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Datasheet for the decision of 14 March 2019

Case Number: T 2292/13 - 3.5.04

Application Number: 10008061.3

Publication Number: 2271076

IPC: H04N5/335, H04N5/217, H04N5/243

Language of the proceedings: EN

Title of invention:
Column readout circuit with increased signal range for CMOS image sensor

Applicant:
Sony Corporation

Headword:

Relevant legal provisions:
EPC Art. 56, 84, 123(2)
RPBA Art. 13(1)

Keyword:
Late-filed auxiliary requests - admitted (yes)
Inventive step - main and fourth auxiliary request (no)
Claims - clarity - second and third auxiliary requests (no)
Amendments - added subject-matter (yes)

Decisions cited:

Catchword:

Europäisches Patentamt
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Beschwerdekammern

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Chambres de recours

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Case Number: T 2292/13 - 3.5.04

D E C I S I O N
of Technical Board of Appeal 3.5.04
of 14 March 2019

Appellant: (Applicant)	Sony Corporation 1-7-1 Konan, Minato-ku Tokyo 108-0075 (JP)
Representative:	Müller Hoffmann & Partner Patentanwälte mbB St.-Martin-Straße 58 81541 München (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 3 July 2013 refusing European patent application No. 10008061.3 pursuant to Article 97(2) EPC**

Composition of the Board:

Chairman	C. Kunzelmann
Members:	B. Willems
	T. Karamanli

Summary of Facts and Submissions

I. The appeal is against the decision of the examining division dated 3 July 2013 refusing European patent application No. 10 008 061.3, which was published as EP 2 271 076 A2.

II. The documents cited in the decision under appeal included the following:

D1: Schanz M. et al: "*A High-Dynamic-Range CMOS Image Sensor for Automotive Applications*", IEEE Journal of Solid-State Circuits, IEEE Inc., New York, US, vol. 35, no. 7, July 2000, pages 932 to 938, XP001100943, ISSN: 0018-9200;

D2: Cha You-Jin et al: "*Digitally-controlled automatic gain control circuits for CMOS CCD camera interface*", Electronics Letters, IEE Stevenage, GB, vol. 35, no. 22, 28 October 1999, pages 1909 to 1910, XP006012903, ISSN: 0013-5194, DOI: 10.1049/EL:19991327;

D3: WO 99/60524 A1.

III. The application was refused on the following grounds.

(a) The subject-matter of independent device claim 10 and corresponding method claim 1 of the main and the first, second and third auxiliary requests lacked inventive step over the combined disclosures of documents D1 and D2 and the common general knowledge of the person skilled in the art (Article 56 EPC).

(b) The subject-matter of claim 10 of the first auxiliary request extended beyond the disclosure of the application as filed (Article 123(2) EPC).

(c) Claim 10 of the first auxiliary request did not meet the requirements of Article 84 EPC.

(d) For the subject-matter of claim 10 of the third auxiliary request, the application did not meet the requirements of Article 83 EPC.

IV. The applicant filed notice of appeal. With its statement of grounds of appeal, the appellant filed amended claims in accordance with first and second auxiliary requests and requested that the decision under appeal be set aside and that a European patent be granted on the basis of the claims of the main request forming the basis for the decision under appeal or alternatively, on the basis of the claims of the first or second auxiliary request submitted with the statement of grounds. The appellant provided arguments as to why the requests on file met the requirements of Articles 54, 56, 84 and 123(2) EPC.

V. The board issued a summons to oral proceedings. In a communication under Article 15(1) RPBA (Rules of Procedure of the Boards of Appeal, OJ EPO 2007, 536) annexed to the summons the board introduced the following documents into the appeal proceedings:

D4: Shoji Kawahito et al: "*A Column-Based Pixel-Gain-Adaptive CMOS Image Sensor for Low-Light-Level Imaging*", 2003 IEEE International Solid-State Circuits Conference, Digest of Technical Papers, February 2003, ISBN 0-7803-7707-9, pages 1 - 10, XP010661616;

D5: US 2004/0080637 A1.

It also gave its provisional opinion that the subject-matter of claims 1 and 10 of the main request and the first and second auxiliary requests lacked inventive step over the combined disclosures of D4 and D1 and the common general knowledge of the person skilled in the art and that document D5 and its priority document would be prior art under Article 54(2) EPC if the present application did not validly claim priority from the application No. JP 2003407966.

VI. With a reply dated 21 January 2019, the appellant filed amended claims according to a main request and first to third auxiliary requests. It stated that claims 1 to 18 of the fourth auxiliary request corresponded to the claims of the main request filed by letter dated 25 April 2013. It indicated a basis for the claims of all requests and submitted arguments as to why the amended claims met the requirements of Articles 54 and 56 in view of the disclosures of documents D4 and D1.

VII. The board held oral proceedings on 14 March 2019.

The appellant's final requests were that the decision under appeal be set aside and that a European patent be granted on the basis of the claims of the main request filed at the oral proceedings of 14 March 2019 or, in the alternative, of one of auxiliary requests 1 and 2 filed at the oral proceedings of 14 March 2019, or of auxiliary request 3 filed by letter dated 21 January 2019, or of auxiliary request 4 corresponding to the main request underlying the decision under appeal.

At the end of the oral proceedings, the chairman announced the decision.

VIII. Claim 1 of the main request reads as follows:

"An electronic apparatus for executing predetermined signal processing on signals output from a semiconductor device including a signal obtaining unit (110) and column processors (62), the signal obtaining unit including unit elements (103) arranged in rows and columns, the unit elements each including a charge generator (132) for generating signal charges corresponding to incident electromagnetic waves and a signal generator, the column processors (62) being provided for the respective columns to read the signals on a row-by-row basis, to amplify the signals by certain gains, and to sequentially output amplified signals, the column processors (62) respectively including pixel-signal amplifiers (230) for amplifying the signals read from the unit elements by gains set to the pixel-signal amplifiers (230) comprising:

a pixel-signal detector (210) configured to detect signal levels on an input side of the pixel-signal amplifiers (230),

a pixel-signal-level detector (213) arranged in the pixel-signal detector (210), adapted to compare signal levels detected by the pixel-signal detector (210) with a plurality of threshold values to classify the signal levels, and to generate and output classification signals representing results of the classification,
a classification-signal generator (224) arranged in the pixel-signal detector (210), said classification-signal generator (224) being adapted to control the gain

setting based on an M-bit classification signal (Vsepa) representing the result of classification to the respective pixel-signal amplifier (230) in the column region unit (61),

a control signal generator (46) connected to the pixel-signal amplifiers (230) via a control line (231) and adapted to set gains to the pixel-signal amplifiers (230), and connected to the pixel-signal detectors (210) via a further control line (211) and adapted to control operations of the pixel-signal detectors (210), the control signal generator (46) being configured to receive the M-bit digital classification signal (Vsepa) from the pixel-signal level detectors (210) and to set gains to the pixel-signal amplifiers (230) based on the M-bit digital classification signal (Vsepa), wherein

the pixel-signal amplifiers (230) are adapted to amplify the signals read from the unit elements by gains set from the control signal generator (46), or by the gain setting control of the classification-signal generator (224)."

IX. Claim 1 of the first auxiliary request differs from claim 1 of the main request by the following definition of the feature "a control signal generator (46)" (the additional wording in claim 1 of the first auxiliary request is in *italics*):

"a control signal generator (46) connected to the pixel-signal amplifiers (230) via a control line (231) and adapted to set gains to the pixel-signal amplifiers (230), and connected to the pixel-signal detectors (210) via a further control line (211) and adapted to control operations of the pixel-signal

detectors (210), the control signal generator (46) being configured to receive the M-bit digital classification signal (Vsepa) from the pixel-signal level detectors (210) and to set gains to the pixel-signal amplifiers (230) based on the M-bit digital classification signal (Vsepa), *the gains being corrected based on an average signal level reported from a central controller or based on instructions from a user, the instructions being sent by the central controller, wherein [...].*"

X. Claim 1 of the second auxiliary request corresponds to claim 1 of the first auxiliary request with the feature "*or based on instructions from a user, the instructions being sent by the central controller,*" being deleted.

XI. Claim 10 of the third auxiliary request reads as follows:

"An electronic apparatus for executing predetermined signal processing on signals output from a semiconductor device including a signal obtaining unit (110) and column processors (62), the signal obtaining unit including unit elements (103) arranged in rows and columns, the unit elements each including a charge generator (132) for generating signal charges corresponding to incident electromagnetic waves and a signal generator, the column processors (62) being provided for the respective columns to read the signals on a row-by-row basis, to amplify the signals by certain gains, and to sequentially output amplified signals, the column processors (62) respectively including pixel-signal amplifiers (230) for amplifying the signals read from the unit elements by gains set to the pixel-signal amplifiers (230), comprising:

a pixel-signal-level detector (213) arranged in the pixel-signal detector (210), adapted to compare signal levels detected by the pixel-signal detector (210) with a plurality of threshold values to classify the signal levels, and to generate and output classification signals representing results of the classification,

a classification-signal generator (224) arranged in the pixel-signal detector (210), said classification-signal generator (224) being adapted to control the gain setting based on an M-bit classification signal (Vsepa) representing the result of classification to the respective pixel-signal amplifier (230) in the column region unit (61),

a signal extending unit (310) for executing gain correction on output signals from the column processors (62), based on the gains set to the respective pixel-signal amplifiers (230), thereby extending a dynamic range of signals of the signal obtaining unit (110),

a control signal generator (46) connected to the pixel-signal amplifiers (230) via a control line (231) and adapted to set gains to the pixel-signal amplifiers (230), and connected to the pixel-signal detectors (210) via a further control line (211) and adapted to control operations of the pixel-signal detectors (210), the control signal generator (46) being configured to receive the M-bit digital classification signal (Vsepa) from the pixel-signal level detectors (210) and to set gains to the pixel-signal amplifiers (230) based on the M-bit digital classification signal (Vsepa), the gains being corrected based on an average signal level reported from the central controller or based on instructions

from a user, the instructions being sent by the central controller, wherein the pixel-signal amplifiers (230) are adapted to amplify the signals read from the unit elements by gains set from the control signal generator (46), or by the gain setting control of the classification-signal generator (224)."

XII. Claim 10 of the fourth auxiliary reads as follows:

"An electronic apparatus for executing predetermined signal processing on signals output from a semiconductor device including a signal obtaining unit (110) and column processors (62), the signal obtaining unit including unit elements (103) arranged in rows and columns, the unit elements each including a charge generator (132) for generating signal charges corresponding to incident electromagnetic waves and a signal generator, the column processors (62) being provided for the respective columns to read the signals on a row-by-row basis, to amplify the signals by certain gains, and to sequentially output amplified signals, the column processors (62) respectively including pixel-signal amplifiers (230) for amplifying the signals read from the unit elements by gains set to the pixel-signal amplifiers (230), comprising:

a pixel-signal-level detector (213) arranged in the pixel-signal detector (210), adapted to compare signal levels detected by the pixel-signal detector (210) with a plurality of threshold values to classify the signal levels, and to generate and output classification signals representing results of the classification,
a classification-signal generator (224) arranged in the pixel-signal detector (210), said classification-signal generator (224) being adapted to control the gain setting based on an M-bit classification signal (Vsepa)

representing the result of classification to the respective pixel-signal amplifier (230) in the column region unit (61),

a signal extending unit (310) for executing gain correction on output signals from the column processors (62), based on the gains set to the respective pixel-signal amplifiers (230), thereby extending a dynamic range of signals of the signal obtaining unit (110),

a control signal generator (46) connected to the pixel-signal amplifiers (230) via a control line (231) and adapted to set gains to the pixel-signal amplifiers (230), and connected to the pixel-signal detectors (210) via a further control line (211) and adapted to control operations of the pixel-signal detectors (210), wherein

the pixel-signal amplifiers (230) are adapted to amplify the signals read from the unit elements based on the M-bit digital classification signal (Vsepa) and to amplify the signals read from the unit elements by gains set from the control signal generator (46), or by the gain setting control of the classification-signal generator (224)."

XIII. The examining division's objections, where relevant to the present decision, may be summarised as follows.

(a) Manual or automatic gain setting of the image signals (ISO sensitivity) was common in image capturing devices (see decision, point 15).

(b) The definition of the "*correcting step*" in claim 10 of the auxiliary request was not clear and contravened Article 123(2) EPC.

XIV. The appellant's arguments, where relevant to the present decision, may be summarised as follows.

(a) The main request should be admitted into the appeal proceedings because the amendments were a response to the objections on the basis of the disclosure of document D4 raised in the board's communication. The first and second auxiliary requests should be admitted into the appeal proceedings because the amendments were a response to the discussions during the oral proceedings.

(b) D1 did not disclose that the control signal generator was configured to receive the M-bit signal and set gains to the pixel-signal amplifiers based on this signal. Nor did it disclose that the amplifiers were adapted to amplify the signals read from the unit elements by gains set from the control signal generator or from the gain setting control of the classification-signal generator (see statement of grounds of appeal, page 3, third and fourth full paragraphs and letter dated 21 January 2019, page 4, point 2.1.1). D4 did not disclose the aforementioned features or the comparing of the signal levels detected by the pixel-signal detector with a plurality of threshold values (see letter dated 21 January 2019, page 5, point 2.1.2).

(c) The technical problem to be solved could be identified as how "*to provide an electronic apparatus in which the flexibility of gain setting*

is improved and which at the same time has an extended dynamic range" (see statement of grounds of appeal, page 4, penultimate paragraph and letter dated 21 January 2019, page 5, point 2.1.3).

(d) Both setting the gains to the pixel-signal amplifier by the control signal generator and the comparison with a plurality of threshold values to obtain an M-bit classification signal improved the contrast ratio. The distinguishing features mutually influenced each other to achieve a technical success over and above the sum of their respective individual effects (see letter dated 21 January 2019, page 6, third paragraph).

(e) Changing the ISO sensitivity changed the gain independently from the signal intensity. In contrast, claim 10 of the main request underlying the decision under appeal defined that the gains were determined based on the M-bit digital classification signal (see letter dated 21 January 2019, page 6, point 2.1.4). D4 failed to disclose that the pixel-signal amplifiers amplified the signals read from the unit elements based on the M-bit digital classification signal by gains set from the control signal generator. Contrary to the analysis under section 4.5 of the board's communication, the control signal generator also took into account the M-bit digital classification signal when setting the amplification in the pixel-signal amplifier (see letter dated 21 January 2019, page 8, point 2.5.2).

(f) The amendments to claim 1 of the first auxiliary request were based on pages 43, 44, 45 and 46. The phrase bridging pages 45 and 46 stated that the

"*central controller 92 receive[d] instructions for gain setting for a single entire screen from a user, and sends the instructions to the control signal generator 46*". The preceding lines on page 45 referred to the M-bit classification signals Vsepa.

(g) It was clear from claim 1 of the second auxiliary request and claim 10 of the third auxiliary request that the gains were corrected based on an average signal level. The person skilled in the art would readily have chosen the appropriate point in the circuit shown in Figure 3 to detect the signal levels which were to be averaged. This need not be defined in the claims.

Reasons for the Decision

1. The appeal is admissible.

2. *Main request and first and second auxiliary requests - admission into the proceedings (Article 13(1) RPBA)*

2.1 The main request was filed in response to the objections set out in the board's communication and further refined during the oral proceedings. The first and second auxiliary requests were filed in response to the discussions during the oral proceedings (see point XIV(a) above).

2.2 The board exercised its discretion referred to in Article 13(1) RPBA and decided to admit the main request and the first and second auxiliary requests into the appeal proceedings.

3. *Main request - inventive step (Article 56 EPC)*

3.1 The appellant did not dispute that document D4 may be considered the closest prior art for the assessment of inventive step of the subject-matter of claim 1 of the main request.

3.2 D4 discloses an electronic apparatus for executing predetermined signal processing on signals output from a semiconductor device including a signal obtaining unit and column processors, the signal obtaining unit including unit elements arranged in rows and columns (see Figure 12.7.1). The unit elements each include a charge generator for generating signal charges corresponding to incident electromagnetic waves and a signal generator (see Figures 12.7.1 and 12.7.2, pinned photo-diode). The column processors are provided for the respective columns to read the signals on a row-by-row basis (see Figure 12.7.1, V. Scanner), to amplify the signals by certain gains (see left-hand column: "*the control signal TX opens the transfer gate [...] The amplified signals are sampled and held for horizontal scanning*"), and to sequentially output amplified signals (see Figure 12.7.1, H. Scanner).

The column processors respectively include pixel-signal amplifiers for amplifying the signals read from the unit elements by gains set to the pixel-signal amplifiers (see left-hand column: "*The signal level [...] is compared with a reference voltage by the comparator [...] The results of comparison are read out as a one-bit digital code of the applied gain and are also used to set the gain of the column amplifiers*") and comprise:

a pixel-signal-level detector arranged in the pixel-signal detector adapted to compare signal levels detected by the pixel-signal detector with a threshold value to classify the signal levels (see left-hand column: "*[t]he gain of 1 or 8 is adapted to the sensor output depending on its amplitude. If the sensor output is less than one-tenth of the saturation level, the gain of 8 is used to enhance the sensitivity and to reduce the total read noise. Otherwise, the gain is set to 1*"), and to generate and output classification signals representing results of the classification (see Figure 12.7.4, Gain output);

a classification-signal generator arranged in the pixel-signal detector adapted to control the gain setting based on a one-bit classification signal representing the result of classification to the respective pixel-signal amplifier in the column region unit (see left-hand column: "*The results of comparison are read out as a one-bit digital code of the applied gain and are also used to set the gain of the column amplifiers*" and Figure 12.7.2);

wherein the pixel-signal amplifiers are adapted to amplify the signals read from the unit elements based on the one-bit digital classification signal (see left-hand column: "*The results of comparison are read out as a one-bit digital code of the applied gain and are also used to set the gain of the column amplifiers*").

The electronic apparatus comprises a controller connected to the pixel-signal amplifiers via a control line and connected to the pixel-signal detectors via a further control line (see Figure 12.7.1).

D4 (see the left-hand column) discloses that the gain of 8 is used to enhance the sensitivity if the "*sensor output is less than one-tenth of the saturation level*". It is apparent from this passage and Figure 12.7.1 that the signal levels are detected at the input side of the pixel-signal amplifiers.

3.3 The subject-matter of claim 1 of the main request differs from the disclosure of D4 in that the former specifies comparing the signals with multiple thresholds to generate an M-bit signal (rather than one threshold to generate a one-bit signal) and that the signals can be amplified by gains set by the control signal generator or by the gain setting control of the classification-signal generator, both setting the gains on the basis of the M-bit digital classification signal.

3.4 The board is of the opinion that generating the M-bit signal and providing a further circuit for setting the gains do not mutually influence each other to achieve a technical success over and above the sum of their respective individual effects. Any improvements to the contrast ratio these features may provide are independent from each other. Therefore, it has to be established whether each set of features is separately obvious in light of the prior art (see Case Law of the Boards of Appeal of the European Patent Office, 8th Edition, 2016, I.D.4.1 and I.D.9.2.2).

3.5 The technical problem to be solved by providing multiple thresholds to generate an M-bit classification signal may be identified as how "*to provide an electronic apparatus in which the flexibility of gain setting is improved and which at the same time has an extended dynamic range*" (see also point XIV(c) above).

The technical problem to be solved by setting gains either via the control signal generator or via the classification signal generator is to provide a back-up circuit for setting the gains.

3.5.1 D4 discloses an image sensor for a low-light-level environment in which the gain can be set to 1 or 8 to enhance the sensitivity and to reduce the total read noise (see the left-hand column). D4 discloses in its introduction that D1 (referred to as [4] in D4) uses a similar technique for high-dynamic range CMOS image sensors. D1, in section "*III. High dynamic range principle*", page 934, left-hand column, lines 6 to 10, discloses that each column amplifier is equipped with a variable voltage gain and that one of three different gains is available to provide a pixel-specific adjustment of the amplification factor. A person skilled in the art would have improved the flexibility of the gain setting and extended the dynamic range in the sensor known from D4 by comparing the signal level with two thresholds to provide three different gains as suggested by D1.

3.5.2 The apparatus known from D4 comprises a controller connected to the comparators and the amplifiers (see Figure 12.7.1). The person skilled in the art would have used this controller also as a back-up for setting the gains, i.e. the controller would receive from the comparator an M-bit classification signal and set the gain of the corresponding amplifier based on this M-bit signal.

3.6 In view of the above, the subject-matter of claim 1 of the main request lacks inventive step over the combined disclosures of D4 and D1 and the common general knowledge of the person skilled in the art. Therefore,

the subject-matter of claim 1 of the main request does not meet the requirements of Article 56 EPC.

4. First and third auxiliary requests - added subject-matter (Article 123(2) EPC)

4.1 According to the consistent interpretation of Article 123(2) EPC by the Enlarged Board of Appeal, an amendment can only be made within the limits of what the skilled person would derive directly and unambiguously, using common general knowledge, and seen objectively and relative to the date of filing, from the whole of the description, claims and drawings as filed (see G 3/89, OJ EPO 1993, 117; G 11/91, OJ EPO 1993, 125; G 2/10, OJ EPO 2012, 376).

4.2 Claim 1 of the first auxiliary request and claim 10 of the third auxiliary request specify that "*the control signal generator (46) [is] configured to receive the M-bit digital classification signal (Vsepa) from the pixel-signal level detectors (210) and to set gains to the pixel-signal amplifiers (230) based on the M-bit digital classification signal (Vsepa), the gains being corrected based on an average signal level reported from a central controller or based on instructions from a user, the instructions being sent by the central controller*".

Thus, according to these claims, the individual gain set to each amplifier is based on the corresponding M-bit classification signal and corrected by an average signal level or by user instructions reported by the central controller.

4.3 The board has not been persuaded that the feature cited in point 4.2 above is directly and unambiguously

derivable from the passages indicated by the appellant (see point XIV(f) above).

4.3.1 The passage on pages 45 and 46 indicated by the appellant discloses that:

"*[...] a single screen displayed on a monitor is represented by intensity information or color information based on M-bit classification signals Vsepa representing results of detection by the pixel-signal detectors 210 so that the levels of pixel signals or the values of gains can be found from outside. The central controller 92 receives instructions for gain setting for a single entire screen from a user, and sends the instructions to the control signal generator 46.*"

4.3.2 This passage consistently refers to a single (entire) screen. Thus, the gain setting for an entire screen is based on multiple M-bit classification signals and one user instruction applicable to the entire screen.

4.3.3 The paragraph following the cited passage on page 46 specifies that "*Compared with a case where gains can be controlled only within the chip, by allowing external setting by a user, flexibility of gain setting is increased. Furthermore, since classification signals Vsepa can be referred to even from outside the chip, compared with a case where the brightness of an image is controlled by controlling gains from the outside irrespective of signal levels, precise control is allowed even though setting is made manually by a user*". This passage suggests that the classification signals Vsepa are supplied to the user and that the user manually sets the gain by "referring" to the classification signals. According to a normal reading

of the quoted passages, the person skilled in the art would manually have set the gain based on the classification signals. These passages do not provide a direct and unambiguous basis for the control signal generator being configured to set the individual gain to each amplifier based on the corresponding M-bit classification signal and corrected by an average signal level or by user instructions reported by the central controller.

4.4 In view of the above, claim 1 of the first auxiliary request and claim 10 of the third auxiliary request do not meet the requirements of Article 123(2) EPC.

5. *Second and third auxiliary requests - clarity (Article 84 EPC)*

5.1 The clarity of a claim is not diminished by the mere breadth of a term contained in it if the meaning of that term - either *per se* or in light of the description - is unambiguous for the person skilled in the art (see also Case Law of the Boards of Appeal of the European Patent Office, 8th edition 2016, II.A.3.3).

5.2 Claim 1 of the second auxiliary request and claim 10 of the third auxiliary request specify that the gains are corrected based on an average signal level reported from a (or the) central controller.

5.3 These claims do not specify which signal levels are averaged to correct the gains. The description, page 44, lines 6 and 7, discloses that an average level of signals in a single entire screen is detected. However, the description does not disclose which levels are detected, i.e. whether, in the circuit shown in

Figure 3, the levels at the input or the output of the pixel-signal amplifiers (reference numeral 230), or the levels at the output amplifier (reference numeral 129) or at the output of the signal extending unit (reference numeral 310) are detected. Hence, claim 1 of the second auxiliary request and claim 10 of the third auxiliary request are ambiguous because it is not apparent which signal levels are detected and averaged.

5.4 In view of the above, claim 1 of the second auxiliary request and claim 10 of the third auxiliary request do not meet the requirements of Article 84 EPC.

6. *Fourth auxiliary request - inventive step (Article 56 EPC)*

6.1 Document D4 is the closest prior art for the assessment of inventive step of the subject-matter of claim 10 of the fourth auxiliary request.

6.2 The disclosure of D4 has been summarised in point 3.2 above. The apparatus known from D4 also comprises a signal extending unit for executing gain correction on output signals from the column processors, based on the gains set to the respective pixel-signal amplifiers, thereby extending a dynamic range of signals of the signal obtaining unit (see Figure 12.7.4).

6.3 The subject-matter of claim 10 of the fourth auxiliary request differs from the disclosure of D4 in that the former specifies comparing the signals with multiple thresholds to generate an M-bit signal (rather than one threshold to generate a one-bit signal) and that the signals can be amplified by gains set from the control signal generator, or by the gain setting control of the

classification-signal generator (see also point XIV(b) above).

6.4 The technical problem to be solved may be identified as how "*to provide an electronic apparatus in which the flexibility of gain setting is improved and which at the same time has an extended dynamic range*" (see point XIV(c) above).

6.5 The board is not convinced that the distinguishing features identified in point XIV(b) above mutually influence each other to achieve a technical success over and above the sum of their respective individual effects (see point XIV(d)). The number of bits of the classification signal is independent of whether the gain is set by the control signal generator or the classification-signal generator.

6.6 Therefore, it has to be established whether each set of features is separately obvious in the light of the prior art.

6.6.1 As set out in point 3.5.1 above, the person skilled in the art would have improved the flexibility of gain setting and extended the dynamic range in the sensor known from D4 by comparing the signal level with two thresholds to provide three different gains as suggested by D1.

6.6.2 Contrary to the appellant's assertion (see point XIV(e) above), claim 10 of the fourth auxiliary request does not specify that the gains set by the control signal generator are based on the M-bit digital classification signal. Thus, claim 10 of the fourth auxiliary request encompasses that the control signal generator sets one

gain to the entire screen based on a user input (e.g. based on an ISO value set by the user).

The board agrees with the examining division that providing manual gain setting (based on an ISO value) and automatic gain setting in one image capturing device was common at the priority date of the present application (see point XIII(a) above).

The apparatus known from D4 comprises a controller connected to both the detectors and the amplifiers via separate control lines. The board is not persuaded that the teaching of D4 is incompatible with "*the concept of ISO sensitivity*" (see point XIV(d) above). The board is convinced that the person skilled in the art would have used the available controller of D4 to control the gain setting on the basis of an external signal (e.g. an ISO value input by the user) in addition to controlling the gain setting by the classification-signal generator.

6.7 In view of the above, the subject-matter of claim 10 of the fourth auxiliary request lacks inventive step over the combined disclosures of D4 and D1 and the common general knowledge of the person skilled in the art. Therefore, the subject-matter of claim 10 of the fourth auxiliary request does not meet the requirements of Article 56 EPC.

7. Since none of the appellant's requests is allowable, the appeal is to be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

K. Boelicke C. Kunzelmann

Decision electronically authenticated