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D E C I S I O N
of 10 December 2003

Case Number: T 0253/01 - 3.4.3

Application Number: 92304870.6

Publication Number: 0516436

IPC: H01J 37/34

Language of the proceedings: EN

Title of invention:
Sputtering device

Patentee:
DEPOSITION SCIENCES, INC.

Opponent:
Optical Coating Laboratory Inc.

Headword:

-

Relevant legal provisions:
EPC Art. 100(a), 100(b)

Keyword:
"Sufficient disclosure (yes)"
"Novelty and inventive step (yes)"
"Admission of late filed documents (no)"
"New facts and related arguments (not admitted)"

Decisions cited:

-

Catchword:

-



Case Number: T 0253/01 - 3.4.3

D E C I S I O N
of the Technical Board of Appeal 3.4.3
of 10 December 2003

Appellant: Optical Coating Laboratory Inc.
(Opponent) 2789 Northpoint Parkway
Santa Rosa
California 95407 (US)

Representative: Bayliss Geoffrey Cyrill
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Respondent: DEPOSITION SCIENCES, INC.
(Proprietor of the patent) 386 Tesconi Court
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Representative: Ruuskanen, Juha-Pekka
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 15 December 2000
rejecting the opposition filed against European
patent No. 0516436 pursuant to Article 102(2)
EPC.

Composition of the Board:

Chairman: R. K. Shukla
Members: E. Wolff
J. P. B. Seitz

Summary of Facts and Submissions

- I. This is an appeal against the decision of the opposition division, dispatched 15 December 2000, to reject the opposition to European patent No. 0 513 834.
- II. The opposition was based on the grounds that the invention lacked novelty and did not involve an inventive step (Article 100(a)) and was not sufficiently clearly and completely disclosed (Article 100(b)). The opponent had relied on the following prior art documents referred to in the patent application as filed

D1 US-A-4 851 095

D2 US-A-4 420 385

and on the following documents submitted after the expiry of the opposition period

D3 US-A-5 006 219

D4 GB-A-2 180 262

D5 WO-A-92/13114

D6 US-A-4 931 158

The opposition division considered documents D3 to D6 not to be prima facie relevant and in the exercise of its discretion under Article 114(2) EPC did not admit them into the proceedings.

III. The appellant (opponent) filed a notice of appeal on 21 February 2001 and paid the appeal fee on the same day. The statement setting out the grounds of appeal was filed on 25 April 2001. All the grounds of opposition were maintained in the appeal proceedings. The appellant requested that the decision under appeal be set aside and that the patent be revoked.

In the appeal proceedings, the appellant relied upon documents D3 and D5 as well as on the following further prior art document filed together with the statement setting out the grounds of appeal:

D7 US-A-4 492 620

IV. The respondent (proprietor) requested that the appeal be dismissed and that none of the documents D3, D5 and D7 be admitted into the proceedings.

V. Oral proceedings took place on 10 December 2003.

VI. Claim 1 of the patent as granted and maintained by the opposition division reads as follows:

"1. A magnetron sputtering apparatus (10) for sputter depositing at least one selected material on a substrate (3) and effecting reaction of said material, which apparatus comprises a vacuum chamber, a substrate holder (2) within the vacuum chamber, adapted for mounting substrates thereon, the substrate holder and the vacuum chamber defining therebetween a relatively narrow elongated reaction volume into which a reactive gas is introduced, at least one magnetron sputter device (5) positioned at a first workstation adjacent

said substrate holder and comprising a target of selected material adapted for generating a first plasma (9) throughout the reaction volume for sputter depositing at least one selected material onto said substrates, and at least one secondary plasma device (6), characterized in that the secondary plasma device is positioned at the first workstation adjacent the magnetron sputter device and adjacent the substrate holder, whereby the sputter device and secondary plasma device respectively provide sputter and activation zones which are atmospherically and physically adjacent, and adapted for enhancing the plasma of the sputter device to effect reaction of the reactive gas with the sputter deposited material at a relatively low ambient partial pressure of the reactive gas and in that the substrate holder is adapted for rotating the substrates past associated workstations."

VII. The arguments of the appellant can be summarized as follows. The detailed arguments of the appellant are incorporated in the "Reasons for the Decision".

Claim 1 of the patent in suit is either insufficient or invalid in the light of the prior art.

In particular, if the term adjacent in the phrase "physically and atmospherically adjacent" is interpreted as in the decision of the opposition division, the invention is insufficiently disclosed to allow the skilled person to carry out the invention disclosed in the patent.

If the term "adjacent" in the phrase "physically and atmospherically adjacent" of claim 1 were to be

interpreted in the light of the description in order to meet the objection of insufficient disclosure, then documents D3, D5 and D7 become relevant to determining whether the subject matter of claim 1 is patentable or not. Documents D3, D5 and D7 should therefore be admitted into the proceedings.

VIII. The arguments put forward by the respondent can be summarized as follows.

Claim 1 should be interpreted in accordance with the principles laid down in Article 69 and its Protocol on Interpretation. The interpretation provided by the appellant does not satisfy this requirement in that it combines an overly literal approach with hindsight interpretation. At the time the opposition was filed, there was only one feature of the claim which was attacked for not having been sufficiently described. The appellant's attempt to introduce at the appeal stage for the first time further reasons, facts and evidence concerning the sufficiency of the disclosure in respect of other terms of the claim is against the principles set out in the established case law of the Boards of appeal. Moreover, all the objections raised under the heading of lack of sufficiency are, in fact, objections against the clarity of the claim and therefore do not fall under the grounds of opposition available under Article 100 EPC.

As regards documents D3, D5 and D7, these were submitted after the expiry of the period of opposition with documents D7 having been submitted only with the statement of the grounds of appeal. None of these documents fulfils the requirement of being highly

relevant and, following the established case law of the Boards of appeal on this point, should not be admitted into the proceedings.

Reasons for the Decision

1. The appeal is admissible.
2. *Interpretation of the claims*
 - 2.1 In the decision under appeal, the opposition division held that in the phrase "physically and atmospherically adjacent" in claim 1 the term "adjacent" has the same meaning of "near or next to" as elsewhere in the claim (decision, points 3.2 and 3.3).
 - 2.1.1 The appellant argued that the term "adjacent" was used in its normal meaning of "near or next to" to claim the spatial relationship between sputter device and the substrate holder, between the sputter device and the secondary plasma device and between the secondary plasma device and the substrate holder (see, e.g. statement of grounds, page 11, Section B). The sputtering and activation zones were also claimed as being "physically and atmospherically adjacent". According to the description, the two zones were brought physically and atmospherically together, thereby effectively blending the plasmas (column 2, lines 16 to 22). This would suggest that a "zone" is equivalent to the region occupied by plasma. Taking "adjacent" to have the same meaning as elsewhere in the claim would imply that the zones and their associated plasmas need only be near each other, subject only to

the limitation that the claimed enhancement must take place. The patent in suit disclosed only one way of obtaining the called for enhancement, which is to bring the sputter device and the secondary plasma device close (enough) together to blend the plasmas. However, in this case, the zones were not "adjacent" in the normal sense of the word which is used elsewhere in the claim, but were "intersecting" or "intermixed" (statement of grounds, page 7, first full paragraph).

2.2 In the phrase "atmospherically and physically adjacent" the word "adjacent" is, unlike elsewhere in the claim, qualified in a way which requires the meaning of the phrase to be considered as a whole. There is no compelling reason to assume that the word "adjacent" as used in this phrase has the same meaning of "near or next to" as elsewhere in the claim where it is used on its own.

2.2.1 According to the description, the invention avoids the shortcomings of the prior art "by bringing the sputter and activation zones atmospherically and physically together while eliminating any baffles or differential pumping, thereby effectively blending the plasmas of these two zones into a single continuous plasma ..." (column 2, lines 16 to 22); and the "... plasma 11 is spatially continuous over target 5 and plasma generation device 6" (column 4, lines 17 to 19). If the term "atmospherically and physically adjacent" is to read onto either or both these parts of the description, it must mean that the plasmas are contiguous (see also column 4, lines 55 to 58, "... carries plasma away from the target and towards substrate 3 (Fig. 1) and contiguous plasma generating device 6 (Fig. 1)". This

interpretation is further supported, for example, by statements in the description that "plasma 11 electrically couples the target and plasma generation device." (column 4, lines 20 to 22) and that "it is clear that the sputter magnetron and microwave device operate as an integral unit" (column 6, lines 4 to 6).

This interpretation is also the sole one which the respondent (patentee) relying on the above quoted passages of the description, defended all throughout the written procedure and during the oral proceedings.

2.2.2 The Board therefore concludes that, correctly interpreted, the term "atmospherically and physically adjacent" in claim 1 means that there is no physical or atmospheric separation of the sputter and activation zones.

3. *Sufficiency of disclosure of the invention*
(Article 100(b) EPC)

3.1 The appellant had argued that if the interpretation of the term "adjacent" which was adopted by the opposition division is followed, then the description is insufficient not only in that it fails to explain adequately what is meant in the claim by a sputter zone and an activation zone being "physically and atmospherically adjacent" but also in that it was then not apparent how the sputter device and the secondary plasma device would be "adapted for enhancing the plasma of the sputter device".

3.2 The interpretation, that the term "atmospherically and physically adjacent" in claim 1 means that the sputter and activation zones are neither physically nor atmospherically separated, is firmly based on the more detailed description in the patent (see paragraph 2.2.1 above) which the Board considers to be sufficiently clear and complete. The invention as claimed is, in this respect, therefore sufficiently disclosed.

3.2.1 It further follows from the interpretation adopted by the Board that all that is required for the zones to be "adapted for enhancing the plasma of the sputter device" is that they are "atmospherically and physically adjacent", that is, that they are not atmospherically or physically separated. In this respect, too, the invention as claimed is therefore sufficiently disclosed.

3.3 The appellant also alleged that it was not disclosed how to adapt a substrate holder to "rotate past selected workstations," since the only arrangement described has only one workstation. However, the Board observes that the claim is not restricted to a single workstation ("at least one magnetron sputter device (5) positioned at a first workstation" clearly implies that there may be several workstations) and agrees with the conclusion reached by the opposition division (page 4, first paragraph), that it would be clear to the skilled person that the selection of the work stations is done by the operator and not by the substrate holder, and that the claim merely requires that the substrate holder is adapted to rotate the substrate past the workstations and, hence, also past selected ones.

3.4 The appellant objected that the requirement of sufficiency of disclosure was not given in respect of the expression "a relatively narrow elongated reaction volume". Thus only in the description of Figure 7 (column 12, lines 43 to 46) was the word "long" used to describe the plasma; otherwise there was no mention of the direction in which the volume has to be narrow and in which direction elongated. Moreover, on account of claim 20, which claims that the substrate holder is a disk, claim 1 also extended to disks. If the substrate holder were a disk, the sputtering devices must be on top of or underneath the disk but there was no description as to what a relatively narrow elongated reaction zone would be in this context.

3.4.1 As pointed out by the appellant himself, the description of Figure 6 and the associated description sets out at least one example of what is to be understood by "a relatively narrow elongated reaction volume". There is in the Board's view no doubt that the skilled person could follow those instructions and implement the requirement of "a relatively narrow elongated reaction volume" without difficulty.

3.5 For the foregoing reasons, the Board considers that the invention claimed in claim 1 of the patent in suit is sufficiently and clearly described as required by Article 100(b) EPC.

4. *Admissibility of late filed documents*

4.1 During the proceedings before the opposition division, after the expiry of the period for opposition, the appellant had filed inter alia documents D3 and D5. The

opposition division considered these documents not to be prima facie relevant and they were therefore not admitted into the proceedings.

- 4.2 The appellant requested that documents D3 and D5, as well as document D7 which is submitted for the first time, should be admitted into the proceedings before the Board.
- 4.2.1 Documents D3 and D5 were highly relevant in view of the unexpected interpretation which the patentee and subsequently the opposition division gave to claim 1 (see the appellant's submission entitled "Opponent's response to patentee's observations to appeal", filed 12 November 2003, page 9, point 2). Document D7 was highly relevant on account of the opposition division's reasoning ("Opponent's response ..." page 10, section B) and was the closest prior art for the purpose of determining whether the claimed invention involves an inventive step.
- 4.2.2 Document D5 was highly relevant because it discloses an ion vapour deposition apparatus with several magnetron devices (36, 38, 42), of which some (36 and 38) are sputtering devices to deposit metals which are oxidized by an oxygen plasma generated by magnetron 42 (page 11, third and fourth paragraphs). Substrates in the form of spectacle lenses are loaded onto a disc which spins at high speed to transport the substrates past these magnetron devices. Also, a brief calculation shows that the distances between the magnetrons 36, 38 and 42 are approximately ten inches and are thus similar to the distance between the sputter target and the microwave window described in the patent in suit. In the absence

of any mention of any baffles within the chamber 34 of the document D5, it would be inherent that in the device of document D5 a sputter zone associated with magnetron 36 or 38 is "atmospherically and physically adjacent" to the reaction zone associated with magnetron 42. Moreover, because enhancement is merely a result of bringing the two zones together, the enhancement claimed for the invention in the patent in suit would also occur in the device of document D5, especially since the inlets for oxygen and argon are shown in the drawing of Figure 2 to lie close together.

4.2.3 Document D7 was more relevant than document D1 and, should be taken as the nearest prior art. It concerns a plasma deposition apparatus which comprises a plasma formation chamber in which a plasma is generated with the aid of microwaves, a sputter target, and a substrate. Ions formed in the plasma formation chamber are used to sputter a target consisting of a sputtering material, and the atoms sputtered from the target are taken in the plasma stream and ionised. The sputtered atoms which are thus ionised are entrained into the plasma stream and transported towards the substrate for the purpose of depositing a thin film of chemical compound or an alloy including sputtered atoms. If operated at sufficiently high voltages, the sputter target would by itself provide a plasma. As a result, when operated together with the microwave plasma generating device, there would be formed in the region of the substrate an annular zone exposed to the plasma generated by the sputter device, while the plasma inside the annular zone would be plasma arriving directly from the plasma generating device. Thus, the requirement of claim 1 for "sputter and activation

zones which are atmospherically and physically adjacent" would be fulfilled.

4.2.4 Document D3 also had a greater degree of relevance than document D1 (see the "Opponent's response ...", page 7, point (b)) as the apparatus disclosed has two plasma regions forming a single plasma above the substrate. A diode sputtering arrangement 1 is located in a chamber opposite the substrate, microwave radiators 37 and 38, and magnetic fields provided by permanent magnets 8, 35, 36, 41, 42 and 43 being chosen such that the microwave radiation directed at the plasma region immediately above the substrate 3 would lead to electron cyclotron resonance.

4.3 According to decision T 1002/92, a new document not mentioned in the indication of facts, evidence and arguments presented in the notice of opposition must pass the test of being prima facie highly relevant in the sense that its admission can reasonably be expected to change the eventual outcome in that it is highly likely to prejudice the maintenance of the European patent.

4.3.1 Document D5 is prior art only in respect of novelty according to Article 54(3) EPC. Document D5 neither mentions any interaction of the plasmas associated with the magnetrons 36, 38 and 42, nor does it give any indication that such an interaction might be beneficial. There is also no detailed description concerning the interior of the processing chamber. Therefore, document D5 cannot be considered to be prima facie highly relevant for determining the novelty of the claimed invention.

- 4.3.2 In the apparatus of document D7, although containing both a sputtering target and a microwave plasma generating device, only the sputter target can be considered to be adjacent to the substrate in the sense of "near or next to". Also, there is no substrate holder which "is adapted for rotating the substrates past associated workstations." Modifications to provide such a substrate holder would, in the view of the Board, not be trivial. The argument that, if operated at much higher voltages than described in document D7, the sputter target would by itself provide a plasma, is based wholly on hindsight and must therefore be rejected. It follows that the document is thus neither more suitable as prior art starting point than document D1 nor can it be said to be prima facie highly relevant in the required sense.
- 4.4 Although document D3 discloses two plasma regions forming a single plasma adjacent the substrate, the apparatus concerned does not provide neighbouring zones each positioned adjacent the substrate holder, of which one is a sputtering zone and the second an activation zone as is required by claim 1 of the patent in suit. Document D3 cannot therefore be regarded as prima facie highly relevant in the required sense.
- 4.5 Since none of the documents D3, D5 and D7 fulfils the requirement of being prima facie highly relevant in the sense of decision T 1002/92, these documents are not admitted into the proceedings.

5. *Novelty and inventive step*

5.1 With documents D3, D5 and D7 not being admitted into the proceedings, the only documents to be considered are documents D1 and D2. However, objections against novelty and the presence of an inventive step on the basis of documents D1 and D2 were not pursued by the appellant and the Board has no reasons to depart from the finding of the opposition division that the invention as claimed in claim 1 of the patent in suit is new and inventive having regard to these two documents.

6. In the Board's judgement, for the reasons given above, the invention disclosed in the patent in suit is described in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art as required by Article 100(b) EPC, and the invention claimed in claim 1 is new and involves an inventive step as required by Article 100(a) EPC referring to Articles 54 and 56 EPC respectively.

Order

For these reasons it is decided that:

The appeal is dismissed

The Registrar:

The Chairman:

P. Martorana

R. K. Shukla