THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 25

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte ALAN G. KNAPP

Appeal No. 96-0236
Application 08/187,364[1]

ON BRIEF

Before MARTIN, TORCZON, and CARMICHAEL, Administrative Patent Judges.

MARTIN, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 from the examiner's rejection of claim 1-5, 9-14, and 16 under 35 U.S.C. § 103. The remaining pending claims, i.e., claims 5-8

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[1] Application for patent filed January 26, 1994.

and 15, stand objected to for depending on rejected claims. We reverse.

The invention relates to drive voltage control for a matrix display device in which each display element has an electro-optical elements connected in series with a two-terminal non-linear switching device, which may be of the MIM[2] type (Spec. at 5, lines 14-15). The problem to be solved is that the threshold voltage characteristic of the non-linear devices may change over time, thereby altering the drive currents in the electro-optical elements and thus the brightness of thereof (Spec. at 2, lines 10-15). Appellant's invention solves this problem by measuring the drive current through at least one non-linear device and adjusting the drive voltages to compensate for variations due to aging.

There are only two independent claims on appeal, apparatus claim 1 and method claim 13, which read as follows:

1. A matrix display device comprising sets of row and column address conductors, a row and column array of picture elements operable to produce a display, each of which comprises an electro-optic display element connected in series with a two terminal non- linear device exhibiting a

[2] The Kuijk reference explains that MIM stands for metal-insulator-metal (p. 2, line 33).

threshold characteristic between a row conductor and a column conductor, and picture element drive means connected to the sets of address conductors for applying drive voltages to the picture elements comprising a scanning signal drive circuit for applying selection signals to the conductors of one set and a data signal drive circuit for applying data signals to the conductors of the other set, characterised in that the drive means includes a sensing circuit which is arranged to provide a control signal indicative of electrical current flowing in at least one address conductor of the one set in response to the application of selection signals to that address conductor, and a voltage control circuit to which the control signal is supplied for determining the drive voltages applied by the drive means to the picture elements in accordance with the value of the control signal.

13. A method of operating a matrix display device comprising sets of row and column address conductors, a row and column array of picture elements operable to produce a display, each of which comprises an electro-optic display element connected in series with a two terminal non-linear device exhibiting a threshold characteristic between a row conductor and a column conductor, and picture element drive means connected to the sets of address conductors for applying drive voltages to the picture elements comprising a scanning signal drive circuit for applying selection signals to the conductors of one set and a data signal drive circuit for applying data signals to the conductors of the other set, characterised by the steps of deriving a control signal indicative of the electrial current flowing in at least one address conductor of the one set in response to the application of selection signals to that address conductor and controlling the level of the drive voltages applied to the picture elements in accordance with the value of the control signal.

We note that although method claimed 13 appears to be in proper step-plus-function format and thus is entitled to be construed in accordance with 35 U.S.C. § 112 ¶ 6, O.I. Corp. v. Tekmar Co., 115 F.3d 1576, 1582-83, 42 USPQ2d 1777, 1781-82 (Fed. Cir. 1997), Appellant does not rely on § 112 ¶ 6 to distinguish this claim from the prior art.

The references relied on by the examiner in the Answer are:

Hoshino	3-146,992 (Japan)	June 21, 1991
Kuijk	0,362,939 (EPO)	April 11, 1990
Fuse	3-200,214 (Japan)	Sept. 2, 1991

When the final Office action and the Answer were prepared, the only portions of Hoshino and Fuse that had English-language translations were the abstracts. The PTO-892 mailed with the Supplemental Examiner's Answer additionally lists an English-language translation of the entire Hoshino reference and Fuse U.S. patent 5,229,761, which the examiner characterizes as corresponding to the Fuse Japanese reference (Supplemental Examiner's Answer at 8). In response to

Appellant's complaint (Supplemental Reply Brief at 1) that a copy of the Hoshino translation did not accompany the Supplemental Examiner's Answer, a copy was sent to Appellant (paper No. 20), who did not file a response. With respect to Hoshino, we will rely on the English-language abstract and full translation. However, we will not rely on the Fuse U.S. patent, because it is not cited in the statement of the rejection, as is necessary for it to be considered in connection with the rejection. In re Hoch, 428 F.2d 1341, 1342 n.3, 166 USPQ 406, 407 n.3 (CCPA 1970). Furthermore, it does not directly correspond to the Fuse Japanese patent and thus cannot be considered to be an English-language translation thereof (e.g., Fuse U.S. has twelve figures; Fuse Japan has only seven). Fuse U.S. apparently combines the disclosures of the Fuse Japanese reference and another Fuse Japanese application, both of which are identified in Fuse U.S. as priority applications.

Claims 1, 2, 4, 9-14, and 16 stand rejected under 35 U.S.C. § 103 as unpatentable over Hoshino in view of Kuijk. Claims 3 and 5 stand rejected under § 103 as unpatentable over Hoshino in view of Kuijk and Fuse.

Hoshino discloses voltage control circuitry for controlling contrast in a liquid crystal display device as a function of the drive frequency of the individual elements of the display device (Abstract; Transl. p. 3, last sentence). Referring to Figure 3, individual picture elements are selected for activation by a scanning side drive circuit 7 and a signal side drive circuit 6 (Transl. at 5, lines 23-25). Figures 4(b) and 4(c) show examples of scanning side drive voltages and signal side voltages, respectively, which have voltage levels V_1-V_6. Figure 4(a) shows the difference between these two voltages, which is the differential drive signal across the display elements. In this differential drive signal, voltage levels V_s and $-V_s$ are selection voltages, V_n and $-V_n$ are non-selection voltages, and V_b and $-V_b$ are bias voltages (Transl. p. 5, lines 20-21). Referring to Figure 6: waveform FLM is a frame signal; waveform CL is a dot clock signal; waveform V_A is a differential drive signal in which the drive frequency is the lowest; and waveform V_B is a differential drive signal in which the drive frequency is the highest (Transl. p. 7, line 23 to p. 8, line 3). Figure 7 shows the differential voltage needed to achieve maximum contrast as a function of drive frequency (Transl p. 8, lines 4-19).

Referring to Figure 1 and to pages 16-17 of the translation, a drive frequency detection circuit 9A detects the frequency of the liquid crystal drive voltage from data signals DA and control signals CS and generates a voltage control signal CV, which is used to control the voltages V_1-V_6. In Figure 10, the data signal D takes the form of a two-level signal, which we presume represents selection and non-selection states (Transl. p. 12, lines 13-14). The drive frequency is obtained by measuring the frequency of the status variations between selection and non-selection states at each signal electrode, i.e., at each electrode of the signal side drive circuit 6 (Transl. p. 13, line 7 to p. 14, line 9). Figure 12 shows an example of circuitry for deriving voltage control signal CV from a plurality of signal electrode data signals D_a-D_e. This circuitry includes respective counters C_a-C_e for obtaining counts K_a-K_e of the status variations in the signal electrode data signals, an addition circuit 10 for obtaining the sum of counts K_a-K_e, and a voltage control signal conversion circuit

11[3] responsive to this sum and to control signals CS for generating control voltage CV (Transl. p. 18, line 15 to p. 19, line 8).

Regarding claim 1, the examiner correctly notes that Hoshino fails to disclose using a picture element in the form of a display element connected in series with a two-terminal non-linear device (Suppl. Answer at 3, lines 10-11). To cure this deficiency, the examiner relies on Kuijk, which discloses a matrix display device wherein each picture element includes a liquid crystal pixel element 12 connected in series with a non-linear switching element 15, which may be of the MIM type (Fig. 1a; p. 3, lines 6-9). Appellant does not challenge the examiner's conclusion that it would have been obvious in view of Kuijk to implement each of Hoshino's picture elements as a non-linear switching element in series with a liquid crystal pixel element. Instead, Appellant challenges the examiner's following argument regarding the requirement of the claim for "a sensing circuit . . . arranged to provide a control signal indicative of electrical current flowing in at least one

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[3] The name of this circuit is given in the translation at p. 36, under the heading "Figure 12."

address conductor . . . in response to the application of selection signals to that address conductor" (our emphasis):

> As to claims 1 and 13, it would have been obvious to have the control signal (CV) [in Hoshino] to indicate electrical current flowing in at least one address conductor in response to the selection signals (V_{LCD}) to the address conductor since Hoshino applies the signals (V_{LCD})to drive a display(1) (see Hoshino's figures 1,4; page 5, lines 15-26; page 6 and page 7, lines 1-5) and Kuijk teaches the current will flow into an address conductor and a data conductor when a driving voltage is applied to the matrix display (see Kuijk's figure 3 and page 3, lines 2-3)[which state that Figure 3 shows the current-voltage characteristic for the non-linear switching device]. [Suppl. Answer at 3-4.]

Despite the use of the term "obvious," it is apparent from the foregoing argument, the lack of any suggestion in Kuijk to measure current, and the examiner's failure to proposed any further structural modification of Hoshino that the examiner's actual position is that Hoshino as modified to employ Kuijk's non-linear switching elements <u>inherently</u> will satisfy the claim limitation in question, i.e., that detected frequency of the status variations in the signal electrode data signals inherently will be "indicative of" the current flowing in at least one of the display elements.

Appellant challenges the rejection on several grounds, the first being that Hoshino and Kuijk collectively fail to address the problem of changes in the voltage-current characteristics due to aging. This argument is unconvincing because the claims do not require that the voltage control signal provide compensation for this particular problem and the references need not be combined to solve the particular problem addressed in Appellant's disclosure. In re Beattie, 974 F.2d 1309, 1312, 24 USPQ2d 1040, 1042 (Fed. Cir. 1992).

Appellant also argues that while Hoshino as modified to employ Kuijk's non-linear switching elements develops a voltage control signal (CV) that is used to adjust the drive voltages, the voltage control signal is not "indicative of" the current in at least one address conductor (i.e., at least one display element). We agree, because the frequency of the status variations in the signal electrode data signals, which frequency is detected and used to generate the voltage control signal,
has no fixed relationship to the amount of current flowing in the display elements. Instead, average current is a function of the frequency and duration of the selection pulses. Thus, a given frequency of short-duration selection pulses will provide less average current than the same frequency of long-

duration selection pulses. In fact, it is possible for low-frequency pulses of long duration to produce a higher average current than is produced by high-frequency pulses of short duration.

For the foregoing reason, the rejection of independent claims 1 and 13 for unpatentability over Hoshino in view of Kuijk is reversed, as is the rejection of dependent claims 2, 4, 9-12, 14, and 16 over those two references.

The above-noted deficiency in the teachings of Hoshino and Kuijk is not cured by Fuse, on which the examiner additionally relies in rejecting claims 3 and 5. Consequently, the rejection of these claims over Hoshino in view of Kuijk and Fuse is also reversed.

REVERSED

JOHN C. MARTIN Administrative Patent Judge	)	
	)	BOARD OF PATENT
RICHARD L. TORCZON, JR. Administrative Patent Judge	)	APPEALS AND

	)	INTERFERENCES
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