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D E C I S I O N
of 17 May 1994

Case Number: T 0146/93 - 3.5.1

Application Number: 83901876.9

Publication Number: 0111521

IPC: H04N 5/18

Language of the proceedings: EN

Title of invention:
Video driver circuit and method for automatic gray scale adjustment and elimination of contrast tracking errors

Patentee:
Motorola, Inc.

Opponent:
N.V. Philips' Gloeilampenfabrieken

Headword:
-

Relevant legal norms:
EPC Art. 52(1), 56

Keyword:
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0146/93 - 3.5.1

D E C I S I O N
of the Technical Board of Appeal 3.5.1
of 17 May 1994

Appellant: (Opponent)
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Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office dated 4 December 1992 concerning maintenance of European patent No. 0 111 521 in amended form.**

Composition of the Board:

Chairman: P. K. J. van den Berg
Members: A. S. Clelland
E. M. C. Holtz

Summary of Facts and Submissions

I. European patent No. 0 111 521 was granted on 30 August 1989 on the basis of European patent application 83 901 876.9.

II. An opposition was filed on the grounds that the subject-matter of the patent did not involve an inventive step (Article 100(a) EPC).

The Opponent referred *inter alia* to the prior art documents

D1: US-A-4 012 775,
D2: US-A-4 204 229 and
D6: US-A-3 804 981.

III. By its decision of 4 December 1992 the Opposition Division maintained the patent in amended form.

IV. Claim 4, the broadest independent claim, reads:

"A method for controlling a video signal in a video driver circuit for a video display which circuit has a video signal gain adjustment including sampling a level of the video signal at the video display for providing feedback signals, and including the steps of:

providing a black reference level signal as the video signal and comparing the black reference feedback signal at the video display to an input dc setup reference voltage and locking the black reference signal of the video signal to the dc setup reference voltage;

providing a contrast control signal as the video signal and comparing the contrast control feedback signal at the video display to a variable gain setup

reference voltage and locking the contrast control feedback signal to said variable gain set up reference voltage; and

controlling the brightness of the video signal by providing a brightness control signal indicative of a desired dc level of the video signal, and modulating said brightness control signal in accordance with said contrast control signal and producing a brightness control pedestal for application to the video signal, whereby the amplitude of said brightness control pedestal is determined by said brightness and contrast control signals."

V. On 10 February 1993 the Opponent filed a notice of appeal against this decision and paid the prescribed appeal fee. Cancellation of the decision and revocation of the patent were requested and, as an auxiliary request, oral proceedings. A statement setting out the Grounds of Appeal was subsequently filed on 17 February 1993.

VI. In a communication pursuant to Article 11(2) of the Rules of Procedure of the Boards of Appeal, dated 18 February 1994, the Rapporteur referred in particular to the issues of whether the skilled person would find it obvious firstly, to apply the contrast control signal in each colour channel at a point within the contrast control loop rather than upstream of that loop, e.g by using the white level reference voltage of D1 as a contrast control variable voltage; and secondly whether he would combine the contrast control loop with a circuit for compensating for changes in contrast setting by automatically effecting corresponding changes in the brightness level.

VII. Oral Proceedings were held on 17 May 1994. The Appellant (Opponent) requested that the decision under appeal be set aside and the patent be revoked. The Respondent (Patentee) requested that the appeal be dismissed.

VIII. At the oral proceedings the Appellant's representative argued that the claimed subject-matter was obvious in view of the disclosures of D1 or D2, taken together with D6.

It was stated that the video driver circuit in D1 contains gain and brightness feed-back loops for stabilising automatically the current of the Red, Green and Blue guns of the cathode ray tube, making its characteristics largely independent of long-term drift. Starting out from this prior art and wishing to add to it the manual brightness and contrast control usually present on a display unit, the skilled person would immediately recognise that the circuitry would be simplified if the variable amplifier in the feed-back loop was used for the contrast control.

Such an arrangement was moreover known from D2, which disclosed a circuit for expanding the contrast of video signals having a low dynamic range and, similarly to D1, comprised two feed-back loops for defining the levels of the output signal. The presence of potentiometers in the loops indicated that the viewer may vary both an upper limit, which corresponds to setting the contrast, and a lower limit, which corresponds to setting the brightness. This interpretation was said to be supported by the fact that no other contrast and brightness controls are shown in D2.

The modulation of the brightness control signal in accordance with the contrast control signal, which is claimed in the final feature of Claim 4, was an obvious

addition in view of D6. Since it is known from that document that an undesirable change of the brightness of the video image may occur when the contrast setting is altered, and a solution is provided in the form of a resistor connecting the contrast control signal with the brightness setting, the skilled person would be aware of the problem of interaction between the two controls. The features contained in Claim 4 for achieving this goal do not go beyond what is known from D6.

IX. The Respondent's arguments in support of the patentability of the subject-matter of Claim 4 can be summarised as follows.

If the skilled person had wanted to add a contrast and brightness control to the circuit known from D1, he would presumably have provided it upstream of the loops. The prior art in no way suggested that he might use the variable amplifier in the feed-back loop for the contrast setting; on the contrary, he would see the loop circuitry as exclusively dedicated to compensating the drift of the tube currents. Moreover, even supposing he would have contemplated setting the contrast by means of the loop amplifier he would have abandoned the idea seeing that he would not be able to set the brightness in an independent manner.

D2 was concerned with control of the dynamic range of a video signal, not with user-settable contrast and brightness controls. The potentiometers shown in the drawings were for factory adjustments. The feedback loops were operative during the active part of the scan and not, as according to the invention or D1, during a number of blanked lines only.

D6 showed a circuit in which the brightness correction is provided downstream of the contrast control. In the invention, the arrangement is reversed. Moreover, the circuit in D6 may be suitable for black-and-white video but would be too crude for a colour system.

Grounds for the Decision

1. The appeal is admissible.

2. *Admissibility of the amendments*

It is implicit in the contested decision that the patent as amended was regarded by the Opposition Division as complying with Article 123(2),(3) EPC. The Board sees no reason for deviating from this view.

3. *Clarity of Claim 4*

The expression "variable gain setup reference voltage" is ambiguous in that it could mean that either the gain or the reference voltage is variable; the description makes clear however that reference to a variable gain is intended and the claim has been interpreted in this sense.

4. *Inventive step*

4.1 It is common ground between the parties that the single most relevant prior art document is D1. This document describes a colour video display with a circuit which compensates for variations - in particular those caused by ageing - of the cathode ray tube current. The c.r.t. current is stabilised by means of white and black level feedback loops which are only operative during respective scan lines in the vertical blanking interval

as determined by a line counter 51. During these intervals the loops sample reference values provided by way of respective gates 55, 57. In the Fig 2C modification of the Figure 2B circuit of D1 the first loop when operative acts directly on the c.r.t. cathode current to set a black level by a method which includes sampling and holding in a circuit 56 a voltage dependent on the cathode current at nominal black when a black level voltage is supplied by gate 55. Even though D1 does not explicitly refer to the step of comparing the sampled feedback signal to a reference voltage - as required by Claim 4 - such a comparison is necessary if an error voltage is to be derived for correction. The result of the comparison, on line 56A, is supplied to a "DC restorer" 42 which adjusts the DC level of the video signal to a corrected black level. The second loop includes a further sample-and-hold circuit 58 which by means of an error signal line 58A controls an analog multiplier 59. In the Board's view the analog multiplier 59 constitutes a gain-controlled amplifier. The second control loop when operative thus sets the tube current to a value corresponding to white by a sampling and measuring process similar to that for the black level signal, a white level voltage being supplied by gate 57 and thereafter video gain adjusted. Implicit in D1 is that the "white level voltage" and "black level voltage" applied to gates 57 and 55 respectively are fixed rather than variable. There is no reference to separate contrast or brightness control.

4.2 Thus D1 discloses, using in substance the language of Claim 4, a method for controlling a video signal in a video driver circuit for a video display which circuit has a video signal gain adjustment including sampling a level of the video signal at the video display for providing feedback signals, and including providing a black reference level signal as the video signal and

comparing the black reference feedback signal at the video display to an input dc setup reference voltage and locking the black reference signal of the video signal to the dc setup reference voltage, and providing a second signal as the video signal and comparing the second feedback signal at the video display to a variable gain setup reference voltage and locking the second feedback signal to said variable gain set up reference voltage.

4.3 The method according to Claim 4 adds to this teaching the following features:-

(a) the second signal is a contrast control signal, whilst the brightness of the video signal is controlled by a brightness control signal indicative of a desired dc level of the video signal, and

(b) modulating said brightness control signal in accordance with said contrast control signal and producing a brightness control pedestal for application to the video signal, whereby the amplitude of said brightness control pedestal is determined by said brightness and contrast control signals."

4.4 These features permit a user to have manual control of the image brightness and contrast. The fixed reference value in D1 corresponding to white level is replaced by a variable contrast control signal, and a variable brightness control signal is provided which is modulated (in the sense of multiplied) in accordance with the contrast control signal.

4.5 As a consequence of feature (a) the video gain assumes a value corresponding to the predetermined white level corrected for any additional gain (i.e. contrast variation) desired by the viewer; no extra circuitry is needed for setting the contrast. Feature (b) serves to compensate the DC level (brightness) of the video signal for variations due to changes in the contrast control, since variation in gain causes a consequential variation in the DC level. Ideally, the compensation is such that the brightness and contrast controls are completely independent of each other. Feature (b) thus ensures that the DC pedestal as determined by the brightness control - which is placed upstream of the contrast control - does not vary with the contrast setting.

4.6 The Appellant, whilst admitting that D1 discloses no manual contrast and brightness controls, argued that the skilled man would find it obvious to modify the D1 arrangement by providing variable white and black level voltages as the reference voltages and would as a matter of course provide the necessary compensation between the contrast and brightnesss signals. Reference was made to D2. Although D2 relates to a monochrome arrangement its application to colour merely requires triplication of the circuit as in the claimed arrangement. This document discloses a method of black and white level clamping similar to that of D1 using respective feedback loops. In D2 however the fixed reference voltages in the feedback loops are set by pots VR1 and VR2 which, it was argued by the Appellant, could be varied manually in accordance with feature (a).

4.7 The Board is unable to accept the Appellant's arguments. Although in any practical system the skilled man would need to add manual contrast and brightness control to the circuit described in D1, the obvious modification to D1 to provide such controls is the addition of a

separate control circuit upstream or perhaps downstream of the feedback loops. The alternative, a conflation of the two circuits, so that instead of separate variable gain amplifiers for contrast and white level control a single circuit is used, does not appear to the Board to be an alternative at which the skilled man could be expected to arrive without the exercise of invention. He could not be expected to appreciate from the disclosure of D1 that the constant reference signal corresponding to the white level and applied to the variable gain amplifier could be replaced by a variable contrast control signal.

Thus D1 alone would not have led the skilled man to the invention.

4.8 Nor would the disclosure of D2, either alone or taken in combination with D1, have led the skilled man to the claimed solution. As indicated by the Respondent, this document is concerned with expansion of a signal of limited dynamic range to preset upper and lower levels, i.e. predetermined black and white levels. There is therefore no good reason why the skilled man, faced with the problem of compensating for tube current variations, should consider D2. Moreover, the document does not disclose any conventional contrast and brightness controls. The pots VR1, VR2 shown in Figure 2 appear to be factory adjusted pre-sets which serve to set two limits defining the dynamic range of the amplified output signal. Once the limits have been set the actual amplifier gain will depend on the dynamic range of the input signal. The skilled man would appreciate that D2 gives him a preset dynamic range and does not leave any room for further, manual, adjustment of contrast or brightness.

Moreover, even if for the sake of argument the skilled man were considered capable of deriving from D2 the idea that variable reference levels can be provided for the feedback loops, he has still to arrive at the appreciation that in the D1 circuit the provision of such a variable reference level in conjunction with the variable gain amplifier could be used for setting the contrast. Such an appreciation would, in the Board's view, require the exercise of invention.

4.9 The Board accordingly concludes that the subject-matter of Claim 4 involves an inventive step. It is not therefore necessary to address the question of whether the last feature of the claim - the modulation of the brightness signal - is rendered obvious by D6.

4.10 It therefore follows that independent Claim 1, which is an apparatus claim based on the method steps of Claim 4 and includes additional features, is also allowable.

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

M. Kiehl P. K. J. van den Berg