

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

POSCO,
Petitioner,

v.

ARCELORMITTAL,
Patent Owner.

IPR2019-01275
Patent 9,708,683 B2

Before CHRISTOPHER L. CRUMBLEY, MICHELLE N. ANKENBRAND,
and DEBRA L. DENNETT, *Administrative Patent Judges*.

ANKENBRAND, *Administrative Patent Judge*.

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

I. INTRODUCTION

This is a Final Written Decision in an *inter partes* review challenging the patentability of claims 1–11 (collectively, the “challenged claims”) of U.S. Patent No. 9,708,683 B2 (“the ’683 patent,” Ex. 1001). We have jurisdiction under 35 U.S.C. § 6. We issue this Final Written Decision under

35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, we determine that Petitioner demonstrates, by a preponderance of the evidence, that the challenged claims are unpatentable.

A. Procedural History

POSCO (“Petitioner”) filed a Petition (Paper 2, “Pet.”) requesting an *inter partes* review under 35 U.S.C. § 311. ArcelorMittal (“Patent Owner”) filed a Preliminary Response. Paper 5 (“Prelim. Resp.”). On January 8, 2020, we instituted an *inter partes* review of the challenged claims. Paper 7 (“Institution Decision” or “DI”).

Following institution, Patent Owner filed a Response (Paper 18, “Resp.”), Petitioner filed a Reply (Paper 23, “Reply”), and Patent Owner filed a Sur-reply (Paper 24, “Sur-reply”).

Petitioner relies on the Declaration of Michael Miles, Ph.D. (Ex. 1003), and submitted a Rebuttal Declaration (Ex. 1051) from Dr. Miles and a Declaration of Jinkeun Oh (Ex. 1066) with its Reply. Patent Owner took cross-examination testimony of Dr. Miles via deposition and filed the transcript (Ex. 2011).

Patent Owner relies on the Second Declaration of Dr. Anthony J. DeArdo (Ex. 2010) in its Response. Petitioner took cross-examination testimony of Dr. DeArdo via deposition and filed the transcript (Ex. 1052).

We heard oral argument on October 7, 2020, and the record includes a transcript of the argument. Paper 30 (“Tr.”).

B. Related Matters

The ’683 patent is a divisional of U.S. Application No. 12/447,777, filed March 18, 2011, which issued as U.S. Patent No. 8,307,680 on November 13, 2012. Paper 4, 2. Patent Owner identifies additional United

States patent applications that are either continuation applications of the '683 patent or claim the benefit of the '683 patent. *Id.*

C. The '683 Patent

The '683 patent issued on July 18, 2017. Ex. 1001, at [45]. The '683 patent relates to, among other things, coated steels and stamped products prepared from coated steels. *Id.* at 1:18–22. According to the Specification, “the use of pre-coated steels in hot-stamping processes for the shaping of parts has become important, especially in the automotive industry.” *Id.* at 1:40–42. Main steps for making the parts include: pre-coating steel sheets by hot dipping, trimming or cutting the sheets to form blanks, heating the blanks “to obtain alloying of the steel substrate with the pre-coating, as well as the austenitizing of the steel, and “[h]ot forming followed by rapid cooling of the part in order to obtain predominantly martensitic structures.” *Id.* at 1:43–50.

The parts obtained after heating and rapid cooling “display very high mechanical resistance and may be used for structural applications” in the automotive industry. *Id.* at 2:6–9. Such parts frequently are welded with others and, therefore, require high weldability. *Id.* at 2:9–27. The '683 patent states that “[t]here remains a need for coated steels which may be conveniently used to prepare shaped parts by a stamping process” “which are suitable for welding.” *Id.* at 2:28–34.

The Specification explains that the inventors have discovered that: (1) controlling “the homogeneity of the pre-coating thickness over the entire sheet within given tolerances is an important factor for obtaining the desired degree of intermetallic alloying”; (2) “particularly good weldability of aluminized and hot stamped parts is associated with a special succession of coating layers on the parts, proceeding from the steel substrate outwards”;

and (3) “a specific combination of transfer time between the heating furnace and the stamping die, the amount of deformation during stamping, the temperature of stamping, [and] the cooling rate of the product during stamping” results in a fabricated part “with a fully homogeneous martensitic structure.” *Id.* at 2:57–3:6, 6:14–30 (describing the layers), 7:7–46 (describing preferred heating, heating rate, and dwell time conditions for obtaining favorable layer deposition), 7:47–51 (explaining that “[a] special advantage arises from pre-coatings” with a thickness between 20 and 33 micrometers), 7:52–56 (describing the hot forming and cooling processes during stamping).

Figure 1 depicts “a preferred embodiment of an invention coated part, after heat treatment and stamping.” *Id.* at 3:57–58. We reproduce Figure 1 below.

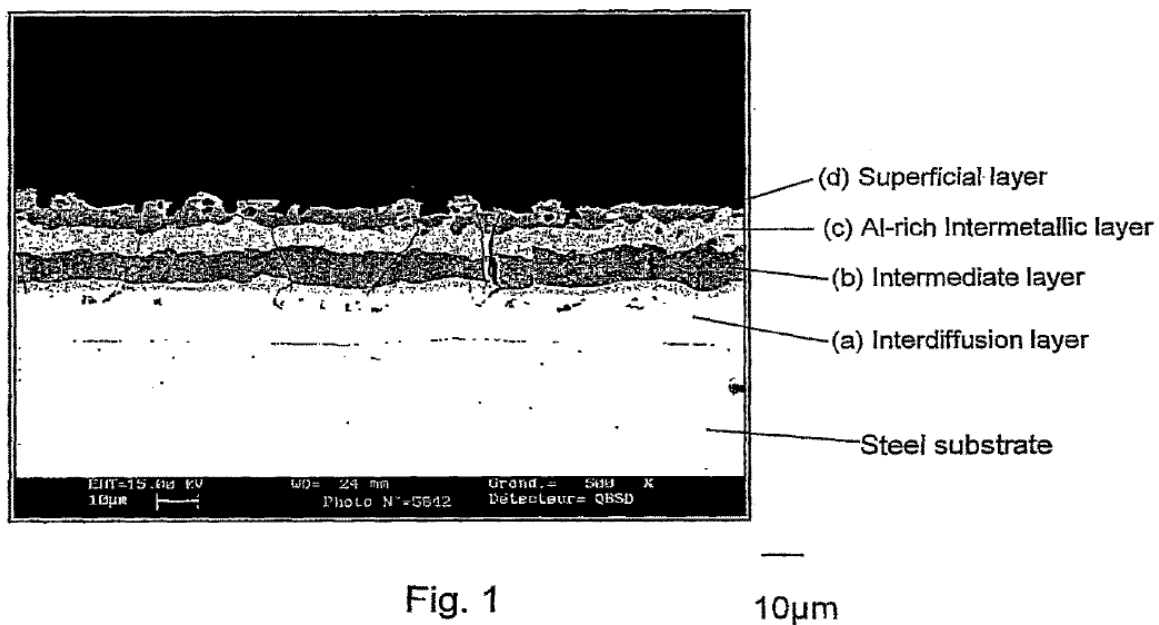


Figure 1 is a photo of a coated part after heat treatment and stamping, depicting the order of coating layers on a steel substrate is, proceeding from the substrate outwards: (a) interdiffusion layer; (b) intermediate layer;

(c) intermetallic layer; and (d) superficial layer. *Id.* at 3:58–61. “This arrangement is particularly favorable for the further welding of the part.” *Id.* at 3:61–62.

D. Illustrative Claim

Claim 1 is the only independent claim and illustrative of the claimed subject matter. Claim 1 recites:

1. A coated steel stamped product, which comprises:
 - (a) a strip of base steel having a first side and a second side; and
 - (b) a coating on at least one of said first side of said strip of base steel and said second side of said strip of base steel,wherein:
 - (i) said coating results from the interdiffusion between said base steel, and aluminum or aluminum alloy pre-coating, and
 - (ii) wherein said coating comprises, proceeding from the base steel outwards:
 - (a) an Interdiffusion layer,
 - (b) an Intermediate layer,
 - (c) an Intermetallic layer, and
 - (d) a Superficial layer,wherein said coating has a thickness greater than 30 micrometers and wherein said layer (a) has a thickness less than 15 micrometers.

Ex. 1001, 15:21–39.

Claims 2–11 depend directly from claim 1. Claim 2 recites that layers (c) and (d) are quasi continuous by occupying at least 90% of a level corresponding to each layer and limits layer (c) to less than 10% at an extreme surface of the product. *Id.* at 15:40–44. Claims 3–6 recite

components and compositions of the steel in the strip and claim 7 recites a composition of the aluminum or aluminum alloy pre-coating. *Id.* at 15:45–16:36. Claim 8 recites a land motor vehicle comprising the heat treated coated steel product. *Id.* at 16:37–38. Claim 9 recites a hot formed product with a strain higher than 10% and a cooling rate higher than 50°C/s. *Id.* at 16:39–41. Claim 10 recites a coated stamped steel product wherein the product includes a full martensitic structure. *Id.* at 16:42–43. Claim 11 recites a layer (a) thickness of less than 10 micrometers. *Id.* at 16:44–46.

E. The Instituted Grounds of Patentability

We instituted an *inter partes* review of the challenged claims on the following grounds of unpatentability:

Claim(s) Challenged	35 U.S.C. §¹	Reference(s)/Basis
1, 2	102	Cornette ²
8, 11	103	Cornette
3, 4, 6, 7, 10	103	Cornette, Laurent ³
11	103	Cornette, Laurent, EP Laurent, ⁴ FR Laurent ⁵

¹ Because the claims at issue have an effective filing date before March 16, 2013, the effective date of the applicable provisions of the Leahy Smith America Invents Act, Pub. L. No. 112–29, 125 Stat. 284 (2011) (“AIA”), we apply the pre-AIA versions of 35 U.S.C. §§ 102, 103 in this decision.

² C. Cornette et al., *High Strength Steels for Automotive Safety Parts*, Society of Auto. Engineers, Inc. (2001) (Ex. 1004)

³ US 6,296,805 B1, issued Oct. 2, 2001 (Ex. 1008).

⁴ EP 1 013 785 B1, issued Oct. 25, 2006 (Ex. 1012).

⁵ FR 2,833,504, published June 20, 2003 (Ex. 1009). In this decision, we rely on the certified English translation of FR Laurent that Petitioner provides as Exhibit 1010.

Claim(s) Challenged	35 U.S.C. § ¹	Reference(s)/Basis
5	103	Cornette, Nishibata ⁶
9	103	Cornette, Somani ⁷
11	103	Cornette, Engels ⁸

II. ANALYSIS

A. Legal Standards

To prevail in its challenge, Petitioner must demonstrate by a preponderance of the evidence that the claims are unpatentable. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). To establish anticipation, each limitation in a claim must be found in a single prior art reference, arranged as recited in the claim. *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008). Although the elements must be arranged or combined in the same way as in the claim, “the reference need not satisfy an *ipsissimis verbis* test.” *In re Gleave*, 560 F.3d 1331, 1334 (Fed. Cir. 2009).

A claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time of the invention to a person having ordinary skill in the art. *KSR Int’l Co. v. Teleflex, Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of

⁶ WO 2004/106573 A1, published Dec. 9, 2004 (Ex. 1006). In this decision, we rely on the certified English translation of Nishibata that Petitioner provides as Exhibit 1007.

⁷ Mahesh Somani et al., *Dimensional Changes & Microstructural Evolution in a B-bearing Steel in the Simulated Forming & Quenching Process*, 41 ISIJ Int’l 361–367 (2001) (Ex. 1005).

⁸ H. Engels et al., *Controlling & Monitoring of the Hot-Stamping Process of Boron-Alloyed Heat-Treated Steels*, in *New Developments in Sheet Metal Forming* (Mathias Liewald ed., 2006) (Ex. 1041).

the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) objective evidence of nonobviousness, i.e., secondary considerations.⁹ *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). Subsumed within the *Graham* factors are the requirements that all claim limitations be found in the prior art references and that the skilled artisan would have had a reasonable expectation of success in combining the prior art references to achieve the claimed invention. *Pfizer, Inc. v. Apotex, Inc.*, 480 F.3d 1348, 1361 (Fed. Cir. 2007). “Obviousness does not require absolute predictability of success . . . all that is required is a reasonable expectation of success.” *In re O’Farrell*, 853 F.2d 894, 903–4 (Fed. Cir. 1988).

Moreover, “[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.” *KSR*, 550 U.S. at 416. “If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability.” *Id.* at 417.

B. Level of Ordinary Skill in the Art

In the Institution Decision, we determined that a person of ordinary skill in the art “would have had at least an undergraduate degree in materials science, manufacturing engineering, mechanical engineering, or equivalent knowledge, training, or experience, with at least two years of experience working on the development of steels” because that description was undisputed and consistent with the level of skill reflected in the prior art.

⁹ The record does not contain evidence or argument regarding objective evidence of non-obviousness.

DI 7–8 (adopting Dr. Miles’s description of the level of ordinary skill in the art, a description with which Dr. DeArdo agreed).

For purposes of this Final Written Decision, we maintain our determination from the Institution Decision because neither party disputes that determination and because that level of ordinary skill is consistent with the record.

C. Claim Construction

In an *inter partes* review, we construe claim terms according to the standard set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–17 (Fed. Cir. 2005) (en banc). 37 C.F.R. § 42.100(b). Under that standard, we construe claims “in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” 37 C.F.R. § 42.100(b). Furthermore, we expressly construe the claims only to the extent necessary to determine whether to institute *inter partes* review. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co. Ltd.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (“[W]e need only construe terms ‘that are in controversy, and only to the extent necessary to resolve the controversy.’” (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

In the Petition, Petitioner proposed constructions for the terms “interdiffusion,” “an Interdiffusion layer,” “an Intermediate layer,” and “a Superficial layer” (collectively, the “layer limitations” or the “layer terms”). Pet. 20–24. Patent Owner’s Preliminary Response addressed the term “layer” and also proposed that the preamble of claim 1 is a limitation. Prelim. Resp. 26–27, 33–39.

In our Institution Decision, we first addressed claim 1’s preamble and then turned to the layer limitations. As to the preamble, we determined that

Patent Owner’s argument did not persuade us that the preamble was a limitation of claim 1. DI 9–10. We further noted it appeared to us that the preamble language may be a process limitation not entitled to patentable weight. *Id.* at 10. Because neither Petitioner nor Patent Owner had addressed whether the preamble is a product-by-process limitation, or whether a stamped product has structural or functional differences from a non-stamped product, we did not take a position on whether the preamble is a limitation that imparts patentable weight and we invited the parties to further brief the issue during trial, if they so desired. *Id.* at 11.

Turning to the layer limitations, we found that, contrary to Patent Owner’s argument, Petitioner’s claim construction properly accounted for the four different layers recited in claim 1. *Id.* at 11–12. We declined to construe the layer terms further, and invited the parties to further brief the issue during trial, if they so desired. *Id.* at 12–13.

In its trial briefing, Patent Owner further addresses both claim construction issues, arguing that claim 1’s preamble is a limitation and proposing its own construction for the term “layer.” Resp. 25–38, 39–47; Sur-reply 3–11. Patent Owner also proposes that we construe the term “cooling rate.” Resp. 39. Petitioner also addresses both claim construction issues we invited the parties to address in its Reply. Reply 2–10. For purposes of this decision, only the following claim terms merit discussion: (1) claim 1’s preamble, and (2) “layer.” *See Nidec*, 868 F.3d at 1017.

1. Claim 1 preamble

Claim 1’s preamble recites “[a] coated steel stamped product.” Ex. 1001, 15:21. In the Institution Decision, after reviewing the claim language, Specification, and remaining preliminary record, we did not “find ‘clear reliance’ on the preamble in the prosecution history [of the challenged

patent], or that the preamble provides antecedent basis for the body of the claim.” DI 10. Rather, it appeared that the preamble recited the purpose of the invention. *Id.* We further found that the preamble language “stamped product” appeared to be “a process limitation that does not impart patentable weight to the claim unless the resulting product (i.e., the claimed product) has ‘structural and functional differences that distinguish the claimed product from the prior art.’” *Id.* at 10–11 (citations omitted). We invited the parties to further address whether “stamped product” was a process limitation. *Id.* at 11.

Patent Owner argues that the phrase “coated steel stamped product” is not a statement of purpose or intended field of use because “the recited layers are not merely *intended* to be stamped, they *are* stamped, and the specification makes this clear.” Resp. 40. Patent Owner further argues that “[t]he modifier ‘stamped’ in ‘stamped product’ imports a structural feature to [the] product and gives life to the claim by telling the reader what it is: not any product, but a *stamped* product.” *Id.*; see Sur-reply 10–11.

Patent Owner first directs us to the preamble language itself as support for its position that the claim is limited to a “stamped product.” Resp. 41–42. Specifically, Patent Owner asserts that the inventors chose the phrase “coated steel stamped product” “because it recites essential structure and gives life, meaning, and vitality to the claim.” *Id.* at 41–42.

Turning next to the Specification, Patent Owner contends the Specification “makes clear the importance that the claimed product is a ‘stamped product’” because the Specification “describes stamped products and how to make them in numerous examples, thus evidences that it is an important characteristic of the claimed invention.” *Id.* at 43. Patent Owner identifies a number of instances in which the Specification uses the term

“stamped product” as support for Patent Owner’s argument that the preamble language is an important characteristic of the claimed invention. *Id.* at 43–44 (citing Ex. 1001, 3:32–41, 3:57–4:10, 6:14–30, 7:52–54, 9:9–11, 12:23–24, 12:54–13:7, 14:50–15:16; *see also id.* at 42 (citing *Poly-Am., L.P. v. GSE Lining Tech., Inc.*, 383 F.3d 1303, 1310 (Fed. Cir. 2004) for the proposition that repeated references in the Specification to the preamble to describe the invention indicates that the preamble is a limitation).

Petitioner argues that the preamble is not limiting because claim 1 does not include any references for which the preamble provides antecedent basis, a fact that Dr. DeArdo admitted during cross-examination. Reply 2 (citing Ex. 1052, 126:9–16). Petitioner further notes, for the claims that mention the “product” at all, the bodies of those claims “omit any reference to ‘stamped,’ despite [Patent Owner] calling-out its importance.” *Id.* (citing Ex. 1001, claim 8). Petitioner also asserts Patent Owner’s “argument that ‘stamped’ adds ‘a structural feature’ to the claimed product . . . lacks evidentiary support” because Patent Owner “fails to identify any specific structural feature that is imparted by stamping.” *Id.* at 3 (citing Resp. 40). In fact, Petitioner argues, the Specification attributes the four-layer structure formation to an alloying reaction occurring during the heat treatment that immediately precedes hot stamping. *Id.* (citing Ex. 1001, 14:62–67). And Petitioner contends that the preamble in this case is different from the preamble at issue in *Poly-America* because “the preamble’s recitation of ‘coated steel stamped product’ is ‘entirely conventional apart from the alleged improvement in the body of the claims.’” *Id.* at 3–4 (quoting *Arctic Cat Inc. v. GEP Power Prod., Inc.*, 919 F.3d 1320, 1329–30 (Fed. Cir. 2019)).

“[A]s a general rule, preamble language is not treated as limiting.” *Aspex Eyewear, Inc. v. Marchon Eyewear, Inc.*, 672 F.3d 1335, 1347 (Fed. Cir. 2012) (citing *Allen Eng’g Corp. v. Bartell Indus., Inc.*, 299 F.3d 1336, 1346 (Fed. Cir. 2002)); see *Catalina Mktg. Int’l, Inc. v. Coolsavings.com, Inc.*, 289 F.3d 801, 808 (Fed. Cir. 2002) (“A preamble generally is not limiting when the claim body describes a structurally complete invention such that deletion of the preamble phrase does not affect the structure or steps of the claimed invention.”). On the other hand, “a preamble limits the invention if it recites essential structure or steps, or if it is ‘necessary to give life, meaning, and vitality’ to the claim.” *Catalina*, 289 F.3d at 808 (quoting *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1305 (Fed. Cir. 1999)). “Whether to treat a preamble term as a claim limitation is determined on the facts of each case in light of the claim as a whole and the invention described in the patent.” *Am. Med. Sys., Inc. v. Biolitec, Inc.*, 618 F.3d 1354, 1358 (Fed. Cir. 2010) (internal quotation marks omitted).

After having reviewed claim 1, the Specification, and the prosecution history, we determine that claim 1’s preamble is not limiting. First, we note that the preamble does not provide antecedent basis for the body of claim 1. Rather, claim 1’s body recites a structurally complete invention—a strip of base steel with two sides and a coating on a least one of the two sides that results from the interdiffusion between the base steel and aluminum or aluminum alloy pre-coating, whereby the coating comprises four layers ((a), (b), (c), (d)) proceeding from the base steel outwards, has a thickness greater than 30 micrometers, and has a layer (a) thickness less than 15 micrometers. Ex. 1001, 15:21–39. And although Patent Owner argues that the preamble “recites essential structure and gives life, meaning, and vitality to the claim,” as we found in the Institution Decision, Patent Owner’s argument on that

point appears to be circular. *See, e.g.*, Resp. 40 (“The modifier ‘stamped’ in ‘stamped product’ imports a structural feature to product and gives life to the claim by telling the reader what it is: not any product, but a *stamped* product.”), 40–41 (“The term ‘stamped’ in ‘coated steel stamped product’ thus recites an essential structure of the claimed product—it is stamped.”); DI 9–10. As discussed below, Patent Owner has not identified any structural feature that differentiates a stamped versus unstamped steel product; as such, it is difficult to see how the term “stamped” adds “essential structure” to the otherwise structurally complete claimed invention.

Second, although Patent Owner identifies instances in which the Specification describes stamped products, Resp. 43–45, the preamble appears to be “entirely conventional apart from the alleged improvement in the body of the claims.” *Arctic Cat*, 919 F.3d at 1329–30. Here, the Specification’s Background of The Invention section explains that pre-coated stamped steel products were conventional. Ex. 1001, 1:40–41 (“In recent years the use of pre-coated steels in hot-stamping processes for the shaping of parts has become important.”), 1:42–2:1 (describing the known steps for fabricating stamped parts and associated drawbacks, including roller fouling). Contrary to Patent Owner’s arguments about the importance of stamping to the invention, the Specification describes partially pre-coating the base steel on at least one side with aluminum or an aluminum alloy such that the pre-coating “has a defined thickness and is substantially uniform” and a certain succession of coating layers that form during an alloying reaction, proceeding from the steel substrate outwards, as important aspects of the invention. *See, e.g., id.* at 2:38–47 (Summary of Invention), 4:19–25, 4:47–50 (explaining that “[i]n relation to the problem of fouling of rollers, the control of the pre-coating thickness on the side of the sheet or

blank which is directly in contact with the rollers is especially important”), 4:57–63 (“control of the homogeneity of the pre-coating thickness over the entire sheet within given tolerances is an important factor for obtaining the desired degree of intermetallic alloying, allowing one to improve the resistance to the subsequent melting of the coating during travel on rollers”), 6:14–30. Thus, the Specification indicates that it is the thickness of the partial pre-coating and succession of coating layers on the steel that are important characteristics of the claimed invention (i.e., the recitations in claim 1’s body), and not the “stamped product” prepared from the steel. As a result, claim 1’s preamble is different from the preamble at issue in *Poly-America*, upon which Patent Owner relies, because the preamble language in *Poly-America* “represented an important characteristic of the claimed invention,” whereas claim 1’s preamble does not. 383 F.3d at 1310 (“The specification is replete with references to the *invention* as a ‘blown-film liner, including the title of the patent itself, and the ‘Summary of the Invention.’”).

Even if we were to determine that the body of claim 1 does not define a structurally complete invention, we would nevertheless find that the preamble language “stamped product” is a product-by-process limitation that does not impart patentable weight to the claim. *Greenliant Sys., Inc. v. Xicor LLC*, 692 F.3d 1261, 1268 (Fed. Cir. 2012) (explaining that “the process by which a product is made is irrelevant[,]” unless the process “imparts ‘structural and functional differences’” that distinguish the product from the prior art); *In re Thorpe*, 777 F.2d 695, 697 (Fed. Cir. 1985) (“The patentability of a product does not depend on its method of production.”). Patent Owner argues that “stamped” denotes a structural limitation for the same reasons that “stamped product” is not an intended use. Resp. 46

(referring back to arguments that the preamble is a limitation). However, as Petitioner points out, Patent Owner does not identify any structural feature that stamping imparts. Reply 3; *see also* Tr. 36:10–12 (Judge Crumbley: . . . “When looking at a set of layers, is there anything intrinsic about them that tells us whether they are a result of stamping or not?” Patent Owner’s Counsel: “I don’t think so.”). Nor are we aware of any structural characteristic of the coated steel that the Specification ties to stamping. Indeed, Figure 2 of the ’683 patent illustrates a coated *stamped* steel product that does not correspond to the invention. Ex. 1001, 3:63–65. And the Specification attributes the recited four-layer structure to an alliation (i.e., alloying) reaction that occurs “during the heat treatment immediately preceding hot stamping.” Ex. 1001, 14:59–67; *see id.* at 6:14–22 (“the thermal treatment causes an alloying reaction with the steel substrate which modifies both the physico-chemical nature and the geometry of the pre-coating”). Dr. DeArdo’s testimony that “changes occur after stamping” does not persuade us otherwise because it is speculative. Ex. 2010 ¶¶ 151–156 (testifying about how the coating “could” change). Accordingly, the process limitation “stamped” has no patentable weight. *See Greenliant*, 692 F.3d at 1268.

Nevertheless, as we explain below, even if we conclude that the preamble is limiting, Petitioner establishes that Cornette teaches a stamped product. *See infra* § II.E.1.

2. “Layer”

Claim 1 requires that the coating “comprises, proceeding from the base steel outwards: (a) an Interdiffusion layer, (b) an Intermediate layer, (c) an Intermetallic layer, and (d) a Superficial layer.” Ex. 1001, 15:31–36. Petitioner proposes that we construe the terms “interdiffusion,” “an

Interdiffusion layer,” “an Intermediate layer,” “an Intermetallic layer,” and “a Superficial layer.” Pet. 20–24. In the Institution Decision, we determined that Petitioner properly accounts for “the different layers” recited in claim 1, but we declined to construe the layer terms further. DI 12–13. We also invited the parties to brief the issue further during trial.

Patent Owner does not provide any constructions for the terms “Interdiffusion,” “Intermediate,” “Intermetallic,” or “Superficial” that modify the word “layer.” Rather, Patent Owner argues that we should construe the term “layer” as “a material spread over the base steel different from other materials spread over the base steel.” Resp. 28, 31.¹⁰ According to Patent Owner, its construction is consistent with the ordinary and customary meaning of “layer” to a person of ordinary skill in the art. *Id.* at 31 (citing Ex. 2008, 409, a dictionary defining “layer” as “a thickness of some material laid on or spread over a surface”). Patent Owner also asserts that its construction “is consistent with the manner in which the term is used in the claims, specification, and prosecution history” of the ’683 patent. *Id.*

Referring first to the claims, Patent Owner asserts that claim 1 “labels each layer sequentially” and with a different name, signifying “that each layer is a different material spread over the base steel.” *Id.* at 32 (citing Ex. 2010 ¶ 59); *see* Sur-reply 4. Patent Owner also argues that claim 2 contemplates the simultaneous presence of layers (c) and (d), and that

¹⁰ Patent Owner’s counsel clarified at oral argument that when the proposed construction refers to “a material” “different from other materials,” it means “different main compositions across each material.” Tr. 26:1–3. That is, the layers all contain the same materials, i.e., iron, aluminum, and silicon, but that the percentages of those materials have to be different in each layer. *Id.* at 26:6–10.

simultaneous presence is **only** possible when layers (c) and (d) are different materials. *Id.* at 32–33 (citing Ex. 2010 ¶¶ 57–58); *see* Sur-reply 5.

Turning next to the Specification, Patent Owner explains that the Specification also uses different names for the four layers, which again indicates that the materials of each layer are different. *Id.* at 33 (citing Ex. 1001, 3:56–62, 6:14–64, 12:57–13:7; Ex. 2010 ¶ 59). Patent Owner also points to Figure 1 as showing the simultaneous presence of the Superficial and Intermetallic layers at the extreme surface of the product. *Id.* at 34 (citing Ex. 1001, Fig. 1). Patent Owner then refers to Example 2 of the Specification, asserting that “the ***mean compositions*** of the materials” are different for the four layers and that an ordinarily skilled artisan would understand this to mean that “each of these four layers is of a different material.” *Id.* at 34–35. Finally, Patent Owner discusses Figure 2 of the patent, explaining that the intermetallic layer in that figure is “separated and at different levels in the coating,” yet “referred to as ***one layer***, not multiple layers.” *Id.* at 37.

Patent Owner also discusses the ’683 patent’s prosecution history, noting that the Examiner relied on a reference that “describes ‘a multi-layer structure such as a five-layer structure having five layers of ***different alloy compositions***.” *Id.* at 38. According to Patent Owner, because the Examiner relied on this disclosure, “the Examiner understood that different layers in the succession of layers must be different materials.” *Id.* (citing Ex. 1002, 141;¹¹ Ex. 2002 ¶ 24).

Petitioner responds that there is no basis in the claims, the Specification, or the prosecution history for importing a “different from

¹¹ We cite to the pages that Petitioner added to the exhibit.

other materials” requirement into the term “layer.” Reply 4–8. Beginning with the claims, Petitioner argues that none of the claims recites any compositional requirements for the layers and that claim 1, instead, recites positional requirements for the four claimed layers and certain thicknesses for the coating and layer (a). *Id.* at 4 (citing Ex. 1001, claim 1). Petitioner further contends that Patent Owner’s reliance on claim 2 to support a “different from other materials requirement” fails because claim 2 does not require the “simultaneous presence of layers (c) **and (d)**” at the extreme surface, as “0% of layer (c) could be present.” *Id.* at 5. And Petitioner notes that the ’683 patent does not assign any importance to the layer names because it specifies that the “first layer can be referred to as the “[i]nterdiffusion layer or intermetallic layer,” even though the third layer is also called intermetallic layer. *Id.* at 7.

As for Patent Owner’s arguments regarding the Specification, Petitioner asserts that Patent Owner improperly reads mean compositions from one embodiment (i.e., Example 2) into the claims, while excluding the compositions the preferred embodiment describes. *Id.* at 5–6. Petitioner further argues that Example 2 falls outside the scope of claim 1 because it does not satisfy the thickness requirements for the interdiffusion layer (layer (a)). *Id.* at 6 (citing Ex. 1001, 12:60–62, claim 1).

Petitioner also contends that Patent Owner “mischaracterizes the prosecution history” because “the Examiner understood the claims as requiring only ‘the presence of the four claimed layers’ and made no statements reflecting a compositional-distinctness of those layers.” *Id.* at 8 (quoting Ex. 1002, 141–142).

Finally, Petitioner argues that if the term “layer” requires construction, we should construe the term in accordance with its plain and

ordinary meaning to mean any of four dictionary definitions. *Id.* at 9 (citing Exs. 1053–1055; 1057).

Based upon the dictionary definitions that the parties cite, the parties agree that a “layer” is “a thickness of material” and that the layer “spread[s] out,” “spread[s] over” or “covers” a surface. *See, e.g.*, Ex. 1053, 623 (one of Petitioner’s proffered dictionaries defining “layer” as a “single thickness, coating, or stratum spread out or covering a surface”), Ex. 2008, 409 (Patent Owner’s proffered dictionary defining “layer” as “a thickness of some material laid on or spread over a surface”). Thus, the only dispute for us to resolve is whether the term “layer” additionally requires that each material is different from all the other materials, as Patent Owner argues. We determine that it does not.

We begin with the claim language. We acknowledge that claim 1 refers to each layer by a different name, but we agree with Petitioner that nothing in either the layer names or the remaining claim language requires different mean compositions of the materials in each layer. Instead, two of the layer names recite positional requirements, i.e., Intermediate layer and Superficial layer, and two recite characteristics of the layer, i.e., Interdiffusion layer and Intermetallic layer. Ex. 1001, claim 1. Further, although claim 2 encompasses embodiments in which layer (c) and layer (d) can both be present at the extreme surface of the product, it does not require that layer (c) and layer (d) both be present at that surface. Instead, claim 2 includes a product in which none of layer (c) may be present at the extreme surface. *Id.* at claim 2 (reciting, “wherein less than 10% of layer (c) is present at an extreme surface of the product,” which includes 0%). Thus, the claim language does not support Patent Owner’s proposed construction.

We next consider the Specification. The Specification explains that all four layers contain iron, aluminum, and silicon. *Id.* at 6:31–53. As we explained in the Institution Decision, the Specification describes “a preferred embodiment” in which the Intermediate layer and the Superficial layer have the same ranges of iron, aluminum, and silicon and, therefore, can contain the same amounts of each of the elements that make up the layer. *Id.* (disclosing that “(b) Intermediate layer” “[i]n a preferred embodiment . . . has the following composition, by weight 39-47% Fe, 53-61% Al, 0-2% Si” and that “(d) Superficial layer” “[i]n a preferred embodiment . . . has the following composition, by weight: 39-47% Fe, 53-61% Al, 0-2% Si”);¹² *see* DI 26–27. Patent Owner’s proposed construction, which requires different mean compositions (i.e., different materials) for each layer, would exclude at least some of the compositions encompassed by the preferred embodiment, and a claim construction that excludes the preferred embodiment “is rarely, if ever, correct.” *InterDigital Commc’ns, LLC v. Int’l Trade Comm’n*, 690 F.3d 1318, 1325 (Fed. Cir. 2012) (quoting *Pfizer, Inc. v. Teva Pharm., USA, Inc.*, 429 F.3d 1364, 1374 (Fed. Cir. 2005)).¹³

¹² Although Dr. DeArdo testified on cross-examination that “each layer is going to have its own composition,” Ex. 1052, 101:22–23, when further asked whether diffusion as described in the ’683 patent will automatically result in every layer being different, Dr. DeArdo responded “I can’t answer what it would look like. It’s pure speculation.” *Id.* at 102:3–10.

¹³ As we explain above, Patent Owner relies on Example 2 as supporting an interpretation that requires different mean compositions of material for each layer. But we agree with Petitioner that Example 2 is outside the scope of claim 1 because it contains an Interdiffusion layer (layer (a)) that is 17 micrometers thick, whereas claim 1 requires “a thickness less than 15 micrometers” for the Interdiffusion layer. Reply 6; *compare* Ex. 1001, 12:60–62, *with id.* at claim 1. Even if we consider Example 2, however, we decline to adopt Patent Owner’s construction because it improperly imports

We also consider the prosecution history. The Examiner found that the prior art discloses “an aluminum-coated structural member” having “[a] multi-layer structure . . . [that] is advantageous for maintaining good contact with a welding gun in spot welding even under great pressure for high tension material.” Ex. 1002, 140. The Examiner further found that the prior art process “appears to be identical or substantially identical to the process set forth in the specification of the instant application, which produces the claimed product.” *Id.* at 141. The Examiner concluded, “absent a showing to the contrary, it appears that the properties of the product in the prior art necessarily or inherently possesses the characteristics of the claimed product, including the presence of the four claimed layers.” *Id.* at 141–142. The Examiner, however, did not rely on the prior art reference “for disclosing ‘five layers of ***different alloy compositions***,” as Patent Owner argues. *See id.* at 140–142. Thus, the prosecution history does not support interpreting the term “layer” to require different mean compositions or different materials.

Based on our review of the claim language, the Specification, and the prosecution history, we conclude that the term “layer” means “a thickness of material spread over or covering a surface.”

Petitioner also argues that we should “construe ‘interdiffusion,’ ‘an Interdiffusion layer,’ ‘an Intermediate layer,’ ‘an Intermetallic layer,’ and ‘a[] Superficial layer’ as requested in the Petition.” Reply 10. Petitioner acknowledges, however, that Dr. DeArdo provided meanings for each of the terms modifying “layer” that “align with Petitioner’s constructions.” *Id.*

a limitation from the Specification. *See Cont’l Circuits LLC v. Intel Corp.*, 915 F.3d 788, 797 (Fed. Cir. 2019).

(citing Ex. 1052, 107:8–109:23). Further, the parties’ dispute does not center on whether the prior art discloses the terms modifying “layer.” Thus, we need not construe those terms. *See Nidec*, 868 F.3d at 1017.

D. Asserted Prior Art

Before considering the asserted grounds of unpatentability, we provide a brief overview of the asserted references.

*1. Cornette (Ex. 1004)*¹⁴

Cornette relates to, *inter alia*, pre-coated boron steel for use in the automotive industry. Ex. 1004, Abstract, 9. Cornette states “significant progress has been made concerning safety, fuel economy, dent resistance, and comfort” in the automotive industry. *Id.* at 3. “To achieve these goals, a variety of steels are being used in the vehicles.” *Id.* Lighter cars are better for fuel economy and the environment, but safety and comfort considerations require additional equipment that contradicts the pursuit of lighter weight vehicles. *Id.* To help achieve the automotive industry goals, Cornette discloses a range of high and ultra-high strength steels, including pre-coated boron steel (USIBOR). *Id.* at 3, 9. The pre-coated steel has excellent material properties after the press hardening process (i.e., stamping) with good corrosion protection. *Id.* at 9. Cornette’s Figure 21 discloses a process for hot forming the pre-coated steel, which we reproduce below.

¹⁴ We cite to the page numbers that Petitioner added to the reference.

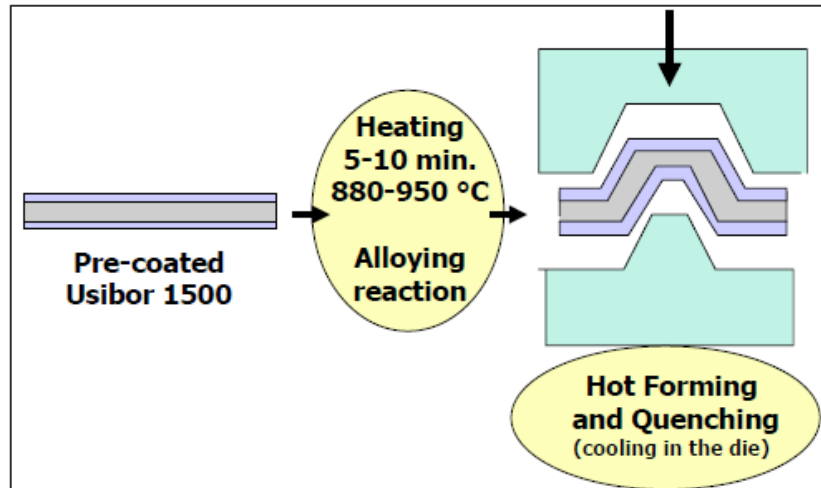


Fig. 21. Process used for the hot forming of USIBOR 1500 Pre-coated.

Figure 21 depicts the process used for hot forming the pre-coated steel. “The coating, made of aluminum and silicon, is applied with a hot dipped process.” *Id.* Heating the pre-coated steel, generally to 900°C for five minutes, creates an alloying reaction between the iron substrate and the aluminum-silicon coating that results in “a hard multiphase alloy layer.” *Id.* Cornette explains that the Fe-Al-Si layer is typically about 40 μm at the steel surface and provides a photo, Figure 22, showing a section view of the coating after heat treatment, as reproduced below.

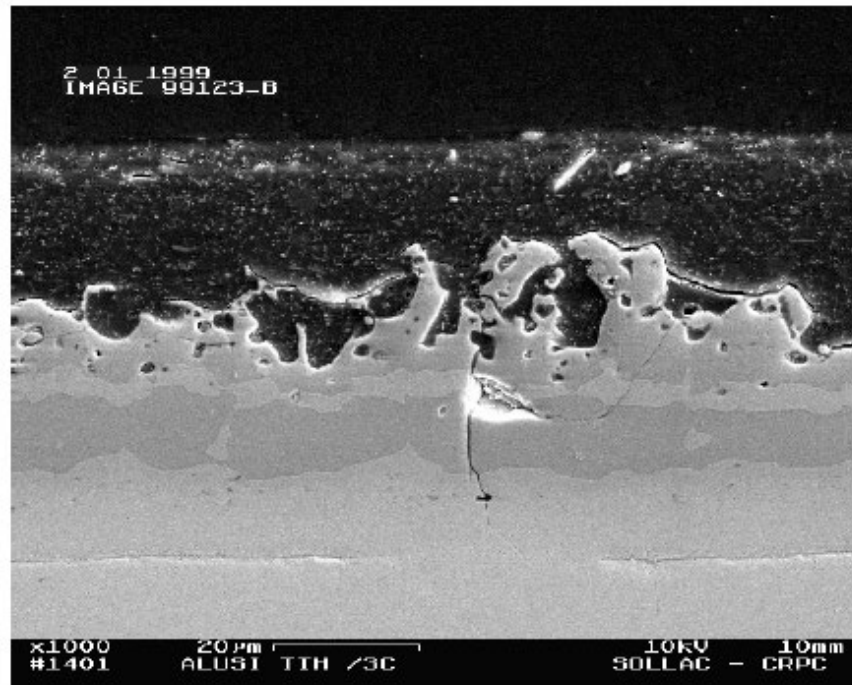


Figure 22 is a section view of the coating after heat treatment. *Id.* at 10.

Cornette further discloses that the pre-coated steel can be used to obtain complex parts through “hot stamping” that have high mechanical characteristics and are lighter. Ex. 1004, 11.

2. *Laurent (Ex. 1008)*

Laurent relates to a coated, hot- and cold-rolled steel sheet comprising a very high resistance after thermal treatment. Ex. 1008, 1:6–8. Laurent discloses compositions of boron steels that include an aluminum-based coating. *See, e.g., id.* at 1:47–64, 2:40–45. Laurent explains that the coating protects the sheet against hot and cold corrosion and that the mechanical characteristics of the sheet “allow a great variety of shaping, in particular a deep stamping.” *Id.* at 2:46–56. “At the time of thermal treatment performed on a finished casting or at the time of a hot-shaping process, the coating forms a layer having a substantial resistance to abrasion, wear, fatigue, shock,” “good resistance to corrosion,” and “good capacity for

painting and gluing.” *Id.* at 2:57–61. In an “example of implementation,” Laurent discloses a coating “about 20 μm in thickness.” *Id.* at 3:37–43.

3. *EP Laurent (Ex. 1012)*

EP Laurent relates to “a process for manufacturing a part from a strip of hot-rolled sheet steel.” Ex. 1012 ¶ 1. EP Laurent “also concerns a hot-rolled sheet comprising a metal or metal alloy coating deposited on the surface, for the hot manufacture of an intermetallic compound” that provides, among other things “protection against corrosion, a barrier against decarburation of the steel sheet, lubrication upon hot forming of the sheet, and on the finished part . . . a high degree of mechanical hardness of the steel and a high degree of superficial hardness” of the finished part’s surface. *Id.* ¶ 6. EP Laurent discloses an aluminum-based coating having a thickness of “5 μm to 100 μm , preferably between 10 μm and 25 μm ” before thermal treatment. *Id.* ¶ 11.

4. *FR Laurent (Ex. 1010)*¹⁵

FR Laurent relates to a process for making a part, such as an automotive vehicle wheel, using a hot forming (i.e., hot stamping) method on a pre-coated steel sheet that is hot-rolled for thermal treatment. Ex. 1010, 1:1–2, 2:6–9. The coating is aluminum-based and the sheet is coated with a layer about 25 μm thick before thermal treatment. *Id.* at 5:4–5. The sheet-metal blank is heated in a furnace at a temperature between 750°C and 1000°C for a time that varies depending on thickness. *Id.* at 5:6–8. During heating of the sheet-metal blank, the coating alloys with the steel substrate to form an intermetallic alloy. *Id.* at 5:12–13. “By interdiffusion, the alloying

¹⁵ For clarity, we add line numbers when citing to this reference.

leads to an increase of the thickness of the [coating] layer” that “corresponds to a 50% increase.” *Id.* at 5:13–15.

5. *Nishibata (Ex. 1007)*¹⁶

Nishibata relates to hot formed members, such as automobile body parts, and methods of manufacturing the parts using hot forming, i.e., hot stamping or pressing. Ex. 1007, 1:1–4. Nishibata discloses a coated steel part prepared from a base steel with an aluminum alloy pre-coating. *Id.* at 5:11–12. Nishibata further discloses several working examples of steel sheets with a sulfur content of 0.001 to 0.004 mass percent. *Id.* at 8 (Table 1).

6. *Somani (Ex. 1005)*

Somani investigates the influences of high temperature plastic deformation and applied stress on the martensitic transformation in a boron steel during the forming and quenching processes. Ex. 1005, Abstract, 362. Somani explains that “[t]he presence of ferrite would evidently mean poorer strength properties of the steel.” *Id.* at 366. According to Somani, “several variables, such as the temperature at the moment of deformation, the amount of plastic strain and the cooling rate, are of importance and need to be optimised and controlled” to minimize ferrite formation. *Id.* Somani finds that “even a cooling rate as high as 280°C/s was unable to prevent a tiny fraction of ferrite to be formed, though only after the relatively high strain of 0.24.” *Id.* In the hot stamping process, “[t]ypical cooling rates of the order of 100°C/s have been estimated. . . . This is lower than the maximum rate of 280°C/s used in the tests, still resulting in the formation of some ferrite.”

¹⁶ We use the page numbers provided in the translation. For clarity, we add line numbers when citing to this reference.

Id.; *see also id.* at 363 (Figures 3 and 4, depicting flow stress under continuous compression in various temperature regimes during cooling at 50°C/s and relative diametric changes of the specimens in the course of cooling, respectively).

7. *Engels (Ex. 1041)*

Engels relates to hot stamping boron-alloyed steels and discloses a boron steel coated with an aluminum alloy. Ex. 1041, 136, 142–143, Fig. 5. Figure 5 depicts “a cross-section polish of the diffusion layer of a hot-dip aluminum coated boron steel. Five phases which differ in their layer thickness and chemical composition can easily be distinguished.” *Id.* at 142–143, Fig. 5.

E. *Anticipation by Cornette*

Petitioner contends that Cornette anticipates claims 1 and 2 of the ’683 patent. Pet. 24–42.

1. *Claim 1*

Petitioner asserts that Cornette discloses each element of claim 1, and supports its analysis with citations to Cornette and Dr. Miles’s testimony. (citing Ex. 1003 ¶¶ 68, 71, 73, 76–77, 84, 88–89, 91–96, 98, 101, 107, 108; Ex. 1004, 3, 9–11, Figs. 21, 22). Patent Owner disagrees, arguing that Petitioner’s ground fails for two reasons: (1) Cornette does not disclose a “stamped product,” and (2) Cornette does not disclose a coating with four different materials spread out over a steel sheet. Resp. 52–61 (citing Ex. 1004, 9–10; Ex. 1013, 9–11; Ex. 2001 ¶¶ 35–36, 47, 52, 54, 56, 77–89). We first address the disputed limitations and then turn to the remaining limitations of claim 1, which Patent Owner does not contest separately. *See generally* Resp.

a) *Preamble - “A coated steel stamped product, which comprises:”*

As we explain above, we determine that claim 1’s preamble is not a limitation on the scope of the claim. Thus, Petitioner need not establish that Cornette discloses a stamped product. Nevertheless, we address the parties’ arguments as to whether Cornette discloses a stamped product.

Petitioner argues, to the extent claim 1’s preamble is a limitation, Cornette discloses a coated steel stamped product. Pet. 25; *see also* Ex. 1003 ¶ 66. In particular, Petitioner points to Cornette’s disclosure of pre-coated boron steel for hot forming that “can be used to ‘obtain complex parts **by hot stamping**.’” *Id.* (citing Ex. 1004, 3, 9 and quoting Ex. 1004, 11). Petitioner also directs us to Figure 21, which Petitioner annotates, as depicted below.

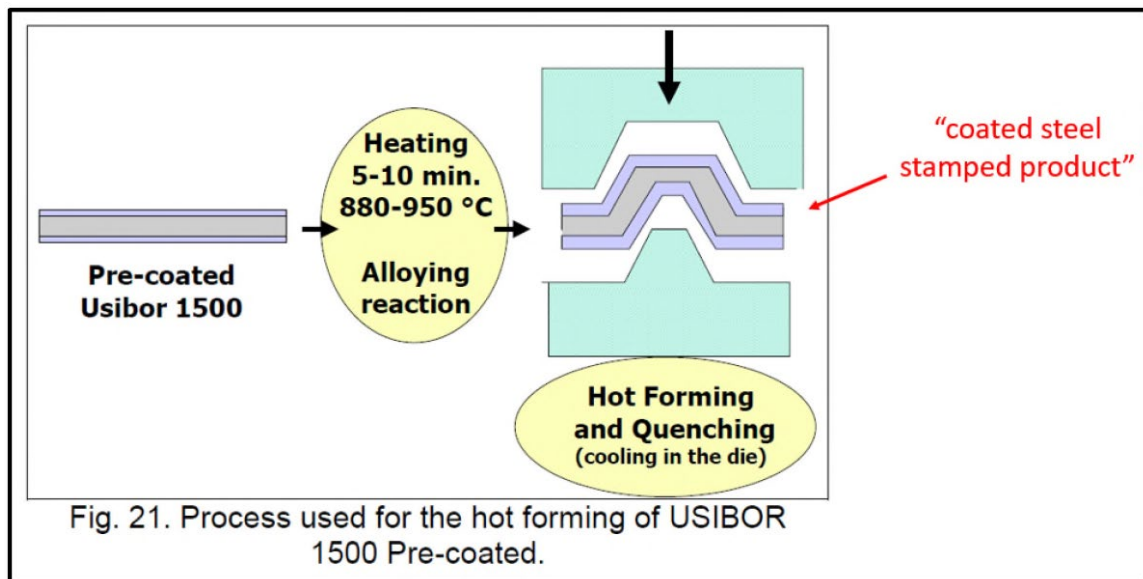


Figure 21 illustrates Cornette’s process for hot forming the pre-coated steel, with Petitioner’s annotation showing the “coated steel stamped product.” *Id.* The pre-coated USIBOR 1500 steel product includes a coating (purple) on either side of the base steel (grey), and is hot formed via stamping and quenched/cooled in a die (blue). *Id.* at 26; Ex. 1003 ¶¶ 67–68. Petitioner

also relies on Cornette’s Figure 22, which depicts “a section view of the coating after heat treatment,” to show the layer limitations of claim 1, as well as a stamped product (to the extent that the claim requires a stamped product). Pet. 33–36; Reply 11–19.

Patent Owner responds that the preamble is limiting and requires a stamped product. *See supra* § II.C.1 (addressing Patent Owner’s claim construction arguments). Patent Owner argues that Petitioner’s unpatentability analysis “relies on the premise that figure 22 of Cornette shows a stamped product with a four layer structure,” but “Figure 22 is not an image of a stamped product, and . . . cannot be used to establish the layers of a stamped product.” Resp. 57 (citing Ex. 2010 ¶¶ 76, 77, 143); *see id.* at 58 (arguing that Cornette draws a distinction between “‘heat treatment’ on the one hand, and ‘hot forming’ or ‘hot stamping’ on the other”).

Patent Owner also directs us to the Vaissiere¹⁷ reference, which Patent Owner contends bolsters its position that Cornette’s Figure 22 is not stamped. *Id.* at 58. Specifically, Patent Owner explains that Vaissiere’s Figure 15 and Cornette’s Figure 22 “are the same images and are both captioned as heat treated coated steel.” *Id.* at 59 (citing Ex. 1033, 7; Ex. 1013, 10; Ex. 2010 ¶ 86). Patent Owner continues that “[i]t is even more evident in Vaissiere’s figure 15 that the image of the coating is not related to stamping because figure 15 is specifically relied on to show the ‘high roughness level of the alloyed layer’ for the adherence of paint, not what any purported levels of the coating look like after stamping.” *Id.*

¹⁷ L. Vaissiere et al., Development of Pre-Coated Boron Steel For Applications on PSA Peugeot Citroën and RENAULT Bodies in White, reprinted from Proceedings of the 2002 SAE Int’l Body Eng’g Conference & Auto. & Transportation Tech. Conference (2002) (Ex. 1033).

(citing Ex. 1033, 7; Ex. 2010 ¶ 87). Thus, Patent Owner concludes that Cornette and Vaissiere “mak[e] it clear that the coating is not stamped.” *Id.*; *see also* Sur-reply 12–14 (arguing that Cornette’s Figure 22 is heat treated, not stamped).

Patent Owner discounts Petitioner’s reliance on other sections of Cornette that describe stamping, e.g., Figure 21, because those sections “only . . . reinforce the difference between a part that has been subjected to ‘heat treatment’ . . . [such as is shown in Figure 22] and the subsequent step of stamping. . . .” *Id.*; *see also* Sur-reply 16–17 (similarly arguing that references to “good quenchability” in Vaissiere or to “stamping” in Cornette do not mean that the figures show stamped specimens). According to Patent Owner, because Figure 22 depicts a coating before stamping, “it cannot disclose anything about the coating and thickness *after* stamping.” *Id.* (citing Ex. 2001 ¶¶ 148–158). And Patent Owner argues that “[f]rom the time a coated steel blank is heat treated to the time that it is stamped and quenched/cooled the structure of the compounds of the layers could change, resulting in possible changes to the number layers and possible changes to the thicknesses of the layers.” *Id.* at 59–61 (citing Ex. 2010 ¶¶ 152–158).

Petitioner replies that, if “stamped” is a limitation, “Cornette still anticipates.” Reply 11. According to Petitioner, “it is clear that Cornette discloses a stamped product in Figure 22” for at least two reasons: (1) Cornette’s heat treatment is a “multi-stage process from heating to cooling” that includes stamping; and (2) contextual indicia in Cornette and Vaissiere “confirm that Figure 22 shows a stamped product.” *Id.* at 11.

As to the heat treatment process, Petitioner points to a statement in Vaissiere, “good quenchability of parts **during heat treatment (critical quenching speed: 27 C/s)**” and contends the statement demonstrates that

Cornette's heat treatment includes a quenching step, which occurs with or after hot-stamping. *Id.* at 12 (quoting Ex. 1033, 4 and citing Ex. 1004, 9 (Figure 21)). For contextual indicia, Petitioner explains that Vaissiere's Figure 15 (which is the same as Cornette's Figure 22) has a caption noting "that the depicted specimen has a cataphoresis layer" and argues that a cataphoresis layer is applied to a stamped part prior to painting. *Id.* at 13–14 (citing Ex. 1033, 7; Ex. 1051 ¶ 8; Ex. 1052, 142:2–8). Petitioner also notes that Cornette "mentions '[m]aterial after cataphoretic paint' and identifies that cataphoretic paint as 'PPG 742/962,' which is '15 to 20 microns' . . . and measurable in Cornette's Figure 22." *Id.* at 14 (citing Ex. 1004 10–11; Ex. 1051 ¶ 9). And Petitioner asserts that Cornette's Figure 22 "is presented in the context of improved safety parts for automobiles, *i.e.*, finished automobile parts after stamping." *Id.* at 15 (citing Ex. 1004, 1, 3, 9–10). According to Petitioner, the context in Cornette's text "shows that Figure 22 is included in Cornette as part of a broader demonstration of USIBOR 1500's [*i.e.*, the steel's] suitability for automobile parts," as Cornette's discussion of "advantageous 'mechanical characteristics,' 'spot weldability,' and 'corrosion resistance' properties" evidence. *Id.* at 15–16.

As we explain above, we do not determine that the preamble language "stamped" is a limitation, therefore, the question of whether Cornette discloses a stamped product has no bearing on the question of anticipation. Even if we were to determine that it is a limitation, however, Petitioner shows that Cornette discloses a coated steel stamped product. First, we note that many of Patent Owner's arguments to the contrary are based on the premise that Petitioner relies *only* on Cornette's Figure 22 for disclosing a coated stamped product. Petitioner, however, relies on Cornette's entire disclosure, which describes using the pre-coated steel to make complex parts

through “hot stamping.” Ex. 1004, 11; Pet. 25–26. Petitioner also relies on Cornette’s Figure 21, which sets forth the process for hot forming the pre-coated steel that includes *stamping* and quenching in a die. *Id.* at 25 (reproducing Fig. 21). Dr. Miles relies on these same disclosures in opining that Cornette discloses a coated stamped product. Ex. 1003 ¶¶ 67–68. And Patent Owner does not dispute that Cornette discloses a hot forming process, which includes hot stamping. *See* Resp. 58 (agreeing that Figure 21 shows hot forming and that Cornette discloses making complex parts by hot stamping). Patent Owner’s arguments focus on Figure 22 because Petitioner relies on Figure 22 as showing the four-layer structure recited in claim 1 and Patent Owner contends that Figure 22, therefore, needs to disclose a stamped four-layer product. Thus, we consider Figure 22.

Cornette discloses that Figure 22 depicts a coating surface “after heat treatment.” Ex. 1004, 9, 10 (Figure 22 caption). The parties dispute whether that “heat treatment” includes stamping. Resp. 58; Reply 11–13. We conclude that it does. We acknowledge that Figure 22’s caption does not provide further details about the depicted specimen or the meaning of “heat treatment,” but we agree with Petitioner that one of ordinary skill in the art would have understood the reference to “heat treatment” in Cornette to mean the entire hot-forming process, which includes stamping, not just a heating step. For example, the text immediately following Figure 22 contrasts the mechanical characteristics of the steel “[b]efore heat treatment” with those after the hot forming process, i.e., those “obtained after austenitization at 900°C during 5 minutes and cooling in the die.” Ex. 1004, 10. This disclosure indicates that Cornette uses the terms “hot forming” and “heat treatment” to describe the same process, which includes stamping and cooling in the die. Cornette also includes a section on Corrosion Resistance

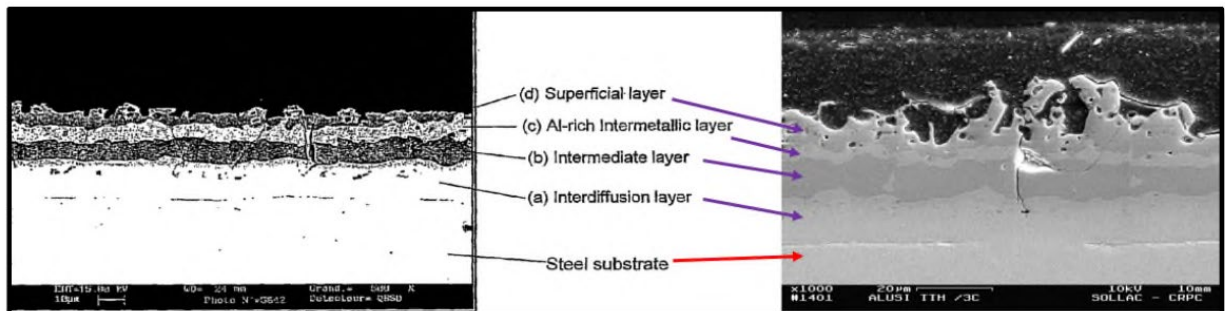
for the steel “[a]s quenched,” explaining that the pre-coated steel was “tested after heat treatment.” *Id.* The disclosure of testing after heat treatment that includes quenching also suggests that the heat treatment process Cornette describes includes stamping because quenching follows stamping. Ex. 2010 ¶ 32 (Dr. DeArdo’s testimony that “steel products with very high strength . . . can be manufactured . . . by reheating and hot stamping the part, followed by in-die quenching.”); Ex. 1003 ¶ 68 (Dr. Miles’s testimony that Cornette’s Figure 21 shows a coated steel that is “hot formed via stamping and quenched/cooled in a die”); Ex. 1052, 44:10–22 (Dr. DeArdo testifying that in a hot forming process, the steel blank is heated to 20 degrees above the forming temperature, then transported to the die where “it’s hot stamped to the final shape” and “[t]he water circulating through the die quenches the steel.”). Further, Dr. DeArdo testified on cross-examination that Cornette’s use of “heat treatment” includes the steps of “heating to the die temperature, heating to the forming temperature, holding, *stamping*, cooling.” Ex. 1052, 172:17–173:8; *see also id.* at 69:11–70:11 (Dr. DeArdo acknowledging that the French (i.e., Cornette’s authors) use the term “heat treatment” to describe the entire process of hot forming from the cold coated steel to stamping and quenching even though he does not use the term “heat treatment” in the same way). Thus, Dr. DeArdo admits that Cornette’s reference to “heat treatment” includes stamping.

We also find Vaissiere supports Petitioner’s position that Cornette’s Figure 22 shows a stamped product. The parties agree that Vaissiere’s Figure 15 depicts the same image as Cornette’s Figure 22. *See* Resp. 59; Reply 13. Vaissiere’s Figure 15 caption explains that the figure is a “[s]ection of alloyed and cataphoresis layer.” Ex. 1033, 7 (Figure 15). Dr. Miles testifies that a cataphoresis layer “is a corrosion-resistant layer

applied to a stamped part prior to painting.” Ex. 1051 ¶¶ 8; *see id.* ¶¶ 9–10 (Dr. Miles’s testimony that Cornette’s Figure 22 shows a cataphoretic paint/layer support with an annotated version of Cornette’s Figure 22 pointing to the cataphoretic layer). Dr. DeArdo agrees that a cataphoresis layer or cataphoretic paint is applied after stamping. Ex. 1052, 141:21–142:8. Because a cataphoresis layer is applied after stamping, the alloyed and cataphoresis layer depicted in Vaissiere’s Figure 15 (which is the same figure as Cornette’s Figure 22) is additional evidence that Cornette’s Figure 22 depicts a stamped product. Accordingly, assuming that “stamped” is a limitation of claim 1, Petitioner establishes that Cornette discloses a “stamped product.”

b) “wherein said coating comprises, proceeding from the base steel outwards: (a) an Interdiffusion layer, (b) an Intermediate layer, (c) an Intermetallic layer, and (d) a Superficial layer,”

Petitioner asserts Cornette discloses the layer limitations of claim 1. Pet. 32–36. Specifically, Petitioner points to Cornette’s Figure 22, which it reproduces in the Petition alongside Figure 1 of the ’683 patent for comparison. *Id.* at 33. We reproduce Petitioner’s annotated and combined figure below.



’683 Patent, Ex. 1001, Fig. 1

Cornette, Ex. 1004, Fig. 22

'683 patent Figure 1, depicted on the left, “illustrates a preferred embodiment of an invention coated part, after heat treatment and stamping.” Ex. 1001, 3:57–58. “The succession of layers of the coating on the steel substrate is: (a) interdiffusion layer; (b) intermediate layer; (c) [i]ntermetallic layer; and (d) superficial layer.” *Id.* at 3:58–61. Cornette’s Figure 22, depicted on the right, is a photo of a section view of coating (i.e., multiphase alloy layer) after heat treatment. Ex. 1004, 9. Petitioner asserts that, like Figure 1 of the '683 patent, Cornette’s Figure 22 “shows that the multiphase alloy layer formed at the steel surface includes four distinct phases/layers” that correspond to the claimed interdiffusion layer, intermediate layer, intermetallic layer, and superficial layer.” Pet. 34 (citing Ex 1003 ¶ 88).

Petitioner acknowledges that the layers are not labeled in Cornette’s Figure 22, but argues that a person of ordinary skill in the art would have understood that Cornette’s layers correspond to the four claimed layers, as the terms are used in the '683 patent. *Id.* (citing Ex. 1003 ¶ 89); *see also id.* at 34–35 (explaining that the '683 patent depicts the steel substrate and interdiffusion layer as “essentially the same color” and describes the intermediate layer as “appearing **darker**,” the intermetallic layer as “appearing as a **pale phase**,” and the superficial layer as the “**Darker** superficial layer”). Petitioner contends that Cornette’s Figure 22 includes the same four-layer structure and color scheme. *Id.* at 35 (citing Ex. 1003 ¶¶ 91, 93), 36 (citing Ex. 1003 ¶¶ 93–94 and setting forth how Cornette discloses that one of its layers is formed through interdiffusion and another layer is composed of two or more metals, i.e., intermetallic); *see also id.* at 31–33 (explaining how Cornette discloses interdiffusion between the base steel and the pre-coating).

Patent Owner argues that Petitioner’s ground fails because “Cornette does not disclose a coating with four different materials spread out over a steel sheet.” Resp. 52. In particular, Patent Owner contends that Petitioner fails to point to any support in Cornette that Figure 22 shows four different materials. *Id.* (citing Ex. 2010 ¶¶ 121–127). Patent Owner also argues that nothing in Cornette’s Figure 22 “would cause a [person of ordinary skill in the art] to conclude that the purported intermediate and superficial layers are different material. . . . Instead, the purported superficial and intermediate layers in figure 22 actually appear to have the same shade and tone” and, “consequently, appear to be and certainly could be of a same material and not different.” *Id.* at 53–54 (citing Ex. 2010 ¶¶ 79–83, 128–131), 56. According to Patent Owner, this “is in contradistinction to figure 1 and the claims of the ’683 patent, where the four layers are specifically described in the specification as different, having four different mean compositions and four different names, and not on the basis of shade, tone or color . . . and their location, but rather based on materials.” *Id.* at 54 (citing Ex. 1001, 12:58–13:7; Ex. 2010 ¶¶ 59, 83, 136, 138–139). Patent Owner continues that without a compositional analysis an ordinarily skilled artisan would not be able to determine that layers (b) and (d) are different materials and notes that Petitioner failed to submit such a compositional analysis. *Id.* at 54–55; *see id.* at 56 (further arguing that Dr. Miles’s analysis cannot show that the layers are of different materials).

Having evaluated the evidence, we find that Cornette discloses the recited four-layer structure. The majority of Patent Owner’s arguments are based on its claim construction of the term “layer,”—i.e., as requiring different materials—which we do not adopt. *See supra* § II.C.2. As we explain above, the term “layer” means “a thickness of material spread over

or covering a surface.” *See id.* Like Figure 1 of the ’683 patent, Cornette’s Figure 22 shows four layers, as Petitioner’s side-by-side comparison of Figure 1 and Figure 22 illustrates. Ex. 1004, 10 (showing four different layers); *see* Pet. 33–36; (Dr. Miles’s testimony regarding the four-layer structure in Cornette’s Figure 22). Although Cornette’s Figure 22 does not label its layers, we credit Dr. Mile’s testimony that one of ordinary skill in the art would have understood the four layers to correspond to the claimed layers based on the materials in each layer, the process for producing the coated steel product, the color scheme, and the arrangement of the layers. Ex. 1003 ¶¶ 88–94. Indeed, Dr. DeArdo testified on cross-examination (similar to Dr. Miles’s direct testimony) that the coloration in a micrograph (e.g., the depiction in Figures 1 and 2 of the ’683 patent or Figure 22 of Cornette) would give him an idea of the compositions for each colored band in the figure. Ex. 1052, 86:15–87:17; *see also id.* at 87:18–88:8 (Dr. DeArdo describing the colored bands in Figure 2 of the ’683 patent, for example, a “very light” interdiffusion layer and “very light” aluminum intermetallic layers).

Patent Owner further argues that Petitioner “improperly relies on figure 22 of Cornette in combination with figure 1 of the ’683 patent” because Petitioner compares the two figures side-by-side in its analysis, but the figures “are different and not properly comparable to each other.” Resp. 48–49. Patent Owner identifies five alleged differences between the two figures: (1) Figure 1 is of a stamped product, whereas Figure 22 is not; (2) Cornette discloses that a pre-coated steel sheet “is heated for, ‘generally 900°C, 5 minutes,’” but “there is no indication that this temperature and time . . . was used to arrive at Cornette’s figure 22 steel,” whereas Figure 1 of the ’683 patent “results from a specific heating rate and cooling rate”; (3) the

Figure 1 specimen was etched, prepared or otherwise processed to reveal the layers of the coating, whereas Cornette's Figure 22 specimen was not;

(4) Figure 1 and Figure 22 are of different magnifications; and (5) the '683 patent uses a compositional analysis to describe the four-layer structure in Figure 1, whereas Cornette contains no compositional analysis. *Id.* at 49–50 (citing Ex. 2010 ¶¶ 44–47, 49–52, 54–56, 59, 75–90, 112–120, 143–157), 51–52 (similarly arguing that Petitioner improperly relies on the '683 patent's disclosed process to support its allegation of anticipation).

According to Patent Owner, "Petitioner's comparison of the heat treated blank of Cornette (Fig. 22) and layers within the coated stamped product of the '638 patent (figure 1) is a comparison of apples and oranges." *Id.* at 50.

We do not agree that Petitioner's comparison of Cornette's Figure 22 to Figure 1 of the '683 patent is improper. All of the differences Patent Owner identifies are features that fall outside of the scope of claim 1. Ex. 1001, 15:21–39; *see supra* § II.C.1 (discussing "stamping" in the preamble); *cf. supra* § II.E1.a) (explaining that even if "stamping" is a limitation, Cornette discloses a stamped product). To satisfy its burden in establishing that Cornette discloses the four layer structure, Petitioner only need establish that Cornette teaches a coating that comprises (from the base steel outwards): an interdiffusion layer, an intermediate layer, an intermetallic layer, and a superficial layer. *Id.* As we explain above, Petitioner makes such a showing by comparing the two figures, as well as explaining, with Dr. Miles's credible testimony, why Cornette discloses the four-layer structure. Accordingly, Petitioner establishes that Cornette discloses a coating comprising, proceeding from the base steel outwards: (a) an Interdiffusion layer, (b) an Intermediate layer, (c) an Intermetallic layer, and (d) a Superficial layer.

c) Remaining limitations

Petitioner explains how Cornette discloses the remaining limitations of claim 1. For example, Petitioner explains that Cornette discloses “a strip of base steel having a first side and a second side” and a coating on at least one side of the base steel. Pet. 26–30 (citing Ex. 1004, 9–10, Figs. 21, 22; Ex. 1003 ¶¶ 71, 73, 76; Ex. 1036). Petitioner also explains that Cornette discloses that its multiphase alloy layer or coating “results from the interdiffusion between the base steel and the aluminum or aluminum alloy pre-coating.” *Id.* at 30–33 (citing Ex. 1004, 9, Fig. 21; Ex. 1003 ¶¶ 84, 86; Ex. 1010). Petitioner further points to Cornette’s disclosure that “[h]eating the pre-coated boron steel (generally 900°C, 5 minutes) creates an alloying reaction between substrate (iron) and the coating (aluminum-silicon) which leads to a hard **multiphase alloy layer**,’ which ‘is typically **about 40 µm at the steel surface**’” as disclosing a coating thickness greater than 30 micrometers. *Id.* at 37 (quoting Ex. 1004, 9); *see id.* at 36, 38 (citing Ex. 1004, 9–10, Fig. 22; Ex. 1003 ¶ 98). And Petitioner explains, with citations to Cornette’s Figure 22, how Cornette discloses that layer (a), i.e., the interdiffusion layer, that has a thickness less than 15 micrometers. *Id.* at 38–39 (citing Ex. 1004, Fig. 22; Ex. 1003 ¶ 101).

Patent Owner does not address these assertions and, therefore, has forfeited any arguments for patentability based on these uncontested limitations. *See generally* Resp.; *see* Paper 8, 7–8 (Scheduling Order cautioning Patent Owner that “any arguments for patentability not raised in the response will be deemed waived”); *cf. In re Nuvasive*, 842 F.3d 1376, 1381 (Fed. Cir. 2016) (explaining that a patent owner waives an argument presented in the preliminary response if it fails to renew that argument in the patent owner response during the instituted trial). Because a preponderance

of the evidence supports Petitioner’s arguments relating to Cornette’s teachings, we adopt Petitioner’s arguments as our own. *See* Pet. 26–33, 36–39 (and evidence cited therein); *see also In re Nuvasive*, 841 F.3d 966, 974 (Fed. Cir. 2016) (explaining that the Board need not make specific findings as to claim limitations that a patent owner fails to dispute the prior art discloses). Accordingly, Petitioner establishes that Cornette anticipates claim 1.

2. Claim 2

Claim 2 recites “[t]he coated steel stamped product according to claim 1, wherein the said layers (c) and (d) are quasi continuous by occupying at least 90% of a level corresponding to each said layer and wherein less than 10% of layer (c) is present at an extreme surface of the product.” Ex. 1001, 15:40–44. Petitioner explains how Cornette discloses the additional limitations of claim 2. Pet. 39–42 (citing Ex. 1003 ¶¶ 107–108; Ex. 1004, Fig. 22). Patent Owner does not contest Petitioner’s arguments or evidence as to the additional limitations claim 2 and, again, has forfeited any arguments as to the patentability of this claim. *See generally* Resp.; Paper 8, 7–8. Because a preponderance of the evidence supports Petitioner’s arguments relating to Cornette’s teachings, we adopt Petitioner’s arguments as our own. *See* Pet. 39–42 (and evidence cited therein); *Nuvasive*, 841 F.3d at 974. Accordingly, Petitioner establishes that Cornette anticipates claim 2.

F. Obviousness Grounds

Petitioner asserts six obviousness grounds against dependent claims 3–11: (1) in ground 2, that the subject matter of claims 8 and 11 would have been obvious over Cornette (Pet. 42–46); (2) in ground 3, that the subject matter of claims 3, 4, 6, 7, and 10 would have been obvious over Cornette in view of Laurent (*id.* at 46–57); (3) in ground 4, that the subject

matter of claim 11 would have been obvious over Cornette in view of Laurent, EP Laurent, and FR Laurent (*id.* at 57–60); (4) in ground 5, that the subject matter of claim 5 would have been obvious over Cornette in view of Nishibata (*id.* at 61–63); (5) in ground 6, that the subject matter of claim 9 would have been obvious over Cornette in view of Somani (*id.* at 64–68); and (6) in ground 7, that the subject matter of claim 11 would have been obvious over Cornette in view of Engels (*id.* at 68–72).

Patent Owner presents responsive arguments only for claim 11, challenged in grounds 2, 4, and 7, and claim 9, challenged in ground 6. We first address the contested grounds and claims and then turn to the uncontested grounds and claims.

1. Contested grounds and claims

We begin our analysis with the contested grounds and claims. We address claim 9 and then claim 11.

a) Claim 9

Claim 9 depends from claim 1 and recites a hot formed product with a strain higher than 10% and a cooling rate higher than 50°C/s. Ex. 1001, 16:39–41. Petitioner argues, “claim 9 is a product-by-process claim,” and “the process is not entitled to patentable weight over and above the product claimed in claim 1” because the process imparts no additional structure to the product recited in claim 1. Pet. 64 (citing Ex. 1003 ¶ 180).

Patent Owner responds that “the limitation of claim 9 undoubtedly imparts structure to the claimed coated steel stamped product and is entitled to patentable weight.” Resp. 72 (citing Ex. 1001, 11:10–29). In that regard, Patent Owner contends Petitioner’s assertion that “Somani provides a detailed account of how ‘hot compression and simultaneous or subsequent fast cooling’ changes the microstructure of a boron steel (Petition, pp. 64–

65), is an admission that the degree of straining and the cooling rate, at the very least,” affects the structure and dimensions of the stamped product. *Id.* at 73. Thus, Patent Owner argues Somani evidences that the strain and cooling rate limitation is entitled to patentable weight. *Id.*

Petitioner replies that, for product-by-process claim like claim 9, it need only show that “the product in the product-by-process claim is the same as or obvious from a product of the prior art.” Reply 20 (emphasis omitted) (quoting *Thorpe*, 777 F.2d at 698). Petitioner notes Patent Owner “at best implies” that claim 9’s recited strain and cooling rate process ranges impart “a full martensitic transformation” or structure to the base steel and argues that Patent Owner admits that Cornette discloses a full martensitic base steel. *Id.* at 20–21 (citing Resp. 72, 77).

The question of whether claim 9’s strain and cooling process limitations distinguish over the prior art turns on whether, as Petitioner correctly notes, “the product in the product-by-process claim is the same as or obvious from a product of the prior art.” *Thorpe*, 777 F.2d at 698. That is, “the patentability of a product does not depend on its method of production.” *Id.* Here, Patent Owner appears to argue that the product recited in claim 9 is distinguishable from the product recited in claim 1 because the process limitations result in a fully martensitic structure. Resp. 72 (quoting Ex. 1001, 11:10–29); Sur-reply 21 (“[T]he claim 9 process limitations result in a fully martensitic structure.”). Assuming that Patent Owner’s argument is correct, Petitioner must show that the asserted art discloses the same product, i.e., a fully martensitic structure, or an obvious variation. *Thorpe*, 777 F.2d at 698. As Petitioner points out, Patent Owner admits that “Vaissiere teaches full martensite for the same steel as figure 22 of Cornette at 27°C.” Resp. 77 (citing Ex. 1033, 6). In other words, Patent

Owner admits that that Cornette's Figure 22 has the same structure Patent Owner alleges the process recited in claim 9 imparts. *See also* Ex. 1033, 6 (“The critical quenching speed enabling a completely martensitic structure, under these conditions, is 27°C/s.”); Ex. 1003 ¶ 150 (Dr. Miles's testimony that although Cornette “lacks explicit disclosure of a full martensitic structure[,]” an ordinarily skilled artisan would have understood that Cornette discloses a full martensitic structure because “its hot-stamped steel product can achieve a tensile strength of at least 1500 MPa”). It does not matter that Cornette may achieve the fully martensitic structure using a different cooling process, i.e., 27°C/s. *See Thorpe*, 777 F.2d at 698.¹⁸

Like the parties, we understand Petitioner's ground to rely on Somani only if Petitioner must establish that the prior art discloses a strain higher than 10% and a cooling rate higher than 50°C/s. *See* Pet. 64; Resp. 71 (acknowledging Petitioner argues that it need not show that the prior art teaches the strain and cooling rate limitation). Because we determine that Petitioner does not need to make such a showing, we do not address the parties' arguments regarding Somani. Given the foregoing, Petitioner establishes that the subject matter of claim 9 would have been obvious over Cornette.

¹⁸ In its Sur-reply, Patent Owner argues Cornette's Figure 22 “is not stamped and stamping changes structure.” Sur-reply 21. Patent Owner similarly argues that Petitioner provides no evidence that Cornette's Figure 22 “would have the claimed four-layer coating, and the fully martensitic structure” “when stamped and cooled according to Somani.” *Id.* Patent Owner's arguments about stamping are not persuasive for the reasons we provide in connection with the same arguments Patent Owner raises in addressing claim 1. *See supra* § II.E.1.a).

b) Claim 11

Claim 11 depends from claim 1 and further recites “wherein said layer (a) has a thickness less than 10 micrometers.” Ex. 1001, 16:43–45.

Petitioner asserts three grounds against claim 11: obviousness over Cornette (Pet. 43–46); obviousness over Cornette, Laurent, EP Laurent, and FR Laurent (*id.* at 57–60); and obviousness over Cornette and Engels (*id.* at 68–72).

(1) Obviousness over Cornette alone

Petitioner acknowledges that Cornette does not disclose a layer (a) thickness of less than 10 micrometers. Pet. 44 (“As shown in Figure 22, above, Cornette’s ‘interdiffusion layer’ has a thickness *very close to* 10 μm (*e.g.*, approximately 10.5 μm in at least one location).” Petitioner asserts, however, Cornette would have rendered a 10 micrometer layer (a) thickness obvious because “a *prima facie* case of obviousness exists where the claimed ranges or amounts do not overlap with the prior art but are merely close.” *Id.* (quoting MPEP § 2144.05, which cites *Titanium Metals Corp. of Am. v. Banner*, 778 F.2d 775, 783 (Fed. Cir. 1985)). According to Petitioner, Cornette’s 10.5 micrometer interdiffusion layer “is so close to the claimed thickness that one skilled in the art would have expected them to have the same properties.” *Id.* at 45 (citing Ex. 1003 ¶ 116). Petitioner further contends that the ’683 patent’s failure to describe how reducing the interdiffusion layer’s thickness would cause meaningful changes in the interdiffusion layer or the coating as a whole supports its position. *Id.* In other words, Petitioner contends that it has established a *prima facie* case of obviousness and that Patent Owner cannot show that the 10.5 micrometer thickness is critical to the ’683 patent. *Id.*

Patent Owner responds *Titanium Metals* is distinguishable and that *In re Patel*, 566 F. App'x 1005 (Fed. Cir. 2014) (non-precedential), is more applicable. Resp. 62–65. Specifically, Patent Owner argues that there is no overlap between the less than 10 micrometer thickness range in claim 11 and Cornette's thickness range and that Cornette fails to “teach its thickness can be flexibly applied.” *Id.* at 64.

Having considered the arguments and evidence, we determine that Petitioner has the better position. In the context of an *inter partes* review, the Federal Circuit has held that overlapping ranges disclosed in the prior art create a presumption of obviousness, which a patent owner may rebut by showing that the claimed range is critical, i.e., it produces an unexpected result “different in kind not merely in degree from the results of the prior art,” that the prior art teaches away from the claimed range, or other relevant evidence of nonobviousness. *E.I. DuPont de Nemours & Co. v. Synvina C.V.*, 904 F.3d 996, 1006, 1008 (Fed. Cir. 2018). A similar framework applies to cases in which the claimed range and prior art range “do not overlap but are close enough such that one skilled in the art would have expected them to have the same properties.” *In re Peterson*, 315 F.3d 1325, 1329 (Fed. Cir. 2003) (citing *Titanium Metals*, 778 F.2d at 783). Here, similar to *Peterson* and *DuPont*, Petitioner argues that Cornette discloses a range that renders the claimed range *prima facie* obvious. Thus, we consider the general principles that apply to cases involving optimization of ranges, particularly in the context of overlapping and close ranges. *DuPont*, 904 F.3d at 1008 (explaining that *In re Magnum Oil Tools International, Ltd.*, 829 F.3d 1354 (Fed. Cir. 2016) “did not alter the framework governing overlapping range cases”).

The Federal Circuit has “recognized that ‘where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.’” *Id.* at 1006 (quoting *In re Aller*, 220 F.2d 454, 456 (CCPA 1955)). Thus, a *prima facie* case of obviousness exists when “[t]he proportions [between the prior art and the claimed range] are so close that . . . one skilled in the art would have expected them to have the same properties.” *Titanium Metals*, 778 F.2d at 783.

Patent Owner’s reliance on *Patel*, which is non-precedential, falls short here because *Patel* “does not stand for the proposition . . . that a claimed range and prior art range must overlap . . . to find a *prima facie* case.” *In re Brandt*, 886 F.3d 1171, 1177 (Fed. Cir. 2018). Nor does *Patel* stand for the notion that there *must* be evidence from the prior art that the range is flexible. *Id.* Indeed, *Brandt* explains that a *prima facie* case of obviousness exists where “the claimed range and the prior art range abut one another” and “there is no meaningful distinction between the two ranges.” *Id.* at 1174, 1177–78 (observing that “the insignificance of the range difference between the claims and the prior art can be gleaned from [the Appellants’] application itself, which discloses embodiments . . . having a density of greater than 2.5 and less than 20 pounds per cubic foot,” even though the claimed range required a density of less than 6 pounds per cubic foot); *see also Ortho-McNeil Pharm., Inc. v. Teva Pharm. Indus., Ltd.*, 344 F. App’x 595, 600 (Fed. Cir. 2009) (non-precedential) (applying *Titanium Metals* to a district court appeal and explaining that “[b]ecause the difference between 1:7.1 and 1:10 is so slight, [the prior art] creates a *prima facie* case of obviousness with regard to claim 6” that the patent owner can rebut “if it can show that the prior art teaches away from the claimed range, or the

claimed range produces new and unexpected results over the prior art range”).

It is undisputed on this record that Cornette discloses a layer (a) thickness of approximately 10.5 micrometers. Pet. 44; Ex. 1003 ¶ 115; *see* Resp. 62–65 (not contesting Petitioner’s showing regarding Cornette’s layer (a) thickness). We find that the ranges “are close enough such that a person of ordinary skill in art would have expected them to have the same properties.” *Peterson*, 315 F.3d at 1329 (citation omitted); *see* Ex. 1003 ¶ 116. And, as in *Brandt*, the ’683 patent itself supports Petitioner’s position that there is no meaningful difference between Cornette’s 10.5 micrometer thickness and the 10 micrometer thickness recited in claim 11. *See* Ex. 1001, 6:56–61 (disclosing embodiments in the thickness of layer (a) is “less than 15 micrometers, for example 14, 12, 10, 8, 6, 4, 2, or 1 micrometers, and all whole numbers, ranges and subranges therebetween . . . including all numbers between each listed value . . . (e.g., 13.84 micrometers)”). Accordingly, Petitioner establishes a prima facie case of obviousness for claim 11 and the burden of production shifts to Patent Owner to come forward with evidence of teaching away, unexpected results, or other pertinent evidence of nonobviousness. *DuPont*, 904 F.3d at 1008.

Patent Owner, however, does not direct us to any evidence that Cornette teaches away from the layer (a) thickness recited in claim 11. *See generally* Resp.; Sur-reply. Nor does Patent Owner provide evidence of unexpected results or other pertinent evidence of nonobviousness. *Id.* Thus, Petitioner establishes that claim 11 would have been obvious over Cornette.

(2) Remaining grounds

Having determined that claim 11 of the ’638 patent would have been obvious over Cornette alone, we do not address Petitioner’s additional

obviousness grounds challenging claim 11 based on Cornette, Laurent, EP Laurent, and FR Laurent or Cornette and Engels. *See SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1359 (2018) (holding a petitioner “is entitled to a final written decision addressing all of the claims it has challenged”).

2. *Uncontested grounds and claims*

As noted above, Petitioner argues that the subject matter of claims 3–8 and 10 would have been obvious over Cornette and additional prior art references. Claims 3–8 and 10 depend directly from claim 1. Claims 3–6 recite components and compositions of the steel in the strip and claim 7 recites a composition of the aluminum or aluminum alloy pre-coating. *Id.* at 15:45–16:36. Claim 8 recites a land motor vehicle comprising the heat treated coated steel product. *Id.* at 16:37–38. Claim 10 recites a coated stamped steel product wherein the product includes a full martensitic structure. *Id.* at 16:42–43.

For each claim and ground, Petitioner explains how the asserted art discloses the additional limitations of the claim and provides reasons why one of ordinary skill in the art would have had a reason to combine the references’ disclosures with a reasonable expectation of success in achieving the claimed inventions. *See* Pet. 42–43 (ground 2, claim 8 as having been obvious over Cornette), 46–57 (ground 3, claims 3, 4, 6, 7, and 10 as having been obvious over Cornette and Laurent), 61–63 (ground 5, claim 5 as having been obvious over Cornette and Nishibata). In arguing that Petitioner fails to carry its burden on these challenges, Patent Owner refers to its arguments with respect to claim 1. *See* Resp. 61–62. For the reasons we discuss above, we do not find those arguments persuasive. Because a preponderance of the evidence supports Petitioner’s arguments as to claims 3–8 and 10, we adopt Petitioner’s arguments as our own. *See* Pet. 42–43,

46–57, 61–63 (and evidence cited therein); *Nuvasive*, 841 F.3d at 974. Accordingly, Petitioner establishes that claim 8 would have been obvious over Cornette, claims 3, 4, 6, 7, and 10 would have been obvious over Cornette and Laurent, and claim 5 would have been obvious over Cornette and Nishibata.

III. CONCLUSION

Based on the evidence and arguments, Petitioner establishes by a preponderance of the evidence that claims 1–11 of the '683 patent are unpatentable.¹⁹

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner establishes by a preponderance of the evidence that claims 1–11 of the '683 patent are unpatentable; and

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

In summary:

¹⁹ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Claim(s) shown unpatentable	Claim(s) Not shown unpatentable
1, 2	102	Cornette	1, 2	
8, 11	103	Cornette	8, 11	
3, 4, 6, 7, 10	103	Cornette, Laurent	3, 4, 6, 7, 10	
11	103	Cornette, Laurent, EP Laurent, FR Laurent ²⁰		
5	103	Cornette, Nishibata	5	
9	103	Cornette, Somani	9	
11	103	Cornette, Engels ²¹		
Overall Outcome			1–11	

²⁰ As discussed in § II.F1.(b)(2), we do not reach this ground.

²¹ As discussed in § II.F1.(b)(2), we do not reach this ground.

IPR2019-01275
Patent 9,708,683 B2

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