

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

POSCO,
Petitioner,

v.

ARCELORMITTAL
Patent Owner.

Case IPR2019-01275
Patent 9,708,683

PATENT OWNER'S RESPONSE

PURSUANT TO 37 C.F.R. § 42.120

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LISTING OF EXHIBITS

Exhibit Number	Description
Exhibit 2001	Declaration of Dr. DeArdo
Exhibit 2002	U.S. Publication No. 2004/0009366 to Takagi
Exhibit 2003	EP Patent No. 2086755 to Drillet
Exhibit 2004	U.S. Patent No. 8,307,680
Exhibit 2005	Prosecution History for U.S. Application No. 12/447,777
Exhibit 2006	Declaration of Oleg Ioselevich
Exhibit 2007	Cornette Color Scan
Exhibit 2008	Random House Webster's Dictionary, pp. 409, 445 (2001)
Exhibit 2009	Kurtz, Dictionary of Civil Engineering, Kluwer Academic / Plenum Publishers, p. 1201-2 (2004).
Exhibit 2010	Second Declaration of Dr. DeArdo.
Exhibit 2011	Deposition Transcript of Dr. Michael Miles
Exhibit 2012	First Declaration of Oleg Ioselevich
Exhibit 2013	Second Declaration of Oleg Ioselevich

I. INTRODUCTION

ArcelorMittal ("Patent Owner") submits this Patent Owner's Response responding to the Petition (the "Petition") for *Inter Partes* Review ("IPR") of U.S. Patent No. 9,708,683 ("the '683 patent") filed by POSCO ("Petitioner").

Petitioner's case hinges on the premise that Cornette figure 22 (Ex. 1013) discloses the '683 patent's claimed coated steel stamped product which "comprises, proceeding from the base steel outwards: (a) an Interdiffusion layer, (b) an Intermediate layer, (c) an Intermetallic layer, and (d) a Superficial layer." The sole *written* disclosure of the coating in Cornette is "a hard multiphase alloy layer" without any discussion of how many phases or layers are present. (Ex. 1013, [0009]).

Figure 22 of Cornette does not show a four-layer structure as claimed in the '683 patent nor does it show a four-layer structure of a stamped product.

To hide this fact Petitioner attempts three main arguments which are improper both legally and factually:

1. Petitioner provides definitions and interpretations of the four-layer structure that contradict the specification of the '683 patent and are not reasonable under any standard, let alone under a *Phillips* analysis. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1315 (Fed. Cir. 2005)(en banc). There is simply no possible

interpretation consistent with the *Phillips* analysis that would permit figure 22 to be considered to have a four-layer structure and be encompassed by the claims of the '683 patent.

2. Petitioner improperly uses the specification of the '683 patent to assert that figure 22 is the same as the figure 1 embodiment of the '683 patent by arguing that the process of Cornette is the same as the process described in the '683 patent. (Petition, pp. 34, 35). Yet Cornette fails to disclose the same process, including for example a key heating rate. The assertion that figure 22 of Cornette is the same as the figure 1 embodiment of the '683 patent is not factually true: Cornette is made in a different way and the asserted "hard multiphase alloy layer" of Cornette is at most a three-layer structure and is therefore different from the four-layer structure depicted in figure 1 of the '683 patent. Despite this, Petitioner uses an eyeball comparison of "coloring"¹ of figure 1 of the '683 patent to figure 22 of Cornette in an attempt to supplement the inadequate written disclosure of "a hard multiphase alloy layer" in Cornette.

¹ In fact, both figure 1 of the '683 patent and figure 22 of Cornette are in black and white, not color.

3. Petitioner and its expert improperly combine unrelated figures 21 and 22 of Cornette (Petition, p. 30) in an attempt to mislead the Board into believing that figure 22 shows a stamped part when figure 22 clearly does not. Figure 22 of Cornette shows a section view of the “coating, made of aluminum and silicon ... after heat treatment” (Ex. 1013, [0009], [0010]) that is not stamped. Figure 22 of Cornette thus says nothing about the number of layers present in a stamped part.

Petitioner bears the burden of demonstrating by a preponderance of the evidence that the asserted claims are unpatentable. “[T]he burden of persuasion is on the petitioner to prove ‘unpatentability by a preponderance of the evidence,’ 35 U.S.C. §316(e), and that burden never shifts to the patentee.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1375 (Fed. Cir. 2016).

II. BACKGROUND AND THE ’683 PATENT

The ’683 patent solves problems associated with manufacturing parts with high strength and weldability. (Ex. 1001, 2:6-10; Ex. 2010, ¶36).

One of the key features of the ’683 patent is the claimed four-layer coating in a stamped product which provides improved weldability. (Ex. 2010, ¶37). The ’683 patent states that the claimed four-layer coating provides better weldability:

The inventors have discovered that particularly good weldability of aluminized and hot stamped parts is associated with the following succession of coating

layers on the parts ("four-layer coating"), proceeding from steel substrate outwards:

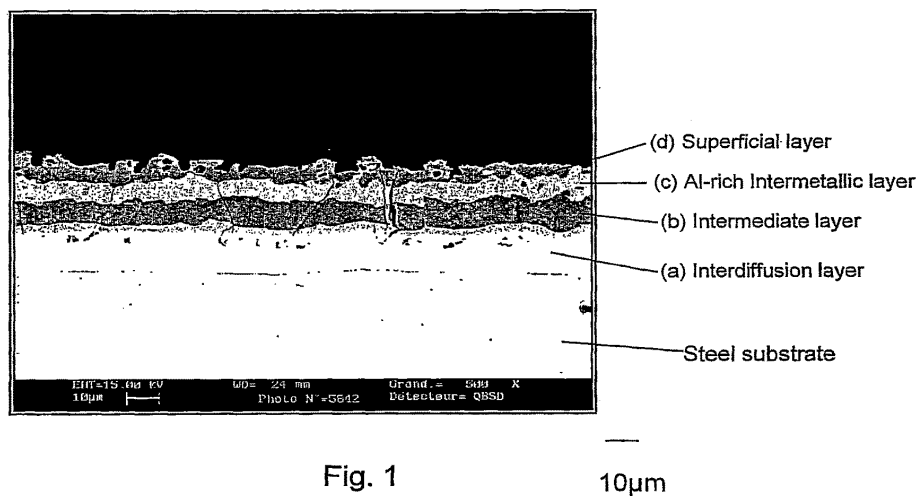
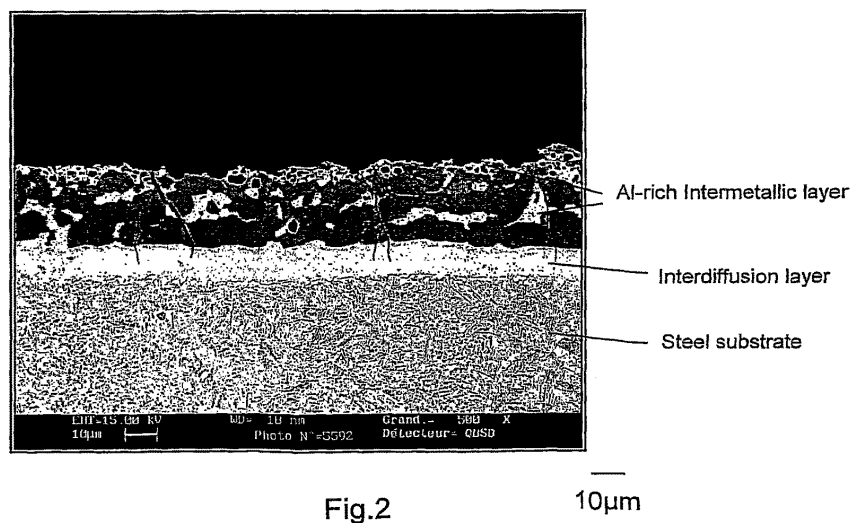
- (a) Interdiffusion layer ("layer (a)" or "Interdiffusion layer"),
- (b) Intermediate layer ("layer (b)" or "Intermediate layer"),
- (c) Intermetallic layer ("layer(c)" or "Intermetallic layer"),
- (d) Superficial layer ("layer (d)" or "Superficial layer"). (Ex. 1001, 6:22-30; Ex. 2010, ¶38).

Current flow, heat generation at the surfaces and nugget formation at the initial stage of spot welding are all affected by the four-layer coating because "this particular layer disposal, in particular layers (a), (c) and (d) influence the resistivity of the coating both by their intrinsic characteristics and by the effect of roughness." (Ex. 1001, 6:67-7:6; Ex. 2010, ¶39).

The '683 patent specification teaches that a specific controlled process creates the claimed four-layer structure in a coated stamped product. (Ex. 7:7-13, 28-31; Ex. 2010, ¶¶40-45). Heating temperatures and heating rate are important factors in that process (Ex. 2010, ¶42). At the time of the invention, conventional processes did not produce a four-layer structure as evidenced, e.g., by figure 2 of the '683 patent. (Ex. 1001, 13:13-26, Fig. 2; Ex. 2010, ¶45).

A. Figure 1 And Figure 2 Of The '683 Patent

Figures 1 and 2 of the '683 patent, show SEM microscope images of **heat treated and hot stamped parts**. (Ex. 2010, ¶¶46-48). Figure 1 shows a coated hot stamped part having layers (a) to (d) and figure 2 shows a coated hot stamped part **without** the four-layer coating as known in the art. (Ex. 1001, 3:57-67; Ex. 2010, ¶¶52-53).



Figures 1 and 2 show different structures for stamped blanks with the same base steel and precoating but treated with different heat treatment parameters.

Figure 1 was heat treated according to the invention, for 6 mins at 920°C and V_C was 10°C/s, while figure 2 was heat treated to “not correspond to the invention” (Ex. 1001,3:63-65), for 7 mins at 950°C and V_C was 11°C/s. The ensuing alloying reactions resulted in different coating structures in Figures 1 and 2 and different weldability. (Ex. 1001, Example 2). Figure 1, which is according to the invention, includes a four-layer structure: coating layers (a) to (d) and has good weldability, whereas figure 2 includes a three-layer structure, with a discontinuous Al-rich intermetallic layer scattered within the coating: “about 50% of this layer is present at the extreme surface of the part” which results in undesirable weldability. (Ex. 1001, Example 2, 12:47-13:46; Ex. 2010, ¶¶53-54).

Therefore, the '683 patent teaches how important the controlled process parameters are to the creation of the claimed four-layer coating in a coated stamped steel product, and differentiates the four-layer structure of figure 1, which has good weldability, from the three-layer structure in figure 2, which does not. (Ex. 2010, ¶¶54-55).

B. Claim 1

The '683 patent issued with 11 claims. Claim 1 recites:

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; Ex. 2010, ¶60).

III. THE ASSERTED PRIOR ART

A. CORNETTE

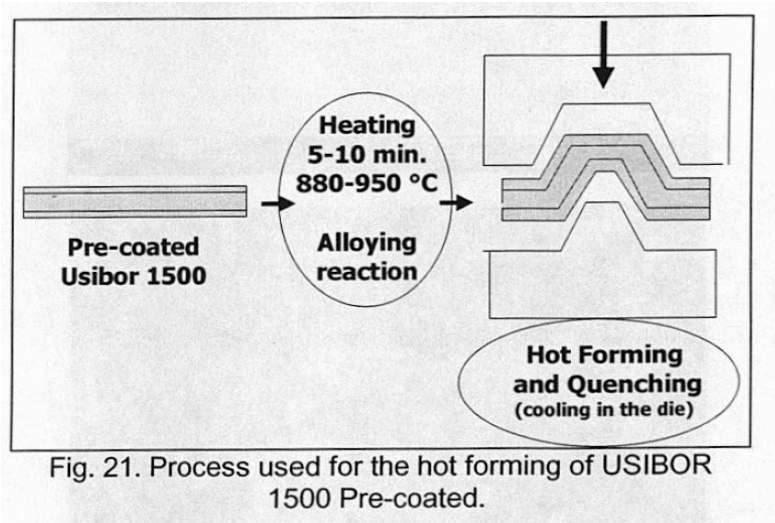
1. Cornette Precoated Steel

Cornette discloses precoating and heat treating a coated steel, USIBOR, to obtain high mechanical strength and corrosion protection. (Ex. 1013, [0009]; Ex. 2010, ¶¶70-71). USIBOR is coated with an Al-Si coating via hot dipping, with an average coating thickness of 25µm. *Id.* Cornette discloses that this precoated steel sheet is heated for, “generally 900°C, 5 minutes,” so an alloying reaction between the iron in the steel sheet and Al-Si precoating occurs, resulting in a hard Fe-Si-Al alloy layer with a thickness of “typically about 40µm at the steel surface.” *Id.*

Cornette does not disclose and is completely silent about any further process parameters such as a heating rate V_c or any transfer time or cooling rate. (Ex. 1013, Ex. 2010, ¶72).

2. Cornette Hot Forming

Cornette describes that hot forming follows heat treatment as shown below in Figure 21. (Ex. 1013, at [0009]; Ex. 2010, ¶73).

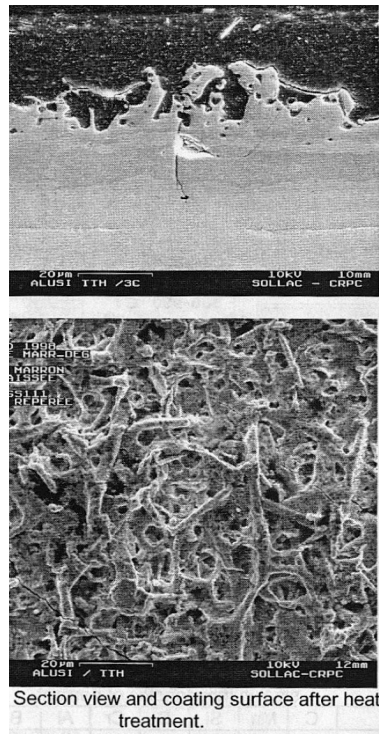


Cornette does not provide details of the hot forming process and only describes the heat treatment and cooling: “after austenization at 900°C during 5 minutes and cooling in the die.” (Ex. 1013, [0010]). Cornette does not disclose any cooling rates or strain during hot forming and quenching. The sole information about cooling in Cornette is: “cooling in the die.” Cornette clearly differentiates between “heat treatment” and “hot forming.” (*Compare* Ex. 1013, at figure 21 (“heating” vs. “Hot Forming and Quenching”), at [0009] (“after heat

treatment”), at [0010] (“before heat treatment” vs. “after hot forming”). (Ex. 2010, ¶74).

3. Cornette's Figure 22

Cornette shows the following as figure 22 (Ex. 1013):



The only information about figure 22 in Cornette is the caption “Section view and coating surface after heat treatment” and the immediately preceding sentence: “The following photo shows a section view of the coating *after heat treatment.*” (Ex. 1013, [0010]) (emphasis added). Other than clearly indicating that the image is after heat treatment as contrasted with after hot forming or hot stamping, there is no disclosure of any other information about figure 22 itself in Cornette. There is no description of what heating temperature or heating rate was

used to obtain the sheet of figure 22. Although different sections of Cornette discuss general heating temperatures of times *typically* used for USIBOR, there is no indication of what temperature, time, and heating rate was used to obtain the sheet of figure 22. Nor is there any description, let alone discussion, in Cornette of how many phases are present in figure 22. (Ex. 2010, ¶¶75-78).

B. LAURENT

U.S. Patent No. 6,296,805 to Laurent et al. (“Laurent”) is directed to a hot- or cold-rolled steel sheet, “which, after thermal treatment performed on the finished casting, makes it possible to obtain a mechanical resistance in excess of 1000 MPa, a substantial resistance to shocks, fatigue, abrasion and wear, while retaining a good resistance to corrosion as well as a good capacity for painting and gluing.” (Ex. 1008, 1:37-44, Ex. 2010, ¶91).

The thermal treatment of the metal in the sheet in Laurent “consists in a heating at a temperature ranging between A_{c1} , starting temperature of austenitic transformation, for example 750° C. and 1200° C., in a furnace, for a period which depends on the temperature to be reached and the thickness of the casting sheet.” (Ex. 1008, 3:60-65, Ex. 2010, ¶92).

Laurent discloses that “[i]f the structure sought is completely martensitic, the holding temperature should be in excess of Ac₃, for example 840° C., ending temperature of austenitic formation.” (Ex. 1008, 3:67-4:2, Ex. 2010, ¶93).

Laurent teaches that “[t]he temperature holding should be followed by a cooling adjusted to the final structure sought.” (Ex. 1008, 4:2-4). For example, “[f]or a completely martensitic structure and for a steel having the composition of the example, the speed of cooling should be in excess of the critical speed of hardening which is 27° C./s for an austenitizing at 900° C. for 5 min., the sheet having a thickness of approximately 1 mm.” (*Id.* at 4:4-9, Ex. 2010, ¶94).

Laurent states that “[a]t the time of thermal treatment, the base coating, of aluminum for example, is transformed into a layer alloyed with iron and comprising different phases depending on the thermal treatment and having a considerable hardness which may exceed 600 HV100 g.” (Ex. 1008, 4:47-51, *also* 2:57-61). Laurent however does not state how many phases are present in the layer. (Ex. 2010, ¶95).

With respect to the number of layers in the coating, Laurent states that its coating may have “a first alloy layer in contact with the surface of the steel” and a “second coating layer, on top of the first.” (Ex. 1008, 3:14-25). In an example of

implementation, Laurent teaches “an aluminum-based layer about 20 μm in thickness.” (Ex. 1008, 3:38-43, Ex. 2010, ¶96).

Laurent warns that “[t]he first alloy layer may crack when the sheet is shaped for the manufacture of castings.” (Ex. 1008, 3:24-25. Ex. 2010, ¶97).

C. EP LAURENT

European Patent No. 1013785 (“EP Laurent”) describes a process for manufacturing a part from a strip of hot-rolled sheet steel. (Ex. 1012, ¶[0001]). The process includes the steps of (i) “coat[ing] [the rolled sheet] with a metal or a metal alloy providing protection of the surface and the steel”; (ii) increasing the temperature of the coated sheet, which “creates an alloyed intermetallic compound, providing protection against corrosion, and against decarburation of the steel, it being possible for said intermetallic compound to provide a lubricating function”; (iii) forming by stamping, and (iv) cooling the resulting part. (*Id.*, ¶[0004], Ex. 2010, ¶98).

EP Laurent teaches that “[u]pon heat treatment, or an increase in temperature for forming, the coating forms an alloyed layer presenting a high resistance to corrosion, abrasion, wear and fatigue.” (Ex. 1012, ¶[0009], Ex. 2010, ¶99).

EP Laurent states that “[u]pon increasing the temperature, the aluminum-based coating transformed into an alloyed layer on the surface comprising various phases depending on the heat treatment and presenting a high degree of hardness that can exceed 600 HV 100g.” (Ex. 1012, ¶[0012]). EP Laurent does not state how many phases are present in the layer. (Ex. 2010, ¶100).

D. FR LAURENT

French Patent Publication No. 2,833,504 (“FR Laurent”) “relates to obtaining a part by a hot-forming method and in particular obtaining all or part of an automobile vehicle wheel.” (Ex. 1010, [0002], Ex. 2010, ¶101).

Before the thermal treatment, “an aluminum-based layer [is] about 25 μm thick.” (Ex. 1010, [0006]). However, during reheating of the sheet-metal blank, “the coating alloys with the substrate to form an intermetallic alloy” and that “[b]y interdiffusion, the alloying leads to an increase of the thickness of the layer.” *Id.* For the treatment specified in FR Laurent, the increase is “a 50% increase.” *Id.*, (Ex. 2010, ¶102).

Although FR Laurent discloses that “[t]he alloy layer made on the part has a hardness gradient” (Ex. 1010, [0007]), FR Laurent does not disclose how many different hardnesses the alloy layer in FR Laurent has. (Ex. 2010, ¶103).

E. SOMANI

Somani describes an investigation of high-temperature plastic deformation and applied stress on the martensitic transformation in a B-bearing steel by dilatometric measurements and compression tests. (Ex. 1005, Abstract). “The forming and quenching process was simulated by hot compression and simultaneous or subsequent fast cooling” in Somani. (Ex. 1005, [0002], Ex. 2010, ¶104).

Somani reports that “[s]tress applied during the martensitic transformation increases diametric dilatation by as much as 200 % under axial compression.” (Ex. 1005, Abstract). Somani states that:

Typical flow stress curves are plotted in Fig. 9. A decreasing level of flow stress with an increasing prior plastic strain is evident, as shown by the marked drop at a strain as small as 0.04. The corresponding microstructure after the test is shown in Fig. 10 revealing a few ferrite grains among martensite, the fraction about 6%. After the strain of 0.04, $\Delta D/D$ was about 0.4 %, which value is smaller than that (0.53 %) without any plastic deformation. All this is in agreement with the

observations of microstructures. Especially the flow stress at small strains is significantly affected, obviously due to yielding of the softer ferrite (170- 180 HV 10) first. The similar trend in yield strength was very clear as a result of the changes in microstructure from hard martensitic to softer austenitic + bainitic or to austenitic (Ex. 1005, [0006]).

Somani further reports that “plastic deformation of austenite was found to enhance ferrite formation so significantly that the dilatation due to the low-temperature transformation decreases even at a cooling rate of 280°C/s.” (Ex. 1005, Abstract) Somani concludes that “cooling rates high enough to avoid any ferrite formation at the most highly strained locations may be difficult to achieve.” (Ex. 1005, [0006], Ex. 2010, ¶¶105-106).

Somani teaches that, to avoid the strain-induced phase transformation, “forming should take place at a high temperature, $\geq 800^{\circ}\text{C}$, where the driving force for the austenite decomposition is low, or the time should be long enough for static recrystallisation to occur.” (Ex. 1005, [0006]) At the same time, Somani warns that Yada et al. “showed that austenite can transform into ferrite due to plastic deformation even above the equilibrium start temperatures of proeutectoid ferrite,

A₃. For the present steel, A₃ is about 780°C according to the dilatometric measurements. A rough estimate based on the recrystallisation kinetics of a low-carbon steel suggests that the time needed for complete recrystallisation would be about 29s at 900°C (at a strain of 0.15 and a strain rate of 0.1 s⁻¹) and 255 s at 800°C.” *Id.* (internal citations omitted). Somani concludes that “[s]uch long times are certainly not available due to the rapid cooling at least at the contact points of the profile and the tools.” *Id.* Somani recommends that “[a]nother, more realistic alternative might be forming at low temperatures, such as ≤600°C, i.e. below the ferrite regime.” *Id.*, (Ex. 2010, ¶¶107-108).

F. ENGELS

Engels discloses that “[h]igh material strengths may lead to wear problems during the trimming operation following the hot-stamping process” and suggests that “the trimming operation can be integrated into the hot-stamping process.” (Ex. 1041, [0007]). Thus, Engels states that “it is suggested to merge the two process steps, hot stamping and edge trimming, into one single operation.” *Id.* at [0011]. According to Engels, “[t]his will cut production and tool costs, as trimming after the hot-stamping process becomes redundant.” *Id.*, (Ex. 2010, ¶109).

With regard to the heat treatment, Engels teaches that, “[w]hen using hot-dip aluminum coated boron steels, it is crucial to look for a correctly shaped diffusion layer with regard to layer thickness, porosity and roughness, as this layer will decisively impact the corrosion and welding properties of the hot stamped parts.” (Ex. 1041, [0014]). According to Engels, the parameters “which have to be taken into account when setting the temperature profile” are the heating rate, the total processing time, the maximum austenization temperature and the material thickness. *Id.* As an example of a diffusion layer, before describing simulation of the cooling behavior during the hot stamping process and acknowledging that a structural change takes place during hot-stamping process at page [0015], Engels provides an SEM micrograph of a cross-section polish of a diffusion layer in Figure 5. (Ex. 2010, ¶110).

Engels states that “Figure 5 shows a cross-section polish of the diffusion layer of a hot-dip aluminum coated boron steel.” (Ex. 1041, [0014]) “Five phases which differ in their layer thickness and chemical composition can easily be distinguished.” *Id.* There is no indication in Engels that the diffusion layer depicted in Figure 5 was ever stamped. There is also no teaching in Engels of how to control thickness and chemical compositions of each layer. (Ex. 2010, ¶111).

IV. PETITIONER'S CLAIM CONSTRUCTION CANNOT BE ADOPTED

A. PETITIONER'S CONSTRUCTION IS CONTRARY TO THE INTRINSIC RECORD BECAUSE IT CONTRADICTS THE CLAIMS OF THE '683 PATENT

Petitioner's "claim construction refers to each of the layer terms and *defines them according to their locations within the steel coating.*" (Institution Decision, p. 11) (emphasis added). Petitioner's claim construction does not, therefore, allow for two layers to be simultaneously present on extreme surface of the product.

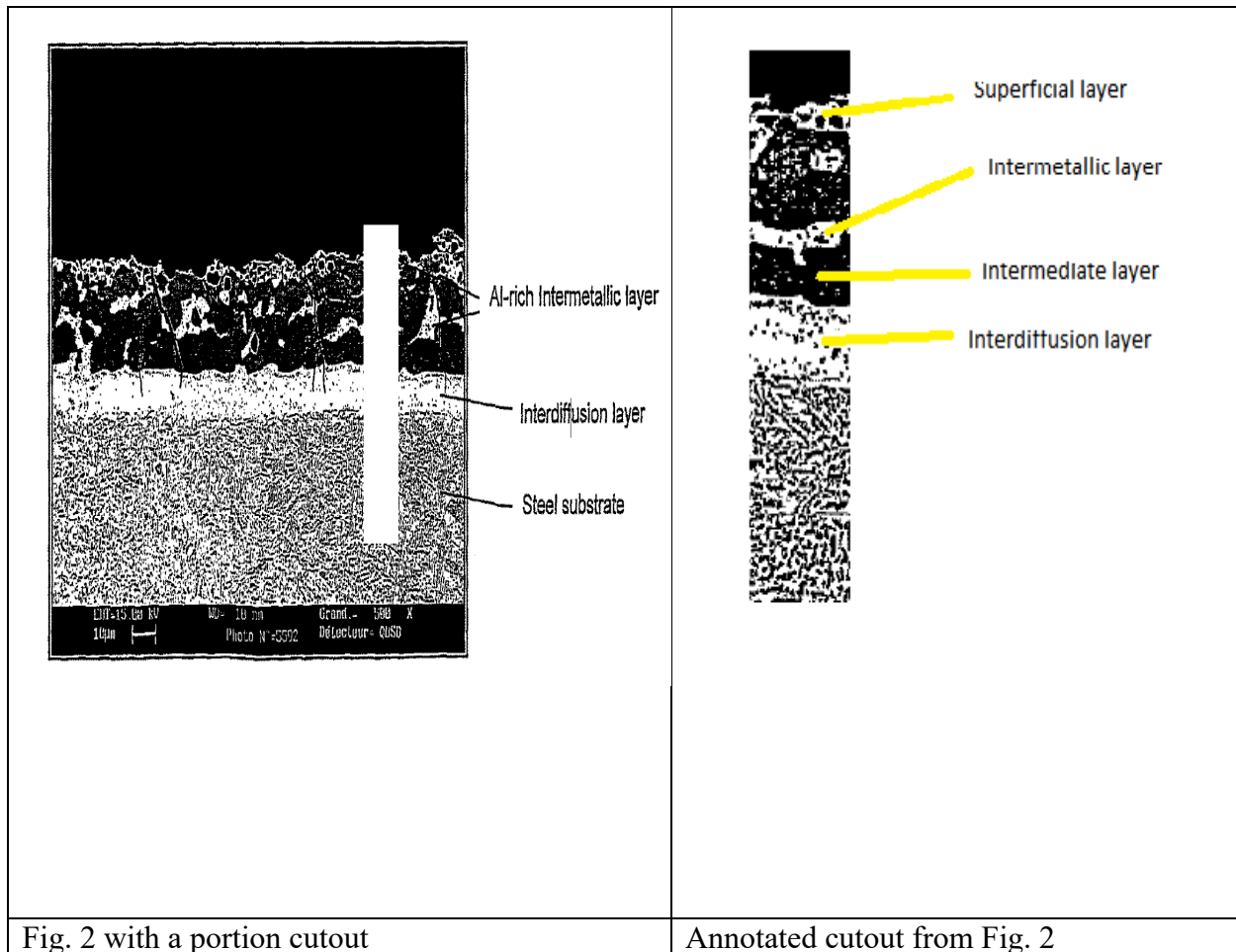
However, any proper claim construction of the layers of claim 1 must allow for the simultaneous presence of the Intermetallic layer and the Superficial layer on the extreme surface of the product. Claim 2 of the '683 specifies that from 0% up to "10% of layer (c) be present at an extreme surface of the product." (Ex. 1001).

Consequently, the Petitioner's construction of the term layer, which precludes the Intermetallic layer from being present at the extreme surface of the product, is at odds with the claims of the '683 patent and, for this reason alone, should not and cannot be adopted. *Markman v. Westview Instruments*, 517 U.S. 370, 389 (1996) ("In the main, we expect, any credibility determinations will be subsumed within the necessarily sophisticated analysis of the whole document, required by the standard construction rule that *a term can be defined only in a way that comports with the instrument as a whole*").

**B. PETITIONER'S CONSTRUCTION IS CONTRARY TO THE
INTRINSIC RECORD BECAUSE IT CONTRADICTS
FIGURE 2**

Petitioner did not offer a construction for the term “layer.” Instead, the Petitioner attempted to define the four layers recited in claim 1 by their location within the sequence of the layers. (Pet. at 23-4, Institution Decision, p.11). For example, Petitioner asserted that term “Intermediate layer” means “a layer between two other layers and “Superficial layer” means “a surface layer.” Id.

Under the Petitioner's construction, figure 2 of the '683 patent would show a structure comprising four layers:



However, the '683 patent makes clear that “Fig. 2 illustrates a coating of steel substrate after heat treatment and stamping which *does not correspond to the invention...*” (Ex. 1001 at 3:63-67) (emphasis added)). The '683 patent therefore distinguishes the inventive four-layer structure from the three-layer structure depicted in figure 2. (Ex. 2010, ¶54).

Consequently, Petitioner's proposed construction broadens claim 1 to encompass something expressly excluded from the scope of the invention in the

'683 patent and as such contradicts the written description of the '683 patent and cannot be adopted. *Markman* at 389.

Petitioner's proposed constructions are at odds with the claims and the specification of the '683 patent and encompass figure 2 which expressly "does not correspond to the invention" of the '683 patent. Petitioner's constructions do not comport with the '683 patent instrument as a whole, and the Petitioner's construction should not and cannot be adopted by the Board. *Id.*; *see also Phillips* 415 F.3d at 1317.

V. PATENT OWNER'S CLAIM CONSTRUCTION

A. "LAYER" MEANS "A MATERIAL SPREAD OVER THE BASE STEEL DIFFERENT FROM OTHER MATERIALS OVER THE BASE STEEL"

For the reasons set forth below, the term "layer" should be construed to mean "a material spread over the base steel different from other materials spread over the base steel." Patent Owner's construction affords the term layer its ordinary meaning as would have been understood by a person of ordinary skill in the art at the time of the invention (hereinafter "POSITA"), and comports with the term "layer" as used in the claims, specification, and prosecution history of the '683 patent. The Board did not construe the term "layer" in deciding whether to

institute the *Inter Partes* Review, and invited the parties to further brief this issue during trial. (Institution Decision, pp. 12-13). (“Aside from determining that Petitioner’s construction properly accounts for the different layers, we decline to construe the layer terms further for purposes of this decision”).

For petitions requesting an *inter partes* review filed on or after November 13, 2018, the Board interprets a claim “using the same claim construction standard that would be used to construe the claim in a civil action . . . including construing the claim 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). “[T]he ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, i.e., as of the effective filing date of the patent application.” *Phillips*, 415 F.3d at 1312. However:

[t]he ordinary meaning of a claim term is not “the meaning of the term in the abstract.” [Phillips] at 1321. Instead, “the ‘ordinary meaning’ of a claim term is its meaning to the ordinary artisan after reading the entire patent.” *Id.*; see also *Netword, LLC v. Centraal Corp.*, 242 F.3d 1347, 1352 (Fed. Cir. 2001) (“The claims are directed to the invention that is described in the specification; they do not have meaning

removed from the context from which they arose.”); *Toro Co. v. White Consol. Indus., Inc.*, 199 F.3d 1295, 1299 (Fed. Cir. 1999) (“Determining the limits of a patent claim requires understanding its terms in the context in which they were used by the inventor, considered by the examiner, and understood in the field of the invention.”).

Eon Corp. IP Holdings LLC v. Silver Spring Networks, Inc., 815 F.3d 1314, 1320 (Fed. Cir. 2016)

A patent's specification constitutes the “single best guide to the meaning of a disputed term.” *Phillips*, 415 F.3d at 1315, quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996). When resorting to a patent's specification for guidance with respect to disputed claim terms one must consider it as a whole, and all portions should be read in a manner that renders the patent internally consistent. *Budde v. Harley-Davidson, Inc.*, 250 F.3d 1369, 1379-80 (Fed. Cir. 2001). Extrinsic evidence, which “consists of all evidence external to the patent and prosecution history, including expert and inventor testimony, dictionaries, and learned treatises” can also be used to assist in the interpretation of claims. *Phillips*, 415 F. 3d at 1317-1319. However, “because words often have multiple dictionary meanings, the intrinsic record must be consulted to determine

which of different possible dictionary meanings is most consistent with the use of the term in question by the inventor.” *Phillips*, 415 F.3d at 1319-20. Any extrinsic evidence that is unsupported or inconsistent with the claims themselves, the written description, or the prosecution history, should be discounted. *Phillips*, 415 F.3d at 1318-19; *see also Porto Tech. Co. v. Cellco P'ship*, 2013 U.S. Dist. LEXIS 176919 (E.D. Va 2013) (“... extrinsic evidence, including dictionaries, learned treatises, and expert ... should not be used to support a construction that contradicts the intrinsic evidence.”).

Claim 1 recites “an Interdiffusion layer”, “an Intermediate layer”, “an Intermetallic layer” and “a Superficial layer.” The term “layer” is used extensively in the specification in a manner which is consistent with its ordinary and customary meaning to a POSITA to mean “a material spread over the base steel different from other materials spread over the base steel.” For example, Random House Webster’s Dictionary defines “layer” as “a thickness of some material laid on or spread over a surface.” (Ex. 2008, p. 409). A POSITA would have understood that “material” is “the substance of which something is made or composed.” (Ex. 2008, p. 445). Unlike Petitioner’s interpretation, Patent Owner’s interpretation of “layer” is consistent with the manner in which this term is used in the claims, specification, and prosecution history as explained in detail below.

1. Patent Owner's Interpretation is Consistent with the Use of the Term "layer" in the Claims

Claim 1 labels each layer sequentially and each layer in claim 1 has a different name. The four different names for the four claimed layers signify that each layer is a different material spread over the base steel. (Ex. 2010, ¶59). The fact that the claim recites a different name for each layer is consistent with, and strongly supports, a conclusion that the term layer is used in accordance with its ordinary and customary meaning to mean "a material spread over the base steel different from other materials spread over the base steel." Notably, claim 1 does *not* recite that the coating comprises "*a first portion*" of layer and a "*second portion*" of a layer, as would have been expected if any two of the layers were to be the same material. Rather, claim 1 recites that the coating comprises: "(a) an Interdiffusion layer, (b) an Intermediate layer, (c) an Interdiffusion layer, and (d) a Superficial layer."

Moreover, claim 2 of the '683 patent recites that "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." Thus, claim 2 specifically contemplates that from 0% to "less than 10% of layer (c) is present at an extreme surface of the product." The simultaneous

presence of layers (c) and (d) is **only** possible when layers (c) and (d) are different materials. (Ex. 2010, ¶¶57-58).

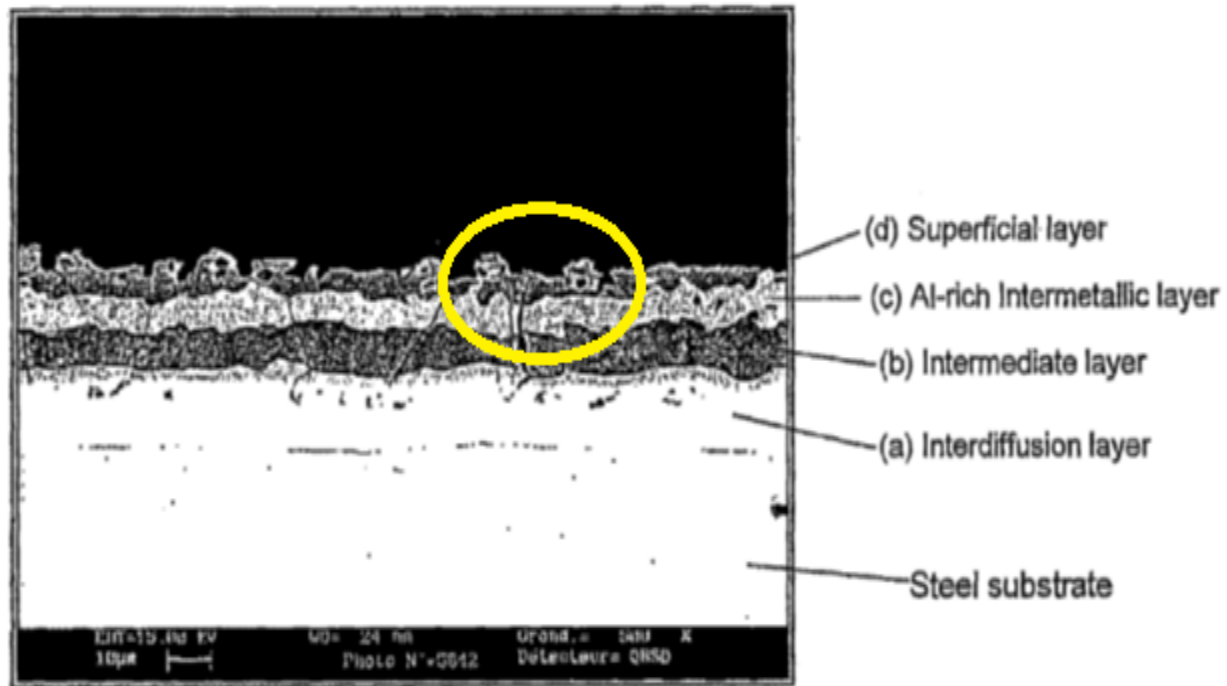
Thus, according the term “layer” its ordinary and customary meaning as “a material spread over the base steel different from other materials spread over the base steel” is consistent with and comports with the manner in which this term is used the claims of the ‘683 patent.

2. Patent Owner’s Interpretation is Consistent with the Use of the Term “layer” in the Specification

According the term “layer” its ordinary and customary meaning as “a material spread over the base steel different from other materials spread over the base steel” is also consistent with the manner in which this term is used in the specification of the ’683 patent.

Similar to claim 1 of the ’683 patent, the specification of the ’683 patent also uses four different names for the four layers of the claimed four-layer stamped product. (Ex. 1001, 3:56-62; 6:14-54; 12:57-13:7). The use of four different names for the four layers signifies that each layer is a different material spread over the base steel: had the materials were the same there would be no need to use four different names. (Ex. 2010, ¶59).

Furthermore, Fig. 1 shows both layer (c) and (d) simultaneously present at the extreme surface of the product:



(Ex. 1001, Fig. 1) (oval added). The simultaneous presence of the Superficial and the Al-rich Intermetallic layer would not have been possible, had the layers been the same material. (Ex. 2010, ¶57).

Consistent with the use of four different names for four different layers and different depiction of the layers in Fig. 1, the *mean compositions* of the materials of the four different layers depicted in Fig. 1 and exemplified in Example 2 are all different:

(a) Interdiffusion layer or intermetallic layer, 17 micrometers thick. This layer is itself composed of two sub-layers. Hardness HV50g ranges from 295 to 407, and the *mean composition* is: 90% Fe, 7% Al, 3% Si.

(b) Intermediate layer, appearing darker, 8 micrometers thick. This layer has a hardness of 940HV50g and *a mean composition*, by weight: 43% Fe, 57% Al, 1% Si.

(c) Intermetallic layer appearing as a pale phase, 8 micrometers thick, displaying a hardness of 610HV50g, *a mean composition* of 65% Fe, 31% Al, 4% Si

(d) Darker superficial layer, 7 micrometers thick, 950 HV50g, with *a mean composition* of 45% Fe, 54% Al, 1% Si

(Ex. 1001 at 12:60-13:7) (emphasis added).

A POSITA would understand that the each of these four layers is of a different material, since the mean compositions are different. (Ex. 2010, ¶59).

Patent Owner would like to directly address the Board's statement that the '683 patent "sets forth broader ranges for the compositions of each layer, including

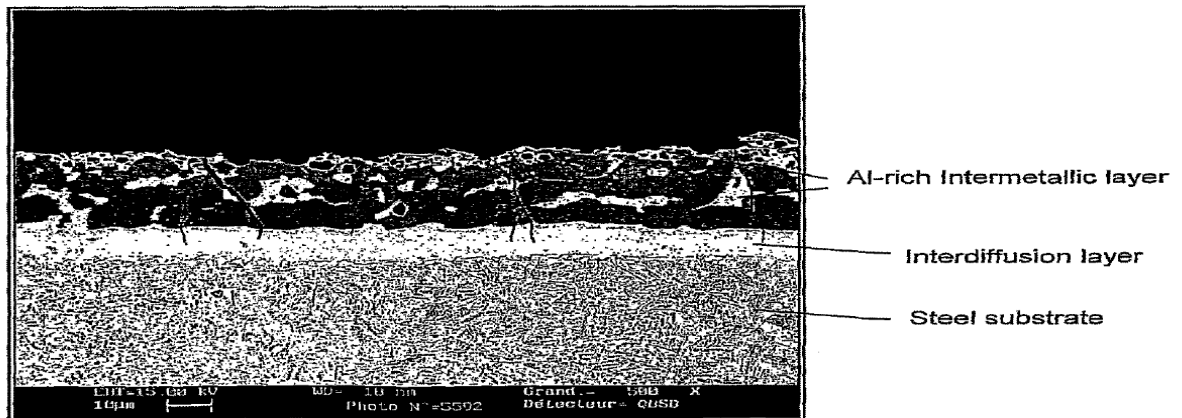
ranges for the intermediate layer and superficial layer that completely overlap” at 6:31-53 (Institution Decision, p. 26). Patent Owner respectfully submits that the weight percentages of Fe, Al and Si disclosed at 6:31-53 are **ranges** of individual elements Fe, Al, and Si that may be present throughout each layer ***for the four layers depicted in Fig. 1*** and do ***not provide information about mean compositions or the actual material of each layer.***

Despite the overlap in the ranges for the Intermediate layer and the Superficial layer at 6:31-53 (i.e., 39–47% Fe, 53–61% Al, and 0–2% Si), the materials of the Intermediate layer and the Superficial layer ***must be and actually are*** different. This is clear both from Example 2 of the specification invention (the mean composition of the Intermediate layer, by weight, being 43% Fe, 57% Al, 1% Si, and the mean composition of the Superficial layer being 45% Fe, 54% Al, 1% Si)(Ex. 1001 at 12:65-137) and from figure 2 where a ***same material at different levels is labeled as one layer*** (i.e., Al-rich intermetallic layer”). In contradistinction, when different materials are spread over the base steel, a different name is used for each layer. For example, the Intermediate layer and the Superficial layer of the examples are different materials (***the mean composition*** of the Intermediate layer, by weight, being ***43%*** Fe, ***57%*** Al, 1% Si, and the ***mean***

composition of the Superficial layer being 45% Fe, 54% Al, 1% Si), and consequently have different names.

The four different *mean compositions* of the four different layers depicted in figure 1 and exemplified in Example 2 is consistent with the construction of the term “layer” as “a material spread over the base steel different from other materials spread over the base steel.”

The ‘683 patent also, with respect to figure 2, describes and shows an Al-rich Intermetallic layer (c) “to be scattered within the coating”:



(Ex. 1001, at 13:20-21, Fig. 2).

The sections of the Al-rich Intermetallic layer, separated and at different levels in the coating, are labeled and referred to as *one layer*, not multiple layers. The labeling of the different sections of the Intermetallic layer in figure 2 at different heights in the coating as one layer in the ‘683 patent conveys to a POSITA that it is not a location of the layer in the coating that defines the layer in

the '683 patent, it is the material that does. The labeling of the different height sections of the Intermetallic layer as one layer in the '683 patent is consistent with the construction of the term "layer" as "a material spread over the base steel different from other materials spread over the base steel."

3. Patent Owner's Proposed Construction is Consistent with the Prosecution History

The prosecution history of the '683 patent is also consistent with the construction of the term "layer" as "a material spread over the base steel different from other materials spread over the base steel." During prosecution, the Examiner relied on "Takagi" (Ex. 2002), which describes "a multi-layer structure such as a five-layer structure having five layers of *different alloy compositions*." (Ex. 1002, [0141], Ex. 2002, [0024] (emphasis added)). Because the Examiner relied on Takagi for disclosing "five layers of *different alloy compositions*," the Examiner understood that different layers in the succession of layers must be different materials. (Ex. 1002, [0141]; Ex. 2002, [0024] (emphasis added)).

Thus, the claims, the specification and the prosecution of the '683 patent supports a construction of the term layer as "a material spread over the base steel different from other materials spread over the base steel."

B. “COOLING RATE” MEANS “THE MEAN RATE BETWEEN THE EXIT OF THE HEATED BLANK FROM THE FURNACE, DOWN TO 400° C.”

The '683 patent contains an express definition of cooling rate: “The cooling rate is defined as the mean rate between the exit of the heated blank from the furnace, down to 400° C.” (Ex. 1001, 11:27-29, *also* 7:54-56).

VI. THE PREAMBLE IS A LIMITATION

The preamble of claim 1 of the '683 patent recites “[a] coated steel stamped product.” (Ex. 1001, claim 1). Petitioner and their expert appear to agree that the preamble is a limitation and goes through great lengths to prove that figure 22 is a stamped product. (Petition, at 24, 25, annotated figure, 26, 29-30) (“claims of the '683 patent are directed toward a finished stamped product.” (Ex. 1003, ¶21; Petition, at 11)).

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. Conversely, a **preamble** is not limiting ‘where a patentee defines a structurally complete invention in the claim body and uses the **preamble** only to state a purpose or intended use for the invention.’” *Catalina Mktg. Int’l v. Coolsavings.com, Inc.*, 289 F.3d 801, 808 (Fed. Cir. 2002) (citations omitted). *See General Elec. Co. v.*

Nintendo Co., 179 F.3d 1350, 1361-62 (Fed. Cir. 1999) (preamble “raster scan display device” limited a method for displaying computer generated information on a screen, because “[i]n light of the specification, to read the claim indiscriminately to cover all types of display systems would be divorced from reality”); *Corning Glass Works v. Sumitomo Elec.*, 868 F.2d 1251, 1257 (Fed. Cir. 1989) (preamble “optical waveguide” limiting because “[t]he invention is restricted to [optical] fibers that work as waveguides as defined in the specification, which is not true with respect to fibers constructed with the limitations of the [body of the claim] only”); *Diversitech Corp. v. Century Steps, Inc.*, 850 F.2d 675, 678 (Fed. Cir. 1988) (phrase “a base for the support of equipment” was essential in giving meaning to the invention and therefore limiting).

The term “coated steel stamped product” is not a statement of the invention’s purpose or intended field use - the recited layers are not merely ***intended*** to be stamped, they ***are*** stamped, and the specification makes this clear. (Ex. 1001, 3:31-33, 40-41, 57-62, 15:17). 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.

The term “stamped” in “coated steel stamped product” thus recites an essential structure of the claimed product—it is stamped. (Ex. 2009, pp. 5-

6)(“Stamping, Metal Construction, A shaping process allowing to obtain a form not developable from a plane sheet metal (flank), by making it undergo a permanent set with two complimentary tools, a punch and a mold.”).

Determining whether a preamble is a limitation requires review of the “entire patent,” prosecution history and an “understanding of what the inventors actually invented and intended to encompass by the claim.” *Catalina Mktg*, 289 F.3d at 808; *see also Applied Materials, Inc. v. Advanced Semiconductor Materials Am., Inc.*, 98 F.3d 1563, 1572–73 (Fed. Cir. 1996).

A. THE PREAMBLE IS A LIMITATION ACCORDING THE CLAIM LANGUAGE

The starting point for any claim construction is the claims themselves. A plain reading of the claim language indicates that the claim is limited to a “stamped product.” The preamble does not recite “a coated steel product”, rather it recites “a coated steel stamped product.” Nor does it recite “a product for stamping” or “a stampable product” – it requires a “stamped product.” The Petitioner itself declares in their petition and expert declaration that the “claims of the ’683 patent are directed toward a finished stamped product, and, in particular, a coating of the finished stamped product resulting from an alloying reaction between the

aluminum pre-coating and the base steel.” (Ex. 1003, ¶21, Petition, p. 11). Each claim in the '683 patent requires a “coated steel stamped product” and the inventors chose this language for the preamble because it recites essential structure and gives life, meaning, and vitality to the claim. Every figure of the '683 patent shows a stamped product and the specification makes clear that described products are stamped.

B. REPEATED USE OF THE TERM “STAMPED” IN THE ‘683 PATENT SPECIFICATION

Repeated use of the preamble to describe the invention throughout a patent specification weighs in favor of the preamble being construed as a claim limitation. *See Poly-America, L.P. v. GSE Lining Tech., Inc.*, 383 F.3d 1303, 1310 (Fed. Cir. 2004) (“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’ [] preferred embodiments and [] is restated in each of the patent's seven claims. Our analysis shows that the inventor considered that the ‘blown-film’ preamble language represented an important characteristic of the claimed invention.”).

The specification makes clear the importance that the claimed product is a “stamped product” and describes stamped products and how to make them in numerous examples, thus evidencing that it is an important characteristic of the claimed invention. Indeed, Figures 1-4 of the '683 patent are images of stamped products and the patent defines the term “product” as a “stamped blank”. *See* Ex. 1001, at 14:50-54-15:16 (“the following terms as used in the following list of preferred embodiments and **claims** have the following noted meanings in order to **avoid any confusion** product—a **stamped** blank”)(emphasis added). The specification explains that the image in figure 1 represents an example of the four layers in the claim and that these layers are part of a stamped product. *See id.* at 3:57-61 (“FIG. 1 illustrates a preferred embodiment of an invention coated part, after heat treatment and stamping. The succession of layers of the coating on the steel substrate is: (a) [through] (d)” layers.).

The inventors state that it is an object of the invention to provide stamped parts and figures 1 through 4 show images of stamped parts. *See id.* at 3:57-4:10 (Description Of The Drawings); *see also id.* at 3:32-34 (“It is another object of the present invention to provide novel stamped parts which are prepared from such a coated steel.”); *id.* at 3:37-39 (“It is another object of the present invention to provide novel articles of manufacture, such as a motor vehicle, which contain such

stamped parts.”); *id.* at 3:40-41 (“It is another object of the present invention to provide novel stamped parts.”). There is clear intent by the inventors that the “coated steel stamped product” is a limitation of the claims.

The term stamped is also used repeatedly to describe the preferred embodiments. *See id.* at 12:54-60 (“The blanks were finally hot stamped and quenched in order to obtain full martensitic structures. The parts obtained after hot-stamping are covered by a coating, 40 micrometers thick, illustrated at FIG. 1, which has a four layer structure. Starting from the steel substrate, the layers are the following: (a) [through] (d).”); *id.* at 7:52-54 (“Heated blanks are thereafter transferred to a die, hot stamped to obtain a part or product, and cooled at a rate of more than 30° C./s.”); *id.* at 9:9-11 (“As mentioned above, ultra-high-strength can be provided with the steel sheet coated and hot stamped according to the invention.”).

The importance of the term “stamped product” is further underscored in the following quotation from specification:

The inventors have also discovered that good welding results are achieved if the coating obtained on parts made out of blanks having undergone intermetallic alloying, austenitizing and hot stamping, displays distinctive features. It must be pointed out that this coating is different from the initial pre-coating, since 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: in this regard the inventors have discovered that particularly good weldability of aluminized and hot stamped parts is associated with the following succession of coating layers on the parts, proceeding from steel substrate outwards:

- (a) Interdiffusion layer,
- (b) Intermediate layer,
- (c) Intermetallic layer,
- (d) Superficial layer

Id. at 6:14-30.

Thus, the specification explains that the layers (a) through (d) are stamped, further signifying the importance of the preamble language “a coated steel stamped product.”

The examples further signify the importance of the term “stamped product.” *See id.* at 12:23-24 (Example 1 “Blanks were thereafter transferred from the furnace to a stamping press.”); *id.* at 12:54-55 (Example 2 “The blanks were finally hot stamped and quenched in order to obtain full martensitic structures.”); *id.* at 12:56-13:7 (Example 2 “The parts obtained after hot-stamping are covered by a coating, 40 micrometers thick, illustrated at FIG. 1, which has a four layer structure [(a) interdiffusion layer; (b) intermediate layer; (c) Intermetallic layer; and (d) superficial layer].”).

For the foregoing reasons, the preamble recites essential structure and gives life, meaning, and vitality to the claim.

C. THE TERM “STAMPED” IN “STAMPED PRODUCT” IS A STRUCTURAL LIMITATION, NOT A PROCESS LIMITATION

At page 10 of the Institution Decision, the Board states that “[e]ven if we were to determine that the preamble of claim 1 does not simply recite the purpose of the invention, it appears that the preamble language “stamped product” may 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.”

To the contrary, for the reasons outlined above, the term “stamped” in “stamped product” denotes a structural limitation.

“[W]ords of limitation that can connote with equal force a structural characteristic of the product or a process of manufacture are commonly and by default interpreted in their structural sense, unless the patentee has demonstrated otherwise.” *In re Nordt Dev. Co., LLC*, 881 F.3d 1371, 1376 (Fed. Cir. 2018), *citing 3M Innovative Props. Co. v. Avery Dennison Corp.*, 350 F.3d 1365, 1371–72 (Fed. Cir. 2003); *see Hanzai v. United States Int'l Trade Comm'n*, 126 F.3d 1473,

1479 (Fed. Cir. 1997) (concluding that “chemically engraved” was not a process term).

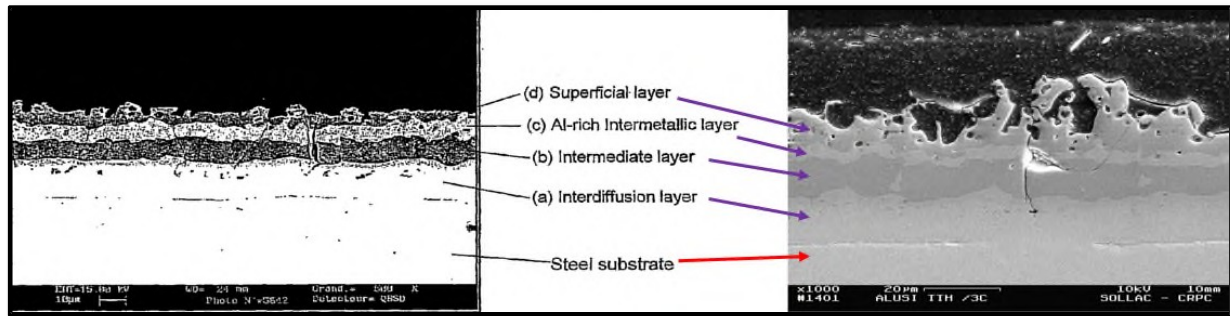
Further, in *In re Garnero*, 56 C.C.P.A. 1289 (1969) the Court explained that the terms “‘intermixed,’ ‘ground in place,’ ‘press fitted,’ ‘etched,’ and ‘welded,’ all of which at one time or another have been separately held capable of construction as structural, rather than process, limitations.” *Id.* at 1293. Similarly, in *Ex parte Kessler*, 2018 Pat. App. LEXIS 7508 * 6 (PTAB 2018), the preamble term “monolithic blow molded container” was found to recite additional structural limitations, specifically, that the container is a monolithic container having structure connoted by the process of blow molding” and that the structure should be considered. *Id.* at 6-7.

VII. RELIANCE ON THE '683 PATENT TO SUPPLEMENT CORNETTE IS IMPROPER AND COMPELS DENIAL OF ALL GROUNDS OF INVALIDITY

At the outset, the Petition fails legally because Petitioner relies on Patent Owner's own teachings in the '683 patent in an improper attempt to add information to Cornette's figure 22.

A. RELIANCE ON FIGURE 1 OF THE '683 PATENT IS IMPROPER

Petitioner improperly relies on figure 22 of Cornette in combination with figure 1 of the '683 patent (shown below) to try to add information to figure 22 in order to explain what figure 22 allegedly shows.



'683 Patent, Ex. 1001, Fig. 1

Cornette, Ex. 1004, Fig. 22

A bulk of Petitioner's and Expert's arguments stem from this annotated image which contains information not present in Cornette. (Petition, at 33-34, 39-41, and 44)(Ex. 1003, ¶¶88-96). Petitioner and their expert assert that layers (a)-(d) are taught by Cornette based solely on Petitioner's annotated comparison of figure 1 of the '683 patent to figure 22 of Cornette. (Petition, at 34). Petitioner then concludes that this is "exactly the same as in Cornette's Figure 22." (Petition, at 35).

The use of this comparison is improper and wrong factually. The figures are different and not properly comparable to each other for at least the following reasons:

1. Figure 1 of the '683 patent is of a stamped product, figure 22 of Cornette is not, and stamping imports structural features to the product. (Ex. 2010, ¶¶46-47, 54, 75-77, 112-113, 143-157).

2. Cornette sole disclosure on heating is that a precoated steel sheet is heated for, “generally 900°C, 5 minutes” and there is no indication that this temperature and time, or what temperature and time, was used to arrive at Cornette’s figure 22 steel. (Ex. 2010, ¶¶71-74, 78). In fact, use of the word “generally” indicates that it is not in reference to a specific test, but rather to general parameters for heating USIBOR. Figure 1 of the '683 patent, in contrast, results from a specific heating rate and cooling rate never discussed or disclosed in Cornette to form a four-layer structure, which also was neither discussed nor disclosed in Cornette. (Ex. 2010, ¶¶44-45, 55-56, 120).

3. In figure 1 of the '683 patent, the artifact was etched, prepared or otherwise processed to reveal the layers of the coating; whereas, in figure 22 of Cornette, the artifact was not etched, prepared or otherwise processed to reveal such layers. (Ex. 2010, ¶¶114-118, 49-52, 79-82, 84-90).

4. Figure 22 of Cornette and figure 1 of the '683 patent are of different magnifications. (Ex. 2010, ¶119).

5. The '683 patent used a compositional analysis to describe the four-layer structure shown in figure 1 of the '683 patent. (Ex 1001, 12:58-13:7, Ex. 2010, ¶¶59, 83, 114). Cornette contains no compositional analysis at all that would allow any clear interpretation of how many layers are shown in its figure 22. (Ex. 2010, ¶¶83, 114).

Consequently, Petitioner's comparison of the heat treated blank of Cornette (Fig. 22) and layers within the coated stamped product of the '683 patent (figure 1) is a comparison of apples and oranges. (Ex. 2010, ¶¶112-120).

Therefore, Petitioner's reliance on the '683 patent to show layers (a) to (d) is improper and unsupported by factual evidence and, consequently, cannot support any of the Grounds of Unpatentability.

B. RELIANCE ON THE '683 PATENT PROCESS TO INFER A LAYER STRUCTURE IN CORNETTE IS IMPROPER

Petitioner also improperly attempts to use the '683 patent process to support Petitioner's allegation of anticipation by Cornette. Cornette discloses 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.” (Ex. 1013, [0009]).

Petitioner, however, asserts the following about Cornette:

Furthermore, and just like the '683 patent, Cornette's multiphase alloy layer has a four-layer structure, including an interdiffusion layer adjacent to the Usibor 1500 base steel, two layers—the intermediate layer and the intermetallic layer—that are between other layers, and a surface/superficial layer. *Cf. Ex. 1001 at 12:55-58 (explaining that parts obtained after hot-stamping using conditions according to the invention have “a four layer structure”)*.

(Petition, at 35) (emphasis added).

Exhibit 1001, *the sole support for this assertion* that Cornette's multiphase layer is a four-layer structure, *is the '683 patent*. Petitioner thus uses *the '683 patent process* to support its argument that what is depicted in figure 22 of Cornette is the claimed four-layer arrangement (which it is not). (Petition, at 34, 35). However, Cornette's figure 22 is not hot-stamped and does not show a part obtained with the process “conditions according to the invention” of the '683 patent. Cornette does not use the '683 patent process and says nothing about key features of the process described in the '683 patent such as heating rate V_c , cooling rate, or transfer time. (Ex. 2010, ¶¶56, 72, 74, 78).

Petitioner is using the '683 process as if it were disclosed in Cornette (which it is not) and again the Petition must fail because Petitioner relies on information

not present or properly deducible from Cornette in support of its Grounds of Unpatentability.

**VIII. GROUND 1 (ANTICIPATION) FAILS BECAUSE CORNETTE'S
FIGURE 22 AND PASSAGES DO NOT DISCLOSE A COATING
WITH FOUR DIFFERENT MATERIALS AS CLAIMED**

Cornette does not disclose a coating with four different materials spread out over a steel sheet. Petitioner admits that the asserted “four phases/layers are not labeled in Cornette’s figure 22.” (Petition, at 34). Petitioner does not point to any support in Cornette that there are four different materials shown in figure 22 and Cornette does not state that figure 22 shows four different materials or, for that matter four different “phases/layers.” (Ex. 2010, ¶¶121-127).

Cornette further does not state how many “phases/layers” and what materials are present in the “hard multiphase alloy layer” of figure 22. Cornette’s entire written description of the “hard-multiphase alloy layer” is:

Heating 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*.

Fe-Al-Si layer is typically about 40 μm at the steel surface.

(Ex. 1013, [0009] (emphasis added)).

Thus, there is no indication in Cornette that any of the asserted layers are what the Petitioner alleges they are or whether they are different from one another.

(Ex. 2010, ¶¶124-127). Consequently, Ground 1 fails.

A. VISUAL INSPECTION OF CORNETTE FIGURE 22 SHOWS THAT THE ALLEGED INTERMEDIATE AND SUPERFICIAL LAYERS LOOK THE SAME AND COULD BE THE SAME MATERIALS

Petitioner's allegation of anticipation rests solely on their visual interpretation of a 100 micrometer wide image in figure 22 without any supporting evidence from Cornette itself. There is nothing in figure 22 that would cause a POSITA to conclude that the purported intermediate and superficial layers are different material. (Ex. 2010, ¶¶79-83,128-131). Instead, the purported superficial and intermediate layers in figure 22 actually appear to have the same shade and tone (*i.e.*, “darker (e.g., than adjacent layers/phases)” (Petition, Paper 2, at 35)) and, consequently, appear

to be and certainly could be of a same material and not different. (Ex. 2010, ¶¶130-131).

Further, the sample in figure 22 was not prepared to show the materials of the layers so a person or ordinary skill in the art at the time of the invention could not draw these distinctions from a simple visual inspection. (Ex. 2010, ¶¶117-118, 132). Visual inspection of figure 22 is similar to inspecting a black and white photograph and concluding everyone is wearing the same color clothing. (Ex. 2010, ¶133). While the same color/tone is not conclusive of the materials being the same, it certainly does not suggest that they are different. (Ex. 2010, ¶134). The alleged superficial and intermediate layers appear to be the same color/tone which, if anything, suggests that they are the same material. (Ex. 2010, ¶¶135, 139).

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 (or grayscale) and their location, but rather based on materials. (Ex 1001, 12:58-13:7, Ex. 2010, ¶¶59, 83, 136, 138-139). Without this compositional analysis, a POSITA would not be able to determine that layers (b) and (d) are different materials.

(Ex. 2010, ¶136). Petitioner has submitted no compositional analysis of figure 22 of Cornette, and has provided no evidence that its asserted Intermetallic layer and Superficial layers are different. Reliance the correspondence to the appearance of Fig. 1 of the '683 patent is not sufficient evidence, a POSITA cannot even tell the difference in Fig. 1 of the layers based solely on appearance. (Ex. 2010, ¶137).

Consequently, a POSITA has no basis, even if somehow figure 22 corresponded in appearance to figure 1 of the '683 patent (which it does not), to assert that the purported intermediate layer and superficial layers shown in figure 22 of Cornette are different materials. (Ex. 2010, ¶¶124-142).

A finding of “invalidity by anticipation requires that the four corners of a single, prior art document describe every element of the claimed invention, either expressly or inherently, such that a person of ordinary skill in the art could practice the invention without undue experimentation.” *Advanced Display Sys. v. Kent State Univ.*, 212 F.3d 1272, 1282 (Fed. Cir. 2000), *citing Atlas Powder Co. v. Ireco Inc.*, 190 F.3d 1342, 1347 (Fed. Cir. 1999); *In re Paulsen*, 30 F.3d 1475, 1479 (Fed. Cir. 1994). Anticipation requires that “the prior art necessarily functions in accordance with, or includes, the claimed limitations.” *MEHL/Biophile Int'l Corp. v.*

Milgraum, 192 F.3d 1362, 1365 (Fed. Cir. 1999). “Probabilities and possibilities” are not enough. *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999)

B. SUBJECTIVE EXPERT ANALYSIS OF FIGURE 22 IS INSUFFICIENT

Subjective expert analysis of figure 22 cannot overcome the fact that figure 22 does not show a four-layer structure. Petitioner's expert's subjective analysis that “the color scheme and arrangement of the four phases/layers mirror the color scheme and arrangement of the four phases/layers shown in figure 1 of the '683 patent” (Ex. 1003, ¶89) cannot overcome the fact that figure 22 does not show a four-layer structure. Petitioner's expert concedes that figure 22 itself cannot reveal whether layers are of different materials. (Ex. 2011, 84:7-25 ("Does the image itself disclose the ... materials of the individual layers? ... the individual composition and crystal structures are ... not provided by just looking at the layers ... the exact composition of each layer is not gathered by the ... figure")). To the extent the alleged “color scheme” is indicative of anything at all, it would suggest that the asserted “Superficial layer” and the asserted “Intermediate layer”, having the same “color scheme” are of the *same material*, not different, as required by the

claims. (Ex 2010, ¶¶130-138). Consequently, Ground 1 fails because figure 22 of Cornette does not show the claimed four-layer structure.

It is Petitioner's burden to *prove*, by a preponderance of the evidence, that Cornette discloses the claimed four layer arrangement, exactly as claimed. Cornette does not show the claimed four layer arrangement, and Petitioner's arguments to the contrary are pure conjecture.

IX. GROUND 1 (ANTICIPATION) FAILS BECAUSE FIGURE 22 OF CORNETTE IS NOT AN IMAGE OF A "STAMPED PRODUCT" AS CLAIMED

Petitioner's allegation of unpatentability relies on the premise that figure 22 of Cornette shows a stamped product with a four layer structure. Figure 22 is not an image of a stamped product, and thus, cannot be used to establish the layers of a stamped product. (Ex. 2010, ¶¶76, 77, 143)

Petitioner wrongly contends that figure 22 of Cornette represents a coating after stamping. (Petition, at 25, 30; Ex. 1003, ¶¶67, 78 (figure)). Nowhere in Cornette is figure 22 described as a stamped coating. Rather, it is described as a coating after heat treatment. (Ex. 2010, ¶¶76, 77, 144-146). This is plainly evident in figure 22's caption which specifically states that the image is of a coating after heat treatment: "FIG. 22. Section view and coating surface after heat treatment"

(Ex. 1004, [0010]), and in the sentence immediately preceding figure 22 which reads “[t]he following photo shows a section view of the coating after heat treatment.” (Ex. 1004, [0009]). (Ex. 2010, ¶146). Cornette does not disclose anywhere that figure 22 is a coating after stamping and Petitioner in as much admits this when Petitioner asserts that “[Figure 22] shows a section view of the coating after heat treatment” of a hot dipped process. (Petition, at 25 (brackets in original); Ex. 1003, ¶67). Petitioner wrongly concludes that because Cornette mentions making complex parts by hot stamping (Petition, at 25; Ex. 1013, [0011]), figure 22 represents the coating after stamping. (Petition, at 29-30, figure). This is simply not the case: Figure 22 specifically states that the image is of a coating after heat treatment, and thus is an image taken before any stamping might occur. (Ex. 2010, ¶¶76, 77, 147).

Throughout Cornette, a distinction is drawn between “heat treatment” on the one hand, and “hot forming” or “hot stamping” on the other. Figure 21 shows “Heating” separate from “Hot Forming;” the caption of Figure 22 reads “after heat treatment;” and page [0010] distinguishes mechanical properties of USIBOR “[b]efore heat treatment” from those “after hot forming.” The distinction between “heat treatment” and the subsequent process of hot stamping or hot forming is also clear from the ’683 patent. (Ex. 1001, 1:46-50, 3:57-58, 3:63-64, 5:60).

This is further evidenced by Vaissiere. Vaissiere's figure 15 and Cornette's figure 22 are the same images and are both captioned as heat treated coated steel. (Ex. 1033, [0007]; Ex. 1013, [0010], Ex. 2010, ¶86). It 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. (Ex. 1033, [0007], Ex. 2010, ¶87). Cornette's and Vaissiere's use of these figures are completely consistent: both making it clear that the coating is not stamped. (Ex. 2010, ¶87).

Petitioner points to other sections of Cornette which describe stamping, including figure 21 which illustrates a heat treatment and stamping process. However, this only serves to reinforce the difference between a part that has been subjected to "heat treatment" (i.e. "heating" in figure 21), and the subsequent step of stamping ("hot forming and quenching" in figure 21).

Since figure 22 of Cornette represents a coating *before* stamping it cannot disclose anything about the coating and thickness *after* stamping. (Ex. 2010, ¶¶148-158). From 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. The coating undergoes dynamic processes that are temperature, time and strain dependent. Thus, depending on when in the process a coating is observed, the number of layers, thickness of the layers, thickness of coating, and compositions could be different. (Ex. 2010, ¶152). During heat treatment in a furnace the coating and blank are heated causing changes to the structure of the coating. (Ex. 2010, ¶153). When the coated steel is transferred from the furnace to the stamping press, depending on the stability of the structure of the compounds after heat treatment, the structure of the compounds of the coating could once again undergo changes. (Ex. 2010, ¶154). The coating could change again during and after stamping, and change again during cooling, depending on, for example, plastic strain involved in the forming and whether it is slow or fast cooled. For example, after stamping, the thickness of the steel is reduced by deformation and depending on the strain, the reduction could be almost 50%, and the coating could be reduced by the same amount. Accordingly, a POSITA looking at Cornette figure 22 would not be able to determine or predict what the coating would look like after stamping. (Ex. 2010, ¶¶155-157).

There is no indication in Cornette that the layers would be the same after stamping and a POSITA observing Cornette could not assume that the coating in figure 22 would be the same after stamping. Therefore, it is improper to compare

the thicknesses and number of layers of the claimed stamped coating to the coating produced after heat treatment shown in figure 22. (Ex. 2010, ¶158).

Petitioner's allegation of anticipation is based on pure conjecture, improperly bolstered by a hindsight comparison to patent owner's specification. A finding of "invalidity by anticipation requires that the four corners of a single, prior art document describe every element of the claimed invention, either expressly or inherently, such that a person of ordinary skill in the art could practice the invention without undue experimentation." *Advanced Display Sys*, 212 F.3d at 1282, citing *Atlas Powder Co.*, 190 F.3d at 1347; *In re Paulsen*, 30 F.3d at 1479. Anticipation requires that "the prior art necessarily functions in accordance with, or includes, the claimed limitations." *MEHL/Biophile Int'l Corp.*, 192 F.3d at 1365. "Probabilities and possibilities" are not enough. *In re Robertson*, 169 F.3d at 745.

X. GROUNDS 2 THROUGH 7 (OBVIOUSNESS) FAIL

Grounds 2 to 7 rely on Cornette as the primary reference. (Petition, Paper 2, at 10). In grounds 2 to 7, Petitioner relies on Cornette in the same manner as Ground 1 (Petition, Paper 2, at 46-72) and provides no evidence that Fig. 22 is hot stamped or that Cornette would be modifiable to produce the claimed four-layer structure in a stamped product. Thus grounds 2 to 7 fail for at least the reasons

discussed herein. (Ex. 2010, ¶¶159-160). Set forth below are additional reasons why Grounds 2, 4, 6, and 7 fail.

A. GROUND 2, CLAIM 11 IS NOT OBVIOUS OVER CORNETTE

Claim 11 recites:

The coated steel stamped product according to claim 1,
wherein said layer (a) has a thickness less than 10
micrometers.

Petitioner admits that the thickness of the alleged layer (a) of Cornette does not overlap with the “less than 10 micrometers” thickness recited in claim 11.

According to Petitioner, the coating of the alleged layer (a) is “approximately 10.5 μm in at least one location.” (Petition at p. 44). Petitioner relies on *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 783 (Fed. Cir. 1985) and argues that the proximity between the thickness of the alleged layer (a) and the thickness recited in claim 11 renders claim 11 obvious. *Titanium Metals* however is distinguishable and inapplicable to the present facts.

As summarized by the Federal Circuit in *In re Patel*, 566 Fed. Appx. 1005, 1009 (Fed. Cir. 2014):

In *Titanium Metals*, claim 3 disclosed an alloy having 0.3% Molybdenum ('Mo') and 0.8% Nickel ('Ni'). The court found that claim obvious over prior art which disclosed two alloys having the following characteristics: (1) 0.25% Mo with 0.75% Ni, and (2) 0.31% Mo with 0.94% Ni. *Titanium Metals*, 778 F.2d at 782-83. While it is true that, in finding the claim obvious, the court stated that '[t]he proportions are so close that prima facie one skilled in the art would have expected them to have the same properties,' *id.* at 783, the facts of the case put that comment in context. ***The claims and prior art in Titanium Metals disclosed single points, not ranges, and the claimed amount fell within the two single amounts disclosed by the prior art.*** In other words, the prior art establishes two measures—which were themselves not far apart--and the claim simply adopted a measure between those end points. *Titanium Metals* is thus a case much like the range cases where the claimed amount falls directly within the established prior art range. (emphasis added).

In the present case, “a thickness less than 10 micrometers” recited in claim 11 does not overlap with the ranges of thickness in Cornette. (Ex. 2010, ¶¶162-166). Petitioner admitted that that it does not. (Petition, at p. 44). Petitioner relied

on a single thickness (*i.e.*, “approximately 10.5 μm ”, the thickness that is outside the “less than 10 micrometers” thickness range recited in claim 11. *Id.*

Consequently, *Titanium Metals* does not control.

Similarly, because there is no overlap between the thickness recited in claim 11 and the thickness range of Cornette and Cornette does not teach its thicknesses can be flexibly applied, Petitioner's reliance on *In re Woodruff*, 919 F.2d 1575, 1578 (Fed. Cir. 1990), is without merit. Unlike in the present case, in *In re Woodruff*, there was evidence that the disclosure of “about 1-5%” in the prior art “allow for concentrations slightly above 5%” and therefore there was an overlap between the “more than 5%” recited in the claims about “about 1-5%” in the prior art. *Id.* at 1577. *In re Woodruff*, therefore, is inapplicable.

Rather, the reasoning of *In re Patel* applies here. *In re Patel* holds that a reference disclosing a range of 0.5 to 25 weight percent cannot establish a prima facie case of obviousness of a range of 26 to 80 weight percent “because the ranges do not overlap and the prior art does not teach that a broader range would be appropriate.” *In re Patel* at 1009. Similarly, in the present case, the “less than 10 micrometers” thickness range recited in claim 11 does not overlap with the range of thicknesses of Cornette, and Cornette does not teach that a broader range of thicknesses is appropriate. (Ex. 2010, ¶167).

Under *In re Patel*, Cornette does not render claim 11 obvious. *Id.*; *see also Ex parte Capanema*, Appeal No. 2017-003064 (PTAB March 27, 2018) (reversing an obviousness rejection, when “[t]he Examiner has not directed [the Board] ... to a teaching in [the cited references] ... that would have suggested forming lignins that would have fallen within the range specified by the claimed invention.”); *Ex parte Tibbetts*, Appeal No. 2017-001867, pp. 13-14 (PTAB September 18, 2017)(Reversing an obviousness rejection of claim reciting a range of “between about 15-30%” over a reference describing “a range between about 0.1-10%”, because “the Examiner has not sufficiently shown that the skilled artisan would have recognized sufficient identity between the end points of the non-overlapping ranges to conclude that the ranges ‘are close enough that one skilled in the art would have expected them to have the same properties.’”); *In Ex parte Wan et al.*, Appeal No. 2017-006500, p. 12 (PTAB 2018) (a thickness ratio of “about 0.01 to about 0.75” is not rendered prima facie obvious by a thickness ratio of 1).

Contrary to Petitioner's unsupported assertion that “a PHOSITA would have been able to achieve said reduction in thickness through routine experimentation, and would have expected a successful result” (Petition at p. 46), formation of layer (a) with “a thickness less than 10 micrometers” in a coating resulting from the interdiffusion between a base steel and aluminum or aluminum alloy pre-coating,

the coating having the sequence of layers and a thickness greater than 30 micrometers is not a trivial matter. Cornette provides POSITA with no guidance regarding how to control layer formation, and provides neither a suggestion for such a layer, nor a reasonable expectation of forming such a layer. (Ex. 2010, ¶168). Claim 11 is not rendered obvious by Cornette.

B. GROUND 4, CLAIM 11 IS NOT OBVIOUS OVER CORNETTE, LAURENT, EP LAURENT, FR LAURENT

Cornette does not teach or suggest the claimed four layer arrangement of claim 1 for the reasons set forth above. Further, Cornette does not disclose or suggest the “wherein said layer (a) has a thickness less than 10 micrometers” of claim 11, and none of Laurent, EP Laurent and FR Laurent can cure this deficiency. (Ex. 2010, ¶¶169-171).

Neither Laurent, EP Laurent nor FR Laurent disclose the formation of a “multi-phase alloy layer,” much less a coating with the alleged layers of Fig. 22 of Cornette. Neither Cornette, Laurent, EP Laurent, nor FR Laurent, when considered alone or in any combination, teach or suggest how to control a thickness of a layer in a multi-layer coating resulting from the interdiffusion

between a base steel and an aluminum or aluminum alloy pre-coating. (Ex. 2010, ¶¶172-174).

Cornette, Laurent, EP Laurent, FR Laurent, when considered alone or in any combination, do not disclose a four-layer coating with (i) “a thickness greater than 30 micrometers” and (ii) an interdiffusion layer with “a thickness less than 10 micrometers” as recited in claim 11 and therefore do not provide a reason for PHOSITA to provide such a four-layer coating. (Ex. 2010, ¶¶171-175).

Petitioner's assertions (Petition at pp. 57-60) are misleading, lack factual basis and are based on the impermissible use of hindsight of the claim 11. It is pure speculation that “reducing a thickness of Cornette's pre-coating (e.g., from 25 μm to 24.5, 24, 23.5, 23, etc.) would decrease a thickness of the resulting coating, and, in turn, the thicknesses of the respective phases/layers shown in Cornette's Figure 22, including Cornette's ‘Interdiffusion layer’ to less than 10 μm thick” (Petition at pp. 57-58), especially when Cornette states that “the best compromise between corrosion protection and weldability is 25 μm ,” and none of Cornette, Laurent, EP Laurent, FR Laurent provide a POSITA with any information needed to control the thickness, number or arrangement of layers in a coating. (Ex. 1013, [0009], Ex. 2010, ¶¶176-179).

Similarly, Petitioner's assertion, that "a pre-coating as thin as 20 μm (as taught by Laurent and EP Laurent) will still lead to an overall thickness of the coated layer being greater than 30 μm after processing, which would undoubtedly have a first/interdiffusion layer of less than 10 μm , thereby meeting the thickness limitations of claims 1 and 11" is also pure speculation for the same reasons. (Ex. 1013, [0009], Ex. 2010, ¶180).

Petitioner's statement that "reducing a thickness of the aluminum alloy precoating, and in turn the interdiffusion layer, would have been obvious to try because there are a limited number of coating thicknesses discussed in EP Laurent (10-25 μm)" is also misleading and unpersuasive. The coating thicknesses of the pre-coating *prior to* heating discussed in the secondary references is irrelevant. The teaching of how to control a thickness of a phase in the "hard multiphase alloy layer" of Cornette is missing from the cited references. (Ex. 2010, ¶181)

Further, Cornette reports that its "hard multiphase alloy layer" "shows good results regarding the welding range (2.1 kA)" and [b]ecause of high roughness values after hot forming process ... do not require any phosphatization to achieve acceptable paint appearance." (Ex. 1013, [0010]). Thus, there is no apparent reason to modify the phases in the hard multiphase alloy layer of Cornette. (Ex. 2010, ¶182)

Thus, Cornette, Laurent, EP Laurent, FR Laurent do not provide a reason to optimize the thickness of the alleged interdiffusion layer in Fig. 21 of Cornette and Petitioner failed to show that using a lower thickness of precoating would meet the claim element. (Ex. 2010, ¶183)

Cornette in view of Laurent, EP Laurent and FR Laurent do not render claim 11 obvious. (Ex. 2010, ¶184).

C. GROUND 7, CLAIM 11 IS NOT OBVIOUS OVER CORNETTE AND ENGELS

Similar to Ground 4, Engels cannot cure the deficiencies in Cornette with regard to claim 11.

Engels shows “a cross-section polish of the diffusion layer of a hot-dip aluminum coated boron steel.” (Ex. 1041, [0014], Fig. 5). There is no disclosure in Engels of the conditions used to arrive at the depicted layer. There is also no disclosure or indication in Engel that the depicted diffusion layer was stamped or is on a stamped product. (Ex. 2010, ¶¶185-190). Yet, there is a teaching that “structural change” take place during the forming process. (Ex. 1041, [0015]). Petitioner failed to address the structural change that takes during the forming process. Thus, there is no factual basis for an assertion that Fig. 5 depicts a layer of “a coated stamped product”, the layer having “a thickness less than 10 micrometer”

as recited in claim 11. (Ex. 2010, ¶¶191-192). Like Cornette, Engels lacks any disclosure on how to control a thicknesses of individual phases/layers depicted in figure 5. Engels therefore cannot cure the deficiency of Cornette and Cornette in view of Engels cannot teach a layer of “a coated stamped product”, the layer having “a thickness less than 10 micrometer” as recited in claim 11. (Ex. 2010, ¶193).

Further, Cornette describes that heating increases the thickness of the layer (Ex. 1013, [0009]), whereas Engel states that “the diffusion layer build up during heat treatment may complicate matters”. (Ex. 1041, [0010]).

Consequently, POSITA would not have combined Cornette and Engels. (Ex. 2010, ¶194).

Assuming *arguendo* POSITA would have combined Cornette and Engels, the results of the combination would have been unpredictable. Cornette and Engels do not teach how to control a thickness of a phase/layer in a four-layer structure formed during alloying, and while controlling the total thickness of the layer. (Ex. 2010, ¶195). Petitioner did not offer any evidence that the alleged modifications by “*minor tweaks* (i.e., routine experimentation) to Cornette’s processing parameters” would have resulted in the claimed four-layer structure, with the total thickness of greater than 30 micrometers, and layer (a) having a

thickness of less than 10 micrometers. To the contrary, neither Cornette nor Engels provide POSITA with any guidance on how to control formation of the alleged layers. (Ex. 2010, ¶¶196-197).

Cornette in view of Engels does not render claim 11 obvious.

D. GROUND 6, CLAIM 9 IS NOT OBVIOUS

Dependent claim 9 recites the “coated steel stamped product according to claim 1, wherein the product is hot formed with a strain higher than 10% and cooled with a cooling rate higher than 50° C./s.” (Ex. 1001, 16:39-41).

Petitioner makes two arguments in support of unpatentability. First, Petitioner argues that the limitation is a product-by-process limitation which does not impart structure to the claimed product and thus is not entitled to patentable weight. (Petition, p. 64). Second, Petitioner alleges that this limitation is taught by Somani and that it would have been obvious to look to Somani for strain and cooling parameters. (Petition, pp. 65-68).

1. The Limitation Hot forming with a strain higher than 10% and cooled with a cooling rate higher than 50° C./s Imparts Structure

Contrary to Petitioner's allegation, the limitation of claim 9 undoubtedly imparts structure to the claimed coated steel stamped product and is entitled to patentable weight. The '683 patent explains that:

... obtaining of a fully martensitic structure is linked to the amount of deformation in the hot forming operation: the amount of local deformation caused by hot forming is closely linked to the shape of the part or product and may exceed locally 40 or 50% in some particular regions. The inventors found that, when the local strain exceeds a critical value of 10%, the cooling rate must be sufficiently high in order to get a total martensitic transformation. Otherwise, bainitic transformation can take place at a significant amount instead of martensitic transformation. Thus, the risk is that heterogeneous structure appears on parts with complex shape where some locations are much more deformed than others. In this respect, the inventors put into evidence that, on the locations of the parts where the forming strain is higher than 10%, the cooling rate must be increased beyond 50° C./s in order to guarantee full martensitic transformation. The cooling rate is defined as the mean rate between the exit of the heated blank from the furnace, down to 400° C. (Ex. 1001, 11:10-29).

Thus, contrary to Petitioner's assertion, a strain higher than 10% and cooling with a cooling rate higher than 50° C./s does result in a change in structure. (Ex. 2010, ¶¶198-200).

Moreover, Petitioner's reliance on Somani and Petitioner's statement 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, it affects the structure and dimensions of the stamped product.

Somani states:

Typical flow stress curves are plotted in Fig. 9. A decreasing level of flow stress with an increasing prior plastic strain is evident, as shown by the marked drop at a strain as small as 0.04. The corresponding microstructure after the test is shown in Fig. 10 revealing a few ferrite grains among martensite, the fraction about 6 %. After the strain of 0.04, $\Delta D/D$ was about 0.4 %, which value is smaller than that (0.53 %) without any plastic deformation. All this is in agreement with the observations of microstructures. Especially the flow stress at small strains is significantly affected, obviously due to yielding of the softer ferrite (170- 180 HV 10) first. The similar trend in yield strength was very clear as a result of the changes in microstructure from hard

martensitic to softer austenitic + bainitic or to austenitic... (Ex. 1005, [0006]).

Thus, Somani is further evidence that the strain during hot forming and the cooling rate affects the structure of the stamped part. (Ex. 2010, ¶201).

Accordingly, the limitation “wherein the product is hot formed with a strain higher than 10% and cooled with a cooling rate higher than 50° C./s” is entitled to patentable weight as a product-by-process limitation.

2. Somani does not cure the deficiency of Cornette

Somani does not teach “wherein the product is hot formed with a strain higher than 10% and cooled with a cooling rate higher than 50° C./s,” and in any event, there would be no motivation to combine Somani with Cornette to provide this claimed feature. (Ex. 2010, ¶¶202-210).

First, Petitioner fails to acknowledge that the cooling rates allegedly disclosed in Somani are **not** “the rate[s] between the exit of the heated blank from the furnace, down to 400° C,” which is the **definition** of the term “cooling rate” in the ‘683 patent. (Ex. 1001, 11:27-29). (Ex. 2010, ¶¶203-205)

Somani is directed to “the modelling of the behavior of the steel profiles in the forming and quenching process.” (Ex. 1005, Abstract). “The forming and

quenching process was simulated by hot compression and simultaneous or subsequent fast cooling.” (Id., at [0002]). (Ex. 2010, ¶206).

Thus, the Somani cooling rate is the rate of cooling *in the* stamping press, and does not include the cooling of the blank *from the exit of the furnace* until the blank is placed in the stamping press. (Ex. 2010, ¶¶207-208).

Consequently, the cooling rates purportedly disclosed in Somani do **not** read on the cooling rate of claim 9.

Thus, even if there was a reason to combine Cornette with Somani (which there is not), the combination of Cornette and Somani would not have taught or suggested “a cooling rate higher than 50° C./s” as recited in claim 9. (Ex. 2010, ¶¶209-210).

3. Somani suggests that controlling a cooling rate is NOT a viable option for controlling the steel's structure and offers an alternative solution

As taught in the ‘683 patent, “where the forming strain is higher than 10%, the cooling rate must be increased beyond 50° C./s in order to guarantee full martensitic transformation.” (Ex. 1001, 11:25-29). Petitioner alleges that “a PHOSITA would have also been motivated to determine strain values and cooling rates to . . . minimize ferrite formation while maximizing martensite formation . . .” (Petition, p. 67, Ex. 2010, ¶¶211-212).

However, even assuming the cooling rates of Somani can be compared to the rates of claim 9, Somani does not teach or suggest that controlling a cooling rate is a viable option for avoiding ferrite formation in a steel substrate, let alone a steel coating “resulting from the interdiffusion between ... base steel and aluminum or aluminum alloy pre-coating” as recited in claim 1. (Ex. 2010, ¶213).

Somani discloses that “the maximum rate of 280° C/s used in the tests ... still result[ed] in the formation of some ferrite” and concluded that “cooling rates high enough to avoid any ferrite formation at the most highly strained location may be difficult to achieve.” (Ex. 1005, [0006]). Moreover, Somani states a “rough estimate based on the recrystallisation kinetics of a low-carbon steel suggests that the time needed for complete recrystallisation would be about 29s at 900°C (at a strain of 0.15 and a strain rate of 0.1 s⁻¹) and 255 s at 800°C). Such long times are certainly not available due to the rapid cooling at least at the contact points of the profile and the tools.” *Id.* Thus, contrary to Petitioner’s assertion in the Petition at page 67, Somani does not provide a reason to optimize the cooling rate “to minimize ferrite formation while maximizing martensite formation”. (Ex. 2010, ¶214).

Instead, Somani recommends “that forming should take place at a high temperature, $\geq 800^{\circ}\text{C}$, where the driving force for the austenite decomposition is

low, or the time should be long enough for static recrystallisation to occur.” (Ex. 1005, [0006]) According to Somani, “[a]nother, more realistic alternative might be forming at low temperatures, such as <600°C, i.e. below the ferrite regime.” *Id.* Thus, in essence, Somani teaches away from using cooling rate as a means of controlling the final microstructure of the steel. (Ex. 2010, ¶215).

In contradiction to Somani's teaching that that “the maximum rate of 280° C/s used in the tests ... still result[ed] in the formation of some ferrite” (Ex. 1005, [0006]), Vaissiere teaches full martensite for the same steel as figure 22 of Cornette at 27 °C. (Ex. 1033, [0006]). Similarly, Laurent states that “[f]or a completely martensitic structure and for a steel having the composition of the example, the speed of cooling should be in excess of the critical speed of hardening which is 27° C./s for an austenitizing at 900° C. for 5 min.” (Ex. 1008, 4:4-9, Ex. 2010, ¶216).

Thus, POSITA would not have had a reason to go higher than the 27°C cooling rate disclosed in Vaissiere and Laurent for the same steel as Cornette figure 22 and look to Somani and cool at the rates disclosed in Somani. (Ex. 2010, ¶¶217-221).

Cornette in view of Somani does not render claim 9 obvious.

XI. CONCLUSION

For the foregoing reasons, the Petitioner has failed to establish by a preponderance of the evidence that claims 1- 11 of the '683 patent are unpatentable. Accordingly, the Petition should be denied.

Respectfully submitted,

Dated: April 8, 2020

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CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. § 42.24(d), the undersigned certifies this document complies with the type-volume limitation of 37 C.F.R. § 42.24(b)(2). Patent Owner's Response contains 13970 words, as calculated by Microsoft Word, excluding the parts of this document exempted by 37 C.F.R. § 42.24(a)(1).

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §§ 42.6(e), the undersigned certifies that on April 8, 2020, a true and correct copy of this PATENT OWNER'S RESPONSE was served in its entirety by electronic mail to the following counsel of record for Petitioner, POSCO:

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