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**Datasheet for the decision
of 2 June 2017**

Case Number: T 1573/12 - 3.4.03

Application Number: 06725454.0

Publication Number: 1866974

IPC: H01L31/18, H01L31/0224

Language of the proceedings: EN

Title of invention:

PROCESS FOR MANUFACTURING PIECES OF A FOIL HAVING AN INORGANIC
COATING OF E. G. TCO

Applicant:

HyET Energy Systems B.V.

Headword:

Relevant legal provisions:

EPC 1973 Art. 56, 84, 111(1)
EPC Art. 123(2)

Keyword:

Amendments - added subject-matter (no)
Claims - clarity (yes)
Inventive step - (yes)

Decisions cited:

T 0482/92

Catchword:



Beschwerdekammern
Boards of Appeal
Chambres de recours

European Patent Office
D-80298 MUNICH
GERMANY
Tel. +49 (0) 89 2399-0
Fax +49 (0) 89 2399-4465

Case Number: T 1573/12 - 3.4.03

D E C I S I O N
of Technical Board of Appeal 3.4.03
of 2 June 2017

Appellant: HyET Energy Systems B.V.
(Applicant) Westervoortsedijk 71 K
6827 AV Arnhem (NL)

Representative: Hesselink, Dinah Elisabeth
De Vries & Metman
Overschiestraat 180
1062 XK Amsterdam (NL)

Decision under appeal: **Decision of the Examining Division of the European Patent Office posted on 23 February 2012 refusing European patent application No. 06725454.0 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman G. Eliasson
Members: M. Papastefanou
C. Heath

Summary of Facts and Submissions

- I. The appeal is against the decision of the examining division refusing European patent application No. 06 725 454.0 on the ground that both the Main and the Auxiliary requests before it contained subject matter extending beyond the content of the application as filed, contrary to the requirements of Article 123(2) EPC.
- II. The following documents, cited during the first instance examination proceedings are considered to be relevant:
- D1: WO 2005/015638 A1
 - D2: US 5 385 848
 - D3: US 2002/0031863 A1
- III. In a communication pursuant to Rule 100(2) EPC, the board indicated that the main request filed with the statement of the grounds of appeal appeared to be fulfilling the requirements of Articles 52(1) EPC 1973 and 123(2) EPC, but raised objections under Article 84 EPC 1973 for lack of clarity.
- IV. In reaction to this communication by the board, the appellant filed an amended request taking into account the Board's objections.
- V. The appellant requests that the decision under appeal be set aside and that a patent be granted in the following version:

Claims 1- 6 filed with letter dated 3 May 2017;

Description:

pages 1, 2 and 5 to 14 as published;

pages 3-1, 3-2 and 4 filed with letter dated 3
May 2017;

Drawings: Sheet 1/1 as published.

- VI. Claim 1 of the sole request has the following wording
(compared to the originally filed claim 1, additions
are underlined and deletions in ~~strike through~~):

*A process for manufacturing pieces of a foil having an
inorganic coating, the process comprising the
successive steps of:*

- (a) providing an etchable temporary substrate foil,*
- (b) applying the inorganic coating onto the temporary
substrate foil,*
- (c) applying a permanent carrier,*
- (d) ~~optionally,~~ removing part of the temporary
substrate foil,*
- (e) cutting the foil along a cutting line into the
pieces, wherein the cutting line is positioned at a
portion of the foil where the temporary substrate foil
is present, said portion ~~and~~ having a width of at least
0.25 mm relative to each side of the cutting line,*
- (f) removing at least part of the temporary substrate
foil.*

Reasons for the Decision

- 1. The appeal is admissible.
- 2. Amendments (Article 123(2) EPC)
 - 2.1 Some of the amendments are mere linguistic
modifications ("the process comprising", "said
portion") which serve to clarify the definitions in the
claim and do not affect its subject matter.

2.2 The specification that the process steps (a) to (f) are *successive* is a limitation compared to the original version of the claim, since the order of the execution of the steps is now specifically defined in the process. Basis for this amendment can be found in Figure 1 and lines 11 - 19 of page 7 of the application as originally filed (published).

2.3 The addition of the word "foil" in "*temporary substrate foil*" in features (b), (d), (e) and (f) was objected by the examining division during the first instance proceedings (see communication of 27 October 2011 annexed to summons to oral proceedings). Making reference to page 8, line 8 of the original description, the examining division found that the additional specification that the foil was made of metal or a metal alloy had also to be introduced in the claim and that its omission was an unallowable intermediate generalisation going beyond the originally filed content of the application.

The board notes, however, that the term "*temporary substrate foil*" was already present in feature (a) of original claim 1, without any additional indication as to what material the temporary substrate foil was made of. Hence, the introduction of this term into the other features of the claim cannot be seen to introduce subject matter going beyond the original content of the application.

2.4 The deletion of the term "optionally" in feature (d) renders this process step obligatory in the execution of the claimed process.

- 2.5 Regarding the dependent claims, the amendments carried out are the following:
- the term "temporary substrate" was replaced with "temporary substrate foil" in claims 2 - 6; and
 - steps (a), (c) - (f) were deleted in claim 5.

Regarding the former, the same arguments as in the case of claim 1 (see paragraph 2.3 above) apply. Regarding the latter, taking into account that claim 5 is dependent on claim 1 and the deleted process steps are already included in claim 1, the subject matter of current claim 5 does not differ from the subject matter claimed in original claim 5.

- 2.6 The remaining grounds for refusal in the appealed decision referred to a version of claim 1 that included additional features which have now been deleted and, therefore, do not apply to the current version of the claims.

- 2.7 The board is, thus, satisfied that claims 1 - 6 comply with Article 123(2) EPC.

3. Although the sole ground of refusal has been overcome with the amendments carried out in the claims, the board decides to use its power conferred by Article 111(1) EPC 1973 and proceed to decide on the case. The appellant in the grounds of appeal has also argued in relation to other criteria of patentability, even if they were not among the grounds for the appealed decision.

4. Claims (Article 84 EPC 1973)

- 4.1 In its communication of 27 October 2011, the examining division considered that claim 1 then on file was not clear because an essential feature of the claimed invention was missing(see point 5). Although the current version of claim 1 is different from the one on file at that time, the objection would still apply to current claim 1 and, therefore, the board considers it appropriate to address it.
- 4.2 The examining division considered that the range of the thickness of the temporary substrate foil should have been mentioned in claim 1. Making reference to the statements in lines 5-13 on page 9 of the description, the examining division stated that the thickness range of 1 - 200 μm of the temporary substrate foil mentioned therein was an essential feature of the invention, since it was *required* (page 9, line 5) that the temporary substrate foil had a certain thickness to ensure sufficient support for the foil during its manufacturing process. The omission of this essential feature was contrary to the requirements of Article 84 EPC.
- 4.3 The board does not share the examining division's conclusion on this matter.

In the introductory passage describing the temporary substrate (foil) - page 7, line 30 - page 8, line 6 - a series of conditions the temporary substrate foil has to meet are enumerated, concluding that "*The person skilled in the art will be able to select a suitable temporary substrate within these guidelines*" (page 8, lines 5 and 6).

Regarding the thickness of the temporary substrate (foil) the application mentions several possibilities.

In the relevant passage (page 9, lines 7-13), it is stated that the thickness is *generally* not required to be more than 500 μm . Then it is stated that the thickness is *preferably* 1-200 μm and, ultimately, that a thickness of 5-150 μm , or more particularly of 10-100 μm is *preferred*. Finally, in the following paragraph, it is stated that "*...by proper selection of the width of the etch-resist in combination with the thickness of the temporary substrate, the current crack-preventing properties can be regulated.*" (page 9, lines 14-16). These passages lead to the conclusion that a specific value of the thickness of the temporary substrate foil is not considered to be an essential feature of the claimed invention; rather, the selection of a thickness value for the temporary substrate foil depends on other parameters as well and is considered to be within the skilled person's common general knowledge.

Hence, there are no essential features of the invention missing from the claims. The board is also satisfied that the other requirements of Article 84 EPC 1973 are met.

5. Inventive Step (Article 56 EPC 1973)

5.1 Closest prior art

5.1.1 According to the established case law of the Boards of Appeal, the closest prior art for assessing inventive step is normally a prior art document disclosing subject-matter conceived for the same purpose as the claimed invention and having the most relevant technical features in common (T 482/92, Reasons, point 4.1, third paragraph).

5.1.2 With this in mind, the board considers document D1 to be representing the closest prior art. D1 describes a process for manufacturing a solar cell foil using a temporary substrate.

5.1.3 Using the terminology of claim 1, D1 discloses:

A process for manufacturing a foil (page 10, line 9- page 11, line 6, Fig. 1a, 1b) having an inorganic coating (Fig. 1a, element 2, page 10, lines 28-30 and page 19, line 25-page 20, line 16) comprising the successive steps (page 10, the process steps disclosed in lines 11-26 are carried out in this order as can be seen from the final product in Fig. 1a, 1b) of:

- a) providing an etchable temporary substrate (page 10, line 11, page 18, lines 17-21; Fig. 1a element 1),
- (b) applying the inorganic coating onto the temporary substrate foil (page 10, lines 12-14, "TCO", Fig. 1a, element 2),
- (c) applying a permanent carrier (page 10, line 22, Fig. 1a, element 5)
- (f) removing at least part of the temporary substrate (page 10, lines 25 and 26).

5.2 Differences and technical problem

5.2.1 The process of claim 1 differs from the one described in D1 first of all in that it further includes the steps of cutting the foil along a cutting line into pieces, wherein the cutting line is positioned at a portion of the foil where the temporary substrate foil is present, said portion having a width of at least 0.25 mm relative to each side of the cutting line (feature (e) of claim 1) and that a part of the temporary substrate foil is removed before cutting

takes place (feature (d) of claim 1). Cutting of the manufactured foil into pieces is never discussed in D1 at all.

5.2.2 Further, the claimed process has two additional steps with respect to the method in D1: removing a part of the temporary substrate foil, and cutting the foil into pieces before the final step of removing more of the temporary substrate foil. In addition, the cutting is done along a cutting line that has a specific position with respect to the non-removed part of the temporary substrate foil.

5.2.3 The use of a temporary substrate foil in the manufacturing of a foil having an inorganic coating is known in the art, as it is described in D1. Due to the fact that the manufactured foil is thin and fragile, a temporary substrate foil is used for carrying it during the manufacturing process (see D1, page 18, lines 8-15). As its name indicates, the temporary substrate foil is at least partially removed at the end of the manufacturing process, see for example the embodiments of the manufacturing process described in pages 10 and 11 of D1.

5.2.4 As explained in the present application, when it is desired to cut the manufactured foil into pieces, since the inorganic layer of the foil is a relatively brittle layer, cracks around the cutting position(s) are likely to occur (page 3, lines 16-24 of the description). By maintaining a part of the temporary substrate foil at the position of the cutting line(s), additional support is provided to the inorganic layer during cutting in order to prevent cracking (page 4, lines 25-29). At the same time, removing part of the temporary substrate (foil) before cutting facilitates the cutting, since it

would be more difficult to cut through the temporary substrate (foil) (page 4, lines 31 - page 5, line 8). By defining a minimum width relative to the cutting line (25 mm to each side) it is safeguarded that not too much of the temporary substrate foil is removed before cutting takes place (page 4, lines 26-29).

5.2.5 Considering that cutting the foil would be an obvious step for the skilled person who wishes to obtain smaller pieces from the manufactured solar cell foil of D1, the technical problem the skilled person would be faced with would be how to implement an efficient cutting process whilst at the same time preventing cracking of the inorganic layer during this cutting process.

5.3 Obviousness

5.3.1 Document D2 describes a process for manufacturing an array of interconnected solar cells. A flexible substrate (foil) carrying semiconductor and conductive layers is produced and is then divided in individual devices by slitting the substrate (see abstract). Apart from the fact that there is no use of temporary substrate foil in the manufacturing method of D2, there are no details about the slitting (cutting) of the foil into pieces, either. There is mention of cutting in column 4, lines 21-31 and in Figure 1b, but the problems related to the cutting process and the risk of damage to the foil are not addressed in D2 at all. The skilled person seeking to solve the identified technical problem would not find any help in this document.

5.3.2 Document D3 relates to manufacturing of IC chips and focuses on the dicing of silicon wafers during the

manufacturing process (see paragraph [0003]). The IC chips are thin and easily breakable. One of the points in the manufacturing process at which IC chips tend to break is during dicing of silicon wafers to IC chips (paragraph [0006]). The solution proposed in D3 is to provide reinforcing materials that are attached to the surfaces of the wafers on which circuits are not formed before dicing takes place (paragraph [0008]). As it is further explained, these reinforcing materials consist of a base material and an adhesive (paragraph [0009]) and are provided before dicing of the silicon wafers takes place. They are integrated into the manufactured IC chips (see paragraphs [0031]-[0040] and Figures 1A-2D for two embodiments of the manufacturing process). Hence, these reinforcing (or support) materials are not temporary, i. e. they are not removed (not even partially) at the end of the manufacturing process.

5.3.3 The board agrees with the appellant in that the skilled person starting from D1 and faced with the identified technical problem would not look into D3 for a solution because D3 relates to the problem of preventing damage of silicon wafers for IC chips during dicing and not of preventing cracking at the cutting edges of an inorganic coating carried by a foil substrate (see grounds of appeal). The problems encountered in the manufacture of IC chips on silicon wafers are not related to the problems that have to be addressed in the manufacture of a foil with an inorganic coating as described in D1. The skilled person would therefore not be incited to look into D3 for a solution to the technical problem.

5.3.4 Even if the skilled did consider document D3, the solution to the technical problem of silicon wafers

breaking during dicing consists in providing reinforcing materials in the back side of the silicon wafers, as explained paragraph 5.3.2 above. These reinforcing materials - consisting of a base material and an adhesive - are integrated in the produced IC chips, i. e. they are permanent. There is no indication of using a temporary substrate (foil) that is removed - not even partially - in the end of the manufacturing process. Hence, the skilled person trying to apply the teaching of D3 in the manufacturing process of D1, would provide reinforcing material(s) in the back of the foil. According to D3, these reinforcing materials would be permanently integrated into the pieces cut from the foil in the end of the manufacturing process. This would imply that, either, the temporary substrate foil would not be removed at all at the end of the process, or additional reinforcing materials would have to be provided. In either case, the resulting manufacturing process would not be the same as the one defined in claim 1.

- 5.3.5 In a different line of argument, similar to the one of the examining division during the first instance proceedings (see letter of 27 October 2011), it could be considered that the skilled person would simply derive the idea from document D3 to provide a supporting material under the foil to be cut in order to prevent cracking. Applying this solution to the identified technical problem in the context of D1, the skilled person would use the temporary substrate foil as a reinforcing/support material during the cutting process of the foil. There is nothing, however, in D1 nor in D3 which would prompt the skilled person to remove part of the temporary substrate foil before cutting the manufactured foil into pieces (feature (d) of claim 1).

5.3.6 Therefore, the manufacturing process of claim 1 is not obvious to the skilled person when taking the combination of D1 with D3 into account. The board, hence, agrees with the indication of the examining division that by defining step (d) of the manufacturing process as an obligatory step, the claimed process would involve an inventive step (see communication of 27 October 2011 and point 8 of the Facts and Submissions in the appealed decision).

5.4 For the above reasons, the Board concludes that the subject matter of claim 1 involves an inventive step in the sense of Article 56 EPC 1973.

Order

For these reasons it is decided that:

1. The appealed decision is set aside.
2. The case is remitted to the department of first instance with the order to grant a patent in the following version:

Claims 1- 6 filed with letter dated 3 May 2017;

Description:

pages 1, 2 and 5 to 14 as published;

pages 3-1, 3-2 and 4 as filed with letter dated 3
May 2017;

Drawings: Sheet 1/1 as published.

The Registrar:

The Chairman:



T. Buschek

G. Eliasson

Decision electronically authenticated