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Datasheet for the decision of 27 June 2013

Case Number: T 1913/09 - 3.2.07

Application Number: 98303723.5

Publication Number: 878270

IPC: B24D 13/14, B24B 37/04

Language of the proceedings: EN

Title of invention:
Polishing pad having a grooved pattern for use in a chemical mechanical polishing apparatus

Patent Proprietor:
Applied Materials, Inc.

Opponent:
Terada, Kiyoshi

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 83, 84, 100(c), 123(2)

Keyword:
"Amendments: allowable (yes)"
"Sufficiency of disclosure - enabling disclosure (yes)"
"Novelty (yes)"
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-

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Case Number: T 1913/09 - 3.2.07

D E C I S I O N
of the Technical Board of Appeal 3.2.07
of 27 June 2013

Appellant: (Opponent)
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Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted 17 June 2009 concerning maintenance of the European patent No. 878270 in amended form.**

Composition of the Board:

Chairman: K. Poalas
Members: H. Hahn
E. Kossonakou

Summary of Facts and Submissions

I. The appellant (opponent) lodged an appeal against the decision of the Opposition Division to maintain the European patent 0 878 270 in amended form.

II. The following documents submitted during the opposition proceedings are relevant for the present decision:

D6 = US-A-5 489 233
D7 = US-A-5 578 362
D12 = EP-A-0 674 972
D13 = JP-H5-146969
D14 = "Improved CMP performance using grooved polishing pads", Weling et al., CMP-MIC Conference, 22-23 February 1996
D25 = US-A-5 738 574
D28 = "Handbook of Semiconductor Manufacturing Technology", Nishi & Doering, Marcel Dekker, New York, USA, 2000, pages 415-428, Chapter 15, Shinn, Grover and Fang
D29 = Sworn statement by Venkata Batagani of Allied Materials, filed at USPTO on 12.03.2008 in respect of application 90/010,106 from Osterheld et al.

The following documents were submitted during the appeal proceedings:

D31 = Declaration of Mr. K. Terada dated 17 October 2009, pages 1-18
D32 = Second Declaration of Mr. K. Terada dated 10 April 2010, pages 1-17

D33 = "Technological Breakthrough in Pad Life Improvement and its Impact on CMP CoC", S. Huey et al., 1999 IEEE/SEMI Advanced Semiconductor Manufacturing Conference, 8-10 September 1999, pages 54-58.

III. An opposition had been filed against the patent in its entirety under Article 100(a) EPC, for lack of novelty and inventive step, under Article 100(b) EPC, that the patent does not disclose the invention in a manner sufficiently clear and complete for it to be carried out by the person skilled in the art, and under Article 100(c) EPC that the subject-matter of the patent in suit extends beyond the content of the application as originally filed.

The Opposition Division held that the claims 1 and 5 of the main request filed with letter dated 7 April 2009 comply with the requirements of Articles 100(c) and 123(2) EPC. The feature "and the grooves have side walls that are substantially perpendicular to the polishing surface" incorporated into claim 1 was additionally considered not to contravene Article 84 EPC. The Opposition Division further held that the patent complies with Article 83 EPC so that all the objections under Article 100(b) EPC cannot be sustained. It further considered that the subject-matter of claim 1 is novel with respect to D12, D7 and D13 (the paragraphs 13.3 and 13.4 of the reasons relating to D13 each contain an erroneous reference to D7). Furthermore, the subject-matter of claim 1 of the main request was considered to involve inventive step with respect to combinations of the teachings of D13 with D14 and/or D29; D14 and D6; D14 and the common general knowledge

of the skilled person; D7 with D6 or D14; or D12 with D6 or D14. Consequently, the patent was maintained in that amended form.

IV. With a communication annexed to the summons to oral proceedings the Board presented its preliminary opinion with respect to claims 1-10 of the patent as maintained, which at that time represented the main request of the respondent (= patent proprietor) in the appeal proceedings.

The Board remarked amongst others that the allowability of the amendments made in claims 1-10 as maintained has to be discussed with respect to Articles 84, 100(c) and 123(2) EPC.

The Board further remarked that it concurs with the respondent's arguments that Article 83 EPC is complied with.

The Board then concluded that the subject-matter of claim 1 appeared to be novel, particularly over the disclosures of D7 and D13.

With respect to the issue of inventive step the Board remarked that it would be dealt with by taking into consideration the problem-solution approach, the problem to be solved having to be based on the technical effect of the distinguishing features.

V. With letter dated 17 May 2013 the appellant submitted further arguments concerning the non-allowability of the amendments made in claims 1-10 of the main request and with respect to lack of inventive step.

VI. With letter dated 23 May 2013 respondent submitted, as a response to the summons to oral proceedings, five auxiliary requests together with arguments concerning the admissibility of the amendments made therein, as well as further arguments concerning the allowability of the amendments made in the claims of the main request and with respect to novelty and inventive step.

VII. Oral proceedings before the Board were held on 27 June 2013, where the respondent submitted an amended auxiliary request 2. Claim 1 of this request was discussed with respect to Articles 83 and 54 EPC, both parties referring to their written submissions in this respect, and with respect to inventive step, particularly in the light of D14 and the common general knowledge of the person skilled in the art. Finally, the respondent made this auxiliary request 2 to its (new) main request and adapted the description to the subject-matter of claim 1 of said request.

(a) The appellant requested that the decision under appeal be set aside and that the patent be revoked.

(b) The respondent requested that the decision under appeal be set aside and the patent be maintained in accordance with the main request filed during the oral proceedings.

At the end of the oral proceedings the Board announced its decision.

VIII. Independent claim 1 of the (new) main request reads as follows (amendments as compared to claim 1 as granted

are in bold with deletions in brackets, emphasis added by the Board):

"1. A polishing pad (100) for polishing a substrate in a chemical mechanical polishing system, comprising a polishing surface (102) suitable for integrated circuit fabrication having a first plurality of substantially circular grooves (104) characteri**[z]s**ed in that: the grooves have a depth **[of at least] between** about 0.50 **and 1.3mm** (0.02 **and 0.05** inches), a width **[of at least] between** about 0.38 **and 1.0mm** (0.015 **and 0.04** inches), and a pitch of between about 2.3 and 6.1mm (0.09 and 0.24 inches); **and each of the grooves has side walls that are perpendicular to the polishing surface; wherein the grooves are separated by partitions, and the ratio of the width of the grooves to the partitions is between about 0.10 and 0.25; and wherein the pad has an upper layer providing said polishing surface and a lower layer adapted to mount the pad, the distance (Dp) between the bottom of the groove and the lower layer being about 0.89mm and 2.2mm (0.035 inches and 0.085 inches).**"

IX. The appellant argued, insofar as relevant for the present decision, essentially as follows:

There are no objections under Articles 84, 100(c) and 123(2) EPC with respect to claims 1-3 of the main request.

Although the description provides a general discussion on pad hardness and flexibility the patent in suit lacks sufficiency as to how to prepare a polishing pad suitable for integrated circuit fabrication, since the

ratio of groove width Wg to partition width Wp and Dp is not present in claim 1 of the patent as maintained.

There are no lack of novelty objections with respect to claim 1 of the main request.

The closest prior art document is D14 which discloses the so-called "K-groove" polishing pad for CMP comprising an upper-layer made of IC1000 on a lower layer of SUBA IV (see page 41, first paragraph). Said upper-layer of the pad comprises a plurality of circular grooves, said grooves having a substantially U-shaped groove cross-section with two walls being perpendicular to the polishing surface; the groove width is 0.254 mm (0.01 inches), the groove depth is 0.381 mm (0.015 inches) in the 1.27 mm (0.05 inches) thick upper layer (so that Dp is calculated to be 0.89 mm or 0.035 inches), the groove pitch is 1.524 mm (0.06 inches) and the calculated ratio of groove width to the partition width is 0.2 (see page 43, figures 1(b) and 1(d)). Thus this "K-groove" embodiment shows 5 of the 8 features of claim 1.

D14 compares the polishing effectiveness of this "K-groove" pad with a perforated pad having pretty wide round perforations in its upper layer of identical thickness (see page 43, figures 1(a) and 1(c)) and states that said grooves are much smaller and shallower indentations on the surface of the pad (see page 41, second paragraph). D14 is silent about a specific size of these grooves which only have to be smaller than the perforations of the prior art.

There are no data in the patent which show any beneficial effect besides an increase of the pad life (compare D33). However, a synergistic effect of the dimensions of the grooves according to claim 1 has not been demonstrated by the respondent, let alone that the limits of the ranges are critical. Claim 1 thus aims to solve two partial technical problems, namely on the one hand to provide a polishing pad having a longer life time while maintaining its polishing properties over the same, and on the other hand to provide a polishing pad having a uniform distribution of the slurry during the polishing and a uniform removal rate over the entire surface of the polished substrate. It is clear that the perpendicular side walls and the groove depth provide a substantially uniform surface area over life time.

D33 does not show any surprising effect either when comparing the two polishing pads IC1010-DV and IC1000 ([="K-groove]) which differ from each other only in the groove depths of 30 and 15 mils, respectively (see table 1). Page 2 of D33 reveals the impact of the groove making tool on the quality of the resulting grooves while page 3 deals with the impact of grooving dimension (i.e. variable groove depth). D33 does not mention the technical features of claim 1 and the corresponding figure 4 shows an effect not supporting the respondent's allegations for an improved performance of a pad according to claim 1.

According to the results of D33 the improved pad is "comparable" with that of the prior art. Thus the amendment of the pitch, width has not brought any surprising effect but only a comparable behaviour

together with increased pad life. However, common general knowledge teaches the person skilled in the art that increasing the thickness, i.e. doubling it, should result in doubling the life of the pad.

D31/D32 present test results, said tests being made with the intention to provide a comparison of the "K-groove" pad of D14 with the one claimed in the patent in suit. It is acknowledged that the parameters of the different experiments are not identical and no reasoning can be presented for that by the appellant. However, each of the first three experiments thereof (i.e. the polishing rate, the polishing conditions and planarization) applied identical conditions to both pads.

Appendix 1A of D32 provided by the respondent with its last submission shows a 7% deterioration since an even removal over the whole area of the wafer is intended but the claimed pad removes more material at the centre of the wafer.

Concerning the alleged commercial success of the claimed pad it is remarked that no evidence has been submitted in this context. D29 mentions market share values which are not supported by any data while the BKM ("best known method") feature (see D29, points 7 and 9) is unrelated to claim 1. Furthermore, the increase of the pad life is unexpectedly low since it is only 1.6 times longer.

X. The respondent argued, insofar as relevant for the present decision, essentially as follows:

Claim 1 of the (new) main request derives from a combination of the originally filed claims 1-4 and the features derivable from page 13, lines 6 and 7; page 13, lines 28 and 29 and page 14, lines 11 to 14 of the description of the application as originally filed. The feature "suitable for integrated circuit fabrication" of claim 1 as granted is clearly derivable from page 1, lines 1 and 2; page 2, lines 31 to 34 and page 9, lines 15 to 18 (the latter passage referring to D25 which disclosure is incorporated by reference; see D25, column 1, lines 12 to 14, paragraph spanning columns 3 and 4 and column 15, lines 5 to 9) of the application as originally filed. Therefore claim 1 of the main request complies with Articles 100(c) and 123(2) EPC. The requirements of Article 84 EPC are also met.

The key parameters of the invention according to the patent in suit are clearly disclosed in the patent specification. The appellant conceded that "the Patentee has simply modified the dimensions and configurations of existing polishing pads". Furthermore, the appellant was able to present a test report, i.e. that it had no difficulty in putting the invention into practice. From the above follows that the invention is sufficiently disclosed in the patent in suit and the requirements of Article 83 are complied with.

Novelty was already acknowledged by the Board in points 7 to 7.4 of its communication annexed to the summons.

D14 represents the closest prior art for the present invention. It teaches the person skilled in the art that rinsing slurry off the relatively shallow grooves is easier, i.e. it teaches the provision of shallower

grooves, and it discloses specific groove dimensions. Claim 1 differs from the pad of D14 in that at least the groove width, depth and pitch have to be changed. Simply doubling the groove depth A in the pad known from D14 would provide a pad which would not work.

Furthermore, the groove width, depth and partition width are not features which can be defined independently from each other since the slurry distribution is a function of the groove cross-section. Likewise the polishing uniformity is a function of the rigidity which is dependent upon the pitch and the groove depth while the polishing rate requires a constant surface area which is also pitch and depth related.

Starting from the pad known from D1 as representing the closest prior art claim 1 provides a pad having an increased pad life, having undergone a major alteration of the groove width, depth and pitch geometry without adversely effecting the other properties of the pad, such as for example its rigidity.

Thus, the subject-matter of claim 1 aims to solve a single complex technical problem and not two independent partial problems.

From D28 it can be derived that the CMP pads were the most poorly understood components of a CMP system (see page 427, right-hand column, second paragraph) so that the person skilled in the art could not expect such a benefit when selecting specific dimensions of the grooves of a polishing pad.

D29 shows that the claimed polishing pad has commercial success (see point 9).

Hence D28 and D29 are *prima facie* indicators for inventive step.

D33 is titled a technological breakthrough in pad life improvement and mentions several pad life factors (see page 2) and results of extended runs (see page 4, "Extended Run Process Results for IC1010-DV"; and page 6, "Conclusions"). D33 is post-published and therefore cannot teach the skilled person anything.

D31/D32 should be disregarded for not being reliable experiments. Appendix 1A of D31/D32 as submitted with the last submission dated 23 May 2013 shows a 7% increase of the removal rate of the claimed polishing pad. Figure 2 of D31/D32 shows a more even removal rate across the wafer distance, figure 5 shows a better planarization uniformity, figure 6 shows a more uniform removal rate profile while figure 7 shows that the claimed pad even with the marathon wafer test - which conditions are detrimental to pad life - outperforms the pad of the prior art.

It does not matter whether or not the IC1010-DV pad is improved compared to the prior art IC1000 pad as long as the pad life thereof has been increased.

The subject-matter of claim 1 of the main request is thus not obvious over a combination of D14 with common general knowledge and therefore complies with Article 56 EPC.

Reasons for the Decision

1. *Admissibility of the amendments made in claim 1 of the main request (Articles 84, 100(c) and 123(2) EPC)*

Claim 1 of the main request is based on claims 1-4 of the application as originally filed in combination with the additional feature of the polishing surface being **"suitable for integrated circuit fabrication"** and with the further additional features that **"each of the grooves has side walls that are perpendicular to the polishing surface; wherein the grooves are separated by partitions, and the ratio of the width of the grooves to the partitions is between about 0.10 and 0.25; and wherein the pad has an upper layer providing said polishing surface and a lower layer adapted to mount the pad, the distance (Dp) between the bottom of the groove and the lower layer being about 0.89mm and 2.2mm (0.035 inches and 0.085 inches)"** which are either explicitly taken or clearly derivable from the description of the application as originally filed as follows.

1.1 As already mentioned in the Board's communication annexed to the summons to oral proceedings (see point 4.1) the feature **"suitable for integrated circuit fabrication"** - which was already comprised in claim 1 of the patent as granted (see point VIII above) - is considered to be clearly and unambiguously derivable from the application as originally filed (which in the following is quoted). This application relates to chemical mechanical polishing (CMP) of substrates (see page 1, lines 1 and 2) and to the problems related to

CMP treatment of substrates suitable for integrated circuit fabrication (see page 2, lines 31 to 34 and page 9, lines 15 to 18; the latter passage mentions in the context of figure 1 document D25, whose entire disclosure is incorporated by reference, which relates to a CMP apparatus for polishing and planarizing semiconductor substrates or wafers: see D25 abstract; column 1, lines 12 to 50 and column 4, lines 5 to 27 and line 49 to column 5, line 4). Taking these facts into account, it is clear that the polishing pad as disclosed in the application as originally filed has to be suitable for CMP treatment of substrates suitable for the fabrication of integrated circuits.

Consequently, this feature "**suitable for integrated circuit fabrication**" does **not** extend beyond the content of the application as originally filed.

1.2 The further features "**each of the grooves has side walls that are perpendicular to the polishing surface; wherein the grooves are separated by partitions, and the ratio of the width of the grooves to the partitions is between about 0.10 and 0.25; and wherein the pad has an upper layer providing said polishing surface and a lower layer adapted to mount the pad, the distance (Dp) between the bottom of the groove and the lower layer being about 0.89mm and 2.2mm (0.035 inches and 0.085 inches)**" have a basis at page 13, lines 6 and 7, page 13, lines 28 and 29, and page 14, lines 11 to 13 of the application as originally filed. These features are disclosed in the context of the specific embodiment of figures 3 and 4 which polishing pad has an upper and a lower layer structure with a total thickness T of the

upper layer being the sum of groove depth Dg and the distance Dp.

1.3 By incorporating these additional features into claim 1 of the patent as granted the scope thereof has been restricted.

1.4 When asked by the Board at the oral proceedings the appellant stated that it had no further formal objections concerning the claims 1-3 of the main request under Articles 84, 100(c) and 123(2) EPC.

1.5 Taking account of the above, the Board reaches the conclusion that claims 1-3 of the main request comply with the requirements of Articles 84, 100(c) and 123(2) EPC.

2. *Sufficiency of disclosure (Article 83 EPC)*

The patent in suit concerns the modification of the dimensions and configurations of grooves in polishing pads, the latter being *per se* known to the person skilled in the art. Therefore, in order to be suitable for the intended use in a process for integrated circuit fabrication (for example for planarizing wafers using CMP), these polishing pads have to be provided with specific properties such as a certain hardness, a certain flexibility, a certain minimum thickness, etc. of their grooves and their layer structure. These properties of commercially available polishing pad materials such as Rodel's IC1000 or Suba IV are, however, known in the prior art, see e.g. D14.

The appellant conceded in its statement of the grounds of appeal that "the Patentee has simply modified the dimensions and configurations of existing polishing pads" and it was also able to present the test reports D31/D32, i.e. that it had no difficulty in putting the invention into practice. The appellant acknowledged further in its response to the summons to oral proceedings that the description of the patent in suit provides a general discussion on pad hardness and flexibility.

The appellant's remaining objection in this context that the patent in suit, unless the ratio of groove width Wg to partition width Wp and Dp are incorporated into claim 1 of the patent as maintained, would lack sufficiency as to how to prepare a polishing pad suitable for integrated circuit fabrication does no longer apply since these "missing" features have been incorporated into claim 1 of the main request (see point VIII above).

The Board therefore considers that the requirements of Article 83 EPC are met.

3. *Novelty (Article 54 EPC)*

3.1 Under points 7 to 7.4 of its communication annexed to the summons to oral proceedings the Board, taking account of the statement of grounds of appeal and the respondent's reply thereto, expressed its preliminary opinion that the subject-matter of claim 1 of the patent as maintained was considered to be novel, particularly with respect to the disclosures of D7 and D13.

3.2 Neither in its reply to the summons (see point V above) nor at the oral proceedings, did the appellant submit any further arguments concerning lack of novelty, let alone with respect to the subject-matter of the even more restricted claim 1 of the main request.

3.3 The Board considers that the subject-matter of claim 1 of the main request - due to the definitions of the groove dimensions of the two layer polishing pad and the definition that "each of the grooves has side walls that are perpendicular to the polishing surface" - is even more clearly delimited over the pads known from D7 or D13.

3.3.1 The specific embodiment of figures 5 and 6 of D7 has a plurality of grooves **not** having a pair of side walls which are perpendicular to the polishing surface but only a buttress thread with a 60° ramp, does not specify the layer thickness so that Dp cannot be calculated, and the depth and pitch values of the grooves of **0.356 mm** and **1.397 mm** (see column 9, lines 47 to 51), respectively, are **outside** the respective ranges claimed in claim 1.

3.3.2 The grooves of the monolayer pad of D13 do **not** have a pair of side walls which are perpendicular to the polishing surface but they can have a triangle form or they may have a flat bottom or a semicircular cross-section (see paragraph [0016] and figure 3). Furthermore, D13 does **not** specify any **width** of said grooves.

3.4 Taking account of the above, the Board is satisfied that the subject-matter of claim 1 is novel and fulfils the requirements of Article 54 EPC.

4. *Inventive step (Article 56 EPC)*

Document D14 was considered by both parties as the closest prior art for the polishing pad of claim 1 of the single request.

4.1 D14 discloses the so-called "K-groove" polishing pad for CMP of wafers, said pad comprising a hard upper-layer made of Rodel's IC1000 which is placed over a soft lower layer of Rodel's SUBA IV, which combination is stated to achieve good global planarity while maintaining with-in wafer uniformity (see page 41, first paragraph). The upper-layer of the pad comprises a plurality of concentric circular grooves which have a substantially U-shaped groove cross-section, each of the grooves having two side walls which are perpendicular to the polishing surface. The groove width is 0.254 mm (0.01 inches), the groove depth is 0.381 mm (0.015 inches) in the 1.27 mm (0.05 inches) thick upper layer (so that a distance Dp between the bottom of the groove in the upper layer and the surface of the lower layer of the pad can be calculated as being 0.89 mm or 0.035 inches), the groove pitch is 1.524 mm (0.06 inches) so that the ratio of groove width to the partition width can be calculated as being 0.2 (see page 43, figures 1(b) and 1(d)).

4.2 The subject-matter of claim 1 of the main request therefore differs from this "K-groove" polishing pad of D14 in that the grooves have:

i) a depth between about 0.50 and 1.3 mm (0.02 and 0.05 inches);
ii) a width between about 0.38 and 1.0 mm (0.015 and 0.04 inches);
iii) a pitch between about 2.3 and 6.1 mm (0.09 and 0.24 inches).

4.3 The Board considers that the effects of these distinguishing features are the following:

4.3.1 Feature i) is responsible for the life time of the substantially uniform surface area of the polishing pad being lengthened by increasing the depth of the grooves having perpendicular side walls (see patent specification, paragraphs [0028], [0031] and [0062]).

4.3.2 The features ii) and iii) are responsible for a uniform distribution of the polishing slurry and removal of waste material and thereby influence the removal rate and uniformity of the polished substrate (see patent specification, paragraphs [0030], [0039], [0043], [0060] and [0061]).

4.3.3 The Board notes that it disregards the comparative test results presented in D31/D32 - which were stated to have been made with the intention to provide a comparison of the "K-groove" pad of D14 with a pad according to the patent in suit - since each of the comparative experiments I to IV was made with different parameters: different platen/carrier rpm, slurry flow, slurry type (colloidal silica or fumed silica), slurry concentration, diamond conditioning (diamond size, diamond protrusion and spacing). The representative of

the appellant acknowledged this fact at the oral proceedings and stated that she does not know why these specific conditions were selected for each of them.

Consequently, all arguments based on D31 or D32 submitted by both parties are **not** taken into consideration by the Board.

4.3.4 D33, a post-published document, discloses the results of a comparison of two polishing pads, namely

• IC1010-DV, which, as admitted by the respondent, is made in accordance with claim 1 of the patent in suit, and

• IC1000, which corresponds to the "K-groove" pad of D14.

Given the fact that D33 does not belong to the state of the art according to Article 54(2) EPC and that it does not disclose clearly recognisable experimental parameters and data of the tests carried out, all arguments based on D33 are not taken into consideration by the Board.

4.4 The objective technical problem is therefore defined as comprising:

a) a first partial technical problem which is based on feature i), i.e. to increase the life time of the polishing pad known from D14 and at the same time maintaining its polishing properties over the life time, and

b) a second partial problem based on features ii) and iii), i.e. to provide an alternative polishing pad to that of D14 which has a uniform distribution of the slurry during the polishing and a uniform removal rate over the entire surface of the polished substrate (see paragraphs [0014] and [0061] of the patent in suit).

4.5 These technical problems are solved by the subject-matter of claim 1 of the main request.

4.6 The Board considers that the solution of at least the second partial problem is not rendered obvious by a combination of the teachings of D14 and the common general knowledge of the person skilled in the art for the following reasons.

4.6.1 The Board notes that even when accepting that the skilled person trying to double the life time of the commercially available pad known from D14 - said pad having grooves with perpendicular side walls but with a width of 0.254 mm, a depth of 0.381 mm and a pitch of 1.524 mm - would double the depth of said grooves to 0.762 mm, he still would not arrive at a pad fulfilling all the dimensional ranges claimed in claim 1, since a hint in the state of the art towards the claimed width and pitch ranges is missing.

4.6.2 The appellant's further arguments cannot hold for the following reasons.

D14 compares on the one hand the polishing effectiveness of the "K-groove" pad with a perforated pad having pretty wide round perforations in its upper layer of identical thickness (see page 43, figures 1(a)

and 1(c)) and states that the said "K-grooves" are much smaller and shallower indentations on the surface of the pad (see page 41, second paragraph). On the other hand, D14 is silent about a specific size of these grooves which only have to be smaller than the perforations of the prior art. However, there is neither a teaching suggested in D14, nor has it been made plausible by the appellant why the person skilled in the art, when starting from either this general teaching of D14 or from the very specific embodiment of figures 1(b) and 1(d) of D14, would select, in order to solve the problem mentioned in point 4.4 b) above, the ranges of the groove width and groove pitch as defined in claim 1 of the main request. The Board cannot see any conclusive reason for the person skilled in the art to do so.

The "K-groove" pad of D14 was stated to improve the slurry flow (see page 42, paragraph "Conclusions") during the polishing of wafers and the Board considers that the specific embodiment of figures 1(b) and 1(d) represented a typical (but already optimised) groove embodiment. Therefore the cross-section of the grooves was large enough to allow the flow of the slurry during the polishing process. Thus, even if the person skilled in the art by chance would realize that the groove dimensions of the pad have to be changed, he would have no reason to change it in the manner required by claim 1, since the commercially available pad works as it is.

4.7 Taking account of the above the Board considers that the subject-matter of claim 1 of the main request involves inventive step.

4.8 The description as amended during the oral proceedings according to the main request complies also with the EPC.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance with the order to maintain the patent with the following documents:

- description:
  columns 3-8 as filed during the oral proceedings
  columns 1-2 and 9-13 of the patent specification

- claims:
  1-3 of the main request as filed during the oral proceedings

- figures:
  1-16 of the patent specification

The Registrar: The Chairman:

P. Martorana K. Poalas