BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

Internal distribution code:
(A) [ ] Publication in OJ
(B) [ ] To Chairmen and Members
(C) [ ] To Chairmen
(D) [X] No distribution

Datasheet for the decision of 3 May 2012

Case Number: T 1318/08 - 3.5.04

Application Number: 03757881.2

Publication Number: 1665790

IPC: H04N 7/12, H04N 7/52

Language of the proceedings: EN

Title of invention:
System and method for lossless reduction of bandwidth of a data stream transmitted via a digital multimedia link

Applicant:
INOVA Semiconductors GmbH

Headword:
-

Relevant legal provisions:
RPBA Art. 13(1)

Relevant legal provisions (EPC 1973):
EPC Art. 56

Keyword:
"Inventive step (no - all requests)"

Decisions cited:
-

Catchword:
-

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 1318/08 **-** 3.5.04

D E C I S I O N
of the Technical Board of Appeal 3.5.04
of 3 May 2012

Appellant: (Applicant)
INOVA Semiconductors GmbH
Ismaninger Str. 3 Rgb.
D-81675 München (DE)

Representative:
Winter, Brandl, Fürniss, Hübner,
Röss, Kaiser, Polte - Partnerschaft
Alois-Steinecker-Straße 22
D-85354 Freising (DE)

Decision under appeal:
Decision of the Examining Division of the European Patent Office posted 18 January 2008 refusing European patent application No. 03757881.2 pursuant to Article 97(2) EPC.

Composition of the Board:

Chairman: F. Edlinger
Members: M. Paci
C. Vallet

Summary of Facts and Submissions

I. The appeal is against the decision of the examining division refusing European patent application No. 03 757 881.2, which was published as international patent application WO 2005/029857 A1.

II. The following document, cited as prior art in the decision under appeal, is relevant to the present decision:

D1: GB 2262405 A.

III. The decision under appeal was based on the grounds that claims 1 and 6 were not clear (Article 84 EPC 1973) and that their subject-matter lacked novelty in view of each of D2, D3 and D5 (Article 54(1) and (2) EPC 1973) and inventive step (Article 56 EPC 1973) in view of each of D1 and D4.

IV. In a communication under Article 15(1) RPBA (Rules of Procedure of the Boards of Appeal, OJ EPO 2007, 536), annexed to the summons to oral proceedings, the board *inter alia* expressed doubts as to whether claims 1 and 6 clearly defined the matter for which the appellant sought protection (Article 84 EPC 1973).

V. With a letter dated 3 April 2012 the appellant filed a set of amended claims 1 to 10, replacing all previous claims, and description pages 1 and 2, replacing previous description pages 1 to 3.

VI. During oral proceedings held on 3 May 2012 the appellant filed a set of amended claims 1 to 10

according to an auxiliary request. At the end of the oral proceedings the board announced its decision.

VII. The appellant's final requests are that the decision under appeal be set aside and that a patent be granted on the basis of claims 1 to 10 filed with letter of 3 April 2012 as a main request, or in the alternative, on the basis of claims 1 to 10 submitted in the oral proceedings as an auxiliary request.

VIII. Independent claim 1 according to the **main request** reads as follows:

"System for lossless reduction of bandwidth of a data stream (fifoData) transmitted via a digital multimedia link, wherein the data stream is a pixel stream which comprises pixel color data as payload data, and pixel control signals used for horizontal and vertical synchronization,

wherein the pixel color data and the pixel control signals are provided synchronous to a pixel clock,

the system being configured to replace the pixel control signals by control words which just indicate a change of status of the control signals and to suppress any pixel color data during a blanking period so that the resulting data stream comprises pixel color data during a period of no blanking followed by a sequence of control words when the blanking period occurs, comprising:

coding means (2) for coding the pixel control signals (pixelCtrl1, pixelCtrl2);

multiplexer means (3) for multiplexing the payload data (pixelData) and the control word (ctrl1, ctrl2, ctrln) such that there is provided said data stream

(fifoData) comprising said payload data (pixelData) if no blanking period of said payload data (pixelData) is present;

data transmission means (4, 5, 6) for transmitting said data stream (fifoData);

demultiplexer means (7) for receiving said data stream (fifoData) transmitted by said data transmission means (4, 5, 6) for demultiplexing said payload data (pixelData) and said control words (ctrl1, ctrl2, ctrln) from said data stream (fifoData) such that said payload data (pixelData) and said control words (ctrl1, ctrl2, ctrln) are separated from each other; and

decoding means (8) for decoding said control words (ctrl1, ctrl2, ctrln) such that said pixel control signals (pixelCtrl1, pixelCtrl2) are recovered,

wherein

said coding means (2) is adapted to perform said coding of said pixelcontrol signals (pixelCtrl1, pixelCtrl2) such that said control words (ctrl1, ctrl2, ctrln) are generated only each time said pixel control signals (pixelCtrl1, pixelCtrl2) change and said control words (ctrl1, ctrl2, ctrln) just indicate a change of status of said pixel control signals (pixelCtrl1, pixelCtrl2), and

said data stream (fifoData) further comprises said control words (ctrl1, ctrl2, ctrln) only if said blanking period of said payload data (pixelData) is present."

Claims 2 to 10 according to the main request have no bearing on the present decision.

IX. Independent claim 1 according to the **auxiliary request** is identical to claim 1 according to the main request except for the following additional text at the end:

", wherein, due to the fact that changes of pixel control signals do not occur very often, there are transmitted merely few control words because a different control word is merely generated and transmitted if the pixel control signals change, so that in an example of four changes of pixel control signals merely four control words are transmitted."

Claims 2 to 10 according to the auxiliary request have no bearing on the present decision.

X. The examining division's reasoning in the decision under appeal as to why the subject-matter of claim 1 then on file lacked inventive step in view of D1 can be summarised as follows:

D1 discloses a system having all the features of the system of claim 1 except that it does not explicitly disclose how the control word (the start new line signal "SNL" in D1) is generated from the control signal (the horizontal synchronising signal "H sync" in D1).

However, it would be obvious for the skilled person, based an the disclosure of D1 and given the direct link between the SNL signal and the H sync signal, to generate the SNL signal based on the H sync signal and to insert the SNL signal once it was generated.

XI. The appellant essentially argued as follows:

Claim 1 according to the main request

D1 relates to a system for transmitting video signals with reduced horizontal and vertical blanking periods. According to D1, horizontal and vertical blanking intervals can be reduced or even completely eliminated by providing a FIFO buffer (24) which has a faster input clock rate than its output clock rate. The digital transmission video signal therefore has a reduced data rate since the video data are expanded so as to fill the periods previously allocated to the blanking intervals. On the reception side, these blanking intervals are restored by an inverse technique.

Document D1 thus provides a clearly different approach by changing the frequency of inputting and outputting of signals into the FIFO buffers at the sending or receiving stage. Moreover, the signal SNL is transmitted at each instant in which no picture data is present.

This is in clear contrast to the system of claim 1 which teaches the replacement of pixel control signals by control words but only during blanking periods and only when a pixel control signal changes.

More specifically, D1 neither discloses nor suggests the following features of claim 1:

- "the system being configured to replace the pixel control signals by control words which just indicate a change of status of the control signals and to suppress any pixel color data during a blanking period", and

- "said control words (ctrl1, ctrl2, ctrln) are generated only each time said pixel control signals (pixelCtrl1, pixelCtrl2) change and said control words (ctrl1, ctrl2, ctrln) just indicate a change of status of said pixel control signals".

In the system of D1 there are no control words which are converted from control signals and indicate only a change of status of control signals because, as shown in figures 3 and 4 of D1, the SNL signal is left unchanged by both the transmitter (see figure 2) and the receiver (see figure 7), and thus is not "generated only each time" control signals (H or V sync signals in D1) change.

Moreover, there is no blanking period at the transmission stage in D1. Hence the system of D1 cannot "suppress any pixel color data during a blanking period".

For the above reasons, the subject-matter of claim 1 is not obvious in view of D1, even when taking into account common general knowledge.

Claim 1 according to the auxiliary request

The additional feature of claim 1 according to the auxiliary request makes even clearer that the control words are merely generated and transmitted if the pixel control signals change.

As explained with reference to the main request, this feature is neither disclosed nor suggested by D1.

Accordingly, the system of claim 1 according to the auxiliary request involves an inventive step in view of D1.

Reasons for the Decision

1. The appeal is admissible.

Main request

2. Amendments

The board is satisfied that the amendments made to claim 1 according to the main request comply with the requirements of Article 123(2) EPC and overcome the objections under Article 84 EPC 1973 (clarity and support) raised in the reasons for the appealed decision. Moreover, these amendments were filed in reaction to further objections raised by the board, did not increase the complexity of the claimed subject-matter and could be dealt with during the oral proceedings.

For these reasons, the board exercised its discretion under Article 13(1) RPBA to admit the appellant's main request into the proceedings.

3. Claim 1 - Inventive step in view of D1

3.1 D1 discloses a system for lossless reduction of bandwidth (see D1, page 5, lines 15 to 27) of a data stream transmitted via a digital multimedia link (see link 34 in figure 2). The system includes a sender and

a receiver (shown in figures 2 and 7 respectively) at the respective ends of the digital multimedia link (34).

At the sender side (shown in figure 2) an **original data stream** received by the sender includes a pixel stream which comprises pixel color data as payload data (see DATA in figure 2 and page 4, lines 18 to 22) and pixel control signals used for horizontal and vertical synchronisation (see the paragraph bridging pages 3 and 4, and in figure 2 the SYNCS signal comprising horizontal and vertical synchronisation signals H-DRIVE and V-DRIVE). The pixel color data and the pixel control signals are provided synchronous to a pixel clock (see CLK signal on the left of figure 2) to a FIFO buffer (24 in figure 2).

The FIFO buffer (24) generates a **modified data stream** in which the pixel color data (DATA) and "a very small number of digital synchronising codes" (see page 4, lines 18 to 22) are time-multiplexed (see figure 3). The very small number of digital synchronising codes include a "start new line" code SNL (see page 6, lines 1 to 3, and figures 3 and 4) at the start of each new line. The modified data stream output by the sender FIFO buffer (24) is transmitted continuously at a reduced data rate (see page 4, lines 18 to 37) over the digital multimedia link because the time needed for transmission of data during the blanking periods, which comprise almost no data, has been shrunk to almost nothing and the pixel color data has been time-expanded per line to fit into most of each blanking period of the original data stream (see page 5, lines 15 to 27, and figure 3).

At the receiver side (shown in figure 7) the modified data stream transmitted over the digital multimedia link is stored in the receiver FIFO buffer (60) and demultiplexed and the synchronising codes are decoded, such that the operations performed at the sender side are reversed so as to restore the original data stream including the horizontal and vertical synchronisation signals and blanking periods (see from page 8, line 19, to page 9, line 6).

3.2 In view of the above, the only features of claim 1 which are not explicitly disclosed by D1 are the following:

(a) "the system being configured to replace the pixel control signals by control words which just indicate a change of status of the [horizontal and vertical] control signals and to suppress any pixel color data during a blanking period", and

(b) "said control words (ctrl1, ctrl2, ctrln) are generated only each time said pixel control signals (pixelCtrl1, pixelCtrl2) change and said control words (ctrl1, ctrl2, ctrln) just indicate a change of status of said pixel control signals".

3.3 The board however regards these features as either implicit or obviously derivable from the disclosure of D1 for the following reasons:

It can be derived from the sender shown in figure 2 of D1 that the "start new line" code SNL transmitted over the digital multimedia link 34 must have been generated by FIFO buffer 24 from the horizontal synchronisation signal H-DRIVE, because the SNL was not present at the input of FIFO buffer 24 and because SNL and H-DRIVE

have the same function of indicating the start of a new line of pixel data. Even if this feature is not regarded as implicit in the disclosure of D1, it is at least obvious to the skilled person. Thus, the SNL code can be regarded as a control word coded by the FIFO buffer from the pixel control signal H-DRIVE. Since horizontal synchronisation signals such as H-DRIVE are well-known to change only once, at the beginning of a horizontal blanking interval immediately before the start of a new line, the SNL code, which is coded only to mark the start of a new line, is effectively a control word which is generated only each time the pixel control signal H-DRIVE changes. In particular, it does not change at each clock edge of the pixel clock but constitutes an event at control signals when a new line begins (compare the difference as indicated by figure 1 of the present application). For the sake of completeness the board adds that it sees no difference between a digital synchronising "code" (SNL in D1) and "control words" which replace "control signals used for ... synchronization" (terminology used in claim 1). In any case, D1 also uses the expression "code words" to refer to codes such as SNL (see page 2, lines 1 to 3).

According to D1, page 6, lines 8 to 10, "[v]ertical blanking is achieved in a similar manner, but with the vertical blanking intervals introduced between frames". The board understands this statement as implying, or at least making obvious, that a "start new frame" code (hereinafter also referred to as "SNF") is generated from the vertical synchronisation signal V-DRIVE and multiplexed onto the digital multimedia link each time a new frame starts.

The board thus considers that from the disclosure of D1 it was obvious, if not implicit, to a person skilled in the art that, for the transmission of control signals via the digital multimedia link, the system would be "configured to replace the pixel control signals (H-DRIVE and V-DRIVE) by control words (SNL, SNF) which just indicate a change of status of the (horizontal and vertical) control signals" and "are generated only each time said pixel control signals change", as stated in features (a) and (b) above.

As to the remaining part in feature (a) above, i.e. that the system is configured "to suppress any pixel color data during a blanking period", the board considers that this feature is also present in the system of D1 for the following reasons:

As shown in figure 3 of D1, the blanking periods in the timing chart of the original data stream are shrunk to (almost) nothing in the timing chart of the modified data stream output by FIFO buffer 24 and transmitted over digital multimedia link 34. This is because the blanking period contains only "a very small number of digital synchronising codes", as stated on page 4, lines 18 to 22, and can thus be heavily compressed without loss of data. The board, however, does not agree with the appellant's argument that in D1 the blanking period completely disappears during transmission. In the board's view, the expression "blanking period" refers to a period of time between the end of one line/frame and the beginning of the next line/frame. During these periods no new pixels are displayed. However, in digital data transmission,

pixels are usually (channel-) coded and not normally transmitted in the same sequence as they arrive at the input in the transmitter. The data used for synchronisation of the blanking periods in D1 is still there, immediately after the SNL control word (see figure 3), but for a so much shorter duration that it is sometimes referred to in D1 as being absent and is not shown in figure 3. It is however necessarily there because the "very small number of digital synchronising codes" must still be transmitted. The board notes that the system of D1 operates in this respect in the same way as described in figures 2 and 3 of the present application, according to which the data stream is transmitted at a reduced data rate over the multimedia data link by time-compressing the blanking period which comprises only few control words and by time-expanding the pixel data in the time intervals thus freed.

3.4 For the above reasons the board considers that features (a) and (b) above are either implicit or obviously derivable from D1.

3.5 The appellant's arguments

The appellant submitted that D1 provides a clearly different approach by changing the frequency of inputting and outputting of signals into the FIFO buffers at the sending or receiving stage.

In the board's view, according to figures 2 and 3 of the present application and the associated description the system of the invention achieves the reduced bandwidth by changing the frequency of the data stream in the FIFO buffers of the sending or receiving stages

in order to transmit the data stream at a reduced frequency on the digital multimedia link. This can be derived in particular from page 7, lines 3 to 9, and figure 3 which shows the fill levels of the FIFO buffers at the sending and receiving stages during blanking periods and active video periods. This argument is thus not convincing.

The appellant also argued that in the system of D1 there are no control words which indicate a change of status of control signals, because as shown in figures 3 and 4 of D1 the SNL signal is left unchanged by both the transmitter (see figure 2) and the receiver (see figure 7), and thus is not "generated only each time" control signals (H or V sync signals in D1) change.

The board disagrees with the appellant's reading of figures 3 and 4 of D1. According to the board's understanding of these figures, the SNL control word is present only in the modified data stream transmitted on the digital multimedia link 34, but not, as asserted by the appellant, in the original data stream received by the sender FIFO buffer (24 in figure 2) or restored at the output of receiver FIFO buffer (60 in figure 7). In the board's view, the hatched areas in the first line of figure 3 and in the second line of figure 4 do not represent SNL codes, because it is clear from figure 2 of D1 and the associated description that only the horizontal synchronisation signal H-DRIVE, not the SNL, is present in this original data stream input to FIFO buffer 24. The SNL control word must thus be created by a circuit which is schematically shown as FIFO buffer 24 in response to a change of status of the H-DRIVE control signal.

3.6 Conclusion on inventive step

For the above reasons, the subject-matter of claim 1 does not involve an inventive step in view of D1.

4. Conclusion on the appellant's main request

For the above reasons the appellant's main request is not allowable.

Auxiliary request

5. Amendments

The board considered that the amendments made to claim 1 according to this request did not increase the complexity of the claimed subject-matter, did not raise new issues and could be dealt with without adjourning the oral proceedings.

For these reasons the board exercised its discretion under Article 13(1) RPBA to admit the appellant's auxiliary request into the proceedings.

6. Claim 1 - Inventive step in view of D1

The text inserted at the end of claim 1 effectively only brings the additional limitation (versus claim 1 according to the main request) that "changes of pixel control signals do not occur very often" and that therefore "there are transmitted merely few control words".

These additional features however do not further distinguish the system of claim 1 from that of D1, because D1 discloses that there is only one SNL code word per blanking period, not for each pixel clock (see figures 3 and 4, and page 6, lines 1 to 3), and even fewer code words for controlling the vertical synchronisation (see page 6, lines 8 to 10).

Hence the reasoning under section 3 *supra* concluding that the subject-matter of claim 1 according to the main request lacks inventive step applies also to the subject-matter of claim 1 according to the auxiliary request.

Conclusion

7. Since the appellant's main and auxiliary requests are not allowable, the appeal must be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

K. Boelicke F. Edlinger