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Datasheet for the decision of 5 May 2009

Case Number: T 0529/06 - 3.4.03

Application Number: 03252169.2

Publication Number: 1355347

IPC: H01L 21/00

Language of the proceedings: EN

Title of invention:
Workpiece holder for semiconductor manufacturing apparatus

Applicant:
Sumitomo Electric Industries, Ltd.

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 123(2)

Relevant legal provisions (EPC 1973):
EPC Art. 56

Keyword:
"Added subject-matter (yes) - main request"
"Inventive step (no) - auxiliary request"

Decisions cited:
-

Catchword:
-

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Case Number: T 0529/06 - 3.4.03

D E C I S I O N
of the Technical Board of Appeal 3.4.03
of 5 May 2009

Appellant: Sumitomo Electric Industries, Ltd.
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 17 November 2005 refusing European patent application No. 03252169.2 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: G. Eliasson
Members: R. Q. Bekkering
P. Mühlens

Summary of Facts and Submissions

I. This is an appeal against the refusal of application 03 252 169 for added subject-matter, Article 123(2) EPC, (main request) and lack of an inventive step, Article 56 EPC, (auxiliary request) over

D1: US 6 310 755 B

II. Oral proceedings were held in the absence of the appellant applicant, of which the board had been informed in advance.

III. The appellant requested in writing that the decision under appeal be set aside and a patent granted on the basis of the following:

Main request: claims 1 to 5 filed with the statement setting out the grounds of appeal (corresponding to the claims of the main request as refused), or

1st auxiliary request: claims 1 to 5 filed with the statement setting out the grounds of appeal (corresponding to the claims of the auxiliary request as refused).

IV. Claim 1 of the main request reads as follows:

"*A retaining member for use in a semiconductor manufacturing apparatus, the retaining member being composed of a wafer holder made of a ceramic and including a resistive heating element, and a support member for supporting the wafer holder, characterised in that the wafer holder is made of AlN or contains AlN*

as a principal component, the support member is made of AlN or contains AlN as a principal component, and the thermal conductivity of the support member is lower than that of the wafer holder."

Claim 1 of the 1st auxiliary request reads as follows:

"*A retaining member for use in a semiconductor manufacturing apparatus, the retaining member being composed of a wafer holder made of a ceramic and including a resistive heating element, and a support member for supporting the wafer holder, characterised in that the wafer holder is made of AlN or contains AlN as a principal component, and the thermal conductivity of the support member is lower than that of the wafer holder, and the wafer holder and the support member are not joined.*"

V. The appellant applicant argued as follows:

Contrary to the Examining Divisions finding, the claimed wording according to the main request did not add any new matter to the application as originally filed. In particular, support for the claim could be found in the specification as filed having regard to original claims 1, 3 and 4, and the description in the paragraph bridging pages 5 and 6, page 9, lines 9 to 13, page 17, lines 9 to 23, page 19, line 23, page 20, lines 14 and 15, and page 21, lines 3 and 4. The skilled person reading the specification would consider that it did disclose the possibility of a support member made of AIN or containing AIN as a principal component.

Moreover, all of the claims complied with the requirements of Articles 52(1) and 56 EPC. In particular, Dl did not disclose: (i) that the thermal conductivity of the support member is lower than that of the wafer holder; (ii) the provision of a resistive heating element in the wafer holder; and (iii) a wafer holder that is not joined to the support member. It was not apparent that there would have been any motivation for one skilled in the art to modify the disclosure of Dl in these three respects with a view to arriving at the subject-matter of claim 1. Therefore, claim 1 was not obvious over Dl.

Reasons for the Decision

1. The appeal is admissible.

2. *Main request*

2.1 *Amendments*

The feature of claim 1 as amended that "*the support member is made of AlN or contains AlN as a principal component*" in combination with the remaining features of the claim, in particular the feature that "*the thermal conductivity of the support member is lower than that of the wafer holder*" extends beyond the content of the application as originally filed, contrary to the requirements of Article 123(2) EPC.

As to the parts of the application as originally filed referred to by the appellant, the following is noted:

Claims 1, 3 and 4, the paragraph bridging pages 5 and 6 and page 9, lines 9 to 13 all relate to the material of the wafer holder.

The description, page 17, lines 9 to 23 discloses a support member made of a mixture of 5 weight % of Al_2O_3 powder added to AlN powder of embodiment 1 (ie AlN with 0.5 weight % Yttrium oxide and an organic binder (page 10, lines 13 to 16)). The wafer holder is made of AlN as in embodiment 1.

The feature of claim 1 as amended that "*the support member is made of AlN or contains AlN as a principal component*" constitutes an undue generalisation of the above-disclosed specific composition and thus introduces matter extending beyond this disclosure.

Finally, page 19, line 23, page 20, lines 14 and 15 and page 21, lines 3 and 4 of the description disclose examples wherein the support member is made of the same AlN as the wafer holder. The thermal conductivities of the support member and the wafer holder are the same (see comparative example 1: page 19, line 21 to page 20, line 3). The wafer holder and support member in comparative examples 2 and 3 are fabricated by the same method as with comparative example 1 (page 20, line 11 to page 21, line 11).

Accordingly, claim 1 as amended contains subject-matter which extends beyond the content of the application as filed, contrary to the requirements of Article 123(2) EPC.

3. *1st auxiliary request*

3.1 *Novelty*

3.1.1 *Document D1*

Document D1 discloses a chuck comprising an electrostatic member (100), a base (175) and a support (190). A resistive heating element (255) may be embedded in the base (figure 2; column 10, lines 22 to 37).

The electrostatic member (100) may be made of a ceramic material. Suitable high temperature materials include ceramics such as for example, one or more of aluminum oxide, aluminum nitride, silicon nitride, silicon dioxide, titanium dioxide, zirconium oxide, or mixtures thereof. Generally, aluminum nitride is preferred for its high thermal conductivity which provides high heat transfer rates from the substrate to the electrostatic chuck (column 6, lines 1-2; column 12, line 56 to column 13, line 12).

The base (175) may be made of a porous ceramic with eg metal infiltrated in the pores. Suitable ceramic materials include one or more of aluminum oxide, aluminum nitride, boron carbide, carbon, cordierite, mullite, silicon carbide, silicon nitride, silicon dioxide and zirconium oxide. Suitable metals for infiltrating the porous ceramic include aluminum, copper, iron, molybdenum, titanium, tungsten or alloys thereof (column 5, lines 48 to 53; column 6, lines 10 to 13; column 15, lines 6 to 10). Alternatively, as shown in figure 5, the base (175) comprises a thermally

insulating material such as a ceramic member that thermally insulates the electrostatic chuck from the surface of the chamber or the support (190) (column 7, lines 37 to 41). Suitable ceramic materials are, for example, aluminum oxide, aluminum nitride, boron carbide, carbon, cordierite, mullite, silicon carbide, silicon nitride, silicon dioxide and zirconium oxide (column 8, lines 3 to 7).

The support (190) comprises a ceramic, metal, or composite or mixture of ceramic and metal, including by way of example, one or more of aluminum oxide, aluminum nitride, boron carbide, carbon, cordierite, mullite, silicon carbide, silicon nitride, silicon dioxide, zirconium oxide, aluminum, copper, molybdenum, titanium, tungsten, zirconium and mixtures thereof (column 11, lines 9 to 16). The support serves as a thermal insulator or thermal conductor depending upon the desired temperature of the substrate (column 10, lines 60 to 67).

Bonding between the base and the support is suggested in order to improve heat transfer and to reduce mechanical stress (column 8, lines 22 to 53).

Accepting that in view of the many materials disclosed in D1, the skilled person would have to make an appropriate selection of the materials for the wafer holder and the support member, the subject-matter of claim 1 differs from D1 by the features of the characterising portion of claim 1.

The subject-matter of claim 1 is, thus, novel over document D1 (Article 54(1), (2) EPC 1973).

3.2 *Inventive step*

3.2.1 Document D1 constitutes the closest prior art.

The claimed materials provide for the required isothermal properties of the chuck. As to claim feature that the wafer holder and the support member are not joined, according to the application the effect hereof is that thermal stress between the two parts is avoided (description, page 8, lines 4 to 6).

Accordingly, the objective problem to be solved relative to document D1 may be formulated as to select the appropriate materials for the wafer holder and the support member based on the desired application for the chuck and to decide on the appropriate assembling.

3.2.2 For applications such as resist baking, requiring a heated wafer holder, it would be obvious to a person skilled in the art to choose AlN for the wafer holder (electrostatic member) as its high thermal conductivity provides high heat transfer within the wafer holder. Moreover, it would be obvious to the skilled person to thermally insulate the heated wafer holder from the chamber and, thus, to select for the support member a material having a lower thermal conductivity.

Furthermore, as to claimed feature that the wafer holder and the support member are not joined, in document D1 bonding between the base and the support is suggested in order to improve heat transfer and to reduce mechanical stress (column 8, lines 22 to 53).

It would however be obvious to a person skilled in the art that such bonding is not desirable if thermal insulation of the wafer holder as discussed above is wanted or if stress induced damage is observed. Not joining the parts is a solution which would readily occur to the skilled person.

Accordingly, the subject-matter of claim 1 of the auxiliary request lacks an inventive step in the sense of Article 56 EPC 1973.

Order

For these reasons it is decided that:

The appeal is dismissed.

Registrar Chair

S. Sánchez Chiquero G. Eliasson