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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte ROBERT JAY RAFAC, RICHARD L. SANDSTROM, DANIEL
JOHN WILLIAM BROWN, and KAI-CHUNG HOU

Appeal 2018-004153¹
Application 14/979,657
Technology Center 2800

Before MAHSHID D. SAADAT, ERIC S. FRAHM, and
JOHN A. EVANS, *Administrative Patent Judges*.

FRAHM, *Administrative Patent Judge*.

DECISION ON APPEAL²

STATEMENT OF CASE

Introduction

Appellant³ appeals under 35 U.S.C. § 134(a) from the Examiner's
Final Rejection of claims 1 and 3 through 23. Claim 2 has been canceled.
We have jurisdiction under 35 U.S.C. § 6(b).

¹ This application is a continuation of U.S. Patent Application Serial No. 14/489,411, which issued as U.S. Patent No. 9,232,623 on January 5, 2016, filed on September 17, 2014, and claims the benefit of the filing date of January 22, 2014, of U.S. Provisional Patent Application No. 61/930,392.

² An Oral Hearing for this appeal scheduled for December 6, 2019, was waived.

³ We use the word "Appellant" to refer to "applicant" as defined in

We REVERSE the Examiner's anticipation and obviousness rejections of all pending claims.

Appellant's Disclosed Invention

Appellant's disclosed invention is a method and system for producing an extreme ultraviolet (EUV) light source (*see generally* Spec. 1:10–5:3; Abstract; Title; Figs. 2A, 11–13) that emits “electromagnetic radiation having wavelengths of around 50 nm or less (also sometimes referred to as soft x-rays), and including light at a wavelength of about 13 nm” for “use[] in photolithography processes to produce extremely small features in substrates, for example, silicon wafers” (Spec. 1:14–17). The production method (Fig. 7) is performed by directing a target along a target path toward a target location in a vacuum (Fig. 7, 710), and directing an amplified light beam toward the target location (Fig. 7, 720) with energy sufficient enough to convert target material at the target into plasma that emits EUV light (*see* Spec. 7:15–9:28, 16:15–22:15, 29:8–33:11; Figs. 2A, 8A–C, 11–13; claims 1, 13, 22).

Exemplary Claim

Claims 1 (method), 13 (system), and 22 (photolithography system) are independent claims, and each recite emission of EUV light through the use of non-orthogonal propagation (path of the amplified light beam) and target (path of target toward the target location in the vacuum) paths (*see* claims 1,

37 C.F.R. § 1.42. “The word ‘applicant’ when used in this title refers to the inventor or all of the joint inventors, or to the person applying for a patent as provided in §§ 1.43, 1.45, or 1.46.” 37 C.F.R. § 1.42(a). Appellant identifies the real party in interest as ASML Netherlands B.V. (Appeal Br. 1).

13, 22). Exemplary independent claim 1 under appeal, with emphases and bracketed lettering added, reads as follows:

1. A method comprising:

[1] *directing a target along a target path toward a target location in a vacuum chamber*, the target comprising target material in a geometric distribution that comprises a first extent in a first dimension, the first dimension being along a first direction, and a second extent in a second dimension, the second dimension being along a second direction, the first and second direction being orthogonal directions, the second extent being greater than the first extent; and

[2] *directing an amplified light beam toward the target location*, the amplified light beam traveling along a propagation path and having an energy sufficient to convert at least some of the target material in the target to a plasma that emits EUV light, wherein

[2A] *the propagation path and the target path are non-orthogonal at the target location*,

[2B] a portion of the target that extends in the second direction receives the amplified light beam, and

[2C] the propagation path and the second direction are non-orthogonal at the target location such that a reflection produced by an interaction between the amplified light beam and the portion of the target propagates away from the target along the first direction.

Examiner's Rejections

(1) The Examiner rejected claims 1, 3–11, 13–19, 22, and 23 as being anticipated under 35 U.S.C. § 102(a)(2) by Yanagida et al. (US 2010/0181503 A1; published July 22, 2010) (hereinafter, “Yanagida”).
Final Act. 2–4.

(2) The Examiner rejected claims 12, 20, and 21 as being unpatentable under 35 U.S.C. § 103 over Yanagida and Bykanov et al. (US

7,491,954 B2; issued February 17, 2009) (hereinafter, “Bykanov”). Final Act. 4–5.

ISSUES

Based on Appellant’s arguments in the Appeal Brief (Appeal Br. 4–19) and the Reply Brief (Reply Br. 1–7), the following issue is presented on appeal:⁴

Has Appellant shown the Examiner erred in in rejecting (1) claims 1, 3–11, 13–19, 22, and 23 as being anticipated under 35 U.S.C. § 102(a)(2) by Yanagida; and (2) claims 12, 20, and 21 as being unpatentable under 35 U.S.C. § 103 over the combination of Yanagida and Bykanov, because the Examiner has not sufficiently shown Yanagida discloses, teaches, or suggests (i) directing a target along a target path toward a target location (*see e.g.*, claim 1, limitation 1); and (ii) directing an amplified light beam toward a target location along a propagation path (*see e.g.*, claim 1, limitation 2), *wherein “the propagation path and the target path are non-orthogonal at the target location”* as recited in limitation [2A] of independent claim 1 (emphasis added), and as commensurately similarly recited in remaining independent claims 13 and 22?

⁴ We recognize that Appellant’s arguments present additional issues. We were persuaded of error by the issue presented as to limitation 2A, and as such we do not reach the additional issues as this issue is dispositive of the appeal.

ANALYSIS

Claim 1 requires “directing a target along a target path” (*see e.g.*, claim 1, limitation 1) and “directing an amplified light beam” (*see e.g.*, claim 1, limitation 2), where “the propagation path and the target path are *non-orthogonal*” (*see e.g.*, claim 1, limitation 2A (emphasis added)). Remaining independent claims 13 and 22 recite commensurate limitations regarding the propagation and target paths being non-orthogonal at a target location (*see* claims 13, 22).

We agree with Appellant’s contentions (Appeal. Br. 5–9; Reply Br. 4–6) that Yanagida has not been shown to disclose limitation 2A recited in claim 1, and similarly recited in claims 13 and 22. Specifically, with regard to claims 1, 13, and 22, we agree with Appellant’s arguments that (i) Yanagida fails to disclose any light beam for emitting EUV light that has a propagation path non-orthogonal to a target path as recited in limitation 2A (Appeal Br. 5–8; Reply Br. 4–5); and (ii) combining Yanagida’s laser beams 1 and 2 is improper and would not yield the amplified light beam recited in the claims as being propagated along a path non-orthogonal to the target path at the target location, i.e., limitation 2A (Reply Br. 4–6).

Notably, the Examiner’s anticipation rejection in the Final Rejection fails to map any portion of Yanagida to limitation 2A (*see* Final Act. 3). Specifically, in the statement of the anticipation rejection in the Final Office Action, the Examiner maps limitations 1 (*see* Final Act. 2 citing Yanagida Figs. 1, 2B; ¶¶ 72, 86), 2, 2B, and 2C (*see* Final Act. 3 citing Yanagida Figs. 1, 2A–C; ¶ 78) to portions of Yanagida, but omits any discussion of, or mapping of any portions in Yanagida to, limitation 2A (wherein “the propagation path and the target path are non-orthogonal at the target

location”) (*see* Final Act. 2–3). The Examiner relies on Yanagida’s laser apparatuses 9 through 11 (*see* Fig. 1, where laser apparatuses 9–11 emit laser beams 1–3) as disclosing the directed “amplified light beam” recited in limitation 2 of claim 1, and similarly recited in claims 13 and 22 (*see* Final Act. 3). Then, in response to Appellant’s arguments in the Appeal Brief – that none of the laser beams 1 through 3 meet (i) limitation 2A recited in claims (*see* Appeal Br. 7–8), and/or the commensurate limitations recited in claims 13 and 22 (Appeal Br. 9) – the Examiner concedes that main-pulse laser apparatus 9 generates a laser beam 2 on a propagation path that is *orthogonal* to the target path at the target path location, and then speculates the laser beams 1 and 2 must be “working together to prepare the droplet target to form a plasma” to produce the arrangement shown in Yanagida’s Figure 1, where “at least one of the two lasers is non-orthogonal to the path of the target droplet” (Ans. 3).

In this light, the Examiner has not articulated a satisfactory or rational explanation as to how/why Yanagida discloses disputed limitation 2A in claim 1, and/or the commensurate limitations in claims 13 and 22, of the target path being non-orthogonal to the propagation path at the target location. At best, the Examiner leaves us to speculate as to which laser beam or combination of laser beams shown in Yanagida one of ordinary skill in the art might somehow modify to meet the disputed “non-orthogonal” limitation recited in claims 1, 13, and 22. We will not resort to speculation or assumptions to cure the deficiencies in the Examiner’s fact finding and reasoning. *See Warner*, 379 F.2d at 1017; *Ex parte Braeken*, 54 USPQ2d 1110, 1112 (BPAI 1999) (unpublished) (“The review authorized by 35 U.S.C. [§] 134 is not a process whereby the examiner . . .

invite[s] the [B]oard to examine the application and resolve patentability in the first instance.”).

We do not agree with the Examiner’s speculation as to the combination of laser beams 1 and 2 working together to produce the subject matter recited in limitation 2A of claim 1, and commensurately recited in claims 13 and 22, and find it conclusory. Instead, we agree with Appellant that the Examiner has not sufficiently shown Figures 1 and 2A through C and the accompanying text disclose, teach, or suggest a non-orthogonal relationship between the propagation path of an amplified light beam and a target path of a target at a target location. Therefore, Appellant’s contentions that the Examiner has not shown Yanagida discloses the method of emitting EUV light including limitation 2A recited in claim 1, and commensurately recited in claims 13 and 22, are persuasive.

In view of the foregoing, Appellant has established that the Examiner erred in determining that Yanagida anticipates independent claims 1, 13, and 22. Further, because the Examiner relies on Yanagida’s teachings in reaching the conclusions of obviousness for claims 12, 20, and 21 (which depend respectively from claims 1 and 13), Appellant has also established the Examiner erred in determining that claims 12, 20, and 21 would have been obvious in view of the combination of Yanagida and Bykanov. Because Appellant has established that the Examiner erred in rejecting (1) claims 1, 3–11, 13–19, 22, and 23 as being anticipated under 35 U.S.C. § 102(a)(2) by Yanagida; and (2) claims 12, 20, 21 as being unpatentable under 35 U.S.C. § 103 over the combination of Yanagida and Bykanov, the anticipation rejection of claims 1, 3–11, 13–19, 22, and 23 and obviousness rejection of claims 12, 20, and 21, both based on Yanagida, are reversed.

CONCLUSION

For all of the reasons above, we hold as follows:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1, 3–11, 13–19, 22, 23	102(a)(2)	Yanagida		1, 3–11, 13–19, 22, 23
12, 20, 21	103	Yanagida, Bykanov		12, 20, 21
Overall Outcome				1, 3–23

REVERSED