

THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 18

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte JOSEF WINNERL and WALTER NEUMUELLER

Appeal No. 1996-2246
Application No. 08/052,910¹

HEARD: January 10, 2000

Before THOMAS, RUGGIERO, and GROSS, Administrative Patent Judges.

RUGGIERO, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the final rejection of claims 1, 2, and 6-10, all of the claims pending in the present application. Claims 3-5 have been canceled. An

¹ Application for patent filed April 27, 1993.

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amendment after final rejection was filed October 17, 1994 and was entered by the Examiner.

The claimed invention relates to a method for producing a via hole to a doped region in a semiconductor device.

Appellants assert at pages 3-5 of the specification that their invention avoids the etching of active structures and the use of auxiliary layers in the contact area thus eliminating the need to remove these layers after via hole production. More particularly, Appellants' specification indicates that the foregoing problems are addressed by using an etch-stop layer of boron-doped amorphous silicon in the region of the via hole.

Claim 1 is illustrative of the invention and reads as follows:

1. A method for producing a via hole to a doped region in a semiconductor device, comprising the steps of:

providing a substrate;

generating in the substrate a doped region that is laterally limited by insulating regions, which insulating regions are positioned at least on a surface of the substrate;

depositing an undoped, amorphous silicon layer surface-wide on the substrate;

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producing a doped region in the amorphous silicon layer that overlies the doped region in the substrate by masked implantation of boron;

selectively removing undoped amorphous silicon in the amorphous silicon layer relative to the doped region in the amorphous silicon layer by wet chemical etching with potassium hydroxide solution;

producing an insulating layer surface-wide on the substrate; and

forming the via hole in the insulating layer by selectively anisotropically etching the insulating layer to remove a portion thereof that overlies the doped region in the amorphous silicon layer, while employing the doped region in the amorphous silicon layer as an etching stop in the formation of the via hole.

The Examiner relies on the following prior art:

Henry	4,231,820	Nov. 04, 1980
Komatsu et al. (Komatsu)	4,438,556	Mar, 27, 1984
Ishii et al. (Ishii)	4,569,123	Feb. 11, 1986
Ueno et al. (Ueno)	4,629,520	Dec. 16, 1986
Chan et al. (Chan)	4,868,138	Sep. 19, 1989
Ogura et al. (Ogura)	4,992,389	Feb. 12, 1991

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Jonkers et al. (Jonkers)	5,081,065	Jan. 14, 1992
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Claims 1, 2, 6, and 8 stand finally rejected under 35 U.S.C. § 103 as being unpatentable over Ogura in view of Komatsu, Ueno, and Henry. Claims 7 and 9 stand finally rejected under 35 U.S.C. § 103 as being unpatentable over Ogura in view of Komatsu, Ueno, and Henry and further in view of Ishii. Claim 10 stands finally rejected under 35 U.S.C. § 103 as being unpatentable over Ogura in view of Komatsu, Ueno, Henry, and Ishii and further in view of Jonkers and Chan.

Rather than reiterate the arguments of Appellants and the Examiner, reference is made to the Brief² and Answer for the respective details thereof.

OPINION

We have carefully considered the subject matter on appeal, the rejections advanced by the Examiner and the

² The Reply Brief filed May 16, 1995 was considered by the Examiner as not being limited to new points of arguments or to new grounds of rejection and was not entered. Accordingly, the arguments in such Reply Brief have not been considered in this appeal.

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evidence of obviousness relied upon by the Examiner as support for the rejections. We have, likewise, reviewed and taken into consideration, in reaching our decision, Appellants' arguments set forth in the Brief along with the Examiner's rationale in support of the rejection and arguments in rebuttal set forth in the Examiner's Answer.

It is our view, after consideration of the record before us, that the evidence relied upon and the level of skill in the particular art would have suggested to one of ordinary skill in the art the obviousness of the invention as set forth in claims 1, 2, 6, and 8-10. We reach the opposite conclusion with respect to claim 7. Accordingly, we affirm-in-part.

Appellants have indicated (Brief, page 4) that, for the purposes of this appeal, the claims will stand or fall in the following groups: Group I (claims 1, 2, 6, and 8-10) and Group II (claim 7). Consistent with this indication, Appellants have made no separate arguments with respect to any of the dependent claims 2, 6, and 8-10 in Group I and, accordingly,

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these dependent claims will stand or fall with their base claim.

As a general proposition in an appeal involving a rejection under 35 U.S.C. § 103, an Examiner is under a burden to make out a prima facie case of obviousness. If that burden is met, the burden of going forward then shifts to Appellants to overcome the prima facie case with argument and/or evidence. Obviousness is then determined on the basis of the evidence as a whole and the relative persuasiveness of the arguments. See In re Oetiker, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992); In re Hedges, 783 F.2d 1038, 1039, 228 USPQ 685, 686 (Fed. Cir. 1986); In re Piasecki, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984); and In re Rinehart, 531 F.2d 1048, 1052, 189 USPQ 143, 147 (CCPA 1976).

With respect to representative independent claim 1 from Group I, the Examiner, as the basis for the obviousness rejection, proposes to modify the semiconductor fabricating method of Ogura which lacks the claimed selective implantation of impurities to form a doped region in a silicon layer with

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the subsequent etching of undoped regions of the silicon layer. To address this deficiency, the Examiner turns to Komatsu for a teaching of forming a polysilicon electrode by selectively doping impurities into an electrode region of a polysilicon layer followed by the etching of the undoped regions. In the Examiner's line of reasoning, the skilled artisan would have found it obvious to modify the teachings of Ogura by providing for the selective doping of the polysilicon layer and subsequent etching of the undoped regions to obtain a pattern with high precision. The Ueno and Henry references are additionally added to the Examiner's proposed combination as providing a teaching of the use of amorphous silicon and potassium hydroxide etching, respectively.

In making the obviousness rejection, the Examiner, therefore, has pointed out the teachings of Ogura, Komatsu, Ueno, and Henry, has reasonably indicated the perceived differences between this prior art and the claimed invention, and has provided reasons as to how and why the prior art references would have been modified and/or combined to arrive at the claimed invention (Answer, pages 3-6). In our view, the Examiner's analysis is sufficiently reasonable that we

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find that the Examiner has at least satisfied the burden of presenting a prima facie case of obviousness. The burden is, therefore, upon Appellants to come forward with evidence or arguments which persuasively rebut the Examiner's prima facie case of obviousness. Arguments which Appellants could have made but elected not to make in the Brief have not been considered in this decision (note 37 37 CFR § § 1.192).

Appellants' arguments (Brief, pages 6 and 7) in response to the Examiner's rejection initially center on the combination of Ogura with Henry. As correctly pointed out by the Examiner (Answer, page 8), however, the primary combination which establishes the basis for the obviousness rejection is Ogura and Komatsu with Henry being cited solely for teaching the obviousness of using potassium hydroxide as a wet etch chemical solution.

Further, we find Appellants' arguments which do focus on the merits of Komatsu (Brief, page 7) to be unpersuasive. Appellants attack the relevance of Komatsu by asserting that, contrary to the via hole producing method of the present invention, an etching attack occurs on active regions in Komatsu. It is clear from the Examiner's statement of the

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rejection (Answer, pages 3-5), however, that the primary reference relied on for teaching via hole formation is Ogura. In Ogura, etching of active regions during via hole formation is prevented by the etch stop created by the patterned silicon layer 144 (Ogura, column 11, lines 55-68 and Figure 16e). Komatsu is relied on by the Examiner solely for the teaching of patterning the silicon layer 144 of Ogura by a selective doping technique. In our view, the fact that Komatsu's process of forming silicon patterns may result in etching of active regions is of no moment since the combination with Ogura clearly results in a via hole formation with no etching of active areas as a result of Ogura's clear teaching of a silicon layer etch stop. One cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. In re Keller, 642 F. 2d 413, 208 USPQ 871 (CCPA 1981); In re Merck & Co., Inc., 800 F. 2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

We find Appellants' remarks with respect to the Ueno reference to be similarly deficient. As discussed previously, Ueno was cited by the Examiner solely to provide a teaching of the obviousness of utilizing an amorphous silicon layer

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instead of a polysilicon film in the fabrication of a semiconductor device. The fact that Ueno lacks a teaching of selective etching of undoped silicon or the use of a silicon layer as an etch stop is irrelevant since these features are clearly provided by other references in the Examiner's proposed combination.

In view of the above discussion, it is our view that the Examiner's prima facie case of obviousness with respect to independent claim 1 remains unrebutted by any convincing arguments offered by Appellants. Accordingly, the rejection of claim 1 under 35 U.S.C. § 103 is sustained. Since, as noted above, Appellants have grouped claims 1, 2, 6, and 8-10 as standing or falling together, claims 2, 6, and 8-10 fall with claim 1 in accordance with 37 CFR § 1.192(c)(7). Thus, it follows that the decision of the examiner to reject claims 2, 6, and 8-10 under 35 U.S.C. § 103 is also sustained.

Turning now to a consideration of dependent claim 7, grouped and argued separately by Appellants, we note that, while we found Appellants' arguments to be unpersuasive with respect to the obviousness rejection of claims 1, 2, 6, and 8-10, we reach the opposite conclusion with respect to claim 7.

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We agree with Appellants that no prima facie case of obviousness has been established since the boron doping concentration value of $2 \times 10^{20} \text{ cm}^{-3}$ taught by Ishii clearly does not encompass or fall within the specific claimed doping concentration range of "between 10^{18} cm^{-3} and 10^{20} cm^{-3} ." As to the Examiner's contention of the obviousness to the skilled artisan of optimizing the doping concentration to an appropriate value, we also agree that no teaching exists in the references that would support the desirability of modifying the disclosed doping concentration to achieve Appellants' claimed doping concentration value. The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification. In re Fritch, 972 F. 2d 1260, 1266 n.14, 23 USPQ2d 1780, 1783-84 n. 14 (Fed. Cir. 1992). Thus, the Examiner's 35 U.S.C. § 103 rejection of claim 7 is not sustained.

In summary, the Examiner's 35 U.S.C. § 103 rejection is sustained with respect to claims 1, 2, 6, and 8-10 but is not sustained with respect to claim 7. Accordingly, the decision

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of the Examiner rejecting claims 1, 2, and 6-10 is affirmed-
in-part.

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

AFFIRMED-IN-PART

JAMES D. THOMAS)	
Administrative Patent Judge)	
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)	BOARD OF PATENT
JOSEPH F. RUGGIERO)	APPEALS
Administrative Patent Judge)	AND
)	INTERFERENCES
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ANITA PELLMAN GROSS)	
Administrative Patent Judge)	

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DECISION: AFFIRMED-IN-PART
Send Reference(s): Yes No
or Translation (s)
Panel Change: Yes No
Index Sheet-2901 Rejection(s):
Prepared: December 5, 2000

Draft Final

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OB/HD GAU

PALM /ACTS 2/BOOK
DISK(FOIA)/REPORT