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**Datasheet for the decision
of 16 October 2015**

Case Number: T 1101/13 - 3.2.03

Application Number: 05729912.5

Publication Number: 1736035

IPC: F21K7/00, H05B33/14

Language of the proceedings: EN

Title of invention:

ROLL-TO-ROLL FABRICATED LIGHT SHEET AND ENCAPSULATED
SEMICONDUCTOR CIRCUIT DEVICES

Applicant:

Grote Industries, Inc.

Headword:

Relevant legal provisions:

EPC Art. 54(1), 84

Keyword:

Decisions cited:

Catchword:



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Case Number: T 1101/13 - 3.2.03

D E C I S I O N
of Technical Board of Appeal 3.2.03
of 16 October 2015

Appellant: Grote Industries, Inc.
(Applicant) 2600 Lanier Drive
Madison, IN 47250 (US)

Representative: Daub, Thomas
Patent- und Rechtsanwaltskanzlei Daub
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Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted on 10 December
2012 refusing European patent application No.
05729912.5 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman G. Ashley
Members: Y. Jest
M. Blasi

Summary of Facts and Submissions

I. On 18 February 2013 the appellant (applicant) lodged an appeal against the decision of the examining division to refuse European patent application No. 05729912.5 (based on international application No. PCT/US2005/010051 published with the International Publication No. WO 2005/099310).

By its decision dated 10 December 2012 the examining division refused the European patent application No. 05729912.5 on the grounds of lack of novelty (Articles 52(1) and 54(1), (2) EPC) of the subject-matter of both independent claims 1 and 16 filed with the letter of 27 May 2012 as compared to the state of the art disclosed in document US-A-2002/0096254 (D5).

II. By letter dated 17 April 2013 the appellant filed the grounds of appeal and requested the contested decision to be set aside and a patent granted on the basis of an amended set of claims according to a main request or subsidiary to an auxiliary request.

In reply to the board's communication pursuant to Rule 100(2) EPC dated 13 November 2014, the appellant submitted new main and auxiliary requests dated 17 March 2015.

In response to the communication of the board pursuant to Article 15(1) RPBA accompanying the summons to oral proceedings dated 15 May 2015, the appellant filed with a letter dated 9 September 2015 four sets of amended claims according to a main and three auxiliary requests.

III. By fax-letter of 28 September 2015, the appellant requested a postponement of the oral proceedings by

three months as the wife of the responsible attorney was expecting childbirth around 10 October 2015. By communication of 7 October 2015, the registrar of the board informed the appellant that the board maintained the date scheduled for the oral proceedings.

- IV. Oral proceedings were held on 16 October 2015. The appellant was represented by a sub-authorized professional representative.

In the oral proceedings the appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the set of claims of the main request filed with the letter of 9 September 2015, alternatively on the basis of the set of claims of a first auxiliary request filed as auxiliary request 4 or of a second auxiliary request filed as auxiliary request 5, both filed during the oral proceedings (auxiliary request 4 at 12:25 hrs and auxiliary request 5 at 11:10 hrs).

At the end of the oral proceedings the board pronounced its decision.

- V. The independent claims according to the main and first auxiliary request read as follows:

a) Main request

i) Claim 1:

"A light active sheet, characterized by:
a bottom substrate flexible sheet having an electrically conductive surface;
a top transparent substrate flexible sheet having a transparent conductive layer disposed thereon;

an electrically insulative adhesive flexible sheet; light active semiconductor elements fixed to the electrically insulative adhesive sheet, said light active semiconductor elements each having an n-side and a p-side, the electrically insulative adhesive sheet having the light active semiconductor elements fixed thereon being inserted between the electrically conductive surface and the transparent conductive layer to form a lamination and activated so that the electrically insulative adhesive electrically insulates and binds the top substrate sheet to the bottom substrate sheet so that one of said n-side or said p-side of the light active semiconductor elements is in electrical communication with the transparent conductive layer of the top substrate sheet and so that the other of said n-side or said p-side of each said light active semiconductor element is in electrical communication with the electrically conductive surface of the bottom substrate sheet to form a light active device, wherein the electrical communications are direct."

ii) Claim 9:

"A method of making a light active sheet, characterized by the steps of:
providing a bottom substrate having an electrically conductive surface;
providing an electrically insulative adhesive;
fixing light active semiconductor elements to the electrically insulative adhesive, said light active semiconductor elements each having an n-side and a p-side;
providing a top transparent substrate having a transparent conductive layer disposed thereon;

inserting the electrically insulative adhesive having the light active semiconductor elements fixed thereon between the electrically conductive surface and the transparent conductive layer to form a lamination; and activating the electrically insulative adhesive to electrically insulate and bind the top substrate to the bottom substrate so that one of said n-side or said p-side of the light active semiconductor elements is in electrical communication with the transparent conductive layer of the top substrate and so that the other of said n-side or said p-side of each said light active semiconductor element is in electrical communication with the electrically conductive surface of the bottom substrate to form a light active device, wherein the electrical communications are direct."

b) First auxiliary request
(the features added as compared to the claims of the main request are underlined)

i) Claim 1:

"A light active sheet, characterized by:
a bottom substrate flexible sheet having an electrically conductive surface;
a top transparent substrate flexible sheet of transparent or semi-transparent substrate material having a transparent conductive layer disposed thereon, wherein the transparent conductive layer is a sputtered coated indium-tin-oxide, a conductive polymer or a thin metal film;
an electrically insulative adhesive flexible sheet;
light active semiconductor elements fixed to the electrically insulative adhesive sheet, said light active semiconductor elements each having an n-side and a p-side, the electrically insulative adhesive sheet

having the light active semiconductor elements fixed thereon being inserted between the electrically conductive surface and the transparent conductive layer to form a lamination and activated so that the electrically insulative adhesive electrically insulates and binds the top substrate sheet to the bottom substrate sheet so that one of said n-side or said p-side of the light active semiconductor elements is in electrical communication with the transparent conductive layer of the top substrate sheet and so that the other of said n-side or said p-side of each said light active semiconductor element is in electrical communication with the electrically conductive surface of the bottom substrate sheet to form a light active device, wherein the electrical communications are direct face-to-face electrical connections."

ii) Claim 7:

"A method of making a light active sheet, characterized by the steps of:

providing a bottom substrate having an electrically conductive surface;

providing an electrically insulative adhesive;

fixing light active semiconductor elements to the electrically insulative adhesive, said light active semiconductor elements each having an n-side and a p-side;

providing a top transparent substrate of transparent or semitransparent substrate material having a transparent conductive layer disposed thereon, wherein the transparent conductive layer is a sputtered coated indium-tin-oxide, a conductive polymer or a thin metal film;

inserting the electrically insulative adhesive having the light active semiconductor elements fixed thereon

between the electrically conductive surface and the transparent conductive layer to form a lamination; and activating the electrically insulative adhesive to electrically insulate and bind the top substrate to the bottom substrate so that one of said n-side or said p-side of the light active semiconductor elements is in electrical communication with the transparent conductive layer of the top substrate and so that the other of said n-side or said p-side of each said light active semiconductor element is in electrical communication with the electrically conductive surface of the bottom substrate to form a light active device, wherein the electrical communications are direct face-to-face electrical connections."

VI. The appellant's arguments can be summarised as follows.

a) Main request

The device according to claim 1 as well as the method of claim 9 differ from the state of the art disclosed in D5 by several features.

The embodiment of figure 7 of D5 discloses contact pads 46 provided on the transparent upper substrate and contact lands 44 provided on the bottom substrate. These pads and lands are not in direct face-to-face electrical contact with the n- and p-sides of the light active elements 40, since the electrical connection in D5 requires the presence of interposed electrically conductive hard particles 20. The hard particles can be attached to or deposited on the lands/pads using the two-step plating process described in paragraphs [0058] and [0045] of D5 and in more detail in US patent application US-A-2002/0192363 (D5a), which is incorporated in D5 by reference to application Ser. No. 09/883,012 (see [0045] of D5). The method according to

D5a consists of co-depositing metal and hard particles. However, such a method is not suitable for attaching hard particles 20 to the contact pads 46 of the transparent upper substrate because it would result in a non-transparent plated layer.

Although D5 discloses a substrate in the form of a flexible chip carrier 12 for the embodiment of figure 1, it remains silent on the flexible characteristics of substrates 38, 42, or of the adhesive material 48 for the embodiment shown in figure 7.

b) First auxiliary request

The subject-matter of independent claims 1 and 7 is further distinguished from D5 by the additional limiting feature of the material of the transparent conductive layer, which is defined as a sputtered coated indium-tin-oxide, a conductive polymer or a thin metal film. It is known from D5, see paragraph [0055], to use indium-tin-oxide as material for the pads, but there is no indication of the method for applying said material to the upper substrate. It is clear for the skilled person that, since the hard particles 20 are to be embedded in or at least attached to the contact pads 46 of the upper substrate 42, a minimum thickness is required for these pads. The material of the pads 46 can therefore not be in form of a sputtered coating of indium-tin-oxide, or of a thin metal film within the meaning generally acknowledged for the expression "thin film" in the field of coatings.

Reasons for the Decision

1. Request for postponement of oral proceedings

According to Article 15(2) RPBA, a change of date for oral proceedings may exceptionally be allowed at the board's discretion on receipt of a written and reasoned request made as far as possible in advance of the appointed date. Examples of circumstances that may be taken into account when exercising this discretion are given in the Notice of the Vice-President of Directorate-General 3 dated 16 July 2007 concerning oral proceedings before the boards of appeal (see Supplementary publication No. 1, OJ EPO 2015, 69). The Notice also provides further guidance concerning the substantiation of such a request.

The board does not deny that childbirth expected to be given by the partner of the professional representative on a date close to the fixed oral proceedings may be accepted as a substantive reason for requesting a change of the date for oral proceedings. However, in the light of the circumstances of the present case, the board decided to maintain the date fixed for the oral proceedings for two reasons.

Firstly, no statement was provided in the request for postponement as to why the representative prevented from attending the oral proceedings could not be substituted by another representative as set out in point 2.3 of the above-mentioned Notice. In this context, the board notes that in fact none of the appellant's submissions indicate, as signee, the name of the representative concerned. Instead, all the submissions show a handwritten signature, or were electronically authenticated, by a different representative, namely the one whose name appears in the European Patent Register pursuant to Rule 143(1)(h) EPC as the representative in this case.

Secondly, the request was not made as far in advance of the appointed date for oral proceedings as possible (cf. Article 15(2) RPBA). Postponement was requested only about two and a half weeks prior to the scheduled date. In the absence of any explanation for the lateness of the request, the board had to assume that the reason, i.e. the expected date of childbirth, must have been known to the representative for quite some time, and hence the board considered the request as late-filed.

When deciding on the requested postponement, the board, in accordance with established case law (see e.g. T 869/06, T 1053/06) considered, in addition to the interests of the appellant, the aspects of procedural economy, an optimised use of resources and capacities of the board and the interest of the public. In the present case, the latter aspects outweighed the interests of the party. Due to the lateness of the request, the board was prevented from rearranging its calendar of oral proceedings, e.g. by bringing forward oral proceedings in this case in order to avoid the proximity to the delivery date or by using the blocked date for holding oral proceedings in a different case.

2. Main request

2.1 Device of claim 1

The state of the art disclosed in D5, see especially the embodiment of figure 7, relates to a light active module/sheet having a bottom substrate sheet 38 provided with electrically conductive surfaces (contact lands) 44 and a top transparent substrate sheet 42 having a transparent conductive layer (contact pads 46) disposed thereon, see paragraphs [0052] to [0055]. The module

further comprises an electrically insulative adhesive material/sheet 48 and light active semiconductor elements 40, for example LEDs (see paragraph [0030]) fixed to the electrically insulative adhesive sheet 48, said light active semiconductor elements each having an n-side and a p-side. The electrically insulative adhesive sheet/material 48 having the light active semiconductor elements 40 fixed thereon is inserted between the electrically conductive contact lands 44 and the transparent conductive contact pads 46 to form a lamination, and activated so that the electrically insulative adhesive electrically insulates and binds the top substrate sheet 42 to the bottom substrate sheet 38, such that one of said n-side or said p-side of the light active semiconductor elements is in electrical communication with the transparent conductive contact pads 46 of the top substrate sheet 42, and the other of said n-side or said p-side of each said light active semiconductor element is in electrical communication with the electrically conductive contact land 44 of the bottom substrate sheet 38, thereby forming a light active device.

In the board's view, the adjective "flexible" used in claim 1 for characterising the top and bottom substrates as well as the adhesive sheet is rather vague and undefined, so that it would generally apply to light active modules incorporating LEDs as illustrated by the light module known from D5. The skilled reader is even taught by D5 to use flexible substrates, namely in the form of a "flexible chip carrier", see paragraph [0030]. The board can thus agree with the appellant that this indication concerns the mode of realisation of figure 1 (which is described in paragraph [0030]) and not of figure 7. However, the person skilled in the art would nevertheless understand that such a physical property

(flexibility) may also be selected for the top and bottom substrates of the embodiment of figure 7.

The board is also of the opinion that the electrical communications provided at the contact lands/pads are direct. The adjective "direct" is not further defined or limited, so that even if after compression the hard particles 20 adhering to the contact lands/pads were not wholly embedded, the electrical communications which formed by contact of the hard particles with the n- and p-sides of the light elements 40 would nevertheless meet the definition of a "direct communication", since it does not require the use of wire-bonding to connect the components.

The board therefore arrives at the conclusion that claim 1 of the main request lacks a feature which could define a clear distinction over the state of the art disclosed in D5.

The requirements of Articles 52(1) und 54(1) EPC are thus not met.

2.2 Method of claim 9

Per analogy the method defined in claim 9 cannot be unambiguously distinguished from D5 and lacks novelty too.

3. First auxiliary request

The set of claims 1 to 18 forming the basis for the first auxiliary request was filed as "fourth auxiliary request" at 12:25 hrs during the oral proceedings held on 16 October 2015.

3.1 Article 123(2) EPC

3.1.1 Claim 1 and method-claim 7 are based on originally filed claims 39 and 1 respectively, and both comprise additional features relating to the material selected for the transparent conductive layer of the top substrate, namely a sputtered coated indium-tin-oxide, a conductive polymer or a thin metal film, and to the direct face-to-face electrical connections/communications.

The first feature is originally disclosed at page 55, second paragraph, and the second at page 22, second paragraph and page 55, last paragraph of the international application as published.

3.1.2 The features of dependent claims 2 to 6 and dependent claims 8 to 18 correspond respectively to those of originally filed claims 43, 44, 45, 50, 17 and claims 44, 45, 24, 23, 26, 50, 51, 52, 53, 55 and 16.

3.1.3 The set of claims according to the first auxiliary request therefore meets the requirements of Article 123(2) EPC.

3.2 Novelty

As mentioned above, the transparent conductive layer of the top substrate of the embodiment of figure 7 in D5 is provided by the contact pads 46, which can be made of indium-tin-oxide (paragraph [0055]), and by the hard particles 20 attached to or embedded in the contact pads (paragraph [0043]).

3.2.1 Document D5 is silent as to the method used for applying the contact pads 46 to the top substrate.

Although D5 does not define the size of the hard particles, document D5a, which is incorporated by reference in D5, discloses the use of hard particles having a size between 0,5 to 50 microns (see [0030] of D5a). Owing to the size of the hard particles to be used and to the minimum thickness required for the pads in order to adhere the hard particles thereon or to embed them therein, it is not inevitable that the indium-tin-oxide film would in D5 be formed by sputtering, and therefore it cannot be said that this feature is directly and unambiguously disclosed. The provision of contact pads in the form of a thin metal film is also not unambiguously disclosed for the same reasons, since a thin metal film can refer to a layer of metal with a thickness in the range of a nanometer. The third option, namely a conductive polymer, is not disclosed in D5 and cannot be considered as implicit.

- 3.2.2 Owing to the limitation defining the physical nature of the conductive surface on the top substrate, the last feature of claim 1 requiring a direct face-to-face electrical connection has a clearly defined meaning that excludes electrical connections provided, at least partially, via the hard particles 20 of the embodiment of figure 7 in D5.
- 3.2.3 The features incorporated in claim 1 and in claim 7 of the first auxiliary request, i.e. the feature restricting the transparent conductive layer of the top substrate to sputtered coated indium-tin-oxide, or to a conductive polymer or to a thin metal film and the feature defining direct face-to-face electrical connections, are thus not known from D5.

3.2.4 Therefore the light active sheet as defined in claim 1 and the method of claim 7 of the first auxiliary request are novel as compared to D5.

4. Remittal

The impugned decision was based on the sole ground of lack of novelty of the claimed subject-matter as compared to D5. Other issues have not been dealt with and were actually not to be addressed by the decision to refuse.

In the exercise of its discretion pursuant to Article 111(1) EPC the board decides to remit the case to the examining division for further prosecution, in particular in view of the requirement of inventive step pursuant to Article 56 EPC.

5. Second auxiliary request

Since the claimed subject-matter of the first auxiliary request is considered to meet the requirement of novelty, and since the board decides to remit the case for further examination on that basis, there is no need to examine the second auxiliary request.

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:

The Chairman:



C. Spira

G. Ashley

Decision electronically authenticated