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**Datasheet for the decision
of 18 July 2024**

Case Number: T 0333/21 - 3.4.03

Application Number: 14166914.3

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Language of the proceedings: EN

Title of invention:

Multijunction solar cell with bonded transparent conductive interlayer

Applicant:

The Boeing Company

Headword:

Relevant legal provisions:

EPC Art. 76(1), 97(2), 113(1), 123(2)

EPC 1973 Art. 111(1)

EPC R. 115(2)

RPBA 2020 Art. 13(1), 13(2), 15(1), 15(6)

Keyword:

Late-filed request - admitted (no) - raised objections are not overcome, amendments give rise to new objections

Decisions cited:

T 0714/00, T 1587/07

Catchword:



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Case Number: T 0333/21 - 3.4.03

D E C I S I O N
of Technical Board of Appeal 3.4.03
of 18 July 2024

Appellant: The Boeing Company
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Representative: Duxbury, Stephen
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Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted on 30 October 2020
refusing European patent application No.
14166914.3 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman T. Häusser
Members: A. Böhm-Pélissier
E. Mille

Summary of Facts and Submissions

- I. The appeal is against the decision of the examining division to refuse European patent application No. 14 166 914 on the grounds of lack of clarity (Article 84 EPC), lack of novelty (Articles 52(1), 54(1) and (2) EPC) as well as added subject-matter (Articles 76(1) and 123(2) EPC).
- II. Reference is made to the following **document**:
- D0 = EP 1 798 774 A2 (parent application of the present application)
- III. The appellant (applicant) **requests** that the decision to refuse the patent application be set aside and that a patent be granted on the basis of the set of claims of a final main request submitted by letter dated 8 June 2024.
- IV. **Request**

Claim 1 according to the sole request reads as follows (highlighting [representing additions to the main request as filed with the statement setting out the ground of appeal] is added by the board):

A method for making a multijunction solar cell assembly, comprising:

forming a first single-junction solar cell (200) comprising a first subcell, comprising a first layer (204) doped to form an electrode having a first polarity being n-type or p-type and a doped substrate

(202), coupled to a first side of the first layer (204), having a second polarity being p-type if the first polarity is n-type and n-type if the first polarity is p-type, the doped substrate (202) and the first layer (204) forming a p-n junction, as well as a first amorphous Transparent Conductive Coating, TCC, layer (206) coupled to a second side the first layer (204) [sic] of the first subcell;

forming a second single-junction solar cell (208) comprising a second subcell, comprising a second layer (210) and a third layer (212) coupled to a first side of the second layer (210), as well as a second amorphous TCC layer (214) coupled to a second side of the second layer (210), wherein a diode (216) is formed between the second layer (210) and the third layer (212); and

bonding the first single-junction solar cell (200) to the second single-junction solar cell (208) by bonding the first amorphous TCC layer (206) of the first single-junction solar cell (200) to the second TCC layer (214) of the second single-junction solar cell (208),

wherein the first subcell and the second subcell are configured to absorb light at a first and second wave length, respectively, wherein the first and second wave lengths are different;

wherein the first TCC layer (206) and the second TCC layer (214) have different refractive indices and are configured to increase reflectance of a range of wavelengths of light back through the second subcell, so as to give such reflected light greater chance of being absorbed in the second layer (210) and the third layer (212); and

wherein interference effects due to the different refractive indices of the TCC layers (206, 214) are employed to maximize light transmission to first

single-junction solar cell (200) comprising the first subcell, comprising the doped substrate (202) and the first layer (204) as active layers beneath a bond interface (302) between the first single-junction solar cell (200) and the second single-junction solar cell (208), the bond interface (302) comprising an anti-reflection coating using the TCC layers (206, 214) between the first subcell and the second subcell.

V. In its communication under Article 15(1) RPBA the board noted that the requests then on file were filed with the statement setting out the grounds of appeal and expressed the preliminary opinion that they should not be admitted into the appeal proceedings. The board also expressed the preliminary opinion that the claimed subject-matter of all requests did not comply with the requirements of Articles 76(1) and 123(2) EPC (insufficient basis in the application as filed and the parent application) and of Articles 52(1) and 56 EPC (inventive step).

VI. The **arguments of the appellant** as far as they are relevant for the decision can be summarised as follows:

- (a) the newly added features in claim 1 of the sole request ("final main request") corresponded to the features that were objected to by the board as being inextricably linked to the previously isolated features of the embodiment according to Figs. 2 and 3; therefore the objection of added subject-matter (intermediate generalisation) was overcome;
- (b) the new features were neither disclosed nor suggested by the prior art.

Reasons for the Decision

1. The invention

1.1 The aim of the invention is to provide a solar cell for a wide range of wavelengths.

1.2 The objective is achieved by a stack of a first and second solar subcell for different ranges of wavelengths bonded together with a material reflecting light back to one of the solar subcells. The reflectance of the reflecting material is adjusted by using different refractive indices. The reflection can be adjusted by the layer thicknesses and the coating between the solar subcells.

2. Oral proceedings before the board

With letter dated 15 June 2024 the appellant stated that it would not be attending the hearing. The oral proceedings thus took place in the appellant's absence in accordance with Rule 115(2) EPC. The purpose of oral proceedings is to give the party the opportunity to present its case and to be heard. However, a party gives up that opportunity if it does not attend the oral proceedings. Moreover, the board agrees with the finding of the decision T 1587/07 that an appellant who submits amended claims as a new request after oral proceedings have been arranged but does not attend these proceedings must expect a decision not admitting the new request into the appeal proceedings pursuant to Article 13 RPBA in its absence (point 2.2 of the Reasons). In the present case, the sole request was filed with the letter dated 8 June 2024, i.e. after the

oral proceedings before the board had been arranged, and was not admitted into the appeal proceedings for the reasons set out under point 3. below. The appellant had to expect a discussion on the admission of this newly filed request during the oral proceedings, in particular because reference had been made to Article 13(2) RPBA in the board's communication pursuant to Article 15(1) RPBA annexed to the summons to oral proceedings. By not attending the oral proceedings the appellant gave up the opportunity to present its case as to why the request should be admitted into the appeal proceedings and could thus be treated as relying only on its written submissions. The board's decision not to admit the newly filed request was therefore in conformity with the requirements of Article 113(1) EPC that the decisions of the EPO may only be based on grounds or evidence on which the parties concerned have had an opportunity to present their comments. Accordingly, the case was ready for decision at the conclusion of the oral proceedings in accordance with Article 15(6) RPBA.

3. **Admission of the new sole request**

3.1 **Article 13 RPBA**

3.1.1 The "final main request" was submitted in response to the communication under Article 15(1) RPBA, so that the admission conditions under Article 13(1) and (2) RPBA must be examined. In particular, Article 13(2) RPBA requires exceptional circumstances, which have been justified with cogent reasons, in particular a convincing reason why the request was filed so late. When examining whether the conditions of Article 13(2) RPBA are satisfied the Boards of Appeal have routinely

also taken into account the conditions of Article 13(1) RPBA.

3.1.2 According to Article 13(1) RPBA the board shall exercise its discretion in view of, *inter alia*, the suitability of the amendment to resolve the issues which were raised by the board, and, whether the party has demonstrated that any such amendment, *prima facie*, overcomes the issues raised by the board and does not give rise to new objections. The board therefore examines whether, *prima facie*, at least the requirements of Articles 76(1) and 123(2) EPC are met.

3.2 Added subject-matter, sufficiency of the disclosure

3.2.1 Intermediate generalisation

According to T 714/00 extracting an isolated feature from an originally disclosed combination and using it for delimiting claimed subject-matter can only be allowable under the concept of Article 123(2) EPC if that feature is not inextricably linked with further features of that combination (T 714/00, Reasons 3.3). An intermediate generalisation is justified only in the absence of any clearly recognisable functional or structural relationship among the features of the specific combination ("Case Law of the Boards of Appeal of the EPO" [CLBoA], 10th edition 2022, section II.E.1.9.1, fourth and fifth paragraph).

3.2.2 Amendments

The feature "*different refractive indices*" of the first and second TCC layers is disclosed only in the context provided in the following passages describing the embodiment according to Figs. 2 and 3:

- (i) page 6, line 31, to page 7, line 4 of the description as originally filed (corresponding to page 8, line 28, to page 9, line 7 of the parent application D0);
- (ii) page 7, lines 5 to 18 of the description as originally filed (corresponding to page 9, lines 8 to 22 of D0).

In view of this context the features

- (a) "*interference effects*",
 - (b) "*maximize light transmission*", and
 - (c) "*anti-reflection coating using the TCC layers*"
- were included into new claim 1 of the sole request to overcome the board's objections in its communication under Article 15(1) RPBA that the feature (d) "*different refractive indices*" was only disclosed *inter alia* in close connection with and inextricably linked to features (a) to (c).

3.2.3 Features (a) "*interference effects*" and (b) "*maximize light transmission*"

The new feature "*interference effects due to the different refractive indices of the TCC layers (206, 214) are employed to maximize light transmission to first single-junction solar cell*" has a basis in the passage (i). As discussed in the communication under Article 15(1) RPBA features (a), (b) and (d) are disclosed to be in close connection also in the passage (ii). In this passage it is mentioned that the reflection and transmission functions may be accomplished "*with thicknesses chosen to optimize the interference effects in the overall transparent stack*". Therefore, the "*interference effects*" are achieved by means of adapting the thicknesses of the TCC layers.

Even though it is also mentioned that other transparent layers may be used to achieve the desired transmission and reflection characteristics the board came to the conclusion that even in that case the thicknesses of the TCC layers must be adapted accordingly and that the aforementioned features "*different refractive indices*", "*interference effects*" and "*adapting thicknesses of the TCC layers*" have been disclosed within the same embodiment of Fig. 3 and are all interlinked because only by adapting the thicknesses of the TCC layers the interference effects can be optimised and the desired transmission and reflection characteristics can be achieved. Therefore, the features "*interference effects*" and "*maximize light transmission*" cannot be isolated from "*adapting thicknesses of the TCC layers*" without resulting in an inadmissible intermediate generalisation. Therefore the added subject-matter objection has not been overcome (Articles 76(1) and 123(2) EPC).

Moreover, the description is silent on how the light transmission into the active layers is maximized in concrete technical terms. In particular there is no indication which material compositions and layer thicknesses are used to achieve the desired maximization effect. Therefore the description does not provide sufficient details to carry out these features and achieve the claimed results thus giving rise to an objection of lack of sufficient disclosure (Article 83 EPC).

3.2.4 Feature (c) "*anti-reflection coating using the TCC layers*"

Both TCC layers are bonded together in order to enhance reflection of incident light back into the active

layers of the second stack. In the embodiment of Figs. 2 and 3 the bonding is performed "*using heat and/or pressure*" (page 6, lines 13-19 of the description; page 8, lines 7-14 of D0). First, the board notes that there is no detailed description on how the TCC layers are on the one hand configured to achieve the claimed *increased reflectance* of a range of wavelengths and are on the other hand bonded at an interface comprising the claimed *anti-reflection* coating using these TTC layers. The board can only conclude that the anti-reflective properties must be related to the way in which the bonding between the TCC layers is carried out, i.e. "*using heat and/or pressure*". Therefore, the use of heat and/or pressure appears to be inextricably linked to the creation of the anti-reflective coating using the TCC layers. The feature "*using heat and/or pressure*" is also disclosed as a non-optional feature in the description of Figures 2 and 3. Consequently, it appears that the feature "*anti-reflection coating using the TCC layers*" cannot be isolated from the embodiment of Figures 2 and 3, in particular from the non-optional feature "*bonding using heat and/or pressure*" (Articles 76(1) and 123(2) EPC).

Furthermore, the description is too brief to allow a skilled person to carry out the feature "*anti-reflection coating using the TCC layers*", since only a result to be achieved is defined in claim 1, but no indications are given in the description as to how this result is achieved in detailed technical terms. The use of heat and/or pressure can only be one partial aspect of achieving the desired "*anti-reflection coating using the TCC layers*". This gives rise to an objection of lack of sufficient disclosure (Article 83 EPC).

3.3 Conclusion on the admission of the sole request

Consequently, the board concluded that the newly filed claims are *prima facie* deficient under Articles 76(1), 123(2) and 83 EPC and are thus inadmissible under Article 13(2) in combination with Article 13(1) RPBA. They cannot *prima facie* overcome the objections raised under Articles 76(1) and 123(2) EPC (intermediate generalization) and even lead to new objections under Article 83 EPC.

4. Overall conclusion

Since the sole request is not admitted into the proceedings the examining division's decision refusing the application is confirmed. Consequently, the appeal has to be dismissed (Articles 97(2) and 111(1) EPC).

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



A. Vottner

T. Häusser

Decision electronically authenticated