

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 34

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte YASUSHI YAMAZAKI

Appeal No. 2003-2097
Application No. 09/247,926

HEARD: February 5, 2004

Before JERRY SMITH, GROSS, and LEVY, Administrative Patent Judges.
LEVY, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 134 from the examiner's final rejection of claims 1-25 and 40¹.

¹ The rejection of claims 1-5, 7-25, and 40 under 35 U.S.C. § 103(a) as being unpatentable over the Admitted Prior Art (APA) in view of Lu has been withdrawn by the examiner (answer, page 2).

BACKGROUND

Appellant's invention relates to a process for fabricating a semiconductor integrated circuit device having a polycide line and impurity region respectively exposed to contact holes that are different in depth. An understanding of the invention can be derived from a reading of exemplary claim 1, which is reproduced as follows:

1. A process for fabricating a semiconductor device, comprising the steps of:

a) preparing a semiconductor structure including a first lower-level conductive line having a semiconductor layer and a refractory metal silicide layer laminated on said semiconductor layer and a second lower-level conductive line without a refractory metal silicide layer;

b) forming an inter-level insulating layer over said semiconductor structure having a first portion over said first lower-level conductive line and a second portion over said second lower-level conductive line;

c) etching said first portion and said second portion until said refractory metal silicide layer of said first lower-level conductive line is exposed to a first contact hole, said second lower-level conductive line being still covered with a remaining second portion;

d) removing a part of said refractory metal silicide layer exposed to said first contact hole from said first lower-level conductive line; and

e) etching said remaining second portion for exposing said second lower-level conductive line to a second contact hole.

The prior art references of record relied upon by the examiner in rejecting the appealed claims are:

Tatsumi et al. (Tatsumi)	5,180,464	Jan. 19, 1993
Sandhu et al. (Sandhu)	5,298,463	Mar. 29, 1994

Claims 1-5, 7-25, and 40 stand rejected under 35 U.S.C. § 103 as being unpatentable over the Admitted Prior Art (APA) in view of Sandhu.

Claim 6 stands rejected under 35 U.S.C. § 103(a) as unpatentable over APA in view of Sandhu and Tatsumi.

Rather than reiterate the conflicting viewpoints advanced by the examiner and appellant regarding the above-noted rejections, we make reference to the examiner's answer (Paper No. 27, mailed February 26, 2003) for the examiner's complete reasoning in support of the rejections, and to appellant's brief (Paper No. 26, filed December 30, 2002) and reply brief (Paper No. 29, filed April 25, 2003) for appellant's arguments thereagainst. Only those arguments actually made by appellant have been considered in this decision. Arguments which appellant could have made but chose not to make in the brief have not been considered. See 37 CFR 1.192(a).

OPINION

In reaching our decision in this appeal, we have carefully considered the subject matter on appeal, the rejections advanced by the examiner, and the 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, appellant's arguments set forth in the briefs along with the examiner's rationale in support of the rejections and arguments in rebuttal set forth in the examiner's answer.

Upon consideration of the record before us, we reverse, for the reasons set forth by appellant in the reply brief. We begin with the rejection of claims 1-5, 7-25, and 40 under 35 U.S.C. § 103(a) as unpatentable over APA in view of Sandhu. We turn to claim 1. In rejecting claims under 35 U.S.C. § 103, it is incumbent upon the examiner to establish a factual basis to support the legal conclusion of obviousness. See In re Fine, 837 F.2d 1071, 1073, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). In so doing, the examiner is expected to make the factual determinations set forth in Graham v. John Deere Co., 383 U.S. 1, 17, 148 USPQ 459, 467 (1966), and to provide a reason why one having ordinary skill in the pertinent art would have been led to

modify the prior art or to combine prior art references to arrive at the claimed invention. Such reason must stem from some teaching, suggestion or implication in the prior art as a whole or knowledge generally available to one having ordinary skill in the art. Uniroyal, Inc. v. Rudkin-Wiley Corp., 837 F.2d 1044, 1051, 5 USPQ2d 1434, 1438 (Fed. Cir. 1988); Ashland Oil, Inc. v. Delta Resins & Refractories, Inc., 776 F.2d 281, 293, 227 USPQ 657, 664 (Fed. Cir. 1985); ACS Hosp. Sys., Inc. v. Montefiore Hosp., 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984). These showings by the examiner are an essential part of complying with the burden of presenting a prima facie case of obviousness. Note In re Oetiker, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). If that burden is met, the burden then shifts to the applicant to overcome the prima facie case with argument and/or evidence. Obviousness is then determined on the basis of the evidence as a whole. See id.; 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).

The examiner's position (answer, page 4) is that APA does not disclose that a portion of insulating layer 6 remains over the second conductive line 5a. The examiner additionally asserts

(answer, pages 4 and 5) that APA does not teach the step of etching the remaining second portion for exposing the second lower level conductive line to a second contact hole. To overcome these deficiencies in APA, the examiner turns to Sandhu for a teaching of performing a first etch of inter-level insulating layer 42 while leaving the second lower conductive line covered with a second portion of the inter-layer insulating layer. The examiner adds (id.) that the remaining portion of the insulating layer protects the second lower conductive line from further processing to the first lower conductive line. Then, the remaining portion of the insulating layer 42 over the second conductive line is removed by etching the remaining second portion of the inter-layer film 42. The examiner takes the position (id.) that "[i]t would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of **APA** by partially etching through the dielectric layer **6** of **APA** (**42** in Sandhu) over the 'second lower-level conductive line' **5a** of **APA** (**16a**, **16b** in Sandhu), as taught in **Sandhu**, because leaving the second lower conductive lines unexposed would prevent the potential harmful effects occurring during additional processing of the first lower conductive lines **43**, **45** of **APA** (**36** in Sandhu), as taught in **Sandhu**."

Appellant asserts (reply brief, page 11) that one skilled in the art would not have been motivated to combine the teachings of the APA and Sandhu. Appellant argues (reply brief, page 14), that Sandhu's suspension of the first etching process and the addition of the etch stop layer 50 is to protect the silicide layer at the top elevation. It is further argued (reply brief, page 15) that in the APA, the second etching process is performed to remove the silicide layer 45 of word line 4b. This same etching process removes a portion of source/drain region 5a.

In Sandhu, the etch stop prevents the silicide layer from being removed. It is further argued (reply brief, pages 15-17) that because Sandhu is protecting the silicide layer, the etching is stopped to protect the silicide layer and not to prevent the source/drains from being damaged. Appellant further argues (reply brief, page 19) that the APA intentionally removes the silicide layer to decrease the resistance in the contact hole 8a. In contrast, Sandhu suspends the etching process and adds the etch stop layer 50 to prevent the removal of the silicide layer 45. If Sandhu were somehow combined with the APA, after the etching to the silicide layer was reached, an etch stop would be formed on layer 45. As a result, when the etching continued to expose the source/drain regions, none of the silicide layer would

have been removed. Appellant adds (reply brief, page 20) that "not removing the portion of the silicide layer 45 that is exposed via the contact hole 8a contradicts the APA's express purpose of reducing the resistance in the contact hole 8a. In fact, adding the etch stop layer 50 would actually increase the resistance in the contact hole 8a."

From our review of the APA and Sandhu, we find that the APA (figure 1b) teaches removal of the silicide layer 4b at the bottom of contact hole 8a. In Sandhu, it is disclosed that the etching stops at the high elevation conductive region outer surface 36 (col. 4, lines 62-65). Sandhu further discloses (col. 5, lines 2-5) selectively depositing an etch stop layer atop the outer surface 36 of the high elevation conductive region.

From the disclosures of APA and Sandhu, we find that APA teaches removing the silicide layer, whereas Sandhu teaches preventing removal of the silicide layer. Because APA teaches removing the silicide layer and Sandhu teaches keeping the silicide layer, we find that an artisan would not have been motivated to have combined the teachings of APA and Sandhu to arrive at the claimed invention, as advanced by the examiner.

Although Sandhu is directed to etching of contact openings through insulating dielectric layers to contacts on a wafer that is positioned at varying elevations (col. 1, lines 16-19), and discloses (col. 6, lines 16-19) that the invention protects the material at the higher bases of the contacts from further etching, and further discloses that the etching is stopped before the source/drain (active) regions 16a, 16b are reached (col. 4, lines 9-11), we find that the etching is stopped before the source/drain regions are reached, in order to protect the high contact elevations and not to protect the source/drain regions. Although the stopping of the etching at a point where insulation remains above the source/drain (active areas) is similar to the step performed by appellant, we find that this general teaching, because it for a different purpose, is not sufficient to suggest the claimed invention.

In our view, the only suggestion for modifying the APA in the manner proposed by the examiner to meet the above-noted limitations stems from hindsight knowledge derived from the appellant's own disclosure. The use of such hindsight knowledge to support an obviousness rejection under 35 U.S.C. § 103 is, of course, impermissible. See, for example, W. L. Gore and Assocs.,

Inc. v. Garlock, Inc., 721 F.2d 1540, 1553, 220 USPQ 303, 312-13 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984).

From all of the above, we find that the examiner has failed to establish a prima facie case of obviousness of claim 1. Accordingly, the rejection of claim 1, and claims 2-5, 7-25 which depend therefrom, is reversed. We likewise reverse the rejection of independent claim 40, as claim 40 recites limitations similar to those found in claim 1.

Turning to the rejection of claim 6 under 35 U.S.C. § 103(a) as unpatentable over APA in view of Sandhu, and further in view of Tatsumi, we reverse the rejection of claim 6 as the examiner has not shown how Tatsumi makes up for the deficiencies of the basic combination of APA and Sandhu.

CONCLUSION

To summarize, the decision of the examiner to reject claims 1-25 and 40 under 35 U.S.C. § 103(a) is reversed.

REVERSED

JERRY SMITH)	
Administrative Patent Judge)	
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)	BOARD OF PATENT
ANITA PELLMAN GROSS)	APPEALS
Administrative Patent Judge)	AND
)	INTERFERENCES
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