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D E C I S I O N
of 17 June 2002

Case Number: T 0984/01 - 3.2.7

Application Number: 95116693.3

Publication Number: 0709166

IPC: B24B 57/00

Language of the proceedings: EN

Title of invention:

Chemical-mechanical polisher and a process for polishing

Applicant:

MOTOROLA, INC.

Opponent:

-

Headword:

-

Relevant legal provisions:

EPC Art. 56

Keyword:

"Inventive step - (no)"

Decisions cited:

-

Catchword:

-



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Boards of Appeal

Chambres de recours

Case Number: T 0984/01 - 3.2.7

D E C I S I O N
of the Technical Board of Appeal 3.2.7
of 17 June 2002

Appellant: MOTOROLA, INC.
1303 East Algonquin Road
Schaumburg
IL 60196 (US)

Representative: Hudson, Peter David
Motorola
European Intellectual Property Operations
Midpoint
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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 14 March 2001
refusing European patent application
No. 95 116 693.3 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: A. Burkhart
Members: P. A. O'Reilly
E. Lachacinski

Summary of Facts and Submissions

- I. The appellant (applicant) filed an appeal against the decision of the Examining Division to refuse the European patent application No. 95 116 693.3.
- II. The Examining Division held that the subject-matter of claims 1 to 11 did not involve an inventive step in view of the general art in the field and the prior art as disclosed in

D1: US-A-4 059 929

D2: US-A-5 382 272

D3: US-A-5 527 423

D4: US-A-4 944 836.

Documents D2 to D4 were filed by the appellant before the Examining Division to support his case.

- III. The appellant requested that the decision of the Examining Division be set aside and that a patent be granted on the basis of the single request filed with letter of 22 December 2000 which contained the following independent method claim:

"A process for polishing a semiconductor substrate characterised by the steps of:
placing the semiconductor substrate (134) in a chemical-mechanical polisher (10); and
chemically and mechanically polishing the semiconductor substrate (134) using a polishing fluid, the polishing fluid comprising a first fluid (111) and a second fluid

(113) which when in the presence of each other affect a polishing rate of the polishing fluid over time, wherein the step of polishing includes a step of providing the polishing fluid to the semiconductor substrate (134) that includes the steps of:
flowing the first fluid (111) through a first feed line (113) having an outlet;
flowing the second fluid (112) through a second feed line (114) having an outlet;
mixing the first and second fluids within a mixing section (12) within the chemical-mechanical polisher to form the polishing fluid and to lessen the time variability of the polishing fluid's polishing rate, wherein:

the mixing section has an inlet and an outlet; and
the outlets of the first and second feed lines (113 and 114) are connected to the inlet of the mixing section (12); and
flowing the polishing fluid through the outlet of the mixing section (12) to provide the polishing fluid to the semiconductor substrate (134)."

IV. In their decision to refuse the application the Examining Division argued as follows:

Chemical-mechanical polishing of semiconductor substrates was generally well known, document D4 being an example. The skilled person would want to provide an exact control of the composition of the polishing fluid as in mentioned on page 11, lines 7 to 11 of the application in suit. The skilled person would find the solution to the problem in document D1. This document discloses all the features of claim 1 which are not part of the well known polishing process. Document D1 does not refer to semiconductor polishing but the

skilled person would have considered its use for semiconductor polishing. Document D1 mentions particle sizes for the polishing slurry down to 0.25 microns which is suitable for semiconductor polishing.

V. In a communication the Board expressed the provisional opinion that the subject-matter of claim 1 of the main request lacked an inventive step in view of document D4 in combination with document D1.

VI. In their grounds for the appeal and in a submission made in response to the communication of the Board the appellant essentially argued as follows:

The skilled person would not consider document D1 since the document did not consider semiconductor polishing and did not refer to time dependent changes in polishing rate of slurry. Document D1 disclosed polishing with an average particle size down to 0.25 microns. None of documents D2, D3 or D4 disclose an average particle size greater than 0.25 microns. In this respect the Examining Division have confused aggregate size distribution as referred to in D3 with average aggregate particle size. The Examining Division have therefore falsely considered that the process disclosed in document D1 is also applicable to semiconductor polishing. Document D1 also does not address time dependent changes occurring in the slurry. The passage in the document to which the Examining Division referred in this respect does not in fact address time dependent changes.

The skilled person wishing to improve the process for chemical-mechanical polishing of semiconductors would search in class H01L 21/304 of the international patent

classification since that section concerns the polishing of semiconductors. He would there find document D4. The skilled person would have no reason to search elsewhere. Document D1 is classified in B24B so that the skilled person would not have found this document. Document D1 predates the priority date of the patent by almost 17 years so that the skilled person would for this reason have considered that its teaching was not relevant to the rapidly moving semiconductor field.

Even if the solution proposed in document D1 were incorporated into the process disclosed in document D4 this would still not lead to the invention as claimed. In document D1 there are two separate inlets to the mixing section whereas according to claim 1 there is one inlet which receives both slurry component feed lines.

Reasons for the Decision

Inventive step

1. *Closest prior art*

In the opinion of the Board the closest prior art is the generally known process, exemplified in document D4, whereby the semiconductor substrate is placed in a chemical-mechanical polisher and chemically and mechanically polished using a polishing fluid, whereby the step of polishing includes a step of providing the polishing fluid to the semiconductor substrate.

2. *Problem to be solved*

In the prior art process according to document D4 the polishing slurry is prepared on a batch basis in a mixing tank. According to the appellant the problem to be solved is to avoid time dependent changes in the slurry and gel formation. This is stated in the grounds for appeal and in the application on page 1, lines 26 to 36 and page 2, lines 29 to 31.

In the opinion of the Board therefore the basic problem is to be seen in avoiding the changes over time which occur in the tank in batch preparation.

3. *Solution to the problem*

The solution to the problem according to the application is as follows:

A process wherein the polishing fluid comprising a first fluid and a second fluid which when in the presence of each other affect a polishing rate of the polishing fluid over time, and wherein the step of providing the polishing fluid to the semiconductor substrate (134) includes the steps of:
flowing the first fluid through a first feed line having an outlet; flowing the second fluid through a second feed line having an outlet; mixing the first and second fluids within a mixing section within the chemical-mechanical polisher to form the polishing fluid and to lessen the time variability of the polishing fluid's polishing rate, wherein the mixing section has an inlet and an outlet; and the outlets of the first and second feed lines are connected to the inlet of the mixing section; and flowing the polishing fluid through the outlet of the mixing section.

It appears that the above features of claim 1 would solve the above mentioned problem since the slurry is prepared continuously. A long period in the tank, which would allow gel formation, is avoided.

4. This solution to the problem is obvious for the following reasons:

The distinguishing features of the process of claim 1 over the process of document D4 are disclosed in document D1. In document D1 the polishing fluid comprises a first fluid (a slurry concentrate from tank 20) and a second fluid (a diluent from tank 22) which when in the presence of each other affect a polishing rate of the polishing fluid over time (the concentrate in the presence of the diluent will allow settling of the abrasive particles which will affect polishing rate over time). Document D1 further discloses the steps of flowing the first fluid through a first feed line 24 having an outlet; flowing the second fluid through a second feed line 26 having an outlet; mixing the first and second fluids within a mixing section 28 within the polisher to form the polishing fluid and to lessen the time variability of the polishing fluid's polishing rate (the mixing just prior to use must have this effect), wherein the mixing section has an inlet and an outlet; and the outlets of the first and second feed lines are connected to the inlet of the mixing section; and flowing the polishing fluid through the outlet of the mixing section.

The appellant has disputed that the feature that the outlets of first and second feed lines are connected to the inlet of the mixing section is disclosed in document D1. In the opinion of the appellant the said

outlets are connected to a respective inlet of the mixing section. The Board cannot agree with this view however. In Figure 1 of document D1 there is shown only one inlet of the mixing section 28. This inlet receives both outlets of the feed lines 24 and 26. The appellant has not indicated how any other interpretation could be reached.

The Board is thus satisfied that document D1 discloses those features of claim 1 which are not disclosed in document D4.

Document D1 is concerned with mechanical polishing. Document D1 does not state any specific field of application however it does concern applications where abrasive grains need to be maintained in suspension. The problem of suspension arises with larger particles (see column 1, lines 26 to 29). When the liquid is less viscous it is unable to support the particles which fall out of suspension. This means that after initial mixing there are changes over time in the batch preparation tank. Constant mixing or agitation may be required to prevent these changes.

Document D1 also mentions the problem with batch processing of knowing the composition of the tank, particularly when new material is added (column 2, lines 27 to 36). This problem is also mentioned in the application in suit (page 2, lines 29 to 35).

The Board is thus satisfied that document D1 solves the same underlying problems as the application in suit.

The skilled person wishing to solve the problems set out in the application in suit would consider document

D1 because it teaches a solution to the same problem. In incorporating the solution of document D1 into the known prior art process the skilled person would arrive at the subject-matter of claim 1. Document D1 is not specifically limited in its technical area and the particle sizes disclosed therein are at least close to overlapping with those used in chemical-mechanical polishing of semiconductor substrates so that there is no technical prejudice against the use of the solution of document D1 in this field.

It may also be mentioned that in general when supplying a liquid to a process whereby the liquid is prepared from two components the question is always posed to the skilled person whether to use a batch method or a continuous method for the preparation of the liquid. The advantages and disadvantages of these two methods are well known. In the absence of clear strong prejudices the skilled person will always consider both of these methods and in any particular circumstances consider replacing one method by the other if appropriate. It may therefore be considered that document D1 merely confirms this general knowledge.

The appellant has argued that the grain sizes mentioned in document D1 are different to those used in chemical-mechanical polishing of semiconductor substrates. Since document D1 does not specifically mention chemical-mechanical polishing this view is the same as the argument that the problem to be solved in document D1 is different to the problem to be solved by the application.

The Board can agree with the argument of the appellant that the disclosed technical areas of application of

the process of document D1 do not coincide with the chemical-mechanical process set out in claim 1. However, as already indicated above the underlying problem addressed by both the application and document D1 is the same. This problem is the changes over time which occur in a batch tank. There are also the other problems with a batch tank regarding consistent composition, which are solved both in document D1 and the application in suit, as mentioned above. The Board therefore cannot agree that a possible difference in the grain sizes in the field of polishing semiconductor substrates and those mentioned in document D1 would alone be a reason for the skilled person to ignore the teaching of document D1.

The Board also cannot agree with the argument of the appellant regarding the search a skilled person would carry out using the international patent classification. In the first place it is the constant jurisprudence of the Boards of Appeal that the skilled person has available the whole state of the art for consideration, irrespective of how he evaluates the significance of a document for providing a solution to the problem that he faces. The argument of the appellant that he would not find document D1 cannot therefore be followed already for this reason. Moreover, the skilled person could reasonably be expected to look for solutions to the posed problem where solutions could be expected, i.e. in other technical fields where the same problem arises. The skilled person can therefore be expected to consider not just documents in the specific field of the application in suit, but also documents which have a general field of applicability and concern the same problem.

The arguments of the appellant in respect of the age of document D1 cannot be shared by the Board. The problems to be solved by the application in suit were not problems which by their nature could have arisen only shortly before the priority date, but rather they were problems which always occur when fluids have to be mixed with their properties being maintained constant over time. The constituents being mixed may change but the fundamental problem remains the same. The skilled person would therefore have no hesitation to consider older documents.

5. Therefore the subject-matter of claim 1 does not involve an inventive step in the sense of Article 56 EPC.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

A. Townend

A. Burkhart