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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* THORSTEN HOFMANN, TRISTAN BRET, PETRA SPIES,  
NICOLE AUTH, MICHAEL BUDACH, and DAJANA CUJAS

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Appeal 2018-002226  
Application 14/200,264  
Technology Center 1700

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Before JEFFREY T. SMITH, LINDA M. GAUDETTE, and  
MONTÉ T. SQUIRE, *Administrative Patent Judges*.

SMITH, *Administrative Patent Judge*.

DECISION ON APPEAL

Pursuant to 35 U.S.C. § 134(a), Appellant<sup>1</sup> appeals from the Examiner's decision to reject claims 1, 3, 5–7, 10–19, 21–30, 32, and 36–44. An oral hearing was held on September 24, 2019.<sup>2</sup> We have jurisdiction under 35 U.S.C. § 6(b).

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<sup>1</sup> We use the word “Appellant” to refer to “applicant” as defined in 37 C.F.R. § 1.42. Appellant identifies the real party in interest as Carl Zeiss SMT GmbH. App. Br. 1.

<sup>2</sup> A written transcript of the oral hearing will be entered into the record when the transcript is made available.

We AFFIRM.

Appellant's invention relates to a method for protecting a substrate during processing by a particle beam. (Spec. ¶ 20.) Claims 1 and 37 are the independent claims on appeal. Claim 1 is reproduced below from Appellant's Brief:

1. A method for protecting a substrate during processing by at least one particle beam, the method comprising the following steps:

a. depositing a locally limited protection layer on the substrate, wherein depositing the locally limited protection layer comprises depositing the locally limited protection layer adjacent to a portion of the substrate or to a layer to be processed, and wherein the locally limited protection layer has a lateral extension on the substrate from 0.1 nm to 5000 nm;

b. etching the substrate and/or the layer arranged on the substrate by use of the at least one particle beam and at least one etching gas; and

c. removing the locally limited protection layer from the substrate, wherein removing the locally limited protection layer comprises directing an electron beam and at least one second etching gas onto the locally limited protection layer.

The following rejections are presented for appeal:

I. Claims 1, 3, 7, 10–16, and 32 are rejected under 35 U.S.C. § 103 as unpatentable over the combination of Flanigan (US 2006/0199082 A1, published Sept. 7, 2006), Liang (US 2003/0000921 A1, issued Jan. 2, 2003) and Takagi<sup>3</sup> (JP2012-078561, published Apr. 19, 2012).

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<sup>3</sup> We refer to the English language machine translation of this document that has been presented in the record.

II. Claims 17, 21–30, and 36 are rejected under 35 U.S.C. § 103 as unpatentable over the combination of Flanigan, Liang, Takagi, and Chandler (US 2008/0142735 A1, published June 19, 2008).

III. Claims 18 and 19 are rejected under 35 U.S.C. § 103 as unpatentable over the combination of Flanigan, Liang, Takagi, Chandler, and Auth (US 2011/0183444 A1, published July 28, 2011).

IV. Claims 5 and 37–44 are rejected under 35 U.S.C. § 103 as unpatentable over the combination of Takagi, Flanigan, Liang, and Chandler.

V. Claim 6 is rejected under 35 U.S.C. § 103 as unpatentable over the combination of Takagi, Flanigan, Liang, and Musil (US 2003/0047691 A1, published Mar. 13, 2003).

VI. Claims 5 and 37–44 are rejected under 35 U.S.C. § 103 as unpatentable over the combination of Liang, Flanigan, Takagi, and Chandler.

VII. Claim 6 is rejected under 35 U.S.C. § 103 as unpatentable over the combination of Liang, Flanigan, Takagi, and Musil.

OPINION<sup>4</sup>

We have reviewed each of Appellant’s arguments for patentability. We will sustain the Examiner’s rejections for the reasons expressed by the Examiner.

Rejection I<sup>5</sup>

The Examiner finds Flanigan teaches a method for repairing a defect on a substrate comprising forming a protection layer over a defect on the substrate wherein the protection layer has an opening that exposes the substrate, etching to remove the defect, and etching to remove the protection layer from the substrate. (Final Act. 5; Flanigan ¶¶ 22, 26, 27.) The Examiner finds Flanigan teaches that the etching may be performed by using focused ion beam or focused electron beam and is chosen to selectively etch the defects. (Final Act. 5; Flanigan ¶¶ 24, 25, 26.) Flanigan discloses in one embodiment the masking layer comprises metal of appropriate thickness. (Flanigan ¶ 29.) The Examiner finds Flanigan is silent about the details of the etching process. (Final Act. 5.) The Examiner finds Liang is also directed to a method for repairing a defect on a photomask substrate utilizing electron beam-induced chemical etching —comprising an electron beam and an etching gas— where in the etching gas is selected to provide high selectivity. (Liang ¶¶ 16, 33.) The Examiner determined it would have been obvious to use electron beam-induced chemical etching having an electron beam and an etching gas, such as described by Liang, to remove the defect and

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<sup>4</sup> Appellant limits the arguments to independent claims 1 and 37. Appellant in the principal brief does not present arguments addressing dependent claims 3, 5–7, 10–19, 21–30, 32, 36, and 38–44. (App. Br. 7–19.) We limit our discussion to the independent claims 1 and 37.

<sup>5</sup> We limit our initial discussion to independent claim 1.

subsequently the protection layer in the invention of Flanigan. (Final Act. 6–7.)

The Examiner further finds Flanigan teaches that the protection layer may have a thickness of about 300 nm but is silent about a lateral dimension of the protection layer. (Final Act. 7.) The Examiner finds Takagi, also directed to a method for repairing a defect on a photomask, teaches the protection layer—that is formed adjacent to a defect on a photomask—has a lateral dimensions of 1000 nm x 200nm (Final Act. 7; Takagi ¶ 32.) The Examiner determines it would have been obvious to a person of ordinary skill in the art to form the protection layer with a lateral dimension of about 1000 nm in the invention of Flanigan. (Final Act. 7.)

Appellant argues the combination of Flanigan, Liang, and Takagi fails to teach or suggest the claimed feature “removing the locally limited protection layer comprises directing an electron beam and at least one second etching gas onto the locally limited protection layer.” (App. Br. 7–12.) Appellant argues Flanigan does not disclose or suggest the use of a locally limited protection layer or removing a locally limited protection layer by directing an electron beam and at least one second etching gas onto the locally limited protection layer as required by independent claim 1. (App. Br. 7.)

Appellant’s arguments fail to identify reversible error in the Examiner’s rejection. Flanigan discloses the use of a mask material (locally limited protection layer) selected so as to be resistant to the subsequent etching process utilized to remove the exposed defect in the substrate. (Flanigan ¶ 22.) Flanigan discloses a variety of suitable repair processes

including focused energy beam, electromagnetic beams, and acoustic energy beams can be utilized to selectively remove the mask protection layer. (Flanigan ¶¶ 24, 25.) Flanigan discloses upon removal of the defect the masking film is removed to restore the photomask structure to the original configuration without the defect. (Flanigan ¶ 27.) Appellant has not disputed Liang’s teaching that the use of electron beam-induced etching including an etching gas was known to persons of ordinary skill in the art. Accordingly, we agree with the Examiner’s determination that it would have been obvious to use electron beam-induced etching including an etching gas, such as described by Liang, to remove the protection layer in the invention of Flanigan. (Final Act. 6–7.) A person of ordinary skill in the art would have reasonably expected that known etching procedures for removal of the mask material would have been suitable so long as the underlying substrate was not damaged. *See In re O’Farrell*, 853 F.2d 894, 904 (Fed. Cir. 1988). (“For obviousness under § 103, all that is required is a reasonable expectation of success.”)

Appellant argues Flanigan fails to teach depositing the masking film just covering the vicinity of the defect and covering only a portion of the photomask. (App. Br. 8–11.)

As set forth above, the Examiner cited Takagi for suggesting the obviousness of providing the limited protection layer with lateral dimensions of about 1000 nm x 200 nm. (Takagi ¶ 32.) Appellant has not directed us to evidence that the locally limited protection layer having a lateral extension on the substrate from 0.1 nm to 5000 nm produces unexpected results. A person of ordinary skill in the art would have recognized the masking film should have the dimensions suitable for protecting the underlying surface.

Appellant has not established that the claimed invention directed to covering only a portion in the vicinity of the defect within the substrate produces a patentably distinct invention from a masking material covering a larger portion of a substrate. In the absence of such evidence, a person of ordinary skill in the art would have had sufficient skill to select the appropriate dimensions of the locally limited protection layer so as not to damage the underlying layers during further processing.

Rejection IV and VI<sup>6</sup>

Appellant argues the combination of Takagi, Flanigan, Liang, and Chandler does not disclose or suggest removing the locally limited protection layer comprising directing the electron beam and at least one second etching gas onto the locally limited protection layer as required by independent claim 37. (App. Br. 13–14, 17–18.) Appellant specifically argues Chandler does not disclose or suggest how to remove the protection layer. (App. Br. 14, 18.)

As set forth above, we agree with the Examiner's reasoning's for combining the teachings of Flanigan, Liang, and Takagi. Contrary to Appellants' argument, Chandler was not cited for teaching removing the protection layer. The Examiner cited Flanigan and Liang for suggesting the removing of a locally limited protection layer utilizing an electron beam and at least one etching gas. (Final Act. 5–7.) The Examiner cited Chandler for teaching depositing a protection layer by using an electron beam to decompose a metal precursor compound, such as  $W(CO)_6$  or  $C_9H_{15}Pt$  (Final Act. 13–14; Chandler ¶¶ 3, 9, 28.) The Examiner determined that it would

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<sup>6</sup> We limit our discussion to independent claim 37.

have been obvious to perform a process according to the combination of Takagi, Flanigan, and Liang wherein a metal protection layer is deposited utilizing an electron beam and a metal precursor gas such as described by Chandler.<sup>7</sup> (Final Act. 14.)

Appellant argues the combination of Takagi, Flanigan, Liang, and Chandler does not disclose or suggest depositing the locally limited protection layer comprises depositing at least one metal containing layer by means of an electron beam and at least one volatile metal compound on the substrate as required by independent claim 37. (App. Br. 15–16, 18–19.) Appellant specifically argues “Chandler does not disclose or suggest using an electron beam and at least one volatile metal compound on the substrate to deposit the protection layer.” (App. Br. 16, 19.)

Appellant’s arguments lack persuasive merit. Flanigan teaches the masking layer can comprise metal of appropriate thickness. (Flanigan ¶ 29.) Flanigan further discloses conductive materials in addition to the masking layer may be deposited utilizing e-beam techniques. (Flanigan ¶ 30.) Chandler teaches that a metal protection layer may be deposited utilizing an electron beam to decompose a gas comprising a metal precursor compound. (Chandler ¶¶ 9, 28.) A person of ordinary skill in the art would have reasonably expected that known techniques for depositing a masking protection layer would have been suitable for use on a metal-containing protection layer.

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<sup>7</sup> The Examiner’s further determination regarding the teachings of Takagi, Flanigan, and Liang were addressed above when discussing Rejection I.

For this reason above, we sustain the Examiner's rejection of independent claims 1 and 37. We likewise affirm the Examiner's decision to reject dependent claims 3, 5-7, 10-19, 21-30, 32, 36, and 38-44. The Examiner's additional reliance on the Auth or Musil references for the rejection of dependent claims 6, 18, and 19 was not separately address by Appellant.

### CONCLUSION

The Examiner's rejections are affirmed.

### DECISION SUMMARY

<b>Claims Rejected</b>	<b>35 U.S.C. §</b>	<b>Basis</b>	<b>Affirmed</b>	<b>Reversed</b>
1, 3, 7, 10-16, 32	103	Flanigan, Liang, Takagi	1, 3, 7, 10-16, 32	
5, 17, 21-30, 36-44	103	Flanigan, Liang, Takagi, Chandler	17, 21-30, 36	
18, 19	103	Flanigan, Liang, Takagi, Auth	18, 19	
6	103	Takagi, Flanigan, Liang, Musil	6	
<b>Overall Outcome</b>			1, 3, 5-7, 10-19, 21-30, 32, 36-44	

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

AFFIRMED