

**United States Court of Appeals  
for the Federal Circuit**

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**KENNAMETAL, INC.,**  
*Appellant*

v.

**INGERSOLL CUTTING TOOL COMPANY,**  
*Appellee*

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2014-1350

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Appeal from the United States Patent and Trademark  
Office, Patent Trial and Appeal Board in Reexamination  
No. 95/001,417.

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Decided: March 25, 2015

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Before PROST, *Chief Judge*, NEWMAN, and LINN, *Circuit Judges*.

LINN, *Circuit Judge*.

Kennametal, Inc. (“Kennametal”) appeals the decision of the Patent Trial and Appeal Board (the “Board”) in an *inter partes* reexamination of U.S. Patent No. 7,244,519 (the “’519 patent”) in which the Board: (a) entered a new anticipation ground of rejection asserted by Ingersoll Cutting Tool Co. (“Ingersoll”) against certain of the pending claims; and (b) affirmed the Examiner’s obviousness rejection of certain remaining claims. *See Ingersoll Cutting Tool Co. v. TDY Indus.*, Reexamination Ctrl. No. 95/001,417, available at 2013 WL 6039030 (P.T.A.B. Nov. 12, 2013) (“Board Decision on Rehearing”); *Ingersoll*, available at 2013 WL 3294868 (P.T.A.B. May 6, 2013) (“Initial Board Decision”). Because substantial evidence supports the Board’s determinations of anticipation and obviousness and because we see no error in the Board’s legal conclusion of obviousness, we affirm.

## I. BACKGROUND

### A. The ’519 Patent

The ’519 patent was filed in 2004 and issued in 2007. The ’519 patent relates to cutting tools containing ruthenium as a binder that are coated using physical vapor deposition (“PVD”). *See, e.g.*, ’519 patent Title; *id.* Abstract. The patent explains that cemented carbide cutting tools are generally useful. *Id.* col.1 ll.15–19. These tools are made by consolidating hard particles and a binder to form a compact, which is then sintered to form a tool blank from which a variety of tools can be formed. *Id.* col.1 ll.19–26. Cobalt is often used in the binder. *Id.* col.1 ll.48–50.

According to the ’519 patent, it was unusual to include ruthenium with cobalt in the binder, and, in those instances when a cobalt-ruthenium binder was used, no one

had coated the tools using PVD. *Id.* col.1 ll.54–56, col.2 ll.58–61. The patent suggests that the reason cobalt-ruthenium binders were not coated by PVD was because the use of cobalt in a binder tends to create cobalt structures on the surface—a process known as “cobalt capping.” *Id.* col.3 ll.6–10; *id.* col.3 ll.38–40. This problem is supposedly exacerbated when ruthenium is included in the binder. *Id.* col.3 ll.13–15. According to the patent, PVD coating—which is done at a lower temperature than other methods of coating, such as chemical vapor deposition—is not hot enough to re-melt the surface of the binder, so coatings applied via PVD do not adhere well to binders that produce cobalt capping. *Id.* col.3 ll.33–36. Additionally, PVD coatings, as the patent describes, can be too thin to compensate for the cobalt capping effect. *Id.* col.3 ll.36–37.

The inventors assigned their interests in the invention claimed in the ’519 patent to TDY Industries, Inc. (“TDY”) at the time the application for the patent was filed. ’519 patent Assignee. In 2010, TDY sued Ingersoll for infringement of the ’519 patent. *TDY Indus. Inc. v. Ingersoll Cutting Tool Co.*, No. 2:10-cv-00790-CB (W.D. Pa., filed June 10, 2010). After the suit was filed, TDY assigned the ’519 patent to Kennametal. Ingersoll successfully petitioned the Patent and Trademark Office (the “Patent Office”) for *inter partes* reexamination of the ’519 patent, and the district court, in turn, stayed the litigation.

#### B. Proceedings at the Patent Office

Ingersoll submitted a request for *inter partes* reexamination, claiming that some of the original claims were anticipated under 35 U.S.C. § 102(b) and all of the claims were obvious under § 103(a). The Examiner did not adopt any of Ingersoll’s proposed anticipation rejections but did reject all of the pending claims as obvious. In response, the patentee amended the existing claims and filed nu-

merous new claims. Pending claim 1 is representative, and recites as amended:

1. A cutting tool, comprising:

a cemented carbide substrate, wherein the substrate comprises hard particles and a binder, and the binder comprises ruthenium; and

at least one physical vapor deposition coating on at least a portion of the substrate.

Ingersoll again proposed both anticipation and obviousness rejections. The Examiner refused to adopt the anticipation rejections but did reject all of the claims as obvious. Kennametal appealed the rejections, and Ingersoll cross-appealed the Examiner's refusal to adopt its proposed anticipation rejections.

In the Initial Board Decision, the Board found that the Examiner erred in not adopting Ingersoll's proposed rejection of pending claims 1–4, 9–18, 23, 24, 27–31, 35, 36, 45, 46, 49, 50, 58, 83, 85 and 89 as anticipated by U.S. Patent No. 6,554,548 to Grab ("Grab"). Initial Board Decision, at \*3–5.

The Board found that claim 5 of Grab expressly described the majority of the elements recited in pending claim 1 of the '519 patent. *Id.* at \*3–5. Claim 5 of Grab and its parent, claim 1, recite:

1. A coated cutting insert comprising:

a rake face and a flank face, a cutting edge at the juncture of the rake face and the flank face;

the cutting insert having a hard refractory coating and a substrate wherein the coating is adherently bonded to the substrate;

the substrate comprising a tungsten carbide-based material comprising a bulk composition of at least about 70 weight percent tungsten and carbon, between about 3 weight percent and about 12 weight percent cobalt, and at least 0.09 weight percent chromium;

the cobalt and the chromium forming a binder alloy:

wherein the binder alloy content being enriched in a surface zone of binder alloy enrichment beginning near and extending inwardly from a peripheral surface of the substrate; and

wherein the bulk composition of the substrate further comprises tantalum in an amount up to about 10 weight percent, niobium in an amount up to about 6 weight percent, and titanium in an amount up to about 10 weight percent.

5. The coated cutting insert of claim 1 wherein the binder alloy further includes one or more of tungsten, iron, nickel, ruthenium, and rhenium.

The Board noted that claim 5 of Grab specifically recites five metals, one of which was ruthenium. Initial Board Decision, at \*4. Claim 5 also recites a “coating,” but, the Board acknowledged, does not state that the coating is applied via PVD. *Id.* The Board noted, however, that the specification of Grab discloses PVD as one of three contemplated methods of coating. *Id.* Specifically, Grab states:

Generally speaking, one or more of the coating layers of the coating schemes are applied by chemical vapor deposition (CVD) and moderate temperature chemical vapor deposition (MTCVD).

However, applicants also contemplate that one or more layers of a coating scheme may be applied by physical vapor deposition (PVD).

Grab col.4 ll.56–61. The Board also found that claim 5’s recitation of a “coating” was “a specific hook back into the Grab disclosure for the further description of how that coating is applied.” Initial Board Decision, at \*5. The Board found that the description of coating by PVD was not negated by the fact that CVD and MTCVD were “characterized by Grab as preferred.” *Id.* at \*4. The combination of one of five metals with one of three coatings leads to only fifteen possibilities, which, according to the Board, was a sufficiently definite and limited class so that each member of the class was anticipated by Grab. *Id.* at \*4–5. The Board stated that Ingersoll provided evidence that claims 2–4, 9–18, 23, 24, 27–31, 35, 36, 45, 46, 49, 50, 58, 83, 85 and 89 were also anticipated, and neither the Examiner nor the Patent Owner distinguished these claims from claim 1. Therefore, the Board ruled that these claims were also anticipated by Grab. *Id.* at \*5.

Because the Board found these claims anticipated, it refused to consider whether these claims were also obvious. *Id.* at \*7. The Board separately found claims “5–8, 19–22, 23, 24, 25, 26, 56, 57, 59, 86, and 90”<sup>1</sup> obvious over Grab in view of additionally cited prior art. *Id.*

Regarding obviousness, the Board affirmed the Examiner’s rejections of: claims 33, 34, 37–44, 47, 48 and 84 as obvious over U.S. Patent No. 6,214,247 to Leverenz (“Leverenz”); claims 24, 25, 26, 49–52, 56, 57, 59, 86–90 and 93

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<sup>1</sup> Claims 23 and 24 appear to be erroneously included in this list as the Board already ruled them anticipated by Grab and it stated that it would not review the obviousness of the claims it already found anticipated.

as obvious over Leverenz in view of other prior art; and claims 2–14, 16–23, 27, 31, 33–48, 58, 84 and 85, “[w]ith respect to the dependent claims not already addressed,”<sup>2</sup> as obvious over Leverenz in view of T.L. Shing, et al., *The effect of ruthenium additions on the hardness, toughness and grain size of WC-Co*, 19 Int’l J. Refractory Metals & Hard Materials 41 (2001). The Board rejected Kennametal’s assertion that these claims provided unexpected results because it found that the unexpected results lacked a nexus to the limitations recited in the claims. *Id.* at \*7–8.

The Board denied Kennametal’s request for a rehearing, finding that although Grab appeared not to have applied coatings by PVD, it still anticipated this usage. Board Decision on Rehearing, at \*3. It also found that Grab’s teachings, especially in view of the art at the time, would have avoided a cobalt capping problem and were therefore enabling. *Id.* at \*4.

## II. DISCUSSION

Kennametal appeals all the Board’s rejections. We have jurisdiction pursuant to 28 U.S.C. § 1295(a)(4).

### A. Standard of Review

Anticipation under 35 U.S.C. § 102 is a question of fact, while obviousness under § 103 is a question of law based on underlying findings of fact. *Flo Healthcare Solutions, LLC v. Kappos*, 697 F.3d 1367, 1375 (Fed. Cir. 2012) (citing cases). We review the Board’s factual findings for substantial evidence and its legal conclusions without deference. *Id.* at 1375–76 (citing cases). “Sub-

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<sup>2</sup> Presumably this refers to the Leverenz rejections that were not previously addressed, as all these claims were already determined to be anticipated and/or obvious over some art.

stantial evidence is ‘such relevant evidence as a reasonable mind might accept as adequate to support a conclusion.’” *In re Applied Materials, Inc.*, 692 F.3d 1289, 1294 (Fed. Cir. 2012) (quoting *Consol. Edison Co. v. NLRB*, 305 U.S. 197, 229 (1938)).

### B. Anticipation

A patent is invalid if “the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.” 35 U.S.C. § 102(b) (2006).<sup>3</sup> A prior art reference can only anticipate a claim if it discloses all the claimed limitations “arranged or combined in the same way as in the claim.” *Wm. Wrigley Jr. Co. v. Cadbury Adams USA LLC*, 683 F.3d 1356, 1361 (Fed. Cir. 2012) (quoting *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1370 (Fed. Cir. 2008)). However, a reference can anticipate a claim even if it “d[oes] not expressly spell out” all the limitations arranged or combined as in the claim, if a person of skill in the art, reading the reference, would “at once envisage” the claimed arrangement or combination. *In re Petering*, 301 F.2d 676, 681 (C.C.P.A. 1962).

Kennametal argues that Grab does not disclose the combination of ruthenium as a binder and a PVD coating. It notes that Grab discloses five potential metals to use in the binder, which, allowing for combinations of metals

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<sup>3</sup> This provision has since been amended. See Leahy–Smith America Invents Act (“AIA”), Pub. L. No. 112-29, § 3(c), 125 Stat. 284, 287 (2011). However, because the pending claims have an effective filing date before March 16, 2013, the pre-AIA § 102(b) applies. See AIA, 125 Stat. at 293; *In re Giannelli*, 739 F.3d 1375, 1376 n.1 (Fed. Cir. 2014).



(*e.g.*, the combination of tungsten and ruthenium), allows for 31 different possibilities—although it recognizes that 16 of these include ruthenium. Op. Br. at 38. Kennametal also notes that the examples in Grab include three to five coating layers. Kennametal asserts that allowing for three options for each coating creates a total of 351 possible coating solutions, which, when multiplied by the 31 different binder possibilities, allows for 10,881 possibilities. Op. Br. at 40. Kennametal further maintains that, in fact, claim 5 of Grab allows an infinite number of options since, for instance, the percentages of the various binders and the thickness of the coating are undefined. Kennametal claims that the number of options taught by Grab distinguishes this case from *Petering* and makes it more akin to cases where this court did not find anticipation.

Furthermore, every example in Grab, Kennametal points out, uses CVD or MTCVD methods of coating. Kennametal contends that in this context, the use of ruthenium as a binder and the contemplation of the use of PVD as a coating were among a multiplicity of options so that a person of skill in the art would not immediately envisage the claimed combination. Citing its expert's testimony, Kennametal claims that the specific combination of ruthenium metal and PVD coating would not have been considered viable.

Ingersoll responds that Grab discusses a coating, which allows for three coating techniques, including PVD, along with any one of five metal binders, including ruthenium. Thus, according to Ingersoll, Grab effectively discloses the combination of PVD coating with ruthenium. Ingersoll also claims that the lack of PVD coating in the *examples* of Grab does not mean the reference cannot anticipate such coatings.

According to Ingersoll, a person of skill in the art reading Grab would immediately envisage examples using

one metal as a binder and one type of coating—not combinations of multiple metals or multiple coatings. In the alternative, Ingersoll claims that allowing for multiple coatings and/or metals only increases the likelihood that Grab would teach embodiments within the scope of the claim. For instance, of the 31 possible combinations of the five metals, 16 include ruthenium. Ingersoll claims that allowing for multi-metal and multi-coating embodiments makes 17% or 29% of the embodiments described by Grab fall within the ambit of pending claim 1. Resp. Br. at 20, 21. Ingersoll also argues that the fact that Grab teaches five similar metals and three well-settled methods of coating makes the scope of Grab’s teaching narrower, and, consequently, more likely to be anticipatory.

Substantial evidence supports the Board’s determination that pending claim 1 of the ’519 patent is anticipated. Kennametal does not contest that, with the exception of combining ruthenium binders with PVD coatings, claim 5 of Grab expressly recites all the elements of pending claim 1. Claim 5 of Grab recites using a binder consisting of one of five metals, one of which is ruthenium, together with a coating. Grab only discloses three coating methods, one of which is PVD. While CVD and MTCVD coatings are the coatings on which Grab focuses, it “also contemplate[d] that one or more layers of a coating scheme may be applied by physical vapor deposition.” Grab col.4 ll.59–61. Because all the limitations of Kennametal’s claim are specifically disclosed in Grab, the question for the purposes of anticipation is “whether the number of categories and components” disclosed in Grab is so large that the combination of ruthenium and PVD coatings “would not be immediately apparent to one of ordinary skill in the art.” *Wrigley*, 683 F.3d at 1361. The fact that a skilled artisan had various ways of formulating a coated cutting insert based on Grab’s teaching does not help Kennametal, since many of these are within the scope of its claim. *See id.* at 1362 n.4 (“The fact that one of ordinary

skill in the art might also have included other flavorings would not remove the resulting composition from the broad reach of [the challenged] claim 34.”).

At the very least, Grab’s express “contemplat[ion]” of PVD coatings is sufficient evidence that a reasonable mind could find that a person of skill in the art, reading Grab’s claim 5, would immediately envisage applying a PVD coating. Grab col.4 l.59. Thus, substantial evidence supports the Board’s conclusion that Grab effectively teaches 15 combinations, of which one anticipates pending claim 1.

Though it is true that there is no evidence in Grab of “actual performance” of combining the ruthenium binder and PVD coatings, this is not required. *Novo Nordisk Pharm., Inc. v. Bio-Tech. Gen. Corp.*, 424 F.3d 1347, 1355 (Fed. Cir. 2005) (quoting *Bristol-Myers Squibb Co. v. Ben Venue Labs., Inc.*, 246 F.3d 1368, 1379 (Fed. Cir. 2001)). “Rather, anticipation only requires that those suggestions be enabled to one of skill in the art.” *Id.* (quoting *Bristol-Myers Squibb*, 246 F.3d at 1379).

Accordingly, we affirm the Board’s determination that pending claim 1 is anticipated. In its appeal brief, Kennametal did not argue that any of the claims depending from claim 1—namely pending claims 2–4, 9–18, 23, 24, 27–31, 35, 36, 45, 46, 49, 50, 58, 83 or 85—are not anticipated for any reason not present for claim 1. As for independent claim 89, the only discussion of its independent patentability comes in a footnote, Op. Br. at 20 n.9, which claims that it is “unclear” whether the Board intended to reject claim 89 as anticipated. Kennametal does not appear to make a substantive argument as to why claim 89 might not be anticipated even if claim 1 is. In any event, “[a]rguments raised only in footnotes . . . are waived.” *Otsuka Pharm. Co. v. Sandoz, Inc.*, 678 F.3d 1280, 1294 (Fed. Cir. 2012) (citing *SmithKline Beecham Corp. v. Apotex Corp.*, 439 F.3d 1312, 1320 (Fed. Cir.

2006)). Accordingly, we affirm the Board's determination that claims 2–4, 9–18, 23, 24, 27–31, 35, 36, 45, 46, 49, 50, 58, 83, 85 and 89 are anticipated as well. See *Sud-Chemie, Inc. v. Multisorb Techs., Inc.*, 554 F.3d 1001, 1009 (Fed. Cir. 2009) (refusing to consider the independent validity of certain claims where the appellant did not separately argue that they were patentable).

### C. Obviousness

#### 1. Waiver

As noted above, the Board found pending claims 2–14, 16–31, 33–52, 56–59, 84–88, 90 and 93 obvious over a variety of prior art references. Initial Board Decision, at \*9. Kennametal challenges these findings. However, before addressing the substance of these rejections we address the threshold question of whether Kennametal waived its right to challenge the Board's invalidity decisions for these claims.

In its brief to the Board appealing the Examiner's rejections, all of which were based on obviousness, Kennametal stated that "Patent Owner argues independent claims 1, 15, 83, 89, and 93 as a group. The respective dependent claims are not argued separately." The Board noted this in its Initial Board Decision, at \*5, \*7.

Ingersoll claims that because Kennametal failed to argue at the Board for the independent patentability of the remaining claims, we should not review the Board's decisions on these claims. Kennametal replies that, at the time of its briefing, all of the claims were rejected for obviousness. Kennametal argues that only when the Board instituted a new basis for rejection, rejecting some of the claims for anticipation, and correspondingly regrouping the claims, was there any reason Kennametal should have separately argued for the patentability of the remaining claims.

Kennametal is correct. “[A]rguments . . . cannot be deemed waived if they were not previously required to have been made.” *Hyatt v. Dudas*, 551 F.3d 1307, 1314 (Fed. Cir. 2008). At the Board, Kennametal was facing a different set of rejections than it is now. Accordingly, we see no reason to foreclose Kennametal from independently challenging the obviousness determinations of these claims.

## 2. Analysis

“A patent may not be obtained . . . if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” 35 U.S.C. § 103(a) (2006). Obviousness is a question of law, based on underlying factual determinations, including: “the scope and content of the prior art”; “differences between the prior art and the claims at issue”; “the level of ordinary skill in the pertinent art”; and “[s]uch secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc.” *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966), *cited with approval in KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 399 (2007). The Patent Office “bears the initial burden of showing a prima facie case of obviousness. When a prima facie case of obviousness is made, the burden then shifts to the applicant to come forward with evidence and/or argument supporting patentability.” *Giannelli*, 739 F.3d at 1379 (citations omitted).

Kennametal claims that the Board failed to establish a *prima facie* case of obviousness. Because of the problems relating to cobalt capping, Kennametal contends, it would not have been obvious to combine ruthenium binders with PVD coating. It cites the declarations of Dr. Gilles Festeau, one of the named inventors on the ’519 patent, and Dr. Craig Morton, who claim that prior to

the '519 patent it was difficult to manufacture PVD-coated ruthenium-featured cutting tools, at least partially because of cobalt capping effects. Dr. Morton claims that “[t]he inventors listed on the '519 patent discovered” treatment conditions that unexpectedly allow for effective PVD-coating.

Kennametal further claims that the Board erred in rejecting its evidence of secondary considerations. The '519 patent compares the performance of various carbide cutting inserts. *See* '519 patent Figure 2; *id.* col.9 l.33–col.10 l.23. According to Kennametal, the data demonstrate that the combination of PVD-coating and ruthenium binders achieves a “surprising and unexpected” tool lifetime. Kennametal claims that because the Board rejected the independent claims as anticipated by Grab, it never considered whether those claims would also be obvious. According to Kennametal, this is especially problematic for obviousness rejections of claims such as claim 33, which were not based on Grab at all.

Ingersoll responds that the Examiner’s Right of Appeal Notice (“Notice”) explained that both Grab and Leverenz disclosed a finite number of possibilities, so that it would have been obvious to try ruthenium binders and PVD coatings, both of which were expressly taught. Ingersoll relies on the declarations of Dr. Dennis Quinto, who opined that the invention was obvious because there were a finite number of solutions, and Mr. Kenneth Brookes, who opined that the problem of cobalt capping and solutions to it have long been known, and these solutions are independent of the presence of ruthenium.

Ingersoll argues that the Board correctly found that the unexpected results touted by Kennametal would have been present in the inserts made according to Grab and, therefore, lacked any nexus to a novel feature of the invention. Ingersoll further contends that by adopting the Notice, the Board adopted the Examiner’s reasoned

explanation that there was insufficient evidence to demonstrate that the unexpected results were due to the combination of PVD and ruthenium.

As discussed earlier, *infra* at 10–11, substantial evidence supports the Board’s factual determination that Grab expressly taught combining a ruthenium binder with a PVD coating. While references that anticipate an invention can, theoretically, still not make it obvious, see *Cohesive Techs., Inc. v. Waters Corp.*, 543 F.3d 1351, 1364 n.2 (Fed. Cir. 2008), that is the rare case. Here, because a person of skill in the art reading Grab would readily envisage the combination of ruthenium binders and PVD coatings, it would have been obvious to that person that these two could be combined with a reasonable expectation of success. Substantial evidence supports the Board’s finding that this express teaching was not significantly undermined by the problem of cobalt capping, especially in view of the similar teaching of Leverenz.

Substantial evidence also supports the Board’s determination that there was “factual[] support[]” for the Examiner’s conclusion in the Notice that the limitations of claims 33, 34, 37–44, 47, 48 and 84 were taught in Leverenz. Initial Board Decision, at \*8 (citing Notice at 18–20). The Notice states that Leverenz teaches producing cutting inserts using elements “within Group VIII of the periodic table (elements having atomic numbers 26–28, 44–46, and 76–78),” and that ruthenium has atomic number 44. Notice at 19 (quoting Leverenz col.5 ll.46–48). The Notice also remarks that Leverenz teaches that the inserts can be coated using PVD. *Id.* (citing Leverenz col.8 ll.47–51). These teachings provide substantial evidence to support the Board’s legal conclusion of obviousness.

Kennametal’s claim of unexpected results is unavailing. Kennametal cites to the ’519 patent that, allegedly, shows that the combination of ruthenium binder and PVD

coating results in unexpected tool lifetimes. As discussed above, the precise combination of ruthenium binders and PVD coatings was taught in Grab. Accordingly, “the offered secondary consideration actually results from something other than what is both claimed and *novel* in the claim, [so] there is no nexus to the merits of the claimed invention.” *In re Huai-Hung Kao*, 639 F.3d 1057, 1068 (Fed. Cir. 2011). Thus, Kennametal’s secondary consideration argument falls short.

In its opening brief, Kennametal did not argue for the independent patentability of any of pending claims 2–14, 16–31, 33–52, 56–59, 84–88, 90 and 93. It only contested that the combination of ruthenium as a binder and PVD as a coating was non-obvious. In its reply brief, Kennametal claimed that the prior art did not teach the limitations found in certain dependent claims regarding the specific amounts of ruthenium in the binder. Reply Br. at 22–23. It raised this argument too late. “[A]rguments not raised until [the] reply brief are waived.” *Lifestyle Enter., Inc. v. United States*, 751 F.3d 1371, 1377 (Fed. Cir. 2014) (citing *Becton Dickinson & Co. v. C.R. Bard, Inc.*, 922 F.2d 792, 800 (Fed. Cir. 1990)). Accordingly, we need not, and do not, separately analyze whether the Board correctly found obviousness even as to the additional limitations recited in these claims. Thus, we affirm the Board’s finding that claims 2–14, 16–31, 33–52, 56–59, 84–88, 90 and 93 would have been obvious.

### III. CONCLUSION

For the foregoing reasons, this court affirms the Board’s determination that claims 1–4, 9–18, 23, 24, 27–31, 35, 36, 45, 46, 49, 50, 58, 83, 85 and 89 are anticipated and claims 2–14, 16–31, 33–52, 56–59, 84–88, 90 and 93 would have been obvious.

**AFFIRMED**