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Datasheet for the decision of 17 April 2018

Case Number: T 0590/13 - 3.4.03

Application Number: 05725822.0

Publication Number: 1743316

IPC: G09G3/34

Language of the proceedings: EN

Title of invention:
METHODS FOR DRIVING BISTABLE ELECTRO-OPTIC DISPLAYS

Applicant:
E-Ink Corporation

Headword:

Relevant legal provisions:
EPC 1973 Art. 84

Keyword:

Decisions cited:

Catchword:

Europäisches Patentamt
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Case Number: T 0590/13 - 3.4.03

D E C I S I O N
of Technical Board of Appeal 3.4.03
of 17 April 2018

Appellant: (Applicant)	E-Ink Corporation 733 Concord Avenue Cambridge, MA 02138-1002 (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 4 October 2012 refusing European patent application No. 05725822.0 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	G. Eliasson
Members:	M. Stenger
	G. Decker

Summary of Facts and Submissions

I. The appeal concerns the decision of the Examining Division to refuse European patent application no. 05725822 for lack of compliance with the requirements of Article 84 EPC.

II. In a communication in preparation of oral proceedings, the Board expressed its preliminary opinion that the independent claims did not meet the requirements of Articles 84 and 83 EPC 1973.

III. At the end of the oral proceedings before the Board, the appellant requested to set aside the contested decision and to grant a patent on the basis of claims 1 to 12 of the main and only request filed with letter dated 4 April 2018.

IV. The wording of claim 1 is as follows:

A method of driving a multi-bistable electro-optic display having at least one pixel which comprises applying to the pixel a waveform V(t) for achieving transitions between optical states, characterized in that for each transition, a calculated value for an integral J_d has an absolute value less than 1 volt sec, wherein J_d is defined as:

$$J_d = \int_0^{T+\Delta} V(t) M(T+\Delta-t)\,dt$$

where

T is the length of the waveform,

the integral is over the duration of the waveform and a short time Δ after an update, Δ being a positive period less than the period T,
V(t) is the waveform voltage in volts as a function of time t,
M(t) is a memory function that characterizes the reduction in efficacy of a remnant voltage resulting from previous waveforms to induce dwell-time-dependence arising from a short pulse at time zero, and

the memory function is given by

$$M(t) = \exp\left(-\frac{t}{\tau}\right)$$

where τ is a predetermined decay time in the range from about 0.2 to about 2 seconds.

V. The wording of independent claim 9 is as follows:

A method of driving a multi—bistable electro-optic display having at least one pixel capable of displaying at least three different optical states, which method comprises applying to the pixel a set of waveforms V(t) sufficient to cause the pixel to undergo all possible transitions among its various optical states, the method being characterized in that the waveforms of the set are all such that a calculated value for an integral J_d is less than 40 per cent of the transition impulse, which is an impulse applied by a single pulse of constant amplitude having a magnitude equal to the highest voltage applied by any of the waveforms of the set and just sufficient to drive a pixel from one of its extreme optical state to the other extreme optical state, wherein J_d is defined as:

$$J_d = \int_0^{T+\Delta} V(t)\,M(T+\Delta-t)\,dt$$

(where T is the length of the waveform V(t), the integral is over the duration of the waveform and a short time Δ after an update, Δ being a positive period less than the period T, or 0, V(t) is the waveform voltage in volts as a function of time t, M(t) is a memory function that characterizes the reduction in efficacy of a remnant voltage to induce dwell-time-dependence arising from a short pulse at time zero, and T, t and Δ are measured in seconds) is less than 40 per cent of the transition impulse,

the memory function is given by

$$M(t) = \exp\left(-\frac{t}{\tau}\right)$$

where τ is a predetermined decay time in the range from about 0.2 to about 2 seconds.

VI. The arguments of the appellant may be summarised as follows.

The memory function was defined in a concrete manner by means of an exponential function with a decay time. This decay time was limited to a range from about 0.2 to about 2 seconds and was an experimental / measured value reflecting the properties of the electro-optic display, essentially the ability of the electro-optic medium to discharge the separation of charges within the medium resulting from the application of an electric field. Thus, the decay time could not be chosen in an arbitrary manner.
The memory function was thus clearly defined and the independent claims were therefore clear.

Reasons for the Decision

1. Article 84 EPC 1973, claims 1 and 9

The application is generally directed at reducing dwell time dependence in bi-stable electro-optic displays by applying driving waveforms V(t) with low remnant voltages. The waveforms applied are defined in claims 1 and 9 as having a value J_d lower than a predefined threshold (claim 1: 1 volt sec; claim 9: 40% of the transition impulse).

The value J_d of a waveform V(t) is calculated by the convolution of the driving waveform V(t) with a memory function M(t) defined in claims 1 and 9 according to the two formulae contained in each of these claims.

In order to be able to decide whether the J_d value of a given waveform is below the threshold or not, it is a prerequisite that this value can be calculated in an unambiguous manner.

However, the formulae by means of which J_d is defined comprise various parameters.

For instance, a range is given for the decay time corresponding to a factor of 10 (0.2s to 2s). Further, the integration limits are only defined to within a factor of 2 (0 to $T + \Delta$ with $0 < \Delta < T$). Moreover, the values of the waveform voltage V(t) for $T < t < T + \Delta$ are not defined at all.

Thereby, the value J_d calculated for a single given waveform V(t) will vary depending on the particular choice of these parameters.

That is, even if such a single given waveform V(t) is itself well-defined for $0 < t < T$ (i.e., over its duration), different values J_d will be obtained depending on how the decay time τ and the short time Δ are chosen and how V(t) is defined for $t > T$.

Therefore, the skilled person could not reliably establish whether or not such a single given waveform falls under the scope of claims 1 and 9 or not.

Thereby, the claims 1 and 9 are not clear according to Article 84 EPC 1973.

2. Arguments of the appellant

2.1 The appellant argued that the exponential function required by the second formula defined the memory function in a concrete manner.

The Board agrees that the memory function is defined by the exponential function in a more precise way than without any such function (as was the case in the previous set of claims).
However, the large range of values permitted for the decay time τ over a factor of 10 (0.2s to 2s) in combination with an exponential function still allows for a large range of memory functions M(t), and the additional parameters intervening when calculating J_d further enhance the ambiguity of the overall result of the calculations performed.

Therefore, the Board is not persuaded by this argument.

2.2 The appellant further argued that the decay time τ was not an arbitrarily chosen parameter, but representative

of the medium and could thus not be chosen in an arbitrary manner.

The Board accepts that the verbal definition of M(t) used in claims 1 and 9 that *M(t) is a memory function that characterizes the reduction in efficacy of a remnant voltage (resulting from previous waveforms) to induce dwell-time dependence arising from a short pulse at time zero* somehow links the memory function M(t) to the medium properties.
However, this definition is in itself vague and unclear (as argued by the Examining Division, see sections 5.1 and 5.2 of the contested decision) and does not give the skilled person any suggestion of how to determine the correct decay time for a particular medium. In that respect, the Board notes that quite different electrophoretic media can be used according to the application (e.g., charged particles moving through a suspending fluid on the one hand and rotating bichromal members on the other hand, see page 11, lines 7 to 16).

Thus, this argument does not convince the Board, either.

3. Article 83 EPC 1973

The Board further notes that the objection with respect to Article 83 EPC 1973 made in its communication in preparation of the oral proceedings still applies.

4. The only request on file does not comply with the requirements of the EPC. Thus, 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