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Datasheet for the decision of 25 August 2015

Case Number: T 2000/10 - 3.5.04

Application Number: 05250518.7

Publication Number: 1686789

IPC: H04N5/217

Language of the proceedings: EN

Title of invention:
Imaging system utilizing imaging lens and image sensor and method for aligning optical axis therein

Applicant:
STMicroelectronics (Research & Development) Limited

Headword:

Relevant legal provisions:
EPC 1973 Art. 84, 56

Keyword:
Claims - clarity (no)
Inventive step - auxiliary request (no)

Decisions cited:

Catchword:

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Case Number: T 2000/10 - 3.5.04

D E C I S I O N
of Technical Board of Appeal 3.5.04
of 25 August 2015

Appellant: (Applicant)	STMicroelectronics (Research & Development) Limited Planar House, Parkway, Globe Park Marlow, Buckinghamshire SL7 1YL (GB)
Representative:	Style, Kelda Camilla Karen Page White & Farrer Bedford House John Street London, WC1N 2BF (GB)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 7 May 2010 refusing European patent application No. 05250518.7 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	C. Kunzelmann
Members:	R. Gerdes
	B. Müller

Summary of Facts and Submissions

I. The appeal is directed against the decision to refuse European patent application No. 05 250 518.7, published as European application EP 1 686 789 A1.

II. The patent application was refused by the examining division on the grounds that claim 1 of all requests then on file contained subject-matter which extended beyond the content of the application as filed, thereby infringing Article 123(2) EPC. Moreover, claim 1 of the main and first auxiliary requests was found to lack clarity (Article 84 EPC). Furthermore, the subject-matter of claim 1 of the main request and the first auxiliary request was found to lack inventive step. The examining division cited the following documents in its reasoning concerning lack of inventive step:

D2: Patent Abstracts of Japan vol. 2000, no. 26, 1 July 2002 & JP 2001 257930 A (Olympus Optical Co Ltd), 21 September 2001 and

D3: EP 1 206 126 A2 (Canon Kabushiki Kaisha) 15 May 2002.

III. The applicant appealed against this decision and, with the statement of grounds of appeal, submitted claims of a new main request as well as of new first and second auxiliary requests.

IV. With a letter of 24 July 2015 the appellant replied to a communication annexed to a summons to oral proceedings and submitted claims according to a new main request and first to third auxiliary requests, replacing all previous requests on file.

V. Oral proceedings were held before the board on 25 August 2015. The appellant withdrew the second and third auxiliary requests submitted with the letter of 24 July 2015 and filed claims of a fourth auxiliary request.

The appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the claims of the main request or the first auxiliary request, both filed with the letter of 24 July 2015, or on the basis of the claims of the fourth auxiliary request filed in the oral proceedings before the board.

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

"An image sensor (10) having:
a pixel array (12);
an imaging lens (15) for forming an image on the pixel array (12), said imaging lens being configured to form an image outline onto said pixel array;
pixel readout means (14);
a pixel sub-array selection means (16) which is pre-configured to select a sub-array (22) of pixels for readout based upon a stored reference location, said sub-array (22) having a centre that is in alignment with a lens centre (19);
wherein the imaging lens is configured to have a field of view and a focal length such that said image outline formed on said pixel array is smaller than said pixel array."

VII. Claim 1 of the first auxiliary request contains the following additional feature appended to claim 1 of the main request:

"..., and wherein the non-selected pixels comprise unused pixels."

VIII. Claim 1 of the fourth auxiliary request reads as follows:

"An image sensor (10) having:
a pixel array (12);
an imaging lens (15) for forming an image on the pixel array (12), said imaging lens being configured to form an image outline onto said pixel array;
pixel readout means (14);
a pixel sub-array selection means (16) which is pre-configured to select a sub-array (22) of pixels for readout based upon a stored reference location, said sub-array (22) having a centre that is in alignment with a lens centre (19);
wherein the non-selected pixels comprise unused pixels, said unused pixels in said array which are not in the sub-array (22) being disconnected, the readout means (14) in use thereby only reading out pixel values of the sub-array (22)."

IX. With respect to inventive step of the subject-matter of claim 1 according to the main request then on file, the examining division stated in the decision under appeal that D2 disclosed the features of the preamble of claim 1, but it was arguable whether in Fig. 2b of D2 the image outline was smaller than the pixel array, and hence whether the last feature of claim 1 according to the applicant's main request was disclosed in D2. In any case the alleged difference, if any, did not render the claimed sensor inventive. It could be seen as a consequence of applying the method of D2 to relatively big misalignments between the lens and the pixel array (see decision under appeal, Reasons 13.4 to 13.6).

Concerning the dependent claims 2 to 4 specifying three options for handling unselected pixels ("unused pixels") when the sub-array was read out, the examining division stated that they related to different well-known alternatives (see decision under appeal, Reasons 16.1).

X. The appellant's arguments, as far as relevant to the present decision, may be summarised as follows:

With respect to clarity of claim 1 according to the main request, the claim required that the image outline be formed on the pixel array and that this image outline be smaller than said pixel array. For the image outline to be formed on the array, the image outline necessarily had to be smaller than the pixel array.

It was also apparent from the application (see figure 1 and paragraphs [0024], [0026] and [0039] of the application as published, henceforth "the application") that the underlying idea of the invention was to provide a much bigger sensor than needed for different applications, which went against the technical prejudice that the image outline should be at least as big as the pixel array so that the pixel array did not have redundant areas. Hence, the correct interpretation of the feature specifying that the "image outline formed on said pixel array is smaller than said pixel array" was that the (typically circular) image outline was completely contained within the rectangular pixel array.

In the embodiment of the invention described in paragraph [0032] of the application, the image outline was completely contained in the SVGA pixel array,

leaving corners of the VGA sub-array outside of the image outline.

With respect to clarity of claim 1 of the first auxiliary request, the appellant argued that the additional feature of that claim further clarified that the pixel array was much bigger than needed for an application, so that the image outline was completely contained in the pixel array. Those parts of the pixel array which were not contained in the selected sub-array of pixels were unused pixels for a given application and because of the large size of the pixel array it made sense to treat those parts as unused pixels.

Concerning inventive step of claim 1 of the fourth auxiliary request, the appellant argued that this claim differed from D2 in its last feature. Due to the use of a much bigger pixel array than needed for an application, parts of the pixel array could be disconnected so that they were not read out and power consumption was thus reduced. The application referred to three different options for handling unused pixels, and disconnecting unused pixels was different from not reading out pixels. Disconnecting unused pixels was not to be understood in the sense given to it in the decision under appeal as being "disconnected from the output" (see Reasons 16.1). Instead, this option implied that the unused pixels were disconnected permanently, for example by blowing a fuse.

D2 only disclosed a pixel array having a small margin around the selected sub-array to compensate for the misalignment of the optical axis. For such a low number of extra pixels it did not make sense to make the

effort of disconnecting those pixels. Hence, the subject-matter of claim 1 was not obvious from D2.

Reasons for the Decision

1. The appeal is admissible.

The invention

2. The present application relates to an image sensor, which includes a pixel array, an imaging lens and a lens holder in a fixed assembly. According to the prior art described in the application, typically the imaging lens, which projected a circular image outline onto the rectangular pixel array, had to be aligned with the pixel array such that the centre of the image outline coincided as closely as possible with the centre of the pixel array.

According to the invention, the imaging lens is chosen such that the image outline projected onto the pixel array is smaller than the pixel array. Hence, a sub-array of pixels can be selected for readout such that this sub-array contains the pixels having the highest mean intensity in response to a continuous white illumination of the image sensor. Such a selection of the sub-array means that the sub-array is aligned with the lens centre. For example, a sub-array of 640 x 480 pixels within a pixel array having 800 x 600 pixels can be selected for readout. As a consequence, accuracy requirements on the lens-to-pixel-array positioning can be reduced (see application, paragraphs [0025] to [0032], [0039] and [0040]).

Main request

3. According to Article 84 EPC 1973, the claims shall define the matter for which protection is sought. They shall be clear and concise and be supported by the description.

3.1 The last feature of claim 1 requires that "the imaging lens is configured to have a field of view and a focal length such that said image outline formed on said pixel array is smaller than said pixel array."

3.2 This feature could be understood in the sense that the (typically circular) image outline should be completely contained in the (typically rectangular) pixel array. It could also be understood in the sense that the area enclosed by the image outline should be smaller than the area of the pixel array. As is apparent from the example in paragraph [0032], this feature could also be understood such that the identified sub-array (22) contained within the image outline (20) is smaller than the pixel array. In the last two situations the image outline need not be completely contained within the pixel array. Due to these different interpretations, the expression is ambiguous, leading to uncertainty as to the scope of claim 1.

3.3 It follows from the above that claim 1 of the appellant's main request does not meet the requirements of Article 84 EPC 1973.

3.4 The appellant's arguments did not convince the board.

The appellant argued that the correct interpretation of the last feature was that the image outline was completely contained within the rectangular pixel

array. However, there is no support for this interpretation in the application. The only example of the invention giving concrete figures for the dimensions of the sub-array and the pixel array discloses a sub-array of 640 x 480 pixels in a pixel array of 800 x 600 pixels (see paragraph [0032]). It follows from these figures that the smallest circular image outline enclosing the sub-array exceeds the pixel array, which is therefore in contradiction with the appellant's interpretation. The appellant argued that the image outline need not necessarily completely enclose the sub-array. However, if this were the case, corners of the sub-array would be outside the image outline and would consequently not be illuminated, which would result in the sub-array having an uneven response to illumination. Such an interpretation goes against the teaching of the invention requiring that pixels are identified "with the highest mean intensity that **comprise** a predetermined sub-array size" and that "the sub-array ... represents the area of pixels that have responded as expected to the predetermined illumination" (emphasis added by the board, see paragraphs [0032] and [0038]).

Furthermore, the appellant also argued that the expression in claim 1 "said imaging lens being configured to form an image outline onto said pixel array" implied that the image outline had to be completely contained in the pixel array. The board cannot subscribe to such a restrictive interpretation. In general, this wording does not exclude the existence of parts of the image outline being projected onto sections of the image plane outside the pixel array. This view is supported by the above-mentioned embodiment which is presented as an example of the invention (see paragraphs [0026] and [0032]).

Moreover, the appellant referred to figure 1 and paragraphs [0024], [0026] and [0039] of the application, arguing that the underlying idea of the invention was to provide a much bigger sensor than needed for different applications, which went against the technical prejudice that the image outline should be at least as big as the pixel array. The board cannot find any support in the cited passages for a "much bigger sensor" than needed. It is also noted in this respect that figure 1 is only a schematic drawing and does not disclose specific details in addition to those disclosed in the description (see Case Law of the Boards of Appeal of the European Patent Office, 7th edition, 2013, section II.E.1.5).

3.5 Hence, the appellant's main request is not allowable because its claim 1 lacks clarity (Article 84 EPC 1973).

First auxiliary request

4. Claim 1 according to the first auxiliary request adds the feature that the non-selected pixels comprise unused pixels.

4.1 The appellant argued that those parts of the pixel array which were not contained in the selected sub-array of pixels were unused and because of the size of the pixel array it made sense to treat those parts differently, i.e. as unused pixels. The additional feature reinforced the point that the pixel array was much bigger than needed for an application, so that the image outline was completely contained in the pixel array.

4.2 As outlined above (see point 3.4), the board cannot see any support for the appellant's interpretation of the application as providing a "much bigger" pixel array than needed. The fact that pixels may be "unused" depends on a particular application or use of the image sensor and does not allow conclusions to be drawn about the size of the image outline with respect to the pixel array.

4.3 Hence, the reasoning relating to the lack of clarity of claim 1 according to the main request is not affected by the additional feature and applies equally to the first auxiliary request (Article 84 EPC 1973).

Fourth auxiliary request

5. Claim 1 according to the fourth auxiliary request does not contain the feature resulting in the lack of clarity of claim 1 of the main request and the first auxiliary request. Instead, compared with claim 1 of the main request, it additionally specifies that "the non-selected pixels comprise unused pixels, said unused pixels in said array which are not in the sub-array (22) being disconnected, the readout means (14) in use thereby only reading out pixel values of the sub-array (22)."

5.1 It is common ground that all features of claim 1 except the additional feature are disclosed in D2 (see abstract, figures 1, 2a to 2c and paragraphs [0004], [0016] to [0018], [0023], [0024] of the machine translation).

5.2 The appellant argued that the application referred to three different options for handling unused pixels. Disconnecting unused pixels was different from not

reading out pixels and from ignoring the values of pixels outside the sub-array. In particular, disconnecting unused pixels was not to be understood in the sense given to it in the decision under appeal as being "disconnected from the output" (see Reasons 16.1). Instead, this option implied that the unused pixels were disconnected permanently, e.g. by blowing a fuse.

The board cannot subscribe to this view. There are no further details in the application specifying how the unused pixels are disconnected. In particular, there is no hint that unused sections of the pixel array should be permanently disconnected, for example by means of fuses. Hence, the expression has to be understood in its broadest sense, which includes, for example, switching off bias or supply voltages for parts of the pixel array.

5.3 As argued by the appellant, the distinguishing feature contributes to a reduction in energy consumption and required data processing power because unused pixels are not read out. Hence, the technical problem can be formulated as how to reduce energy consumption and the data processing power required.

5.4 It is obvious that pixels outside the selected sub-array do not contain useful information. It is also well known that only information from pixels containing useful information needs to be processed (see paragraphs [0021] and [0028] of D2 and paragraph [0106] of D3), either by only reading out the sub-array or by ignoring that information. Disconnecting pixels outside the selected sub-array is a further alternative well known in the art. This view is confirmed by the fact that details of this alternative are not described in

the present application. Hence, the board agrees with the examining division that the additional feature specifies one of three well-known alternatives for how the selected sub-array is read out (see decision under appeal, Reasons 16.1).

5.5 It follows that the subject-matter of claim 1 lacks inventive step in view of D2.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

K. Boelicke C. Kunzelmann

Decision electronically authenticated