

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.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. 35

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte TING P. YEN, PAMELA S. TRAMMEL,
PHILIPPE SCHOENBORN, and ALEXANDER H. OWENS

Appeal No. 2000-1991
Application No. 08/587,417

ON BRIEF

Before FLEMING, LALL, and DIXON, Administrative Patent Judges.
LALL, 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, 5-10, 12-18, and 20-25,

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a photoresist layer having window openings over isolations areas to be formed in the silicon substrate, the silicon nitride layer and the pad oxide layer having respective thicknesses in a ratio of at least 10:1, (ii) growing a field oxide within the tapered recess such that an upper surface of the field oxide is substantially above an upper surface of the silicon substrate, without substantial formation of a bird's head, and (iii) removing the silicon nitride layer and the pad oxide layer from the silicon substrate. The invention is well illustrated in Figure 2 of the appellants' disclosure. The following claim further defines the invention.

1. A method of isolating a semiconductor device comprising the steps of:

forming a tapered recess in a silicon substrate having thereon, in sequential order, a pad oxide layer having a thickness between 3 nm and about 50 nm, a silicon nitride layer, and a photoresist layer having window openings over isolation areas to be formed in said silicon substrate, said silicon nitride layer and said pad oxide layer having respective thicknesses in a ratio of at least 10:1,

growing a field oxide within said tapered recess such that an upper surface of said field oxide is substantially above an upper surface of said silicon substrate, without substantial formation of a bird's head, and

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Shan et al. (Shan)	5,296,094	Mar. 22, 1994
Dahm et al. (Dahm)	5,431,778	Jul. 11, 1995
Fukunaga et al. (Fukunaga) (JP)	54-124986	Sep. 28, 1979
Aoyama et al. (Aoyama) (JP)	60-116146	Jun. 22, 1985

Wolf et al. (Wolf), "Silicon Processing for the VLSI Era," Vol. 1, pp. 528-534 (1986).

Claims 1, 5-10, 12-18 and 20-25 stand rejected under 35 U.S.C. § 112, first paragraph, for lack of enablement.

Claims 1, 5-10, 12-18 and 20-25 stand rejected under 35 U.S.C. 112, second paragraph, for being vague and indefinite.

Claims 1, 5, 6, 9, 10, 12 and 20-25 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Aoyama.

Claim 8 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Aoyama and Wolf.

Claims 9, 10, and 23-25 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Aoyama and Fukunaga.

Claims 7, 13-16, 18, 20 and 21 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Aoyama, Fukunaga, Chang, and Shan, or over Aoyama, Fukunaga and Dahm.

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Rather than repeat the arguments of appellants and the examiner, we make reference to the brief (Paper No. 33) and the examiner's answer (Paper No. 34) for the respective details thereof.

OPINION

We have considered the rejections advanced by the examiner and the supporting arguments. We have, likewise, reviewed the appellants' arguments set forth in the brief.

We reverse.

Interpretation of Claims

As pointed out by the Federal Circuit, we must first establish the scope of the claim. "[T]he name of the game is the claim" In re Hiniker Co., 150 F.3d 1362, 1369, 47 USPQ2d 1523, 1529 (Fed. Cir. 1998). Moreover, when interpreting a claim, words of the claim are generally given their ordinary and accustomed meaning unless it appears from the specification or the file history that they were used differently by the inventor. Carroll Touch, Inc. v. Electro Mechanical Sys., Inc., 15 F.3d 1573, 1577, 27 USPQ2d 1836, 1840 (Fed. Cir. 1993). Although an

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1475, 1480, 31 USPQ2d 1671, 1674 (Fed. Cir. 1994). Thus, we look first to the language of independent claims 1 and 23 on appeal to derive an understanding of the scope and content of the claim.

In the present invention, there is a disagreement between appellants and the examiner regarding the phrase "without substantial formation of a bird's head" as recited in both independent claims 1 and 23. The examiner seems to interpret this recitation (answer at page 4) as having no bird's head and asserts that appellants have not shown how applicants have achieved the result of no bird's head using a process similar to Aoyama's. We look to the disclosure, especially pages 8, 9 and 10, and we find that the bird's beak(head) is reduced substantially by the process of appellants. For instance, the bird's beak reduction is disclosed to be approximately 10-90%, (id. at page 9), and a reduction in the bird's beak encroachment of approximately 50% is achieved by appellants (id. at page 10). In light of the appellants' disclosure as noted above, we find that the "without substantial formation of a bird's head" phrase does not mean that there is no bird's head, rather it means that

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Again, we refer to the disclosure, especially at pages 7-10 and Figures 2 and 3. We find that the field oxide recited in claim 1 is indeed substantially above the part of the silicon substrate 30 in recess 38 as illustrated in Figure 2.

Rejection under 35 U.S.C. § 112, first paragraph, lack of enablement

The test for enablement is whether one skilled in the art could make and use the claimed invention from the disclosure coupled with information known in the art without undue experimentation. See United States v. Telectronics, Inc., 857 F.2d 778, 785, 8 USPQ2d 1217, 1223 (Fed. Cir. 1988) cert. denied, 109 S. Ct. 1954 (1989); In re Stephens, 529 F.2d 1343, 1345, 188 USPQ 659, 661 (CCPA 1976).

Thus, the dispositive issue is whether appellants' disclosure, considering the level of ordinary skill in the art as of the date of appellants' application, would have enabled a person of such skill to make and use appellants' invention without undue experimentation. The threshold step in resolving this issue is to determine whether the examiner has met his

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answer. The examiner alleges that the step of achieving no bird's beak is not disclosed adequately by appellants. The examiner further asserts that appellants have not disclosed that their disclosed process is of "not fully recessed" type which would have eliminated the bird's head (id. at page 4).

Appellants argue (brief at pages 6-15) that indeed the process disclosed by appellants would have enabled an artisan to obtain the recited substantially reduced bird's beak in the manufacture of the device claimed. Appellants discuss (id.) how a fully recessed process and a not fully recessed process would have been clear to an artisan reading the disclosure of appellants. However, we are of the opinion that the more relevant argument is (brief at page 8) that:

FIGS. 2B AND 3B of the currently pending application clearly illustrate an example of a field oxide that has an upper surface above an upper surface of the silicon substrate, but that is substantially without a bird's head. The specification provides an example of a method of forming a field oxide without substantial formation of bird's head.

The examiner in his response reiterates his position. We are of the view that consistent with the annunciations made by

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experimentation. Therefore, we do not sustain the lack of enablement rejection of claims 1, 5-10, 12-18 and 20-25.

Rejection under 35 U.S.C. § 112, second paragraph

The second paragraph of 35 U.S.C. § 112 requires claims to set out and circumscribe a particular area with a reasonable degree of precision and particularity. In re Johnson, 558 F.2d 1008, 1015, 194 USPQ 187, 193 (CCPA 1977). In making this determination, the definiteness of the language employed in the claims must be analyzed, not in a vacuum, but always in light of the teachings of the prior art and of the particular application disclosure as it would be interpreted by one possessing the ordinary level of skill in the pertinent art. Id.

The examiner's focus during examination of claims for compliance with the requirement for definiteness of 35 U.S.C. 112, second paragraph, is whether the claims meet the threshold requirements of clarity and precision, not whether more suitable language or modes of expression are available. Some latitude in the manner of expression and the aptness of terms is permitted even though the claim language is not as precise as the examiner

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with a reasonable degree of certainty, a rejection of the claims under 35 U.S.C. § 112, second paragraph, is appropriate.

The examiner rejects claims 1, 5-10, 12-18 and 20-25 under this ground of rejection on page 4 of the examiner's answer. The examiner asserts (id. at page 4) that "[o]ne of ordinary skill in the art would be unable to determine the meets [sic, metes] and bounds of 'substantial' in these contexts [referring to the words "substantially" and "substantial" in claim 1, lines 7-9, and the corresponding recitation in independent claim 23]." Appellants argue (brief at page 17) that:

[t]he only basis provided by the Examiner in support of the rejection is the conclusory statement that one of ordinary skill in the art would be unable to determine the meets [sic, metes] and bounds of "substantial" as recited in the claims. Clearly, the Examiner is attempting to shift the burden of proof back to Appellants, which is not proper.

We agree with appellants that the examiner has not given any explanation or support for the position that the claims do not convey to an artisan the metes and bounds of the claims. Mere allegation that the claims do not meet the requirements of metes and bounds is not adequate to support the rejection. We find,

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examiner's rejection of claims 1, 5-10, 12-18 and 20-25 under this ground of rejection.

Rejections under 35 U.S.C. 103(a)

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 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 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).

The appealed claims have been rejected by the examiner under the following various combinations of the applied references.

Aoyama

Claims 1, 5, 6, 9, 10, 12 and 20-25 are rejected over Aoyama

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times, and pad oxide and nitride thicknesses ranges are not taught [by Aoyama]." However, relying on the case law (id. at page 6), the examiner makes a wholesale statement of obviousness in the rejection of these claims. The examiner asserts (id.) that:

Therefore, it would have been obvious to optimize . . . in order to prevent bird's beak and prevent defects . . . It would have been obvious to optimize the RF power . . . It would have been obvious to choose applicants pad oxide and nitride thickness . . . It further would have been obvious to choose a larger pad oxide thickness . . . while reducing bird's beak compared to the prior art processes also taught in Aoyama"

Appellants respond in detail (brief at pages 22-32) to the assertions made by the examiner. Appellants argue (id. at page 29) that "[a]dditionally, the Examiner cites *In re Aller* for the proposition that optimization of process parameters is obvious. Again, the citation provided by the Examiner is taken out of context [footnotes omitted]." Appellants further advocate (id. at page 31) that:

the Appellants have satisfied both of the *Soni* prerequisites. The instant application describes substantially improved results in that "[t]he bird's

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oxide layer and a silicon nitride layer thereon, wherein the nitride:pad oxide thickness ratio is at least 10:1 **unexpectedly** did not increase the incidence of defects in the silicon substrate to a commercially unacceptable level [footnotes omitted]."

The examiner responds (answer at page 15) that "[h]owever, optimization is not the most compelling argument for the obviousness of appellant's [sic, appellants'] claimed pad oxide thickness. An even better argument is that appellant's [sic, appellants'] claimed range is very near Aoyama's claimed range." Also, the examiner responds (id. at page 16) that "Aoyama teaches that tapered sidewalls prevent defects and that a thin pad oxide reduces birds beak . . . Therefore, appellant's [sic, appellants'] disclosure does not teach any benefits not already known in the prior art and clearly does not provide unexpected results." Regarding the declaration, the examiner responds (id. at page 15) that "[r]ather, appellant[s] merely submitted a subjective declaration which did not provide any objective showing of criticality whatsoever Therefore, the claims are not commensurate in scope with any showing of critical pad oxide thicknesses."

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Aoyama does not discuss the nature of a result effective variable as regards to the interrelationship of the slope of the recess, the thickness of the pad oxide, and the thickness of the silicon nitride. Therefore, we do not sustain the obviousness rejection of claims 1, 5, 6, 9, 10, 12 and 20-25 over Aoyama.

Aoyama and Wolf

In rejecting claim 8 (answer at page 7), the examiner uses Wolf for the teaching of wet etching to the disclosure of Aoyama. However, since Wolf does not cure the deficiency of Aoyama, the combination of Aoyama and Wolf does not meet the limitation recited in claim 8. Therefore, we do not sustain the rejection of claim 8.

Aoyama and Fukunaga

The examiner rejects claims 9, 10 and 23-25 under this combination at page 8 of the examiner's answer. The examiner asserts (id.) that "Fukunaga teaches that a tapered sidewall should be used to prevent bird's beak (see Purpose and Constitution)." Appellants argue (brief at page 33) that "Fukunaga fails to cure the deficiencies of Aoyama. Fukunaga

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We agree with appellants' position. Since Fukunaga does not cure the deficiencies of Aoyama, the combination of Aoyama and Fukunaga cannot sustain the rejection of claims 9, 10 and 23-25.

Aoyama, Fukunaga, Chang and Shan, or, Aoyama, Fukunaga and Dahm

In rejecting claims 7, 13-16, 18, 20 and 21 over this ground of rejection (answer at pages 8 and 9), the examiner uses Chang for the teaching of C_2F_6/CHF_3 being a well known etchant for silicon oxide, Shan for showing that oxygen is used in combination with fluorocarbons to etch silicon, and that Dahm teaches oxygen and C_2F_6 or CHF_3 may be used as etchants for silicon layers. Since none of these references, adding to the teaching of Aoyama, cure the deficiency of Aoyama noted above regarding the various thicknesses and the slope of the incline, the rejection of these claims under this ground is not sustained.

Aoyama, Fukunaga, Chang and Shan, or, Aoyama, Fukunaga and Dahm, each combination with the addition of Wolf

The examiner rejects claim 17 (answer at page 9) by employing the wet etching teaching of Wolf to the teachings of the combination of Aoyama, Fukunaga, Chang, and Shan or the

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these combinations, the rejection of claim 17 is also not sustained.

In summary, the rejection of claims 1, 5-10, 12-18 and 20-25 under 35 U.S.C. § 112, first paragraph, for lack of enablement is not sustained; the rejection of claims 1, 5-10, 12-18 and 20-25 under 35 U.S.C. § 112, second paragraph, is not sustained; the rejection of claims 1, 5, 6, 9, 10, 12 and 20-25 under 35 U.S.C. § 103(a) over Aoyama is not sustained. Neither is the rejection of claim 8 over Aoyama and Wolf sustained; nor the rejection of claims 9, 10, 23-25 over Aoyama and Fukunaga is sustained; nor the rejection of claims 7, 13-16, 18, 20 and 21 over Aoyama, Fukunaga, Chang and Shan is sustained or over Aoyama, Fukunaga and Dahm is sustained; nor the rejection of claim 17 over Aoyama, Fukunaga, Chang, Shan and Wolf; or Aoyama, Fukunaga, Dahm and Wolf.

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The decision of the examiner is reversed.

REVERSED

Michael R. Fleming)	
Administrative Patent Judge)	
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Parshotam S. Lall)	BOARD OF PATENT
Administrative Patent Judge)	APPEALS AND
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