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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/397,779	02/16/2012	RHONDA HYNDMAN	WLJ.188	6711

20987 7590 11/01/2016
VOLENTINE & WHITT PLLC
ONE FREEDOM SQUARE
11951 FREEDOM DRIVE, SUITE 1300
RESTON, VA 20190

EXAMINER

ABRAHAM, IBRAHIME A

ART UNIT	PAPER NUMBER
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1756

NOTIFICATION DATE	DELIVERY MODE
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11/01/2016

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte RHONDA HYNDMAN and STEPHEN BURGESS

Appeal 2015-002127
Application 13/397,779
Technology Center 1700

Before MICHAEL P. COLAIANNI, JULIA HEANEY, and
JEFFREY R. SNAY, *Administrative Patent Judges*.

SNAY, *Administrative Patent Judge*.

DECISION ON APPEAL¹

Appellants² appeal under 35 U.S.C. § 134(a) from the Examiner's decision rejecting claims 1–19.³ We have jurisdiction under 35 U.S.C. § 6(b).

We affirm-in-part.

¹ We cite to the Specification (“Spec.”) filed Feb. 16, 2012; Final Office Action (“Final Act.”) mailed Jan. 28, 2014; Examiner’s Answer (“Ans.”); and Appellants’ Appeal Brief (“App. Br.”) and Reply Brief (“Reply Br.”).

² Appellants identify SPTS Technologies Limited as the real party in interest. App. Br. 3.

³ We adopt the Examiner’s informal renumbering of Appellants’ second-listed claim number 18 as claim 19. See Final Act. 2–3.

BACKGROUND

The subject matter on appeal concerns deposition of aluminum layers or films on a substrate. Spec. ¶ 1. According to Appellants, substrates such as wafers are “subject to considerable warpage or bowing when under the stress induced by the various deposited layers.” Spec. ¶ 3. While stress can be reduced “by sputtering the film at low temperature with the wafer clamped to a cooled electrostatic chuck,” *id.* at ¶ 6, the resulting aluminum layer “exhibits an unfavourable grain structure comprising a very small columnar grain separated by quite large voids,” *id.* at ¶ 7. Appellants purport to achieve improved grain structure and low tensile stress through a process in which a first deposition is performed with the substrate in an unclamped state such that the wafer temperature increases as a result of the deposition process, followed by further deposition with the substrate clamped to an actively cooled support. *Id.* at 6–7.

Sole independent claim 1 is illustrative and reproduced from the Claims Appendix of the Appeal Brief as follows:

1. A method of depositing a film on a substrate, comprising:
 - placing the substrate on a support;
 - depositing material comprising aluminum onto the substrate while the substrate is supported by but is unclamped relative to the support and under a condition in which the temperature of the substrate increases, to thereby form a first metallic layer consisting of aluminum or an aluminum alloy on the substrate; and
 - subsequently depositing material comprising aluminum directly onto the first layer to form a second metallic layer, consisting of aluminum or an aluminum alloy, continuously on the first layer, and

wherein the depositing of the material to form the second layer is carried out while the substrate is supported by and clamped to a support and is actively cooled to a temperature of less than about 22°C, and until the second layer is thicker than the first layer.

REJECTIONS

The Examiner maintained the following grounds of rejection:⁴

- I. Claims 1–4, 6, 8–12, 14, 15, 18, and 19 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Felmetzger⁵ and Kailasam.⁶
- II. Claims 5 and 7 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Felmetzger, Kailasam, and King.⁷
- III. Claim 13 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Felmetzger, Kailasam, and Rich.⁸
- IV. Claims 16 and 17 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Felmetzger, Kailasam, and Wang.⁹
- V. Claim 17 also stands rejection under 35 U.S.C. § 112, second paragraph.

⁴ Final Act. 12–20; Ans. 2–10. Additional grounds of rejection under 35 U.S.C. § 112 were withdrawn. Ans. 10.

⁵ US 2009/0246385 A1, published Oct. 1, 2009 (“Felmetzger”).

⁶ US 7,781,327 B1, issued Aug. 24, 2010 (“Kailasam”).

⁷ US 5,080,455, issued Jan. 14, 1992 (“King”).

⁸ US 2004/015748 A1, published Aug. 12, 2004 (“Rich”).

⁹ Wang, I., *Thin Film Stresses in TiW/AlCuSi/TiW Sandwich Structures*, 130 Mat. Res. Soc. Symp. Proc., 1989, pp. 341–5 (“Wang”).

DISCUSSION

I

With regard to Rejection I, Appellants argue that neither Felmetsger nor Kailasam teaches active cooling only during the second deposition step, as recited in claim 1. App. Br. 31; Reply Br. 3. We agree.

Claim 1 requires a first deposition step during which “the temperature of the substrate increases,” and a subsequent deposition step during which the substrate is “actively cooled to a temperature of less than about 22°C.”

The Examiner found that Felmetsger discloses depositing an aluminum film by a two-step process in which a first aluminum layer is deposited on the substrate, after which a second, thicker aluminum layer is deposited on the first. Final Act. 14. The Examiner also found that Felmetsger “teaches the films are deposited at ambient temperature.” *Id.* Based on that teaching in Felmetsger, the Examiner found that one of ordinary skill would have had a reason to “actively cool the substrate in order to maintain the desired ambient temperature as sputtering alone would raise the deposition [sic, substrate] temperature.” *Id.* at 17.

Appellants argue (*see* App. Br. 25, 31; Reply Br. 3–4) even if Felmetsger’s teaching of sputtering at ambient temperature were sufficient to suggest use of active cooling to offset deposition-induced heating, the Examiner has not articulated a reason why one of ordinary skill would have applied such cooling only during deposition of the second layer, while permitting substrate temperature to increase during deposition of the first layer. Nor does the Examiner identify any teaching in Felmetsger or Kailasam which would support such a finding.

On this record and for the foregoing reasons, we cannot sustain Rejection I.

II–IV

Because each of Rejections II–IV is premised on the same erroneous finding as Rejection I, we will not sustain these Rejections for the same reasons given above in connection with Rejection I.

V

Claim 17 recites that the aluminum alloy identified in claim 16 “is Al-Cu-Si(<5%).” The Examiner found this recitation indefinite because “[i]t is unclear if % is being defined as wt% or at%.”¹⁰ Final Act. 13. Appellants do not dispute the Examiner’s finding that it was known at least with regard to phase diagrams to report alloy compositions in either wt% or at%. App. Br. 23 (“That may be the case as concerns the phase diagrams . . .”). Appellants also do not dispute the Examiner’s finding that “[t]he numerical value of <5% would have a different numerical interpretation depending on whether it is wt% or at%.” *Compare* Ans. 3 with Reply Br. 1–8. Rather, Appellants contend that the use of % alone to refer to weight % “is simply common practice and common notation.” App. Br. 23. However, Appellants do not point us to persuasive evidence in support of their contention that use of % alone would be understood to refer to weight percent. On this record, we are persuaded that a preponderance of evidence

¹⁰ The abbreviations, wt% and at%, refer to weight percent and atomic percent, respectively. Ans. 2.

of record supports the Examiner's finding that claim 17 is indefinite.

Accordingly, we sustain Rejection V.

DECISION

The Examiner's decision rejecting claims 1–19 under 35 U.S.C. § 103(a) is reversed.

The Examiner's decision rejecting claim 17 under 35 U.S.C. § 112, second paragraph, is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136.

AFFIRMED-IN-PART