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**Datasheet for the decision
of 8 May 2017**

Case Number: T 0736/15 - 3.3.06

Application Number: 06765169.5

Publication Number: 1912731

IPC: B01J19/00, G01N33/552, C12Q1/68

Language of the proceedings: EN

Title of invention:
Manufacture of array chips

Applicant:
Radox Laboratories Ltd.

Headword:
Scribed wafer substrate / RANDOX LABORATORIES

Relevant legal provisions:
EPC Art. 52(1), 56, 84

Keyword:
Compliance with the requirements of Article 84 EPC (yes) :
description brought into agreement with the claims
Inventive step (yes)

Decisions cited:

Catchword:



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Case Number: T 0736/15 - 3.3.06

D E C I S I O N
of Technical Board of Appeal 3.3.06
of 8 May 2017

Appellant: Radox Laboratories Ltd.
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted on 11 November 2014 refusing European patent application No. 06765169.5 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman P. Ammendola
Members: L. Li Voti
C. Heath

Summary of Facts and Submissions

I. This appeal lies from the decision of the Examining Division to refuse European patent application no. 06 765 169.5.

II. During examination the following documents were *inter alia* cited:

D1: US 2003/0082587 A1;

D3: EP 1 273 349 A1;

D4: US 5,682,242 A;

D5: MODERN DICTIONARY of ELECTRONICS, by Rudolf F. Graf, seventh edition, 1999, page 671, keywords: "**scribe and break**" and "**scribing**"; and

D6: US 6,399,463 B1.

III. Claim 1 according to the only request finally pending before the Examining Division reads as follows:

"1. A method of manufacturing an array chip, comprising the steps of:

i) depositing at least one ligand onto the active surface of a wafer substrate having at least one scribe line, the active surface being the reverse of the surface comprising the at least one scribe line;

ii) detecting the position of the deposited ligand in relation to the at least one scribe line;

iii) determining whether the ligand has been deposited correctly in relation to the at least one scribe line; and

iv) breaking the wafer substrate along the at least one scribe line, to produce at least one array chip."

Dependent claims 2 to 21 relate to particular embodiments of the method of claim 1.

IV. In its decision the Examining Division found that this claim 1 contravened the requirements of Article 84 EPC (clarity) because of a contradiction existing between the wording of claim 1, specifying that the ligands are deposited on already scribed wafers, and the description (page 5, lines 25-26), mentioning that scribing may occur also after deposition of the ligands.

Moreover, the subject-matter of claim 1 was also found to lack an inventive step. In this respect the Examining Division decided in particular that

- D3 represented the closest prior art;
- the differences of claim 1 with respect to the closest prior art were (I) the use of scribe lines and (II) the active surface being the reverse of the surface having the scribe lines;
- the technical problems solved with respect to D3 consisted, as regards feature (I), in *"the provision of an alternative system for positional determination of ligand deposition that allows separation of individual microchips from a substrate wafer"*; and as regards feature (II) in the *"protection of the active side of the chip from contamination"*;
- however, the skilled person would have obviously arrived at the claimed subject-matter by combining D3

with D4 and with common general knowledge, as represented by D5 and D6.

- V. The Applicant (Appellant) lodged an appeal against this decision. With its statement of grounds of appeal of 17 March 2015 it re-filed as **main request** the set of 21 claims considered by the Examining Division in its decision (III, *supra*) and filed a further amended set of claims as auxiliary request. It also requested, subsidiarily, oral proceedings.

As regards its main request the Appellant submitted in essence that

- claim 1 according to the main request clearly related to a method involving the depositing of at least one ligand onto the "active" surface of an already scribed wafer substrate, i.e. it was limited to only one of the two alternatives specifically indicated in the description; therefore, claim 1 was clear and complied with the requirements of Article 84 EPC;

- the method of claim 1 differed from the disclosure of D3 not only in the features indicated in the decision under appeal but also because D3 did not concern the separation of individual chips from a substrate wafer;

- the objective technical problem to be solved was that set out in the application as filed (page 3, lines 10-12), i.e. "*the provision of an improved production process that allows efficient production and separation of biochips comprising deposited ligands*";

- D4, D5 and D6 belonged to a remote technical field that would not have been familiar to the skilled person developing biochips and methods of making biochips and

that the skilled person would not have considered in trying to solve the technical problem posed;

- moreover, D3 did not contain any guidance or suggestion leading the skilled person to consider documents belonging to such a remote technical field;

- therefore, even if the skilled person would have had knowledge of documents D4 to D6, he would not have been motivated to combine these references with D3 in order to solve the technical problem posed;

- however, even the combination of documents D3 to D6 would not lead to the claimed invention and the skilled person could arrive at the claimed subject-matter only by hindsight having knowledge of the invention of claim 1.

VI. The Appellant was summoned to oral proceedings. In a communication pursuant to Article 15(1) RPBA dated 24 September 2015, the Board expressed *inter alia* its provisional opinion that the description was inconsistent with respect to the subject-matter claimed and that claim 1 thus appeared to contravene the requirements of Article 84 EPC (support by the description) for this reason.

However, the Board remarked that this deficiency could be easily removed by deleting all references to the possibility of depositing the ligand onto a surface of a wafer before scribing, as present for example in the passages contained on page 3, lines 11-12 (...*the surface onto which a ligand **is or** will be deposited...*); page 5, lines 22-23 (...*the array chips that derive from the wafer substrate, has a surface onto which the ligands **are**, or will be, attached...*);

page 5, lines 25-26 (...*The scribing can be carried out before **or after** the ligands have been attached...*); and page 6, lines 21-22 (...*One of these surfaces is to be scribed and the other, i.e. the active surface, **has or** will have the ligand deposited onto it...*) of the description.

As regards inventive step, the Board remarked that

- both document D3, cited in the decision under appeal, as well as document D1, initially cited in writing during examination, could qualify as closest prior art;
- however, considering the distinctive features of the claimed invention, document D1 appeared to be closer to the subject-matter of claim 1 and thus to represent the most suitable starting point for the evaluation of inventive step;
- starting from D1 as closest prior art, the subject-matter of claim 1 according to the main request appeared to involve an inventive step;
- moreover, even starting from document D3 as closest prior art, the claimed subject-matter appeared to involve an inventive step;
- therefore, oral proceedings appeared to be superfluous if a correctly adapted description were filed.

VII. By letter of 31 March 2017 the Appellant filed amended pages 1, 3, 5 and 6 of the description.

The Appellant thus requested that the application be allowed on the basis of the main request and the revised description.

Moreover, provided allowance could be given on this basis, the request for oral proceedings was withdrawn.

No further observations concerning the Board's communication were added.

Reasons for the Decision

Main request

1. Compliance with the requirements of Article 84 EPC
 - 1.1 Claim 1 (see III, *supra*) concerns a method of manufacturing an array chip, characterized by four process steps (i) to (iv).
 - 1.1.1 The Examining Division decided that this claim 1 contravened the requirements of Article 84 EPC (clarity) because of a contradiction existing between the wording of claim 1, specifying that the ligands are deposited on already scribed wafers, and the description (page 5, lines 25-26), mentioning that scribing may occur also after deposition of the ligands.
 - 1.1.2 For the Board, the deficiency identified by the Examining Division arises from the fact that the description had not been adapted to the subject-matter of pending claim 1 and encompassed an alternative

(ligand deposition on a not scribed substrate) wordily not covered by the ambit of claim 1 at issue.

Therefore, the above deficiency concerns the support of claim 1 by the description rather than the clarity of claim 1.

- 1.1.3 In fact, there is no doubt for the Board that the wordings of the four process steps of claim 1 would be clear to the skilled person and that, in particular, the step (i) of the method of claim 1 (see III, *supra*) clearly requires the ligand to be deposited on an already scribed wafer substrate.
- 1.1.4 The amended pages of the description, filed by the Appellant by letter of 31 March 2017, do not contain any longer the originally contained references (see VI, *supra*) to the possibility of depositing the ligand on a not scribed wafer substrate.
- 1.1.5 The Board thus is satisfied that the amended description is fully in agreement with the wording of claim 1 at issue.
- 1.1.6 Claim 1 is thus clear and supported by the description and complies with the requirements of Article 84 EPC.
- 1.2 The dependent claims 2 to 21 do not contain any additional feature which could be considered to be unclear or not in agreement with the description. This was also not contested in the decision under appeal.
 - 1.2.1 The Board thus concludes that claims 2 to 21 also comply with the requirements of Article 84 EPC.
2. Compliance with the requirements of Article 123(2) EPC

2.1 The Board remarks that claim 1 at issue differs from claim 1 as originally filed insofar as it includes the step of "*determining whether the ligand has been deposited correctly in relation to the at least one scribe line*".

The Board finds it therefore appropriate to examine also the compliance of this claim with the requirements of Article 123(2) EPC, even if not dealt with in the decision under appeal.

2.2 As submitted by the Applicant during examination (point 1 of the letter dated 17 February 2014), this feature finds support on page 12, line 30 read in combination with page 14, lines 9-13, of the application as originally filed. The Board has no reason to take a different stance.

2.3 The dependent claims 2 to 21 correspond to claims 2 to 21 of the application as originally filed.

2.4 All claims thus comply with the requirements of Article 123(2)EPC.

3. Inventive step - Claim 1

3.1 The invention

3.1.1 The present invention concerns a method of manufacturing array chips (see claim 1).

As explained in the description (page 2, lines 1 to 7; reference being made to the published international application WO 2007/012885 A1) "*it is essential for the mass production of array chips that quality control*

is total in its nature, whereby every single deposition spot is tested for compliance with the predefined quality/acceptability/array consistency criteria, including size, shape, spot position and degree of donut shape. Assay performance in a array chip format is intimately linked to the amount, activity and stability of the ligands deposited. Ensuring the reproducibility of the deposition buffer therefore ensures reproducibility of the assay results."

However (page 3, lines 4 to 8), "[t]here remains the need for a method to detect accurately whether or not a ligand has been deposited correctly onto a substrate. Each spot in an array is potentially crucial and there is therefore an ongoing need to improve the quality control over array chip production."

3.1.2 The present application defines thus the technical problem underlying the invention as the provision of "an improved production of array chips" (page 3, line 12 and page 5, lines 4 to 5) and of an improved "quality control" over array chip production and, in particular, over the ligand deposition (page 3, lines 4-8 as well as page 1, lines 3-4).

3.2 Closest prior art

3.2.1 In the application of the problem-solution approach "the closest prior art for assessing inventive step is normally a prior art document disclosing subject-matter conceived for the same purpose or aiming at the same objective as the claimed invention and having the most relevant technical features in common, i.e requiring the minimum of structural modifications" (Case Law of the Boards of Appeal of the EPO, 8th edition 2016, I.D. 3.1, pages 163-164).

3.2.2 In view of the technical problem identified in the present application (3.1.2, *supra*) both document D3, concerning (paragraph [0001]) both a method of forming biochips and a method of monitoring a biochip deposit process as well as document D1, concerning both a method of forming biochips (paragraphs [0002] and [0029]) and a method for quality control during fabrication of a biochip (paragraph [0042]), could qualify as closest prior art.

However, the method disclosed in D3 does not involve, at least explicitly, the use of a scribed substrate (see III, *supra*); therefore, D3 does not disclose any of the four steps (i) to (iv) of the method of claim 1, which necessarily involve the presence of scribe lines.

To the contrary, document D1 discloses (paragraphs [0029], [0049] in combination with figure 1(a), and [0103]) a method involving the deposition of ligands onto the scribed surface of a wafer substrate which is then singulated along the scribe lines. Therefore, D1 discloses at least step (iv) and partly step (i) of claim 1 at issue.

Consequently, considering the distinctive features of the claimed invention, document D1 is closer to the subject-matter of claim 1 and thus is found to represent the closest prior art.

3.2.3 For the Board the most suitable starting point for the evaluation of inventive step is represented in particular by the method of manufacturing an array chip of D1 (paragraphs [0029]; [0049] in combination with figure 1(a); and [0103]) comprising the steps of depositing optically encoded beads, bio-functionalized

with at least one ligand, onto the scribed surface of a wafer substrate and breaking the wafer substrate along the scribe lines to produce an array chip.

3.3 The objective technical problem in the light of D1

3.3.1 The technical problem objectively solved by the claimed invention has to be formulated with respect to the closest prior art, represented by D1.

The Board observes in this respect that the technical problem cannot be formulated neither as decided by the Examining Division (see III, *supra*) nor as suggested by the Appellant (page 4, fourth full paragraph of the statement of grounds), as in both cases it was formulated by considering document D3 and not D1 as the closest prior art.

3.3.2 The objective technical problem is rather to be formulated in line with the description of the present application (page 3, line 12 and page 5, lines 4-5) that identifies the goal of the invention in the provision of an improved array chip production process including an improved quality control over array chip production (page 1, lines 3-4 and page 3, lines 7-8).

3.4 Solution and success

3.4.1 As the solution to the alleged technical problem posed, the present invention offers the method of claim 1 involving steps (i) to (iv).

3.4.2 As to the success of the solution, the Board notes that the present application states (page 5, lines 6-7) that preparing array chips from a wafer substrate scribed on the reverse of the surface wherein ligand deposition

occurs is advantageous because (page 6, lines 22 to 24 of the original application) "[s]crubing and depositing on opposite sides of the wafer substrate avoids any substrate material, that is sputtered from the scribe line during scrubing, from interfering with the ligand."

3.4.3 The Board has no reason to doubt of this statement and, thus, concludes that such a feature of the claimed method results in some advantages as regards the production process and the quality control with respect to the method of D1 involving depositing optically encoded beads, bio-functionalized with at least one ligand, on the same surface that is scribed.

3.4.4 Therefore, the Board finds that a method involving the four steps of claim 1 represents an improved array chip production process and an improved quality control of the ligand deposition with respect to the method of the closest prior art.

The method of claim 1 has thus, in the Board's view, successfully solved the technical problem posed.

3.5 Non-obviousness of the solution

3.5.1 The method of claim 1 differs from that of the closest prior art insofar as:

I) the at least one ligand is deposited onto the reverse of the surface comprising the at least one scribe line instead of onto the scribed surface as in D1;

II) the position of the deposited ligand is detected in relation to the at least one scribe line;

III) it is determined whether the ligand has been deposited correctly in relation to the at least one scribe line.

Step (iv) of claim 1 is instead already disclosed in D1 (paragraphs [0029] and [0103]).

3.5.2 It remains thus to be evaluated if, in the light of the prior art and of common general knowledge, it was obvious for the skilled person, faced with the technical problem posed, to modify the method disclosed in the closest prior art, represented by D1, by incorporating the steps I-III indicated above.

3.5.3 It was known from D4 (page 1, left column, lines 13-18, 39-41 and 48-62 and page 1, right column, lines 42 to 45), that, in a silicone wafer used for the manufacture of semiconductor chips, grid lines and, in particular, scribe lines can be used as reference in a method for determining a specific location on the wafer surface for quality control and thus the correctness of the location position. The correct location is then detected by using an optical system (column 3, lines 44 to 55 and figure 2).

D4 thus concerns wafer substrates used in the semiconductor industry and not for the biochips manufacture.

However, contrary to the Appellant's submission (see IV, *supra*), the Board is convinced that the skilled person, looking for an improvement of the quality control of the array chip production of D1, would have also looked in methods applied to wafer substrates in the semiconductors technical field since D1 uses explicitly for the preparation of biochips the same

type of substrate used in D4 (see paragraph [0052], reading "...the substrate can be a semiconductor wafer, such as single crystal semiconductor wafers which are commonly used in the **semiconductor device industry**", emphasis added).

3.5.4 Therefore, it would have been obvious for the skilled person to apply the method for determining a specific location on the wafer substrate and the correctness of such a location of D4 to the method of the closest prior art, in order to further improve the quality control of the ligand deposition on a wafer substrate of D1, which quality control is also based in this document on an optical imaging method (see paragraph [0042] of D1). Therefore, it would have been obvious for the skilled person, faced with the technical problem posed, to detect the location of the deposited ligand in respect of at least one scribe line (step II above) and to determine the correctness of its position in relation to the at least one scribe line (step III above).

3.5.5 The obviousness of the application of the method for quality control of D4 to the biochips of D1 is corroborated by the similar method disclosed in D3, which is a document concerning the manufacture of biochips (see claims 1, 10, paragraphs [0026] to [0030] and figure 1A of D3), according to which the position on a virtual grid of the deposited ligands is detected with respect to the edge(s) of the substrate, step which allows to determine if the ligands have been correctly deposited, the virtual grid used being very similar to the grid lines used as reference in the method of D4.

- 3.5.6 Therefore, for the Board, it would have been obvious for the skilled person, faced with the technical problem posed, to apply steps II and III to the method of the closest prior art.
- 3.5.7 As regards step I, i.e. the deposition of the at least one ligand onto the reverse of the surface comprising the at least one scribe line instead of onto the scribed surface as in D1, the prior art does not disclose or suggest that the deposition of the ligands on the reverse surface with respect to the scribed one could be a suitable alternative to the deposition on the scribed surface as carried out in D1 and that it could bring about any advantage.
- 3.5.8 In fact, D4 discussed above concerns the determination of specific locations only **on the scribed surface** of a wafer by using the scribe lines as reference. Therefore, it would rather lead the skilled person away from attempting to deposit the ligands on the reverse not scribed wafer surface of the method of D1, since such a step would render the quality control method of D4, concerning only the scribed surface, no longer applicable.
- 3.5.9 Document D6, also cited in the decision under appeal, concerns (claims 1 and 5; column 3, lines 44 to 48) a method for the back-side singulation of a wafer substrate comprising scribe lines and functional components (integrated circuits) **on the same first front-surface** of the substrate, i.e. a method wherein the components are deposited on the scribed surface of the wafer substrate and not on its reverse surface. Therefore, contrary to what stated in the decision under appeal (point 2.5), the skilled person, if he would have considered this document at all, would not

have derived from this disclosure any incitation to diverge from the method of D1 and to apply the ligands on the reverse not scribed surface of the wafer substrate.

- 3.5.10 D5, also cited in the decision under appeal, concerns only some definitions belonging to common general knowledge and concerning the known procedure of breaking a semiconductor wafer along its scribe lines. Therefore, it relates only to step (iv) of the method of claim 1 at issue, feature which is already known from D1 (3.5.1, *supra*).
- 3.5.11 The Board thus concludes that the prior art does not contain any teaching which could have possibly motivated the skilled person to apply the ligands to the reverse not scribed side of the wafer substrate in order to solve the technical problem posed.
- 3.5.12 For the sake of completeness, the Board remarks that also starting (*arguendo*) from document D3 as closest prior art the skilled person would not have found for similar reasons any motivation to apply the ligands to the reverse not scribed side of the wafer substrate in order to solve the technical problem posed.
- 3.6 The Board thus concludes that the subject-matter of claim 1 involves an inventive step (Articles 52(1) and 56 EPC).
- 3.6.1 For the same reasons the dependent claims 2 to 21 also involve an inventive step.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the Examining Division with the order to grant a patent with the following documents:

Description: pages 2, 4 and 7-18 as published in WO 2007/012885 A1;
pages 1, 3, 5 and 6 as filed with letter of 31 March 2017.

Claims: numbers 1 to 21 as filed with letter of 17 March 2015.

Drawings: sheets 1/10 - 10/10 as published in WO 2007/012885 A1

The Registrar:

The Chairman:



D. Magliano

P. Ammendola

Decision electronically authenticated