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**D E C I S I O N**  
**of 8 February 2006**

**Case Number:** T 1198/02 - 3.5.04

**Application Number:** 97306476.9

**Publication Number:** 0833505

**IPC:** H04N 5/32

**Language of the proceedings:** EN

**Title of invention:**

Fast scan reset for a large area X-ray detector

**Applicant:**

GENERAL ELECTRIC COMPANY

**Opponent:**

-

**Headword:**

-

**Relevant legal provisions:**

EPC Art. 56

**Keyword:**

"Inventive step - no"

**Decisions cited:**

-

**Catchword:**

-



Case Number: T 1198/02 - 3.5.04

**D E C I S I O N**  
of the Technical Board of Appeal 3.5.04  
of 8 February 2006

**Appellant:**

GENERAL ELECTRIC COMPANY  
1 River Road  
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NY 12345 (US)

**Representative:**

Goode, Ian Roy  
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London WC2N 6LU (GB)

**Decision under appeal:**

Decision of the Examining Division of the  
European Patent Office posted 24 June 2002  
refusing European application No. 97306476.9  
pursuant to Article 97(1) EPC.

**Composition of the Board:**

**Chairman:** F. Edlinger  
**Members:** C. Kunzelmann  
B. Müller

## Summary of Facts and Submissions

- I. The appeal is against the decision of the examining division to refuse European patent application No. 97 306 476.9.
- II. The decision under appeal was based on the ground that the subject-matter at least of the independent claims on file did not involve an inventive step in view of the prior art disclosed in the following documents:
- D1: EP 0 233 104 A1,
- D2: EP 0 517 303 A1 and
- D3: US 5 352 884 A.
- III. With the statement of grounds of appeal the appellant also filed auxiliary requests on the basis of amended claims and requested oral proceedings.
- IV. The Board issued a communication annexed to a summons dated 28 October 2005 to attend oral proceedings.
- V. With a fax received on 10 January 2006 the appellant filed a new set of claims 1 to 4 replacing all existing claims and new description pages 3, 6, 7, 13, 14 and 15. The appellant withdrew all previous requests and declared that they would not be attending the oral proceedings.

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

"An area x-ray detector (12) producing repeated image signals at a frame rate comprising:

- (1) a plurality of electrically-chargeable solid state cells (22) arranged in rows (N,N+1,....) and columns (N,N+1,....);
- (2) charge integrators (44) attached to the cells of each column to provide a reading of total charge delivered to the cells of each column;
- (3) acquisition control electronic circuitry (34) programmed to
  - (a) acquire an image signal during a scan of each of the rows of cells one row at a time at a row rate, the scanning of each row including (i) charging the cells of the row for a first predetermined time period (62) (ii) measuring the total charge delivered to each cell of the row by means of the charge integrators; and (iii) resetting the charge integrators; characterized in that the acquisition control circuitry is also programmed to:
    - (b) restore the charge of the cells of the detector by simultaneously electrically asserting all of the rows of cells to charge all the cells, for a second predetermined time period (76) greater than the first predetermined time period."

Claims 2 and 3 are dependent on claim 1. Claim 4 is directed to a method of operating a large area x-ray detector.

VII. The grounds for refusal given in the decision under appeal, in so far as they apply to the subject-matter of the amended claims, may be summarised as follows.

The area x-ray detector of claim 1 differed from the one known from D1 only in that the resetting operation included charging the cells of multiple rows, up to and including all rows, for a second predetermined time period. However, it was a normal design possibility for the skilled person to extend the photocells' reset time period in order to improve the "recharging" of each cell. The extension of the reset period could be done either by extending the originally present reset period or by adding a second reset period at a convenient time. The examining division also held that these arguments were valid in general for any of the image sensors disclosed by D1, D2 and D3. D2 related to the same problem as the present application and adopted the solution of resetting more than one row at a time.

VIII. In the communication of 28 October 2005 the Board based its argumentation on the prior art forming the preamble of claim 1 and acknowledged in the description of the application as well as in D3. Starting from this prior art, it would appear obvious to a person skilled in the art to solve the known problem of ghost images as suggested by D2, namely by providing a separate level resetting period after the scanning period. During this period a multiplicity of rows was simultaneously reset by supplying reset pulses which seemed to be longer than the first predetermined time period.

In the Board's communication particular reference was made to the second embodiment shown in Figure 5 of D2 which disclosed a strictly simultaneous resetting of multiple rows where starting and ending times of the resetting pulses coincided.

IX. The appellant's arguments most relevant to the grounds set out below can be summarised as follows:

The point of the invention was that more cells (pixels) were reset in one time period, so that fewer time periods were required to reset all the pixels and consequently a faster acquisition rate with less image lag artefacts was possible. Since signal reading was not perfect, remnants of the exposure after signal reading led to a need for an extra reset time, so that the time between exposures was increased and the acquisition rate went down. The invention allowed more reset time to be provided without increasing the time between read and reset operations. Since pixel resetting in the second predetermined time period (i.e. the extra reset time) was performed without image signal acquisition, the time normally required to settle the transients caused by reading the signal was used for pixel resetting. Thus better use was made of the normal read time.

D2 did not disclose the simultaneous charging of all cells. It only disclosed simultaneous charging of groups of rows, with successive groups of rows being charged at overlapping intervals. Nothing in D2 led a person skilled in the art to consider the simultaneous charging technique of the present invention.

- X. The appellant requested that the decision under appeal be set aside and that a decision be taken on the basis of the new main request. The appellant also requested that the Board make any further minor amendments which it considered necessary to bring the application into an allowable form.
- XI. The Board held oral proceedings as scheduled on 8 February 2006 in the appellant's absence and announced its decision.

### **Reasons for the Decision**

1. The appeal is admissible.
2. *Amendments (Article 123(2) EPC)*

The preamble of present claim 1 is the same as that of claim 1 on which the decision under appeal is based. In substance, the characterising portion has been amended by specifying that the second predetermined time period is "greater than the first predetermined time period" and by adding the feature "simultaneously electrically asserting all of the rows". These amendments constitute limitations of original claim 5 which are disclosed in claims 1 and 6, and on page 14, lines 20 to 25 in conjunction with page 15, lines 5 to 7 and Figure 11 of the application as filed, respectively. As a consequence the subject-matter of claim 1 does not extend beyond the content of the application as filed.

3. *Novelty (Articles 52(1), 54 EPC)*

Area x-ray detectors in accordance with the preamble of claim 1 were known at the priority date of the present application. This has been acknowledged in the introductory part of the description of the present application (see page 1, line 6 to page 4, line 14) and in D3. These facts have not been contested by the appellant.

However none of the available prior art documents discloses such an area x-ray detector with the additional feature of acquisition control electronic circuitry programmed to simultaneously electrically assert all of the rows of cells to charge all the cells for a second predetermined time period greater than the first predetermined time period. Thus the subject-matter of claim 1 shall be considered to be new (Article 54(1) EPC).

4. *Inventive step (Articles 52(1), 56 EPC)*

4.1 Area x-ray detectors according to the preamble of claim 1 are used in the technical field of medical x-ray imaging (see Figure 1 and page 1, lines 6 to 26 of the present application, or Figure 1 and column 4, lines 38 to 46 of D3). In this technical field certain applications require high image rate acquisition (see page 4, lines 22 to 26 of the present application). High image rate acquisition may lead to the problem that the charge on the cells (photodiodes) is not fully restored, resulting in ghost images (see page 4, line 28 to page 5, line 5 of the present application).



4.2 This problem of ghost images caused by incomplete resetting of the cells in the technical field of medical x-ray imaging is also addressed in D2 (see column 1, lines 26 to 49). To solve this problem D2 suggests the provision of an additional reset period ("Reset" in Figures 3 and 5), following the image acquisition period, during which the electrically-chargeable solid state cells are reset (D2, claims 1 and 6; Figures 1, 3 and 5). The reset pulses are applied to the cells by electrically asserting a plurality of rows in an overlapping manner during the reset period and have a greater predetermined time period than the first predetermined time period of the reading pulses applied to the rows during the image acquisition period (see Figures 3 and 5).

At least in the second embodiment illustrated in Figure 5 of D2 the resetting is carried out by simultaneously electrically asserting multiple rows of cells to reset the cells (see D2, claim 6; column 8, lines 17 to 23). This is possible because the reset pulses applied during this additional reset period are not used for image acquisition (where individual activation of cells is necessary; cf. D2, column 8, lines 4 to 16) so that the additional reset period can be fully used to restore the initial charge condition of the solid state cells as with the present application.

4.3 In D2 individual rows or groups of rows are successively activated because a concurrent activation of all the cells of the area x-ray detector would give rise to very large charges or currents on the read lines. These currents would destroy the subsequent

circuit elements, in particular the amplifiers (see column 2, lines 30 to 39).

Nevertheless simultaneously electrically asserting all the rows of cells to reset the cells during the reset period is already contemplated in this passage of D2. The number of rows to be asserted simultaneously in the second embodiment (Figure 5 of D2) is selected so as to preclude damage to the circuit elements (D2, column 2, lines 45 to 49). Thus if circuitry is used which is not damaged if all the rows are asserted at the same time it would be obvious to a person skilled in the art to assert all the rows at the same time. This would be one of the quickest ways of resetting the cells, an objective to which D2 explicitly refers (see column 7, lines 52 to 54; column 9, lines 55 to 57).

Furthermore the Board notes that the present application neither discloses any measure for dealing with the problem of large currents which may be the consequence of the simultaneous assertion of all rows of a large area, nor any insight that this problem may be generally disregarded.

The Board therefore judges that the subject-matter of claim 1 cannot be considered as involving an inventive step.

- 4.4 The Board is aware that D2 describes the way of resetting the cells as draining the residual charges left in the cells after readout, i.e. after image acquisition (D2, column 1, lines 33 to 45; column 9, lines 45 to 57). The cells are said to be charged during illumination and discharged during readout (D2,

column 5, lines 44 to 56; column 6, lines 20 to 28). This apparent difference may be due to an erroneous presentation of the function of the detector disclosed in D2, since the capacitances of the cells are said to be biased with a negative voltage and would therefore be initially charged before illumination (D2, column 5, lines 34 to 37).

However the difference in the principles of restoring the initial charge condition as described in D2, namely complete removal of charges, would not have hindered a person skilled in the art in combining the teaching of D2 with that of known area x-ray detectors which start from completely charged cells as the initial charge condition because in both cases it is the amount of charge difference which is measured and which has to be replaced.

5. Since the subject-matter of claim 1 does not involve an inventive step, there is no need to consider the independent method claim 4 and the dependent claims 2 and 3.

Pursuant to Article 113(2) EPC, the Board shall consider and decide upon the application only in the text submitted to it, or agreed, by the applicant. The appellant's request that the Board make any further minor amendments which it considered necessary to bring the application into an allowable form cannot be allowed. Moreover, any minor amendment of the text submitted in accordance with the sole request would not have changed the outcome of this appeal.

**Order**

**For these reasons it is decided that:**

The appeal is dismissed.

The Registrar:

The Chairman:

D. Sauter

F. Edlinger