reasons as claim 1, however, even if TMP is within the scope of claim 12, we conclude that the evidence of obviousness outweighs that of non-obviousness, and that claim 12 is unpatentable under 35 U.S.C. § 103(a) in view of the teachings of Bland and Parker.

3. Dependent Claims 8–10 and 13–17

Claims 8–10 depend, directly or indirectly, from independent claim 1, and dependent claims 13–17 depend from independent claim 12. Petitioners contend that Bland teaches the additional limitations of dependent claims 8–10, 13, and 15–17. Pet. 37–39. Petitioners contend the system of Bland modified with relief valves teaches the limitations of dependent claim 14.

Pet. 39. Patent Owner does not dispute these contentions or offer any argument beyond that offered in support of claims 1 and 12. *See generally* PO Resp.

We find Bland teaches an air tank connected to the air line, as recited in claim 8. *See* Ex. 1003, col. 3, ll. 8–14; Ex. 1002 ¶ 62; Pet. 37. Bland teaches that the air line is connected to at least one shut-off valve between the air tank and the rotary air chamber, as recited in claim 9. *See* Ex. 1003, col. 3, ll. 15–32; Ex. 1002 ¶ 63; Pet. 37–38. Bland teaches that the air line is connected to an air pressure regulator between the air tank and the rotary air chamber, as recited in claim 10. *See* Ex. 1003, col. 3, ll. 33–43; Ex. 1002 ¶ 64; Pet. 38. Bland teaches that the causing means remains stationary when a tire fastened to the axle rotates, as recited in claim 13, because Bland’s air tank and air line conduits through the hollow axles remain stationary when the wheel rotates. *See* Ex. 1003, Fig. 6, col. 4, ll. 16–50; Ex. 1002 ¶ 75; Pet. 39.²² Bland as modified by Parker to meet the limitations of claim 12 also teaches that the injecting means is further configured for injecting air into a second tire when the second tire pressure drops below the first preset value and the releasing means is further configured for releasing air from the second tire when the second tire pressure rises above the second preset

²² Petitioners’ contentions as to claim 12 suggest Bland’s causing means also includes air shaft sleeve 81. Pet. 38–39. In light of Petitioners’ identification of structure disclosed in the ’465 patent corresponding to the claimed function, which does not include an air shaft sleeve, *see* Pet. 22, we understand Petitioners’ reference to Bland’s air shaft sleeve merely to refer to surrounding structure for context.

value, as recited in claim 14, because Bland teaches performing the functions of the tire inflation system with multiple tires, including dual tires on one end of an axle. *See* Ex. 1003, Figs. 1–2, col. 3, ll. 37–39; Ex. 1002 ¶¶ 76–77; Pet. 39. Bland teaches the injecting means rotates with the tire, as recited in claim 15, because the check valves are mounted in adapter 14, which is “adapted to rotate with the wheel and the hub cap.” Ex. 1003, col. 4, ll. 32–34; Pet. 39. Bland teaches the injecting means is a rotary air chamber, as recited in claim 16, because Bland’s check valves are on the rotary air chamber. *See* Ex. 1003, col. 4, ll. 27–50, col. 5, ll. 33–65, Figs. 8–9; Ex. 1002 ¶ 81. Bland as modified by Parker to meet the limitations of claim 12 also teaches that the releasing means is a rotary air chamber because the relief valves would be on the rotary air chamber for the reasons discussed above with respect to claim 1. *See* Ex. 1002 ¶ 82.

Having reviewed the Petition and supporting evidence, and in view of our decision on claims 1 and 12, we determine that Petitioners have shown by a preponderance of the evidence that Bland and Parker as combined to meet the limitations of claims 1 and 12 teach all limitations of dependent claims 8–10 and 13–17.

Our analysis of the reasons for combining Bland and Parker in the manner recited in claims 1 and 12, and our weighing all evidence of obviousness and non-obviousness, including Patent Owner’s evidence of objective indicia, applies to dependent claims 8–10 and 13–17. Thus, for the same reasons as claims 1 and 12, dependent claims 8–10 and 13–17 are unpatentable under 35 U.S.C. § 103(a) over Bland and Parker.

E. Asserted Obviousness over Stech and Loewe

Petitioners contend claims 1, 8–10, and 12–17 of the '465 patent are unpatentable under 35 U.S.C. § 103(a) over Stech and Loewe. Pet. 40–51. As with Bland, Petitioners contend Stech teaches a tire inflation system with all elements of claim 1 except “a plurality of relief valves, each relief valve configured to release air from a corresponding tire when tire air pressure rises above a second adjustable preset value,” as recited in claim 1. Pet. 40–43 (citing Ex. 1004, col. 1, ll. 9–25, col. 2, ll. 16–19, col. 3, ll. 1–6, col. 3, ll. 30–59, col. 4, ll. 22–39, col. 6, ll. 3–5, Fig. 4; Ex. 1002 ¶¶ 86–88, 93). Patent Owner does not dispute these contentions. *See* PO Resp. 22–23 (arguing “Stech does not teach the incorporation of any relief valve, or the incorporation of multiple preset values establishing a range of acceptable tire pressures”). Having reviewed the evidence cited by Petitioners, we find a preponderance of the evidence shows Stech teaches all elements of claim 1 except the relief valves.

Petitioners argue Loewe expressly recognizes reasons why one of ordinary skill in the art would have combined a conventional relief valve with a tire inflation system such as Stech. Pet. 43. As noted by Petitioners, Pet. 44, Loewe states that “[s]ystems for automatically inflating and deflating vehicle tires are well known,” Ex. 1007, col. 1, ll. 60–61, and “[t]hose skilled in the art will recognize that various relief valves are suitable” to prevent over-inflation, *id.*, col. 6, ll. 37–39. Loewe states that “[t]he desirability of maintaining correct inflation pressure in automobile tires and the like is well established,” Ex. 1007, col. 1, ll. 12–13, “[o]ver-

inflation causes excessive wear near the middle of a tire's tread," *id.*, col. 1, ll. 18–19, and "tire pressure varies with the temperature of the air in the tire and is consequently effected [sic] by vehicle speed, road surface, and ambient temperature," *id.*, col. 1, ll. 33–36. *See* Pet. 44. Loewe thus provides background knowledge similar to that provided by Webster, establishing by a preponderance of evidence the desire of one of ordinary skill in the art to incorporate relief valves into a tire inflation system such as Stech to avoid over-inflation. We find one of ordinary skill in the art would have had a high expectation of success in combining the tire inflation system of Stech with the relief valve structure of Loewe, for the reasons given by Petitioners. Pet. 44 (citing Ex. 1002 ¶¶ 95–99).

In addition to the arguments presented against the challenged grounds of patentability collectively, which we discuss above, Patent Owner argues that "[g]iven that Stech[']s test valve [stems] permit manual deflation, Stech already achieves a deflation mechanism that allows a driver to ensure proper tire inflation." PO Resp. 44. As discussed above, however, the presence of other mechanisms for addressing the problem of over-inflation does not mean one of ordinary skill in the art would have had no reason to use other substitutes. That is particularly true here, where the use of pressure relief valves automates an activity that previously was to be performed manually. *See* Pet. Reply 7. "[I]t is well settled that it is not 'invention' to broadly provide a mechanical or automatic means to replace manual activity which has accomplished the same result." *Venner*, 262 F.2d at 95.

Patent Owner also contends the addition of a test valve stem to an inflation-only system is an object of Stech's invention, and that replacing that component with a relief valve would change the basic principle under which Stech was designed to operate. PO Resp. 44–45. We agree with Petitioners, however, that “Stech permits using a test valve stem for checking air pressure ‘if desired,’ but not as a principle of operation.” Pet. Reply 8 (quoting Ex. 1004, col. 1, ll. 54–57); *see* Ex. 1004, col. 4, ll. 39–41.

For the same reasons discussed above for the challenged grounds of claim 1 as unpatentable over Bland and Parker, weighing all evidence of obviousness and non-obviousness, including objective indicia of non-obviousness, we conclude that claim 1 is unpatentable under § 103(a) over Stech and Loewe.

Petitioners contend the teachings of Stech and Loewe combined in the manner recited in claim 1 also teach all elements of independent claim 12 and dependent claims 8–10 and 13–17. *See* Pet. 49–51. Patent Owner does not offer any argument against the combination of Stech and Loewe beyond that offered in support of claim 1, except to argue that TMP falls within the scope of claim 12. *See generally* PO Resp. For the same reasons as claim 1, weighing all evidence of obviousness and non-obviousness, including objective indicia of non-obviousness, we conclude that claims 8–10 and 12–17 are unpatentable under § 103(a) over Stech and Loewe.

F. Asserted Obviousness over White and Schultz

Petitioners contend claims 1, 8–10, and 12–17 of the '465 patent are unpatentable under 35 U.S.C. § 103(a) over White and Schultz. Pet. 52–64.

As with Bland, Petitioners contend White teaches a tire inflation system with all elements of claim 1 except “a plurality of relief valves, each relief valve configured to release air from a corresponding tire when tire air pressure rises above a second adjustable preset value,” as recited in claim 1. Pet. 52–54 (citing Ex. 1005, col. 2, ll. 61–67, col. 5, l. 27–col. 6, l. 12, col. 6, ll. 17–41, col. 7, ll. 37–65, col. 17, l. 49–col. 18, l. 12, col. 18, l. 66–col. 19, l. 6, col. 19, ll. 19–49, col. 20, l. 65–col. 21, l. 22, Figs. 1, 7, 8, 9–11, 19; Ex. 1002 ¶¶ 118–21). Patent Owner does not dispute these contentions. *See* PO Resp. 24–25 (arguing “White lacks the claimed relief valve, but otherwise provides automatic tire inflation”). Having reviewed the evidence cited by Petitioners, we find a preponderance of the evidence shows White teaches all elements of claim 1 except the relief valves.

Petitioners argue that, in addition to the reasons discussed above for incorporating Parker’s relief valves in Bland or Loewe’s relief valves in Stech, which also apply to White, Schultz teaches other well-known advantages of releasing tire pressure as needed using relief valves, thus providing additional reasons for incorporating relief valves in White. Pet. 55. Schultz states that “it is often desirable to decrease the tire pressure from the over-the-road or highway inflation pressure to increase riding comfort on rough roads” and that “[i]t is well known that the traction of vehicles on relatively soft terrain (i.e., on mud, sand, or snow), may be greatly improved by decreasing the inflation pressure within the tires.” Ex. 1008, col. 1, ll. 45–54.

We find that Schultz’ teaching that it is desirable to decrease tire pressure for increased riding comfort on rough roads or improving traction on soft terrain provides a strong reason for one of ordinary skill in the art to add Schultz’ deflation capability to an inflate-only system such as White. Patent Owner argues White “demonstrates that a POSITA would accomplish the goal of proper inflation without relief valves, but instead, with air pulses.” PO Resp. 46. Although White’s air pulses may prevent over-inflation when inflating a tire to a desired pressure, the air pulses would not help in deflating the tire to reach a lower desired pressure.

Patent Owner also argues White teaches only one inflation pressure setting, not a deflation pressure setting, and that Shultz teaches either an inflation or deflation to achieve a single target pressure setting, not two preset values as claimed. PO Resp. 46 (citing Ex. 2056 ¶¶ 16–18; Ex. 1008, col. 10, ll. 32–37). Petitioners contend, however, that “[g]iven the different purposes check and relief valves serve, it would be common sense to a POSITA to have two separate preset values.” Pet. Reply 10 (citing Ex. 1096, 135:18–139:14; Ex. 1098, 103:9–104:23; Ex. 1002 ¶ 128). Petitioners’ evidence includes acknowledgement from one of Patent Owner’s declarants that “one of skill would come to the conclusion that the system needed to have two distinct values” to avoid cycling off and on unnecessarily. Ex. 1096, 135:18–139:14. Thus, even if a system were designed to maintain a nominal tire pressure that can be adjusted up or down, the evidence indicates, consistent with logic, that the relief valve would not be set at the same exact pressure as the regulator, to avoid

unnecessary cycling. Therefore, one of ordinary skill in the art would have added an adjustable relief valve such as those in Schultz to the White system. We also find one of ordinary skill in the art would have had a reasonable expectation of success in doing so, for the reasons given by Petitioners. Pet. 56–57.

Weighing all evidence of obviousness and the evidence of non-obviousness and non-obviousness, including Patent Owner’s objective indicia of non-obviousness as discussed above, we conclude that claim 1 is unpatentable under § 103(a) over White and Schultz.

Petitioners contend the teachings of White and Schultz combined in the manner recited in claim 1 also teach all elements of independent claim 12 and dependent claims 8–10 and 13–17. *See* Pet. 62–64. Patent Owner does not offer any argument against the combination of White and Schultz beyond that offered in support of claim 1, except to argue that TMP falls within the scope of claim 12. *See generally* PO Resp. For the same reasons as claim 1, weighing all evidence of obviousness and non-obviousness, including objective indicia of non-obviousness, we conclude that claims 8–10 and 12–17 are unpatentable under § 103(a) over White and Schultz.

III. PATENT OWNER’S MOTION TO EXCLUDE EVIDENCE

Patent Owner moves to exclude page 97, line 4, to page 99, line 10, of Exhibit 1096, the Deposition Transcript of Gerry McCann. Paper 53. Patent Owner seeks to prevent this excerpt of the deposition of its declarant from being used to support what Patent Owner alleges is a change in claim construction positions by Petitioners. *Id.* at 1–2.

We do not rely on page 97, line 4, to page 99, line 10, of Exhibit 1096 in this Decision. Thus, we *dismiss as moot* Patent Owner's Motion to Exclude Evidence.

IV. MOTIONS TO SEAL

Patent Owner filed four Joint Motions to Seal. The first (Paper 9) was superseded by the second (Paper 13). In the second Joint Motion to seal, the parties seek entry of the default protective order and to seal Exhibits 2011–2013, 2016–2019, 2034, and an earlier version of Patent Owner's Response (Paper 14). Paper 13. In the third Joint Motion to Seal, the parties seek to seal Patent Owner's Response (Paper 42). Paper 40. In the fourth Joint Motion to Seal, the parties seek to seal Patent Owner's Sur Reply (Paper 51). Paper 49. Redacted versions of all exhibits and papers that the parties seek to seal were filed without access restrictions, such that the parties seek to seal only portions of these exhibits and papers.

On April 10, 2018, we granted the parties' request to enter the Standing Protective Order and conditionally granted the parties' request to seal the documents addressed in the second Joint Motion to Seal, on condition that Patent Owner re-file sealed versions of those documents with proper markings. Paper 33. We also reminded the parties of the following instruction in the Trial Practice Guide, 77 Fed. Reg. 48,756 (Aug. 14, 2012):

Confidential information that is subject to a protective order ordinarily would become public 45 days after denial of a petition to institute a trial or 45 days after final judgment in a trial. There is an expectation that information will be made public where the existence of the information is referred to in a decision to grant or deny a request to institute a review or is identified in a final

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written decision following a trial. A party seeking to maintain the confidentiality of information, however, may file a motion to expunge the information from the record prior to the information becoming public. § 42.56. The rule balances the needs of the parties to submit confidential information with the public interest in maintaining a complete and understandable file history for public notice purposes.

Id. at 6–7 (quoting 77 Fed. Reg. at 48,761).

There is a strong public policy that favors making information filed in *inter partes* review proceedings open to the public. *See Garmin Int’l v. Cuozzo Speed Techs., LLC*, Case IPR2012-00001 (PTAB March 14, 2013) (Paper 34) (discussing the standards of the Board applied to motions to seal). The moving party bears the burden of showing that the relief requested should be granted. 37 C.F.R. § 42.20(c).

[A] movant to seal must demonstrate adequately that (1) the information sought to be sealed is truly confidential, (2) a concrete harm would result upon public disclosure, (3) there exists a genuine need to rely in the trial on the specific information sought to be sealed, and (4), on balance, an interest in maintaining confidentiality outweighs the strong public interest in having an open record.

Argentum Pharms. LLC v. Alcon Research, Ltd., Case IPR2017-01053, slip op. at 4 (PTAB January 19, 2018) (Paper 27) (informative).

We determine that good cause exists for Exhibits 2011–2013, 2016–2019, and 2034, Patent Owner’s Response, and Patent Owner’s Sur Reply to remain under seal until 45 days after the resolution of appellate proceedings, or, if no appeal is taken, after the time for filing a notice of appeal has expired. A party seeking to maintain the confidentiality of

information in these documents may file a motion to expunge the sealed version of a document from the record and maintain only the redacted version in the record. A motion to expunge must state whether the document sought to be expunged was referred to in the Final Written Decision and identify any specific portions of the document referred to in the Final Written Decision. The burden for expunging an exhibit or paper referred to in this Final Written Decision is particularly heavy given the public's interest in understanding the basis for our decision on patentability. A party seeking to expunge a sealed version of a document may wish to file a new redacted version avoiding redaction of any material referred to in the Final Written Decision. Any remaining redactions must be addressed with particularity in accordance with the requirements in *Argentum*, considering the public interest specifically in light of the Board's reliance on the information in the Final Written Decision.

V. REDACTION OF THE FINAL WRITTEN DECISION

This Final Decision is entered as a non-public version because it references and cites to documents subject to the parties' Joint Motions to Seal. No later than fourteen (14) business days after entry of the Final Written Decision, the parties may jointly submit, as an Exhibit, a proposed redacted version of the Final Written Decision that will be publicly available. In the absence of such proposal, at the expiration of 14 days from the date of this Decision, the entirety of the Final Written Decision will be made available to the public. If the parties are of the impression that the

Final Written Decision may be made publicly available without any redactions, the parties may notify the Board via email.

No later than fourteen (14) business days after entry of the Final Written Decision, a party seeking to maintain confidentiality of any portion of the Final Written Decision that is proposed to be redacted must submit a motion to seal establishing good cause for such proposed redactions. An explanation that the redacted portions refer to information subject to a prior motion to seal is not sufficient. Beyond the strong public policy that favors making information filed in *inter partes* review proceedings open to the public, the public has a heightened interest in understanding the basis for our decision on patentability. A motion to seal any portion of the Final Written Decision shall address any proposed redactions with particularity and, as to each proposed redaction, demonstrate adequately that (1) the information sought to be sealed is truly confidential, (2) a concrete harm would result upon public disclosure, and (3) on balance, an interest in maintaining confidentiality outweighs the strong public interest in having an open record of our decision on patentability. The Board may deny the motion(s) to seal and issue a publicly available Final Written Decision without redactions or with redactions consistent with a denial-in-part of the motion(s) to seal.

VI. CONCLUSION

For the foregoing reasons, and based on the evidence and arguments, we are persuaded that Petitioners have demonstrated that claims 1, 8–10, and 12–17 of the '465 patent are unpatentable under 35 U.S.C. § 103(a).

VII. ORDER

For the reasons given, it is

ORDERED that claims 1, 8–10, and 12–17 of the '465 patent are unpatentable under 35 U.S.C. § 103(a);

FURTHER ORDERED that Patent Owner's Motion to Exclude Evidence is dismissed;

FURTHER ORDERED that the parties' Joint Motions to Seal are granted;

FURTHER ORDERED that no later than fourteen (14) business days after entry of this Order, the parties may jointly submit, as an Exhibit, a proposed redacted version of the Final Written Decision that will be publicly available;

FURTHER ORDERED that, in the absence of proposed redactions to the Final Written Decision, at the expiration of 14 days from the date of this Decision, the entirety of the Final Written Decision will be made available to the public;

FURTHER ORDERED that no later than fourteen (14) business days after entry of this Order, a party seeking to maintain confidentiality of any portion of the Final Written Decision that is proposed to be redacted must submit a motion to seal establishing good cause for such proposed redactions; and

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

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