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Paper 34
Entered: January 19, 2017

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

WORLD BOTTLING CAP, LLC,
Petitioner,

v.

CROWN PACKAGING TECHNOLOGY, INC.,
Patent Owner.

Case IPR2015-01651
Patent 8,550,271 B2

Before WILLIAM V. SAINDON, STACEY G. WHITE, and JON B. TORNQUIST, *Administrative Patent Judges*.

SAINDON, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
Final Written Decision Determining No Claims Unpatentable
35 U.S.C. § 318(a); *37 C.F.R. § 42.73*
Granting Joint Motion to Seal
37 C.F.R. § 42.54

I. INTRODUCTION

We have jurisdiction under 35 U.S.C. § 6. We enter this Final Written Decision pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. We also grant the parties' Joint Motion to Seal (Paper 22).

With respect to the grounds asserted in this trial, we have considered the papers submitted by the parties and the evidence cited therein. For the reasons discussed below, we determine that Petitioner has not shown, by a preponderance of the evidence, that any claims of U.S. Patent No. 8,550,271 B2 (Ex. 1001, "the '271 patent") are unpatentable. In summary, although we find that Petitioner has offered evidence in support of obviousness, we find that Patent Owner has offered compelling evidence of secondary considerations of non-obviousness.

A. Procedural History

Petitioner filed a Petition (Paper 1, "Pet.") requesting *inter partes* review of claims 1–20 of the '271 patent on five grounds. Pet. 6–7. Patent Owner filed a Preliminary Response. Paper 5 ("Prelim. Resp."). We instituted *inter partes* review on all challenged claims. Paper 6 ("Dec. on Inst.").

Patent Owner filed a Response. Paper 15 ("PO Resp."). Petitioner filed a Reply. Paper 24 ("Pet. Reply")[1]. An oral argument was held and a transcript was entered into the record. Paper 33 ("Tr.").

[1] Petitioner also filed a confidential version of its Reply (Paper 23). We refer to the public version, Paper 24, unless noted otherwise.

Pending before us is a Joint Motion to Seal, which we grant for the reasons expressed later in this paper. Paper 22.

B. Related Matters

Petitioner represents that it knows of no related matters currently pending. Pet. 1; *see also* Paper 4, 1 (Patent Owner affirming that there are no related matters pending). Petitioner notes that its previous petition challenging the '271 patent was denied. Pet. 1–2; *see World Bottling Cap, LLC v. Crown Packaging Tech., LLC*, Case IPR2015-00296 (PTAB May 14, 2015) (Paper 6) (Decision Denying Institution).

C. The '271 Patent

The '271 patent describes a bottle cap, also known as a crown cap or crown cork. The '271 patent describes the invention as a crown cap that is made with thinner and harder steel compared to conventional crown caps. Ex. 1001, 4:63–65, 5:34–38. The '271 patent describes conventional crown caps as formed from T4 tinplate[2] having a thickness of 0.21 mm to 0.23 mm and an average hardness of 61 on the 30T hardness scale.[3] *Id.* at 4:52–58. The '271 patent describes the invention, in contrast, as formed from steel having a thickness of 0.16 mm to 0.18 mm and an average hardness of greater than 62 on the 30T scale. *Id.* at 4:58–65, 5:6–9. Reducing the thickness of the steel allows for less steel to be used per cap, which purportedly provides the benefit of lower carbon emissions, such as from

[2] "Tinplate" is tin-plated steel. *See* Ex. 1001, 4:49–58. "T4" denotes a particular temper for the steel. *See* Ex. 1007 ¶¶ 16, 26.

[3] The Rockwell 30T scale is used to measure the hardness of various steels. *See* Ex. 1007 ¶¶ 16–17.

cooling that material (when aggregated over the billions of caps produced each year). *Id.* at 5:34–38.

D. Challenged Claims

Petitioner challenges each claim of the '271 patent. Claims 1, 12, and 20 are independent. Independent claim 1 is reproduced below.

> 1. A lightweight crown cap for application to a glass beverage bottle, comprising:
> a shell formed of a material comprising steel having an average hardness of greater than 62 on the 30T scale, the shell including:
> a peripheral skirt having, flutes downwardly depending therefrom, the flutes are capable of being crimped to affix the crown cap to a bottle; and
> a round panel integrally formed with the skirt, the panel including at least one recessed circular groove that has its center approximately at the longitudinal center of the panel; and a liner located on the underside of the panel.

E. Prior Art and Instituted Grounds

Our Decision on Institution ordered a trial on each of the grounds asserted by Petitioner (Dec. on Inst. 15):

References	**Basis**	**Claims Challenged**
Frishman[4] and Industrial Heating[5]	§103	1–4, 10, 12–15, and 17–20

[4] U.S. Patent No. 8,061,544 B2, issued Nov. 22, 2011, published Aug. 9, 2007, continuation-in-part of application No. PCT/US2006/002421 (filed on Jan. 24, 2006), provisional application No. 60/758,725 (filed on Jan. 14, 2006) (Ex. 1003).

[5] *Continuous Annealing of Strip Steel at Dominion*

References	Basis	Claims Challenged
Frishman, Industrial Heating, and Wagner[6]	§103	11 and 16
Industrial Heating and Wagner	§103	1–4 and 10–20
Frishman, Industrial Heating, Mumford,[7] and U.S. Steel[8]	§103	5–9
Industrial Heating, Wagner, Mumford, and U.S. Steel	§103	5–9

Petitioner also relies on the testimony of Mr. George K. Crochiere (Ex. 1007).

II. ANALYSIS

A. Joint Motion to Seal

The Joint Motion to Seal (Paper 22) seeks to seal Exhibit 1016 and portions of Petitioner's Reply (Paper 23). The parties represent that Exhibit 1016 contains "confidential and proprietary" information "regarding licensing and royalties associated with foreign-counterpart patents to the '271 patent." Paper 22, 4. We agree that this information is sensitive in nature, and further find that the public has little interest in the contents of Exhibit 1016 because we ultimately need not rely on this information to make our decision. Accordingly, the Joint Motion to Seal is granted. The

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Foundries & Steel, Ltd., XVIII INDUSTRIAL HEATING 564–570 (Mar. 1951) ("Industrial Heating") (Ex. 1004).

[6] U.S. Patent No. 2,233,904, issued Mar. 4, 1941 (Ex. 1005).

[7] U.S. Patent No. 3,152,711, issued Oct. 13, 1964 (Ex. 1006).

[8] Production Catalogue, U.S. Steel (Slovakia) (2005) (archive copy dated May 2, 2006) (originally at http://www.usske.sk/products/cat/tin-mill/index.html#mechanical) (retrieved from the Internet Archive Wayback Machine) (Ex. 1012).

parties are reminded that information designated confidential still may become public after the issuance of a final written decision, and the parties may move to expunge the sealed documents upon the conclusion of this proceeding and any associated appeal. 37 C.F.R. § 42.56.

B. Claim Construction

We interpret the claims of an unexpired patent using the broadest reasonable interpretation in light of the specification of the patent. 37 C.F.R. § 42.100(b). Under that standard, a claim term generally is given its ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *See In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Although our claim interpretation cannot be divorced from the specification, *see Microsoft Corp. v. Proxyconn, Inc.*, 789 F.3d 1292, 1298 (Fed. Cir. 2015) (citing *In re NTP, Inc.*, 654 F.3d 1279, 1288 (Fed. Cir. 2011)), we must be careful not to import limitations from the specification that are not part of the claim language, *see SuperGuide Corp. v. DirecTV Enterprises, Inc.*, 358 F.3d 870, 875 (Fed. Cir. 2004). Any special definition for a claim term must be set forth in the specification with reasonable clarity, deliberateness, and precision. *See In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994).

Independent claims 1 and 12 recite a "[crown] shell formed of a material comprising steel having an average hardness of greater than 62 on the 30T scale." Independent claim 20 includes a similar limitation, but recites "metal" instead of "material." Petitioner asserts that "average hardness" is "the reported hardness value regardless of +/– variations" and that "hardness" refers to Rockwell hardness. Pet. 17–19 (citing Ex. 1001,

4:53–58). We adopted Petitioner's proposed construction, which was not challenged by Patent Owner, in our Decision on Institution. Dec. on Inst. 5–6. This construction was not contested during trial. Tr. 30:3–4 (Patent Owner's counsel stating, "I think both parties have kind of come to the agreement that what we're talking about is the median of a range"); 32:19–33:2 (Patent Owner's counsel agreeing that, when construing the term, "we look at the median value [only]"). Accordingly, we construe "average hardness" to mean "the reported hardness value regardless of +/– variations," i.e., the median value of the reported range, and we construe "hardness" to refer to Rockwell hardness.

C. Overview of the Prior Art and Asserted Grounds

1. Industrial Heating

Industrial Heating is a monthly periodical directed to those in the industrial heating industry. Ex. 1004, Table of Contents (stating that Industrial Heating is "Published Monthly" and including a March 1951 date). One article discusses continuous annealing of strip steel and in particular discusses how "[s]ome of the applications which normally require a T-2 steel (50-55 R 30-T) are regularly made from T-4 continuously annealed steel at 60-65 R 30-T, i.e., crown caps, ..." Ex. 1004, 566. Notably, Industrial Heating defines T4 steel as harder than the '271 patent defines it.

2. Other References

Petitioner also relies on Frishman, Wagner, Mumford, and U.S. Steel. Frishman discloses a crown cap having a pull tab. Ex. 1003, Abstract. Wagner discloses a crown cap having concentric beads and a lining. Ex.

1005, Figs. 1–3. Mumford discloses a closure cap for bottles and jars that uses sheet metal having a Rockwell hardness of about 54 to 72 on the "T-30" scale. Ex. 1006, 1:9–12, 3:74–4:3, 4:44–45. U.S. Steel discloses various tin mill product grades and their mechanical properties. Ex. 1012, *passim*. For example, U.S. Steel discloses T4 tinplate (also known as T61 or TH415), as having hardness ranges from 56 to 66, depending on the thickness of the material.[9] *Id.*

3. Asserted Grounds

Petitioner's asserted grounds can be divided into two groups: the Frishman-led grounds, with Frishman showing most of the features of the crown cap, and the Wagner-led grounds, with Wagner doing the same. Both of these groups rely on Industrial Heating for showing the particular steel recited in each claim. We address the Wagner-led grounds first, then turn to the Frishman-led grounds. We focus our analysis on independent claim 1, except where specifically identified, because our analysis as applied to that claim generally is representative of our analysis as applied to all claims.

D. The Wagner-Led Grounds

1. Petitioner's Assertions

Petitioner asserts that Wagner discloses a crown cap with the claimed shell, peripheral skirt, groove, and flutes. Pet. 42. Petitioner directs us to Figure 1 of Wagner, which we reproduce below:

[9] The scale used for the hardness values in U.S. Steel is obscured, but are generally consistent with values expected of these materials on a Rockwell 30T scale. *See* Ex. 1007 ¶ 16 (depicting a table of various temper designations and corresponding 30T Rockwell hardness range (HR30T)).

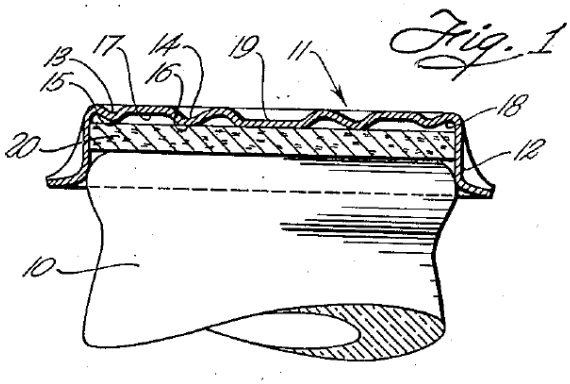

Figure 1 of Wagner depicts an un-crimped crown cap.

Wagner does not disclose the particular claimed hardness value for the crown cap, which Petitioner asserts is disclosed in Industrial Heating. Pet. 43 (citing Ex. 1004, 566). Specifically, the median of the range "60–65," i.e., its "average hardness" as construed herein, would be 62.5, satisfying the limitation for steel having an average hardness "greater than 62." Ex. 1004, 566 ("[s]ome of the applications which normally require a T-2 steel (50-55 R 30-T) are regularly made from T-4 continuously annealed steel at 60-65 R 30-T, i.e., crown caps"). Petitioner asserts that the combination would have been obvious because the hardness values stated in Industrial Heating were known for application in crown caps, with a predictable advantageous result due to the hardness of the steel. Pet. 21–22, 30 (setting forth the obviousness rationale); Ex. 1007 ¶ 39 (Petitioner's declarant, Mr. Crochiere, testifying that it would have been obvious to use a known material to make crown caps); *see also In re Leshin*, 277 F.2d 197, 199 (CCPA 1960) (the selection of a known material based upon its suitability for the intended use is a design consideration within the skill of the art). Petitioner also asserts that it was a trend in the industry to use increasingly thinner but harder crown caps, such that the proposed combination is merely following a known trend. Pet. 16–17 (citing Ex. 1011, 24 (allegedly depicting said

downsizing trend)); *see also* Ex. 1011, 33 (explicitly listing harder steels for crown caps); *KSR Int'l. Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007) ("If [pursuing known options] leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense.").

2. Patent Owner's Assertions

Patent Owner argues that a person of ordinary skill in the art would not modify the steel in the Wagner crown cap to be the harder steel in Industrial Heating. PO Resp. 47–49. Specifically, Patent Owner contends that the crimping process in Wagner requires the flattening of a groove, such that harder steel would interfere with that flattening operation. *Id.* at 49 (citing Ex. 2004 ¶ 41). Figure 3 of Wagner depicts the flattened groove:[10]

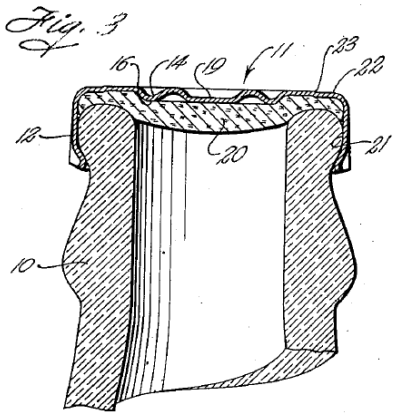

Figure 3 of Wagner depicts the crimped cap from Figure 1 of Wagner. Specifically shown is that groove 13 of Figure 1 that has been mostly flattened, as indicated by item 23, and that the sides are drawn down, as indicated by item 21. Ex. 1005, 2:12–16, 28–30.

[10] The particular groove being flattened is identified as item 13 in Figure 1 reproduced above. *Compare* Ex. 1005, Fig. 1 (uncrimped state, groove 13 present), *with id.* Fig. 3 (crimped state, groove 13 smoothed out).

Patent Owner's declarant, Antonios Kontsos, Ph.D., asserts that the steel in the Wagner crown cap must be soft because groove 13 is stretched in the process of crimping the cap to the bottle. Ex. 2004 ¶ 40. Dr. Kontsos asserts that making the steel harder, as proposed by Petitioner, would interfere with this stretching.[11] *Id.* ¶ 41. Patent Owner also offers the testimony of the inventor of the '271 patent, Mr. Alfredo Merino Caballero, who acknowledges Petitioner's assertion that it has been known to make crown caps progressively harder in order to use less material (called "light-weighting"). Ex. 2005 ¶¶ 15–18. Mr. Merino testifies that, despite the known trend of light-weighting, with the known advantages, crown caps were not made from steel harder than T4[12] (until his invention). *Id.* ¶¶ 18–20. Mr. Merino attributes this to the difficulties in crimping the harder metal onto the crown cap due to spring back, a similar situation as what would happen to the grooves of Wagner when crimped. *See id.* ¶¶ 21–24.

Patent Owner then offers evidence of secondary considerations. PO Resp. 33–44, 61–63. First, Patent Owner addresses the nexus requirement by asserting that it has sold a crown cap meeting the claim limitations as of 2009. *Id.* at 34–36. Patent Owner offers as evidence the testimony of the inventor (who also owns Packaging Products del Peru, or "PPP," the business making the caps[13]), who in turn cites to a steel supplier certificate

[11] The assumption here, consistent with the evidence of record, is that harder steels are generally more difficult to bend. *See, e.g.*, Ex. 1011, 16 (noting that the higher hardness grades have higher yield stresses).

[12] Mr. Merino asserts that "T4," under his understanding, means steel having an average hardness of 61 on the 30T scale. Ex. 2005 ¶ 18.

[13] The record is not clear as to the exact corporate relationship between PPP and Patent Owner but, at the least, Mr. Merino's testimony establishes that

and a report from its major customer that discusses the features of the crown cap Patent Owner sells. Ex. 2005 ¶ 39 ("In 2009, PPP changed our design . . . to implement my invention."), ¶ 40 ("Specifically, PPP began to use steel having an average hardness of greater than 62"); Ex. 2011 (specifying "DR9CA" steel for PPP[14]); Ex. 2012 (reporting a 2010 test of PPP crown corks using DR9CA steel). Mr. Merino also testifies that the PPP crown caps had the claimed flutes, liner, and groove. Ex. 2005 ¶ 41.

Patent Owner then offers its evidence of commercial success. PO Resp. 36–40. Patent Owner provides evidence that its market share in Peru has grown about 7% since offering the harder crown cap. *Id.* at 36–37 (citing Ex. 2005 ¶¶ 44–45). Patent Owner argues that this growth came notwithstanding the fact that the Peruvian market opened to foreign competition around this time. *Id.* Patent Owner also asserts that using the harder steel allowed materials savings on the order of 22–29%. *Id.* at 37 (citing Ex. 2005 ¶ 45). This in turn provided a cost savings on direct and indirect costs of about $0.40 per thousand units (assuming a volume of 10 billion caps per year). *Id.* at 37–38 (citing Ex. 2005 ¶ 48). Given this, Patent Owner asserts that even though the average price on the caps dropped about 12%, the gross margin on the caps rose about 13%. *Id.* at 38–39 (citing Ex. 2005 ¶¶ 49–50).

PPP makes crown caps in accordance with Patent Owner's '271 patent. Ex. 2005 ¶ 39.

[14] *See, e.g.*, Ex. 2005 ¶ 40 (Mr. Merino testifying that "DR9CA" steel has an average hardness of 75); Ex. 1011, 16 (equating DR9CA steel with TH620 steel); Ex. 1012 (listing TH620 steel as having hardness values between 73 and 79). Accordingly, DR9CA steel would satisfy the claim limitations regarding minimum hardness values.

Patent Owner next offers evidence of industry praise. PO Resp. 40–43. Patent Owner offers a press release from its major customer, SABMiller, who praised PPP's thinner crown cap having "a unique design which embosses a ring . . . to prevent a 'spring-back' effect that can lead to leakage and contamination." *Id.* at 41 (quoting Ex. 2013). Patent Owner also offers an article from *The Canmaker*, an industry publication, discussing the thin PPP crown cap having a ring. *Id.* at 41 (citing Ex. 2014). *The Canmaker* issued two awards to PPP, which Patent Owner characterizes as being offered for metal reduction and design and engineering due to the claimed features. *Id.* at 41–42 (citing Ex. 2015). In addition, Patent Owner offers evidence of "governmental praise" of PPP for the ecological and environmental impact resulting from thinner caps. *Id.* at 42 (citing Ex. 2015). Patent Owner argues that these awards, generally directed to cost savings and environmental impact, go to the merits of the invention because the thinner steel allows for cost savings in raw materials and transportation and cooling of raw materials and finished caps. *Id.* at 42–43 (citing Ex. 2005 ¶¶ 56–58; Ex. 2012).

Patent Owner lastly asserts that Petitioner copied the invention, offering as evidence a side-by-side comparison of their respective crown caps. PO Resp. 44.

3. Discussion

a. Petitioner's Obviousness Case

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*, 550 U.S. at 406. The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art at the time of the invention; and (4) when available, secondary considerations such as commercial success, long felt but unsolved needs, and failure of others. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). "A determination of whether a patent claim is invalid as obvious under § 103 requires consideration of all four *Graham* factors, and it is error to reach a conclusion of obviousness until all those factors are considered." *Apple v. Samsung Elecs. Co.*, 839 F.3d 1034, 1048 (Fed. Cir. 2016) (en banc) (citations omitted). "This requirement is in recognition of the fact that each of the *Graham* factors helps inform the ultimate obviousness determination." *Id.*

As is clear from our above discussion of Petitioner's ground, and with a focus on claim 1, the differences between the prior art and the claimed invention are minimal. Wagner discloses a crown cap having the claimed physical shape and features of the claimed cap. Ex. 1005, Fig. 1. The only difference is that Wagner does not disclose the hardness of its steel. The trend in the crown cap industry, i.e., following the knowledge of a person of ordinary skill in the art, is to use progressively harder materials (light-weighting), which provides the benefits of using less raw material (in turn providing cost savings). *See, e.g.*, Ex. 2005 ¶¶ 15–16. The harder steels were known. *See, e.g.*, Ex. 1012 (listing various harder steels for sale); Ex. 1011, 33 (listing various harder steels for sale for crown corks). Indeed, Petitioner points to Industrial Heating as evidence that crown caps having an

average hardness of 62.5, i.e., greater than 62, were known. Ex. 1004, 566 ("[s]ome of the applications which normally require a T-2 steel (50-55 R 30-T) are regularly made from T-4 continuously annealed steel at 60-65 R 30-T, i.e., crown caps"). Accordingly, Petitioner's position is that a person of ordinary skill in the art would simply continue this trend, and follow the guidance of Industrial Heating to make the Wagner cap a certain known hardness using a known steel.

b. Patent Owner's Rebuttal Evidence

Patent Owner points to the specific design of Wagner's cap, which requires the stretching of one of its grooves, and asserts a person of ordinary skill in the art would avoid using Wagner's cap with a harder steel because it would be more difficult to stretch the grooves because of the harder steel. PO Resp. 49 (citing Ex. 2004 ¶ 41). We credit the testimony of Patent Owner's declarant, Dr. Kontsos, on this point, as evidence tending to suggest that a person of ordinary skill in the art, who is familiar with materials science and metal packaging (Pet. 17; PO Resp. 56), would understand that using "harder steel would interfere with the flattening operation" of Wagner. Petitioner argues that we should not credit Dr. Kontsos's testimony (Pet. Reply 9–11), but we find he is sufficiently "qualified in the pertinent art" to testify as to this point because he has an education in materials science and experience in understanding the yielding and plastic deformation of materials. Ex. 2004 ¶¶ 3–5; *Sundance, Inc. v. DeMonte Fabricating Ltd.*, 550 F.3d 1356, 1363–64 (Fed. Cir. 2008); *SEB S.A. v. Montgomery Ward & Co., Inc.*, 594 F.3d 1360, 1372–73 (Fed. Cir. 2010) (upholding admission of the testimony of an expert who admittedly lacked expertise in the design of the patented invention, but had experience with materials selected for use in

the invention); *Mytee Prods., Inc. v. Harris Research, Inc.*, 439 Fed. App'x. 882, 886–87 (Fed. Cir. 2011) (non-precedential) (upholding admission of the testimony of an expert who "had experience relevant to the field of the invention," despite admission that he was not a person of ordinary skill in the art).

We do not consider the evidence to teach away or render the proposed combination inoperable, however, because we do not have sufficient evidence that the effect would be so great as to preclude a person of ordinary skill in the art from considering or making the combination. In other words, we have evidence of a deleterious effect, but Patent Owner has not provided evidence as to the *magnitude* of that deleterious effect. The mere presence of a contraindicating factor does not preclude a combination. *See Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165 (Fed. Cir. 2006) ("[A] given course of action often has simultaneous advantages and disadvantages, and this does not necessarily obviate motivation to combine."); *Winner Intern. Royalty Corp. v. Wang*, 202 F.3d 1340, 1349 n.8 (Fed. Cir. 2000) ("The fact that the motivating benefit comes at the expense of another benefit, however, should not nullify its use as a basis to modify the disclosure of one reference with the teachings of another. Instead, the benefits, both lost and gained, should be weighed against one another."). Given the particular facts at hand, without further evidence as to the magnitude of the effect, or evidence explaining how the level of ordinary skill in the art is not high enough to overcome it, we do not consider the proposed combination to be taught away from or inoperable. Accordingly, we more simply consider this evidence as suggesting that a person of

ordinary skill in the art would understand that the use of harder steel for crown caps would come with certain disadvantages.

This is not dispositive of the obviousness inquiry, because notwithstanding the evidence tending to suggest that a person of ordinary skill in the art would understand that tinplate steel harder than 62 might interfere with the flattening of Wagner's cap, Petitioner has provided roughly equal or better evidence tending to suggest that a person of ordinary skill in the art would have selected steel having an average hardness of at least 62.5, because Industrial Heating directly suggests doing so, and several other references suggest similarly. We now turn to the evidence of secondary considerations to determine if or how they contribute to the balancing of evidence.

c. Patent Owner's Secondary Considerations Evidence

As we identified above, Patent Owner's secondary considerations analysis addresses nexus, commercial success, industry praise, and copying. We address each of these in turn.

(1) Nexus

Patent Owner's evidence of nexus shows that the claimed invention reads on the product sold, and that the claimed invention is not a subcomponent of, but rather the entirety of, the product sold. Ex. 2005 ¶¶ 39–41; *see also* Exs. 2010–2015 (describing the PPP cap as having the claimed features of a groove and/or harder steel); *WBIP, LLC v. Kohler Co.*, 829 F.3d 1317 (Fed. Cir. 2016) ("[T]here is a presumption of nexus . . . when the patentee shows that the asserted objective evidence is tied to a specific product and that product 'is the invention disclosed and claimed.'"); *Demaco Corp. v. F. Von Langsdorff Licensing Ltd.*, 851 F.2d 1387, 1392

(Fed. Cir. 1988) (presumption does not apply if the claimed invention is merely a subcomponent of the product). Although the hardness of the steel in the product sold is much higher than the lower end of the claimed range,[15] based on the evidence before us we consider this a maximization of the benefits of PPP's innovation in its commercial embodiment (i.e., using the thinnest, hardest steel for the most cost savings), rather than evidence that the secondary considerations only apply to a small portion of the claims.

Further, although some of the evidence of secondary considerations is drawn to the thinness of the steel rather than its hardness (e.g., Exs. 2013, 2014), based on the record before us, the thinness of the steel is only allowed because it is harder. *See, e.g.*, Ex. 2005 ¶¶ 15–16 (Mr. Merino testifying that "the crown-cap industry has focused on light-weighting – that is, reducing the thickness of the steel used . . . and offsetting for the reduced thickness by using harder steel"). That is, the purpose of using harder steel is so that a manufacturer can use less of it per cap, to reap the benefits of using less raw material.

In conclusion, Patent Owner's evidence regarding nexus indicates that there will be a strong correlation between any evidence in this case highlighting the merits of the commercial PPP crown cap and the merits of the claimed invention. In other words, we will consider evidence of the success and praise of the new PPP crown cap as direct evidence of the

[15] The evidence before us indicates that PPP used caps having an average hardness of about 76. Ex. 2005 ¶ 40; Ex. 2011 (specifying DR9CA steel); Ex. 2012 (same). Claim 1 requires a minimum average hardness of greater than 62; claims 5–8 walk that minimum up to 65, 68, 71, and 73, respectively.

success and praise of the claimed invention. *See Ashland Oil, Inc. v. Delta Resins & Refractories*, 776 F.2d 281, 306 (Fed. Cir. 1985) (holding that the weight attributed to the secondary evidence is proportional to its nexus to the merits of the invention, implying that a weak nexus requires some discount factor to the evidence, but a strong nexus does not). We now turn to the evidence alleging success and praise.

(2) Commercial Success

Patent Owner provides the following sales and market share information in support of its commercial success argument:

PPP PERUVIAN MARKET SHARE

		Millon units					
		2010	2011	2012	2013	2014	2015
PPP	Sales LG 0.17 mm	1	451	1,963	2,033	2,080	2,009
	Sales STD 0.22 mm	2,315	2,248	850	824	732	506
	Total PPP Sales	**2,316**	**2,699**	**2,813**	**2,857**	**2,812**	**2,515**
	Imported STD 0.22 Crowns	295	280	250	184	120	118
	Total Peruvian Market	**2,611**	**2,979**	**3,063**	**3,041**	**2,932**	**2,633**
	PPP Market Share	88.7%	90.6%	91.8%	93.9%	95.9%	95.5%
	2011-2010	1.9%					
	2012-2010	3.1%					
	2013-2010	5.2%					
	2014-2010	7.2%					
	2015-2010	6.8%					
	% LG of total PPP sales	0.0%	16.7%	69.8%	71.2%	74.0%	79.9%
	% of STD of total PPP sales	100.0%	83.3%	30.2%	28.8%	26.0%	20.1%
	% of STD Imported of total market	11.3%	9.4%	8.2%	6.1%	4.1%	4.5%

This figure is a table showing sales and market share information for PPP from 2010–2015. Ex. 2005 ¶ 44.

Patent Owner asserts that the new PPP crown cap, embodying the claimed invention, was introduced in 2009. *Id.* ¶ 45. The table shows how sales of the new low-gauge ("LG") cap displaced sales of the standard ("STD") cap from 2010–2015. In and of itself, this displacement pattern does not show success—it shows a typical obsolescence curve as one

version of a product replaces another. If this were enough to show success, then virtually every product generation would instantly be successful, even if sales or market share remained flat overall.[16] What is persuasive *here* is that PPP's market share grew during this replacement period, by about 7%—from 88.7% of the market to 95.5% of the market. This allows us to infer that the *increase in market share* is because of the merits of the new product, even if we cannot infer that the *displacement* was because of the merits of the new product.

Petitioner argues that we should dismiss this evidence because PPP already had a near-monopoly of the market and because the market shown in the table is narrowly defined as the country of Peru, rather than the United States, Canada, Mexico, or the European Union. Pet. Reply 16–17.[17] Petitioner does not provide a persuasive analysis explaining why the alleged commercial success here can only be shown in certain countries but not Peru. We appreciate the underlying logic of Petitioner's argument, however, that evidence of success in some countries may not be indicative of true

[16] Certainly, this displacement pattern *could* be because the new product is superior, but without *specific evidence*, it is equally likely that the displacement pattern is the manufacturer purposefully retiring one product line and introducing a new one to replace it in that market segment. There are simply too many variables, not touching the relative merits of the product, that explain a displacement pattern.

[17] Petitioner cites to confidential information in Exhibit 1016 in the non-public version of its Reply Brief (Paper 23). We have reviewed this material, which is directed to PPP's involvement in other markets, but the material does not weigh in or affect our decision or analysis. For purposes of minimizing the exposure of confidential information, we do not discuss it here.

commercial success, i.e., a success based on the choices of an open marketplace free from coercion or manipulation. Petitioner does not offer sufficient evidence that that is the case here. Petitioner points out that Peru had significant international trade restrictions (*id.* at 16), but those restrictions were lifted around the time the new PPP crown cap was introduced into the market (*id.*; Ex. 2005 ¶ 42). Notwithstanding the increased openness of the market, the market share for PPP and its new crown cap grew, as shown in the table above. *See also* Ex. 2005 ¶¶ 43–47. Indeed, the opening exposed PPP to larger competitors with greater economies of scale (*id.* ¶ 48), but PPP was able to increase its market share anyway, which it attributes to the costs savings provided by using the harder steel, i.e., to the merits of the invention (*id.* ¶¶ 48–50). As to Petitioner's argument that PPP had a near-monopoly, we appreciate the economic reality that a business with great influence may be able to increase market share, revenue, or margins in ways that do not implicate the relative merits of its products (hence the existence of antitrust law). However, we have no evidence of such behavior here, and have no reason to believe that the market growth was due to anything other than the merits of the product. Accordingly, Petitioner's rebuttal arguments are unpersuasive.

In light of the above, we are persuaded that Patent Owner has shown commercial success of its new PPP crown cap, and the strong nexus between the new PPP crown cap and the merits of the claimed invention allows us to find that the commercial success is due to the merits of the claimed invention.

(3) Industry Praise

We now turn to Patent Owner's evidence of industry praise. PO Resp. 40–43; *see also Institut Pasteur & Universite Pierre Et Marie Curie v. Focarino*, 738 F.3d 1337, 1347 (Fed. Cir. 2013) ("[I]ndustry praise . . . provides probative and cogent evidence that one of ordinary skill in the art would not have reasonably expected [the claimed invention]."). We have already found a strong nexus between the claimed invention and the commercial embodiment. The evidence of praise of that commercial embodiment, discussed above, serves to show that the relevant industry considered the benefits of the claimed invention (allowing reduced steel inputs), to be significant, from a cost and environmental impact standpoint.

The praise provides evidence that a person of ordinary skill in the art had great incentives to use thinner steel and that the rewards for doing so were also great. Although we do not find the argument that "if it were so obvious, someone would have done it by now" persuasive as a matter of course,[18] in the presence of certain additional facts, it can be a useful (but not sufficient) indicator of non-obviousness. *Cf. Iron Grip Barbell Co. v. USA Sports, Inc.*, 392 F.3d 1317, 1325 (Fed. Cir. 2004) ("[T]he *mere* passage of time without the claimed invention is not evidence of nonobviousness.") (emphasis added). Here, we have an industry highly motivated to use thinner, harder steel, and had in fact been progressively

[18] *See, e.g.*, Tr. 42:3–13 (Patent Owner arguing that "it was not obvious to combine . . . and you know that because no one ever did it"). If someone had ever done it, then the question would be anticipation, not obviousness. Thus, an obviousness inquiry necessarily involves a situation where no one had ever done it.

switching to thinner, harder steel. Ex. 2005 ¶¶ 15–20; Ex. 1004, 566 ("the trend appears to be towards lighter gages and harder temper requirements"); *see also* Pet. 7 (arguing that "the overall trend in the marketplace [is] to favor thinner gauge closures that use less metal for economic reasons"). Even though the next level of thinner, harder steel was known, and there was suggestion to use it for some time (Ex. 1004, 566; Ex. 1011, 33; Ex. 1012; Ex. 2005 ¶¶ 15–20),[19] no one did. Thus, this is not a case where a rapidly evolving industry makes use of ever-better materials as they become available, and where Patent Owner simply is the first to file claims on the industry trend. Instead, the harder steels have been readily available for some time as potentially applicable to crown caps, and industry progress was stalled on that front. *Id.*; *see also* Ex. 1011, 33 (industry literature explaining that "[d]owngauging is becoming a major challenge in [the crown cork] market"). The only evidence suggesting an answer to the question of why there was a roadblock to following the trend, notwithstanding the financial incentives, is offered by Mr. Merino, who testifies that the harder steels *simply did not work*. Ex. 2005 ¶ 20; *see also id.* ¶¶ 21–35 (presenting the inventor's story for how he discovered why the harder steels did not work and how he solved the problem). The record before us supports a conclusion, therefore, that there was a technical reason why the industry trend stalled.

Specifically, we find persuasive Mr. Merino's testimony explaining the technical challenges of using harder steel (Ex. 2005 ¶¶ 20–35), which are corroborated by materials scientist Dr. Kontsos (Ex. 2004 ¶¶ 24–33), to be

[19] For example, Industrial Heating was published in 1951.

evidence that there was a technical roadblock to using harder steel that was overcome by adding grooves. To be clear, the solution was not *mere selection* of a known material, which was already suggested in the art, but rather the addition of grooves to solve a particular problem caused by selection of that material—a technical solution to a technical problem. Although Petitioner provides evidence that grooves were known, they were for other purposes (and thus, might not have solved this problem). *See* Pet. Reply 2 (arguing that the prior art "unquestionably teaches grooves"); *see also* Ex. 1003, Fig. 11, 6:9–10, 14–15 (seat 18, i.e., the grooves, provide a recess for the tab); Ex. 1005, 2:31–34 (corrugation 13, i.e., the groove, provides sealing pressure once flattened); Ex. 2004 ¶¶ 39–42 (Dr. Kontsos testifying as to the purpose of the grooves in the prior art). This evidence provides insight into why there was industry praise—the new PPP crown cap, with harder steel and grooves, was an unexpected and welcome development. The strong nexus between the claims and the new PPP crown cap allows us to consider this praise of the PPP crown cap directed to the merits of the claimed invention.

(4) Copying

We lastly turn to Patent Owner's allegations of copying. PO Resp. 9–11, 44, 63. Patent Owner offers two sets of pictures allegedly comparing PPP's crown with Petitioner's. *Id.* at 11, 44. There is no *evidence*, however, establishing that someone looked at the caps, tested, and compared Petitioner's cap with the claim(s) (e.g., for hardness values). Further, although Patent Owner has provided a copy of a patent application submitted by Petitioner that uses nearly identical wording in many passages (Ex. 2007), this does not tend to show copying of the invention, just copying of

an application. This could have been done for reasons other than copying as it is understood in the narrow secondary considerations context; for example, to provoke an interference or derivation. Copying requires more than mere existence of a similar product, it requires evidence that the other party actually used the claimed product as a roadmap to create their own product. *See Iron Grip Barbell*, 392 F.3d at 1325 ("Not every competing product that arguably fails within the scope of a patent is evidence of copying. Otherwise every infringement suit would automatically confirm the nonobviousness of the patent."); *cf. Vanderberg v. Dairy Equip. Co.*, 740 F.2d 1560, 1567 (Fed. Cir. 1984) (Copying can be evidence of non-obviousness, and "[t]his would be particularly true where the copyist had itself attempted for a substantial length of time to design a similar device, and had failed.").

Here, Patent Owner has not provided sufficient evidence that Petitioner copied the claimed invention, as the word "copy" is understood in the secondary considerations context. Accordingly, this factor does not weigh towards non-obviousness.

4. Conclusion

We find evidence that the prior art included a crown cap (Wagner) that satisfies the structure required by the claim except for the particular material selected, and further find evidence that the prior art suggested using that material. We find evidence that a person of ordinary skill in the art would have understood that use of a harder steel in Wagner's crown cap might interfere with the stretching of the groove. Further, we find evidence that the known harder material was not used, despite the suggestions in the

art, because of the existence of a technical problem. We find evidence of a strong nexus between Patent Owner's commercial embodiment and the merits of the claimed invention. We find evidence that Patent Owner's use of the harder material was the subject of praise because it was an unexpected development, in view of the technical problem. We find evidence that the claimed invention was highly successful, and was successful because of the merits of the invention.

Weighing the evidence of obviousness against the evidence of non-obviousness, we determine that Petitioner has not shown by a preponderance of the evidence that the subject matter of any of claims 1–4 or 10–20 is unpatentable in view of Industrial Heating and Wagner. For the same reasons, we determine that Petitioner has not shown by a preponderance of the evidence that the subject matter of any of claims 5–9, which depend from claim 1, are unpatentable in view of Industrial Heating, Wagner, Mumford, and US Steel. We also note that claims 5–9 are directed to progressively higher hardness levels, resulting in the stretching issue of Wagner being progressively more significant.

E. The Frishman-Led Grounds

Petitioner asserts that Frishman discloses the claimed peripheral skirt, round panel having recessed grooves, and liner. Pet 23–30. Petitioner asserts that Industrial Heating discloses that it was known to make crown caps formed of a material comprising steel having an average hardness of greater than 62 on the 30T scale. *Id.* at 20–23. Petitioner asserts that the combination of Frishman's cap with the steel disclosed in Industrial Heating would have been obvious—a known use with a predictable result. *Id.* at 30;

Ex. 1007 ¶ 39 (Mr. Crochiere testifying that it would have been obvious to use a known material to make crown caps). Petitioner also asserts that it was a trend in the industry to use increasingly thinner but harder crown caps, such that the proposed combination is merely following a known trend. Pet. 16–17 (citing Ex. 1011, 24, depicting said downsizing trend); *see also* Ex. 1011, 33 (explicitly listing harder steels for crown corks).

Patent Owner points out that Frishman's cap uses a pull tab that tears the metal to open the crown cap. PO Resp. 49–50. Patent Owner argues that a person of ordinary skill in the art would understand that using harder steel in Frishman's cap would make it more difficult to tear the metal using the cap, and that Frishman even suggests using a "low hardness" steel for that reason. *Id.* at 50–51 (citing Ex. 1003, 7:64–8:3; Ex. 2004 ¶ 43). Patent Owner also argues that using a thinner, harder steel would make it more difficult to cut the score lines where the metal would tear when pulling the pull tab. *Id.* at 51 (citing Ex. 1003, 3:44–46, 7:18; Ex. 2004 ¶ 44). Lastly, Patent Owner's secondary considerations arguments, discussed above, are applicable equally to this ground. *See id.* at 61–63.

Petitioner's obviousness analysis is no stronger here than in the Wagner-led ground. Just as there was a technical reason contraindicating the use of harder steel in Wagner (more difficult to stretch the groove), Patent Owner offers a technical reason contraindicating the use of harder steel in Frishman (more difficult to use a pull tab in harder steel, or to cut the score lines in thinner steel). This provides evidence indicating that a person of ordinary skill in the art may not have made the proposed modification,

despite the suggestions in the prior art.[20] In addition, Patent Owner's evidence of secondary considerations with respect to commercial success and industry praise applies with equal force. Weighing the evidence of obviousness against the evidence of non-obviousness, we determine that Petitioner has not shown by a preponderance of the evidence that the subject matter of any of claims 1–4 or 10, 12–15, and 17–20 are unpatentable in view of Frishman and Industrial Heating.

With respect to the Frishman-Industrial Heating-Wagner ground (claims 11 and 16), we additionally determine that Petitioner has not established that Wagner teaches the liner including one or more beads, as required by claims 11 and 16. *See* Pet. 40–42. The beads identified by Petitioner are on the steel cap of Wagner, not the liner. Ex. 1005, Fig. 1. Thus, Petitioner's ground does not address the limitations as arranged in the claim. Accordingly, in addition to the reasons expressed above with claims 1 and 12, Petitioner has not shown by a preponderance of the evidence that the subject matter of either of claims 11 or 16, which depend from claims 1 and 12, are unpatentable in view of Frishman, Industrial Heating, and Wagner.

[20] Petitioner suggests in its Reply that the pull tab feature is optional (Pet. Reply 6), but directs us to no disclosure in Frishman of this embodiment. Thus, if removed, then the modification would require an analysis of how it would have been obvious to do so. Such an analysis was not provided in the Petition or the Reply. Further, this analysis seems dubious, in view of the disclosure in Frishman that the grooves are to provide a recess for the tab; removal of the tab calls into question why the grooves would exist. *See* Ex. 1003, 6:9–10, 14–15.

Lastly, for the reasons expressed above, we determine that Petitioner has not shown by a preponderance of the evidence that the subject matter of any of claims 5–9, which depend from claim 1, are unpatentable in view of Frishman, Industrial Heating, Mumford, and US Steel. We also note that the steel required by claims 5–9 are progressively harder, further exacerbating the technical reason not to have harder steel for the pull tab in Frishman.

III. ORDER

In view of the foregoing, it is hereby:

ORDERED that no claims of the ’271 patent have been determined to be unpatentable in this *inter partes* review;

FURTHER ORDERED that this is a Final Written Decision under 35 U.S.C. § 318(a) and that parties to the proceeding seeking judicial review of the decision under 35 U.S.C. § 319 must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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