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**Datasheet for the decision
of 26 April 2018**

Case Number: T 1342/13 - 3.4.02

Application Number: 03768474.3

Publication Number: 1642158

IPC: G02B1/10

Language of the proceedings: EN

Title of invention:

HIGH ENERGY, LOW ENERGY DENSITY, RADIATION-RESISTANT OPTICS
USED WITH MICRO-ELECTROMECHANICAL DEVICES

Applicant:

Micronic Mydata AB
Fraunhofer-Gesellschaft zur Förderung der
angewandten Forschung e.V.

Headword:

Relevant legal provisions:

RPBA Art. 12(4)
EPC 1973 Art. 56
EPC R. 103(1)

Keyword:

Admissibility of main request (no) - broadened claim 1
Inventive step - (no) - first to fifth auxiliary requests

Decisions cited:

Catchword:



Beschwerdekammern
Boards of Appeal
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Case Number: T 1342/13 - 3.4.02

D E C I S I O N
of Technical Board of Appeal 3.4.02
of 26 April 2018

Appellant: Micronic Mydata AB
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Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted on 27 November
2012 refusing European patent application No.
03768474.3 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman R. Bekkering
Members: A. Hornung
G. Decker

Summary of Facts and Submissions

I. The applicants lodged an appeal against the decision of the examining division refusing European patent application No. 03768474.3 *inter alia* on the basis of Article 56 EPC 1973.

II. The appellants requested that the decision under appeal be set aside and that a patent be granted on the basis of the claims according to a main request or, in the alternative, the claims according to first to fifth auxiliary requests, all requests filed with the statement setting out the grounds of appeal dated 8 April 2013.

Furthermore, reimbursement of the appeal fee was requested.

As a precaution, the appellants requested oral proceedings.

III. In a communication annexed to a summons to oral proceedings, the board informed the appellants about its provisional and non-binding opinion according to which, *inter alia*, the main request should not be admitted into the appeal proceedings, the applicants did not enjoy a right of priority of the previous application US 10/335,981 and the subject-matter of claim 1 of the first to fifth auxiliary requests lacked an inventive step.

IV. In the communication annexed to the summons to oral proceedings, reference was made to document

D1: US 2003/0016337 A

In addition, the board considered it appropriate to introduce the following documents D2, D3 and D4 into the proceedings:

D2: "A comparative study of the UV optical and structural properties of SiO₂, Al₂O₃ and HfO₂ single layers deposited by ...", R. Thielsch et al., Thin Solid Films 410 (2002), pages 86-93, XP004358252

D3: "Properties of SiO₂ and Al₂O₃ films for use in UV-optical coatings", R. Thielsch et al., SPIE Vol 3133, 1997, XP055415089

D4: US 5 619 059 A

- V. The board's opinion concerning the admissibility of the set of claims of the main request was worded as follows (see point **6.1** of the communication annexed to the summons):

"The set of claims 1 to 47 of the main request is identical to the set of claims as originally filed. During first-instance proceedings, the applicant limited the scope of the independent claims by amending them. In particular, the independent claims 1 and 37 filed upon entry into the European phase, as well as the independent claims 1 and 26 on which the decision under appeal is based, have a significantly narrower scope than the independent claims 1 and 38 of the present main request.

Therefore, the board is currently of the view that the main request should not be admitted into the appeal proceedings under Article 12(4) RPBA."

- VI. The board's opinion concerning the right of priority was worded as follows (see point **7** of the communication annexed to the summons):

"**7.** Priority right and request of correction of the priority date

The board is of the preliminary opinion that the applicant does not enjoy a right of priority of the previous application US 10/335,981 of 2 January 2003 (Article 87(1) EPC 1973).

7.1 In order to obtain said priority right, the mistakenly filed priority date of 1 January 2003 would have to be corrected. For such a correction under Rule 88 EPC 1973 to take place, as a prerequisite, an effective priority claim would still have to exist.

7.2 However, the priority claim on file has been lost for the application under Article 91(3) EPC 1973, as this loss of rights was noted by the examining division on 10 October 2006 pursuant to Rule 69(1) EPC 1973 and has become *res judicata* since the applicant requested neither an appealable decision according to Rule 69(2) EPC 1973 nor the re-establishment of its rights according to Article 122 EPC 1973. Thus, the question whether the correction of the mistakenly filed priority date is allowable, is of no relevance anymore.

7.3 As a consequence, the examining division seems to have been right in considering the filing date of the international application (19 December 2003) as the filing date according to Articles 54(2) EPC 1973 and 153(2) EPC (see communications of 15 September 2009, point 1; of 9 June 2011, point 2.1; of 15 May 2012, point 3.1). Hence, for the purpose of examination of novelty and inventive step, document D1 appears to form part of the state of the art within the meaning of Article 54(2) EPC 1973."

VII. The board's opinion concerning lack of inventive step of claim 1 of the first auxiliary request was worded as follows (see point **9.3** of the communication annexed to the summons):

"9.3 Inventive step

9.3.1 The board, in its preliminary view, tends to share the opinion of the examining division that the subject-matter of claim 1 lacks an inventive step with respect to the disclosure of D1, possibly in combination with D2 (Article 56 EPC 1973).

D1 discloses a method to improve the resistance to radiation-induced damage in a MEMS comprising a movable mirror (13) (see figure 1, paragraphs [0001], [0023]), said damage resulting from ultraviolet radiation ([0019]), the method comprising the action of forming a radiation-resistant layer comprising MgF_2 ([0027], [0046]).

The subject-matter of claim 1 differs from the method of D1 in that the radiation-resistant layer includes an oxide of hafnium, an oxide of aluminium or an oxide of silicon.

The patent application as filed does not appear to disclose any information about a technical effect specifically related to the differing feature. On the contrary, it would appear from the application as filed (see paragraphs [0028], [0031], [0036], [0038] and [0048]) that magnesium fluoride MgF_2 , on the one hand, and hafnium, aluminium and silicon oxides, on the other hand, are equally preferred alternatives. No distinction between these layer materials, based on their suitability to improve the resistance to UV-light-induced damage or on some other technical effect, is disclosed in the application as filed.

Therefore, as stated in the appealed decision, the differing feature of claim 1 seems to be a solution to the problem of merely finding an alternative material to the layer material MgF_2 of D1.

The board currently concurs with the examining division that hafnium, aluminium and silicon oxides are well-known, typical materials for thin film coatings used with UV illumination. See, for instance, D2 which is concerned inter alia with optical coatings presenting "high resistance against damage by high-fluence excimer laser radiation" (D2, page 86, left column, first sentence) and which discloses that "SiO₂, Al₂O₃ and HfO₂ are the most important oxide thin-film materials for the manufacture of interference coatings in the DUV spectral region, down to 248 nm in the case of HfO₂, or even down to 200 nm for SiO₂ and Al₂O₃" (D2, page 86, right column, first sentence).

Starting from D1 and confronted with the problem of finding an alternative material for the MgF₂ coating of D1, the skilled person, either on the basis of their own technical knowledge or on the basis of the disclosure of D2, would consider selecting either SiO₂, Al₂O₃ or HfO₂, thereby arriving at the claimed subject-matter without exercising any inventive skills.

9.3.2 The applicant argued that the present application and D1 "aim at different goals". D1 disclosed metal-halide coatings of DMD mirrors for preventing them to stick to the substrate. No processes in the UV spectrum below 248 nm were disclosed in D1. In contrast, the present application dealt with micro-mirrors used in "a mask writing tool or a chip-manufacturing tool" and exposed to "low-energy density, high-energy laser pulses ... which may be highly damaging". Hafnium, aluminium and silicon oxides provided the surprising beneficial technical effect of "a highly effective radiation resistant layer for MEMS in lithography processes".

The board, in its preliminary view, is not convinced by these arguments. D1 does indeed relate to micro-mirrors used

in UV-lithography, the mirrors being illuminated by UV radiation as in the present application. Claim 1 does not appear to specify any precise damage as such but only mentions the type of radiation which is at the origin of the damage. The wording of claim 1, referring to laser pulses of low-fluence at 248 nm or less, does not seem to exclude the type of damage described in D1.

9.3.3 The applicant further argued that the skilled person would refrain from using hafnium, aluminium or silicon oxides because sticking due to hydration was the main problem dealt with in D1. Therefore, the skilled person might have considered replacing metal-halides of D1 by another material less hydrophilic than metal-halides but not by hafnium, aluminium or silicon oxides which "can be processed to be more hydrophilic than most metal-halides". The applicant concluded that D1 missed the surprising effect of the quality of the claimed oxides as a radiation-resistant layer.

The board, in its preliminary opinion, is not convinced by these arguments because there is no evidence on file showing that hafnium, aluminium and silicon oxides are more hydrophilic than MgF_2 . On the contrary, since D2 discloses that SiO_2 , Al_2O_3 and HfO_2 are the most important oxide thin-film materials for UV lithography, the skilled person would find it obvious to consider any of the three oxides disclosed in D2. Beyond this first motivational reason to envisage SiO_2 , Al_2O_3 and HfO_2 , the skilled person is explicitly taught by D2 that HfO_2 has a high resistance against damage by UV radiation (figure 10; page 92, left column) and that " Al_2O_3 coatings do not show any water absorption from the atmosphere" (D2, page 89, right-hand column, second paragraph). See also D3, confirming that SiO_2 and Al_2O_3 show similar high resistance against damage by UV radiation.

9.3.4 Finally, the applicant argued that hafnium, aluminium and silicon oxides, contrary to metal-halides, did not interact with CMOS structures and that, therefore, CMOS structures could be processed in the same production line as the radiation-resistant layers. This represented another surprising beneficial technical effect of the claimed materials.

Besides the fact that the applicant did not provide any evidence of their statement, the board, in its preliminary view, maintains that the skilled person would envisage to use any of the hafnium, aluminium and silicon oxides for the reason that these oxides are well-known in the art and show high resistance against damage due to UV radiation.

The board further draws the applicant's attention to document D4 which discloses, with reference to figure 1, a movable modulating DMD or MEMS device (see column 1, lines 12 to 39) comprising inter alia a layer of Al_2O_3 (see the sentence bridging columns 6 and 7) and that "the process for manufacturing a DMD display is compatible with that used in the semiconductor industry" (column 1, lines 28 to 30)."

VIII. The board's opinion concerning lack of inventive step of claim 1 of the second auxiliary request was worded as follows (see point **10.2** of the communication annexed to the summons):

"10.2 Inventive step

It would appear that the subject-matter of claim 1 lacks an inventive step with respect to the disclosure of D1 (Article 56 EPC 1973).

10.2.1 Claim 1 differs from claim 1 of the first auxiliary request in that it comprises a planarizing step providing an RMS flatness of better than 2nm.

10.2.2 The board is of the preliminary opinion that a planar surface and low roughness are desirable features for a micro-mirror in the field of UV-lithography, as it is the case for the micro-mirror of D1. Indeed, lithography deals with imaging very small features, thereby inherently requiring high quality optical surfaces. Furthermore, as would be generally known to the skilled person, the optical disturbance due to roughness increases the shorter the wavelength of the reflected radiation is. As a consequence, the claimed method does not appear to involve an inventive step.

10.2.3 It would appear that the applicant argued that D1 relates to micro-mirrors used exclusively or mainly for digital switching in non-lithographic applications. Therefore, the skilled person would not be motivated to planarize the mirror surface.

The board is currently not convinced since it cannot find a sufficient basis in D1 for the applicant's arguments."

IX. The board's opinion concerning lack of inventive step of claim 1 of the third to fifth auxiliary requests was worded as follows (see point **11.** of the communication annexed to the summons):

"11. Third to fifth auxiliary requests

The subject-matter of claim 1 of the third to fifth auxiliary requests differs from claim 1 of the higher ranking requests essentially in that the material of the radiation-resistant layer is limited to an oxide of

aluminium (third and fourth auxiliary requests) or to Al₂O₃ (fifth auxiliary request). D2 and D3 disclose Al₂O₃ as a preferred layer material. Therefore, it appears that the subject-matter of claim 1 of the third to fifth auxiliary requests lacks an inventive step for reasons corresponding to those given for claim 1 of the first and second auxiliary requests."

X. In response to the summons to oral proceedings, the appellants informed the board with their letter dated 24 April 2018 that they would not be attending the oral proceedings. The appellants did not file any comments concerning the board's preliminary opinion as annexed to the summons, nor any new requests.

XI. Oral proceedings were held on 26 April 2018 in the absence of the appellants.

XII. Independent claim 1 of the **main request** reads as follows:

"A method to improve the resistance to radiation-induced damage in an optical micro-electromechanical system (MEMS) comprising at least one movable modulating element, said damage resulting from superimposed pulses of low-fluence, short wavelength electromagnetic radiation, comprising the action of:

- forming at least one radiation-resistant layer on a front side of at least one movable modulating element."

Independent claim 1 of the **first auxiliary request** further defines with respect to claim 1 of the main request that the short wavelength electromagnetic radiation is "at a wavelength of less than or equal to about 248 nm" and "wherein said radiation-resistant layer includes an oxide of hafnium, an oxide of aluminum or an oxide of silicon."

Independent claim 1 of the **second auxiliary request** further defines with respect to claim 1 of the first auxiliary request:

"and further including, prior to forming the radiation-resistant layer, planarizing the front side, wherein the front side, after the planarizing, has an RMS flatness of better than 2 nm."

Independent claim 1 of the **third auxiliary request** further defines with respect to claim 1 of the main request that the short wavelength electromagnetic radiation is "at a wavelength of less than or equal to about 248 nm" and "wherein said radiation-resistant layer includes an oxide of aluminum."

Independent claim 1 of the **fourth auxiliary request** further defines with respect to claim 1 of the third auxiliary request:

"and further including, prior to forming the radiation-resistant layer, planarizing the front side, wherein the front side, after the planarizing, has an RMS flatness of better than 2 nm."

Independent claim 1 of the **fifth auxiliary request** further defines with respect to claim 1 of the main request that the short wavelength electromagnetic radiation is "at a wavelength of less than or equal to about 248 nm" and "wherein said radiation-resistant layer includes Al₂O₃."

Reasons for the Decision

1. Main request

In the communication annexed to the summons (see point V. above), the board expressed its preliminary view, along with the underlying reasons, that the main request should not be admitted into the appeal proceedings under Article 12(4) RPBA. The appellants did not rebut the board's provisional opinion. The board sees no reason to deviate from its preliminary opinion regarding admissibility of the main request, which therefore becomes final.

It follows that the main request is not admitted into the appeal proceedings under Article 12(4) RPBA.

2. First to fifth auxiliary requests

2.1 The board exercises its discretion under Article 12(4) RPBA by admitting the first to fifth auxiliary requests into the proceedings.

2.2 In the communication annexed to the summons, the board expressed its preliminary view, along with the underlying reasons, that document D1 formed part of the state of the art within the meaning of Article 54(2) EPC 1973 (see point VI. above), that the subject-matter of claim 1 of the first to fifth auxiliary requests lacked an inventive step (Article 56 EPC 1973) and that the appellants' arguments in favour of inventive step (see points VII. to IX. above), filed with the grounds of appeal, were not convincing.

The appellants neither attempted to rebut the board's provisional opinion, nor submitted any new requests aiming at overcoming the objections.

The board sees no reason to deviate from its provisional opinion regarding the validity of the claimed priority and inventive step, which therefore becomes final.

It follows that the subject-matter of claim 1 of the first to fifth auxiliary requests does not meet the requirements of Article 56 EPC 1973 for the reasons set out in the board's preliminary opinion.

3. The appellants' request for reimbursement of the appeal fee was not substantiated in their statement of grounds of appeal. The board does also not see any reason, such as a substantial procedural violation, which would justify such a reimbursement.

It follows that the request for reimbursement of the appeal fee must be refused (Rule 103(1)(a) EPC).

Order

For these reasons it is decided that:

1. The appeal is dismissed.
2. The request for reimbursement of the appeal fee is refused.

The Registrar:

The Chairman:



M. Kiehl

R. Bekkering

Decision electronically authenticated