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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte CHUNLEI GUO and ANATOLIY Y. VOROBYEV

Appeal 2019-005298
Application 13/604,951
Technology Center 1700

Before JEFFREY B. ROBERTSON, JEFFREY R. SNAY, and
MERRELL C. CASHION, JR., *Administrative Patent Judges*.

ROBERTSON, *Administrative Patent Judge*.

DECISION ON APPEAL¹

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant² appeals from the Examiner's decision to reject claims 14, 17, 18, 28, 69, and 73–76.³ Appeal Br. 6. We have jurisdiction under 35 U.S.C. § 6(b).

¹ This Decision includes citations to the following documents: Specification filed September 6, 2012 (“Spec.”); Final Office Action mailed June 1, 2018 (“Final Act.”); Appeal Brief filed November 28, 2018 and corrected on January 16, 2019 (“Appeal Br.”); Examiner’s Answer mailed May 2, 2019 (“Ans.”); and Reply Brief filed July 2, 2019 (“Reply Br.”).

² We use the word Appellant to refer to “applicant” as defined in 37 C.F.R. § 1.42(a). Appellant identifies the real party in interest as University of Rochester. Appeal Br. 3.

³ The Examiner withdrew rejections of claims 74–76 under 35 U.S.C. § 112 in the Answer. Final Act. 4–5; Ans. 3.

We reverse.

CLAIMED SUBJECT MATTER

Appellant states the invention relates to methods for altering the surface structure of metal materials. Spec. 1. Claim 69, reproduced below, is illustrative of the claimed subject matter with emphasis added to highlight key disputed claim limitations (Appeal Br. 29, Claims Appendix):

69. A method for engineering a surface of a material to be superhydrophilic and to increase a degree of capillary effect on the surface of the material, the method comprising:

identifying a surface region of the material to increase the degree of capillary effect;

scanning a first laser spot relative to the identified surface region to produce a first series of adjacent wicking microgrooves;

scanning a second laser spot relative to the identified surface region to produce additional wicking structures on a surface of the first series of wicking microgrooves, the additional wicking structures comprising an array of parallel nanogrooves that are parallel to the first series of parallel microgrooves;

wherein the first series of adjacent wicking microgrooves in combination with the array of parallel nanogrooves that are parallel to the first series of adjacent wicking microgrooves increases the degree of capillary effect on the identified surface region.

REFERENCES

The prior art relied upon by the Examiner is:

Name	Reference	Date
Mazur et al. hereinafter "Mazur"	US 2009/0213883 A1	August 27, 2009

Zhu et al. hereinafter “Zhu”	Effects of Laser-Modified Polystyrene Substrate on CHO Cell Growth and Alignment	February 20, 2004
Bush et al. hereinafter “Bush”	Improved bio-implant using ultrafast laser induced self-assembled nanotexture in titanium	March 10, 2011
Cai	CN 101712102 A, English translation of Record	May 26, 2010

REJECTIONS

1. The Examiner rejected claims 14, 17, 18, 28, 69, and 73 under pre-AIA 35 U.S.C. § 103(a) as unpatentable over Bush. Final Act. 6–7.
2. The Examiner rejected claims 74–76 under pre-AIA 35 U.S.C. § 103(a) as unpatentable over Bush and Mazur. Final Act. 7–8.
3. The Examiner rejected claims 14, 18, and 69 under pre-AIA 35 U.S.C. § 103(a) as unpatentable over Zhu. Final Act. 8–9.
4. The Examiner rejected claims 17 and 73 under pre-AIA 35 U.S.C. § 103(a) as unpatentable over Zhu and Cai. Final Act. 9–10.
5. The Examiner rejected claims 74–76 under pre-AIA 35 U.S.C. § 103(a) as unpatentable over Zhu and Mazur. Final Act. 10–11.

OPINION

We limit our discussion to claim 69, which is sufficient to dispose of the issues in this appeal.

Rejection 1

The Examiner's Rejection

In rejecting claim 69 as obvious over Bush, the Examiner found, *inter alia*, Bush discloses a method for applying a surface texture onto a titanium surface such that the titanium surface remains hydrophilic by exposing the titanium surface to laser pulses. Final Act. 6. The Examiner found Bush discloses a structure including micro scale pillars with a nanoscale ridge texture, which corresponds to the instantly claimed process and resulting structure. *Id.*, see Ans. 5–9. The Examiner determined that forming the micro and nano features of Bush inherently increases the degree of capillary effect on the identified surface regions as recited in claim 69, thus establishing a prima facie case of obviousness. *Id.*

Appellant's Contentions

Appellant argues Bush does not describe a “series of adjacent wicking microgrooves” as recited in claim 69, but rather Bush describes the micro scale pillars or troughs. Appeal Br. 10–11. Appellant also argues that Bush does not disclose “an array of parallel nanogrooves that are parallel to the first series of parallel microgrooves.” *Id.* at 12–13; Reply Br. 3–5.

Issue

The dispositive issue with respect to this rejection is:

Did the Examiner err in determining Bush discloses a method of engineering a surface of a material to produce “a first series of adjacent wicking microgrooves” and “an array of parallel nanogrooves that are parallel to the first series of parallel microgrooves” as recited in claim 69?

Discussion

We are persuaded that Bush fails to disclose a method for producing the arrangement of microgrooves and nanogrooves recited in claim 69. The Examiner annotated Figure 1(a) of Bush (reproduced below) to support the position that Bush discloses the arrangement of microgrooves and nanogrooves recited in claim 69. Ans. 9.

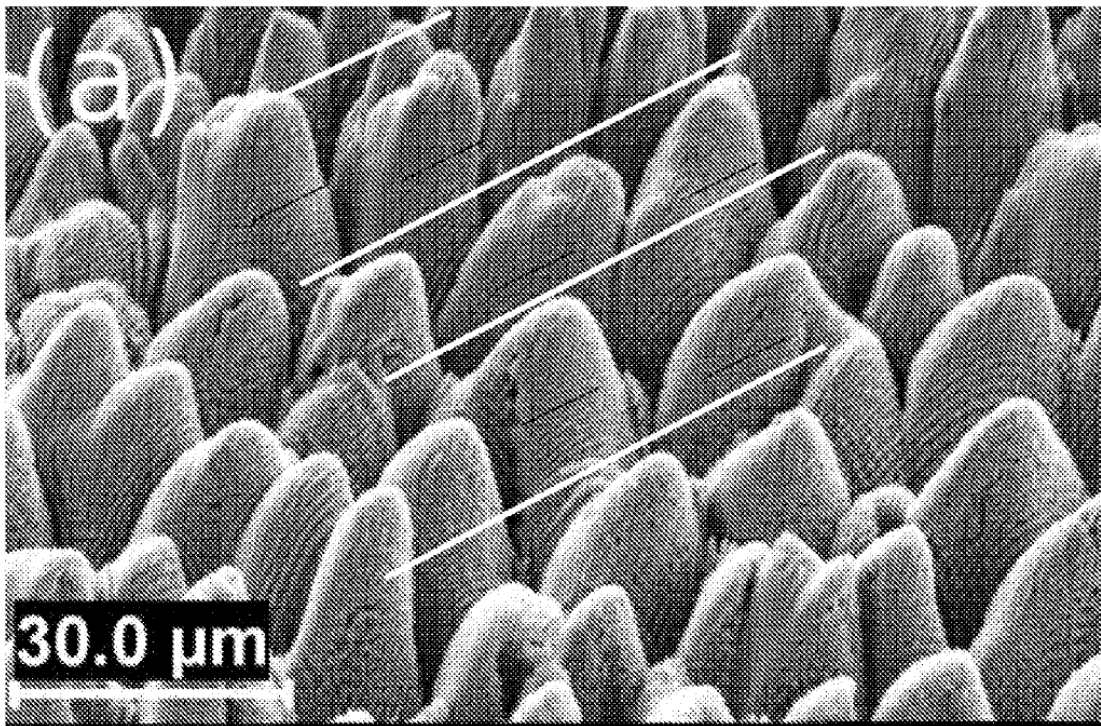


Figure 1(a) depicts a titanium surface textured with laser pulses showing peaks and troughs. Bush 301. The Examiner has annotated Figure 1(a) with white lines to show microgrooves and black lines to show nanogrooves.

Based on our review of Figure 1(a), we are in substantial agreement with Appellant's position, that Bush discloses an irregular topography with pillars and troughs and not microgrooves as recited in claim 69. Appeal Br.

10–11; Reply Br. 3. That is, Bush discloses expressly that after the laser texturing process, “the surface had texture with submicron scale ridges that measure ~250 nm in width superimposed on micron scale pillars and troughs.” Bush 301. The irregular topography depicted in Figure 1(a) of Bush itself does not support the Examiner’s position that the microscale pillars and troughs and nanoscale features shown in Figure 1(a) of Bush correspond to the claimed arrangement. *See* Reply Br. 3–5 (showing how the “nanogrooves” in Bush are “arched-shaped” and thus are not parallel to the Examiner’s characterization of “microgrooves” in Bush). Accordingly, Bush does not disclose the arrangement of microgrooves and nanogrooves recited in claim 69. *See also* Spec. 57–58 (describing processes for producing adjacent microgrooves and parallel nanogrooves).

As a result, we reverse the Examiner’s rejection of claim 69 and claims 14, 17, 18, 28, and 73 dependent therefrom as obvious over Bush.

Rejection 2

In rejecting claims 74–76, which depend from claim 69, as obvious over Bush and Mazur, the Examiner relies on the same determinations for claim 69 with respect to Bush we found to be deficient above. Final Act. 7. Mazur fails to remedy the above identified deficiencies in Bush.

Accordingly, we reverse the Examiner’s rejection of claims 74–76 as obvious over Bush and Mazur for the reasons identified with respect to Rejection 1.

Rejection 3

The Examiner's Rejection

In rejecting claim 69 as obvious over Zhu, the Examiner found, *inter alia*, Zhu discloses a method of laser machining to form the arrangement of microgrooves and nanogrooves recited in claim 69. Final Act. 8–9; Ans. 11.

Appellant's contentions

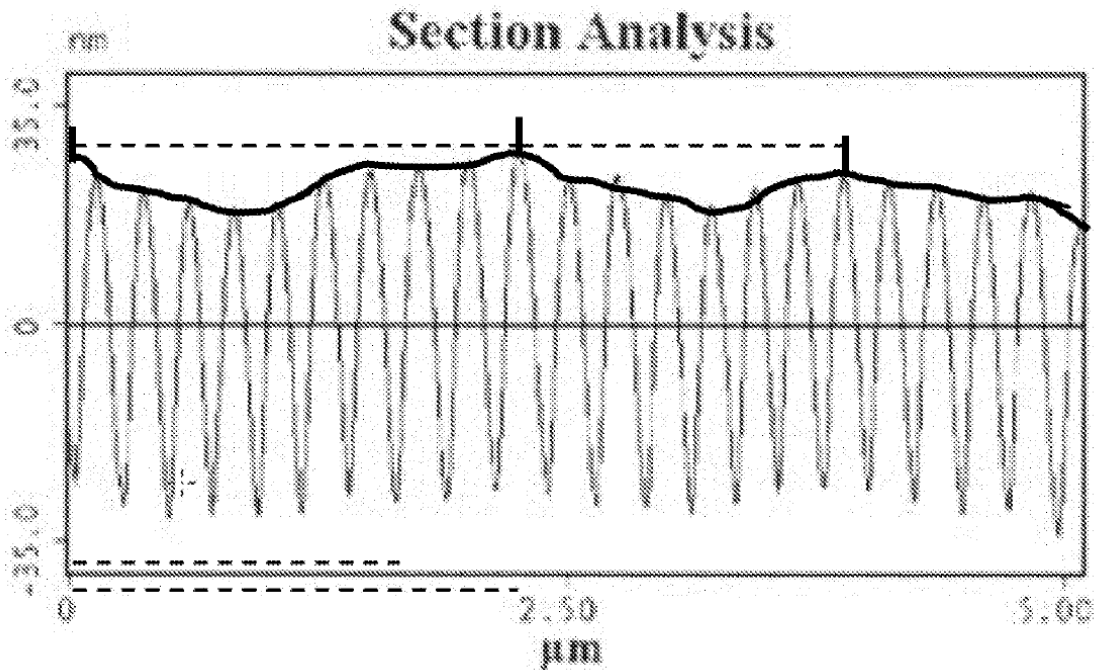
Appellant contends Zhu does not disclose forming microgrooves, but rather discloses forming nanostructures, which are only nanoscale ridges and grooves. Appeal Br. 16–17.

Issue

Did the Examiner err in finding Zhu discloses a method of engineering a surface of a material to produce “a first series of adjacent wicking microgrooves” and “an array of parallel nanogrooves that are parallel to the first series of parallel microgrooves” as recited in claim 69?

Discussion

We are persuaded that Zhu fails to disclose a method for producing the arrangement of microgrooves and nanogrooves recited in claim 69. The Examiner annotated the “Section Analysis” of Figure 1 disclosed in Zhu (reproduced below) to support the position that Zhu discloses the arrangement of microgrooves and nanogrooves recited in claim 69. Ans. 11.



The “Section Analysis” of Figure 1 depicts the size of three-dimensional nanostructure ridges/grooves on a polystyrene substrate made by laser, which is roughly ~ 250 nm in periodicity and 50–60 nm in depth. Zhu 45. The Examiner annotated a black line along the top of the nanostructure ridges/grooves to indicate the presence of microgrooves, with dashed black lines at the top and bottom of the image to indicate a microscale groove width.

We agree with Appellant that the Examiner’s annotations on the cross sectional view are insufficient to establish that the surface structure in Zhu contains microgrooves. Reply Br. 7–8. In this regard, the orientation of the image of the three-dimensional structure in Figure 1 of Zhu is insufficient to show the structure contains microgrooves as asserted by the Examiner. *Id.*; Zhu 45.

Moreover, the contact angles (a measure of hydrophilicity) in Figure 3 of Zhu provide further evidence that the structure in Zhu does not

correspond to the microgroove/nanogroove “superhydrophilic” materials in claim 1, as the smallest contact angle reported is $\sim 55^\circ$, which is well above the contact angles of “zero or nearly a zero contact angle” required for a “superhydrophilic” material as disclosed in the Specification. Zhu 44–46; Spec. 3–4.

Accordingly, we reverse the Examiner’s rejection of claim 69, and claims 14 and 18 dependent therefrom, as obvious over Zhu.

Rejections 4 and 5

In rejecting claims 17 and 73–76, which depend from claim 69, the Examiner relies on the same determinations for claim 69 with respect to Zhu we found to be deficient above. Final Act. 9–11. Cai and Mazur fail to remedy the above identified deficiencies in Zhu.

Accordingly, we reverse the Examiner’s rejection of claims 17 and 73 as obvious over Zhu and Cai and the Examiner’s rejection of claims 74–76 as obvious over Zhu and Mazur for the reasons identified with respect to Rejection 3.

DECISION SUMMARY

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
14, 17, 18, 28, 69, 73	103	Bush		14, 17, 18, 28, 69, 73
74–76	103	Bush, Mazur		74–76
14, 18, 69	103	Zhu		14, 18, 69
17, 73	103	Zhu, Cai		17, 73
74–76	103	Zhu, Mazur		74–76

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Overall Outcome				14, 17, 18, 28, 69, 73– 76
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REVERSED