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Datasheet for the decision of 29 March 2017

Case Number: T 1511/13 - 3.4.02

Application Number: 07837962.5

Publication Number: 2062093

IPC: G02F1/13, G02C7/10

Language of the proceedings: EN

Title of invention:
INTERCONNECTION TAB USED WITH OPTICAL DEVICES

Applicant:
Alphamicron, Inc.

Relevant legal provisions:
EPC 1973 Art. 56, 83, 84

Keyword:
Clarity, support in the description, sufficiency of disclosure, and inventive step (yes - amended claims)

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Case Number: T 1511/13 - 3.4.02

D E C I S I O N
of Technical Board of Appeal 3.4.02
of 29 March 2017

Appellant: (Applicant)	Alphamicron, Inc. 1950 State Route 59 Kent, OH 44240 (US)
Representative:	Barton, Matthew Thomas Forresters Skygarden Erika-Mann-Straße 11 80636 München (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 18 February 2013 refusing European patent application No. 07837962.5 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	R. Bekkering
Members:	F. J. Narganes-Quijano
	B. Müller

Summary of Facts and Submissions

I. The appellant (applicant) lodged an appeal against the decision of the examining division refusing European patent application No. 07837962.5 (publication No. 2062093).

II. In its decision the examining division held that claim 1 of the sole request then on file did not satisfy the requirements of clarity of Article 84 EPC. In addition, the examining division held that the claimed subject-matter did not exclude a direct electrical connection between the electrodes of the interconnection tab and the substrate electrodes of the optical device, and that for this reason the claimed invention did not involve an inventive step (Article 56 EPC) in view of the disclosure of documents

D1: US-A-5067796 and
D5: WO-A-0077559.

Under the "Additional Remarks" appended to the decision the examining division also expressed doubts as to whether the claimed invention was sufficiently disclosed (Article 83 EPC) when the claimed subject-matter was interpreted in the sense that the substrate electrodes of the device were completely covered by the polyimide alignment layer.

III. With the statement setting out the grounds of appeal the appellant requested that the decision under appeal be set aside and a patent be granted on the basis of the set of claims underlying the decision under appeal, as a main request, or, alternatively, on the basis of a

set of claims submitted with the grounds of appeal as an auxiliary request.

IV. In reply to a communication of the board annexed to summons to oral proceedings, the appellant, with its letter dated 27 February 2017, filed an amended set of claims 1 to 10 and amended pages 1, 4 to 6, 10 and 11 of the description replacing the corresponding documents of the application of the previous main and auxiliary requests.

V. In reply to the observations expressed by the board in a subsequent communication, the appellant, with its letter dated 6 March 2017, filed an amended set of claims 1 to 10 and an amended page 4 of the description replacing the corresponding application documents of its previous request.

The appellant requested that the decision under appeal be set aside and a patent be granted on the basis of the following application documents:

- claims: No. 1 to 10 filed with the letter dated 6 March 2017,
- description: pages 1, 5, 6, 10 and 11 filed with the letter dated 27 February 2017, pages 2, 3 and 7 to 9 of the application as published, and page 4 filed with the letter dated 6 March 2017, and
- drawings: sheets 1/5 to 5/5 of the application as published.

VI. The oral proceedings were subsequently cancelled.

VII. The text of claim 1 amended according to the sole request of the appellant reads as follows:

"An optical device having at least one interconnection tab, comprising:

a lens (26) comprising a pair of opposed substrates (50A, 50B) having a gap (56) therebetween filled with an electro-optic material (58), each said substrate having a facing surface with a substrate electrode (52A, 52B) covered by a polyimide alignment layer (54A, 54B) disposed thereon;

a sealing material (60) disposed between said pair of opposed substrates to contain said electro-optic material; and

at least one interconnection tab (500) interposed between said substrates, said interconnection tab comprising:

an insulator layer (502) having opposed surfaces (512, 514), each insulator layer surface comprising a tab electrode layer (522, 552) having at least a portion (524, 556) interposed between said substrates (50A, 50B) and being in contact with the corresponding alignment layer (54A, 54B) on the substrate electrode (52A, 52B) facing said tab electrode layer, and each insulator layer surface further comprising a pad electrode (532, 564) being electrically connected to the tab electrode layer (552, 522) on the opposite surface of the insulator layer (502)."

The appellant's request also includes dependent claims 2 to 10 all referring back to the optical device defined in claim 1.

Reasons for the Decision

1. The appeal is admissible.

2. *Amendments*

The board is satisfied that the application documents amended according to the present request of the appellant satisfy the formal requirements of the EPC. In particular, the set of amended claims 1 to 10 is based on the following passages and figures of the application as originally filed (Article 123(2) EPC):

- claim 1: claim 1 of the application as originally filed, together with Fig. 3, 6 and 7 and the corresponding description (see in particular page 5, lines 5 and 6, page 6, lines 7 to 10, page 9, lines 22 to 29, page 9, line 34 to page 10, line 2, and page 10, lines 14 to 20 of the application as originally filed);
- dependent claim 2: Fig. 6 and 7, together with page 9, lines 22 to 25 of the application as originally filed;
- dependent claim 3: dependent claim 7 of the application as originally filed;
- dependent claim 4: dependent claims 8, 9 and 13 of the application as originally filed;
- dependent claim 5: dependent claim 9 of the application as originally filed;
- dependent claim 6: Fig. 3, together with page 8, lines 11 and 12, and page 9, lines 7 and 8 of the application as originally filed;
- dependent claim 7: Fig. 6 and 7, together with page 10, lines 4 to 11 of the application as originally filed;
- dependent claim 8: page 7, lines 5 and 6, and page 11, lines 8 to 11 of the application as originally filed;
- dependent claim 9: page 11, lines 21 to 23 of the application as originally filed; and

- dependent claim 10: page 6, lines 6 and 7, and page 10, lines 4 to 6 of the application as originally filed.

As regards the description, its content has been brought into conformity with the invention as defined in the claims (Article 84, second sentence, and Rule 27(1)(c) EPC 1973), and the pertinent prior art has been appropriately acknowledged in the introductory part of the description (Rule 27(1)(b) EPC 1973).

3. *Clarity and support in the description - Article 84 EPC 1973*

3.1 Claim 1 is directed to an optical device comprising, among other features,

- an electro-optic material sealed between two opposed substrates, each substrate having, on the surface of the substrate facing the electro-optic material, "a substrate electrode covered by a polyimide alignment layer disposed thereon", and
- an interconnection tab interposed between the two substrates and comprising an insulator layer, each insulator layer surface comprising a tab electrode layer and a pad electrode electrically connected to the tab electrode layer on the opposite surface of the insulator layer,
- the claimed arrangement being such that a portion of each of the tab electrode layers is interposed between the substrates and in contact with the alignment layer on the substrate electrode facing the corresponding tab electrode layer.

3.2 In its decision the examining division held that claim 1 then on file also directed to an optical device of the type now claimed and also comprising "a substrate

electrode covered by a polyimide alignment layer disposed thereon" was not clear in that the expression "covered by" could be interpreted in the sense that the substrate electrode was completely covered, but also in the sense that the substrate electrode was only partially covered by the polyimide layer. The issues raised by the examining division concern the clarity of the claim as well as the interpretation of the claimed subject-matter.

The claimed arrangement formed by an electro-optic material sealed between two substrate electrodes each having a polyimide alignment layer disposed thereon constitutes an electro-optic device of the type well known in the art and requiring that the alignment layer covers the whole surface of the corresponding substrate electrode at least in the section of the device in which the sealed electro-optic material is operational. In addition, the claimed subject-matter requires that the portion of the tab electrode layers of the interconnection tab interposed between the substrates is in contact with the alignment layer of the substrate electrode facing the corresponding tab electrode layer. This feature implicitly requires that the alignment layer extends to also cover the surface of the portion of the substrate electrodes in the section of the device in which the electro-optic material is not present and in which the interconnection tab is interposed between the substrates. In view of these considerations, the board is of the opinion that, in its technical context, the claim is sufficiently clear as regards the extent to which the surface of the substrate electrodes is covered by the corresponding polyimide alignment layer.

In its decision the examining division also expressed the view that the claimed subject-matter did not exclude that the polyimide alignment layer covered only partially the substrate electrodes in the section of the device receiving the interconnection tab, with the consequence that the claim did not exclude in an unambiguous manner a possible direct electrical contact between each of the tab electrode layers and the corresponding substrate electrode. The board, however, cannot adhere to this view as it involves a construction of the claimed subject-matter that is not reflected by the formulation of the claim and, in addition, is not supported by a proper interpretation of the claimed subject-matter along the lines set out in the former paragraph.

It is noted as well that the board's construction of the claimed subject-matter set forth above is also supported by the description, and in particular by the transverse cross-section of the device of the invention represented in Fig. 6 and 7 of the application and showing the polyimide alignment layer interposed between the tab electrode layer and the corresponding electrode substrate. In the decision under appeal the examining division expressed the view that Fig. 6 and 7 only showed a specific cross-section and that, consequently, the figures did not exclude that in another cross-section of the device each of the tab electrode layers might directly contact the corresponding substrate. The board, however, cannot endorse the examining division's view in this respect because the purpose of Fig. 6 and 7 is to represent the essential structural features of the interconnection of the elements of the claimed arrangement (description of the application, page 4, lines 13 to 18, and page 9, line 22 to page 10, line 31), and in particular of the

electrical coupling between the substrate electrodes and the tab electrode layers via the interposed polyimide alignment layer (page 10, lines 12 to 22). A direct electrical contact between the substrate electrodes and the tab electrode layers in a cross-section of the device other than that shown in Fig. 6 and 7 would therefore be at variance with this technical teaching and also with one of the main purposes of the invention, namely avoiding the need to provide the electrodes with a special patterning or a special configuration (last paragraph of each of pages 3 and 6, and page 11, lines 14 to 16 of the description).

3.3 During the first-instance proceedings the appellant referred to the electrical connection of the capacitive type established by the polyimide alignment layer disposed between each of the substrate electrodes and the corresponding tab electrode layer as further support for the interpretation of the claimed subject-matter. In its decision the examining division did not consider the appellant's submissions in this respect persuasive. Due to the nature of these technical considerations and of the additional objection raised by the examining division under Article 83 EPC 1973 in the section "Additional Remarks" appended to the decision (see point II above, second paragraph), these issues are addressed in point 4 below.

In its decision the examining division also referred to a passage of the description of the application as originally filed referring to an electrode layer which "may or may not be covered by a polyimide layer" (sentence bridging pages 9 and 10 of the description). Page 10 of the description as presently amended (see lines 1 and 2) has been brought into

conformity with claim 1 which requires the presence of a polyimide alignment layer covering the substrate electrodes. The corresponding considerations of the examining division are therefore no longer pertinent.

3.4 The board concludes that claim 1 is sufficiently clear and supported by the description within the meaning of Article 84 EPC 1973. In addition, under a proper construction of the claimed subject-matter in its technical context, the polyimide alignment layer covers the surface of each of the substrate electrodes, and the portion of each of the tab electrode layers interposed between the substrates is only connected to the corresponding substrate electrode via the polyimide alignment layer covering the substrate electrode.

4. *Sufficiency of disclosure - Article 83 EPC 1973*

In the section "Additional Remarks" appended to the decision under appeal the examining division expressed its view that the requirements of Article 83 EPC (corresponding to Article 83 EPC 1973) would not be satisfied in the event that claim 1 was construed as requiring that the substrate electrodes were completely covered by the polyimide alignment layer. The examining division mentioned, in particular, that a direct electrical contact would not be possible because polyimide was a dielectric material, and therefore an insulator, that contrary to the appellant's submissions there was no information in the application relating to the provision of an electrical connection of the capacitive type between the substrate electrodes and the tab electrode layers, and that there was no specific disclosure relating to the properties of the polyimide layer (such as the thickness of the layer) that would have allowed the skilled reader to conclude

that the electrical connection under consideration was of the capacitive type.

The board agrees with the examining division in that the application does not explicitly mention that the electrical connection between the interconnection tab and the substrate electrodes is of the capacitive type. However, the description of the application specifies that the "alignment layers [...] are construed of such a material so as to not interfere with the electrical connection between the substrate's electrodes and the electrode layers of the interconnection tab" (page 10, lines 20 to 22). In addition, the portion of the alignment layer interposed between each tab electrode layer and the corresponding substrate electrode is a portion of the same polyimide layer operating as alignment layer in the electro-optic device constituted by the claimed electro-optic material sealed between the substrate electrodes. Thus, the operation of the claimed device as an electro-optic device implicitly requires that both the thickness and the composition of the polyimide alignment layer are such that, on the one hand, the layer constitutes an insulator in the sense that no electrical current passes through the layer, but that, on the other hand, the electrical field generated between the substrate electrodes and reaching the electro-optic material is not shielded by the presence of the layer. As an immediate consequence of these implicit features, the portion of the polyimide alignment layer interposed between each tab electrode layer and the corresponding substrate electrode, although - as held by the examining division - operating as an insulator screening any direct electrical contact between the tab electrode layer and the corresponding substrate electrode, inherently ensures an electrical coupling of the capacitive type

between the tab electrode layer and the corresponding substrate electrode.

In addition, the mere fact that - as noted by the examining division - the application contains no explicit teaching that the electrical connection under consideration is of the capacitive type is, in the circumstances of the present case, not objectionable under Article 83 EPC 1973 because - as submitted by the appellant - once the application provides sufficient information on the technical measures required to put into practice the claimed invention, Article 83 EPC 1973 is complied with, and there is no provision in the EPC that would further require information in the application concerning the physical mechanism underlying the operation of the claimed optical device.

The board concludes that the claimed invention is sufficiently disclosed within the meaning of Article 83 EPC 1973.

5. *Novelty and inventive step*

5.1 In its decision the examining division did not object to novelty of claim 1 then on file, and in the opinion of the board none of the prior art documents on file anticipates the subject-matter of present claim 1 (Article 54(1) EPC 1973).

5.1.1 In particular, document D1 considered by the examining division in its decision (see point II above) discloses an optical device (the liquid crystal display device represented in Fig. 37 and 38 and described in column 18, lines 9 to 32 with reference to Fig. 32 and the corresponding description in column 16, line 43 to

column 17, line 27) comprising an electro-optic material (129) encapsulated between two substrates (121 and 122) and a sealing material (128), the surface of each substrate being formed with a substrate electrode (123, 124), each covered by an alignment layer (125, 126) disposed thereon. The device further comprises an interconnection tab partially inserted between the two substrates, the tab consisting of an insulator layer (153) having on each of its surfaces a tab electrode layer (154, 155) having a portion interposed between the substrates. In addition, the interconnection tab comprises a pad electrode (through-hole 153b) formed on one of the surfaces of the insulator layer and electrically connected to the tab electrode layer (155) on the opposite surface of the insulator layer (Fig. 37 and 38, and column 18, lines 13 to 29).

The optical device defined in claim 1 is new over the disclosure of document D1 in the following features:

a) the arrangement constituted by the pair of substrates and the electro-optic material constitutes a lens;

b) the alignment layer is a polyimide alignment layer;

c) the device comprises not only one pad electrode formed as disclosed in document D1, but two such pad electrodes, each formed on a respective one of the surfaces of the insulator layer; and

d) each of the tab electrode layers on a respective one of the surfaces of the insulator layer is in contact with the corresponding alignment layer on the substrate electrode facing the tab electrode layer.

5.1.2 Document D5, also considered by the examining division in its decision (point II above), and the remaining documents on file are less pertinent than document D5.

5.2 The board concurs with the examining division's view that document D1 represents the closest state of the art.

5.2.1 In the board's opinion the distinguishing features a), b) and c) identified in point 5.1.1 above do not contribute to inventiveness. First, the board can see no technical interaction between each of features a), b) and c) and the remaining distinguishing feature d) identified above, and therefore the issue of inventive step of each of these features can be assessed in isolation from each other. In addition,

- as to feature a), it is obvious to shape the arrangement constituted by the pair of opposed substrates and the electro-optic material of document D1 in the form of a lens, especially in view of the fact that the arrangement is disclosed in document D1 in the context of background prior art relating to the use of similar arrangements as protection spectacles, goggles, and the like (see document D1, column 1, lines 23 to 41);

- as to feature b), it is conventional in the field of liquid crystal devices of the type disclosed in document D1 to provide alignment layers made of polyimide (see for instance document D5, abstract together with page 23, lines 25 to 28, and page 31, lines 4 to 11); and

- as to feature c), it is obvious to also provide the tab electrode layer on the surface of the insulator layer comprising the pad electrode with a pad electrode on the opposite surface when circumstances make it desirable.

5.2.2 As regards the distinguishing feature d) identified above, the examining division held in its decision that

this feature did not exclude a direct electrical contact between each of the tab electrode layers and the corresponding substrate electrode (see point II above) and, based on this interpretation of the claimed subject-matter, the examining division concluded that the feature under consideration did not contribute to inventive step. As already concluded in point 3 above, however, the board cannot follow the examining division's interpretation of the claimed subject-matter. Consequently, while in the device of document D1 the polyimide alignment layer only covers the section of the surface of the substrate electrodes adjacent to the electro-optic material (see alignment layers 125 and 126 in Fig. 37; see also column 14, lines 20 to 28 referring to Fig. 28) and each of the tab electrode layers of the interconnection tab is in direct electrical contact with the corresponding substrate electrode (see Fig. 37), in the claimed invention the alignment layer is extended to also cover the portions of the substrate electrodes receiving the interconnection tab so that each of the tab electrode layers is in contact with the corresponding alignment layer. As a result of the claimed arrangement, an electrical connection of the capacitive type is established between each of the tab electrode layers and the corresponding substrate electrode (see point 4 above) and, in addition, the manufacture of the claimed device is simplified in that the polyimide alignment layer covers the substrate electrodes and there is no need for patterning or removing portions of the alignment layer (see description of the application, page 3, lines 19 to 33, and page 6, lines 31 to 34, together with page 11, lines 12 to 23).

None of the available documents of the prior art discloses or suggests feature d), nor gives a hint

toward the capacitive electrical connection or the manufacturing advantages mentioned above. In particular, document D5 discloses glasses of the electro-optic type (abstract, and Fig. 1 together with the corresponding description) including a polyimide alignment coating (page 23, lines 25 to 28); however, the document only discloses direct electrical connections (Fig. 2 and 3 and the corresponding description, in particular page 5, line 30 to 35, page 16, lines 3 to 5, and page 21, lines 26 to 28), and the document contains no suggestion to use electrical connections of the capacitive type.

5.2.3 The board concludes that the subject-matter of claim 1, and consequently also that of dependent claims 2 to 10, is new and involves an inventive step over the available documents of the prior art (Article 52(1) EPC together with Articles 54(1) and 56 EPC 1973).

6. In view of the above conclusions and considerations, the board concludes that the decision under appeal is to be set aside and a patent can be granted on the basis of the application documents amended according to the present request of the appellant.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance with the order to grant a patent on the basis of the following application documents:

- claims: No. 1 to 10 filed with the letter dated 6 March 2017,

- description: pages 1, 5, 6, 10 and 11 filed with the letter dated 27 February 2017, pages 2, 3 and 7 to 9 of the application as published, and page 4 filed with the letter dated 6 March 2017, and

- drawings: sheets 1/5 to 5/5 of the application as published.

The Registrar: The Chairman:

M. Kiehl R. Bekkering

Decision electronically authenticated