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**D E C I S I O N**  
**of 8 June 1995**

**Case Number:** T 0363/91 - 3.2.2

**Application Number:** 86102365.3

**Publication Number:** 0194495

**IPC:** C30B 25/18

**Language of the proceedings:** EN

**Title of invention:**

Method of producing sheets of crystalline material

**Applicant:**

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

**Opponent:**

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**Headword:**

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**Relevant legal provisions:**

EPC Art. 56

**Keyword:**

"Inventive step"

"Auxiliary request"

"Remitted to the Examining Division"

**Decisions cited:**

T 0063/86

**Catchword:**

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Case Number: T 0363/91 - 3.2.2

**D E C I S I O N**  
**of the Technical Board of Appeal 3.2.2**  
**of 8 June 1995**

**Appellant:**

MASSACHUSETTS INSTITUTE OF TECHNOLOGY  
77 Massachusetts Avenue  
Cambridge, MA 02139 (US)

**Representative:**

Harvey, David Gareth  
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**Decision under appeal:**

**Decision of the Examining Division of the European  
Patent Office dated 31 November 1990 refusing  
European patent application No. 86 102 365.3  
pursuant to Article 97(1) EPC.**

**Composition of the Board:**

**Chairman:** H. J. Seidenschwarz  
**Members:** R. A. Lunzer  
J. C. M. de Preter

## Summary of Facts and Submissions

I. European patent application No. 86 102 365.3, Publication No. 194 495, (a divisional application based on the earlier application No. 81 901 098.4, filed on 6 April 1981) claiming a priority date of 10 April 1980 derived from US Application No. 138 891, was refused by a decision of the Examining Division dated 31 October 1990. That decision was based on a set of 11 claims filed with a letter of 8 August 1988, and a further Claim 12 filed with a letter of 15 November 1989. Claim 1 is as follows:

- "1. A method of producing thin films of essentially single crystal material, including the steps of:
- a) forming a crystal growth mask on a crystallisation substrate such that the mask exposes areas of the substrate for growth thereat; and
  - b) depositing crystalline material at the exposed areas of the substrate under conditions which enable lateral growth of crystalline material over the said mask, the exposed areas being for example provided by slits in the mask; and characterised by the steps of:
    - c) continuing lateral overgrowth until a thin film of essentially single crystal material having desired dimensions has formed;
    - d) bonding a new preexisting substrate comprised of different material from the substrate to the film of essentially single crystal material;
    - e) separating the new substrate and the essentially single crystal material from the crystallisation substrate; and
    - f) optionally reusing the crystallisation substrate to produce additional thin films of essentially single crystal material."

II. The ground for the refusal was that the alleged invention lacked any inventive step having regard to the combined effect of the disclosures of documents:

- (1) US-A-3 364 150 and
- (2) US-A-3 370 980.

The Examining Division held that the alleged invention related to forming a film of an essentially crystalline material through and on a growth mask, which mask was on a crystallisation substrate. A second substrate was then attached to the grown material, so that the grown material, together with the second substrate, could be separated from the crystallisation substrate, which could be reused in subsequent film production. Such a method of growing a thin film was disclosed in document (1), which disclosed steps a) to c) and f) of Claim (1) in suit, but lacked the separation step, which entailed bonding a preexisting substrate of a material different from the deposited crystal onto that crystal. In that respect, document (2), which was concerned with the same technical field, was relevant. It disclosed the deposition of a single crystal film on a growth substrate, and the deposition of a second substrate onto the desired deposited film to aid in the separation of the deposited film from the growth substrate.

The Examining Division accepted that document (2) did not disclose the use of a preexisting substrate, but it regarded the alternatives of the deposition of a substrate, as compared with the bonding of a preexisting substrate, as being simply a matter of choice of one of a number of alternatives which the skilled worker would make without the exercise of any inventive skill. The age of the citations was not material because the application in suit at page 7 lines 9 to 24 referred to the demand for solar cells which have great potential

for both space and terrestrial applications. That demand was, however, of recent rather than long standing origin.

III. An appeal against that decision was filed on 3 January 1991, the appeal fee was paid on 8 January 1991, and the statement of grounds of appeal was filed on 27 February 1991. In that statement, the Appellant contended essentially that the skilled worker confronted with the problem of separating the film, and seeking an alternative to that disclosed in document (1) would, if confronted with document (2), adopt the method of separation there proposed, of making use of a further **deposited** layer, for the sake of giving additional strength to the desired deposit, rather than thinking of still other ways of effecting separation, such as by the use of a preexisting substrate as proposed by the application. The distinct ideas contained in documents (1) and (2) had not been combined in the twenty years that these two documents had been available to the public, and it was only through the use of hindsight that the Examining Division had combined their respective teachings, and then added the further step of suggesting that it was obvious to use a preformed second substrate.

IV. The Appellant's main request is to set aside the decision of the Examining Division, and for the patent to be granted on the basis of the claims and description considered by the Examining Division. As an auxiliary request it seeks a more restricted form of Claim 1, in which steps a) to f) are as in Claim 1 in accordance with the main request, subject to the modification that the full stop in feature (f) after the final words, "crystal material." is replaced by a comma, and the further words added:

"characterised by the step of;

g) at least partially fabricating an electronic device in or on the thin-film of essentially single crystal material before bonding the new preexisting substrate thereto."

## Reasons for the Decision

1. The appeal is admissible.
2. *Main request*
- 2.1 Admissibility of amendments

Claim 1 according to the main request is restricted to producing thin films of essentially single crystal material, whereas in the application as filed the method was concerned with producing sheets of crystalline material. Also, feature (d) of Claim 1 has been restricted in comparison with the form of that Claim in the application as filed, insofar it now requires the "bonding of a new preexisting substrate comprised of different material from the substrate to the film of essentially single crystal material", whereas previously the requirement was merely to apply a new substrate. The Board is satisfied that these features were disclosed in the application as filed, inter alia at page 1 lines 7 to 10, and page 19 lines 17 to 31. The requirements of Article 123(2) are therefore satisfied.

- 2.2 Novelty

Having reviewed the cited documents, the Board is satisfied that none of them discloses a method having all the features defined in Claim 1 in accordance with

the main request. Therefore the subject-matter of Claim 1 is considered to be novel within the meaning of Article 54 EPC.

## 2.3 Inventiveness

2.3.1 In reaching its conclusion adverse to the Appellant, the Examining Division accepted that even the combination of the methods known from documents (1) and (2) did not disclose the method now claimed. Nevertheless, it took the view that the claimed alternative, of bonding a new preexisting substrate, rather than depositing a substrate as disclosed in document (2), was a matter of choice amongst the alternatives available to the skilled worker, without the exercise of any inventive skill.

2.3.2 The Board agrees with that reasoning. The problem with which the application in suit is concerned is that of giving the crystalline deposited material, such as that disclosed in document (1), a degree of mechanical support for the sake of facilitating subsequent separation from the deposition mask. Although document (2) tackles that problem, and proposes the use of a further deposition step, the skilled worker would know that deposition is generally suited to the provision of thin films, and that it would take a relatively long time to build up a film thick enough to have significant mechanical strength. The alternative, of bonding a preexisting substrate is one which the Board considers would readily occur to the skilled worker, and it would not require any inventive ingenuity to adopt that alternative.

2.3.3 Accordingly, insofar as the present appeal relates to Claim 1 in accordance with the main request, the Board upholds the findings of the Examining Division.

3. *Auxiliary request*

3.1 By its auxiliary request the Appellant has introduced into Claim 1 the added feature (g), which limits the claim to a method involving at least partially fabricating an electronic device in or on the deposited thin-film before bonding the new preexisting substrate thereto. The admissibility of this amendment is not in doubt, its subject-matter having been disclosed in relation to Example 7 of the application as filed.

3.2 None of the claims in the application as filed was directed to this feature. The closest, Claim 9, relates to fabricating a device, such as a solar cell or integrated circuit in or from the sheet of crystalline material after the deposited sheet of crystalline material has been detached from what is there termed, "the new substrate". It is evident that Claim 9 does not relate to the fabrication step as now defined in feature (g). As a result, no search has been directed to the combination covered by Claim 1 in accordance with the auxiliary request (see European Search Report).

3.3 In the Board's view the proposed amendment is therefore a substantial amendment which requires further examination in order to establish whether the subject-matter of Claim 1 is patentable or not. Consequently, it is appropriate for the Board to exercise its power under Article 111(1) EPC and remit the case to the Examining Division for further prosecution (see the decision T 63/86, OJ EPO 1988, 224).

**Order**

**For these reasons it is decided that:**

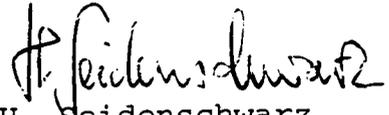
1. The decision under appeal is set aside.
2. The case is remitted to the Examining Division for further prosecution.

The Registrar:



S. Fabiani

The Chairman:



H. Seidenschwarz