

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

WABCO HOLDINGS INC. and LAYDON COMPOSITES LTD.,
Petitioner,

v.

TRANSTEX COMPOSITES INC.,
Patent Owner.

IPR2018-01319
Patent 8,449,017 B2

Before BART A. GERSTENBLITH, TIMOTHY J. GOODSON,
BRENT M. DOUGAL, *Administrative Patent Judges*.

GERSTENBLITH, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. Background

WABCO Holdings Inc. and Laydon Composites Ltd. (collectively, “Petitioner”) filed a Petition (Paper 1, “Pet.”) requesting institution of *inter partes* review of claims 1–20 of U.S. Patent No. 8,449,017 B2 (Ex. 1001, “the ’017 patent”). Transtex Composites Inc. (“Patent Owner”) filed a Waiver of Preliminary Response Pursuant to 37 C.F.R. § 42.107(b). Paper 7. Applying the standard set forth in 35 U.S.C. § 314(a), we instituted an *inter partes* review of all challenged claims. Paper 8 (“Inst. Dec.”).

Patent Owner filed a Patent Owner Response (Paper 11, “PO Resp.”), Petitioner filed a Reply to Patent Owner’s Response (Paper 15, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 17, “PO Sur-reply”). An oral hearing was held on October 29, 2019, and a copy of the transcript was entered into the record. Paper 24 (“Tr.”).

We have jurisdiction pursuant to 35 U.S.C. § 6. This Decision is a Final Written Decision under 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73 as to the patentability of the claims on which we instituted trial. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). Having reviewed the arguments and the supporting evidence, we determine that Petitioner has shown, by a preponderance of the evidence, that challenged claims 1, 5–11, and 15–19 of the ’017 patent are unpatentable, and we determine that Petitioner has not shown, by a preponderance of the evidence, that challenged claims 2–4, 12–14, and 20 of the ’017 patent are unpatentable.

B. Related Proceedings

The parties state that the ’017 patent is involved in litigation in *Transtex LLC and Transtex Composites Inc. v. WABCO Holdings Inc. and*

Laydon Composites Ltd., No. 2:17-cv-12793-SJM (E.D. Mich.). Pet. 3; Paper 6 (Patent Owner’s Updated Mandatory Notices), 2. Additionally, Petitioner challenges related U.S. Patent No. 7,942,471 C1 (“the ’471 patent”) in IPR2018-00737.¹ The ’017 patent states that it is a continuation of a continuation of the application that issued as the ’471 patent. Ex. 1001, code (60).

C. Real Parties in Interest

The Petition identifies “WABCO Holdings Inc. of Rochester Hills, Michigan, and Laydon Composites Ltd. of Ontario, Canada,” as the real parties in interest. Pet. 3. Patent Owner identifies “Transtex Inc. f/k/a Transtex Composite Inc. of Montreal, Quebec, Canada and Transtex LLC of Lebanon, Indiana,” as the real parties in interest. Paper 6, 2.²

¹ The Board issued a Final Written Decision in IPR2018-00737 on September 24, 2019, finding the challenged claims in that case unpatentable. *WABCO Holdings Inc. v. Transtex Composite Inc.*, IPR2018-00737, Paper 30 at 33 (PTAB Sept. 24, 2019).

² There is a difference regarding the spelling of Patent Owner’s name. The ’017 patent lists an assignee as “Transtex Composites Inc., Montreal (CA)” (Ex. 1001, code (73)), and the Petition and Notice of Filing Date (Paper 5) include the same name in the caption. Patent Owner, however, omits the “s” from “Composites,” referring to itself as “Transtex Composite Inc.” See Paper 6, 2; Paper 7 (caption). We consider the two spellings to refer to the same entity and mention the difference here to avoid potential confusion.

D. The Instituted Grounds of Unpatentability

Petitioner challenges the patentability of claims 1–20 of the '017 patent on the following grounds:

Claims Challenged	35 U.S.C. §	References
1–20	102(a), (e)(1), (e)(2)	Layfield ³
1–20	103(a)	Layfield, Rinard ⁴

Petitioner supports its challenge with two declarations by Mr. Paul A. Tres, dated June 29, 2018 (Ex. 1010, “the First Tres Declaration”), and July 30, 2019 (Ex. 1055⁵), respectively, and a Second Declaration of James Haws (Ex. 1054, “the Second Haws Declaration”).⁶ Patent Owner supports its arguments with a declaration by Dr. Gerald J. Micklow, dated April 16, 2019. Ex. 2001.

E. The '017 Patent

The '017 patent generally relates to aerodynamic skirts for trailers. Ex. 1001, code (57). The '017 patent explains that skirts are attached to trailers “to reduce the aerodynamic air drag and improve fuel efficiency.” *Id.* at 1:32–33. Road conditions, however, can cause damage to the skirts,

³ U.S. Patent No. 7,578,541 B2, issued Aug. 25, 2009 (Ex. 1004, “Layfield”).

⁴ U.S. Patent No. 5,280,990, issued Jan. 25, 1994 (Ex. 1006, “Rinard”).

⁵ Exhibit 1055 is titled “THIRD DECLARATION OF PAUL A. TRES.” Petitioner’s exhibit list, *see* Pet. Reply vi, states that the “Second Declaration of Paul A. Tres” is “unfiled.” Therefore, there are only two declarations by Mr. Tres in the record.

⁶ Patent Owner filed a “DECLARATION OF JAMES HAWS” (Ex. 2003), which Patent Owner represents was served as supplemental evidence by Petitioner after the filing of the Petition. PO Resp. 26. Exhibit 2003 also bears “Exhibit No. 1043” in the top header of each page, although it was not filed as Exhibit 1043 in this case.

Id. at 4:9–12.

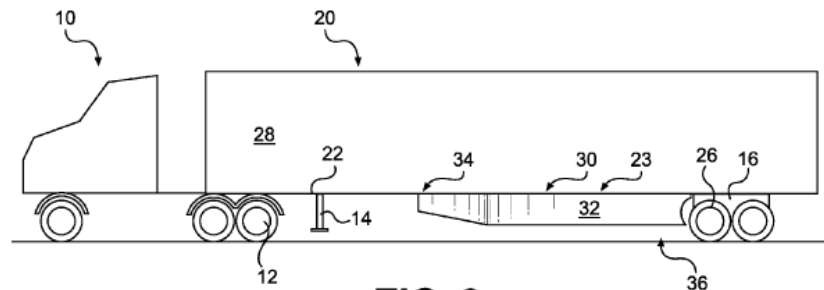


FIG. 2

Figure 2 of the '017 patent illustrates “a road tractor 10 with a road trailer 20 attached thereto equipped with a pair of skirt assemblies 30, installed on each side of the road trailer 20, adapted to deflect and direct the airflow around the road trailer 20.” *Id.* at 5:15–18.

The '017 patent teaches that skirt panel 32 is secured to frame members 23, which form a portion of road trailer 20's floor frame 22, *inter alia*, via a series of intervening resilient struts 42. *See id.* at 6:1–4, 6:19–22. Figure 4, reproduced below, illustrates the arrangement:

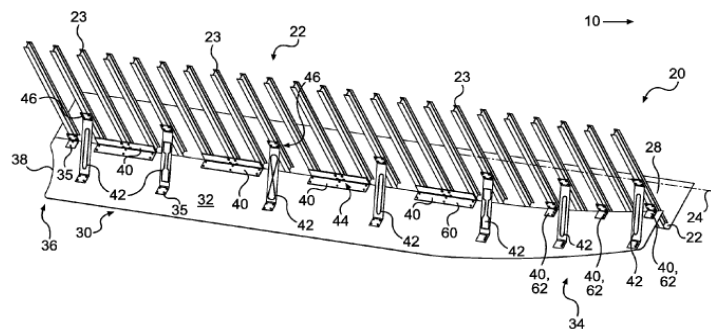


FIG. 4

Figure 4 “is a left-front perspective view of a portion of a floor section of the road trailer,” illustrating a series of frame members 23 forming a portion of road trailer floor frame 22. *Id.* at 4:48–49, 6:1–4.

The '017 patent explains that the resilient struts “can sustain substantial elastic deformation when the skirt panel is under stress by a foreign object and return substantially to a resilient strut original position before being elastically deformed when the skirt panel is no longer under stress by the foreign object.” *Id.* at 4:17–21.

Figure 9B of the '017 patent is reproduced below:

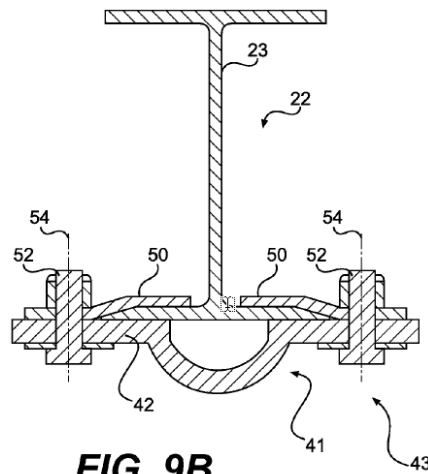


Figure 9B of the '017 patent “is a section view of a portion of the road trailer’s floor with the securing mechanism attached thereto.” *Id.* at 4:60–61. The '017 patent explains that Figure 9B shows a “section of the resilient strut 42 [with] . . . a shape adapted to increase its stiffness.” *Id.* at 10:28–30. Specifically, “[a] ‘U’ shaped 41 resilient strut 42, as seen on a section view 43 of the resilient strut 42, can be manufactured.” *Id.* at 10:30–31.

The '017 patent provides:

Alternatively, an embossed portion on a planar shaped resilient strut 42 can also be manufactured. Preferably the selected shape should prevent dirt and road debris to keep stuck [sic] on the resilient strut 42. The shape can also be uneven along the length of the resilient strut 42 to provide an uneven flex to the resilient strut 42.

Id. at 10:31–37.

F. Illustrative Claim

Claims 1, 11, and 17 are the independent claims challenged in this proceeding. Claim 1 is illustrative and reproduced below:

1. A resilient strut adapted to secure an aerodynamic skirt to a trailer, the aerodynamic skirt being adapted to be substantially longitudinally mounted to the trailer,

the aerodynamic skirt comprising a skirt panel including a front portion and a rear portion, the front portion being adapted to be mounted toward a forward portion of the trailer and the rear portion being adapted to be mounted toward a rear portion of the trailer in a configuration reducing air drag about the trailer, the skirt panel being adapted to move away from the configuration reducing air drag about the trailer when contacting a foreign object and to recover the configuration reducing air drag about the trailer thereafter,

the resilient strut being adapted to sustain an elastic deformation when a load is applied to the resilient strut when the skirt panel moves away from the configuration reducing air drag about the trailer and to self-recover the resilient strut original shape when the load is removed, the resilient strut including a longitudinal shape variation adapted to change a mechanical strength of the resilient strut and influence a stiffness of the resilient strut.

Ex. 1001, 11:2–23.

II. ANALYSIS

A. Level of Ordinary Skill in the Art

Petitioner proposes that the level of ordinary skill in the art at the time of the invention would have been “a bachelor’s degree in mechanics, aeronautics, materials, or a related field of study, or equivalent experience, and at least two years of experience in the development of components of vehicles, or an equivalent amount of relevant work or research experience.”

Pet. 10. Petitioner explains that “[a]dditional education or industry

experience in these or a related field may compensate for a deficit in another aspect of the characteristics stated herein.” *Id.* (citing Ex. 1010 ¶¶ 41–43).

In our Decision on Institution, we found Petitioner’s proposal consistent with the level of ordinary skill in the art reflected by the prior art of record, *see Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001); *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995); *In re Oelrich*, 579 F.2d 86, 91 (CCPA 1978), and, therefore, adopted Petitioner’s unopposed position as to the level of ordinary skill in the art. Patent Owner’s Response does not contest our preliminary finding as to the level of ordinary skill in the art as set forth in the Decision on Institution. Dr. Micklow, however, opines that one of ordinary skill in the art “would have a bachelor’s of science or engineering degree in an engineering field that would include mechanical engineering, materials engineering, industrial engineering, or aeronautical engineering and at least three years of work experience in the design and testing of devices that encompass structural and fluids problems.” Ex. 2001 ¶ 30. Dr. Micklow also testifies that he has “considered the definition of a person having ordinary skill in the art as set forth in the [First Tres Declaration] . . . [and] [u]nder that definition, [his] opinions are the same as set forth in this declaration.” *Id.* ¶ 31.

Dr. Micklow does not explain how or why he proposes a different level of ordinary skill in the art as compared to the level proposed by Petitioner and preliminarily adopted in our Decision on Institution. *See generally id.* ¶¶ 28–31. Additionally, neither Patent Owner nor Dr. Micklow argues that the difference in the proposed level of ordinary skill in the art affects the outcome of this proceeding; Dr. Micklow, in fact, states the

contrary—that his opinions are the same under either level of skill. *See* Ex. 2001 ¶ 31.⁷

Nothing in the full record is sufficient to persuade us that our preliminary finding as to the level of ordinary skill in the art was incorrect. Accordingly, because our preliminary finding is consistent with the level of ordinary skill in the art reflected by the prior art of record, we maintain and reaffirm our preliminary finding that the level of ordinary skill in the art at the time of the invention would have been “a bachelor’s degree in mechanics, aeronautics, materials, or a related field of study, or equivalent experience, and at least two years of experience in the development of components of vehicles, or an equivalent amount of relevant work or research experience.” Inst. Dec. 10–11; *see* Pet. 10.

B. Claim Construction

In an *inter partes* review based on a petition filed prior to November 13, 2018, claim terms in an unexpired patent are construed according to their broadest reasonable interpretation in light of the specification of the patent in which they appear. *See* 37 C.F.R. § 42.100(b) (2017);⁸ *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016).

⁷ The main difference between the proposed levels of skill is in the number of years of work experience. Nonetheless, because there is no evidence before us that the difference affects the findings or conclusions reached herein, the outcome reached herein would be the same under either proposal.

⁸ A recent amendment to this rule does not apply here because the Petition was filed before November 13, 2018. *See* Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340 (Oct. 11, 2018) (amending 37 C.F.R. § 42.100(b) effective Nov. 13, 2018) (now codified at 37 C.F.R. pt. 42 (2019)).

In the Petition, Petitioner proposes three terms for construction: “resilient strut,” “resilient support,” and “embossed portion.” Pet. 11–14. In our Decision on Institution, we found that, on the preliminary record, none of these claim terms required an express construction to determine whether to institute an *inter partes* review. Inst. Dec. 6.

In its Response, Patent Owner contends “Petitioners propose unnecessary constructions of common and well-understood phrases, which do nothing to resolve the controversy of this IPR. (Paper 1 at 11–14). The broadest reasonable interpretation for these terms is, their plain meaning; no further construction is necessary. (Ex. 2001, Micklow Decl. ¶¶ 28–31, 54–71).” PO Resp. 11–12.

1. “resilient strut” and “resilient support”

Petitioner contends that “resilient strut” “would have been understood to mean a strut that can flex or deform in response to a load being applied to it, and then return to its original position after the load is removed from the strut.” Pet. 11 (citing Ex. 1010 ¶¶ 44–56). Petitioner asserts “[n]o range or enumeration of elastic deformation or resiliency is associated with the phrase ‘resilient strut’ itself.” *Id.* Petitioner argues “[c]laim 17 recites that the ‘resilient strut’ can sustain ‘substantial elastic deformation,’ indicating that the phrase ‘resilient strut’ by itself does not establish any particular type or degree of bending.” *Id.*

Petitioner additionally contends “a ‘resilient support’ would have been understood to have the same meaning as ‘resilient strut’” (*id.* at 13 (citing Ex. 1010 ¶¶ 57–58)) because “the phrase ‘resilient support’ is not found in the original specification or the provisional application,” “[t]he illustrated embodiments only refer to a resilient strut 42,” and “[t]he claims use the

phrases ‘resilient strut’ and ‘resilient support’ interchangeably” (*id.* (citing Ex. 1001, 12:1–10 (claim 11), 12:14–16 (claim 13))). Petitioner also states that the Examiner of the ’017 patent application “did not distinguish between a ‘resilient strut’ and a ‘resilient support,’ but rather determined that all of the claims were allowable based upon the presence of a ‘resilient strut.’” *Id.* at 14 (citing Ex. 1002 (prosecution history of the ’017 patent), 534–37).

Patent Owner contends “[t]hese terms need no construction here because—whether the Board adopts Petitioners’ proposed construction or Patent Owner’s—the anticipation and obviousness analysis will not ultimately be impacted.” PO Resp. 12 (citations omitted). Nonetheless, Patent Owner asserts “resilient strut” means “a strut . . . with the ability to sustain significant deformation and return to its original shape.” *Id.* at 13 (emphasis omitted); *see id.* (construing “resilient support” similarly). Patent Owner, however, explains “the parties do not present arguments that depend on the particular amount of bending, or deformation, that a ‘resilient strut’ (or ‘support’) can incur—the principle difference between the parties’ constructions” (*id.* at 12 (citing Pet. 11–13)), and, therefore, “the Board need not adopt any construction of ‘resilient strut’ and ‘resilient support’” (*id.*).

Our analysis of the instituted grounds does not turn on the degree of deformation from which the strut can recover. Therefore, because resolving the difference in the parties’ constructions does not resolve an issue in the case, we need not construe “resilient strut” and “resilient support” expressly. *See Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (holding that “only those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy”); *see also Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d

1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs.* in the context of an *inter partes* review).

2. “*embossed portion*”

Petitioner proposes that “embossed portion” means “a portion that stands out in relationship to an adjacent portion.” Pet. 14 (citing Ex. 1010 ¶ 59). Petitioner explains that the definition of “emboss” is “to ‘carve or mold a design on (a surface) so that it stands out in relief.’” *Id.* (quoting Ex. 1022).

Patent Owner contends that “embossed portion” “needs no construction” because “the broadest reasonable interpretation is simply the plain language itself.” PO Resp. 14; *see id.* (relying on Ex. 2001 ¶¶ 66–71). Patent Owner asserts that, in co-pending district court litigation, Petitioner “construed ‘embossed portion’ simply as ‘a portion manufactured by embossing,’ which is consistent with the plain meaning of that term.” *Id.* at 14–15 (quoting Ex. 2007 (Defendants’ Corrected Construction of Claim Terms), 13) (citing Ex. 2001 ¶¶ 66–71).

In its Reply, Petitioner contends that “embossed portion” should not be limited to a particular manufacturing technique. Pet. Reply 5–6. Petitioner asserts that there are no “structural characteristics of the embossed portion identified” in the Specification and “[t]here is nothing in the claim language or the patent specification that would exclude any particular manufacturing technique to make the ‘embossed portion.’” *Id.* at 6 (citing Ex. 1055 ¶ 27).

In its Sur-reply, Patent Owner argues that not “all manufacturing techniques should be included in the meaning of ‘embossed portion’ because Petitioner[] already construed, in a co-pending district court litigation,

‘embossed portion’ to mean ‘a portion manufactured by embossing.’” PO Sur-reply 4 (citing Pet. Reply 5–6; Ex. 2007 ¶ 13; Ex. 2001 ¶¶ 66–71). Additionally, Patent Owner asserts that because neither the Specification nor the prosecution history provides a special definition of “embossed portion,” the plain meaning should apply and no other construction is necessary. *Id.* at 4–5 (citing Ex. 2001 ¶¶ 66–71).

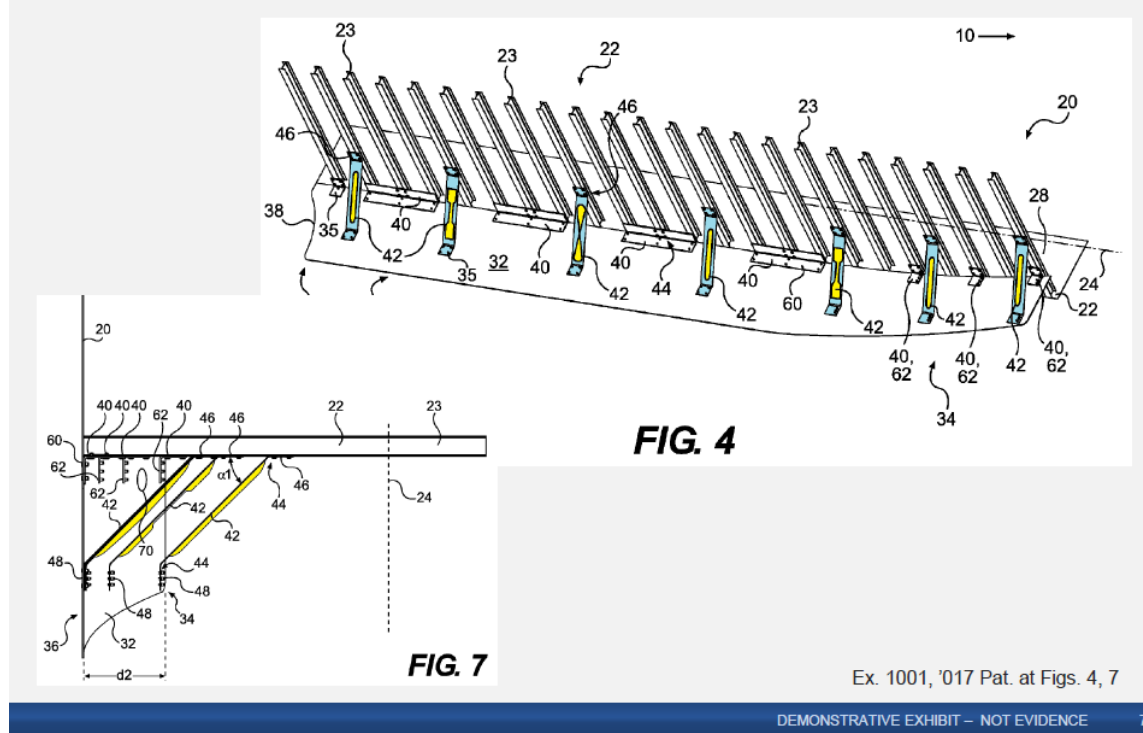
The phrase “embossed portion” is recited in claims 5 and 15 of the ’017 patent. Claim 5 depends from claim 1 and further recites “wherein the resilient strut includes an embossed portion thereon.” Ex. 1001, 11:31–32. Claim 15 depends from claim 11 and further recites “wherein the resilient support includes an embossed portion thereon.” *Id.* at 12:21–23. The Specification of the ’017 patent includes the following description of the phrase:

In another embodiment illustrated in FIG. 9b, the section of the resilient strut 42 has a shape adapted to increase its stiffness. A “U” shaped 41 resilient strut 42, as seen on a section view 43 of the resilient strut 42, can be manufactured. *Alternatively, an embossed portion on a planar shaped resilient strut 42 can also be manufactured.* Preferably the selected shape should prevent dirt and road debris to keep stuck [sic] on the resilient strut 42. The shape can also be uneven along the length of the resilient strut 42 to provide an uneven flex to the resilient strut 42.

Id. at 10:28–37 (emphasis added).

During the oral hearing, counsel for Patent Owner pointed to yellow annotations Patent Owner added to Figures 4 and 7 of the ’017 patent in the following slide from its demonstrative exhibits to illustrate the embossed portions on the struts (Tr. 34:14–20, 35:4–8):

Challenged '017 Patent Claims: 1-20



Ex. 2008, 7. Slide 7 of Patent Owner’s demonstratives includes Figures 4 and 7 of the '017 patent, in which the embossed portions of struts 42 are annotated in yellow and, in Figure 4, the remaining portions of struts 42 are annotated in blue.⁹

We agree with the construction proposed by Petitioner in its co-pending district court litigation—that “embossed portion” means “a portion manufactured by embossing.” Ex. 2007, 13. Patent Owner states that this construction “is consistent with the plain meaning of th[e] term.” PO

⁹ We recognize that demonstrative exhibits are not evidence. Paper 20, 3 (“Demonstrative exhibits are not evidence and may not introduce new evidence or arguments.”). Nonetheless, we include Patent Owner’s slide 7 solely because of the annotations thereon indicating which portions of the struts Patent Owner contends include an “embossed portion.”

Resp. 15 (citations omitted). That construction, however, does not resolve the dispute between the parties because it does not explain what “embossing” means. We find, however, that Petitioner’s dictionary definition of “emboss,” meaning “carve or mold a design on (a surface) so that it stands out in relief,” accurately defines the meaning of “emboss” and “embossing.” Ex. 1022, 3.^{10,11} Accordingly, we construe “embossed portion” to mean “a portion carved or molded on a surface so that it stands out in relief.”

3. “*concave portion*”

Neither party proposes “concave portion” for construction in its initial briefs. Nonetheless, it is evident from the arguments pertaining to the application of the prior art that the parties dispute the meaning of the term. Therefore, Petitioner proposes an explicit definition of the term in its Reply—“‘concave portion’ simply refers to structure defining a hollowed interior.” Pet. Reply 6 (citing Ex. 1056, 3¹²). Petitioner asserts that Patent Owner’s expert “would require the ‘concave portion’ to have a curved surface,” but Petitioner contends the claims “have no such requirement.” *Id.*

¹⁰ Citations are to the page numbers of the exhibit.

¹¹ Even though Patent Owner does not argue this definition in its briefs, Dr. Micklow testified that “embossed” “at least refer[s] to an engineering characteristic of a component whereby during the manufacturing process, the component is either indented or pressed outward to achieve an improvement.” Ex. 2001 ¶ 70. Although there are slight differences between Dr. Micklow’s testimony and the dictionary definition proposed by Petitioner, for the reasons explained in our discussion of claims 5 and 15 herein, we reach the same determination whether “embossed portion” means a technique in which a component is “indented or pressed outward” or manufactured according to Petitioner’s dictionary definition of the term.

¹² Citations are to the page numbers of the exhibit.

Patent Owner asserts Petitioner's dictionary definition, referring to a curved or rounded surface, supports Dr. Micklow's testimony that "concave portion" "require[s] a curved surface," and, therefore, "squarely contradicts Petitioner['s] position." PO Sur-reply 3 (citing Ex. 1052, 185:10–15).

Each of claims 3, 4, 13, and 14 recites a "concave portion." Claims 3 and 4 depend from claim 1; claims 13 and 14 depend from claim 11. Claim 3 is illustrative: "The resilient strut of claim 1, wherein the resilient strut has a substantially rectangular section including *a concave portion* adapted to increase the stiffness of the resilient strut." Ex. 1001, 11:26–28 (emphasis added). The terms "concave" and "concave portion" are not recited elsewhere in the Specification of the '017 patent and are not illustrated in any of the figures. Petitioner's dictionary provides two definitions of "concave": "1: hollowed or rounded inward like the inside of a bowl" and "2: arched in: curving in." Ex. 1056, 3. The dictionary definitions and Dr. Micklow's testimony are consistent in that "concave" means rounded or curved inward. We do not agree with Petitioner that inclusion of "hollowed" in the dictionary definition broadens "concave" such that it does not mean curved or rounded inward. See Pet. Reply 6 (focusing on the "hollowed"). Therefore, we agree with Patent Owner that "concave portion" requires a curved or rounded inward portion.

4. "U' shaped section"

Similar to "concave portion," the parties do not propose constructions for "U' shaped section" in their initial briefs. It is evident from the arguments pertaining to the application of the prior art, however, that the parties dispute the meaning of the term. Petitioner contends that under the broadest reasonable interpretation, "any three-sided 'U' shaped section

satisfies this claim language, such as the block-legged section of the open box construction disclosed in Layfield.” Pet. Reply 6. Petitioner asserts this meaning “is consistent with the ’017 patent’s only passing reference to a ‘U’ shape: ‘A “U” shaped 41 resilient strut 42, as seen on a section view 43 of the resilient strut 42, can be manufactured.’” *Id.* (quoting Ex. 1001, 10:30–31).

Patent Owner asserts that Petitioner’s proposal “broaden[s] the plain meaning of ‘U-Shaped Section’ to include a square or rectangular cross section” without any support in the ’017 patent. PO Sur-reply 3. Patent Owner contends that the ’017 patent “clearly shows that the ‘U-shaped section’ has a curved ‘U’ shape” in Figure 9B. *Id.* at 3–4 (citing Ex. 1001, 10:30–31, Fig. 9B). Patent Owner thus argues that “[w]ithout the ’017 patent attributing any special meaning to “‘U’-Shaped Section’, ‘U-Shaped’ cannot mean box-shaped and the broadest reasonable interpretation of “‘U’-Shaped Section’ is its plain meaning.” *Id.* at 4.

The ’017 patent states the following regarding a U-shaped section: “In another embodiment illustrated in FIG. 9*b*, the section of the resilient strut 42 has a shape adapted to increase its stiffness. A ‘U’ shaped 41 resilient strut 42, as seen on a section view 43 of the resilient strut 42, can be manufactured.” Ex. 1001, 10:28–31.

Figure 9B of the '017 patent is reproduced below:

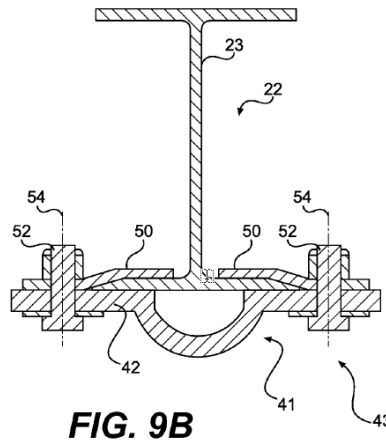


Figure 9B of the '017 patent “is a section view of a portion of the road trailer’s floor with the securing mechanism attached thereto.” *Id.* at 4:60–61.

There is no dispute that “‘U’ shaped section” literally means a section in the shape of a “U.” The dispute centers on whether a U shape can be box-shaped (meaning the base and vertically extending legs meet at essentially right angles) or whether a U shape requires a curvature. Construing terms under the broadest reasonable interpretation does not mean that we expand the meaning of terms beyond their plain and ordinary meaning. Simply put, a U has a curvature, the claim language does not include a modifier to expand the meaning of the term, and the description in the Specification and sole embodiment shown in Figure 9B illustrates a curved U shape. In other words, claim construction under the broadest reasonable interpretation standard does not act to change the claim language from “‘U’ shaped section” to “*generally* ‘U’ shaped section” or “*substantially* ‘U’ shaped section.” Therefore, a U-shape or, as recited here, a “‘U’ shaped section” requires a curvature.

C. Legal Standards – Anticipation

“[A] claim is anticipated ‘if each and every limitation is found expressly or inherently in a single prior art reference.’” *King Pharm, Inc. v. Eon Labs., Inc.*, 616 F.3d 1267, 1274 (Fed. Cir. 2010) (quoting *Celeritas Techs., Ltd. v. Rockwell Int’l Corp.*, 150 F.3d 1354, 1361 (Fed. Cir. 1998)). Anticipation is a question of fact, *In re Gleave*, 560 F.3d 1331, 1334–35 (Fed. Cir. 2009), assessed from the perspective of one of ordinary skill in the art, see *Dayco Prods., Inc. v. Total Containment, Inc.*, 329 F.3d 1358, 1368 (Fed. Cir. 2003) (“‘[T]he dispositive question regarding anticipation [i]s whether *one skilled in the art* would reasonably understand or infer from the [prior art reference’s] teaching’ that every claim element was disclosed in that single reference.”).

D. Anticipation by Layfield

Petitioner contends that Layfield discloses each and every element of claims 1–20. Pet. 22–55. Patent Owner opposes.

1. Layfield

Layfield is directed to a skirt fairing for the underside of a trailer to achieve “increased fuel efficiency and greater driving safety by deflecting and otherwise altering the airflow e.g., by creating laminar flow along the side and underneath the trailer of a tractor trailer rig or the like.” Ex. 1004, 1:6–12. Layfield explains that skirt panels 10 can be attached to the underside of the trailer through a number of support struts 58, as illustrated in Figure 7. *Id.* at 15:7–18.

Figure 7 of the '017 patent is reproduced below:

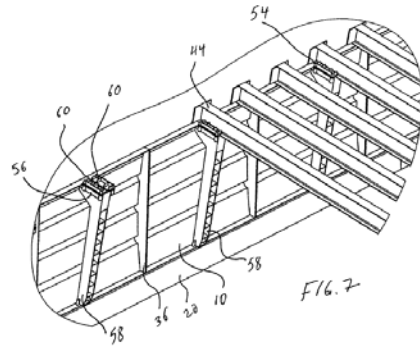


Figure 7 shows support struts 58 connected to skirt panel 10 and I-beam 44, which is part of a tractor-trailer rig (not shown). *Id.*

2. Discussion

a. Independent Claim 1

- i. *Element [1.a]: “A resilient strut adapted to secure an aerodynamic skirt to a trailer, the aerodynamic skirt being adapted to be substantially longitudinally mounted to the trailer”*
- ii. *Element [1.d]: “the resilient strut being adapted to sustain an elastic deformation when a load is applied to the resilient strut when the skirt panel moves away from the configuration reducing air drag about the trailer and to self-recover the resilient strut original shape when the load is removed”*

Petitioner contends Layfield discloses elements [1.a] and [1.d].

Pet. 22–25, 28–29. With respect to element [1.a], Petitioner asserts Layfield “discloses an aerodynamic skirt substantially longitudinally mounted to a trailer.” *Id.* at 22–23 (citing Ex. 1004, 5:44–54, 16:5–28, 18:59–66, Figs. 7, 12, 13). Petitioner contends Layfield’s tractor-trailer rig 300 “is equipped with ‘a fairing which depend[s] from a lower, outer longitudinally extending edge 311 of the tractor-trailer rig 300 and which comprises a plurality of

contiguous skirt panels 312, 312A, 312B, 312C.” *Id.* at 23 (quoting Ex. 1003, 16:11–23) (citing *id.* at 11:19–25, 18:59–66, Fig. 13). Petitioner asserts “[t]he foremost skirt panel 318 is shaped to ‘provide an aerodynamic profile to the contiguous skirt panels 312.’” *Id.* (quoting Ex. 1004, 1:25–28) (citing *id.* at 5:44–54).

Petitioner argues Layfield’s aerodynamic skirt “is secured to the trailer with a plurality of resilient struts (*id.* (citing Ex. 1010 ¶¶ 73–90)), and that Layfield’s strut 58 “is a ‘resilient strut’” (*id.* at 24 (citing Ex. 1010 ¶¶ 73–90, 97–103)). Petitioner asserts Layfield teaches that struts 58 “have an elongated shape and are made from a thermoplastic material, such as [acrylic/butadiene/styrene resin (“ABS”)], [high molecular weight (“HWM”) polyethylene (“PE”)], [polypropylene (“PP”)] and [thermoplastic polyolefin (“TRO”).” *Id.* (citing Ex. 1004, 8:17–24, 18:40–43). Petitioner argues that “[b]ecause thermoplastic materials, such as ABS, HMW polyethylene, PP and TRO, were well known by one skilled in the art to be resilient materials, the struts 58 are ‘resilient struts’ as set forth in claim 1 of the ’017 patent.” *Id.* at 24–25 (citing Ex. 1010 ¶ 74). Additionally, Petitioner contends Layfield’s struts 59 “can sustain an elastic deformation up to the point of plastic deformation,” and “have a range of deformation over which they will elastically deform and be able to return to their original position after the load is removed.” *Id.* at 25 (citing Ex. 1010 ¶ 89).

With respect to element [1.d], Petitioner contends Layfield’s struts 58 “are elastically flexible so that they will bend or deform when the skirt panel moves away from an aerodynamic configuration under the impact of an object striking the skirt panel.” *Id.* at 28 (citing Ex. 1010 ¶ 97). Petitioner asserts that “[w]hen the load is removed, the struts 58 can return to their

original position by virtue of the resiliency of the strut[s] based upon the material from which [they are] made and [their] construction.” *Id.* (citing Ex. 1010 ¶ 97).

Petitioner contends the following regarding the thermoplastic materials disclosed by Layfield:

One of ordinary skill in the art would have understood Layfield to disclose that the strut 58 can be made of the disclosed thermoplastic materials such that the strut 58 is able to sustain a relatively wide range of deformation and return to its original shape. (*Id.* p. 52, ¶98). A person skilled in the art therefore would have understood that the disclosed materials in Layfield would have provided different amounts of elastic deformation, depending on the amount of flexibility desired. For example, a person skilled in the art would have understood that one disclosed thermoplastic material such as ABS would be selected to provide more rigidity of the strut. On the other hand, a person skilled in the art would have also understood that another disclosed thermoplastic material, such as TPO or HMW PE, would be selected to provide greater elasticity and resiliency of the strut when encountering foreign objects. (*Id.*, pp. 52-53, ¶99).

Pet. 28–29.

Additionally, Petitioner asserts that “[c]ommercial versions of struts made following Layfield’s teachings were able to elastically deform inwardly and outwardly over various ranges of travel between two inches and twelve inches.” *Id.* at 29 (citing Ex. 1010 ¶ 102). Petitioner thus argues that

[t]he testing of commercial versions of the Layfield fairing illustrates what one skilled in the art would have understood from Layfield itself, namely that the Layfield strut is adapted to sustain an elastic deformation when a load is applied to the resilient strut when the skirt panel moves away from the configuration reducing air drag about the trailer and to self-

recover the resilient strut original shape when the load is removed.

Id. (citing Ex. 1010 ¶¶ 102–103).

Patent Owner contends “Layfield does not expressly teach that the ‘support struts 58’ are ‘resilient,’” and, therefore, Petitioner must “establish that ‘resilient struts’ are ‘necessarily present in [Layfield], not merely probably or possibly present.” PO Resp. 42 (quoting *Trintec Indus., Inc. v. Top-U.S.A. Corp.*, 295 F.3d 1292, 1295 (Fed. Cir. 2002)) (alteration by Patent Owner). Patent Owner provides several reasons in support of its argument that Petitioner has not established that Layfield’s struts necessarily are resilient.

First, Patent Owner contends several design features of Layfield confirm that Layfield’s struts are “rigid, not ‘resilient.’” *Id.* (referencing Patent Owner’s previous discussion of Layfield). In particular, Patent Owner points to: (1) the box-shaped design of the Layfield’s support struts, which are “braced by horizontal cross-members 162” (*id.* at 23 (citing Ex. 1004, 15:45–47, Fig. 10)); (2) Layfield’s description of the support struts as “rigidly securing” skirt panels 10 to the trailer (*id.* (quoting Ex. 1004, 6:47–49) (citing *id.* at 15:10–13, Fig. 10; Ex. 2001 ¶ 151)); (3) Layfield’s description that each strut is “lock[ed]” to an I-beam by four screws, which Patent Owner contends forms a rigid attachment (PO Resp. 23 (citing Ex. 1004, 15:51–54, 15:15–17, Fig. 10; Ex. 2001 ¶ 152)); (4) reinforcing rectangular lattice 170, which Patent Owner asserts improves the structural rigidity and load-bearing capabilities of Layfield’s strut (*id.* (citing Ex. 1004, 15:49–51, Fig. 10; Ex. 2001 ¶ 153)); and (5) Layfield’s choice to refer to lower base panel 20 as permitting flexing without also referring to the struts

as flexing (*id.* at 23–24 (citing Ex. 1004, 6:59–63, 7:38–42, 9:65–10:3, 14:12–18, 17:1–10, 17:60–18:2, 18:49–55; Ex. 2001 ¶¶ 155–158, 220)).

Second, Patent Owner asserts Petitioner is incorrect to conclude that Layfield’s struts are resilient “simply because they can be made of thermoplastic materials.” PO Resp. 43 (citing Pet. 28–29; Ex. 1010 ¶¶ 74–79; Ex. 2001 ¶¶ 165–174, 176). Patent Owner contends that one of ordinary skill in the art would “understand that material alone is a poor metric for assessing resiliency, and would instead consider the total object, which includes its shape, design, and type of attachment.” *Id.* (citing Ex. 2001 ¶ 160).¹³ Patent Owner argues that “[t]he shape, design, and type of attachment of ‘support struts 58’ indicate that those struts are rigid and not ‘resilient.’” *Id.* (citing Ex. 2001 ¶¶ 150–164) (also referring to the design features discussed above).

Third, Patent Owner contends Mr. Tres was “incorrect where he testified that the thermoplastics disclosed by Layfield for support struts 58, e.g., ABS, HMW polyethylene, PP and TPO, ‘are the same materials identified for the Layfield panel, . . . which is flexible.’” PO Resp. 43 (citing Ex. 1010 ¶ 75). Patent Owner argues that Layfield’s lower panel component 20 is flexible, but it can be formed from SANTOPRENE and PVC. *Id.* (citing Ex. 1004, 15:13–16; 18:49–55; Ex. 2001 ¶ 162).

Fourth, Patent Owner argues that it is incorrect to rely on “yield strain to demonstrate resiliency of the thermoplastics disclosed by Layfield” because “[y]ield strain refers to the percent elongation of a material when

¹³ Patent Owner offers the examples of a solid aluminum pipe or a solid ingot of steel, which it contends would not be flexible, whereas a thin sheet of aluminum or thin steel cable, on the other hand, would be flexible even though made of the same material. PO Resp. 43 (citing Ex. 2001 ¶ 160).

yield stress is applied along a single dimension” whereas “[s]truts have a three dimensional shape” and “tension is never only applied in a single dimension.” PO Resp. 44 (citing Ex. 1010 ¶¶ 79–82; Ex. 2001 ¶ 163).

Fifth, Patent Owner contends that the “taper beam design” of Layfield’s struts, identified by Mr. Tres in concluding that they are “very resilient,” “actually strengthens the ‘support strut 58’ to prevent it from breaking or cracking; it does not make it ‘resilient.’” *Id.* (citing Ex. 1010 ¶¶ 84–87, 100; Ex. 2001 ¶¶ 169–170, 178). Patent Owner argues instead that Layfield’s struts “are tapered to be thicker at the mounting point, where they will experience a higher stress concentration.” *Id.* (citing Ex. 2001 ¶¶ 169–170, 178).

Patent Owner raises additional arguments responding to Petitioner’s reliance on the mechanisms by which the strut is connected on each end to other components of Layfield, contending that the connections, whether by a “cantilever-like connection” or “clamps 54,” do not lead one to conclude that the struts are resilient. PO Resp. 44–46 (citation omitted). And, Patent Owner further argues that Petitioner’s video evidence, Exhibit 1018,¹⁴ does not allow one of ordinary skill in the art to “draw any conclusions . . . as to whether the tested strut was adapted to sustain an elastic deformation when the skirt panel moved away from the configuration reducing air drag, or whether the strut could thereafter self-recover when the load is removed.” *Id.* at 46 (citing Ex. 2001 ¶¶ 179–194).

We find that although Layfield mentions “relatively-flexible side panels” (Ex. 1004, 5:52) and focuses on providing flexible lower panel

¹⁴ According to Petitioner, Exhibit 1018 is a video purporting to show “[t]esting of [a] commercial embodiment of Layfield[’s] fairing.” Pet. xi.

components (*see, e.g., id.* at 17:1–10), Layfield does not contain any express disclosure concerning the flexibility of the struts. Nor does Layfield include any discussion about the desirability of strut flexibility. The closest Layfield comes to discussing flexibility of the struts is by frequently referring to the struts as “support struts” (*see, e.g., id.* at 18:40) and discussing the use of a “bracket means,” which is on the struts, to “rigidly secure” the skirt panels to the trailer (*id.* at 6:48–49). Further, Layfield’s detailed discussion of the embodiment of support strut 58 shown in Figure 10, reproduced below, highlights the bracing and reinforcement features.

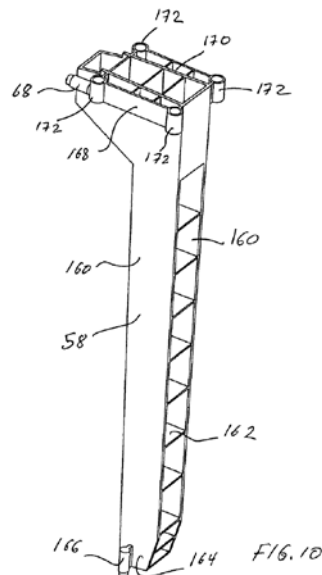


Figure 10, above, shows the construction detail of a support strut 58.

Ex. 1004, 15:45. Specifically, Layfield discloses that strut 58 includes “a pair of spaced-apart vertical members 160, which are braced by horizontal cross-members 162” and “reinforcing rectangular lattice 170.” *Id.* at 15:46–54. Thus, we agree with Patent Owner’s argument that “Layfield does not expressly teach that the ‘support struts 58’ are ‘resilient.’” PO Resp. 42 (citing Ex. 2001 ¶¶ 148–149).

We reiterate that Petitioner’s first challenge is based on anticipation. Thus, Petitioner must show that resilient struts are “either expressly or inherently described, in” Layfield. *Verdegaal Bros. Inc.*, 814 F.2d at 631; *see also* PO Resp. 42. In its Reply Brief and at the oral hearing, Petitioner contends that its challenge is based on express disclosure, not inherency. *See* Pet. Reply 17–18; Tr. 9:21–11:4 (arguing that “this is not a case of inherency”). Petitioner contends one of ordinary skill in the art “would have understood, based upon Layfield’s express disclosures concerning the material, structure, and connection of the strut, that the Layfield strut is resilient and can sustain significant and substantial elastic deformation.” Pet. Reply 18 (citing *REG Synthetic Fuels, LLC v. Neste Oil Oyj*, 841 F.3d 954, 960–61 (Fed. Cir. 2016)).

Whether we analyze Petitioner’s argument based on express disclosure or inherency, we reach the same result. To begin, although we agree with Petitioner that a prior art reference “need not satisfy an *ipsissimis verbis* test” (Pet. Reply 17 (quoting *In re Gleave*, 560 F.3d 1331, 1334 (Fed. Cir. 2009))), there is no express statement that Layfield’s strut is resilient or otherwise exhibits a characteristic synonymous with resiliency.

Additionally, we do not agree that Petitioner’s reliance on the thermoplastic materials, disclosed by Layfield for construction of the strut, establishes whether the strut is resilient and capable of elastic deformation. The evidence submitted by the parties is contradictory as to whether one of ordinary skill in the art would have understood Layfield’s struts to be resilient based on the material alone.¹⁵ *Compare* Ex. 1010 ¶¶ 74–82

¹⁵ Petitioner also points to a finding by the examiner, during prosecution of the ’017 patent application, that an aluminum strut was resilient, and argues

(Mr. Tres opining as to the materials disclosed by Layfield), *with* Ex. 2001 ¶¶ 160–164 (Dr. Micklow contradicting Mr. Tres’s testimony regarding the materials disclosed by Layfield). Further, the evidence is contradictory as to whether one of ordinary skill in the art would have understood from the design of Layfield’s strut, specifically the taper design and mechanism by which the strut connects to the trailer I-beam, that the strut is resilient. *Compare* Ex. 1010 ¶¶ 83–90 (Mr. Tres’s testimony regarding the design and connection mechanism), *with* Ex. 2001 ¶¶ 165–175 (Dr. Micklow’s contradictory testimony).

Turning to Petitioner’s video (Ex. 1018), Petitioner asserts testing of commercial versions of the Layfield fairing illustrates what one skilled in the art would have understood from Layfield itself, namely that the Layfield strut is adapted to sustain an elastic deformation when a load is applied to the resilient strut when the skirt panel moves away from the configuration reducing air drag about the trailer and to self-recover the resilient strut original shape when the load is removed.

Pet. 29 (citing Ex. 1010 ¶¶ 102–103).¹⁶ We afford this evidence little weight for several reasons.

First, the video does not show the strut or the bending of a strut. *See* Ex. 1018. In fact, the only feature shown is a skirt panel attached to a trailer.

that because thermoplastic material is more resilient than aluminum, we should adopt Petitioner’s argument. Pet. Reply 15–16 (citing Ex. 1058, 1–12; Ex. 1010 ¶¶ 77–82). We must base our decision in this case on the arguments and evidence presented. As explained above, the record before us has contradictory evidence in the form of Dr. Micklow’s testimony that was not before the examiner.

¹⁶ Petitioner does not cite Exhibit 1018 in the Petition, but instead cites to Mr. Tres’s testimony regarding the exhibit.

Id. Thus, from the video, it is unknown whether the skirt panel is attached to the trailer by one strut, multiple struts, or additional features.

Second, Petitioner does not identify clearly how the tested system precisely corresponds to the teachings of Layfield. For example, Patent Owner raises a number of issues with the struts and panels in the video to which Petitioner provides either no response or an unconvincing response. For example, Patent Owner argues that each embodiment of Layfield uses trusses 36 to “interconnect each skirt panel and reinforce the panel assembly,” while it is asserted that the skirt panels in the video do not have trusses and are not interconnected. PO Resp. 26. Petitioner argues that the skirt panels in the video were made according to the teachings of Layfield and did include “integral vertical lateral side edges as the connecting mechanism for adjacent panels.” Pet. Reply 19 (citing Exs. 1018, 2003, 2005; Ex. 1004, 18:36–39; Ex. 1010 ¶¶ 63–64; Ex. 1055 ¶¶ 37–38). Other than stating that the skirt panels have connecting mechanisms, Petitioner does not address the fact that the panels are not interconnected according to the teachings of Layfield, as Patent Owner correctly pointed out. *See generally id.* at 19–21.

Patent Owner also argues that the struts in the video “have different shapes and connect to the skirt panel and trailer in different ways” than Layfield’s struts. PO Resp. 28. In response, Petitioner asserts that the struts are “made according to Layfield,” but does not specifically respond to all of the differences identified by Patent Owner. *See* Pet. Reply 18–21. For example, Petitioner does not address Patent Owner’s statement that the

purportedly tested strut is a different shape¹⁷ than that taught by Layfield or that the strut attaches to the trailer in a different manner. Thus, even if we were to agree with all of Petitioner's arguments in response, Patent Owner has raised a number of issues with how the strut and skirt panel in the video correspond to the teachings of Layfield that are not addressed sufficiently by Petitioner. In light of the evidence presented, we find that Patent Owner has pointed to a number of potential inconsistencies between Layfield's skirt panel system and the skirt panel system used in the video to call into question Petitioner's reliance on the video to demonstrate strut resiliency. Thus, we give very little weight to Petitioner's video evidence.

Accordingly, in light of the full record before us, we find Petitioner has not shown, by a preponderance of the evidence, that Layfield expressly teaches a "resilient strut" as recited by claim 1. Additionally, we find that, in light of Petitioner's representation at the oral hearing, Petitioner does not rely upon inherency. Nonetheless, for the same reasons discussed above, we also find that Petitioner has not established that Layfield necessarily discloses a resilient strut.

For completeness, and because Petitioner relies upon Layfield's disclosure in its challenge based on the combination of Layfield and Rinard, we address whether Layfield discloses the remaining limitations of claim 1.

¹⁷ The shape of the strut is a different point from how the strut is constructed, which Petitioner does address. Pet. Reply 19.

- iii. *Element [1.b]: “the aerodynamic skirt comprising a skirt panel including a front portion and a rear portion, the front portion being adapted to be mounted toward a forward portion of the trailer and the rear portion being adapted to be mounted toward a rear portion of the trailer in a configuration reducing air drag about the trailer”*

Petitioner contends Layfield discloses element [1.b] of claim 1. Pet. 25–26. Petitioner explains the position in which Layfield’s skirt panel is mounted in relation to the trailer as well as the aerodynamic configuration. *Id.* Patent Owner does not contest that Layfield discloses element [1.b] of claim 1. See PO Resp. 34–48. For the reasons explained by Petitioner and because Patent Owner has waived any challenge that Layfield fails to disclose element [1.b] of claim 1 (see Paper 12 (Scheduling Order), 7 (cautioning Patent Owner that “any arguments for patentability not raised in the response may be deemed waived”)), we find that Layfield discloses element [1.b] of claim 1.

- iv. *Element [1.c]: “the skirt panel being adapted to move away from the configuration reducing air drag about the trailer when contacting a foreign object and to recover the configuration reducing air drag about the trailer thereafter”*

Petitioner asserts that element [1.c] of claim 1 is disclosed by Layfield’s statement that “[t]he panels are sufficiently rigid to be substantially self-supporting from an attachment to the tractor-trailer rig, while retaining sufficient flexibility to bend when the rig maneuvers over objects, e.g. curbs, railway tracks, below grade loading docks, etc.” Pet. 27 (quoting Ex. 1004, 12:67–13:4) (citing *id.* at 12:62–13:10, 5:44–54, 14:11–15, 18:34–39, 18:49–54).

Patent Owner argues that Layfield's skirt panels 10 are not flexible and therefore they cannot move away from the aerodynamic configuration of the skirt and then recover. PO Resp. 35–42. Rather, only lower panel component 20 is flexible. *Id.* at 37. Patent Owner further argues that skirt panels 10 are not flexible because they include various reinforcements, such as flanged edges, trusses 36, and ribbing. *Id.* at 37–42.

Although we agree that Layfield primarily discusses lower panel component 20 as providing flexibility for going over road objects (*see, e.g.*, Ex. 1004, 17:1–10), Layfield is not as limited as Patent Owner argues. Rather, Layfield expressly teaches that the skirt panels are flexible. For example, Layfield refers to the skirt panels as “relatively-flexible side panels” and “semi-flexible side panels.” *Id.* at 5:52, 12:64. Further, Layfield teaches an embodiment where “the injection molding method produces a skirt panel with ‘the ability to offer greater flexing of the panel as it passes over road objects (e.g., curbs, rail road tracks and below grade loading docks) due to live hinges and/or notches in panel ribs.’” Pet. 27 (quoting Ex. 1004, 18:21–32). Layfield teaches that this same embodiment includes support struts and an extruded flexible lower panel component. Ex. 1004, 18:40, 49–50. Thus, even with a reinforcing support strut and a flexible lower panel, Layfield explicitly teaches flexibility of the skirt panel.

Patent Owner also identifies a number of features in Layfield that Patent Owner argues require rigidity in the skirt panel system. *See* PO Resp. 37–42; PO Sur-reply 8–15. These features include the interconnected nature of the skirt panels, reinforced lateral edges, ribbing, and trusses 36. PO Resp. 37–42. These arguments, however, do not overcome Layfield's express teaching of a flexible skirt panel, as discussed above.

We further find unconvincing Patent Owner’s argument that statements in Layfield’s prosecution history—that the skirt panel does not move, as compared to the hinged movement of the prior art—mean that Layfield does not teach flexible skirt panels. *See, e.g.*, PO Resp. 20–31; PO Sur-reply 6–8. In particular, the statements drew distinctions between Layfield’s skirt panel and hinged movement shown in a prior art reference cited during Layfield’s prosecution. The statements did not address directly whether Layfield’s skirt panel teaches the movement recited by element [1.c] of claim 1. Thus, this argument also does not overcome Layfield’s express teaching of a flexible skirt panel.

On the full record before us, we find Petitioner has shown, by a preponderance of the evidence, that Layfield discloses a flexible skirt panel such that the skirt panel is “adapted to move away from the configuration reducing air drag about the trailer when contacting a foreign object and to recover the configuration reducing air drag about the trailer thereafter,” as recited by element [1.c] of claim 1.

- v. *Element [1.e]: “the resilient strut including a longitudinal shape variation adapted to change a mechanical strength of the resilient strut and influence a stiffness of the resilient strut”*

Petitioner contends that Layfield’s strut includes three longitudinal shape variations that each disclose element [1.e] of claim 1—(1) a U-shaped cross section (focusing on the pair of vertical members 160 and base between vertical members 160); (2) a tapered shape; and (3) horizontal cross-members 162. Pet. 30–33.

Patent Owner asserts Layfield’s struts do not include a longitudinal shape variation as recited in element [1.e] “because the struts 58 in Layfield

are stiff and not resilient.” PO Resp. 48. Patent Owner contends “[t]here is no change in local stiffness along the strut 58 for the simple reason that the entire strut 58 is stiff across its length.” *Id.* (citing Ex. 2001 ¶¶ 195–198).

We find that Petitioner has demonstrated sufficiently that the tapered design¹⁸ of Layfield’s strut 58 discloses element [1.e] of claim 1. Specifically we credit Mr. Tres’s testimony that the tapered design “provides even greater resiliency or flexibility than it would have if it had a constant cross-sectional size.” Ex. 1010 ¶ 106. Even if the strut were stiff across its entire length as Patent Owner contends, that does not mean that an aspect of mechanical strength and stiffness is not changed because of the tapered design.

Accordingly, we find that Petitioner establishes sufficiently on the record before us that the tapered design of Layfield’s strut discloses element [1.e]. Additionally, in light of this finding, we need not address whether the alleged U-shaped cross section and horizontal cross-members also disclose element [1.e] of claim 1.

vi. *Summary of Findings Regarding Claim 1*

For the reasons explained above, we find that Petitioner demonstrates sufficiently that Layfield discloses each and every element of claim 1, with the exception of elements [1.a] and [1.d]—a resilient strut adapted as claimed. Accordingly, we find that Petitioner has not established, by a preponderance of the evidence, that Layfield anticipates claim 1.

¹⁸ At the oral hearing, counsel for Patent Owner acknowledged that Patent Owner did not argue in its briefing that Layfield’s strut 58 is not tapered. Tr. 42:16–18; *see id.* at 28:4–29:6 (discussing Patent Owner’s acknowledgement, in the Patent Owner Response, that Layfield’s strut 58 is tapered).

b. Independent Claims 11 and 17

Independent claims 11 and 17 are directed to “[a] resilient aerodynamic skirt assembly” and recite many elements similar to claim 1. *See* Ex. 1001, 11:46–12:10 (claim 11), 12:36–49 (claim 17). Petitioner contends that Layfield discloses each and every element of claims 11 and 17. Pet. 41–48. With respect to claim 11, Patent Owner raises two of the same arguments discussed with respect to claim 1—that Layfield fails to disclose (1) a resilient strut¹⁹ adapted as claimed and (2) skirt panels that can move. PO Resp. 35–47. With respect to claim 17, Patent Owner raises the same three arguments discussed with respect to claim 1—that Layfield fails to disclose (1) a resilient strut adapted as claimed, (2) skirt panels that can move; and (3) a shape variation²⁰ adapted as claimed. *Id.* Patent Owner does not raise any additional arguments directed to claims 11 and 17.

Our analysis and discussion of the parties’ arguments and our findings directed to claim 1 apply equally to claims 11 and 17. Specifically, for the same reasons explained above, Petitioner establishes sufficiently that the elements of claims 11 and 17 are disclosed by Layfield, with the exception of (1) a resilient support adapted as claimed (claim 11) and (2) a resilient strut adapted as claimed (claim 17). Accordingly, we find that Petitioner has not established, by a preponderance of the evidence, that Layfield anticipates independent claims 11 and 17.

¹⁹ Claim 11 recites “resilient support” in place of “resilient strut.” *See* Ex. 1001, 12:1–10. The parties agree that these terms should have the same meaning. *See, e.g.*, Pet. 13–14; PO Resp. 12.

²⁰ Claims 11 and 17 omit the term “longitudinal” from this phrase.

c. Dependent Claims

Claims 2–10, 12–16, and 18–20 depend from claims 1, 11, and 17, respectively. Because we find that Petitioner has not established that the independent claims are anticipated, we similarly find that Petitioner has not established, by a preponderance of the evidence, that dependent claims 2–10, 12–16, and 18–20 are anticipated by Layfield for the same reasons.

E. Legal Standards – Obviousness

The U.S. Supreme Court set forth the framework for applying the statutory language of 35 U.S.C. § 103 in *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17–18 (1966):

Under § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined. Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented.

As explained by the Supreme Court in *KSR Int’l Co. v. Teleflex Inc.*:

Often, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue. To facilitate review, this analysis should be made explicit.

550 U.S. 398, 418 (2007) (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)) (“[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning

with rational underpinning to support the legal conclusion of obviousness.”)).

“Whether an ordinarily skilled artisan would have been motivated to modify the teachings of a reference is a question of fact.” *WBIP, LLC v. Kohler Co.*, 829 F.3d 1317, 1327 (Fed. Cir. 2016) (citations omitted).

“[W]here a party argues a skilled artisan would have been motivated to combine references, it must show the artisan ‘would have had a reasonable expectation of success from doing so.’” *Arctic Cat Inc. v. Bombardier Recreational Prods. Inc.*, 876 F.3d 1350, 1360–61 (Fed. Cir. 2017) (quoting *In re Cyclobenzaprine Hydrochloride Extended-Release Capsule Patent Litig.*, 676 F.3d 1063, 1068–69 (Fed. Cir. 2012)).

F. Obviousness over Layfield and Rinard

Petitioner asserts that the combined teachings of Layfield and Rinard would have rendered the subject matter of claims 1–20 obvious to one of ordinary skill in the art at the time of the invention. Pet. 56–75.

1. Level of Ordinary Skill in the Art

As discussed and explained *supra*, we find the level of ordinary skill in the art at the time of the invention would have been “a bachelor’s degree in mechanics, aeronautics, materials, or a related field of study, or equivalent experience, and at least two years of experience in the development of components of vehicles, or an equivalent amount of relevant work or research experience.” *See supra* § II.A.

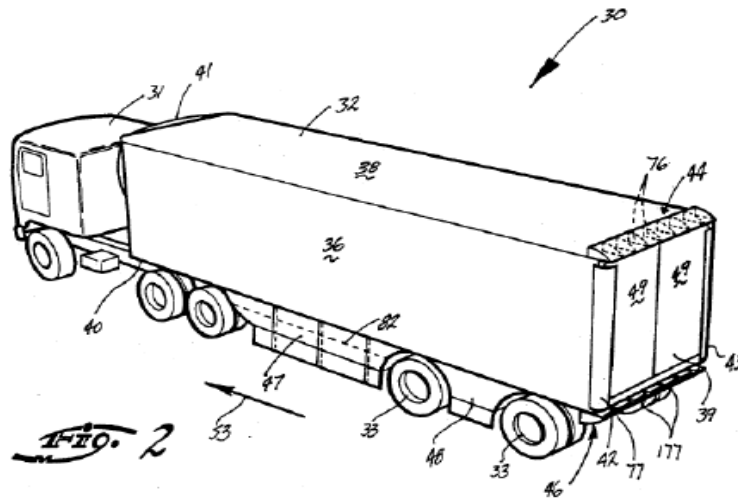
2. Scope and Content of the Prior Art

a. Layfield

Layfield is discussed in the context of Petitioner’s anticipation challenge. *See supra* § II.D.1.

b. *Rinard*

Rinard is directed to a vehicle drag reduction system, including top and bottom scoops to direct airflow. Ex. 1006, Abstract. The “scoops are fabricated from a resilient material to allow compression against a loading dock structure.” *Id.* Figure 2, reproduced below, illustrates a semi-trailer vehicle with a drag reduction system. *Id.* at 6:62–64.



The drag reduction system as shown on the semi-trailer of Figure 2 includes a rear traverse upper air scoop 44 and a rear traverse lower air scoop 46. *Id.* at 7:66–8:4.

Rinard explains that the air scoops, including vertical support elements 76, can be made “from a resilient material.” *Id.* at 10:43–48. This allows the air scoop “to resume its illustrated configuration upon removal of contact” with another structure, such as a loading dock. *Id.* at 10:48–50.

3. *Differences Between the Prior Art and the Claims;
Motivation to Modify*

a. *Independent Claims 1, 11, and 17*

Petitioner’s challenge based on obviousness relies on the same teachings from Layfield, discussed in the context of Petitioner’s anticipation

challenge, as well as teachings from Rinard, which Petitioner contends suggest the use of a resilient material for the skirt panel, struts, and supports. Pet. 56–75. Regarding claims 1, 11, and 17, Patent Owner contests whether (1) the combined teachings of Layfield and Rinard teach or suggest the skirt panel and resilient strut elements adapted as recited in claims 1, 11, and 17, and the shape variation recited in claims 1 and 17; (2) one of ordinary skill in the art would have been motivated to combine the teachings of Layfield and Rinard as proposed by Petitioner; and (3) one of ordinary skill in the art would have had a reasonable expectation of success. PO Resp. 55. The claim elements Patent Owner contests pertain to characteristics of the resilient strut, resilient support, or skirt panel recited in the claims. As discussed above, the only elements of claims 1, 11, and 17 we find missing from Layfield are the resilient struts and resilient supports.²¹ Accordingly, our analysis and findings regarding the other limitations, including the recited skirt panel, apply equally to Petitioner’s obviousness challenge and we expressly adopt them herein. Therefore, our analysis below focuses on whether Rinard suggests the use of a resilient material for the struts and supports taught by Layfield, Petitioner’s reasoning as to why one of ordinary skill in the art allegedly would have been motivated to modify Layfield in light of Rinard, and whether one of ordinary skill in the art would have had a reasonable expectation of success in doing so.

Petitioner asserts that “Rinard teaches securing the air scoop 44 to the trailer using a plurality of vertical support elements: ‘A plurality of transversely spaced apart vertical support elements 76 are adapted to couple

²¹ As we found *supra*, Petitioner demonstrated sufficiently that Layfield discloses the recited skirt panel. See § II.D.2.a.iii.

the arcuate element 72 to the top surface 38 of the trailer 32.” Pet. 59 (quoting Ex. 1006, 10:35–38) (citing *id.* at 10:20–64, Figs. 10, 11).

Petitioner contends Rinard “teaches that the vertical support elements 76 are made from a ‘resilient’ material.” *Id.* (citing Ex. 1006, 10:20–64).

Petitioner argues that “Rinard discloses the problem of aerodynamic fairings mounted to trailers encountering external objects that can damage the aerodynamic performance of the fairing and provides a solution (resilient supports that permit collapse of the fairing) to overcome this problem.” *Id.* at 57–58 (citing Ex. 1010 ¶ 196).

Petitioner argues that

it would have been obvious to one skilled in the art to construct the Layfield strut from a resilient material such that the strut has the capability of sustaining an elastic deformation when a load is applied against it and returning to its original shape after the load is removed as a result of its resiliency.

Id. at 60 (citing Ex. 1010 ¶ 202); *see id.* at 62–63 (citing Ex. 1010 ¶¶ 209–213) (discussing similar reasoning for other claimed aspects of the resilient strut of claim 1). Petitioner asserts “[a] skilled artisan . . . would have had a reasonable expectation of success in doing so as the materials already were disclosed by Layfield.” *Id.* at 58 (citing Ex. 1010 ¶ 197). Petitioner contends “the combination of Layfield and Rinard is merely the predictable use of interchangeable prior art elements according to their established functions.” *Id.* (citing *KSR*, 550 U.S. at 416).

Petitioner relies upon the same arguments and evidence regarding the resilient supports recited in claim 11 and resilient struts recited in claim 17. *See* Pet. 66–70 (discussing claim 11 and resilient supports); *id.* at 71–74 (discussing claim 17 and resilient struts).

As noted above, Patent Owner raises three arguments in response. First, Patent Owner contends that the combination of teachings would not result in all of the limitations of claims 1, 11, and 17. According to Patent Owner, this failure is because Layfield's fairing remains fixed and non-moving. PO Resp. 56; *see* PO Sur-reply 25–26. Patent Owner asserts “skirt panels 10, no matter their material, and support struts 58, no matter how flimsy or flexible, cannot transform the fixed panel assembly into one adapted to move.” PO Resp. 56 (citing § III.A.2 of the Patent Owner Response, referring to Patent Owner's arguments in the context of Petitioner's anticipation challenge; Ex. 2001 ¶¶ 136, 196).

Patent Owner's argument does not directly respond to Petitioner's modification of Layfield's struts and supports. Because we find that Layfield discloses the claimed flexible skirt panels, Petitioner need not rely upon Rinard to modify Layfield's panels. Accordingly, we disagree with Patent Owner and find that Petitioner's proposed combination, employing resilient materials disclosed by Layfield and Rinard, the use of which was encouraged by Rinard's disclosure,²² meets all of the limitations of claims 1, 11, and 17. *See* Pet. Reply 25–26 (arguing that each limitation is met).

Second, Patent Owner contends one of ordinary skill in the art would not have been motivated to combine Layfield and Rinard. PO Resp. 57–61.

²² Nor do we agree that even if Rinard teaches that its skirt panels are rigid (*see* PO Sur-reply 27–28 (arguing that one would not look to Rinard because *Rinard's* skirt panels are rigid)), one would not consider the benefits of using the resilient materials disclosed in Layfield and Rinard to make Layfield's struts resilient. In particular, the advantages of using resilient materials, as taught by Rinard, and argued by Petitioner, are compelling reasons as to why one of ordinary skill in the art would have made the minor modifications proposed.

Patent Owner's arguments focus on whether it would have been obvious to modify Layfield's skirt panels. *See id.*; *see also* PO Sur-reply 26–27. The premise of Patent Owner's argument, however, is Patent Owner's contention that Layfield's skirt panels are fixed and do not move. PO Resp. 58. Patent Owner contends, therefore, that if modified to be resilient, that “would change the basic principles under which [Layfield] was designed to operate and would render [Layfield] inoperable for its intended purpose.” *Id.* (internal quotations and citations omitted); *see also* PO Sur-reply 26. Again, because we find Layfield's skirt panels to be resilient, and not fixed, we disagree with the premise of Patent Owner's argument.

Additionally, Patent Owner similarly contends that the modifications proposed are redundant of Layfield's “flexible lower panel 20,” which already “allow[s] flexing when impacting a road object.” PO Resp. 59 (citing Ex. 1004, 14:13–18); *see* PO Sur-reply 26–27. We disagree. Again, the proposed modifications here are to Layfield's struts. In the context of Petitioner's anticipation challenge, we agreed with Patent Owner and found that Petitioner had not established sufficiently on the record that Layfield's struts were resilient. *See supra*, § II.D.a.i., ii. Therefore, the proposed modification addressed here, to make Layfield's struts resilient, does not duplicate the objective of Layfield's flexible lower panel 20 at least because (a) Layfield's struts are a different structure than lower panel 20 and (b) modification of Layfield's struts would provide greater impact protection to other panels aside from just lower panel 20. *See* Pet. Reply 26–27 (One of ordinary skill in the art “would have been motivated to do so because Rinard and Layfield both seek to provide fairing panels with ‘sufficient flexibility’ to bend when encountering objects.” (citing Ex. 1004, 12:67–

13:4; Ex. 1006, 10:43–50; Ex. 1055 ¶ 47)). We determine that Petitioner has shown that one of ordinary skill in the art would have had a reason with rational underpinning to look to other similar types of trailer components that are flexible to make further improvements to Layfield’s design. *See KSR*, 550 U.S. at 417 (“[I]f a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.”).

Third, Patent Owner contends one of ordinary skill in the art “would not have a reasonable expectation of success at achieving the claimed technology by looking to the vertical supports of Rinard’s air scoops to modify the Layfield skirt panels 10 and support struts 58.” PO Resp. 61 (citing Ex. 2001 ¶¶ 237–240). Patent Owner asserts that because Layfield’s upper skirt panels are rigid and non-moving one of ordinary skill in the art “would not reasonably expect the hypothetical modified panels (with their reinforcing trusses 36) to move.” *Id.* Patent Owner also argues that Rinard teaches “an upper skirt panel that is rigid and non-moving” and so it is not reasonable to expect modifying Layfield as proposed would somehow cause Layfield’s fixed skirt panels to be able to move as claimed. PO Sur-reply 27–28 (citations omitted).

We disagree for the same reasons discussed above—namely, we find Layfield’s upper skirt panels to be resilient. Therefore, one of ordinary skill in the art would have a reasonable expectation of success in achieving a resilient strut adapted as claimed by modifying Layfield’s strut in light of Rinard, for the reasons proposed by Petitioner. *See* Pet. Reply 27 (“Applying this solution to the Layfield skirt panel and struts would yield

the predictable result of allowing the Layfield skirt panel 10 and struts 58 to absorb greater impacts without having to be repaired or replaced.” (citing Ex. 1021, 7–8, 11–12)).

In view of the above, we find Petitioner has shown, by a preponderance of the evidence, that the combination of Layfield and Rinard teaches a resilient strut and resilient support and the related claimed aspects of a resilient strut and resilient support as required by independent claims 1, 11, and 17. Additionally, we find that Petitioner has demonstrated sufficiently that one of ordinary skill in the art would have had reason with rational underpinning to combine the teachings of Rinard and Layfield in the manner proposed by Petitioner with a reasonable expectation of success.

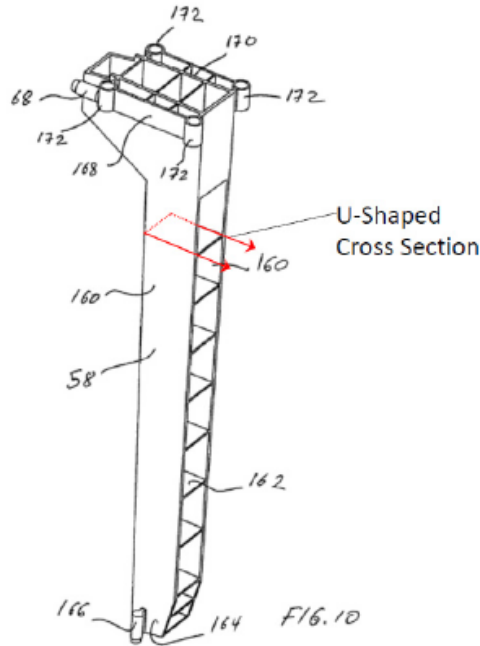
b. Dependent Claims 2 and 12

Claim 2, which depends from claim 1, recites “[t]he resilient strut of claim 1, wherein the resilient strut defines a ‘U’ shaped section.” Ex. 1001, 11:24–25. Claim 12, which depends from claim 11, recites “[t]he resilient aerodynamic skirt assembly of claim 11, wherein the resilient support defines a ‘U’ shaped section.” *Id.* at 12:12–13.

Petitioner contends Layfield discloses and renders obvious a resilient strut “defining a ‘U’ shaped section,” as recited by claim 2 (Pet. 63 (citing Ex. 1010 ¶ 215)), and a resilient support that “defines a ‘U’ shaped section,” as recited by claim 12 (*id.* at 70 (citing Ex. 1010 ¶ 244)). In its discussion of claims 2 and 12 under this ground, Petitioner refers to and incorporates its arguments directed to these claims from its anticipation challenge. *See id.* at 63, 70. In the context of Petitioner’s anticipation challenge, Petitioner asserts Layfield’s strut 58 “has an open box construction with a U-shaped

cross-section.” *Id.* at 33 (citing Ex. 1010 ¶ 110; Ex. 1004, 15:44–54, Figs. 6–10).

Petitioner provides an annotated version of Layfield’s Figure 10 showing the alleged U-shaped cross-section, as reproduced below:



Id. at 34. Layfield’s Figure 10 “is an isometric interior view of a typical support strut construction detail.” Ex. 1004, 13:55–56. Petitioner’s annotations include a red line segment on the base of the strut and two red rays extending from the base of the strut along the pair of spaced-apart vertical members 160.

Patent Owner contests Petitioner’s analysis, arguing that “Layfield’s support struts 58 are box shaped with a square or rectangular cross-section. They are not ‘U’ shaped, as Petitioners contend.” PO Resp. 48–49 (responding to Petitioner’s arguments in the context of its anticipation challenge) (citations omitted); *see id.* at 62 (responding to Petitioner’s arguments in the context of its obviousness challenge).

In Reply, Petitioner asserts that Layfield's cross-section is only rectangular when taken through a cross-member 162. Pet. Reply 22. Rather, Petitioner argues that "[a]long its length between adjacent cross-members 162, the Layfield strut 58 has a three-sided, U-shape." *Id.* Petitioner also responds to Dr. Micklow's deposition testimony, wherein Dr. Micklow had the following opinion:

Q And is – that shape is a U shape, isn't it?

A No, it's not the U shape, which is in the '017 patent.

Q Is it a U shape?

A It doesn't have the continuous radius of curvature that you see in the '017 patent.

Q Must it have that in order for it to be a U-shaped portion, according to the claims in the '017 patent?

A To be able to achieve the increase in stiffness, most definitely, yes.

Ex. 1052, 181:10–23. Petitioner asserts that "a continuous radius of curvature" "is not found in the challenged claims and is contrary to the [broadest reasonable interpretation] of "'U' shaped section." Pet. Reply 22 (citing Ex. 1055 ¶ 25).

In its Sur-reply, Patent Owner restates its argument that "an open box shape" is contrary to the broadest reasonable interpretation of "'U'-shaped section" (PO Sur-reply 19–10), relying upon its construction that a U-shape must have a curved portion (*id.* at 3–4).

As explained in § II.B.4, we determined that the broadest reasonable interpretation standard does not expand the meaning of the claim language such that it would encompass *generally* U-shaped section or *substantially* U-shaped section. Rather, "U' shaped section" means a section shaped as a

U, which requires a curvature²³ because a U is curved. *See supra* § II.B.4. Because the cross-section in Layfield identified by Petitioner is not curved, Petitioner has not established that Layfield teaches a U-shaped cross-section. Additionally, Petitioner does not propose any modification to Layfield’s cross-section or raise an argument explaining why a U-shaped section would have been obvious to one of ordinary skill in the art. Pet. 70.

Accordingly, we find that Petitioner has failed to demonstrate sufficiently that the combination of Layfield and Rinard teaches or suggests a U-shaped section as recited in claims 2 and 12.

c. Dependent Claims 3, 4, 13, and 14

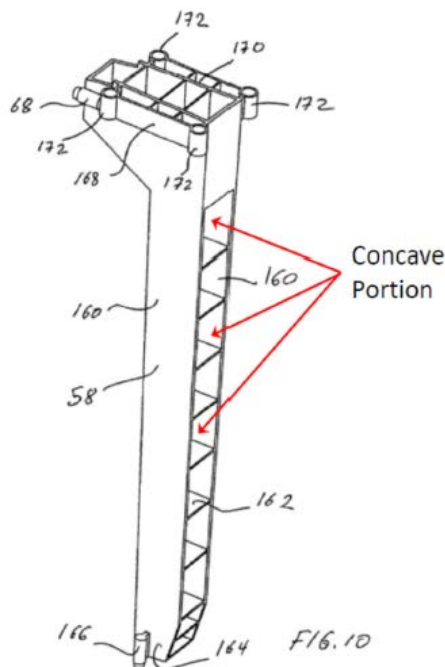
Claim 3 depends from claim 1 and further recites “wherein the resilient strut has a substantially rectangular section including a concave portion adapted to increase the stiffness of the resilient strut.” Ex. 1001, 11:26–28. Claim 4 depends from claim 3 and further defines the concave portion—“wherein the concave portion is uneven along the resilient strut.” *Id.* at 11:29–30. Claim 13 depends from claim 11 and further recites “wherein the resilient support has a substantially rectangular section including a concave portion adapted to increase the stiffness of the resilient strut.” *Id.* at 12:14–17.²⁴ Claim 14 depends from claim 13 and, similar to

²³ We need not take a position on whether a specific or continuous radius of curvature is required because resolving that question is not necessary to resolve the issue before us as neither party contends Layfield’s strut has a curved cross-section. *Cf.* Tr. 22:7–15 (Petitioner’s counsel acknowledges that there is no evidence in the record that the cross-section of Layfield’s strut is curved.).

²⁴ Claims 11 and 13 refer, interchangeably, to “resilient support” and “resilient strut.” Ex. 1001, 11:46–12:10 (claim 11); *id.* at 12:14–17 (claim 13).

claim 4, further defines the concave portion—“wherein the concave portion is uneven along the resilient support.” *Id.* at 12:18–20.

Petitioner contends Layfield’s strut teaches the concave portion recited by claims 3, 4, 13, and 14. Pet. 34–35 (claim 3), 35–36 (claim 4), 49 (claims 13 and 14). Reproduced below is Petitioner’s annotated version of Layfield’s Figure 10 showing the portions identified as “concave”:



Id. at 35. Layfield’s Figure 10 “is an isometric interior view of a typical support strut construction detail.” Ex. 1004, 13:55–56. Petitioner’s annotations include three red rays identifying the locations where Petitioner contends Layfield’s strut is concave. Specifically, Petitioner argues “[t]he area between adjacent cross-members 162, namely where the strut 58 has a U-shaped cross section, constitutes a ‘concave portion.’” Pet. 35 (citing Ex. 1010 ¶ 112).

Patent Owner raises two arguments in response. First, Patent Owner asserts that “[t]he portion of Layfield’s support struts 58 identified by

Petitioner[] and Mr. Tres is simply an empty space of the open-box construction; not a concave portion.” PO Resp. 49. Second, Patent Owner argues that Petitioner provides “no evidence or explanation for how these open, empty spaces ‘are adapted to increase the stiffness of the resilient strut’ as also required by dependent claims 3, 4, 13, and 14.” *Id.* at 50 (citing Ex. 1010 ¶ 113). To the contrary, Patent Owner contends “open, empty spaces would not increase the stiffness of Layfield’s support struts 58.” *Id.* (citing Ex. 2001 ¶ 207).

In its Reply, Petitioner contends that the hollow interior identified in Layfield’s strut constitutes a concave portion and that the “open box structure disclosed in Layfield has increased stiffness relative to what it would have if the strut 58 would have included only the base.” Pet. Reply 22–23 (citing Ex. 1055 ¶ 26).

As explained in § II.B.3, we determined that the broadest reasonable interpretation of “concave portion” “requires a curved or rounded inward portion.” *See supra* § II.B.3. Because Petitioner has not identified a curved or rounded inward portion in Layfield’s strut, those open areas do not teach or suggest a “concave portion.”

Petitioner, however, also contends that “the ’017 patent states no preference or criticality regarding the resilient strut having a rectangular section including a concave portion adapted to increase the stiffness of the resilient strut.” Pet. 64. Thus, Petitioner asserts “this feature is alternatively an obvious design choice which could be based on aerodynamic considerations regarding keeping the skirt panel in an aerodynamic position during use as disclosed by Layfield, for example.” *Id.* (citing Ex. 1010 ¶ 216; Ex. 1004, 12:67–13:4).

Patent Owner counter-argues that Petitioner must set forth more than a mere conclusory statement to establish a reason that would have prompted one of ordinary skill in the art to make the changes proposed. PO Sur-reply 63 (citing *Purdue Pharma L.P. v. Depomed, Inc.*, 643 F. App'x 960, 965 (Fed. Cir. 2016)). Patent Owner contends that Petitioner did not do so here. *Id.* at 63–64.

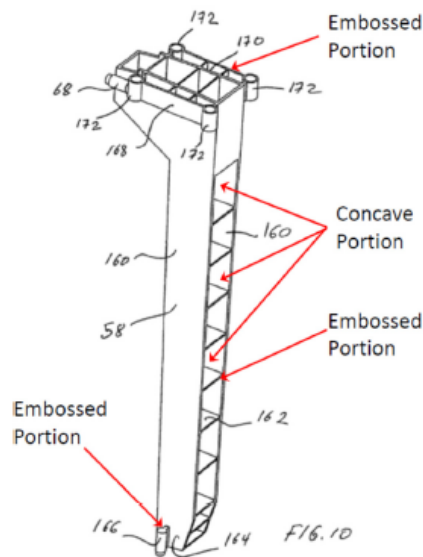
We agree with Patent Owner that Petitioner does not explain sufficiently the reason one of ordinary skill in the art would have been motivated to make the changes contemplated. *See Polaris Indus., Inc. v. Arctic Cat, Inc.*, 882 F.3d 1056, 1069 n.4 (Fed. Cir. 2018) (citing *Cutsforth, Inc. v. MotivePower, Inc.*, 636 F. App'x 575, 578 (Fed. Cir. 2016)) (“merely stating that a particular placement of an element is a design choice does not make it obvious”). In particular, Petitioner does not explain why one of ordinary skill in the art would have modified Layfield’s strut to include a concave portion based on “aerodynamic considerations” or how such a change would have influenced the aerodynamics of the skirt panel. Pet. 64. Mr. Tres’s testimony mirrors Petitioner’s argument and does not offer any additional reason or explanation for the proposed change. *See* Ex. 1010 ¶¶ 216–217.

Accordingly, we find that Petitioner has failed to demonstrate sufficiently that (1) the combination of Layfield and Rinard teaches or suggests a concave portion as recited in claims 3, 4, 13, and 14 and (2) that one of ordinary skill in the art would have had a reason with rational underpinning to modify Layfield’s strut to include a concave portion.

d. Dependent Claims 5 and 15

Claim 5 depends from claim 1 and further recites “wherein the resilient strut includes an embossed portion thereon.” Ex. 1001, 11:31–32. Claim 15 depends from claim 11 and further recites “wherein the resilient support includes an embossed portion thereon.” *Id.* at 12:21–23.

Petitioner alleges that Layfield’s strut discloses at least three different “embossed portion[s]”: (1) lattice 170; (2) the outer edges of the cross-members 162; and (3) screw points 166. Pet. 36–37. Petitioner provides the following annotated version of Layfield’s Figure 10 identifying the embossed portions:



Pet. 37. Layfield’s Figure 10 “is an isometric interior view of a typical support strut construction detail.” Ex. 1004, 13:55–56. Petitioner’s annotations include three red arrows identifying the three “[e]mbossed [p]ortion[s]” of Layfield’s strut. Pet. 37. Petitioner’s annotations also include three red arrows indicating where Petitioner identifies allegedly “[c]oncave [p]ortion[s],” as discussed above in the context of claims 3, 4, 13, and 14. *Id.*

Petitioner explains that because each of these components “stands out in relief relative to the area surrounding it,” each discloses an embossed portion. *Id.* Additionally, Petitioner argues that “the ’017 patent states no preference or criticality regarding the resilient strut having an embossed portion thereon. As such, this feature is considered to be obvious as a design expedient, which could be based on manufacturing preferences, aerodynamic considerations, or aesthetics, for example.” *Id.* at 65 (citing Ex. 1010 ¶ 220).

Patent Owner contends that one of ordinary skill in the art would not have considered any of these elements of Layfield’s struts as constituting an embossed portion because they “are formed by injection molding, not embossing.” PO Resp. 51 (citing Ex. 1004, 18:40–43). Patent Owner asserts that Layfield does not disclose an embossing step when describing the manufacturing steps involved with the “Injection Moulded Panel Method.” *Id.* at 52 (citing Ex. 2007, 13; Ex. 2001 ¶ 211).

In its Reply, Petitioner contends that “it is improper to require the Layfield strut 58 to be made by a particular process.” Pet. Reply 23 (citing *Purdue Pharma L.P. v. Epic Pharma, LLC*, 811 F.3d 1345, 1354 (Fed. Cir. 2016)). Petitioner asserts that the focus should be on the resulting structure as opposed to the process by which it was formed. *Id.* Since the structural features identified are “raised relative to the area surrounding them,” they “stand out” and, therefore, should constitute “embossed portion[s].” *Id.* (citing *Purdue Pharma*, 811 F.3d at 1354, for the proposition that “[i]f the product in a product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process”).

In its Sur-reply, Patent Owner contends that “molding does not yield an ‘embossed portion.’” PO Sur-reply 22. Patent Owner, therefore, argues that because each of the structures identified by Petitioner are manufactured by Layfield’s molding process, none discloses or renders obvious an “embossed portion.” *Id.* at 21–22.

As explained in § II.B.2, we determined that the broadest reasonable interpretation of “embossed portion” means “a portion manufactured by embossing,” and that “emboss” means “carve or mold a design on (a surface) so that it stands out in relief.” *See supra* § II.B.2. Therefore, we construed “embossed portion” to mean “a portion carved or molded on a surface so that it stands out in relief.” *Id.*

Neither party contends that Layfield expressly discloses any portion of its strut as having been formed by “embossing.” Nonetheless, the definition of embossing that we have adopted includes a portion molded on a surface so that it stands out in relief. Under this construction, we find that each of the three structures identified by Petitioner teaches or suggests an “embossed portion.”

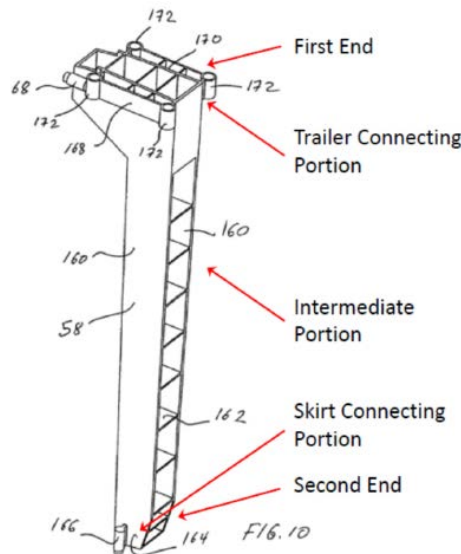
Additionally, to the extent the meaning of “embossed portion” should be limited to a product manufactured by an embossing technique that does not include molding on a surface (e.g., one in which a component is indented or pressed outward as proposed by Dr. Micklow (*see* Ex. 2001 ¶ 70)), we also find that, as product claims, the critical question is whether a structure produced by embossing would be the same as or rendered obvious by the structures identified by Petitioner in Layfield. *See Purdue Pharma*, 811 F.3d at 1354 (“If the product in a product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even

though the prior product was made by a different process.”) (internal quotation and citation omitted). Here, neither party has argued any differences exist such that the structures identified by Petitioner are not the same as or would not render obvious the recited “embossed portion.” Accordingly, for this additional reason, we find that each of the structures identified by Petitioner teaches or suggests an “embossed portion.”

e. Dependent Claim 7

Claim 7 depends from claim 1 and further recites “wherein the trailer connecting portion and the skirt connecting portion are angularly extending from respective ends of the intermediate portion.” Ex. 1001, 11:35–37.

Petitioner provides the following annotated version of Layfield’s Figure 10 identifying the limitations of claim 7:



Pet. 38. Layfield’s Figure 10 “is an isometric interior view of a typical support strut construction detail.” Ex. 1004, 13:55–56. Petitioner’s annotations include five red arrows identifying various parts of Layfield’s strut, including (1) a first end, (2) a trailer connecting portion, (3) an

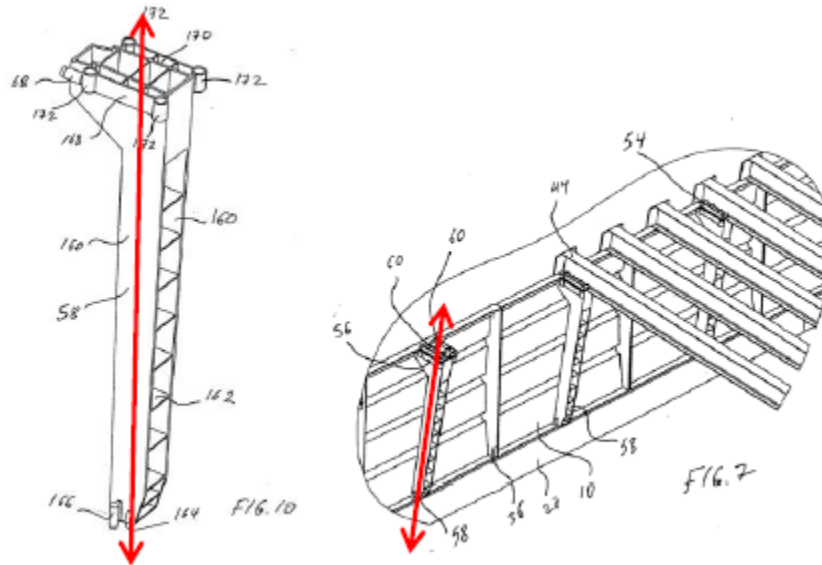
intermediate portion, (4) a skirt connecting portion, and (5) a second end.
Pet. 38.

Petitioner explains the following: “The Layfield strut 58 has a first end 168 with a trailer connecting portion 168, a second end 164, with a skirt connecting portion 166, and an intermediate portion between the first end 168 and the second end 164.” *Id.* (citing Ex. 1004, 9:51–58, 15:49–54, 15:47–49, Figs. 6–10). Petitioner contends “strut 58 includes an upper edge 168 for connecting the strut 58 to an I-beam 44 of the trailer.” *Id.* at 39 (citing Ex. 1004, 15:19–34, 15:49–52, Figs. 8, 8A, 10). Petitioner argues that “[t]he upper edge 168 angularly extends from the adjacent end of the intermediate portion.” *Id.* With respect to the second end, Petitioner asserts “[t]he strut 58 includes a lower edge 164 with structure for connecting the face panel to the strut. The lower edge 164 and the screw points 166 angularly extend from the adjacent end of the intermediate portion.” *Id.* (citing Ex. 1004, 9:51–53, 15:44–54, 15:47–49, Fig. 10).²⁵

Patent Owner contends “[c]onnecting portions of Layfield’s struts 58—at screw points 172 (top) and screw points 166 (bottom)—extend

²⁵ Petitioner’s discussion of claim 7, in the context of its obviousness challenge, incorporates the same arguments from its anticipation challenge without adding more. See Pet. 65.

linearly from its intermediate portion,” as shown in Patent Owner’s annotated versions of Layfield’s Figures 2 and 10, reproduced below:

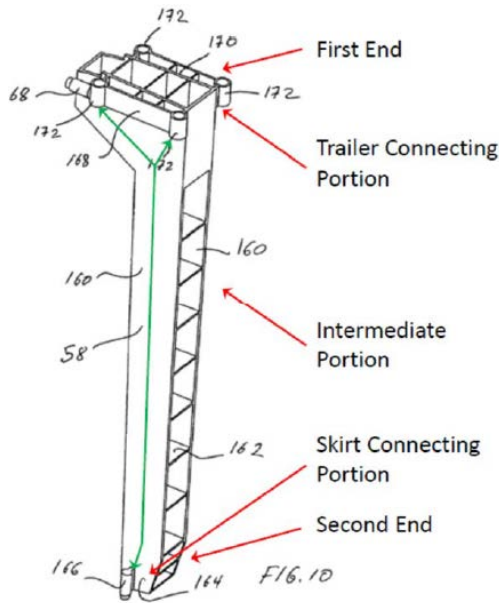


PO Resp. 52–53 (citing Ex. 1004, Figs. 7, 10; Ex. 2001 ¶¶ 216–219). Layfield’s Figure 10 “is an isometric interior view of a typical support strut construction detail.” Ex. 1004, 13:55–56. Layfield’s Figure 4 is an “isometric interior underside view of a portion of a tractor-trailer rig having a plurality of contiguous skirt panels . . . attached thereto.” *Id.* at 13:28–30. Patent Owner annotated each figure to add a red line extending vertically from the top to bottom of Layfield’s strut. PO Resp. 52.

Patent Owner asserts that “[e]ven if screw points 68 at the top of . . . Layfield’s support strut is a ‘skirt connecting portion’ that ‘angularly extends’ from the intermediate portion [of] the strut, Layfield’s ‘trailer connecting portion’ (screw points 172) does not.” *Id.* at 53 (citing Ex. 2001 ¶ 217).

In its Reply, Petitioner explains “screw points 166 and 172 are positioned at an oblique angle with respect to the axis of [the] intermediate

portion of the strut 58.” Pet. Reply 24. Petitioner provides another annotated version of Layfield’s Figure 10, illustrating the oblique angles:



Id. Layfield’s Figure 10 “is an isometric interior view of a typical support strut construction detail.” Ex. 1004, 13:55–56. Petitioner’s annotations include green arrows (in addition to the red arrows and annotations described with respect to the Figure 10 included in the Petition) showing the oblique angles. Pet. Reply 24.

In its Sur-reply, Patent Owner focuses on the second end of Layfield’s strut and Petitioner’s annotations, asserting that Petitioner’s annotated Figure 10 includes “an artificial angle between the ‘intermediate portion’ of the strut 58 and the ‘skirt connecting portion.’” PO Sur-reply 22–23 (citing Pet. Reply 24). Patent Owner contends “[t]here is no such angle in Layfield’s support strut 58” because the strut “extends linearly from the I-beams to the base of the skirt panel.” *Id.* at 23–24 (citing Ex. 1004, Figs. 7, 10; Ex. 2001 ¶¶ 216–219).

To begin, neither claim 1 nor claim 7 explicitly defines the contours of what is considered the intermediate, trailer connecting, or skirt connecting portions of the strut. Taken at its most literal meaning, the connecting portions are precisely that, the portions which connect to either the trailer or skirt. Those portions of the strut include the screw points at each end of the strut as those are the portions that connect to either the trailer or skirt. The intermediate portion is some or all of the portion between the two connecting portions. During the oral hearing, Petitioner clarified that the angular extension shown by the green arrows is meant to illustrate a three-dimensional extension out of the page, as well as being offset. Tr. 25:14–16. As shown in Layfield’s Figure 10 and as illuminated by Petitioner’s annotations (Pet. Reply 24), screw points 68 and 166 angularly extend from respective ends of the intermediate portion because each is at an angle to the intermediate portion.

Accordingly, we find that Petitioner has established sufficiently that Layfield’s strut discloses the limitations of claim 7.

f. Dependent Claims 19 and 20

Claim 19 depends from claim 17 and further recites “wherein the skirt panel comprises fiber reinforced polypropylene.” Ex. 1001, 12:53–54. Petitioner contends “Layfield discloses that the face panel is made from a thermoplastic material, including glass reinforced [polypropylene].” Pet. 55 (citing Ex. 1004, 8:20–22, 12:46–48, 18:34–39). Petitioner asserts “[o]ne of ordinary skill in the art would have understood that glass reinforced [polypropylene] constitutes fiber reinforced polypropylene.” *Id.* (citing Ex. 1010 ¶ 185).

Claim 20 depends from claim 17 and further recites “wherein the skirt panel comprises a polypropylene component and a woven component.” Ex. 1001, 12:55–57. Petitioner contends “Layfield discloses that the face panel is made from a thermoplastic material, including [polypropylene], PC/ABS, and glass reinforced [polypropylene].” Pet. 55 (citing Ex. 1004, 8:20–22, 12:46–48, 18:34–39). Petitioner asserts “[o]ne skilled in the art would have understood that the polypropylene material disclosed by Layfield includes one having a polypropylene component and a woven component.” *Id.* (citing Ex. 1010 ¶ 188). Mr. Tres explains further that “one skilled in the art would appreciate that the disclosure of [polypropylene] includes polypropylene that has been recovered by recycling which includes a woven component.” Ex. 1010 ¶ 188. Therefore, Mr. Tres concludes that one of ordinary skill “would have known that such material *can* include a woven component.” *Id.* (emphasis added).

Additionally, Petitioner argues that since the ’017 patent states no preference or criticality regarding the skirt panel comprising a polypropylene component and a woven component . . . [,] this feature is considered to be obvious as a design expedient, using a known material to produce a predictable result, which could be based on cost, weight or aerodynamic considerations or aesthetics, for example. Pet. 75 (citing Ex. 1010 ¶ 263).

Patent Owner contends that Layfield fails to disclose that its skirt panels may comprise either fiber reinforced polypropylene or a polypropylene component and a woven component. PO Resp. 53 (citations omitted). Patent Owner asserts that Layfield’s skirt panels could not be manufactured to comprise either material because “[a] monolithic skirt panel,” which Patent Owner contends is the panel described by Layfield

formed by injection molding, “does not permit for the alignment of long fibers that are necessarily present in fiber reinforced polypropylene or a woven component.” *Id.* at 53–54 (citing Ex. 2001 ¶ 223).

Additionally, in response to Mr. Tres’s testimony, Patent Owner argues that “Layfield does not describe recovering polypropylene by recycling” and “recycled polypropylene would never include a woven component, which requires an additional physical step of weaving that does not occur through recycling.” *Id.* at 54 (citing Ex. 1004, 8:20–22, 12:46–48, 18:34–39; Ex. 2001 ¶¶ 220–224).

Layfield states: “By an aspect of all the method embodiments of the present invention, the thermoplastic material can be TPO, HMWPE, PP, PC/ABS, glass reinforced PP or glass reinforced ABS.” Ex. 1004, 12:46–48. Patent Owner does not contest Mr. Tres’s opinion that glass reinforced polypropylene is a fiber reinforced polypropylene. Rather, Patent Owner’s argument is focused on Layfield’s failure to disclose the phrase “fiber reinforced polypropylene” and Layfield’s manufacturing technique (injection molding), contesting whether fiber reinforced polypropylene skirt panels could be produced using that method. PO Resp. 53–54.

Accordingly, because it is undisputed that Layfield teaches glass reinforced polypropylene as a material that could be used for the skirt panels, and we credit Mr. Tres’s testimony that glass reinforced polypropylene is a fiber reinforced polypropylene,²⁶ we find that Layfield teaches the limitations of claim 19.

²⁶ We do not read Dr. Micklow’s testimony as contesting that glass reinforced polypropylene is a fiber reinforced polypropylene; rather, his testimony focuses on the manufacturing process disclosed in Layfield and

As to claim 20, however, Petitioner's position is based on Mr. Tres's opinion that polypropylene recovered by recycling "*can* include a woven component." Ex. 1010 ¶ 188 (emphasis added). Petitioner and Mr. Tres thus take two inferential leaps to connect Layfield's disclosure to claim 20: (1) that the mention of polypropylene includes polypropylene recovered by recycling and (2) that recycled polypropylene *can* include a woven component. Dr. Micklow testifies that polypropylene recovered by recycling would never include a woven component because "[a] woven component requires an additional, physical step of weaving which does not occur through recycling." Ex. 2001 ¶ 223. Although we did not credit Dr. Micklow's testimony regarding claim 19, because of the express disclosure in Layfield, his testimony is more persuasive in the context of claim 20 where (1) Layfield does not expressly disclose a woven component included with polypropylene and (2) Petitioner's analysis requires two inferential leaps, at least one of which is attenuated by the mere possibility that recycled polypropylene *can* include a woven component. Accordingly, we find that Petitioner has not established sufficiently that Layfield teaches a skirt panel comprised of a polypropylene component and a woven component, as recited by claim 20.

Petitioner raises an additional argument directed to claim 20, i.e., that it would have been obvious to use a polypropylene component and a woven component in Layfield's skirt panels because the components are "obvious as a design expedient, using a known material to produce a predictable result, which could be based on cost, weight or aerodynamic considerations

opinion on what is "typical" regarding "continuous fibre-reinforced plastics." See Ex. 2001 ¶ 222.

or aesthetics, for example.” Pet. 75 (citing Ex. 1010 ¶ 263). Petitioner’s argument, however, suffers from the same deficiencies discussed above regarding “concave portion.” Namely, Petitioner does not explain sufficiently the reason one of ordinary skill in the art would have been motivated to make the changes contemplated. *See Polaris Indus.*, 882 F.3d at 1069 n.4 (citing *Cutsforth*, 636 F. App’x at 578) (“merely stating that a particular placement of an element is a design choice does not make it obvious”). In particular, Petitioner does not explain specifically how or why “cost, weight, or aerodynamic considerations or aesthetics” would have led one of ordinary skill in the art to modify Layfield’s strut to include a woven component and a polypropylene component. Mr. Tres’s testimony mirrors Petitioner’s argument and does not offer any additional reason or explanation for the proposed change. *See* Ex. 1010 ¶¶ 263–264.

Further, it does not appear that Petitioner has identified a disclosure of a “woven component” in either Layfield or Rinard. As such, we find that Petitioner has not established that a woven component is taught or suggested by the prior art relied upon by Petitioner.

Accordingly, for each of these reasons, we find that Petitioner has not established sufficiently that one of ordinary skill in the art would have modified Layfield’s skirt panel materials to comprise “a polypropylene component and a woven component,” as recited by claim 20.

g. Dependent Claims 6, 8–10, 16, and 18

Claims 6 and 8–10 depend from claim 1; claim 16 depends from claim 11, and claim 18 depends from claim 17. Petitioner relies entirely on Layfield as disclosing the limitations of these claims in its anticipation challenge. *See* Pet. 37 (citing Ex. 1004, 8:17–24, 18:40–43; Ex. 1010

¶¶ 121–122) (claim 6), 39–40 (citing Ex. 1004, 15:45–47, Fig. 10; Ex. 1010 ¶¶ 127–128) (claim 8), 40 (citing Ex. 1004, 18:40–43; Ex. 1010 ¶¶ 129–130) (claim 9), 40–41 (citing Ex. 1010 ¶¶ 131–134) (claim 10), 50 (citing Ex. 1010 ¶ 165) (claim 16), 34 (citing Ex. 1010 ¶ 184) (claim 18). In the context of its obviousness challenge to these claims, Petitioner incorporates each of its arguments from its anticipation challenge. See Pet. 65 (claims 6 and 8), 66 (claims 9 and 10²⁷), 71 (claim 16), 75 (claim 18). Patent Owner does not raise additional arguments directed to the limitations expressly recited by these dependent claims. Accordingly, Patent Owner has waived any additional argument in support of patentability directed to the limitations of these claims. See Paper 9 (Scheduling Order), 5 (“Patent Owner is cautioned that any arguments for patentability not raised in the response may be deemed waived.” (emphasis omitted)).

We have reviewed Petitioner’s arguments and evidence and we find that Petitioner has shown, based on the reasons and evidence set forth in the Petition and the First Tres Declaration, as cited above, and our determination regarding the independent claims from which these claims depend, that the combination of Layfield and Rinard teaches or suggests the limitations of dependent claims 6, 8–10, 16, and 18.

4. *Objective Indicia of Nonobviousness*

Neither party presents evidence of objective indicia of nonobviousness.

²⁷ Petitioner also argues that the limitations of claim 10 would have been obvious in light of the combination of Layfield and Rinard. Pet. 66.

5. *Weighing the Graham Factors*

“Once all relevant facts are found, the ultimate legal determination [of obviousness] involves the weighing of the fact findings to conclude whether the claimed combination would have been obvious to an ordinary artisan.” *Arctic Cat*, 876 F.3d at 1361. On balance, considering the full record before us, we determine that Petitioner shows, by a preponderance of the evidence, that the combination of Layfield and Rinard would have rendered the subject matter of claims 1, 5–11, and 15–19 obvious to one of ordinary skill in the art at the time of the invention. We also determine, on balance and considering the full record before us, that Petitioner has not shown, by a preponderance of the evidence, that the combination of Layfield and Rinard would have rendered the subject matter of claims 2–4, 12–14, and 20 obvious to one of ordinary skill in the art at the time of the invention.

III. SUMMARY²⁸

For the reasons discussed above, Petitioner has not demonstrated, by a preponderance of the evidence, that (1) claims 1–20 are anticipated by Layfield or that (2) claims 2–4, 12–14, and 20 would have been obvious over the combination of Layfield and Rinard. For the reasons discussed above, Petitioner has demonstrated, by a preponderance of the evidence, that

²⁸ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner’s attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

claims 1, 5–11, and 15–19 would have been obvious over the combination of Layfield and Rinard. The chart below summarizes our conclusions.

Claims Challenged	35 U.S.C. §	References	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–20	102(a), (e)(1), (e)(2)	Layfield		1–20
1–20	103(a)	Layfield, Rinard	1, 5–11, 15–19	2–4, 12–14, 20
Overall Outcome			1, 5–11, 15–19	2–4, 12–14, 20

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, based on a preponderance of the evidence, claims 1, 5–11, and 15–19 of U.S. Patent No. 8,449,017 B2 (“the ’017 patent”) have been proven unpatentable;

FURTHER ORDERED that, based on a preponderance of the evidence, claims 2–4, 12–14, and 20 of the ’017 patent have not been proven unpatentable;

FURTHER ORDERED that, pursuant to 35 U.S.C. § 318(b), upon expiration of the time for appeal of this Final Written Decision, or the termination of any such appeal, a certification shall issue cancelling claims 1, 5–11, and 15–19 and confirming the patentability of claims 2–4, 12–14, and 20 of the ’017 patent; and

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

IPR2018-01319
Patent 8,449,017 B2

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