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Datasheet for the decision of 29 August 2024

Case Number: T 1579/20 - 3.4.03

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Language of the proceedings: EN

Title of invention:
LIGHT EMITTING DIODE CHIP AND METHOD OF FABRICATING THE SAME

Patent Proprietor:
Seoul Viosys Co., Ltd

Opponent:
Everlight Electronics Co., Ltd.

Headword:
Distributed Bragg reflector

Relevant legal provisions:
EPC Art. 52(1), 54(2), 54(3), 87(1), 100(a), 100(c), 101(2), 111(1)
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Case Number: T 1579/20 - 3.4.03

D E C I S I O N
of Technical Board of Appeal 3.4.03
of 29 August 2024

Appellant: (Patent Proprietor)	Seoul Viosys Co., Ltd 65-16, Sandan-ro 163beon-gil, Danwon-gu, Ansan-si, Gyeonggi-do (KR)
Representative:	Schneiders & Behrendt Bochum Gerard-Mortier-Platz 6 44793 Bochum (DE)
Appellant: (Opponent)	Everlight Electronics Co., Ltd. No. 6-8, Zhonghua Rd., Shulin Dist., New Taipei City (TW)
Representative:	Himmelsbach, Mathias Frohwitter Patent- und Rechtsanwälte Possartstraße 20 81679 München (DE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 9 June 2020 concerning maintenance of the European Patent No. 2656402 in amended form.**

Composition of the Board:

Chairman	T. Häusser
Members:	M. Stenger
	T. Bokor

Summary of Facts and Submissions

I. The appeals of the opponent and of the proprietor concern the interlocutory decision of the opposition division to maintain European patent no. EP 2 656 402 in amended form according to then auxiliary request 6a, also referred to as auxiliary request 7.

II. The European patent is based on European application no. 11 850 200 filed on 13 June 2011 and published with International publication no. WO 2012/086888. It claims 24 December 2010 as priority date, stemming from Korean application no. KR 10-2010-0134584 (O11).

III. During the proceedings before the opposition division, all grounds of opposition according to Articles 100(a), (b) and (c) EPC were raised and discussed. A further issue during these proceedings was the validity of the claimed priority.

IV. At the end of the oral proceedings before the board, the proprietor requested that the decision under appeal be set aside and the patent be maintained as granted or, on an auxiliary basis, according to auxiliary requests 1, 15, 17, 14, 16, 6a, 9 and 10, in that order. Alternatively, it requested that the opponent's appeal be dismissed. With letter dated 29 July 2024, the proprietor had requested not to admit the submissions of the opponent based on O5 and O6.

V. The opponent was not present at the oral proceedings before the board, as announced with letter dated 26 July 2024. It had requested in writing that the decision under appeal be set aside and the patent be

revoked in its entirety, alternatively, that the proprietor's appeal be dismissed.

VI. The board's decision was announced at the end of the oral proceedings held on 29 August 2024.

VII. The following documents are referred to:

O3 EP 2 362 453 A2
O3' US 2011/0114969 A1, a family member of O3
O5 printout from the internet site web.archive.org (wayback machine), url: https://web.archive.org/web/20080807142341/http:/www.sspectra.com/designs/bbhr.html
O6 WO 2010/077287 A1
O7 E.F. Schubert: "Light Emitting Diodes", second edition 2006, Chapter 10, pages 163-190
O11 KR 10-2010-0134584, priority application of the patent in suit
O11' English machine translation of O11

VIII. Claim 1 of the main request reads as follows (feature labelling "**1.**" to "**6.**" of the contested decision):

1. *A light emitting diode (LED) chip (100; 200; 200a), comprising:*
a substrate (21);
a light emitting structure (30) arranged on the substrate (21), the light emitting structure (30) comprising a first conductivity type semiconductor layer (25), a second conductivity type semiconductor layer (29), and an active layer (27) disposed between the first conductivity type semiconductor layer (25) and the second conductivity type semiconductor layer (29); and

2. *an alternating lamination bottom structure (43), the substrate (21) arranged on the alternating lamination bottom structure (43), the alternating lamination bottom structure (43) comprising a plurality of dielectric pairs, each of the dielectric pairs comprising a first material layer comprising a first refractive index and a second material layer comprising a second refractive index, the first refractive index being greater than the second refractive index,*
3. *the plurality of dielectric pairs comprising:*
a plurality of first dielectric pairs comprising the first material layer and the second material layer, the first material layer and the second material layer each comprising an optical thickness less than λ/4, wherein λ is a central wavelength of the visible light range,
4. *characterized in that said plurality of dielectric pairs further comprises:*
a plurality of second dielectric pairs comprising the first material layer and the second material layer, one of the first material layer and the second material layer comprising an optical thickness less than λ/4 and the other comprising an optical thickness greater than λ/4; and
5. *a plurality of third dielectric pairs comprising the first material layer and the second material layer, each of the first material layer and the second material layer comprising an optical thickness greater than λ/4, wherein λ is a central wavelength of the visible light range,*
6. *and wherein the plurality of second dielectric pairs is surrounded by first dielectric pairs, third dielectric pairs, or by one first dielectric pair and one third dielectric pair.*

IX. Claim 13 of the main request reads as follows (labelling **"1'"**., **"2'"**., ... added by the board):

1'. *A method of fabricating a light emitting diode chip (100; 200; 200a) the method comprising:*
forming at least one light emitting structure (30) on a first surface of a substrate (21), the light emitting structure (30) comprising an active layer (27); and
2'. *forming an alternating lamination bottom structure (43) on a second surface of the substrate (21), the second surface being on an opposite side of the substrate (21) as the first surface, the alternating lamination bottom structure (43) comprising a plurality of dielectric pairs, each of the dielectric pairs comprising a first material layer comprising a first refractive index and a second material layer comprising a second refractive index, the first refractive index being greater than the second refractive index,*
3'. *the plurality of dielectric pairs comprising:*
a plurality of first dielectric pairs comprising the first material layer and the second material layer, the first material layer and the second material layer each comprising an optical thickness less than λ/4, wherein A [sic] is a central wavelength of the visible light range,
4'. *characterized in that said plurality of dielectric pairs further comprises:*
a plurality of second dielectric pairs comprising the first material layer and the second material layer, one of the first material layer and the second material layer comprising an optical thickness less than λ/4 and the other comprising an optical thickness greater than λ/4; and
5'. *a plurality of third dielectric pairs comprising the first material layer and the second material layer, each of the first material layer and the second material layer comprising an optical thickness greater*

than λ/4, wherein λ is a central wavelength of the visible light range, and

6'. *wherein the plurality of second dielectric pairs is surrounded by first dielectric pairs, third dielectric pairs, or by one first dielectric pair and one third dielectric pair.*

X. In the contested decision, the opposition division set out that the subject-matter of claims 1 and 13 of the patent as granted extended beyond the content of the application as filed. It furthermore set out a number of objections with respect to the former auxiliary requests, some of which also apply to the claims as granted and therefore are discussed in the present decision as well. These objections concern the former second and sixth auxiliary requests as follows.

With respect to the former second auxiliary request, the opposition division concluded that it was not allowable under Article 123(2) EPC.

With respect to the former sixth auxiliary request, it concluded that O3 did not disclose all the features of claim 1. O3 did thus neither prejudice novelty nor the validity of the priority claim.
Furthermore, since the priority stemming from O11 was not validly claimed for the second alternative of the last feature of claim 1, O3' constituted prior art in the sense of Article 54(2) EPC and the subject-matter of this alternative of claim 1 was not inventive over O3'.

XI. The opponent essentially submitted that the independent claims of the main request did not meet the requirements of Article 123(2) EPC and that their subject-matter lacked novelty vis-à-vis O3. For the

latter reason, the claim to priority of the contested patent was not valid. In addition, the subject-matter of the independent claims as granted lacked inventive step over a combination of O5 and O6. It further submitted that the priority stemming from O11 was not validly claimed.

XII. The proprietor essentially submitted that the main request complied with the requirements of Article 123(2) EPC, that O3 did not disclose all the features of the independent claims as granted, that the priority stemming from O11 was validly claimed and that O5 and O6 should not be admitted into the proceedings.

Reasons for the Decision

1. The appeals are admissible.

2. Main request - objections under Article 100(c) EPC

2.1 Plurality of second dielectric pairs

2.1.1 The opposition division held (impugned decision, section 2.2 of the Reasons) that the original application only disclosed a single pair of second dielectric pairs, an example with two second dielectric pairs and mentioned "at least one pair" of second dielectric pairs. It did thus not exclude a plurality of second dielectric pairs. However, since the expression "at least one" had to be read in the context of the application as a whole, the original application did not unambiguously disclose "a plurality of second dielectric pairs" in the broadest sense of this expression, i.e. an indefinite number of second dielectric pairs.

2.1.2 The opponent essentially concurred with the division. In particular, the expression "the second dielectric pairs" on page 8, lines 16 to 17 of the description of the application only referred to the exemplary embodiments of the original application provided with exactly two (and not more) second dielectric pairs.

2.1.3 The proprietor submitted that the application as published explicitly mentioned "at least one second dielectric pair" in relation to Figure 2 of the application (page 6, line 29 to page 7, line 17) and referred to "the second dielectric pairs" (plural) with respect to the exemplary embodiments in general (page 8, lines 15 to 25).

2.1.4 The board holds that the skilled person would read the expression "at least one second dielectric pair" as "one or more (second) dielectric pairs", that is without any specific further restriction, including any number of second dielectric pairs starting from one. From this expression alone, the skilled person would thus not infer any upper limit concerning the number. In a similar, but more general manner, whenever a particular item is referred to in the description in the plural, the skilled person would normally understand that a plurality (i.e. more than one) of the item is referred to, without any upper limit of its number (at least within some undefined but reasonable limits, depending on the technical field in question).

In addition, the board does not believe that the mere absence, in the application as filed, of an embodiment with more than two second dielectric pairs, or the fact that essentially only one second dielectric pair is mentioned in the original claims (with the possible exception of original claims 18 and 19), would be

construed by the skilled person such that the number of second dielectric pairs disclosed in the original application as a whole is limited to one or two, contrary to the opinion of the opposition division and the submissions of the opponent.

Moreover, the board believes that the sentence on page 7, line 9 of the original description stating that "any combination of dielectric pairs is possible", although very general, would have been read by the skilled person at least as encompassing changing the number of the dielectric pairs mentioned in the sentence before, in which it is mentioned that "... *the number of second dielectric pairs is 2*.".

Relating more specifically to "the second dielectric pairs" mentioned on page 8, lines 15 to 20, the board notes that this passage requires that the second dielectric pairs separate the first from the third dielectric pairs, which is not the case in the exemplary embodiment shown in Figure 2, at least not when those pairs are considered which are immediately adjacent to the second dielectric pairs (in Figure 2 two first dielectric pairs are immediately adjacent to the second dielectric pairs, see section 2.2.4 below). Thus, the skilled person would not consider that "the" second dielectric pairs mentioned in that passage are strictly limited to the examples disclosed in more detail in the specification, contrary to the submission of the opponent.

Thus, the use of the expression "a plurality of second dielectric pairs" in the independent claims of the main request does not extend beyond the content of the application as filed, contrary to the conclusion of the opposition division and the submission of the opponent.

2.2 One first and one third dielectric pair surrounding the second dielectric pairs

2.2.1 The opposition division set out that it was not physically impossible to surround a second dielectric pair with a first and a second dielectric pair (section 4.2 of the Reasons for the contested decision, relating to the former second auxiliary request). It was thus not directly and unambiguously derivable for the skilled person that the "second dielectric pair" mentioned on page 7, line 13 of the description of the application as filed was a clerical mistake and that instead a third dielectric pair should have been mentioned.
Therefore, there was no basis in the original application for second dielectric pairs surrounded by one first dielectric pair and one third dielectric pair, whereby the second auxiliary request was not allowable under Article 123(2) EPC.

In addition, there was generally no basis in the original application for the second dielectric pairs being surrounded only by a single pair on each side, which was implied by the term "one" used instead of the term "a".

2.2.2 The opponent submitted that there was no disclosure in the original application of an arrangement of two or more second dielectric pairs surrounded by one first dielectric pair and one third dielectric pair. Instead, the original disclosure only referred to, on page 7, lines 11 to 13, the at least one second dielectric pair being surrounded by one first dielectric pair and one **second** dielectric pair. Thus, the last alternative of features 6 and 6' as well as the amendment of the

description in paragraph [0029] of the opposed patent contravened the requirements of Article 123(2) EPC.

2.2.3 The proprietor submitted that the text passage on page 7, lines 10 to 13 of the original application contained an obvious error. The passage was in itself contradictory in its literal version, which indicated that the second dielectric pairs could be surrounded by a first and a second dielectric pair. This would be no alternative to the embodiment of Figure 2, which was, however, clearly the intention of that sentence, which should read, at the end, "or by one first dielectric pair and one third dielectric pair".

2.2.4 The board notes that arrangements of the first and third dielectric pairs with respect to the second dielectric pairs are described at various places in the original application, namely on page 6, line 29 to page 7, line 17 and on page 8, lines 15 to 25. Further, such arrangements are mentioned in original claims 3, 4, 5, 7, 18 and 19. In the patent as granted, such arrangements are described in paragraphs [28] to [30] and [36] and in claims 1, 2, 3, 4, 6 and 13 to 16.

The expression "surrounded by first dielectric pairs" on page 7, lines 10 to 13 of the original application applies to the configuration shown in Figure 2. In that configuration, one dielectric pair 10 on the left-hand side of the second dielectric pairs 11 and 12 is a first dielectric pair, and all dielectric pairs 13, 14, ... on the right-hand side of the second dielectric pair are also first dielectric pairs. Both pairs 10, 13 directly adjacent to the second dielectric pairs are thus first dielectric pairs. The use of the plural in the above-mentioned expression thus reflects the presence of one first dielectric pair directly adjacent

to the at least one second dielectric pair at each of its two sides. This includes, for instance, arrangements like 1111221333 or 1331221333 (each number 1, 2 and 3 representing a first, second and third dielectric pair, respectively).

Accordingly, the skilled person would, in a literal sense, normally interpret the expression "surrounded by ... one first dielectric pair and one **second** dielectric pair" (emphasis added) which is presented as one possible alternative in the same paragraph in lines 11 to 13 of page 7 as reflecting the presence of one first dielectric pair and one second dielectric pair directly adjacent to the two sides of the at least one second dielectric pair, respectively.

The board furthermore accepts that a second dielectric pair being directly adjacent to an "at least one second dielectric pair" might not be physically impossible, as set out by the opposition division (contested decision, page 15, last paragraph). However, such an interpretation would mean that a *further* second dielectric pair is added to the *at least one* second dielectric pair. This would include the addition of one second dielectric pair to a plurality of second dielectric pairs, the number of which is unspecified, and normally unlimited. The board holds that this interpretation would not make sense to the skilled person; instead, it would be considered to be contradictory in itself, in line with the submission of the proprietor.
Thus, the board believes that the skilled person would not understand the sentence on page 7, lines 11 to 13 in a literal sense. Instead, it would conclude that the expression at the end of this sentence should read

"surrounded by ... one first dielectric pair and one **third** dielectric pair", as submitted by the proprietor.

The board therefore does not believe that the last part of the last features 6 and 6' of claims 1 and 13 of the patent as granted or the corresponding amendment in paragraph [29] of the description extends beyond the content of the application as filed (Article 100(c) EPC), contrary to the view of the opposition division as set out for claim 1 of auxiliary request 2 and the submission of the opponent.

Furthermore, the purpose of the lamination bottom structure is to reflect light over a broad wavelength range. The skilled person would have been aware that this purpose can only be achieved if on both sides of the second dielectric layers, a reasonable number of first and third layers is provided. Thus, it would have read the expression "the plurality of second dielectric pairs is surrounded ... by one first dielectric pair and one third dielectric pair" at the end of claims 1 and 13 as granted as referring only to the two dielectric layers directly adjacent to the two sides of the second dielectric pairs. It would not have inferred any restriction concerning the dielectric pairs not directly adjacent to, or in other words, not in direct contact with the second dielectric pairs from the use of the term "one". Therefore, the skilled person would have considered that both arrangements discussed by the opponent at the bottom of page 8 of its reply to the statement of the grounds of appeal of the proprietor ("11111113221333333" and "11111111122333333") fall under the expression at the end of claims 1 and 13 as granted, contrary to the submission of the opponent.

Thus, the skilled person would not have understood the language of the claims as granted such that the second dielectric pairs were surrounded only by a single pair on each side, despite the use of the term "one" instead of "a", contrary to the finding of the opposition division. The use of the term "one" in the last alternative of features 6 and 6' thus does not extend beyond the content of the application as filed.

2.3 Lamination top structure

2.3.1 The opposition division (section 4.2 Reasons for the contested decision, relating to the former second auxiliary request, penultimate paragraph of page 15) set out that the omission of the top reflector did not represent an intermediate generalisation because the laminating structure with two second dielectric pairs was not intrinsically linked to the example shown in Figure 1 which included the top reflector.

2.3.2 The opponent submitted that an arrangement having more than one second dielectric layer but not the lamination top structure extended beyond the content of the application as filed because the lamination top structure was essential for obtaining the desired technical effect of reflecting over a wide angle blue light originating from the active layer of the LED and reflecting at the top surface light generated by a phosphor layer.

2.3.3 The proprietor submitted that the technical purposes of the second dielectric pairs and the lamination top structure were different. The lamination bottom structure was designed such that it reflected the light from the active layer (and possibly also the light emitted by the phosphors) over the entire visible

spectral range. This effect was recognizable to the skilled person even without the presence of the lamination top structure.

2.3.4 The board notes that according to page 9, lines 5 to 19 and Figure 4 of the original application, the purpose of the lamination top structure is to allow transmission of light generated in the active layer while reflecting light entering the LED chip, in particular, light emitted from the phosphors comprised in molding part 63 (see Figure 5), in line with the submission of the opponent. However, in contrast thereto, according to page 7, lines 18 to 25 and Figure 3, the purpose of the bottom lamination structure, including the dielectric pairs defined in the independent claims, is to reflect light in a wide range of the visible light. In view of Figure 5 this avoids loss of light in adhesive 62 and leads 61a, 61b. Thus, as submitted by the proprietor, the top and the bottom lamination structures have different purposes and each of these structures could be used without the other. Hence, the top lamination structure is not technically intrinsically linked to the lamination bottom structure, as held by the opposition division.

The board therefore does not believe that the omission of the lamination top structure constitutes an intermediate generalisation, contrary to the submission of the opponent, but in line with the division's opinion and the submissions of the proprietor.

2.4 Conclusion on the objections under Article 100(c) EPC

In view of the above the board concludes that the ground for opposition under Article 100(c) EPC does not prejudice the maintenance of the contested patent.

3. Main request - novelty over O3, priority claim

3.1 Document O3

3.1.1 The opposition division (Reasons for the contested decision, section 8.6, relating to the former sixth auxiliary request) set out that O3, while disclosing at least two adjacent pairs which could be interpreted as pairs each having two layers with a different optical thickness, did not unambiguously disclose stack layers with a thickness smaller than 1/4 of 550 nm, i.e. smaller than 1/4 of the central wavelength of the visible light range defined in features 5 and 5'. Instead, thicknesses of 3 λ/4 or 5 λ/4 were not excluded by the disclosure of O3.
The opposition division concluded that O3 did not prejudice novelty and did not prejudice the validity of the priority claim of the contested patent because O3 was not a "first application" under Article 87(1) EPC.

3.1.2 The opponent submitted that the presence of stack layers with a thickness smaller than 1/4 of 550 nm was implied by the intention of O3 to provide a high reflectance band over a wide wavelength range (O3, paragraph [13]). Such a reflectance required the use of λ/4 thick dielectric pairs for the wavelengths of blue (460 nm) and red (640 nm) light indicated in O3 with respect to Figures 4 and 6 (see paragraph [86]). With thicknesses of 3 λ/4 or 5 λ/4, reflectances as shown in Figure 6 of O3 could not be achieved, as could be seen from the calculations in the annex filed with the opponent's statement setting out the grounds of appeal. In view of paragraph [59] of O3 indicating that like reference numerals denoted like elements in the

drawings, the wavelength examples of Figure 4 applied to Figure 5 as well.

3.1.3 The proprietor submitted that the argument that the material layers 40a, 40b or 50a, 50b had a thickness of λ/4 at the respective wavelength was new and should not be admitted. In addition, referring to paragraphs [70] and [77] of O3, it submitted that layers 50a and 50b could not each have an optical thickness of λ/4. The number of layers and the optical thicknesses of the layers 40a, 40b, 50a and 50b were actually not disclosed in O3. The reflectance calculations of the opponent were based on assumptions, gave different results than what was shown in Figure 6 of O3 and thus did not correspond thereto. O3 disclosed only potentially first and third dielectric pairs in Figure 4, but no second dielectric pairs in the sense of the patent in suit.

Furthermore, during its discussion of O3' in its statement setting out the grounds of appeal, the proprietor relied in particular on pages 171 to 175 of O7 and submitted that within the meaning of the disputed patent, a dielectric pair was a pair of adjacent dielectric layers, the assignment (or counting) of layers necessarily starting with the initial pair seen from the direction of incident light, in sequence and without gaps. In particular, a layer 40 and a layer 50 never formed a pair in O3'. The board notes that this latter argument also applies to O3.

3.1.4 The board notes that the question of novelty vis-à-vis O3 was already discussed during the proceedings before the opposition division, as submitted by the proprietor. The "new argument" of the opponent is thus a reinforcement of a previous argument rather than a

completely new one. The board sees no reason not to admit it.

The board furthermore notes that O3 does not explicitly disclose the optical thicknesses of the layers, in line with the submissions of both parties. Nevertheless, the board accepts that the skilled person was aware that for layer thicknesses greater than λ/4, the high-reflectivity stop band would be narrower, as apparent from document O7 (page 171, the paragraph directly beneath formula (10.10)) and in line with the submissions of the opponent. However, as set out by the opposition division (and confirmed by O7), a layer thickness of λ/4 is not an absolute requirement for a distributed Bragg reflector (DBR) *per se*. Instead, a DBR could also be provided with optical thicknesses of the layers of, for example, 3 λ/4 or 5 λ/4. In addition, although the intention of O3 (as expressed in paragraph [13]) may be to provide a DBR with a high reflectivity over a wide wavelength range as set out by the opponent, its intention is not to provide a DBR with the **highest possible** reflectivity over the **widest possible** wavelength range (emphasis added by the board). That is, a (relatively) high reflectivity over a wide wavelength range achieved with optical thicknesses of 3 λ/4 or 5 λ/4 would also fall under the intention of O3 even if an even wider wavelength range could be achieved using optical thicknesses of λ/4.

The board takes note that the calculations of the opponent presented in the annex filed with its statement setting out the grounds of appeal may indicate that with a specific number of layers (10 pairs for each of the two Bragg reflectors) and an optical layer thickness of λ/4, a reflection spectrum similar to (albeit slightly different from, as pointed

out by the proprietor) the one shown in Figure 6 of O3 may be achieved. These calculations may also indicate that with the same specific number of layers and optical thicknesses of either 3 λ/4 or 5 λ/4, the simulated reflection spectra are less similar to the one shown in Figure 6 of O3.
However, the specific number of layers and the optical thicknesses of either λ/4, 3 λ/4 or 5 λ/4 for all of the layers represent assumptions of the opponent, as submitted by the proprietor (reply to the statement setting out the grounds of appeal, page 8, last paragraph).
For instance, the number of layers is not defined in O3. Within the disclosure of that document, this number may thus vary from the one used for the calculations performed by the opponent. In a similar manner, the optical thicknesses of the individual layers need not be the same for the different layers, in contrast to the calculations of the opponent. This is suggested in O3 in paragraph [77]. For instance, the optical thicknesses of the first and third layer 40a, 50a may be integer multiples of the optical thickness of the second and the fourth layers 40b, 50b, as mentioned in paragraph [70].
Therefore, the calculations performed by the opponent do not prove that the reflection spectrum of Figure 6 of O3 cannot be achieved by layers with optical thicknesses different than λ/4. Hence, the reflection spectrum shown in Figure 6 of O3 does not necessarily correspond to the calculations of the opponent, as pointed out by the proprietor.

Thus, O3 does not *directly and unambiguously* imply that the optical thicknesses of the layers 40a, 40b, 50a and 50b correspond to λ/4, contrary to the submission of the opponent, but in line with the view of the

opposition division. Thus, O3 does not disclose directly and unambiguously all the features of the independent claims as granted. Therefore, the subject-matter of claims 1 and 13 is new over O3.

3.1.5 The board notes that in view of the above, O3 does not disclose the *same* invention as defined in the independent claims as granted. It does therefore not in itself prejudice the validity of the claimed priority under Article 87(1) EPC, as held by the division.

In addition, O3 was filed on 16 September 2010, earlier than the claimed priority date of the contested patent (24 December 2010), and published on 31 August 2011, i.e. later than the filing date of the contested patent (13 June 2011). Thus, O3 represents prior art under Article 54(3) EPC (irrespective of the validity in view of O11 of the claimed priority, see below). O3 is therefore irrelevant for inventive step.

3.1.6 In view of the above the board concludes that document O3 is prejudicial neither to the novelty of the subject-matter of claims 1 and 13 of the main request (Articles 52(1) and 54(3) EPC) nor to the priority claim of the patent (Article 87(1) EPC).

3.2 Priority application O11/O11'

3.2.1 The contested patent claims the 24 December 2010 as priority date, stemming from Korean application KR 10-2010-0134584 (O11). The English machine translation of O11 by the Korean Intellectual Property Office (KIPO) is referred to as "O11'".

3.2.2 The opposition division noted that O11' might contain errors. Irrespective thereof, absence of a whole

paragraph could be detected. In the original application, a new paragraph was introduced between paragraphs [0040] and [0041] of O11, corresponding to page 7, lines 10 to 13, in which the second alternative of feature 6 was disclosed. Thus, for this alternative, the priority was not validly claimed and O3' was prior art under Article 54(2) EPC.

3.2.3 The opponent concurred with the opposition division with respect to the additional paragraph. It furthermore submitted that paragraphs [0012] and [0013] of O11' merely stated a positional requirement for at least 80% of the first and the third dielectric pairs, respectively. However, these paragraphs provided no indication as to where the remaining 20% of each type of pairs should be located. The arrangement could therefore have the structure

substrate/80% 1st pairs/20% 3rd pairs/2nd pairs/20% 1st pairs/80% 3rd pairs

in which the second dielectric pairs were not surrounded by third dielectric pairs. Paragraphs [0012] and [0013] thus did not disclose the second alternative of feature 6, either.

In addition, paragraphs [0012] and [0013] of O11/O11' included the "at least 80%" language, which was not part of the claimed subject-matter for which it was argued that the priority was valid. The absence of this further restriction provided a further reason for considering the priority claim invalid.

3.2.4 The proprietor indicated, in its statement setting out its grounds of appeal (section 7.1.2.) that O11' should

not be admitted as late filed and *prima facie* not relevant.

Irrespective thereof, the proprietor submitted, with its letter dated 29 July 2024, a new translation of paragraphs [0013], [0014] and [0039] of O11. O11/O11' disclosed in paragraphs [0012] and [0013] the option that at least 80% of the third dielectric pairs were further away from the substrate than the second dielectric pairs. Together with the last sentence of paragraph [0013] as now correctly translated, according to which **the** - i.e. all - first dielectric pairs were positioned closer to the substrate than **the**, i.e. all third dielectric pairs (board's emphasis), this implied that the second dielectric pairs were surrounded by first dielectric pairs. In a similar manner, paragraph [0014] as now correctly translated implied that the dielectric pairs were surrounded by third dielectric pairs. Paragraph [0039] as now correctly translated corresponded to these two possibilities.

Paragraph [0041], which in the version of O11' also comprised a clerical error (namely, that the penultimate mention of "the second dielectric pair" should read "the first dielectric pair", as correctly translated in the application as originally filed on page 7, line 15) explicitly disclosed the third alternative of feature 6 that the second dielectric pairs were surrounded by one first dielectric pair and one third dielectric pair and generally made it clear that the first and the third dielectric pairs did not have to be arranged in "blocks" but could be mixed.

Throughout O11/O11', the restrictions with respect to the arrangement of the dielectric layers in the embodiments described in detail were presented as

optional. This was apparent from the use of the expressions "can" and "for example" in paragraphs [0012] to [0014], [0021], [0026], [0028], [0038] to [0041] and [0047]. In addition, this was in line with features 6 and 6', which in combination covered virtually all possible arrangements of first and second dielectric pairs with respect to the second dielectric pairs. The only arrangements actually excluded by features 6 and 6' were the ones where the second dielectric pairs were positioned at the very edges/ borders of the lamination bottom structure. This was in line with paragraph [0012] of O11/O11', according to which the "at least one second dielectric pair can be arranged in the nearby center of the underlying structure". Moreover, paragraph [0041] of O11/O11' disclosed that the first, second and third dielectric pairs did not need to be arranged blockwise; instead, the second dielectric pairs could be surrounded by all alternatives listed in features 6/6', depending on which of the conditions listed therein was respected.

3.2.5 With respect to the passage on page 7, lines 10 to 13 of the original description of the application, the board concurs with the opposition division and the opponent that it is not comprised in the priority document O11. Nevertheless, the board believes that all three alternatives comprised in features 6 and 6' are disclosed in O11 for the following reasons.

The main difference between paragraphs [0013], [0014] and [0039] of O11' on the one hand and the translation of these paragraphs as filed by the proprietor on the other hand is that the expressions "multiple first/ second/third dielectric pairs" are replaced by the expressions "the plurality of first/second/third dielectric pairs". The board notes that the expression

"multiple dielectric pairs" in O11' was translated as "the plurality of dielectric pairs" at a number of places in the original application, see for example paragraphs [0037] and [0038] of O11' corresponding to page 6, lines 7 to 23 of the original application. The board therefore accepts that the new translation of paragraphs [0013], [0014] and [0039] filed by the proprietor with its letter dated 29 July 2024 properly reflects the corresponding paragraphs of O11.

In view of this new translation, the board concurs with the submission of the proprietor that paragraphs [0013] and [0014] disclose the alternatives that all first dielectric pairs are closer to the substrate than all third dielectric pairs and *vice versa*. Therefore, these paragraphs provide a basis for the first and the second alternative of features 6 and 6', respectively, i.e. that the second dielectric pairs are surrounded by first or third dielectric pairs.

As submitted by the opponent, the first part of paragraph [0013] includes the "at least 80%" language. In a similar manner, the first part of paragraph [0014] uses an "at least a majority" language.

However, the board does not believe that the skilled person would read the expressions "... the plurality of first/third dielectric pairs ..." used in the last sentences of these two paragraphs as necessarily referring only to the "at least 80%" / "at least a majority" of dielectric first/third pairs mentioned in the same paragraphs before. Instead, the board holds that the skilled person would understand the last sentences of these paragraphs, respectively, as referring to all (first or third) dielectric pairs mentioned in the application, contrary to the

submission of the opponent. This finding is in accordance with the wording of newly translated paragraph [0039] which does not include the "at least 80%" / "at least a majority" language.

Paragraph [0041] of O11' reads (emphasis and underlining added by the board):

"In the meantime, the item number has the third dielectric pair of the few number between the second dielectric pair and most of first dielectric pairs **and** the second dielectric pair of the few number can be interposed between the second dielectric pair and most of third dielectric pairs."

In the application as filed, the corresponding paragraph (page 7, lines 14 to 17) reads (emphasis and underlining added by the board):

"A small number of third dielectric pairs may be interposed between the second dielectric pair and most of the first dielectric pairs, **and** a small number of first dielectric pairs may be interposed between the second dielectric pair and most of the third dielectric pairs.

The underlined terms reflect the correction of the clerical error referred to by the proprietor. The board believes that the skilled person would have immediately been aware that the underlined term in paragraph [0041] of O11' should read "first", since it would not make sense to interpose second dielectric pairs between another second dielectric pair and third dielectric pairs (see also section 2.2.4 above). In addition, the skilled person would read these paragraphs knowing that "the second dielectric pair" could in fact consist of

"a plurality of second dielectric pairs" (see section 2.1 above).

Hence, the skilled person would read (each of) these paragraphs as comprising three alternatives as follows.

1. A small number of third dielectric pairs is interposed between the second dielectric pair(s) and most of the first dielectric pairs, resulting in a structure of the type 111111133322333333333.

2. A small number of first dielectric pairs is interposed between the second dielectric pair(s) and most of the third dielectric pairs, resulting in an arrangement of the type 1111111111221113333322.

3. Both a small number of third dielectric pairs is interposed between the second dielectric pair(s) and most of the first dielectric pairs **and** a small number of first dielectric pairs is interposed between the second dielectric pair(s) and most of the third dielectric pairs, resulting in an arrangement of the type 111111133322111333333.

Hence, alternative 1. corresponds to the second alternative of feature 6 and 6', alternative 2. corresponds to the first alternative of feature 6 and 6' and alternative 3. corresponds to the third alternative of feature 6 and 6'. The board notes that these paragraphs do not include the "at least 80%" / "at least a majority" language.

Taking into account the correction of the clerical error referred to by the proprietor, paragraph [0041] of O11' and the passage on page 7, lines 14 to 17 as originally filed correspond to each other. In view of

the above, there is therefore a basis in the priority document O11/O11' under Article 87(1) EPC for all the alternatives listed in features 6 and 6'. The priority claim is therefore valid.

4. Main request - relevance of document O3'

O3' is a US application. Thus, it does not fall under the scope of Article 54(3) EPC and its filing and priority dates are irrelevant. The publication date of O3' is 19 May 2011, i.e. after the priority date of the contested patent (24 December 2010). Since the priority of the contested patent with respect to O11/O11' is validly claimed (see section 3.2 above), O3' does not represent prior art under Article 54(2) EPC, either. It can thus be disregarded for the assessment of both novelty and inventive step.

5. Main request - inventive step over the combination of O5 and O6

5.1 The opposition division did not provide any comment relating to O5 and/or O6.

5.2 The opponent submitted in its reply to the proprietor's grounds of appeal that claims 1 and 13 as granted, i.e. according to the main request, lack an inventive step over a combination of O5 and O6 (section MAIN REQUEST, C) Lack of Inventive Step, on pages 4-5), referring, *inter alia*, to its submission to the opposition division dated 11 June 2019.

5.3 The proprietor, with letter dated 29 July 2024 (pages 9 to 10), requested not to admit the submissions of the opponent based on O5 and O6 under Articles 12(2), (3) and (4) RPBA. During the proceedings before the

opposition division, the proprietor had requested, with submission dated 18 July 2019, that O5 and O6 not be admitted as late filed and *prima facie* not relevant.

5.4 The impugned decision is silent on O5 and/or O6. The decision was thus not based on the corresponding objection with respect to lack of inventive step in view of these documents. Hence, this objection has to be considered as an amendment within the meaning of Article 12(4) RPBA, unless the opponent demonstrates that it was admissibly raised and maintained in the proceedings leading to the decision under appeal.

However, apart from the reference to the first instance submission mentioned above, the board does not see such demonstration. Moreover, as submitted by the proprietor, this objection was already filed late during the proceedings before the opposition division and the board is not aware of any submission during the earlier proceedings of the then opponent why it was filed late already during these proceedings. Thus, the opponent's objection relating to lack of inventive step in view of O5 and O6 cannot be considered to have been admissibly raised.

Consequently, this objection has to be considered as an amendment within the meaning of Article 12(4) RPBA. Any such amendment may be admitted only at the discretion of the board. The board shall exercise its discretion in view of, *inter alia*, the complexity of the amendment and the need for procedural economy.

The board notes that O5 and O6 were filed after the summons to the oral proceedings dated 25 February 2019. According to the minutes of the oral proceedings before the opposition division, these documents were not

discussed there. Thus, not only the contested decision is silent concerning O5 and O6, but these documents were not discussed at all by the opposition division at any point during the proceedings. The board considers that discussing such an objection for the first time in appeal and, in addition, in the absence of the party that submitted that objection, would be both overly complex (in the absence of any additional explanations of the submitting party) and certainly detrimental to procedural economy.

The board thus decides not to admit the submissions of the opponent based on O5 and O6, as requested by the proprietor (Article 12(4) RPBA).

6. Main request - conclusion

None of the grounds of opposition discussed in the contested decision and/or raised by the opponent prejudice the maintenance of the patent as granted. Hence, the opposition is to be rejected under and the patent maintained as granted (Articles 101(2) and 111(1) EPC).

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is maintained as granted.

The Registrar: The Chairman:

S. Sánchez Chiquero T. Häusser

Decision electronically authenticated