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Datasheet for the decision of 29 September 2017

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Application Number: 05028557.6

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Title of invention:
Light emitting device and method of driving the same

Applicant:
LG Display Co., Ltd.

Headword:

Relevant legal provisions:
EPC 1973 Art. 56

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Case Number: T 2026/12 - 3.4.03

D E C I S I O N
of Technical Board of Appeal 3.4.03
of 29 September 2017

Appellant: (Applicant)	LG Display Co., Ltd. 20, Yoido-dong Youngdungpo-gu Seoul 150-721 (KR)
Representative:	Viering, Jentschura & Partner mbB Patent- und Rechtsanwälte Am Brauhaus 8 01099 Dresden (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 26 March 2012 refusing European patent application No. 05028557.6 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	G. Eliasson
Members:	M. Stenger
	C. Schmidt

Summary of Facts and Submissions

I. The appeal concerns the decision of the Examining Division to refuse European application no. 05028557 for non-compliance with the requirements of Articles 83, 123(2) and 84 EPC.

II. It is referred to the following documents cited during the first instance examination proceedings:

D1: US2002/0044782

D2: EP1134719

D3: EP1260958

D4: EP0651367

D6: US2002/0044143

D7: EP1439516

D8: Anonymous: "Driving method for polyLED displays", Research Disclosure, Mason Publications, Hampshire, GB, vol. 453, no. 30, 1 January 2002 (2002-01-01), XP007129567, ISSN: 0374-4353

III. In a communication with the summons to oral proceedings, the board expressed its preliminary opinion that the application according to the main request and the first to third auxiliary request filed with the notice of appeal did not meet the requirements of Articles 123(2) and 56 EPC.

IV. With letter of 25 August 2017, the appellant filed a new main request and new first and second auxiliary requests. The previous main request and first to third auxiliary request were maintained as third to sixth auxiliary request, respectively. All these requests were discussed during oral proceedings before the Board and maintained by the appellant at the end of the oral proceedings.

V. The appellant thus requests that the decision under appeal be set aside and that a patent be granted on the basis of:

Main request
Claims 1 and 2 filed as main request with letter of 25 August 2017

First auxiliary request
Claims 1 and 2 filed as first auxiliary request with letter of 25 August 2017

Second auxiliary request
Claims 1 and 2 filed as second auxiliary request with letter of 25 August 2017

Third auxiliary request
Claims 1 and 2 filed with the grounds of appeal as main request

Fourth auxiliary request
Claims 1 and 2 filed with the grounds of appeal as first auxiliary request

Fifth auxiliary request
Claims 1 and 2 filed with the grounds of appeal as second auxiliary request

Sixth auxiliary request
Claims 1 and 2 filed with the grounds of appeal as third auxiliary request

VI. Independent claim 1 of the main request has the following wording (Board's labelling):

A driver for driving a plurality of pixels formed by data lines (DL1, DLm) and scan lines (SL1, SLn), comprising:

- a controller (140) configured to transmit a plurality of display data;
- a scan driving circuit (120) configured to provide the scan lines (SL1, SLn) with scan signals under control of the controller (140);
- a data driving circuit (130) configured to receive the plurality of display data from the controller (140) and to provide a data current corresponding to the display data to the data lines (DL1, DLm), wherein the data current is synchronized with the scan signals under control of the controller (140); and
- a power supply providing circuit (150) configured to supply a scan driving voltage to the scan driving circuit (120) and to control the magnitude and the duty ratio of the scan driving voltage,

characterized in that

(a) the controller (140) is configured to detect whether or not a first image is continuously displayed on a panel (102) during a predetermined period,

(b) the scan driving circuit (120) is configured to drive the scan lines (SL1, ..., SLn) by units of two or more scan lines under control of the controller (140) when the first image is continuously displayed on the panel (102) during the predetermined period, wherein the scan lines within each unit are driven simultaneously,

(c) the power supply providing circuit (150) is configured to change the duty ratio of the scan driving voltage, and

(d) an on-off time between the scan lines (SL1 to SLn) and the scan driving circuit (120) is changed depending on the duty ratio.

VII. Independent claim 1 of the first auxiliary request differs from claim 1 of the main request in that the pixels are **passive matrix electroluminescent** pixels.

VIII. Independent claim 1 of the second auxiliary request differs from claim 1 of the main request in that the controller is further configured **to operate a normal screen displaying mode or a screen protection mode in accordance with the detection result.**

IX. Independent claim 1 of the third auxiliary request has the following wording (Board's labelling):

A driver for driving a plurality of pixels formed by data lines (DL1....DLm) and scan lines (SL1, SLn), comprising:
- a controller (140) configured to transmit a plurality of display data;
- a scan driving circuit (120) configured to sequentially provide the scan lines (SL1, SLn) with scan signals under control of the controller (140);
- a data driving circuit (130) configured to receive the plurality of display data from the controller (140) and to provide a data current corresponding to the display data to the data lines (DL1....DLm), wherein the data current is synchronized with the scan signals under control of the controller (140); and
- a power supply providing circuit (150) configured to supply a scan driving voltage to the scan driving circuit (120) and to control the magnitude and the duty ratio of the scan driving voltage,
characterized in that
(a') the controller (140) is configured to detect whether or not a first image is continuously displayed on a panel (102) during a predetermined period, to provide the scan driving circuit (120) with a first

control signal when the first image is continuously displayed on the panel (102) during the predetermined period and to provide the scan driving circuit (120) with a second control signal when the first image is not continuously displayed on the panel (102) during the predetermined period,

(b') the scan driving circuit (120) is configured to sequentially drive the scan lines (SL1....SLn) by units of two or more consecutive scan lines when the first control signal is supplied to the scan driving circuit (120), wherein the scan lines within each unit are driven simultaneously, and to sequentially drive the scan lines (SL1.....SLn) individually when the second control signal is supplied to the scan driving circuit (120), and

(c') the power supply providing circuit (150) is configured to change the duty ratio of the scan driving voltage when the first image is continuously displayed on the panel (102) during the predetermined period.

X. Independent claim 1 of the fourth auxiliary request differs from claim 1 of the third auxiliary request in that the pixels are **passive matrix electroluminescent** pixels.

XI. Independent claim 1 of the fifth auxiliary request differs from claim 1 of the third auxiliary request in that

- the scan driving circuit is configured to sequentially drive the scan lines by units of **(exactly) two** consecutive scan lines when the first control signal is supplied to the scan driving circuit, and in that
- the power supply providing circuit is configured to **double** the duty ratio of the scan driving voltage

when the first image is continuously displayed on the panel during the predetermined period.

XII. Independent claim 1 of the sixth auxiliary differs from claim 1 of the third auxiliary request in that

(e') the controller is further configured **to operate a normal screen displaying mode or a screen protection mode in accordance with the detection result**, and in that

(f') the controller is further configured **to provide display data corresponding to a pre-stored protecting image to the data driving circuit (130) in the screen protection mode**.

XIII. The appellant's arguments, as far as they are relevant to the present decision, may be summarized as follows.

D4 disclosed more details of a matrix display driver than D8 and was thus more suitable to be taken as representing the closest prior art than D8.

D4 disclosed essentially a different way of reducing the power consumption, namely, to reduce the power voltage to the minimum voltage necessary for maintaining the image display. Thereby, the original resolution of the image was maintained, contrary to what was suggested in D8, and the skilled person would therefore not combine D4 and D8.

Only the features of the preamble of claim 1 could be regarded as features that were commonly used in standard passive matrix drivers as the ones referred to in D8. The combination of features forming the characterizing portion of claim 1 could not be seen as being generally present in such drivers.

Further, the two last paragraphs of D8 concerned two different, unrelated types of display modes, i.e., a text display mode (penultimate paragraph) and standby modes (last paragraph). The skilled person would thus not consider combining the features mentioned in these paragraphs.

Finally, document D6 concerned a different concept of the standby mode than D8, involving the shuffling/ shifting of image content as well as using a monochromatic image. Thus, the teaching of D6 which included a pre-stored protection image could not be applied to a driver in which the scan lines were sequentially driven by units of two or more consecutive scan lines in a standby mode.

Reasons for the Decision

1. Prior art document D8

D8 is a brief document relating to various aspects of driving electroluminescent (polyLED/OLED) matrix displays. D8 discloses *conventional matrix displays* (first paragraph) which may be *passive* or *active* (last paragraph) without going into detail concerning the hardware of the displays/drivers.
D8 further discloses a plurality of possibilities to reduce the power consumption of such conventional matrix displays/drivers.

2. Main request, Article 56 EPC 1973

2.1 The preamble

The preamble (lines 3 to 14) of claim 1 defines a driver in terms of structural features (*controller*,

scan driving circuit, *scan lines*, *data driving circuit*, *data lines*, *power supply providing circuit*) as well as in terms of the functions assigned to them (e.g.: *transmit/receive display data, provide scan signals, provide data current, supply scan driving voltage, control the magnitude and the duty ratio of the scan driving voltage*).
The Board finds that the features of the preamble of claim 1 represent standard features present in conventional passive matrix display drivers commonly known at the priority date of the present application.

The appellant did not contest this finding.

As mentioned above, D8 discloses such conventional or commonly known matrix displays. Hence, D8 implicitly discloses a matrix display having the features forming the preamble of claim 1 of the main request.

2.2 Characterizing part

2.2.1 Feature (a) corresponds to an obligatory detection step that has to be performed by a display (driver) before it can enter into a standby-mode. Feature (b) concerns one possibility of reducing power consumption during such a standby mode.

As mentioned above, D8 explicitly discloses reducing power consumption during standby modes by means of multiple-row addressing (see last paragraph, *Another possibility is to select more rows at a time, e.g., during standby modes.*).
Thus, D8 discloses matrix displays/drivers including features (a) and (b).

Hence the device of claim 1 of the main request differs from that of document D8 in features (c) and (d).

2.2.2 Feature (c), i.e., changing the duty ratio of the scan driving voltage as opposed to setting it to a fixed value, relates to a further possibility to reduce the power consumption.

Feature (d), however, does not amount to more than a more detailed description of what actually happens when the duty ratio of the scan voltage is changed. Thus, feature (d) does not effectively limit the claim any more than feature (c).

Thus, the technical effect of features (c) and (d) is to reduce the power consumption further.

The relationship between the duty ratio of the scan signals, the brightness and the power consumption of the display / drive current of the pixels in a matrix display was generally well known at the priority date of the present application as exemplified by D1 (see description of the related art in [9]), D2 ([11-13] and [52-53]), D3 ([24]) and D7 (see [47-48]). Moreover, D8 also refers to that relation by mentioning that increasing the time a line is addressed allows for lower peak brightness which reduces power dissipation (see penultimate paragraph).

Thus, when trying to achieve a further reduction of the power consumption of the matrix display of D8, the skilled person would consider changing the duty ratio of the scan driving voltage and thus the incorporation of features (c) and (d) in this matrix display. The skilled person would thereby arrive at the subject-matter of claim 1 of the main request.

Thus, the subject-matter of claim 1 of the main request can not be regarded as involving an inventive step.

2.3 Discussion of the arguments of the appellant

2.3.1 The appellant argued that D4 disclosed more details of a matrix display driver than D8 and was thus more suitable as representing the closest prior art than D8.

The Board is not convinced by this argument. Although D4 defines a matrix display driver in more detail than D8, which does not go into detail concerning the conventional matrix display/driver referred to, D8 aims at solving the same technical problem as the present application, i.e., to reduce the power consumption of a matrix display (driver), and even discloses the same or similar measures to do so.

D4, on the other hand, suggests other measures to reduce the power consumption (such as reducing the voltage applied to the panel while maintaining the original resolution) than the present application and is thus *less suitable* as a starting point than D8.

2.3.2 The appellant further argued that the features (a) to (d) forming the characterizing portion were not generally present in combination in conventional matrix display (drivers).

The Board concurs with the appellant. However, D8, as mentioned above, explicitly discloses features (a) and (b) to reduce power consumption and it is generally known that changing (actually, increasing) the duty ratio of the scan driving voltage reduces the energy consumption of a matrix display as well. Thereby, the

combination of features (a) to (d) is obvious to the skilled person in combination with a conventional matrix display (driver).

2.3.3 The appellant argued that the skilled person would not consider combining the features of the penultimate and the last paragraph of D8, since they related to different types of display modes.

The Board concurs with the appellant insofar as the penultimate paragraph of D8 mentions text display and the last paragraph of D8 relates to standby modes.

However, the penultimate paragraph of D8 mentions text display only as one example of situations in which rows only containing off-pixels are skipped for addressing. The Board is not aware of any reason why the skilled person would not transfer this teaching to other situations in which some rows contain only off-pixels.

Moreover, the penultimate paragraph of D8 is only one example for the generally well known relationship between the duty ratio of the scan signals, the brightness and the power consumption. The Board is not aware of any reason why the skilled person would not apply that generally known relation to a standby mode as disclosed in the last paragraph of D8.

3. First auxiliary request, Article 56 EPC 1973

Claim 1 of the first auxiliary request differs from claim 1 of the main request in that the pixels are defined to be *passive matrix electroluminescent* pixels.

D8 explicitly mentions these additional features in the second (*PolyLED/OLED displays*) and the last paragraph (*passive ... matrix-driving scheme*).

The subject-matter of claim 1 of the first auxiliary request therefore does not involve an inventive step for the same reasons as for the main request.

4. Second auxiliary request, Article 56 EPC 1973

Claim 1 of the second auxiliary request differs from claim 1 of the main request in that the controller is configured *to operate a normal screen displaying mode or a screen protection mode in accordance with the detection result*.

This additional feature does not go beyond the presence of a standard standby mode. D8 explicitly discloses standby modes, as noted above.

The subject-matter of claim 1 of the second auxiliary request thus does not involve an inventive step for the same reasons as for the main request.

5. Third auxiliary request, Article 56 EPC 1973

5.1 Claim 1 of the third auxiliary request differs from claim 1 of the main request substantially in that features (b') and (c') of the characterizing part of claim 1 of the third auxiliary request differ from the corresponding features (b) and (c) of claim 1 of the main request in that
i) in (b'), the scan lines are driven *sequentially* (individually as well as in units),

ii) in (b'), the units consist of two or more *consecutive* scan lines, and in that
iii) in (c'), the duty ratio of the scan driving voltage is changed *when the first image is continuously displayed* (i.e., during the standby mode).

5.2 Document D8 discloses that the scan lines are driven *sequentially*, with or without interlacing (see D8, first paragraph). Hence, feature i) is already known from D8.

5.3 Document D8 discloses feature (b), but not feature (c), as reasoned above. Thus, the device of claim 1 of the third auxiliary request differs from the matrix display described in D8 in the features ii) and (c').

5.4 The Board is not aware of any synergistic technical effect achieved by the combination of these two differentiating features. They can thus be considered separately when assessing inventive step.

5.5 To address *consecutive* scan lines / rows as one unit (corresponding to a progressive scan mode) has to be considered to be the most straightforward way for the skilled person to implement multiple row-addressing in a matrix-driving scheme as disclosed in D8.
Feature ii) can thus not provide a basis for acknowledging an inventive step.

5.6 The third distinction iii) does not make any inventive contribution, either. Feature (b) of claim 1 of the main request already reflects reducing the power consumption during standby modes. Hence, the skilled person would incorporate feature (c') in the device of D8 without the exercise of an inventive step for the same reasons as for the main request.

5.7 The subject-matter of claim 1 of the third auxiliary request does therefore not involve an inventive step.

6. Fourth auxiliary request, Article 56 EPC 1973

Claim 1 of the fourth auxiliary request differs from claim 1 of the third auxiliary request in that the pixels are defined to be *passive matrix electroluminescent* pixels.

As argued above with respect to the first auxiliary request, D8 explicitly mentions these additional features in the second (*PolyLED/OLED displays*) and the last paragraph (*passive ... matrix-driving scheme*).

The subject-matter of claim 1 of the fourth auxiliary request does not involve an inventive step, either.

7. Fifth auxiliary request, Article 56 1973

Claim 1 of the fifth auxiliary request differs from claim 1 of the third auxiliary request in that
- the units consist of *(exactly) two* scan lines, and
- the duty ratio is *doubled* when the first image is continuously displayed.

These particular parameter choices are no more than obvious design possibilities from which the skilled person would choose without the exercise of an inventive activity. In that respect, the Board notes that changing parameters by a factor of two is commonly done in computer technology in general, due to the underlying binary system.

Thus, the subject-matter of claim 1 of the fifth auxiliary request does not involve an inventive step, either.

8. Sixth auxiliary request, Article 56 EPC 1973

8.1 Claim 1 of the sixth auxiliary request differs from claim 1 of the fourth auxiliary request in that the controller is configured

(e') *to operate a normal screen displaying mode or a screen protection mode in accordance with the detection result*,

and

(f') *to provide display data corresponding to a pre-stored protecting image to the data driving circuit in the screen protection mode*.

8.2 Additional feature (e') is disclosed in D8 as well, see the reasons given with respect to the second auxiliary request.

8.3 Feature (f') concerns the place where the image data for the display comes from. This feature does not interact with the other differentiating features (see discussion of the fourth auxiliary request) such that a combined, synergistic, technical effect is achieved. When assessing inventive step, feature (f') can thus be considered without taking into account these other differentiating features.

D8 already discloses the use of (protecting) images in standby modes (last paragraph, *displayed icons*). Such images/icons have to be either calculated or loaded from a memory before they can be displayed.

The alternative involving calculation saves memory, but increases processor usage and thus power consumption. The alternative of loading an image from a memory reduces processor usage and thus power consumption but increases the memory required.

Since D8 aims at reducing the consumption of power, the skilled person would, starting from D8 and trying to find a way to provide an adapted icon according to the last paragraph, in a straightforward manner opt for the alternative of pre-storing such an icon/image.

Moreover, the aim of D6 is to get rid of a calculating circuit for a screen saver and to reduce electric power consumption (see [26]).
In that respect, D6 suggests to use a pre-stored image (*single display data/first display data*) in a very similar situation (see [27]). The image data is stored in advance in ROM and then transferred to another memory circuit 5 (see [74] and [75]).
The skilled person would thus also, starting from D8 and taking into account the teaching of D6, incorporate feature (f') into the system of D8 without the exercise of an inventive step.

8.4 Discussion of the arguments of the appellant
The appellant argued that D6 concerned a different concept of the standby mode than D8 that could not be applied to a driver where the scan lines were sequentially driven by units of two or more consecutive lines in a standby mode.

However, providing an image/icon (by calculation or from memory) concerns *where* the corresponding data comes from, while the manner in which the scan lines are addressed concerns the *content* of that data.

The board is not aware of any reason why the skilled person would not combine the origin of the image data as disclosed in D6 with the content of the data necessary for the multiple-row addressing of D8.

For these reasons, the subject-matter of claim 1 of the sixth auxiliary request does not involve an inventive step, either.

9. Since none of the appellant's requests meets the requirement of inventive step, the appeal must fail.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

S. Sánchez Chiquero G. Eliasson

Decision electronically authenticated