

**Internal distribution code:**

- (A) [ - ] Publication in OJ
- (B) [ - ] To Chairmen and Members
- (C) [ - ] To Chairmen
- (D) [ X ] No distribution

**Datasheet for the decision  
of 19 September 2019**

**Case Number:** T 2640/16 - 3.4.02

**Application Number:** 12702106.1

**Publication Number:** 2671116

**IPC:** G02F1/13

**Language of the proceedings:** EN

**Title of invention:**

ELECTRONIC DEVICES HAVING REDUCED SUSCEPTIBILITY TO NEWTON  
RINGS, AND/OR METHODS OF MAKING THE SAME

**Applicant:**

Guardian Glass, LLC

**Headword:**

**Relevant legal provisions:**

EPC Art. 123(2), 84, 56

**Keyword:**

Amended main request : Added subject-matter (no) - Clarity (no)  
First auxiliary request : Inventive step (no)  
Second auxiliary request : Added subject-matter (yes)

**Decisions cited:**

T 1482/05, T 0936/96, T 0201/83, T 0876/06

**Catchword:**



**Beschwerdekammern**  
**Boards of Appeal**  
**Chambres de recours**

Boards of Appeal of the  
European Patent Office  
Richard-Reitzner-Allee 8  
85540 Haar  
GERMANY  
Tel. +49 (0)89 2399-0  
Fax +49 (0)89 2399-4465

Case Number: T 2640/16 - 3.4.02

**D E C I S I O N**  
**of Technical Board of Appeal 3.4.02**  
**of 19 September 2019**

**Appellant:** Guardian Glass, LLC  
(Applicant) 2300 Harmon Road  
Auburn Hills MI 48326 (US)

**Representative:** Hoyng Rokh Monegier LLP  
Rembrandt Tower, 31st Floor  
Amstelplein 1  
1096 HA Amsterdam (NL)

**Decision under appeal:** Decision of the Examining Division of the  
European Patent Office posted on 15 July 2016  
refusing European patent application No.  
12702106.1 pursuant to Article 97(2) EPC.

**Composition of the Board:**

**Chairman** R. Bekkering  
**Members:** C. Kallinger  
T. Karamanli

## Summary of Facts and Submissions

- I. The applicant lodged an appeal against the decision of the examining division refusing European patent application No. 12 702 106.1 on the basis of Article 97(2) EPC because the subject-matter of claim 1 of each of the main, the first and the second auxiliary request then on file extended beyond the content of the application as originally filed, contrary to the requirements of Article 123(2) EPC, and independent method claim 5 of the main request was not clear, contrary to the requirements of Article 84 EPC. In an obiter dictum, the examining division reasoned that a "possibly modified" claim 1, which would meet the requirements of Article 123(2) EPC, did not involve an inventive step within the meaning of Article 56 EPC.
- II. With the statement setting out the grounds of appeal dated 16 November 2016, the appellant filed claims of a main request and first and second auxiliary requests and requested that the decision of the examining division be set aside and a patent be granted on the basis of the claims of the main request or one of the first or second auxiliary requests, all requests filed with the statement of grounds of appeal. The appellant also requested oral proceedings *"in case it is not decided according to the main request"*.
- III. By communication dated 12 July 2019, the appellant was summoned to attend oral proceedings on 24 September 2019. In a communication annexed to the summons, the board provided its provisional opinion on the merits of the appeal.

IV. With letter dated 13 August 2019, the appellant informed the board that it would not be attending the oral proceedings and requested a decision "*based on the written arguments*". No further requests or arguments were submitted.

V. The oral proceedings scheduled for 24 September 2019 were cancelled and, by a communication of the board's registrar dated 18 September 2019, the appellant was informed accordingly.

VI. This decision refers to the following documents. The numbering corresponds to the one used during the examination proceedings:

D2 US 2010/0165551 A1  
D3 US 2008/0049431 A1  
D4 US 2003/0064255 A1.

VII. Claim 1 of the main request reads

*"1. A liquid crystal display (LCD) device (1), comprising:  
a TFT substrate (6) and a color filter substrate (4) sandwiching a layer comprising liquid crystal material (2);  
a backlight (36) configured to emit light and provided adjacent to the TFT substrate (6);  
a cover glass substrate (32) adjacent to the color filter substrate (4);  
at least one air pocket (24a, 24b) in an area between the color filter substrate (4) and the cover glass substrate (32) and proximate to a corresponding deformation location (34) in or on the cover glass substrate (32); and*

*a first antireflective (AR) coating provided (42a), directly on a first major surface of the cover glass (32) [sic] substrate facing the color filter substrate (4) or (b) [sic] a major surface of the color filter substrate facing the cover glass substrate, wherein the first AR coating (42a) is optically tuned to reduce constructive interference of light emitted from the backlight (36) in areas proximate to the at least one air pocket (24a, 24b) and the corresponding deformation location (34), and between facing surfaces of the color filter substrate (4) and the cover glass substrate (32), in order to correspondingly reduce the occurrence and/or intensity of Newton Rings, wherein the first AR coating (42a) comprises, in order moving away from the substrate on which it is provided:*

- a first medium index layer (54);*
- a first high index layer (56); and*
- a first low index layer (58),*

*wherein the first medium index (54) layer has a refractive index of 1.6-1.9, the first high index layer (56) has a refractive index of 2.2-2.6, and the first low index layer (58) has a refractive index of 1.45 to 1.55, and wherein the thicknesses of the medium, high, and low index layers are 90-120 nm, 10-25 nm, and 80-120 nm, respectively."*

VIII. Claim 1 of the first auxiliary request

In comparison to the main request, the claims of the first auxiliary request do no longer comprise the method claim 5. All other claims remain unchanged.

IX. Claim 1 of the second auxiliary request

In comparison to the main request, the claim set of the second auxiliary request does no longer comprise claim 5.

Claim 1 has been amended by deleting the following feature as marked by strike-through

*"a first antireflective (AR) coating provided (42a), directly on a first major surface of the cover glass (32) substrate facing the color filter substrate (4) ~~or (b) a major surface of the color filter substrate facing the cover glass substrate,~~"*

and by adding at the end of the claim the following feature:

*"wherein the color filter substrate (4) and the cover glass substrate (32) are separated by a thin air gap of 400 nm to 4000 nm."*

**Reasons for the Decision**

1. The appeal is admissible.
  
2. With its letter dated 13 August 2019, the appellant stated that it would not be attending the oral proceedings before the Board and requested a decision on the basis of its written arguments. Hence, the appellant has unequivocally expressed that it did not wish to present further arguments at the oral proceedings and that it requested a decision according to the state of the file. According to the jurisprudence of the Boards of Appeal, this amounts to a withdrawal of the appellant's request for oral

proceedings (see e.g. T 1482/05, point 2 of the Reasons). The board therefore found it appropriate to cancel the oral proceedings in the present case.

3. Main request

3.1 Independent claim 1 - Article 123(2) EPC

3.1.1 Claim 1 is a combination of claims 1 to 4 and paragraph [0037] of the application as originally filed.

3.1.2 The examining division based its decision with respect to Article 123(2) EPC on the feature that "*the color filter substrate and the cover glass substrate are separated by a thin air gap of 400 nm to 4000 nm.*"

3.1.3 Since this feature is no longer present in claim 1 of the main request and the board considers that all other features of claim 1 are disclosed in the application as originally filed. The board finds that claim 1 of the main request meets the requirements of Article 123(2) EPC.

3.2 Independent claim 5 - Article 84 EPC

3.2.1 The examining division reasoned that claim 5 did not meet the requirements of Article 84 EPC because it was unclear whether the second glass substrate formed part of the article produced by the claimed method since the coated article, i.e. the first substrate, was separated from the second glass substrate by an air gap.

3.2.2 The appellant argued that the method of making a coated article as defined in claim 5 comprised the steps of



- (i) providing an anti-Newton's Ring coating on a major surface of a first glass substrate
- (ii) orienting the first substrate substantially parallel in relation to a second glass substrate.

From these method steps and the whole content of the description it was clear that the second glass substrate formed part of the coated article.

3.2.3 The board is not persuaded by these arguments, because claim 5 does not clearly define the second method step as indicated by the appellant. The first method step is clearly defined as claim 5 defines in active form the step of "disposing an Anti-Newton Ring (ANR) coating". However, in contrast to the appellant's argument, claim 5 uses the formulation "*the first glass substrate (32) is oriented in substantially parallel relation to a second glass substrate*". The board is of the opinion that this feature relates rather to a characteristic of the first glass substrate than to an active method step of providing a second glass substrate.

Furthermore, the description discloses in figure 5 and paragraph [0038] explicitly a coated article with only a single glass substrate, i.e an article as manufactured by the method of claim 5 and without a second glass substrate.

In view of the above, claim 5 of the main request does not meet the requirements of Article 84 EPC as it is not clear whether the second glass substrate forms part of the coated article produced by the method steps defined in claim 5.

4. First auxiliary request

In comparison to the main request, the claims of the first auxiliary request no longer comprise method claim 5. All other claims remain unchanged.

4.1 Inventive step - Article 56 EPC

The examining division discussed in an *obiter dictum* inventive step with respect to a "*modified claim*" which corresponds to independent claim 1 of the first auxiliary request.

4.1.1 Closest prior art

Both the examining division and the appellant regarded document D3 as the closest prior art. The board sees no reason to deviate from D3 as the closest prior art.

D3 discloses a display device (see paragraph [0004]) comprising (see figure 1 and paragraph [0035]):

- a display panel with a substrate (70) and a light emitting layer (60),
- a cover glass substrate (30) adjacent to display with the light emitting layer and
- an air gap (50) and air pockets in an area between the cover glass and the display panel and proximate to a corresponding deformation location in or on the cover glass substrate (see paragraphs [0006] and [0007]: variations in air gap thickness causing "Newton's Rings").

To avoid or minimize the formation of Newton's Rings, D3 provides an anti-reflective (AR) coating (40) (see paragraph [0009]) directly on the major surface of the

cover glass facing the display panel (see also paragraph [0035]).

The AR coating is optically tuned to reduce constructive interference of light emitted from the light emitting layer in areas proximate to the air pockets and the corresponding deformation locations, and between facing surfaces of the color filter substrate and the cover glass substrate, to correspondingly reduce the occurrence and/or intensity of Newton's Rings (see paragraphs [0035] and [0040]). According to D3, the AR coating (40) comprises three layers with the following values for refractive index n and physical thickness d (shown in comparison to claim 1, differences marked in bold):

Layers	Claim 1		D3: Example 2, [0064]	
	n	d [nm]	n	d [nm]
low index	1.45-1.55	80-120	<b>1.38</b>	98 nm
high index	2.2-2.6	10-25	2.32	<b>116 nm</b>
medium index	1.6-1.9	90-120	1.62	<b>83 nm</b>
Substrate				

This has not been contested by the appellant.

#### 4.1.2 Differences

The examining division identified the following differences:

##### (a) Type of display

The display device of D3 is an OLED flat panel display, whereas according to claim 1, a conventional backlit color LCD device is employed.

(b) Layer structure

According to claim 1, the medium index layer has a thickness of 90-120 nm, the high index layer has a thickness of 10-25 nm and the low index layer a refractive index of 1.45-1.55, whereas D3 discloses a thickness of the medium index layer of 83 nm, a thickness of the high index layer of 116 nm and a refractive index of 1.38 for the low index layer, respectively (see bold values in table above).

This has not been contested by the appellant and also the board sees these differences.

4.1.3 Independent claim 1 - inventive step

(a) Type of display

The examining division argued in its obiter dictum that whether the display panel was an LCD panel, a plasma display panel, an OLED display panel or a CRT display panel could not render the subject-matter of claim 1 inventive, since the problems arising from the close proximity of glass substrates, namely the occurrence of Newton's Rings, occurred in all of these devices. To exemplify this common general knowledge, the examining division referred to document D2, paragraphs [0004] to [0006].

The appellant did not provide any arguments to the contrary. In addition, the description of the application (see paragraph [0046]) is considered to support the examining division's argument that the choice of a particular type of display does not contribute to the presence of an inventive step.

The board therefore agrees with the examining division's finding that the choice of a particular display type, in the present case an LC display panel, does not render the subject-matter of claim 1 inventive.

(b) Layer structure

The examining division argued that both D3 (see paragraph [0059]) and D4 (see paragraph [0001]) disclosed three-layer AR coatings of the so-called quarter-half-quarter (QHQ) design. Such AR coatings consisted of three layers with optical thicknesses of a quarter, half and a quarter of the optical wavelength and corresponding medium, high and low indices of refraction. As D4 (see paragraph [0007]) disclosed an optimized design of such three-layer coatings with a thin second layer, the skilled person would use this design in order to improve the AR coating used in D3. The examining division argued further that D4 (see paragraphs [0019] to [0022] and Table 1) disclosed the layer structure as claimed and that therefore this layer structure could not contribute to the presence of an inventive step either.

The examining division argued that due to the reduced thickness of the high index layer the AR coating could be produced faster by a sputtering process. Based on this technical effect, the problem to be solved by the skilled person was to improve the throughput of the production of the optical coating. Since D4 (see paragraph [0007]) explicitly taught to use a high-index layer which was thinner than in the conventional three-layer AR coatings (as e.g. known from D3), the skilled person received the explicit teaching to modify the three-layer coating of D3 according to the teaching of

D4 and would thus arrive at the claimed subject-matter without the involvement of an inventive step.

The examining division therefore found that the skilled person would arrive at the subject-matter of claim 1 without an inventive step being involved.

The appellant did not contest the disclosure of the claimed layer structure in D4 but argued that the examining division's problem-solution approach was flawed because the examining division had not chosen the correct objective technical problem.

Both, the examining division and the appellant agreed that the differing layer structure (difference (b)) resulted in a reduced thickness of the AR coating.

Based on this difference, the appellant identified the problem to be solved as to provide an improved transparency of the AR coating.

The appellant argued that neither D3 nor D4 contained a teaching of AR coatings with increased transparency and that therefore the skilled person had no incentive to modify the AR coating of D3 according to the teaching of D4. In conclusion, the subject-matter of claim 1 involved an inventive step.

The appellant's argument that the examining division did not formulate the correct objective technical problem and that therefore its inventive step assessment was wrong is not convincing. The board is of the opinion that the problem which was formulated by the examining division is realistic and that, in view of the combined teachings of documents D3 and D4, the solution to this problem does not involve an inventive

step. Although the problem formulated by the appellant is also valid and neither D3 nor D4 provide a solution to this problem, this does not render the examining division's reasoning flawed. This is in line with e.g. decision T 936/96 in which the board concerned held that an assessment of lack of inventive step which is based on a realistic problem was not altered by the fact that the claimed invention inherently also solved further technical problems such as in the present case the improvement of transparency (see Case Law of the Boards of Appeal of the EPO, 8th edition 2016 and also 9th edition 2019, I.D.10.8).

The board notes that D4 (see figure 1 and paragraphs [0019] to [0022]) discloses in general three-layer anti-reflection films with the following ranges for refractive indices and physical thicknesses (shown in comparison to claim 1):

Layers	Claim 1		D4 [0019]-[0022]	
	n	d [nm]	n	d [nm]
low index	1.45-1.55	80-120	1.46-1.52	70-95
high index	2.2-2.6	10-25	2.2-2.6	20-35
medium index	1.6-1.9	90-120	1.7-2.1	70-100
Substrate				

As all disclosed ranges have considerable overlap with the claimed ranges, D4 discloses the claimed three-layer AR coating.

In view of the above, the board finds that the skilled person would combine the teachings of documents D3 and D4 and thereby arrive at the subject-matter of claim 1 of the first auxiliary request which thus lacks an inventive step within the meaning of Article 56 EPC.

5. Second auxiliary request

In comparison to the main request, the claim set of the second auxiliary request does no longer comprise claim 5.

In addition, claim 1 has in essence been amended by adding the feature that *"the color filter substrate (4) and the cover glass substrate (32) are separated by a thin air gap of 400 nm to 4000 nm."*

5.1 Amendments - Article 123(2) EPC

The appellant argued that a clear and unambiguous disclosure for the added feature was disclosed in paragraph [0043] and figures 6a-6d of the application as originally filed.

The examining division argued that Figures 6a-6d and paragraph [0043] related to simulating plots of the spectral transmittance characteristics of two pieces of glass separated by thin air gaps of 400 nm, 800 nm, 2000 nm, and 4000 nm, respectively. Therefore, these plots could not provide the basis for a liquid crystal display device wherein the color filter substrate and the cover glass substrate were indeed separated by a 400 nm to 4000 nm thick air gap.

With respect to the range from 400-4000 nm, the appellant argued that the skilled person understood the four specific examples shown in figures 6a-6d as covering the entire thickness range from 400-4000 nm.

The board agrees with the appellant in that the skilled reader is taught by the simulations shown in figures 6a-6d that the suppression or reduction of spectral interference fringes will not only be obtained for the



four specific thicknesses shown but also within the whole air gap range between 400 nm and 4000 nm separating two plane-parallel pieces of glass.

The appellant argued further that although the disclosure of figures 6a-6d and paragraph [0043] related to graphs simulating plots of transmission versus wavelength, it was nevertheless clear for the skilled person that the thicknesses for the air gaps used in the simulating plots corresponded to the desired thicknesses for the air gaps in practice. Paragraph [0043] did not relate to hypothetical, non-working examples, but to the subject matter of the present invention, namely to glass substrates that were in such a close proximity to each other that Newton Rings might occur. Therefore, the skilled person would understand that the air gaps mentioned and used in the simulating plots were thicknesses that were typically suitable for the desired application, i.e. an LCD display device having a front pane with the claimed anti-reflective three-layer coating. The appellant also referred to decisions T 201/83 and T 876/06.

The board is not persuaded by this argument. Paragraph [0043] is silent about LC display panels and the simulation plots do not necessarily apply to the claimed liquid crystal display panel with a cover glass separated from the color filter substrate of the LC display panel by an air gap of the given thickness values. The skilled reader understands that the purpose of said simulation plots is merely to show that the design of the described AR coatings enables suppression of optical interference.

The board agrees with the examining division's argument that figures 6a-6d simulate the spectral transmission

characteristics of two perfectly parallel pieces of glass and that Newton's Ring interferences caused by local deformations with air pockets of non-uniform thicknesses were thus not involved in said simulations. In addition, a skilled reader understands that a generally uniform air gap (i.e. an air gap with only local deformations and air pockets as defined in claim 1) between a cover glass and the color filter substrate of a real LC display panel in the order of 400 nm (i.e. close to the lower limit of the claimed range) is technically not feasible, because it would appear impossible to maintain a generally uniform air gap in a thickness range overlapping the wavelength range of visible light across a real LC display panel having typical diameters of several centimeters.

Finally, in view of the above, the decisions cited by the appellant are not relevant to the present case, because they concern the use of a particular value disclosed in an example to limit a range.

The board therefore finds that independent claim 1 of the second auxiliary request extends beyond the disclosure of the application as originally filed, since a liquid crystal display device having a color filter substrate and a cover glass substrate mutually separated by a thin air gap of 400 nm to 4000 nm has originally not been disclosed. Independent claim 1 of the second auxiliary request does therefore not meet the requirements of Article 123(2) EPC.

6. Since none of the appellant's requests is allowable, the appeal is to be dismissed.

**Order**

**For these reasons it is decided that:**

The appeal is dismissed.

The Registrar:

The Chairman:



M. Kiehl

R. Bekkering

Decision electronically authenticated