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NAVAL RESEARCH LABORATORY
ASSOCIATE COUNSEL (PATENTS)
CODE 1008.2
4555 OVERLOOK AVENUE, S.W.
WASHINGTON, DC 20375-5320

EXAMINER	
AHMED, SHAMIM	

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Please find below and/or attached an Office communication concerning this application or proceeding.

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte LAURA RUPPALT, WOO K. LEE, PAUL E. SHEEHAN, and ADRIAN PODPIRKA

Appeal 2019–004733
Application 15/430,725
Technology Center 1700

Before BEVERLY A. FRANKLIN, N. WHITNEY WILSON, and JEFFREY R. SNAY, *Administrative Patent Judges.*

FRANKLIN, *Administrative Patent Judge.*

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant[1] appeals from the Examiner's decision to reject claims 1–9 and 19–23. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

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[1] 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 "The Government of the United States of America as represented by the Secretary of the Navy". Appeal Br. 2**.**

CLAIMED SUBJECT MATTER

Claim 1 is illustrative of Appellant's subject matter on appeal and is set forth below:

> **1.** A method for nanopatterning phase change materials, comprising:
>
> heating a probe;
>
> contacting the heated probe with a surface of a phase change material thereby inducing a local phase change at the contacted surface; and
>
> moving the heated probe across the surface of the phase change material resulting in a patterned region.

REFERENCES

The prior art relied upon by the Examiner is:

Name	Reference	Date
Chen	US 2008/0246076 A1	Oct. 9, 2008
William P. King, *Heated Atomic Force Microscope Cantilevers and their Applications*, Annual Review of Heat Transfer (2013), Vol. XVI, pp. 287–326)		

REJECTIONS

1. Claims 1–4 and 8–9 are rejected under 35 U.S.C. §103 as being unpatentable over William P. King (hereafter "William").

2. Claims 5–7 and 19–23 are rejected under 35 U.S.C. § 103 as being unpatentable over William as applied above, and further in view of Chen.

OPINION

For purposes of this appeal, we address separately argued claims (we select claims 1 and 5 as representative), and the remaining claims stand or fall with the argued claims, consistent with 37 C.F.R. § 41.37(c)(1)(iv) (2017).

Upon consideration of the evidence and each of the respective positions set forth in the record, we find that the preponderance of evidence supports the Examiner's findings and conclusion that the subject matter of Appellant's claims is unpatentable over the applied art. Accordingly, we sustain each of the Examiner's rejections on appeal essentially for the reasons set forth in the Final Office Action and in the Answer, and affirm, and add the following for emphasis.

Rejection 1

The Examiner relies upon William for teaching a process of contacting a heated probe with a surface of a phase change material thereby inducing a local phase change at the contacted surface (the cantilever tip is in contact with a polymer substrate; William, p. 291); and moving the heated probe across the surface of the phase change material resulting in a nano patterned region (nanostructures patterning a wide variety of materials with heated AFM cantilever tips; William, p. 311). Ans. 3. The Examiner states that William may not explicitly teach the patterning may be performed on a phase change material surface; however, William teaches that the heated atomic force microscopy (AFM) cantilever tip can be used for thermomechanical writing on polymer and phase-change material. William, [2.1] at p. 291. Ans. 3.

Appellant argues that William does not disclose the limitation in claim 1 of moving a heated probe across the surface of a phase change material resulting in a patterned region. Appeal Br. 3. Appellant also argues that the Examiner has not provided any motivation to combine the teachings of William. Appeal Br. 3–4.

In response, the Examiner states that William discloses a process of nanofabrication on a wide variety of materials using a heated AFM cantilever probe tips. William, p. 311; Ans. 5. The Examiner states that William also discloses that heat is generated within the cantilever, and that the heated cantilever tip is in contact with a polymer substrate, and the hot tip would cause indentations into the polymer surface, and also can be used for thermomechanical writing on polymer and phase change material (see paragraph under the heading 2.1 at page 291 of William). Ans. 5.

The Examiner states that the aforementioned heated nanofabrication reads on the limitation of patterning on a phase-change material because the heated cantilever tip is in contact with the polymer and the phase-change material as disclosed by William, and such applied heat would cause change in the physical properties, or, indentations may formed onto the phase change material as it forms on the polymer substrate as suggested by William on page 291, at [2.1]. The Examiner concludes that therefore it is expected to have the same effect (patterns or indentations) as is formed on the polymer substrate, as on the phase change material, when the heated tip is in contact with the phase change material. We agree as Appellant has not persuaded us otherwise.

In view of the above, we affirm Rejection 1.

Rejection 2

With regard to the rejection over William in view of Chen, Appellant argues that the Examiner has provided no specific understanding or technological principle within the knowledge of one skilled in the art that would have suggested the combination. Appeal Br. 4. Appellant submits that it would not be obvious to one of ordinary skill in the art to combine these references, and refers to paragraph [0007] of the Specification which discloses: "[t]hough nanoscale patterning of chalcogenide-based PCMS has previously been demonstrated, the reported means and modalities for patterning differ significantly from the present invention. Conductive AFM and NFM both use similar AFM probes, but have significant disadvantages in terms of limiting the material stacks that can be used and inducing probe damage." Appeal Br. 4–5. Appellant submits that thus it would not be obvious to expect that a chalcogenide phase change material could be substituted for a non-chalcogenide phase change material with any likelihood of success. The prior art can be modified or combined to reject claims as *prima facie* obvious as long as there is a reasonable expectation of success. *In re Merck & Co., Inc.*, 800 F.2d 1091 (Fed. Cir. 1986). While obviousness does not require absolute predictability, at least some degree of predictability is required. In the instant case, it cannot be said that associated disadvantages leads to a determination of no reasonable expectation of success.

Appellant further argues that Chen discloses using a phase change material electrically connected to an electrical contact (FIG. 10C and paragraph [0116]). Appeal Br. 5. Appellant states that the claimed subject

matter contacts the heated probe with the phase change material to transfer heat to the PCM surface. Appellant submits that this is a significant difference because "[electrically biased tips use an electrical current to induce a transformation, requiring an electrically conducting buried layer or substrate." (Spec. ¶ 4). Appellant submits that using Chen's phase change material with just a heated probe would not produce the present invention. Appellant states that in order for Chen's phase change material to work, it has to be electrically connected to an electrical contact. Appellant states that heat transferred to its surface would not result in a phase change. *Id.*

The Examiner responds by stating that the argument is not persuasive because Chen discloses that a commonly known phase change material is chalcogenide (Chen, [0114]), and one of ordinary skill in the art would have been motivated to use it because it exhibits a high resistance property (undergoes rapid heating and cooling) that is beneficial for the lifetime of the device to be formed as taught by Chen, para. [0114]. Ans. 6. Paragraph [0113] of Chen teaches that the phase change material or PCM (phase change memory) material refers to a material that is capable of being converted from a crystalline to an amorphous state via the application of external energy, suitably in the form of heat. Hence, while paragraph [0116] of Chen's teaches an embodiment wherein the form of heat involves electrical contact and electrical connection, paragraph [0113] is broader by indicating that the external energy is suitably in the form of heat. Hence, we agree with the Examiner's position in the record and are unpersuaded by Appellant's arguments in this regard.

In view of the above, we affirm Rejection 2.

CONCLUSION

We affirm the Examiner's decision.

DECISION SUMMARY

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1–4, 8–9	103	King	1–4, 8–9	
5–7, 19–23	103	King, William	5–7, 19–23	
Overall Outcome			1–9 and 19–23	

TIME PERIOD FOR RESPONSE

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED