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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/199,084	08/01/2016	Patrick James McCluskey	283633-US-1 (551-0419US1)	1017
161134	7590	10/08/2020	EXAMINER	
The Small Patent Law Group LLC 225 S. Meramec Ave. St. Louis, MO 63105			YANG, ZHEREN J	
			ART UNIT	PAPER NUMBER
			1781	
			NOTIFICATION DATE	DELIVERY MODE
			10/08/2020	ELECTRONIC

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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* PATRICK JAMES MCCLUSKEY,  
BERNARD PATRICK BEWLAY, AMBARISH JAYANT KULKARNI,  
KRZYSZTOF JACEK LESNICKI, BYRON ANDREW PRITCHARD, and  
NICOLE JESSICA TIBBETTS

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Appeal 2019-005559  
Application 15/199,084  
Technology Center 1700

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Before LINDA M. GAUDETTE, BRIAN D. RANGE, and  
DEBRA L. DENNETT, *Administrative Patent Judges*.

GAUDETTE, *Administrative Patent Judge*.

DECISION ON APPEAL<sup>1</sup>

The Appellant<sup>2</sup> appeals under 35 U.S.C. § 134(a) from the Examiner’s decision finally rejecting claims 1–5, 7, 8, 10, 11, 13–17, 19–22, and 24–26.<sup>3</sup>

We REVERSE.

CLAIMED SUBJECT MATTER

The invention relates to an anti-stick coating for components, such as gas turbine engine components, that inhibits the accumulation of adherent, contaminant deposits typically entrained in the flow of air through the components during service. Spec. ¶ 1. Claim 1, reproduced below, is illustrative of the claimed subject matter:

1. An article, comprising:
  - a substrate that is substantially opaque to visible light;
  - and
  - a coating disposed on the substrate, wherein the coating comprises a coating material having an inherent index of refraction, wherein the coating has an effective index of refraction that is less than the inherent index of refraction, and wherein the coating comprises a plurality of columnar structures oriented such that a longitudinal axis of each of the plurality of columnar structures form an angle with respect to a direction tangential to the substrate that is less than 90 degrees, and wherein each of the plurality of columnar structures have a nominal width of less than 2.5 micrometers, and wherein each

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<sup>1</sup> This Decision includes citations to the following documents: Specification filed June 30, 2016 (“Spec.”); Final Office Action dated July 26, 2018 (“Final Act.”); Appeal Brief filed December 19, 2018 (“Appeal Br.”); Examiner’s Answer dated May 31, 2019 (“Ans.”); and Reply Brief filed July 16, 2019 (“Reply Br.”).

<sup>2</sup> We use the word “Appellant” to refer to “applicant” as defined in 37 C.F.R. § 1.42. The Appellant identifies the real party in interest as General Electric Company. Appeal Br. 2.

<sup>3</sup> We have jurisdiction under 35 U.S.C. § 6(b).

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of the plurality of columnar structures have a nominal intercolumnar spacing of less than 5 micrometers such that the effective index of refraction of the coating is less than 1.8.

Appeal Br. 7 (Claims App.).

## REFERENCES

The Examiner relies on the following prior art as evidence of unpatentability:

Name	Reference	Date
Suzuki	US 2010/0039708 A1	Feb. 18, 2010
Kulkarni	US 2010/0247321 A1	Sept. 30, 2010
Varanasi	US 2013/0129978 A1	May 23, 2013
Schmidt	US 2013/0236322 A1	Sept. 12, 2013

Zachary et al., (“The Long and Short of Last-stage Blades”, from PowerMag, 15 December 2006, retrieved on 1 April 2017).

Siemens (“SGT-400 Industrial Gas Turbine”, Power Generation: (ISO) 12.90 MW(e)).

## REJECTIONS

1. Claims 1–5, 7, 8, 10, 11, 13–17, 19–21, 25, and 26 are rejected under 35 U.S.C. § 103 as unpatentable over Varanasi and Schmidt, as evidenced by Suzuki and Zachary.

2. Claim 22 is rejected under 35 U.S.C. § 103 as unpatentable over Varanasi and Schmidt, as evidenced by Suzuki and Zachary, further in view of Siemens.

3. Claim 24 is rejected under 35 U.S.C. § 103 as unpatentable over Varanasi and Schmidt, as evidenced by Suzuki and Zachary, further in view of Kulkarni.

OPINION

The Appellant argues that the Examiner reversibly erred in finding that Varanasi discloses or suggests a “coating” “compris[ing] a plurality of columnar structures” (independent claims 1, 26). Appeal Br. 4. The Appellant’s argument is persuasive for the reasons discussed below.

The Specification defines the term “coating” as “a material disposed on at least a portion of an underlying surface in a continuous or discontinuous manner.” Spec. ¶ 12. The coating “comprises (a) a fluoride of one or more alkaline earth elements, (b) alumina, silica, zirconia, or chromia, or (c) a combination including any one or more of the foregoing alternatives.” *Id.* ¶ 26. The underlying surface (substrate) may be “a titanium alloy, a superalloy, or a ceramic-matrix composite.” *Id.* According to the Specification, the coating may be applied to the substrate by physical vapor deposition methods such as sputtering or evaporation, or by other known techniques such as chemical vapor deposition, thermal spraying, plasma spraying or spin coating. *Id.* ¶ 27. “Columnar structures . . . may be deposited, for example, using electron-beam assisted physical vapor deposition.” *Id.*

Varanasi discloses “articles, devices, and methods for controlling the impingement behavior of molten metal/ceramic droplets on surfaces in industrial processes.” Varanasi ¶ 6. Varanasi is said to have discovered that the texture of a substrate surface can be engineered to achieve either metalphobicity, such that impinging molten metal droplets bounce off the surface, or metalphilicity, such that impinging molten metal droplets stick to the surface. *Id.* ¶¶ 6, 41; *see also id.* ¶ 42 (disclosing that for applications involving “metal fouling of turbines,” a “metalphobic surface is desired,” and for applications involving “thermal spray coatings,” a “metalphilic

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surface is desired.”). More specifically, Varanasi discloses “forming a micro-scale and/or nanoscale surface texture upon the surface prior to exposing the surface to an environment comprising liquid metal droplets or ceramic droplets.” *Id.* ¶¶ 7, 10.

When discussing embodiments in which the substrate surface texture is engineered so that the surface is metalophilic (i.e., impinging droplets stick to the surface), Varanasi additionally describes “coating the surface with a metal (e.g., an alloy) or ceramic in a thermal spray process.” *Id.* ¶ 10. Varanasi discloses that the surfaces of intrinsically metalophobic materials may become supermetalophobic when non-wetting features are introduced to the surface. *Id.* ¶ 34. Varanasi defines “non-wetting features” as “physical textures (e.g., random, including fractal, or patterned surface roughness) on a surface that, together with the surface chemistry, make the surface non-wetting.” *Id.* Varanasi discloses that non-wetting features may result from chemical, electrical, and/or mechanical treatment of a surface. *Id.*

Varanasi describes experiments “conducted to observe molten metal droplets impinging onto substrates whose surface texture features were precisely controlled.” *Id.* ¶ 47. Varanasi tested “three different surface textures on silicon—square microposts . . . , nanograss . . . , and mirror polished silicon.” *Id.* Varanasi figure 2 shows the impingement of a molten tin droplet on the “silicon surfaces with different texture dimensions, including the smooth case.” *Id.*

The Examiner cites Varanasi paragraph 38 in support of a finding that Varanasi describes a “coating” comprising a plurality of columnar structures. Final Act. 2–3. Varanasi paragraph 38 is reproduced below with added emphases:

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Described herein are experiments with *surfaces/coatings* with controlled impingement behavior of molten metal/ceramic droplets, for which a systematic demonstration of development towards complete rebound or deposition on target surfaces is performed. These *surfaces/coatings* can improve efficiency and reduce costs in a wide variety of industrial applications such as power plant metal fouling, thermal spray coating, spray forming, solder jet bumping, and rapid prototyping.

The Examiner contends that “the ‘/’ punctuation in ‘surfaces/coatings’ of ¶ 0038 of Varanasi takes on the meaning of the non-exclusive ‘or’, thus implying that the two objects (viz. surfaces and coatings) have similar designs and usages.” Ans. 6. The Examiner contends that paragraph 38 “makes it clear that the inventive concept of Varanasi may be either a featured surface (formed on a substrate by an undisclosed means) or a coating.” Ans. 6.

The Appellant argues that the Examiner has mischaracterized Varanasi’s reference to “surfaces/coatings” (Varanasi ¶ 38). The Appellant cites Varanasi ¶ 7 in support of its contention that “the ‘surface’ of Varanasi should be interpreted as the textured surface and ‘coating’ of Varanasi should be interpreted as the liquid metal or ceramic droplets.” Appeal Br. 5. The Appellant further argues that “the Examiner’s Answer has provided no evidence that in the art the ‘/’ punctuation is automatically interpreted as ‘or’, or that one skilled in the art would ignore the teachings [of] Varanasi as a whole to consider the ‘/’ punctuation to mean ‘or’.” Reply Br. 2.

“[P]reponderance of the evidence is the standard that must be met by the [US]PTO in making rejections.” *In re Caveney*, 761 F.2d 671, 674 (Fed. Cir. 1985).

A rejection based on section 103 clearly must rest on a factual basis, and these facts must be interpreted without hindsight reconstruction of the invention from the prior art. In making

this evaluation, all facts must be considered. The Patent Office has the initial duty of supplying the factual basis for its rejection. It may not, because it may doubt that the invention is patentable, resort to speculation, unfounded assumptions or hindsight reconstruction to supply deficiencies in its factual basis.

*In re Warner*, 379 F.2d 1011, 1017 (CCPA 1967). When “there is a doubt as to the factual basis supporting the conclusion . . . that the invention would have been obvious to one of ordinary skill in the art[,] . . . the doubt should be resolved in favor of the applicant.” *In re Sporck*, 301 F.2d 686, 690–91 (CCPA 1962).

Having considered the Examiner’s and the Appellant’s respective arguments and evidence, as well as Varanasi’s disclosure in its entirety, we are persuaded that the Examiner did not provide a sufficient factual basis to support a finding that Varanasi discloses or suggests the claimed “coating.” Rather, the Appellant has argued persuasively that Varanasi’s reference to “surfaces/coatings” (Varanasi ¶ 38) more likely describes a substrate having texture in the surface itself and a textured surface to which a coating has been applied. *See, e.g., id.* ¶¶ 6–8, 10 (describing texturizing a surface prior to coating with a metal or ceramic); *compare id.* ¶ 34 (“In certain embodiments, non-wetting features result from chemical, electrical, and/or mechanical treatment of a surface.”), *with* Schmidt<sup>4</sup> ¶ 40 (describing chemical and mechanical surface treatments to form geometric features as involving, respectively, removal of surface portions and deformation).

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<sup>4</sup> The Examiner relied on Schmidt for a teaching of surface geometric structures that are inclined at different angles with respect to a substrate surface. *See* Final Act. 6.

In sum, for the reasons discussed above, the Appellant has persuaded us of reversible error in the Examiner’s obviousness determination as to independent claims 1 and 26. The Examiner relies on the same, unsupported findings in rejecting the dependent claims. *See generally* Final Act. 7–11. Accordingly, we do not sustain the rejections of claims 1–5, 7, 8, 10, 11, 13–17, 19–22, and 24–26.

DECISION SUMMARY

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1–5, 7, 8, 10, 11, 13–17, 19–21, 25, 26	103	Varanasi, Schmidt, Suzuki, Zachary		1–5, 7, 8, 10, 11, 13–17, 19–21, 25, 26
22	103	Varanasi, Schmidt, Suzuki, Zachary, Siemens		22
24	103	Varanasi, Schmidt, Suzuki, Zachary, Kulkarni		24
<b>Overall Outcome:</b>				1–5, 7, 8, 10, 11, 13–17, 19–22, 24–26

REVERSED