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**Datasheet for the decision
of 4 November 2022**

Case Number: T 1297/20 - 3.4.02

Application Number: 16167210.0

Publication Number: 3089151

IPC: G09G3/3291

Language of the proceedings: EN

Title of invention:

FOUR-PRIMARY-COLOR ORGANIC LIGHT EMITTING DISPLAY AND DRIVING
METHOD THEREOF

Applicant:

LG Display Co., Ltd.

Headword:

Relevant legal provisions:

EPC Art. 56

Keyword:

Inventive step - (yes)

Decisions cited:

Catchword:



Beschwerdekammern
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Case Number: T 1297/20 - 3.4.02

D E C I S I O N
of Technical Board of Appeal 3.4.02
of 4 November 2022

Appellant: LG Display Co., Ltd.
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Representative: Viering, Jentschura & Partner mbB
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Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted on 17 February
2020 refusing European patent application No.
16167210.0 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman R. Bekkering
Members: C. Kallinger
G. Decker

Summary of Facts and Submissions

- I. The applicant (appellant) lodged an appeal against the decision of the examining division refusing European patent application No. 16 167 210.0 on the basis of Article 56 EPC.
- II. During the first-instance proceedings reference was made to the following documents:
- D1 US 2005/0140597 A1
 - D2 US 2004/0222999 A1
 - D3 US 2007/0242006 A1
 - D6 US 2006/0284882 A1
 - D9 J.P. Spindler, et al: "*4.3: Lifetime- and Power-Enhanced RGBW Displays Based on White OLEDs*", SID 05 DIGEST, 24 May 2005, pages 36-39, XP007012166
- III. In the decision under appeal the examining division held in respect of the requests then on file that the subject-matter of claim 1 of the main and the auxiliary request did not involve an inventive step over document D1 in combination with the common general knowledge of the person skilled in the art and with document D6 (Article 56 EPC).
- IV. With the statement setting out the grounds of appeal the appellant submitted arguments supporting inventive step and requested that the decision under appeal be set aside and that a patent be granted on the basis of claims 1 to 11 filed with the letter dated 16 October 2018, pages 1 to 25 of the description filed in electronic form on 11 January 2018 and the originally filed drawing sheets 1/12 to 12/12 (i.e. the

main request that formed the basis for the decision under appeal) or, as an auxiliary request, on the basis of the respective claims of the auxiliary request filed with a letter dated 16 October 2018.

V. Claim 1 of the main request reads as follows:

"A four-primary-color organic light emitting display comprising:

a display panel (10) where a plurality of first-color pixels, second-color pixels, third-color pixels, and fourth-color pixels are disposed; and
a data drive circuit (13) that has a single, digital-to-analog converter (134) to generate first- to fourth-color data voltages and to apply the first-color data voltage to the first-color pixels, the second-color data voltage to the second-color pixels, the third-color data voltage to the third-color pixels, and the fourth-color data voltage to the fourth-color pixels, wherein the maximum grayscale voltages for the first- to fourth color data voltages are adjusted to be different on a single gamma graph defined as the input grayscale versus output voltage;and
a data modulator (12) configured to receive the same number m of bits of first-, second-, third-, and fourth-color digital video data, which is to be displayed in each of the first- to fourth-color pixels, and that is configured to modulate the first- to fourth-color digital video data based on the maximum grayscale values of the first- to fourth-color digital video data individually determined based on luminous efficiency, wherein m is a natural number, wherein, with the first-color pixels having the lowest luminous efficiency and the fourth-color pixels having the highest luminous efficiency, the data modulator (12) is configured to set the maximum grayscale value

of the first color at a reference value of 2^m-1 , and is configured to bypass first-color digital video data as the modulated first-color video data, and is configured to set the maximum second- and third-color grayscale values to be smaller than the reference value and the maximum fourth-color grayscale value to be smaller than the maximum second- and third-color grayscale values, and is configured to then bypass second-color digital video data as second-color video data if the second-color digital video data does not exceed the second-color maximum grayscale value or to replace second-color digital video data by the second color maximum grayscale value if second-color digital video data exceeds the second-color maximum grayscale value, and to bypass third-color digital video data as third-color video data if the third-color digital video data does not exceed the third-color maximum grayscale value or to replace third-color digital video data by the third-color maximum grayscale value if third-color digital video data exceeds the third-color maximum grayscale value, and to bypass fourth-color digital video data as fourth-color video data if the fourth color digital video data does not exceed the fourth color maximum grayscale value or to replace fourth color digital video data by the fourth-color maximum grayscale value if fourth-color digital video data exceeds the fourth-color maximum grayscale value."

Reasons for the Decision

1. The appeal is admissible.
2. Main request - Inventive step
 - 2.1 Closest prior art

As held by the examining division in its decision, the closest prior art is constituted by the three primary-color organic light emitting display of document D1.

This was not contested by the appellant and the board agrees that document D1 represents the closest prior art.

- 2.2 Difference

The examining division held that the four-primary-color organic light emitting display defined in claim 1 of the main request differed from the device disclosed in document D1 in that:

- (1) in the display panel a plurality of fourth-color pixels are disposed,
- (2) the digital-to-analog converter is to generate fourth-color data voltages and to apply the fourth-color data voltage to the fourth-color pixels,
- (3) the maximum grayscale voltages for the fourth-color data voltages are adjusted to be different on the single gamma graph defined as the input grayscale versus output voltage,
- (4) the data modulator is configured to bypass first-color digital video data as the modulated first-color video data, and then to bypass second-color digital

video data as second-color video data if the second-color digital video data does not exceed the second-color maximum grayscale value or to replace second-color digital video data by the second-color maximum grayscale value if second-color digital video data exceeds the second-color maximum grayscale value, and to bypass third-color digital video data as third color video data if the third-color digital video data does not exceed the third-color maximum grayscale value or to replace third-color digital video data by the third-color maximum grayscale value if third color digital video data exceeds the third-color maximum grayscale value, and to bypass fourth-color digital video data as fourth-color video data if the fourth-color digital video data does not exceed the fourth-color maximum grayscale value or to replace fourth-color digital video data by the fourth-color maximum grayscale value if fourth-color digital video data exceeds the fourth-color maximum grayscale value.

This was not contested by the appellant and the board agrees that document D1 fails to disclose at least differences (1) to (4).

The board notes that the appellant generally referred to the features of difference (4), i.e. in particular the limitation of data values above a respective maximum grayscale value to the maximum value, as "clipping". This expression will also be used in the following.

2.3 Two separate problems

Based on the above listed differences, the examining division identified two separate problems to be solved. The features listed under (1) to (3) were directed at

increasing the luminous efficiency and thus reducing the power consumption of a three-primary-colour OLED. The features listed under (4) solved the problem of simplifying the structure of the data modulator.

2.4 Solution of the first problem

The examining division argued that the person skilled in the art would combine the teachings of D1 with their general knowledge, as exemplified by any of documents D2 or D3, to solve the first problem.

This was not contested by the appellant and the board agrees with the examining division's conclusion.

2.5 Solution of the second problem

2.5.1 The examining division argued that, in order to solve the second problem, the skilled person would have combined the teaching of D1 with the teaching of D6 (or its family members) and arrived at a display device with in particular the technical features of differentiating feature (4). The examining division argued with reference to the Guidelines for Examination (see Guidelines for Examination, November 2019, Part G, VII 10.1) that the implementation of the technical features (4) in the device of document D1 was the result of a foreseeable disadvantageous modification, which the skilled person could clearly predict and correctly assess and which was not accompanied by an unexpected technical advantage.

2.5.2 The appellant contested this conclusion and argued that the skilled person, starting from document D1 as closest prior art, would not consult document D6. In addition, even if the skilled person were to combine

the documents D1 and D6, the skilled person would not arrive in an obvious way at the subject-matter according to claim 1.

2.5.3 The board is not convinced by the examining division's line of argument but follows the appellant's reasoning for the following reasons.

D1, like the present application, deals with the problem of differing luminous efficiencies of primary colour pixels in multi-colour displays. According to D1, this problem is solved by converting the input N-bit digital video data into M-bit digital video data, wherein M is larger than N. This conversion is performed by mapping the value of the respective input N-bit digital video data for the R, G, and B pixels with a predetermined M-bit value through corresponding look-up tables (see paragraphs [0047] to [0051] and Table 1). As the conversion via a look-up table as disclosed in D1 avoids the need for "clipping" of the input data, D1 does not contain a hint towards replacing the look-up table approach by "clipping" the input data.

The board acknowledges that document D6 explicitly mentions "clipping" (see paragraphs [0032] and [0033] and Figure 2A and 2B). However, D6 does not disclose "clipping" as a solution for simplifying the data modulator but as an unwanted side effect that occurs when display code values are boosted in order to compensate for a reduction in light source illumination (see e.g. paragraph [0032], last sentence). D6 therefore presents "clipping" as an effect which occurs inadvertently and which should in fact be avoided, but not as a technical means to achieve a certain purpose, in particular not to simplify the structure of the data

modulator of D1, which already solves the problem of differing luminous efficiencies by employing a look-up table and an individual conversion of input values for each colour.

The board is therefore of the opinion that the skilled person does not receive a hint, neither from document D1 nor from document D6, that the data modulator of D1 could be simplified by realising a "clipping" of the digital video data as claimed.

2.5.4 Further documents

In the context of document D6 the examining division also referred to "more than ten different patent families from the same applicant published over a period of more than five years". With respect to the "clipping", the disclosure of these documents does not go beyond the disclosure of document D6. In addition, none of the other documents cited by the examining division discloses the differentiating features (4).

2.5.5 In conclusion, the subject-matter of claim 1 involves an inventive step over document D1 as closest prior art (Article 56 EPC).

2.5.6 Main request - Independent claim 9

Claim 9 is directed to the corresponding method for driving the four-primary-color organic light emitting display of claim 1. Therefore, the subject-matter of claim 9 of the main request involves an inventive step over document D1 as closest prior art on file (Article 56 EPC).

2.5.7 Main request - Dependent claims

The same conclusion applies to dependent claims 2 to 8 and 10 to 11 of the main request by virtue of the reference in these claims to claims 1 and 9, respectively.

2.6 The board concludes that the main request is allowable.

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 in the following version:
 - claims: Nos. 1 to 11 according to the main request filed with the letter dated 16 October 2018;
 - description: pages 1 to 25 filed in electronic form on 11 January 2018; and
 - drawings: sheets 1/12 to 12/12 as originally filed.

The Registrar:

The Chairman:



A. Voyé

R. Bekkering

Decision electronically authenticated