BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS	**BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE**	**CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS**

Internal distribution code:
(A) [ ] Publication in OJ
(B) [ ] To Chairmen and Members
(C) [X] To Chairmen

DECISION
of 15 April 1999

Case Number: T 0031/99 - 3.4.2

Application Number: 88113392.0

Publication Number: 0304046

IPC: G03F 7/26

Language of the proceedings: EN

Title of invention:
A method of stripping a resist mask

Applicant:
Fujitsu Limited

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 123(2), 84

Keyword:
"Subject-matter extended - no"
"Claims - clarity (yes) - essential features"

Decisions cited:
-

Catchword:
-

Case Number: T 0031/99 - 3.4.2

DECISION
of the Technical Board of Appeal 3.4.2
of 15 April 1999

Appellant:

Fujitsu Limited
1015, Kamikodanaka
Nakahara-ku
Kawasaki-shi
Kanagawa 211 (JP)

Representative:

Seeger, Wolfgang, Dipl.-Phys.
Seeger & Seeger
Patentanwälte & European Patent Attorneys
Georg-Hager-Strasse 40
81369 München (DE)

Decision under appeal:

Decision of the Examining Division of the European Patent Office posted 29 June 1998 refusing European patent application No. 88 113 392.0 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: E. Turrini
Members: M. A. Rayner
B. J. Schachenmann

Summary of Facts and Submissions

I. The appeal is against the decision of the Examining Division refusing European patent application No. 88 113 392.0. The reason given for the refusal was that Claim 1 according to the main request infringed Article 123(2) EPC because the word "used" was deleted from the first line of claim 1 as filed. Moreover, the examining division decided that claim 1 does not satisfy Article 84 EPC because it does not contain all the essential features of the invention.

II. According to section 1 of the reasons for the decision of the examining division concerning Article 123(2) EPC, the application as originally filed did not disclose that the method of removing a used resist can also be applied to remove unused resist. The division reasoned that removing used resist is restricted to a step following exposure to light, whereas removing resist in general is not restricted to a lithography technique for fabricating semiconductor devices. The division argued that the application as filed does not contain any teaching whatsoever to apply the method to a technique other than a photolithography technique for fabricating semiconductor devices. The examining division referred to page 1, lines 10 to 15 and page 9, lines 9 to 23 in support of its view. The division also referred to removal of aluminium with the method.

According to section 2 of the reasons for the decision of the examining division concerning Article 84 EPC, use for removing used resist is presented as an essential feature of the invention, page 2 lines 21 to 24 of the application as filed, referring to a general object of the invention and including this feature. The division went on to explain that page 2 lines 21 to 24 state clearly and unambiguously that removal of used resist is an essential feature of the invention. Moreover, a method for stripping only non-used resist is not disclosed in the application as originally filed. In addition, it can be derived from page 1, line 4 to page 2, line 19 that the invention is directed to a stripping method for stripping a used resist off a semiconductor wafer. As a consequence, since claim 1 does not contain this feature, it does not meet the requirement, deriving from Article 84 EPC, of including all the technical features essential to the invention.

During the course of the examination proceedings the examining division did nevertheless indicate that if hardened (used) resist can be removed with the method according to claim 1, a fortiori non-hardened (unused) resist can also be removed (see point 1 of the communication dated 16 January 1996). Moreover, the division indicated that the subject matter of the claim filed with the letter of 24 December 1993 seemed to meet the requirements as to novelty and inventive step (see point 1 of the communication dated 18 May 1995), subject to an amendment to remove a lack of clarity in the last feature of the claim, for example according to a suggestion given (see point 5 of the communication of 16 January 1996).

III. In the statement of appeal, the patent applicant (appellant) submitted that the assumption that the original disclosure was restricted to the removal of used resist was not correct. In support of this submission, the appellant referred to the title of the application as well as to page 1, lines 7 to 9, i.e. the first sentence of the description referring to a resist mask. Moreover, the appellant referred to the objects of the invention and to the statement beginning "According to the present invention..." on page 3, lines 10 to 19 as well as the description of the drawings and the preferred embodiments.

IV. Claim 1 as submitted with the main request in the statement of appeal is the same as the claim 1 dealt with in the refusal decision of the examining division and is worded as follows:

"1. A method for removing an organic resist on a semiconductor wafer, the method employing a downstream ashing apparatus that comprises a plasma generating chamber, a reaction chamber and a shield for confining an electromagnetic power within the plasma generating chamber but allowing electrically neutral reactive species generated in plasma to flow into the reactive chamber the method comprising the steps of:

(a) placing the semiconductor wafer in the reaction chamber;

(b) introducing an oxygen gas and an electromagnetic power into the plasma generating chamber so as to generate a gas plasma therein, and

(c) introducing the electrically neutral reactive species toward the semiconductor wafer, characterised in that the electrically neutral reactive species react with the organic resist on the semiconductor wafer while the semiconductor wafer is protected from being bombarded by electrically charged particles generated in the plasma, and

that water vapour is introduced to lower an activation energy of the reaction with the organic resist."

The main request of the Appellant is that the decision under appeal be set aside and a patent granted on the basis of this claim together with the other documents as on file.

V. The Appellant requested, as auxiliary request, substitution of claim 1 by the claim designated auxiliary claim 1 and filed with the appeal statement on 22 October 1998.

Reasons for the Decision

1. The appeal is admissible.

Main Request

2. *Article 123(2) EPC*

2.1 In the view of the Board, the amendments made comply with Article 123(2) EPC.

2.2 All the features in the present Claims 1 to 14 can be found in the originally filed application (see for example the first sentence of the description; page 4, line 20 to page 5, line 10; page 6, lines 7 to 16; page 7, lines 16 to 24; page 8, lines 5 to 25; page 9, lines 10 to 24; page 10, lines 5 to 8; the claims and Figures 1, 2 and 4).

2.3 In the view of the Board, the objection raised against claim 1 under Article 123(2) EPC (see paragraph 1 of the reasons given in the decision under appeal) cannot be upheld. In particular, the deletion of the word "**used**" in the phrase "for removing a used organic resist" which appeared in the original Claim 1 and which constituted the sole reason for the refusal in relation to Article 123(2) EPC does not contravene this article because support for this deletion is contained in the application as filed. This is because the sentence contained in lines 7 to 9 of the introduction constituting the beginning of the description recites: "This invention relates to an improvement of a method of stripping a resist mask (referred to hereinafter as ashing)." Accordingly, the skilled person learns that this is the field of application of the invention. The word "**used**" does not occur in this sentence so the field of application of the invention is not limited thereto. Consequently, the skilled person has no reason to believe from this sentence that the invention should be applied exclusively to a used resist. In addition, the statement of invention contained in the consistory clause in page 3, lines 10 to 12 as filed does not contain any reference to "used".

2.4 Moreover, the description of the drawings does not mention "used" resist and in relation to Figures 2 to 4 makes reference to ashing rate. In the entire description of the preferred embodiments from page 4, line 15 to page 12, line 14, "used" resist is not mentioned. "Ashing" is mentioned a number of times in the detailed description, for example page 4, line 20 and page 9, lines 6 and 8. In both of the last cases, as well as in other places, the "resist" is mentioned. The skilled person knows from the first sentence of the description that "ashing" means "stripping a resist mask". The "ashing" is not therefore limited to a "used" resist mask.

2.5 Parts of the application as filed mentioned in the reasons for the decision under appeal in relation to Article 123(2) EPC are page 1, lines 10 to 15, which is a passage relating to the prior art and page 9, lines 9 to 23, which is a passage occurring in the part of the application describing at least one way of carrying out the invention (cf. Rule 27(1)(e) EPC). The passages were cited by the examining division to demonstrate that the application as filed does not contain any teaching whatsoever to apply the method to a technique other than a photolithography technique for fabricating semiconductor devices. The decision of the division does not however explain why photolithographic techniques for fabricating semiconductor devices include stripping exclusively of used resist and neither do the passages cited even show the invention is limited to such techniques. The first sentence of the first of these passages recites that "as is well known, a mask made of an organic photoresist etc., is necessarily employed in a photo lithography technique for fabricating semiconductor devices, etc..". This sentence in fact means that it is the photo lithography technique which requires a mask, the converse is not necessarily true because this wording does not limit the mask to employment in a photo lithography technique for fabricating semiconductor devices, **etc**. The last sentence of the second passage cited by the examining division makes reference to there no longer being an undesirable etching problem according to the invention. However, since this reference occurs in the part of the detailed description relating to at least one way of carrying out the invention, it does not require that the invention must include features pertaining to the undesirable etching problem. Therefore, the passages relied on by the examining division do not offer any barrier under Article 123(2) EPC to deletion of the word "used".

2.6 The decision under appeal also makes reference by way of illustration to the method of claim 1 being used to remove not only resist but also an aluminium layer. However, since claim 1 does not mention aluminium, the board cannot ascribe any relevance in the sense of Article 123(2) EPC to this reference.

2.7 The reasoning of the division in section 2 of the reasons for the decision concerning used resist being an essential feature of the invention is dealt with in section 3 below. So far as this reasoning can be understood to refer to Article 123(2) EPC, the board makes the following observations. Claim 1 is not directed to a method for stripping **only** non-used resist so that the issue of the original disclosure of **only** non-used resist is not relevant. A method of stripping a resist mask on the other hand is disclosed as mentioned in points 2.3 and 2.4 above. Moreover, page 2, lines 21 to 24 do not state clearly and unambiguously that removal of used resist is an essential feature of the invention, this passage in fact relates to one among a number of objects to which the invention is directed and not to a definition of the invention.

3. *Article 84 EPC (Clarity)*

3.1 In the view of the Board, claim 1 does not lack an essential feature causing it not to be clear within the meaning of Article 84 EPC.

3.2 The application as filed from line 10 on page 1 to line 19 on page 2 is concerned with the prior art and discusses a dry etching method and apparatus for processing a silicon wafer etc. The reaction gas used therein for ashing the organic photoresist is for example an oxygen gas including CF_4 and it is explained that it is not always easy to remove used resist because it has been exposed to light in an exposure process and plasma in a prior silicon etching process and thus is hardened. Another problem is that CF_4 undesirably etches the silicon wafer. In addition, increasing the ashing rate is presented as desirable. Thus, the skilled person becomes aware of particular problems of the prior art addressed by the application.

3.3 The statement of invention contained in lines 10 to 14 as filed recites the steps which in the applicants view were necessary to overcome the problems mentioned, reciting particularly that in a downstream ashing apparatus water vapour is added. This subject matter is thus presented as the essential difference from the prior art and is said to increase ashing rate. The skilled person therefore knows that this is the substance of the solution to the problems underlying the prior art. The appeal board then sees no good reason why the solution to the problems of the prior art must also involve features associated with the underlying problems of the prior art, e.g. in the present case use of CF_4, silicon and particularly used resist, which features once the invention is made are not essential for its definition. Accordingly, the appeal board does not consider the reference to "used" resist to be an essential feature of the invention, so that its deletion from claim 1 does not cause a lack of clarity.

3.4 The examining division relied mainly on the first object of the invention, designated as a "general" object to show that removing a "used" organic resist on a semiconductor wafer is essential to the invention so that its deletion in claim 1 rendered this claim unclear. However, it is not the object to be achieved by the invention which defines the essential features thereof, but the measures needed to achieve this object. Therefore, in the present case, although the method can advantageously be applied to a used resist, limitation solely thereto is not necessary. It is the method steps necessary for stripping a resist mask which are essential and these steps are specified in claim 1, in particular, the addition of water vapour to lower activation energy. It is moreover apparent from the remark of the examining division mentioned in the first sentence of the second paragraph of II above that the skilled person knows that the method claimed can be applied to resist whether it is used or unused, giving a strong indication that application to used resist is not essential.

3.5 The issues involved can also be illustrated by reference to the fourth object of the invention pertaining to avoiding undesirable etching of silicon. In this case, limitation to silicon as an essential feature consequent to the fourth object is plainly not necessary because the skilled person knows that etching properties not exclusively of silicon are effected by the method. In this context, the board observes that the use of the word "general" in association with the first object of the invention does not promote it alone in comparison to the other three objects to an "essential" feature, the other three objects are not necessarily "ranked" lower by virtue of being introduced by words such as "another", "still another" and "further". What is more significant is that features achieving the objects are recited in the claims.

3.6 So far as the reference to "used" occurs in the part of the description discussing the prior art, the board attaches less relevance to them for defining essential features than to parts of the description relating to the invention. In the present case, the board can find no good reason for transferring any teaching specific to the prior art to being an essential feature of the invention.

4. *Novelty and Inventive step*

4.1 Since an amendment meeting the objection of lack of clarity in a claim indicated by the examining division otherwise as satisfying the requirements of Articles 54 and 56 EPC was made in the claim dealt with in the refusal decision, the board considers it, having regard to Article 111(1) EPC, more appropriate to exercise favourably the power of the division in this respect than to remit the case back to the division for further prosecution of novelty and inventive step. In doing so, the board has convinced itself that the documents of the main request meet the requirements of the Convention.

5. *Auxiliary request*

5.1 Furthermore, since the main request does not give rise to objection, it is not necessary to consider the auxiliary request.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to grant a patent in accordance with the main request of the Appellant as follows:

Description: page 1, 12 filed with the letter of 13 April 1999
pages 2 to 3 filed with the letter of 16 July 1996
pages 4 to 11 as originally filed

Claims: claim 1 filed with the appeal statement on 22 October 1998
claims 2 to 14 filed with the letter of 18 September 1995

Drawings: Sheets 1/3-3/3 as originally filed.

The Registrar: The Chairman:

P. Martorana E. Turrini