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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* MICHAEL EDWARD BADDING,  
WILLIAM JOSEPH BOUTON, JACQUELINE LESLIE BROWN,  
TIMOTHY JOSEPH CURRY, ROMAN E. HURNY,  
LANRIK WAYNE KESTER, THOMAS DALE KETCHAM,  
JOHN ALBERT OLENICK, KATHLEEN RITTER OLENICK,  
JEREMY PAANANEN, THOMAS SILVERBLATT,  
DELL JOSEPH ST. JULIEN, VISWANATHAN VENKATESWARAN,  
and NATHAN MICHAEL ZINK

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Appeal 2018-005044  
Application 15/218,689  
Technology Center 1700

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Before MICHAEL P. COLAIANNI, MICHAEL G. McMANUS, and  
MICHAEL A. VALEK, *Administrative Patent Judges*.

VALEK, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant<sup>1</sup> submits this appeal under 35 U.S.C. § 134(a) involving claims to a sintered article with certain surface features. We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

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<sup>1</sup> We use the word “Appellant” to refer to “applicant” as defined in 37 C.F.R. § 1.42. Appellant identifies Corning Incorporated, as the real party in interest. Appeal Br. 1.

## STATEMENT OF THE CASE

Appellant's application "generally relate[s] to processes for sintering green tape, such as green tape including polycrystalline ceramic grains bound in an organic binder, as well as sintered articles, such as ceramic sheets or tapes made from such processes." Spec. ¶ 2. According to the Specification, such articles may

be manufactured by tape casting, gel casting, or other processes that include sintering of green tapes, such as strips of inorganic grains bound in an organic binder. The green tapes are typically placed upon a surface, called a setter board, and placed inside a furnace that burns off the organic binder and sinters the inorganic grains. The setter board is typically formed from a refractory material that can withstand the sintering process. The setter board supports the tape when the binder is removed.

*Id.* ¶ 4. However, "sintering causes a green tape to contract, dragging portions of itself across the setter board" resulting in "surface defects." *Id.*

¶ 5. The Specification explains that "[p]olishing helps to remove flaws or defects on the surfaces of the articles, but is time- and resource-consuming."

*Id.* ¶ 3.

According to the Specification, "Applicants have discovered technology that removes the setter board from the process of sintering green tape, where resulting sintered articles may be unpolished, yet may have good mechanical properties." *Id.* ¶ 8. As explained by the Specification,

Applicant[s] have found that the weight of the tape below the unbound section need not necessarily sever or pull apart the tape at the unbound section before the at least partial sintering occurs, despite the binder of the tape being burned off or charred. Applicants discovered that the tape is able to hold itself together long enough for at least partial sintering, without a setter board. As a result, the sintered article is free of contact induced surface defects produced during sintering typically

caused by setter boards. Surfaces on both sides of the sintered article are consistent with one another in terms of number of defects, and that number is low enough that the resulting sintered article may have improved mechanical properties, such as increased tensile strength, relative to articles with more surface defects.

*Id.* ¶ 9.

Claims 14–43 are on appeal and can be found in the Claims Appendix of the Appeal Brief. Claim 22 is illustrative. It reads as follows:

22. A sintered article, comprising:

wherein the sintered article is a sheet comprising a first surface, a second surface, and a body of material extending therebetween, wherein the second surface is on an opposite side of the sheet from the first surface such that a thickness of the sheet is defined as a distance between the first and second surfaces, a width of the sheet is defined as a first dimension of one of the first or second surfaces orthogonal to the thickness, and a length of the sheet is defined as a second dimension of one of the first or second surfaces orthogonal to both the thickness and the width of the sheet,

wherein the body of material is of material selected from the group consisting of polycrystalline ceramic and synthetic mineral, and wherein the material is in a sintered form such that grains of the material are fused to one another;

wherein the first and second surfaces of the sheet are substantially unpolished such that each has a granular profile that includes grains with a height in a range from twenty-five nanometers to one-hundred-and-fifty micrometers relative to recessed portions of the respective surface at boundaries between the grains;

wherein the sheet is thin and elongate such that the length of the sheet is greater than five times the width of the sheet, the width of the sheet is greater than five times the thickness of the sheet, and wherein the thickness of the sheet is no more than one millimeter and the area of each of the first and second surfaces is greater than ten square centimeters;

wherein the sheet has high surface quality such that the first and second surfaces both have at least ten square centimeters of area having fewer than one hundred surface defects from adhesion or abrasion with a dimension greater than five micrometers; and

wherein the sheet has a flatness in the range of one hundred nanometers to fifty micrometers over a distance of one centimeter in a lengthwise direction along either the first or second surface.

Appeal Br. 23–24. Claims 14, 37 and 42 are also independent. Like claim 22, these claims recite a sintered article with particular surface features, e.g., a “granular profile” (claims 14, 37, and 42), “high surface quality” and “consistent surface quality” determined by the number of “surface defects from adhesion or abrasion” (claim 14), “bulges” (claim 37), and “fewer than 10 pin holes having a cross-sectional area of at least a square micrometer per square millimeter of surface on average over the full surface” of the article (claims 37 and 42). *Id.* at 22, 25–27.

Appellant filed its Appeal Brief seeking review of the following rejections:

- I. Claims 14, 15, and 17–21 under 35 U.S.C. § 102 as anticipated by Hata<sup>2</sup>
- II. Claims 14, 15, and 17–21 under 35 U.S.C. § 103 as unpatentable over Hata
- III. Claims 16 and 22–30 under 35 U.S.C. § 103 as unpatentable over Hata in view of Hata<sup>2</sup><sup>3</sup>

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<sup>2</sup> US 2006/0228555 A1, published Oct. 12, 2006 (“Hata”).

<sup>3</sup> US 6,001,761, issued Dec. 14, 1999 (“Hata2”).

IV. Claims 22, 28, 29, and 31–43 under 35 U.S.C. § 103 as unpatentable over Ketcham<sup>4</sup> in view of Hawtof.<sup>5</sup>

In the Answer, Examiner withdrew the rejections based on Hata and Hata2 (Ans. 10) and entered a new ground rejecting claims 14–21, 23–27, and 30 under 35 U.S.C. § 103 over Ketcham in view of Hawtof (Ans. 5). Appellant elected to maintain the appeal, responding to Examiner’s new ground in its reply brief. *See* Reply Br. 2–8. Accordingly, the sum total of the claims Examiner has rejected as obvious over Ketcham and Hawtof, i.e., claims 14–43, are at issue here; no other rejections remain.

The issue is: Does the preponderance of evidence of record support Examiner’s conclusion that Appellant’s claims would have been obvious over the cited prior art?

*Analysis*

Examiner’s new ground rejecting claims 14–21, 23–27, and 30 over Ketcham and Hawtof is substantially the same as the prior rejection of the other claims over those references. *Compare* Ans. 6–9 with Final Act. 16–18. Because the same issues are presented we consider the rejections together, focusing on claim 22 as illustrative. The same analysis applied below to claim 22 also applies to the other rejected claims.

Examiner finds that Ketcham discloses “sintered ceramic sheets or tapes” with dimensions and a granular profile as recited in claim 22. *See* Final Act. 16. Examiner acknowledges Ketcham does not teach an article with the recited degrees of “high surface quality” and “flatness.” *Id.* at 17. Examiner determines “Hawtof teaches substantially vertically sintering of a

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<sup>4</sup> US 5,089,455, issued Feb. 18, 1992 (“Ketcham”).

<sup>5</sup> US 2013/0316136 A1, published Nov. 28, 2013 (“Hawtof”).

self-supporting sheet material . . . with the purpose of providing a uniformly thick and very flat, smooth surface essentially free of surface defects.” *Id.* at 17–18. According to Examiner, “[i]t would have been obvious . . . to use a roll to roll vertical sintering method as taught in *Hawtof* with the tape formation and a binder burn-off stage for the ceramic sheet of *Ketcham*” and that because this combination would “exclude the use of setter plates during sintering” it would necessarily produce an article with the structural features of Appellant’s claims (e.g., “high surface quality,” “flatness,” “pinhole” limitations, and various other limitations recited in the dependent claims). *Id.* at 18; *see also* Ans. 6–9.

Appellant argues that “one of skill in the art at the time of the invention would not use a tape-cast green tape, as taught by *Ketcham*, in a sintering process, as taught by *Hawtof*, because they would expect unsupported particles of ceramic, after the binder is burned off, to collapse or fall apart.” Appeal Br. 15. According to Appellant, “[d]iscovery that green tape may hold together in the presently disclosed equipment [i.e., a vertical furnace with a binder burn-off location] and with the presently disclosed processes was a surprise.” *Id.* In contrast to the green material of *Ketcham*, *Hawtof* teaches “a sheet of amorphous glass soot bonded to one another” to form a self-supporting sheet “for vertical firing, not loose grains of ceramic.” *Id.* (citing *Hawtof* ¶ 4). Thus, urges Appellant, a skilled artisan “would not reasonab[ly] expect success combining *Ketcham* with the vertical furnace of *Hawtof*.” *Id.* at 16; *see also* Reply Br. 3, 7 (incorporating same argument against Examiner’s new ground of rejection).

Appellant further argues that even assuming the references were combined as articulated in the rejection, Examiner has not shown that

various surface features (e.g., “granular profile,” “high surface quality” with limited “surface defects from adhesion or abrasion,” and “flatness”) recited in claim 22 as well as those in the other independent claims would necessarily be present. *See* Appeal Br. 16–21; Reply Br. 6–8. According to Appellant, there are “aspects of the processes and equipment of the present Application not taught by *Ketcham* or *Hawtof* . . . such as the tension regulator 324 discussed in paragraphs [0041]-[0042] and the binder burn-off location B’ relative to the sintering location C” that affect these features. Appeal Br. 18; Reply Br. 6–7. Thus, urges Appellant, Examiner has not demonstrated that all of the recited structural features are inherently present in a sintered article produced by combining *Ketcham*’s ceramic material with *Hawtof*’s vertical furnace. *Id.*

Upon considering the record as a whole, we determine that Appellant has the better position. *Hawtof* teaches vertical sintering of a “self-supporting soot sheet” formed by depositing heated glass soot particles that “bond with each other and form a dense and mechanically robust soot sheet.” *Hawtof* ¶¶ 4, 43. *Ketcham*, however, indicates that the “green material” in its process is not self-supporting. *See Ketcham*, 9:16–36 (describing the use of binders or support sheets to provide “initial support for the green body during subsequent sintering to a product”), 9:52:-62 (describing the use of “supporting setters within the sintering furnace”). Thus, *Ketcham* is consistent with the Specification’s description of prior art processes requiring a “setter board” to stabilize green tape during sintering. *See, Spec.* ¶¶ 4–5. Examiner’s rejection does not address the difference in the mechanical stability of the materials being sintered in *Hawtof* and *Ketcham*. *See Final Act.* 16; *Ans.* 10–11. Accordingly, the record before us

does not demonstrate that one of ordinary skill in the art would have reasonably expected that Ketcham's green materials could be successfully sintered in the vertical furnace of Hawtof.

In addition, Examiner has not shown that the articulated combination of Ketcham's green material with Hawtof's vertical furnace would necessarily produce sintered articles with the "granular profile," "high surface quality," and "flatness" recited in claim 22. As Appellant points out (Reply Br. 5), our reviewing court has observed that "the use of inherency in the context of obviousness must be carefully circumscribed because '[t]hat which may be inherent is not necessarily known' and that which is unknown cannot be obvious." *Honeywell Int'l, Inc. v. Mexichem Amanco Holdin S.A. DE C. V.*, 865 F.3d 1348, 1354 (Fed. Cir. 2017) (quoting *In re Rijckaret*, 9 F.3d 1531, 1534 (Fed. Cir. 1993)). Here, the Specification describes various process parameters and equipment beyond just the use of a vertical furnace to produce sintered articles with the recited surface features. *See, e.g.*, Spec. ¶¶ 41–42, 73–74, 122, 124 (tension), 43, 47 (varying temperature), 50 (length of binder burn-off location). Examiner has not demonstrated that these additional parameters and equipment were known in the prior art, nor has Examiner shown that the recited surface features would necessarily result without application of those parameters and equipment.<sup>6</sup> Accordingly, we are not persuaded that those features are inherently present in an article produced by the articulated combination of Ketcham and Hawtof.

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<sup>6</sup> This is also true for various surface features recited in the other independent claims, e.g., claim 14 ("high surface quality" and "consistent surface quality"), claim 37 ("granular profile" with specified height range, "fewer than 10 pin holes," and "bulges"), claim 44 ("granular profile" with specified height range and "fewer than 10 pin holes").

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For these reasons, we determine Examiner's rejection is not supported by a preponderance of the evidence.

CONCLUSION

In summary:

<b>Claims Rejected</b>	<b>35 U.S.C. §</b>	<b>Reference(s)/Basis</b>	<b>Affirmed</b>	<b>Reversed</b>
14-43	103	Ketcham, Hawtof		14-43

REVERSED