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**Datasheet for the decision
of 7 February 2020**

Case Number:	T 1735/16 - 3.4.03
Application Number:	09730656.7
Publication Number:	2277162
IPC:	G09G3/20, G09G5/10, G09G3/34
Language of the proceedings:	EN

Title of invention:
METHODS FOR DRIVING ELECTRO-OPTIC DISPLAYS

Applicant:
E Ink Corporation

Headword:

Relevant legal provisions:
EPC Art. 123(2), 84, 54(1), 56

Keyword:
Added subject matter - no
Clarity - after amendment (yes)
Novelty and inventive step - after amendment (yes)

Decisions cited:

Catchword:

Case Number: **T 1735/16 - 3.4.03**

D E C I S I O N
of Technical Board of Appeal 3.4.03
of 7 February 2020

Appellant: (Applicant)	E Ink Corporation 1000 Technology Park Drive Billerica, MA 01821-4165 (US)
Representative:	Hoffmann Eitle Patent- und Rechtsanwälte PartmbB Arabellastraße 30 81925 München (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 28 January 2016 refusing European patent application No. 09730656.7 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	G. Eliasson
Members:	M. Papastefanou
	T. Bokor

Summary of Facts and Submissions

I.   The appeal is against the decision of the examining
        division refusing the European patent application
        No. 09 730 656.7 (published as WO 2009/126957 A1) on
        the grounds that claim 1 of the sole request then on
        file comprised added subject matter (Article 123(2)
        EPC), was not clear (Article 84 EPC), and was not new
        (Article 54(1) EPC).

II.   At the end of the oral proceedings before the board,
        the appellant's (applicant's) requests were that the
        decision under appeal be set aside and that a patent be
        granted on the basis of the following documents:
        -   Description: pages 1-7, 9-11, 15, 16 as published,
            pages 8, 12, 13, 17 filed during the oral
            proceedings before the board (page 14 as published
            to be deleted)
        -   Claims 1-10 as filed during the oral proceedings
            before the board
        -   Drawings: Sheets 1/2, 2/2 as published,
        as Main Request, or, alternatively, on the basis of one
        of the 1st to 4th Auxiliary Requests filed with letter
        dated 7 January 2020.

        In the course of the appeal, the appellant withdrew its
        initial request for reimbursement of the appeal fee
        because of an alleged procedural violation committed by
        the examining division (Rule 103(1)(a) EPC).

III.   Reference is made to the following document, cited in
        the decision under appeal:

        D3: US 2005/0001812 A1.

        D3 is the publication of the US patent application

corresponding to the US patent US 7,119,772 B2, which
is referred to in the description of the application
(see [Para 1] and [Para 20] of the published
application, for example).

IV.   Claim 1 of the Main request has the following wording:

*A method of driving a bistable electro-optic display
having a plurality of pixels and a storage means
arranged to store data representing a plurality of
drive schemes at least equal in number to the different
drive schemes to be stored for the various pixels of
the display, and a time value associated with each of
the stored drive schemes, the method comprising:
storing, for each pixel of the display, data
representing an initial state of the pixel, data
representing a desired final state of the pixel, and a
drive scheme index number representing the drive scheme
to be applied to the pixel; and
generating, for each pixel of the display, output
signals representing the impulse to be applied to each
pixel to switch the pixel from the initial state to the
desired final state, the output signals being
generated, for each pixel, dependent upon the initial
and desired final states of the pixel, the drive scheme
index number, the time value associated with the drive
scheme denoted by the drive scheme index number, and
the stored data representing the drive scheme denoted
by the drive scheme index number,
the method being characterized in that
at least two of the drive schemes begin at different
times and run independently of one another, and
the time value stored for each drive scheme represents
the period since the commencement of the current update
effected with the drive scheme.*

V.   The wording of the claims of the auxiliary requests is
         not relevant for the decision.

VI.   The appellant argued mainly that the subject-matter of
         claim 1 was clear (Article 84 EPC), new (Article 54(1)
         EPC) and involved an inventive step (Article 56 EPC).
         In particular, D3 neither disclosed nor suggested a
         method of driving a bistable eletro-optic display
         whereby at least two drive schemes began at different
         times and ran independently of one another.

Reasons for the Decision

1.   The claimed invention

         The claimed invention relates to a method for driving
         electro-optic displays which comprise a plurality of
         pixels, and such displays.

         According to the claimed method, different drive
         schemes (series of waveforms consisting of impulses,
         which are applied to the pixel electrode) are used to
         drive different (groups of) pixels of the display. When
         an update of the displayed image is carried out, a
         final state (grey value) for each pixel is determined,
         and each pixel is driven with a drive scheme to change
         its colour (grey value) from an initial state (the
         actual grey value) to a final state (updated grey
         value). Pixels which are driven with a faster drive
         scheme will reach their final state before the pixels
         which are driven with a slower drive scheme. Normally,
         the update of the former pixels has to be delayed in
         order to allow the latter pixels to reach their final
         state before a new update can start. This results in
         some pixels being idle for a certain period of time

("unresponsive period" in the application), during
which other pixels complete their transition to their
corresponding final state (updated grey value).

The claimed method eliminates this unresponsive period
by enabling drive schemes used for different (groups
of) pixels to start at different times and run
independently from one another. In this way, when
pixels driven with a faster drive scheme reach their
final state they do not need to "wait" until the
remaining pixels of the display (driven with slower
drive scheme(s)) reach their final state before they
can start a new update but can start a new update
towards a new final state right away (see [Para 21] to
[Para 23] of the application as published).

2.   Main Request

2.1   Amendments, added subject matter (Article 123(2) EPC)

2.1.1   Compared to the Main Request underlying the decision
        under appeal, the claims of the current Main Request
        have been amended as follows:
        -   The feature *"the time value stored for each drive
            scheme represents the period since the commencement
            of the current update effected with the drive
            scheme"* has been added in the end of claim 1. This
            feature finds basis in [Para 30] of the application
            as originally filed (published).
        -   Dependent claims 4, 6, 7, 8, 9 and 10 have been
            amended to define a bistable electro-optic display,
            in line with independent claim 2.
        -   Dependent claim 5 has been amended to refer to
            claim 2 instead of claim 1.

2.1.2   The description has been adapted to the claims of the
         Main Request.

2.1.3   In the decision under appeal, the examining division
         held that the feature of claim 1
         *"the method being characterised in that at least two of
         the drive schemes begin at different times and run
         independently of one another"*
         had no basis in the originally filed application.

         According to the examining division, there were certain
         limitations as to the time a drive scheme could begin,
         which related to the manner in which the electro-optic
         display was driven (see also [Para 38] of the published
         application). The feature in claim 1 implied that the
         drive scheme(s) could begin at any arbitrary time and
         this was beyond the originally filed content of the
         application (see point 1 of the reasons of the impugned
         decision).

         The board does not share this opinion of the examining
         division. The identified feature of claim 1 defines
         only that the two drive schemes begin at different
         times, without any indication as to the actual time the
         drive schemes are supposed to begin. There may be
         limitations to take into account as to when a drive
         scheme can begin, but this is irrelevant for the
         question of the disclosure of the feature that the
         drive schemes begin at different times and run
         independently from one another. The claimed feature is
         described in [Para 37] of the application, which thus
         provides the necessary basis for the amendment.

2.1.4   The board is therefore satisfied that the application
         as amended meets the requirements of Article 123(2)

EPC.

2.2   Claims, Clarity (Article 84 EPC)

2.2.1   The amendments carried out in the claims overcome the
          objections for lack of clarity raised in the board's
          preliminary opinion regarding inconsistencies in the
          terminology used and the presence of multiple
          independent claims (see points 3.1.8 and 3.1.9 of the
          board's communication of 11 September 2019).

2.2.2   The examining division was of the opinion that the term
          "drive scheme" in claim 1 was too broad, rendering the
          claim unclear (see point 2.1 of the decision under
          appeal).

          The board notes at first that a broad term in a claim
          is not necessarily unclear. Secondly, in the case at
          hand, the board is of the opinion that a skilled person
          would understand the meaning of "drive scheme" in the
          context of the application. In addition, the term is
          explained in the description (see [Para 9]). The
          explanations provided in this paragraph make it clear
          what a waveform is and what is meant by a drive scheme.
          In general it is acceptable to provide explanations in
          the description of the meaning of terms in the claims
          (see also *Case Law of the Boards of Appeal of the EPO*,
          9th Edition, July 2019, Chapter II.A.6.3.3).

2.2.3   In the decision under appeal, the examining division
          held that the feature
          *"the method being characterised in that at least two of
          the drive schemes begin at different times and run
          independently of one another"*
          attempted to define the subject-matter for which
          protection was sought in terms of the result to be

achieved instead of defining clear method steps to be
carried out to achieve the claimed result (see point
2.2 of the impugned decision).

The board agrees with the examining division on this
point (see also points 3.1.3 and 3.1.4 of the board's
communication of 11 September 2019). However, with the
addition of the last feature in claim 1 of the current
Main Request (see point IV above), this objection has
been overcome.

As the appellant also explained (see statement of
grounds of appeal, paragraph bridging pages 4 and 5),
the claimed method generated the output signal
depending on the time value associated with the drive
scheme denoted by the drive scheme index number. By
using this time value associated with each of the
stored drive schemes, the claimed method could generate
the output signal individually for each pixel. The time
value represented the time elapsed since the
commencements of the use of the drive scheme and with
it it was possible to know exactly when a drive scheme
was completed, since the time value was reset to zero.
The system would know that the drive scheme ended and a
new update could start (see also [Para 43] to [Para
46]).

In the board's view, with the insertion of the
definition of the time value in the claim, the skilled
person has all the necessary information to be able to
carry out the necessary steps and achieve the claimed
result (the two schemes beginning at different times
and running independently from one another).

2.2.4   The board is, thus, satisfied that the claims of the
         Main Request fulfil the requirements of Article 84 EPC.

2.3   Novelty and Inventive Step (Articles 52(1), 54(1) and
         56 EPC)

2.3.1   Disclosure of D3

         D3 describes a method and an apparatus for driving
         bistable electronic displays in a manner which permits
         pixels in a part (region) of the display to operate at
         a different bit depth (i.e. different number of gray
         levels) from the pixels of the rest of the display. In
         a similar way as in the present application, D3
         recognises the need to update a particular region of a
         display faster than the rest of the display. Different
         drive schemes (in the terminology of the claims) are
         used for different regions of the screen, depending on
         the bit depth (number of gray levels) the pixels in
         each region should be able to display (see paragraph
         [0035] of D3). Depending on the image to be displayed,
         the display is divided in regions and the bit depth of
         each region is determined. For example, the pixels in a
         region that is to display a black and white image (e.g.
         a dialog box or a request for user input) need to be
         able to display only two colours (black/white) and
         therefore they have a bit depth of one (1). The pixels
         in the region of the display that are to display a
         colour image need to be able to display more colours
         (grey levels) and hence have a higher bit depth. In
         order to keep track of the bit depths of the pixels in
         the different regions, the controller of the display
         keeps an array of storage elements, one element for
         each pixel in the display. Each element stores a value
         representing the bit depth of each pixel. When a new
         image is sent to the controller, and the pixels of the

display need to be updated (changed), the pixels are updated with drive schemes (waveforms) corresponding to their respective bit depth. There are thus several different drive schemes running simultaneously, one for each region of the display. As an example D3 describes a display with two regions: a main region at full bit depth and a dialog box region in one-bit mode (see paragraphs [0469] to [0488]).

A contested point during the proceedings before the examining division was whether D3 disclosed the feature *at least two of the drive schemes begin at different times and run independently of one another.* The appellant did not contest, however, that the remaining features of claim 1 of the Main Request in the version underlying the impugned decision were disclosed in D3 (see statement of grounds of appeal, pages 5 to 7, points 3 and 4).

2.3.2   As a first point, the board notes that D3 does not disclose any time value according to the definition of claim 1 of the current Main Request. At least for this reason, the subject-matter of claim 1 is new (Article 54(1) EPC).

2.3.3   Secondly, regarding the contested feature, the board notes that D3 discloses that when the two drive schemes (waveforms) are applied simultaneously, *the shorter one-bit waveforms must be zero-padded appropriately to match the length of the grayscale update* (see paragraph [0480]). The pixels driven with the faster drive scheme (one bit depth) will reach their final state before the pixels driven with the slower drive scheme (grayscale). In the method of D3, however, the two drive schemes are synchronised and the corresponding waveforms must have the same length. This is achieved by adding zeros (0)

("zero-padding") to the shorter waveform of the faster
drive scheme, introducing thus the necessary delay
allowing the slower drive scheme to be completed before
a new update can start.

The examining division was of the opinion that the
important issue in D3 was that the two waveforms (of
the drive schemes) had the same length, so that the
zeros could as well be added in the beginning of the
waveform, before the actual driving of the pixels
starts. In this way, the two drive schemes would end at
the same time but they would start at different times
(see paragraph bridging pages 6 and 7 of the impugned
decision, as well as point 4.1 of the reasons).

The board does not agree. It is true that the passage
of paragraph [0480] cited above does not specify how
the "zero-padding" of the waveforms is done and in
particular it does not indicate whether the zeros are
added in the beginning or at the end of the waveform.
As explained in D3, the purpose of using faster drive
schemes (update methods in the terminology of D3) for
some regions of the display is to enable faster updates
("swift transitions") so that certain information is
presented to the user with minimal delay (see paragraph
[0035]). The aim of the described display driving
method is, thus, to achieve that certain pixels of the
display reach their final state faster than others (see
also paragraphs [0470] and [0471]). In this context,
the skilled person would not contemplate to implement
the zero-padding in the beginning of the waveform
because it would delay the update of the pixels which
are driven with the faster drive scheme (shorter
waveform) and would be at odds with the purpose of the
described method. In the board's view the skilled
person would directly and unambiguously derive that, in

the context of D3, the described zero-padding is done
by adding zeros at the end of the waveform of the
faster drive scheme. The pixels that arrive at their
final state first (due to the shorter waveform) will
have to "wait" for the remaining pixels of the display
to reach their final state before a new update of the
display starts.

This implies that the two drive schemes start at the
same time and finish at different times. The zero-
padding of the waveform implies also that the two drive
schemes are synchronised, i.e. they do not run
independently from one another. The contested feature
is thus not disclosed in D3.

2.4   Difference and technical problem

2.4.1   Hence, claim 1 of the Main Request differs from D3 by
         its characterising features:
         -    at least two of the drive schemes begin at
              different times and run independently from one
              another; and
         -    the time value stored for each drive scheme
              represents the period since the commencement of the
              current update effected with the drive scheme.

2.4.2   The technical effect of these features is that the
         pixels that are updated with the faster drive scheme
         and reach their final state first do not need to wait
         until the slower update of the other pixels is
         finished. The pixels reaching first their final state
         can start a new update towards a newly defined final
         state. This reduces the time pixels have to remain idle
         and "wait" for the whole of the display to be updated
         to the final state of all the pixels (the "unresponsive
         period" in the terminology of the application, see

[Para 23] of the application as published).

2.4.3   Starting from D3 the problem the skilled person is
         faced with is how to reduce the unresponsive period of
         some pixels in the display and accelerate the overall
         operation of the display.

2.5   Solution and obviousness

2.5.1   The claimed method solves the defined technical problem
         by driving the pixels with at least two different drive
         schemes that start at different times and run
         independently from one another. Using the time value
         associated with the drive scheme of every pixel, it is
         possible to know exactly when a drive scheme is
         completed and the corresponding pixel has reached its
         final state. Subsequently, a new final state for that
         pixel can be defined so that the new update can start
         without waiting for the pixels driven with the slower
         drive scheme(s) to reach their corresponding final
         states (see [Para 23] to [Para 28] and [Para 42] to
         [Para 46] of the published application).

2.5.2   As mentioned before, in D3 it is explicitly mentioned
         that the one-bit waveform (faster drive scheme) is
         zero-padded to match the length of the greyscale
         waveform (slower update). The two drive schemes are
         synchronised and start at the same time.

2.5.3   The skilled person would not find any information or
         suggestion in D3 that would motivate them to modify the
         described display driving method and arrive at the
         claimed method without exercising any inventive skill.
         In addition, even if the skilled person attempted to
         carry out such a modification to the display driving
         method of D3, there is no disclosure or suggestion in

D3 of a time value associated with each drive scheme
according to claim 1 of the Main Request that would
help them to arrive at the claimed subject-matter in
obvious manner.

2.5.4   The conclusion of the board is therefore that the
        subject-matter of claim 1 of the Main Request involves
        an inventive step with respect to D3. The same applies
        for independent claim 2, which defines the
        corresponding bistable electro-optic display. Claims 3
        to 10, which depend directly or indirectly on claim 2,
        are considered new and inventive, as well.

3.   The board is, thus, satisfied that the patent
        application according to the Main Request and the
        invention to which it relates meet the requirements of
        the EPC and a patent is to be granted according to
        Article 97(1) EPC.

Order

For these reasons it is decided that:

1.   The decision under appeal is set aside.

2.   The case is remitted to the examining division with the
        order to grant a patent in the following version:

        -   Description: pages 1-7, 9-11, 15, 16 as published,
            pages 8, 12, 13, 17 filed during the oral
            proceedings before the board (page 14 as published
            to be deleted)
        -   Claims 1-10 as filed during the oral proceedings
            before the board
        -   Drawings: Sheets 1/2, 2/2 as published.

The Registrar: The Chairman:

S. Sánchez Chiquero   G. Eliasson

Decision electronically authenticated