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opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.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. 28

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

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Ex parte HIROYUKI MANO,
TOHSIO TANAKA,
TSUTOMU FURUHASHI,
MASAAKI KITAJIMA,
TOSHIO FUTAMI,
MASAKI MEGA, and
SHIGEYUKI TAKAHASHI

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Appeal No. 96-1855
Application 07/953,807[1]

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HEARD: April 5, 1999

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Before BARRETT, FLEMING, and HECKER, ***Administrative Patent Judges***.

HECKER, ***Administrative Patent Judge***.

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[1] Application for patent filed May 30, 1992.

DECISION ON APPEAL

This is a decision on appeal from the final rejection of claims 1 through 8, and 10 through 17. Claim 18 has been allowed and claim 9 has been canceled.

The invention relates to a liquid-crystal display system in which pixel units are displayed as ON data (white), OFF data (black) or halftone data (ON data and OFF data alternately in successive frames) in a manner to reduce flickering.

In particular, prior art Figure 64 shows a display in which the hatched lines (lines 1 and 3) represent a halftone data display, i.e. a gray tone halfway between white (ON) and black (OFF). The white lines (lines 2 and 4) represent a white data display (ON). As shown in prior art Figure 65, the halftone data display is obtained by generating OFF data and ON data alternately in successive frames, i.e. odd and even frames, as halftone data. The halftone data for lines 1 and 3 changes from OFF data in the odd frames to ON data in the even frames. Flickering appears in the display of prior art Figure 64 since the frames making

up the display of Figure 64 have all lines ON (white) for the even frames as shown in prior art Figure 65.

Appellants reduce flickering as shown in Figures 12, 13(a) and 13(b). Figure 12 shows a display in which the hatched lines (lines 1, 3, 5 and 7) represent halftone data display, and the white lines (lines 2, 4, 6 and 8) represent white data display (ON).

As shown in Figures 13(a) and 13(b), the halftone data display is obtained by generating ON data and OFF data alternately in successive frames, i.e. odd and even frames, as halftone data. The halftone data for lines 1 and 5 changes from ON data in the odd frames to OFF data in the even frames. Conversely, the halftone data for lines 3 and 7 changes from OFF data in the odd frames to ON data in the even frames. Thus, the phase at which the ON data and the OFF data is changed over for the lines 3 and 7 is inverted with respect to the phase at which the ON data and the OFF data is changed over for lines 1 and 5. This inverting of the phase of changing-over the ON data and the OFF data of the halftone data reduces flickering by dispersing the ON data displays of

halftone data into separate frames as shown in Figures 13(a) and 13(b), as opposed to concentrating the ON data displays for halftone data in the same frame as shown in prior art Figure 65 (even frames).

Figure 14 illustrates another display example where halftones appear on the left and right half of a frame line. Applying Appellants' invention, halftone display OFF data (and display ON data) are uniformly distributed in the right and left halves of each frame in both the odd and even frames (Figures 15(a) and 15(b)), and flicker is less prone to arise.

When adjacent lines are simultaneously in halftone data display states, the repetition of display ON and display OFF for these lines, at the same timings, gives rise to flicker. Therefore Appellants invert the timings to reduce flicker.

"As set forth above, according to the [first] embodiment of the present invention, the halftone patterns of the successive patterns, in which the timings for affording the display-ON and the display-OFF are changed [i.e. inverted] at the adjacent dots or lines, are determined on the basis of

the contents of the display data [as compared to the contents of preceding display data held in a line memory], so that the flickerless halftone displays are possible at all times irrespective of display patterns." (Appellants' specification at page 37 lines 6-13.)

In a second embodiment, Appellants generate halftone data on the basis of the display data of a current line (in other words, without employing any line memory and without regard to the display data of a preceding line). In this embodiment, the phase of changing over the first data (e.g. ON) and the second data (e.g. OFF) is made different for every pixel and for every line. For a halftone data pixel, whether the first data (e.g. ON) or the second data (e.g. OFF) is displayed first is previously determined based on (1) a position of the pertinent line in a frame and (2) whether the halftone pixel is assigned to an even frame or an odd frame. The phase of changing over the first data (e.g. ON) and the second data (e.g. OFF) is successively inverted at each halftone data pixel on the pertinent line beginning with the first halftone data pixel.

For each embodiment, halftones need not be halfway between white and black. Appellants' figure 26 illustrates display data for 16 tones, having 14 different shades between white and black. Increasing the number of tones requires a commensurate increase in the number of frames used for each tone.

Representative claim 1 is reproduced as follows:

1. A liquid-crystal halftone display system comprising:

a data driver which receives liquid-crystal display data corresponding to input display data representing any of display-ON, display-OFF and a halftone display for each of a plurality of pixels for one line, and which outputs said liquid-crystal display data for one line as horizontal display data;

a scan driver which designates a line of a liquid-crystal panel for displaying said horizontal display data;

a liquid-crystal panel which displays said horizontal display data as visible information on the line designated by said scan driver;

a line memory in which the input display data is stored for at least one line; and

halftone pattern generating means for generating said liquid-crystal display data to be received by said data driver by the use of contents of said line memory and the input display data;

wherein said halftone pattern generating means includes:

ON data generating means for generating ON data in response to the input display data which represents said display-ON for a pixel;

OFF data generating means for generating OFF data in response to the input display data which represents said display-OFF for a pixel;

halftone data generating means for generating ON data and OFF data alternately in successive frames as halftone data in response to the input display data which represents the halftone display for a pixel;

comparing means for comparing the input display data for a pertinent line with the input display data for a preceding line stored in said line memory for every line, the preceding line being in a same frame as the pertinent line; and

inverting means for inverting a phase of changing-over said ON data and said OFF data of said halftone data in accordance with an output of said comparing means.

The Examiner relies on the following reference:

Bassetti, Jr. et al. (Bassetti) 5,185,602 Feb. 9, 1993 (filed Apr. 10, 1989)

Claims 1 through 8 and 10 through 17 stand rejected under 35 U.S.C. § 103 as being unpatentable over Bassetti.

Rather than reiterate the arguments of Appellants and the Examiner, reference is made to the brief and answer for the respective details thereof.

OPINION

We will not sustain the rejection of claims 1 through 8 and 10 through 17 under 35 U.S.C. § 103.

The Examiner has failed to set forth a ***prima facie*** case. It is the burden of the Examiner to establish why one having ordinary skill in the art would have been led to the claimed invention by the reasonable teachings or suggestions found in the prior art, or by a reasonable inference to the artisan contained in such teachings or suggestions. ***In re Sernaker***, 702 F.2d 989, 995, 217 USPQ 1, 6 (Fed. Cir. 1983).

Like Appellants, Bassetti teaches grayscale displays (halftones) on a digitally commanded display system, including a liquid-crystal display panel. Bassetti is also concerned with decreasing the visual disturbance known as flickering. However, Bassetti uses phase shifting to decrease flickering,

with the phase selection being predetermined (as a phase placement pattern) and stored in a memory (note column 4 lines 52-66). Appellants, on the other hand, determine phase inversion (i.e. phase shifting of 180°) dependent on what was displayed previously (using a line memory in the first embodiment), or dependent on (1) a position of the pertinent line in a frame and (2) whether the first halftone pixel is assigned to an even frame or an odd frame (Appellants' second embodiment).

Looking at Appellants' claims, we first note that claims 1 through 7 are directed to the first embodiment, and claims 8 and 10 through 17 are directed to the second embodiment. Claims 1-7

Appellants argue "The Examiner has not explained why one of ordinary skill in the art would have been motivated to replace Bassetti's time delay unit or pixel memory 496 with a line memory as would be required to meet the limitations of claim 1." (Brief at page 18). Looking at claim 1 lines 14 and 15 we see "a line memory in which the input display data is stored for at least one line;" and on lines 32-34 "comparing

means for comparing the input display data for a pertinent line with the input display data for a preceding line stored in said line memory...".

The Examiner responds by citing Bassetti at column 14, lines 39-43, "When raster scan type of displays are considered, crosstalk between the pixels of a single row and between sequentially energized lines, and further between sequentially energized frames must be further considered." This suggested progression of Bassetti, from pixels to lines, and further from lines to frames, is proffered by the Examiner as the motivation to expand Bassetti's pixel comparison (with a pixel memory) to a line comparison (with a line memory). However, in the further context of this quote, Bassetti is contemplating a more elaborate phase placement pattern, to go beyond a two dimensional analysis, to a conceptualized three dimensional analysis of multiple frames along a time axis, as depicted in Figure 7E. This does not involve the storing of any display data in memory, for subsequent comparison of previous line display data to current line display data (claimed as "display data for a pertinent line").

The Federal Circuit states that "[t]he mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification." ***In re Fritch***, 972 F.2d 1260, 1266 n.14, 23 USPQ2d 1780, 1783-84 n.14 (Fed. Cir. 1992), ***citing In re Gordon***, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984). "Obviousness may not be established using hindsight or in view of the teachings or suggestions of the inventor." ***Para-Ordnance Mfg. v. SGS Importers Int'l***, 73 F.3d 1085, 1087, 37 USPQ2d 1237, 1239 (Fed. Cir. 1995), ***cert. denied***, 519 U.S. 822 (1996), ***citing W. L. Gore & Assocs., Inc. v. Garlock, Inc.***, 721 F.2d 1540, 1551, 1553, 220 USPQ 303, 311, 312-13 (Feb. Cir. 1983), ***cert. denied***, 469 U.S. 851 (1984). We find no suggestion or motivation in Bassetti for comparing display line data via a line memory, as proffered by the Examiner. For this reason, we will not sustain the rejection of claim 1, and accordingly, dependent claims 2 through 7.

We also note, without elaboration, agreement with Appellants that Bassetti does not teach or suggest the "inverting means for inverting....in accordance with an output of said comparing means" as recited in claim 1. Bassetti's phase changes are based on a *predetermined* phase placement pattern, not on any display data comparison (also involving a line memory). Even when Bassetti's phase placement pattern is changed, it is changed in accordance with a calculation (Bassetti at column 15 lines 34-48), and is *predetermined*.

Claims 8 and 10 through 17

Appellants' second embodiment does not require a line memory, and is more like Bassetti in that Appellants' initial phase (e.g. first data/second data or second data/first data) of

a halftone "is *previously determined* based on (1) a position of the pertinent line in a frame and (2) whether the first halftone pixel is assigned to an even frame or an odd frame;" (claim 8 lines 24-26, emphasis added). Appellants urge that "absent the applicants' disclosure, nothing whatsoever in Bassetti discloses or suggests previously determining whether first data or second data is outputted from halftone data generating means for a first halftone pixel having a pertinent tone on a pertinent line based on (1) a position of the pertinent line in a frame and (2) whether the first halftone pixel is assigned to an even frame or an odd frame as recited in claim 8." (Brief at page 32).

The Examiner responds that this is taught by Bassetti in Figure 9 by pattern memory 130 with position control for (1) line position (input 134) and (2) frame (input 132); answer at page 10. Reviewing Bassetti (Figure 9) we find that the phase placement pattern (phases 130a) and a specific matrix cell within the selected phase placement pattern (specific phase Px) are selected by (1) the position of a pertinent line (input 134) in a frame and (2) whether the

halftone is assigned to an even or odd frame (input 132), note column 19 lines 51-65. We therefor agree with the Examiner that this claim limitation is met by Bassetti.

Appellants further argue that Bassetti does not disclose or suggest "wherein the phase of changing-over the first data and the second data is successively inverted at each halftone pixel having the pertinent tone on the pertinent line", claim 8, lines 27-29.

The Examiner responds that the phase placement pattern of Bassetti is a type of inverting which assures a different phase for pixels in each line and each frame (answer at the bottom of page 11 et seq.).

Although Bassetti reduces flickering by providing different phases via a phase placement pattern, we find that this is not the same as successively inverting the phase for a pertinent halftone on a pertinent line as claimed. Inverting a phase is not only a change in phase (as disclosed in Bassetti), but a specific 180° phase change. And although the simpler embodiments of Bassetti may be interpreted to include 180° (e.g. Figures 3B and 4E), we find no teaching for

successively inverting the phase for a pertinent tone. Because Bassetti uses a phase placement pattern, simpler Bassetti patterns (e.g. Figures 3B and 4E), even one that could be interpreted as successively inverting the phase, would merely automatically repeat the same phase pattern for all tones, and not recognize or be triggered by any pertinent tone. The Federal Circuit states that "Additionally, when determining obviousness, the claimed invention should be considered as a whole; there is no legally recognizable 'heart' of the invention." ***Para-Ordnance Mfg. v. SGS Importers Int'l, Inc.***, 73 F.3d 1085, 1087, 37 USPQ2d 1237m 1239 (Fed. Cir. 1995), ***citing W. L. Gore & Assocs., Inc. v. Garlock, Inc.***, 721 F.2d 1540, 1548, 220 USPQ 303, 309 (Fed. Cir. 1983), ***cert. denied***, 469 U.S. 851 (1984). For these reasons, we will not sustain the rejection of claim 8, and likewise claims 10 through 17 dependent therefrom.

We have not sustained the rejection of claims 1 through 8 and 10 through 17 under 35 U.S.C. § 103. Accordingly, the Examiner's decision is reversed.

REVERSED

LEE E. BARRETT Administrative Patent Judge	)
MICHAEL R. FLEMING Administrative Patent Judge	) BOARD OF PATENT) APPEALS AND) INTERFERENCES
STUART N. HECKER Administrative Patent Judge	)

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