

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte AMANDA BAER, NIAN-XIANG SUN,
SUE SIYANG ZHANG, and YI ZHENG

Appeal 2008-3182
Application 10/857,151
Technology Center 1700

Decided: August 26, 2008

Before EDWARD C. KIMLIN, PETER F. KRATZ, and ROMULO H.
DELMENDO, *Administrative Patent Judges*.

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DECISION ON APPEAL
STATEMENT OF THE CASE

Appellants appeal under 35 U.S.C. § 134(a) from a final rejection of all pending claims 1-20. (Final Office Action entered November 30, 2006.) We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM-IN-PART.

Appellants' claimed invention relates to fabrication of thin film devices and methods "used to fabricate alignment marks by which successive layers of photolithographic mask can be aligned . . . during the fabrication of magnetic heads." (Spec. 1, ll. 5-10). According to Appellants, the claimed method enhances shallow alignment marks "defined in a relatively thin layer on a wafer by etching the alignment marks into an underlying alignment mark transfer layer." (*Id.* 3, ll. 3-5). Appellants further state:

The invention can be adapted to . . . alignment mark generation processes without having to modify the existing process. Prior to the photolithographic patterning of the alignment marks, the target area of the alignment marks is prepared by depositing material for the transfer layer and optionally a definition layer." (*Id.* 3, ll. 5-7).

After preparing these layers, "alignment marks can be fabricated through the existing process . . . and a RIE [Reactive Ion Etching] process is then used to transfer the shallow marks into thicker transfer layer to form a much deeper stepper alignment marks." (*Id.* 3, ll. 12-15).

Representative claims 1, 10, and 15 read as follows:

1. A method of fabricating thin films on a wafer comprising the steps of:

depositing a transfer layer on an alignment mark area of the wafer;

fabricating an alignment mark filled with a filler material above the transfer layer;

removing the filler material from the alignment mark exposing an underlying surface of the transfer layer; and

deepening the alignment mark by removing material from the underlying surface of the transfer layer.

10. A method of fabricating thin films on a wafer comprising the steps of:

depositing a transfer layer in an alignment mark area;

depositing a definition layer onto the transfer layer in the alignment mark area;

fabricating an alignment mark filled with a filler material in the definition layer;

removing the filler material from the alignment mark exposing an underlying surface of the transfer layer; and

deepening the alignment mark by removing material from the underlying surface of the transfer layer.

15. A method of fabricating thin films on a wafer comprising the steps of:

depositing one or more films as a part of a process of fabricating a selected layer on the wafer;

forming an alignment mark trench in an alignment mark area of the wafer including removing the one or more films deposited as a part of a process of fabricating a selected layer on the wafer;

depositing a transfer layer in the alignment mark trench;

depositing a definition layer onto the transfer layer in the alignment mark trench;

fabricating an alignment mark filled with a filler material in the definition layer;

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removing the filler material from the alignment mark exposing an underlying surface of the transfer layer; and

deepening the alignment mark by removing material from the underlying surface of the transfer layer.

The prior art references relied upon by the Examiner to reject the claims on appeal are:

Lin	US 2005/0174704 A1	Aug. 11, 2005
Ning	US 6,979,526 B2	Dec. 27, 2005

The following rejections are before us for review:

- I. Claims 1-10, 12, 13, 15, 18, and 20 are rejected under 35 U.S.C. § 102(e) as anticipated by Ning.
 - II. Claims 11, 14, 16, 17, and 19 are rejected under 35 U.S.C. § 103(a) as unpatentable in view of the combined teachings of Ning and Lin.
- We affirm rejection I as to claims 1, 6, 7, and 9, but reverse with respect to claims 2-5, 8, 10, 12, 13, 15, 18, and 20. We reverse rejection II.

ISSUES

Have Appellants shown that the Examiner reversibly erred in determining that the subject matter of claims 1-10, 12, 13, 15, 18, and 20 is anticipated by Ning?

Have Appellants shown that the Examiner reversibly erred in determining that the subject matter of claims 11, 14, 16, 17, and 19 would have been obvious to one of ordinary skill in the art over the combined teachings of Ning and Lin?

FINDINGS OF FACT

The record supports the following findings of fact, as well as any other findings of fact described in this opinion, at least by a preponderance of the evidence.

1. Appellants' Figure 2 is reproduced below:

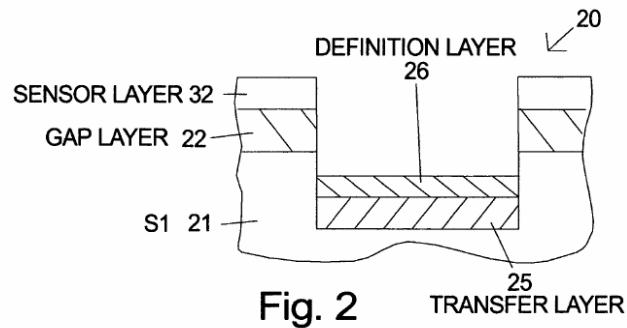


Figure 2 depicts a wafer 20 having a transfer layer 25 and definition layer 26 within an alignment mark trench. (Spec. 7, ll. 9-10, 24-25).

2. Ning's Figure 2 is reproduced below:

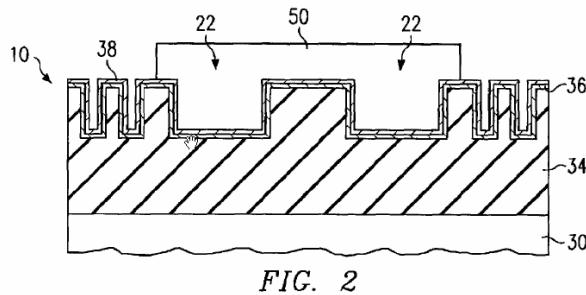


Figure 2 is said to depict a cross-sectional view of a semiconductor wafer 10 including insulating layer 34, alignment mark trenches 22, a liner 36/38 comprising barrier layer 36 and seed layer 38, and a resist filler material 50. (Col. 4, ll. 10-12, 28-30, 57-58).

3. Ning discloses depositing a liner, comprising a barrier layer 36 and a seed layer 38, over an alignment mark trench 22, thus forming an alignment mark. (Col. 4, ll. 18-30; col. 7, ll. 18-23; Fig. 2).
4. Ning discloses the barrier layer component of the liner “may comprise TaN, TiN [titanium nitride], WN, Ta [tantalum], or combinations thereof,” and is deposited as the first layer within the alignment trench. (Col. 4, ll. 41-42).
5. Ning discloses that the barrier layer “is preferably deposited in a thickness of about 5-100 nm.” (Col. 4, ll. 43-45).
6. Ning discloses adding resist filler material above the liner to overfill the alignment mark trenches. (Col. 4, ll. 57-58; col. 7, l. 24).
7. Ning describes a process step of removing filler material and the liner from the alignment mark trenches. (Col. 5, ll. 34-37; col. 7, ll. 39-44).
8. Ning’s process step of removing the filler material and liner necessarily results in exposing the underlying barrier layer in some point in time, as material is removed. (Col. 7, ll. 39-44; col. 8, ll. 49-53; col. 9, l. 37 through 10, l. 2).
9. Ning discloses an alignment mark depth established by the depth of the trench lessened by the liner’s height, and as material from the surface of the liner’s seed and barrier layers is removed, the alignment mark necessarily deepens. (Fig. 2).

PRINCIPLES OF LAW

It is well settled that the United States Patent and Trademark Office (PTO) is obligated to give claim terms their broadest reasonable interpretation, taking into account any enlightenment by way of definitions

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or otherwise found in the specification. *In re Icon Health and Fitness, Inc.*, 496 F.3d 1374, 1379 (Fed. Cir. 2007) (“[T]he PTO must give claims their broadest reasonable construction consistent with the specification. Therefore, we look to the specification to see if it provides a definition for claim terms, but otherwise apply a broad interpretation.”) (Citation omitted); *In re Bigio*, 381 F.3d 1320, 1324 (Fed. Cir. 2004) (“[T]he PTO gives a disputed claim term its broadest reasonable interpretation during patent prosecution.”).

This longstanding principle is based on the notion that “during patent prosecution when claims can be amended, ambiguities should be recognized, scope and breadth of language explored, and clarification imposed.” *In re Zletz*, 893 F.2d 319, 321 (Fed. Cir. 1989). That is, a patent applicant has the opportunity and responsibility to remove any ambiguity in claim term meaning by amending the application. “Only in this way can uncertainties of claim scope be removed, as much as possible, during the administrative process.” *In re Zletz*, 893 F.2d at 322.

“To anticipate a claim, a prior art reference must disclose every limitation of the claimed invention, either explicitly or inherently.” *In re Schreiber*, 128 F.3d 1473, 1477 (Fed. Cir. 1997).

ANALYSIS

Anticipation Rejection of Claims 1-10, 12, 13, 15, 18, and 20 in View of Ning
Claims 1, 6, 7, and 9.

Appellants submit specific arguments addressing claim 1, but do not argue claims 6, 7, and 9 separately. We therefore confine our discussion to claim 1. 37 C.F.R. § 41.37(c)(1)(vii).

The Examiner found that Ning discloses all the limitations of claim 1. (Ans. 3-4). Appellants argue that Ning does not disclose a “two step process of first forming the alignment marks and then deepening of alignment marks . . . [or] the specific method that applicants claim using the transfer layer.” (Br. 8, ll. 10-13). Appellants contend that Ning’s alignment marks 22 are “absolutely unchanged at the end of the process” and that “[t]herefore, it is clear that Ning is not teaching any method of deepening the alignment marks once they are formed.” (*Id.* 8, ll. 17-18). Furthermore, Appellants argue: “Ning’s figures reveal that the described process does not change the alignment marks 22 in any way. The alignment marks 22 are the same in figure 6 at the end of the process as they were at the beginning in figure 1.” (*Id.* 9, ll. 22-24). Additionally, Appellants argue: “Ning’s method includes nothing comparable to applicant’s transfer layer.” (*Id.* 8, ll. 24-26).

We cannot agree with Appellants. Ning discloses depositing a liner 36/38, comprising a barrier layer 36 and seed layer 38, within an alignment mark trench, forming an alignment mark within a semiconductor. (FF 2, 3). Ning discloses the barrier layer component of the liner “may comprise TaN, TiN [titanium nitride], WN, Ta [tantalum], or combinations thereof,” and is deposited as the first layer within the alignment trench. (FF 4). Ning discloses that this barrier layer “is preferably deposited in a thickness of about 5-100 nm.” (FF 5). In the same manner, Appellants’ Specification describes:

[A] bed for the alignment marks is formed in the alignment mark trench T1 by first depositing a transfer layer 25. . . . The transfer layer is preferably a transition metal, preferably tantalum [Ta], but tungsten [W] and titanium nitride (TiN) can also be used [T]he transfer layer can be 100 nm [thick].

(Spec. 7, ll. 9-10; Fig. 2; FF 1).

Thus, one of ordinary skill in the art would have recognized the prior art barrier layer to be the same as Appellants' transfer layer, as both may comprise a layer of tantalum or titanium nitride deposited in the same thickness within an alignment mark trench .

Appellants do not direct us to any persuasive evidence to show that Ning's barrier layer is distinct from the claimed transfer layer in a manner sufficient to confer patentability to the claimed invention. Instead, Appellants rely on arguments (Br. 8-13), but these arguments do not satisfy Appellants' burden. *In re Pearson*, 494 F.2d 1399, 1405 (CCPA 1974) (“Attorney’s argument in a brief cannot take the place of evidence.”).

Additionally, Ning discloses adding resist filler material above the barrier and seed layers to overfill the alignment mark depth. (FF 2, 6). Thereafter, the filler material and liner are removed (FF 7), which necessarily exposes the surfaces of the seed and barrier layers, at some point in time as material is removed. (FF 8). Because the alignment mark includes the trench with the barrier (i.e., “transfer”) and seed layers, the alignment mark deepens as material from the surface of these layers is removed. (FF 9). Thus, one of ordinary skill in the art would have understood that Ning describes “deepening the alignment mark by removing material from the underlying surface of the transfer layer.” (Claim 1).

Though Ning also discloses removing an additional layer (i.e., seed layer) between the filler material and the barrier layer (FF 2, 7), claim 1

reads on a step of removing an intermediate layer in the removal process before exposing the surface of an underlying transfer layer. *In re Zletz*, 893 F.2d at 321 (“During patent examination the pending claims must be interpreted as broadly as their terms reasonably allow.”).

Appellants also argue: “Ning is not teaching the use of his liner 36/38 for the fabrication or enhancement of the alignment marks.” (Br. 9, ll. 20-25).

Appellants’ argument is not persuasive. As discussed above, Ning does disclose barrier (transfer) and seed layers, within an alignment mark trench, resulting in an alignment mark. (FF 3).

Appellants’ argument that the prior art does not teach “enhancing” the alignment marks fails because claim 1 does not require this limitation. *In re Self*, 671 F.2d 1344, 1348 (CCPA 1982) (“Many of appellant’s arguments fail from the outset because . . . they are not based on limitations appearing in the claims.”).

Appellants argue the claimed invention requires “transfer and definition layers [that] are deposited prior to the formation of the initial alignment marks, but Ning’s barrier layer 36 and seed layer 38 are formed after the alignment marks.” (Br. 9, ll. 26-29).

Here again, this argument is unpersuasive because the claim scope encompasses depositing the barrier (transfer) and seed layers to form the alignment mark above these layers.

For these reasons, we uphold the Examiner’s rejection of claims 1, 6, 7, and 9.

Claims 2-5, 8, 10, 12, 13, 15, 18, and 20.

The Examiner states that Ning teaches “forming an alignment mark trench . . . depositing liner layer and seed layer within the trench (transfer and definition layer, [and] leaving a void of space within the trench for the filler, see figure 2).” (Ans. 3, l. 21 through 4, l. 1). Also, the Examiner asserts that Ning illustrates “filling the void formed in the seed layer (definition layer) present in the alignment mark area with a filler material (reference 50 of figure 2).” (*Id.* 8, ll. 15-16).

Appellants argue, with respect to claim 2, that “Ning does not teach ‘forming a void *in the definition layer* for the alignment mark and filling the void with a filler material.’” (Emphasis added; Br. 11, ll. 6-8). Furthermore, Appellants contend that “[i]n applicants’ [independent] claims 10 and 15 the transfer layer and definition layer are deposited first and the initial alignment mark is *fabricated in the definition layer*. . . [which] does not correspond to either layer of Ning’s liner layers 38/36 because Ning’s alignment mark is *not formed in* either of these layers.” (Emphasis added; Br. 9, l. 30 through 10, l. 2).

We agree with Appellants. Claim 2 and independent claims 10 and 15 require “fabricating an alignment mark . . . *in the definition layer*.” (Emphasis added). Contrary to the Examiner’s contentions, there is no explicit or inherent disclosure in the prior art of an alignment mark *in* a layer. Ning discloses a void within the trench, but this void is situated above the liner and seed layers (i.e., “transfer” and “definition” layers, respectively) that line the trench. (FF 1, Fig. 2). The Examiner has not identified evidence or provided acceptable reasoning to show the prior art explicitly or inherently discloses the step of “fabricating an alignment

mark . . . *in* the definition layer" (Emphasis added; claims 2, 10, and 15). Therefore, we must agree with Appellants that the Examiner erred in finding claims 2, 10, and 15, as well as claims depending therefrom, anticipated by Ning.

Obviousness Rejection of Claims 11, 14, 16, 17, and 19 in View of Ning and Lin

Claims 11, 14, 16, 17, and 19 depend from parent claims 10 and 15.

The Examiner stated:

Ning does not disclose that sensor layers for a magnetic head is formed prior to the formation of the transfer layer and that the alignment mark is part of the magnetic read head (claims 11, and 16). Ning does not disclose that the definition layer is rhodium (claims 14, and 19). Ning does not disclose that forming the alignment mark trench includes removing the sensor layer, the gap layer, and a portion of shield layer of the magnetic head (claim 17).

(Ans. 5, ll. 2-7).

The Examiner found Lin teaches the claimed steps and elements missing from Ning's disclosure and determined that combining the teachings of Lin and Ning renders claims 11, 14, 16, 17, and 19 obvious. (Ans. 5, ll. 8-21).

For the reasons as discussed above with respect to claims 2, 10, and 15, we find that the Examiner erred in determining claims 11, 14, 16, 17, and 19 obvious. The Examiner does not point to any portion of Lin that explicitly or inherently teaches fabricating an alignment mark *in* a definition layer, as required by the claims. Therefore, the combined teachings of Ning and Lin do not disclose all steps of the claimed invention. Accordingly, we

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hold the Examiner erred in determining claims 11, 14, 16, 17, and 19 obvious in view of Ning and Lin.

CONCLUSION

In view of the above discussion, we reverse the rejection under 35 U.S.C. § 102(e) over Ning with respect to claims 2-5, 8, 10, 12, 13, 15, 18, and 20. We also reverse the rejection under 35 U.S.C. § 103(a) over the combined teachings of Ning and Lin with respect to claims 11, 14, 16, 17, and 19.

We affirm, however, the U.S.C. § 102(e) rejection of claims 1, 6, 7, and 9 as anticipated by Ning.

Accordingly, the decision of the Examiner to reject the appealed claims is affirmed-in-part.

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-IN-PART

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