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D E C I S I O N
of 1 December 2004

Case Number: T 0780/02 - 3.4.3

Application Number: 96916442.5

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Title of invention:
Slip free vertical rack design

Applicant:
Saint-Gobain Industrial Ceramics, Inc.

Opponent:

-

Headword:
Slip free vertical rack design/SAINT-GOBAIN

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (main request) - no"
"Inventive step (auxiliary request) - no"

Decisions cited:
G 0006/88

Catchword:

-



Case Number: T 0780/02 - 3.4.3

D E C I S I O N
of the Technical Board of Appeal 3.4.3
of 1 December 2004

Appellant: Saint-Gobain
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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 5 July 2001
refusing European application No. 96916442.5
pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: R. K. Shukla
Members: E. Wolff
M. B. Günzel

Summary of Facts and Submissions

I. This is an appeal against the decision of the examining division, posted 5 July 2001, to refuse European patent application No. 96 916 442.5 for lack of an inventive step with regard to document

D2: Patent abstracts of Japan of JP-A-06 349758 and its English translation, document D2*.

II. The notice of appeal was filed on 6 August 2001 and the appeal fee was paid on the same day. The statement setting out the grounds of appeal was filed on 2 November 2001. The appellant requested the grant of a patent on the basis of claims 1 to 12 according to the main request or claims 1 to 10 of the first auxiliary request, which requests formed the basis of the contested decision.

III. On 12 March 2004 the Board issued a written communication. In it the Board expressed the preliminary view that the invention claimed in claim 1 of the main request and the invention claimed in claim 1 of the auxiliary request was not new or, if considered new, did not involve an inventive step. In response to this communication the appellant submitted further arguments and requested oral proceedings which were held on 1 December 2004.

IV. The only independent claim of the main request, claim 1, has the following wording:

"1. A vertical rack for supporting a plurality of semiconductor wafers in a spaced, substantially horizontal, parallel relation, the vertical rack comprising

a) a vertical support means comprising:

i) a plurality of vertical rods, each rod having an upper end and a lower end,

ii) a top plate, and

iii) a bottom plate,

the upper end of each rod being fixed to the top plate and the lower end of each rod being fixed to the bottom plate (sic), and

b) a plurality of vertically spaced, wafer support means comprising an arm extending horizontally from the vertical support means to define a plurality of support levels for supporting the wafers, wherein the wafer support means are projections projecting horizontally to continuously contact the wafer from the wafer edge characterized in that the innermost contact between at least one of the arms at each support level and its supported wafer is in the region between 20% end (sic) 80% of the wafer radius, measured from the edge of the wafer."

The only independent claim of the auxiliary request, claim 1, has the following wording:

"1. A vertical rack for supporting a plurality of semiconductor wafers in a spaced, substantially horizontal, parallel relation, the vertical rack comprising

a) a vertical support means comprising: -

i) a plurality of vertical rods, each rod having an upper end and a lower end,

ii) a top plate, and

iii) a bottom plate,

the upper end of each rod being fixed to the top plate and the lower end of each rod being fixed to the bottom place (sic), and

b) a plurality of vertically spaced, wafer support means comprising an arm and extending horizontally from the vertical support means to define a plurality of support levels for supporting the wafers, wherein the wafer support means are projections projecting horizontally to continuously contact the wafer from the wafer edge characterized in that the innermost contact between at least one of the arms at each support level and its supported wafer is in the region between 33% and 60% of the wafer radius, measured from the edge of the wafer."

V. The arguments put forward by the appellant can be summarised as follows. Document D2 relied on by the examining division and the Board of Appeal is concerned with providing a wafer rack for holding wafers of varying diameters, in order not to have to manufacture several different types of rack each corresponding to a particular wafer diameter. Document D2 is not concerned with the avoidance of slip in the wafers. Moreover, unlike claim 1 of the application in suit, document D2 neither indicates that the wafer should be supported by the support arm over between 20% and 80% of its radius or, in the case of the auxiliary request 33% to 66% of the wafer radius, nor does document D2 mention that the support arm should be in continuous contact with the wafer from the outer edge of the wafer to the end point of the support arm. Consequently document D2 does not disclose all the features of the claimed invention. A

calculation may show that if the rack of document D2 is designed to accommodate wafers of several standard wafer sizes then support arms designed to support the smallest of the wafers may in the case of one or more of the intermediate wafers terminate within the claimed range of between 20% and 80% of the wafer diameter. However, this is not inevitably so. It follows that the invention claimed in the claim 1 of both the main and auxiliary requests, is new.

Concerning the alleged lack of an inventive step, not only does document D2 not deal with the problem of avoiding slip but, instead, it deals only with the practicability of supporting wafers of different diameters in the same boat. There is no indication whatsoever that the man skilled in the art should consider supporting arms which support the wafer from the outside continuously inwards over the ranges claimed in claim 1 of the main request and claim 1 of the auxiliary request, respectively. The invention was therefore not obvious.

Reasons for the Decision

1. The appeal is admissible.

The main request

2. *Novelty*
 - 2.1 Document D2 is to be considered the closest prior art. It discloses a wafer support arrangement in which a plurality of levels of horizontally extending arms

project inwardly from vertically extending support rods. The arms are sufficiently long to support wafers of different diameters (c.f. document D2, title; document D2*, page 3, paragraph [0010]). The arms of the wafer support arrangement, or boat, are formed by cutting deep trenches into the vertically extending support arms along planes perpendicular to the centre line of the boat (document D2, last sentence; document D2*, page 4, paragraph [0016]).

2.2 The invention as claimed in claim 1 is distinguished from the prior art disclosure in document D2 in that there is no explicit disclosure of a defined range of lengths of the arms (20% to 80% of the radius for the main request) and of continuous contact with the wafer in document D2. It was common ground that wafers generally come in standard sizes (the sizes referred to by the appellant being diameters of 100 mm, 150 mm, 200 mm, 250 mm and, possibly, 300 mm), and that the skilled person reading the document D2 would do so with standard sizes such as these in mind.

2.3 The appellant argued that document D2 required of the notches merely that they had to be sufficiently deep to accommodate wafers of different diameters. There was no mention of slip in document D2, nor any mention of the arms having to support the wafer from the edge to between 20% and 80% of the radius of the wafer, nor any indication in document D2 that the contact between the wafer and the arms should be continuous along their whole length. The Board accepts that, although for some wafers and some particular chosen lengths for the supporting arms, the support by the arm will in some cases fall accidentally within the range of 20% to 80%,

this does not happen inevitably as a result of carrying out the instructions of document D2. The Board therefore concludes that the subject-matter of claim 1 of the main request is novel.

3. *Inventive step*

3.1 Of the prior art documents cited during the examination, the wafer support in document D2 is structurally the closest wafer support arrangement.

3.2 As was already remarked by the examining division, document D2 refers to the ability of the wafer support system described there of supporting wafers of a maximum size, a minimum size and wafers of any diameters which are intermediate between these two extreme values. It was not disputed by the appellant that the skilled person reading document D2 would read that document in the light of his knowledge of the standard wafer sizes. The diameters corresponding to these standard wafer sizes were referred to by the appellant as being 100 mm, 150 mm, 200 mm, 250 mm and 300 mm.

3.3 The appellant further accepted that with these standard wafer sizes it may happen that, for one or more of the intermediate wafers sizes the support arm would terminate within the claimed range of 20% to 80% of the radius as measured from the outside edge of the wafer. The appellant, however, did not consider that the mere fact that some of the wafers would be supported between 20% and 80% of their radius, could deprive the claimed invention of an inventive step, for which he gave several reasons. First document D2 contains no

indication of the problem of wafer slip, and concerns itself only with the practicability of supporting wafers of a range of different diameters. Secondly, there was no hint in document D2 that the skilled person should search for a particular range of diameters in order to prevent such slip. Thirdly since document D2 gives no explicit dimensions, any calculation which the skilled person might perform concerning the range of percentages over which different wafers would be supported, depended on the range of the wafers chosen and the relative length in relation to the chosen wafers of the support arms. Thus, if for a given length of support arm the radial percentages over which this arm would support the wafers are, for example, 95%, 75%, 33%, 4%, these percentages will change if the inner most point of the arm terminates at a different radius. Thus, D2 was "elastic" meaning that the percentages of the radius over which a given support arm supports a wafer depends both on the diameter of the wafer, and the length of the wafer support arm.

- 3.4 The Board does not consider the appellant's argument persuasive. It is true that, when considering novelty, it is not inevitable that for any given choice of standard diameters, which historically included wafers as small as 15 mm in diameter and less, wafers of intermediate diameters would inevitably be supported within the claimed range of 20% to 80% of their diameter. However the Board has no doubt that the skilled person reading document D2 at the priority date of the application in suit would read the document in the light of wafers most likely to be used in manufacturing. Thus, the Board considers that, the

skilled person reading document D2 would do so with the wafer sizes most commonly encountered in the manufacture of semiconductor devices prevalent at the time. In the case of the application in suit he would, in the Board's view, consider wafers falling within the range of 100 mm to 300 mm as being the wafer sizes which the arrangement of document D2 should support. As shown in Figure 2 of document D2 the wafer arms are dimensioned as follows. The largest wafer that can be accommodated abuts against the columns into which the grooves holding the wafers are cut, as shown by circle a in Figure 2 of document D2. The smallest of the wafer sizes is supported by a narrow region near the inner end of each of the support arms. Contemplating the ratios of diameters of wafers in the size range of 100 mm to 300 mm diameter, a simple calculation shows that for any combination of four or more wafers in this size range there must be at least one which will be supported by the support arms to between 20% and 80% of the wafer radius as measured from its outside edge inwards. Thus, an obvious choice of wafer diameters leads to the wafer arrangement of document D2 **inevitably** falling within or trivially close to the terms of claim 1 of the application in suit, quite irrespective of whether or not the calculation demonstrating this is performed.

- 3.5 The appellant argued further that there is nothing in document D2 to suggest that the wafer support arms should continuously contact the wafer from the wafer edge inwards. The Board cannot accept this argument. The continuous contact required by claim 1 is achieved by the wafer support means being projections that project horizontally to continuously contact the wafer

(claim 1 last paragraph). In document D2, deep trenches 15 are formed along planes perpendicular to the centre line 13 ("constitution", last sentence). In document D2* it is disclosed in greater detail that the columns 4 each have deep ditches 15 cut from the inner side of the column along planes perpendicular to the centre line 13 (page 4, lines 1 to 3 and lines 25 and 26). Thus claim 1 of the application in suit requires that the wafer support means are projections projecting horizontally from vertical support means, in order to support the wafer continuously from the wafer edge inwards. The arrangement in document D2 is the same, although expressed in different words.

The Board therefore concludes that the examining division arrived at the correct conclusion, which is that claim 1 of the main request is obvious.

Auxiliary request

4. In view of the fact that claim 1 of the auxiliary request differs from claim 1 of the main request only in the claimed range of 33% to 66% instead of 20% to 80% an argument analogous to that made under point 3.4 above in respect to the main request applies equally to claim 1 of the auxiliary request, that is that an obvious choice of wafer diameters leads to the wafer arrangement of document D2 falling inevitably within or trivially close to the terms of claims 1.

5. For the forgoing reasons, the inventions claimed in claim 1 of the main request and the auxiliary request, respectively, do not, in the Boards judgement, involve an inventive step as required by Article 56 EPC.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

P. Cremona

R. K. Shukla