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D E C I S I O N
of 14 September 2005

Case Number: T 1284/01 - 3.4.01

Application Number: 93902890.8

Publication Number: 0724729

IPC: G01T 1/24

Language of the proceedings: EN

Title of invention:

Thin-film, flat panel, pixelated detector array for real-time digital imaging and dosimetry of ionizing radiation

Patentee:

The Regents of the University of Michigan et al.

Opponent:

Steiner, Richard

Headword:

-

Relevant legal provisions:

EPC Art. 113(1)

EPC R. 67

Keyword:

"Admissibility of the opposition (yes)"
"Substantial procedural violation (yes)"
"Remittal of the case (yes)"
"Reimbursement of the appeal fee"

Decisions cited:

G 0003/97, G 0004/97

Catchword:

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Case Number: T 1284/01 - 3.4.01

D E C I S I O N
of the Technical Board of Appeal 3.4.01
of 14 September 2005

Appellant: The Regents of the University of
(Proprietor of the patent) Michigan et al.
1500 East Medical Center Drive
Ann Arbor, MI 48109 (US)

Representative: Poulin, Gérard
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F-75008 Paris (FR)

Respondent: Steiner, Richard
(Opponent) Albertstrasse 11
D-82211 Herrsching (DE)

Representative: Heusler, Wolfgang
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 19 December 2001
revoking European patent No. 0724729 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: B. Schachenmann
Members: M. Rognoni
R. Bekkering

Summary of Facts and Submissions

- I. The appellant (patentee) lodged an appeal, received on 11 December 2001, against the decision of the opposition division, dispatched on 19 October 2001, revoking the European patent number 0 724 729. The appeal fee was paid on 11 December 2001 and the statement setting out the grounds of appeal and was received on 18 February 2002.
- II. The opposition had been filed against the patent as a whole and based on Article 100(a) EPC, in particular on the grounds of lack of novelty (Article 54 EPC) and lack of inventive step (Article 56 EPC).
- III. In the decision under appeal, the opposition division held, *inter alia*, that the subject-matter of claim 1 of the patent as granted did not involve an inventive step having regard to the following document:
- D1: L. E. Antonuk *et al.*: "*Signal, noise, and readout considerations in the development of amorphous silicon photodiode arrays for radiotherapy and diagnostic x-ray imaging*", Medical Imaging V: Image Physics, Roger H. Schneider, Editor, Proc. SPIE 1443, pages 108-119 (1991),
- and to the skilled person's general knowledge.
- IV. Oral proceedings were held on 14 September 2005.

V. The appellant requested:

- (1) that the opposition be rejected as inadmissible;
or
- (2) that the decision under appeal be set aside, the case be remitted to the first instance and the appeal fee be reimbursed;
- (3) the decision under appeal be set aside and the patent be maintained in amended form on the basis of one of the sets of claims filed on 12 September 2005 as main and auxiliary requests 1 to 9, respectively.
- (4) The appellant further requested apportionment of costs.

VI. The respondent (opponent) requested:

- (1) that the appeal be dismissed, or, as auxiliary request,
- (2) that the case be remitted to the first instance for further prosecution.

VII. Claim 1 of the patent as granted reads as follows:

*"1. An imaging device for use with an incident ionizing radiation beam, comprising:
signal conversion means including an array (50) of pixel sensors (30), each having a predetermined capacitance, for converting the incident ionizing radiation beam (10) into an electron hole-pair signal*

and storing said signal at the plurality of pixel sensors, said array of pixel sensors having a pixel-pixel pitch P in μm and a length, L , in cm , of one column of pixels sensors of the array;

switching means (52) including a plurality of transistors, each having a predetermined resistance, wherein each of said plurality of transistors reads out the signal stored by an associated one of said plurality of pixel sensors; and

electronic circuit means (56, 70, 72) for sampling the signals from the array of pixel sensors at an instantaneous frame rate per second IFPS, which is the effective rate at which the array is being read out, and so as to reinitialize the pixel sensors for a time sufficient to achieve a desired signal-to-noise SN which is the inverse of the degree to which each pixel sensor needs to be sampled and thus recharged; wherein the capacitance of one of the plurality of pixel sensors when multiplied by the resistance of an associated transistor yield a time constant, τ_{RC} , in μsec , satisfying the following relationship, which thereby permits real-time imaging of said radiation beam,

$$\tau_{RC} \leq \frac{100 \cdot P}{L \cdot \text{IFPS} \cdot \ln(SN)}$$

where

- $\sim 25 \leq P \leq \sim 10,000,$
- $\sim 2 \leq L \leq \sim 60,$
- $\sim 1 \leq \text{IFPS} \leq \sim 500,$ and
- $\sim 10 \leq \text{SN} \leq \sim 10,000."$

Reasons for the Decision

Admissibility

1.1 In the present case, the appellant alleged that the opponent, Mr Richard Steiner, might be acting as a straw man "*on behalf of a firm behind the scenes for attacking the economically important patent without the real opponents being known*" (appellant's letter dated 24 March 2003: page 4, paragraph [18]).

1.2 According to decisions G 3/97 and G 4/97 (OJ 1999, 245, 270) of the Enlarged Board of Appeal, an opposition is inadmissible if the involvement of the opponent is to be regarded as circumventing the law by abuse of process. Such an allegation, however, must be supported by clear and convincing evidence by the party alleging that the opposition was inadmissible.

The appellant did not provide such evidence and the Board sees no reason to investigate *ex officio* into this matter.

1.3 The appeal complies with the requirements of Articles 106 to 108 and Rule 64 EPC and is thus admissible

Article 113(1) EPC

2.1 According to Article 113(1) EPC the decisions of the European Patent Office may only be based on grounds or evidence on which the parties concerned have had an opportunity to present their comments.

2.2 In the present case, the appellant argued, *inter alia*, that the decision of the opposition division relied on an interpretation of document D1 which was essentially different from the one given by the opponent in the grounds of opposition. Furthermore, the contested decision contained a number of assertions which formed the core of the reasons for revoking the patent and which the patentee never had the opportunity to discuss. Thus, the opposition division's decision violated the patentee's right to be heard pursuant to Article 113(1) EPC.

2.3 The notice of opposition substantiating a request for revocation of the patent was filed by the opponent on 19 January 2001. With a letter dated 3 August 2001, the patentee submitted its observations and requested that the opposition be rejected. Only the opponent requested oral proceedings as an auxiliary measure. On 19 October 2001 the opposition division issued a decision revoking the patent in its entirety without holding oral proceedings or communicating its provisional opinion in writing to the parties.

2.4 In view of the course of action chosen by the opposition division, compliance with Article 113(1) EPC requires that the contested decision essentially rely on grounds and evidence already put forward by the opponent in the notice of opposition.

3.1 In the notice of opposition, the opponent alleged that the subject-matter of claim 1 of the contested patent was not new with respect to D1 and did not involve an

inventive step in the light of this document's disclosure.

3.2 As to the lack of novelty objection, the opponent argued essentially as follows:

- D1 concerned the same technical field as the contested patent and specified an imaging device for use with an incident ionising radiation beam comprising signal conversion means, switching means and electronic circuit means as recited in claim 1 of the contested patent. (notice of opposition, item 5.)

- D1 dealt with the same technical problem as the contested patent, *i.e.* how a desired contrast sensitivity could be achieved. In particular, D1 specified on page 115, second paragraph, that severe constraints were imposed by the contrast demanded by a particular imaging application. A certain "carryover" or "lag" in the readout signals could not be avoided and had to be kept to a minimum in order to achieve the desired contrast. (*ibid.* item 6.)

- Furthermore, D1 pointed out that the time necessary for sufficient initialisation of the sensors directly determined the maximum rate at which an array could ultimately be read out. Thus, this document disclosed essentially the same solution as the contested patent (see page 115, second paragraph), and specified, that, in order to achieve a contrast requiring signal fluctuations below one part in 10^3 , the sensors had

to be reinitialised to at least the same degree.
(*ibid.* item 7)

- The functional relationship linking the sensor charge to the sensor's reinitialisation time and to its time constant τ_{RC} was generally known. It could then be used to determine the minimum reinitialisation time t for ensuring a desired signal- to-noise ratio SN , whereby, as in the contested patent, the latter was defined as the inverse of the degree to which each pixel sensor was recharged. (*ibid.* items 8. and 9.)

- In the example given on page 115 of D1, the fluctuations of the sensor output signals had to be kept below one part in 10^3 , *i.e.* $SN = 10^3$. According to the known relationship between reinitialisation time and SN , the minimum reinitialisation time for achieving a reduction in signal fluctuations of $1/10^3$ was thus equal to the time constant τ_{RC} multiplied by a factor $\ln(10^3)$, *i.e.* τ_{RC} multiplied by ~ 7 , as specified on page 115, paragraph 5, line 6. (*ibid.* item 10.)

- The inequality given in claim 1 of the contested patent followed directly and necessarily from the disclosure in D1, wherein the relationship between the maximum time constant τ_{RC} for achieving the desired degree of reinitialisation was expressed as a function not only of SN but also of device parameters, such as the pixel-pixel pitch P , the length L of an array column and the instantaneous frame rate per second IFPS.

Two examples of sensor arrays given in D1 had values of P and L which fell within the claimed ranges. Though D1 did not mention a frame rate, it was implicit that for real-time imaging the value of IFPS had to be more than 1. On the other hand, there was no known requirement for a frame rate larger than 500. Thus, D1 disclosed to the person skilled in the art an imaging device falling within the terms of claim 1 of the contested patent. (ibid. item 11. and 12.)

3.3 As to the lack of inventive step objection, the arguments submitted by the opponent can be summarised as follows:

- The inequality given in claim 1 of the contested patent derived directly from the requirement that the sensors be reinitialised to a degree imposed by the desired contrast sensitivity. The parameters of the array were determined only by the particular application, radiotherapy or diagnostic, which, as such, was well known to the skilled person. Deviations of L, P and SN from the values disclosed in D1 depended on the type of application and did not imply any inventive activity on the part of the skilled person.

3.4 In summary, the lack of novelty objection raised by the opponent was based on the submission that all the features recited in claim 1 were either explicitly or implicitly disclosed in D1, and, in particular, that at least two examples given in this document had array parameters P, L and SN falling within the claimed ranges. As to the lack of inventive step, the essential

argument of the opponent was that the choice of array parameters different from those shown in D1 and within the claimed ranges would not involve an inventive step since such parameter ranges were essentially arbitrary and directed to covering all possible applications.

4.1 The opposition division came to the conclusion that D1 did not clearly disclose a frame rate between the claimed range of 1 to 500, as a real-time operation of the devices shown in D1 would not imply any clear restriction for the frame rate within a particular range. Thus, the subject-matter of claim 1 was new over D1.

4.2 According to the contested decision, however, the subject-matter of claim 1 did not involve an inventive step in the light of D1 and of the skilled person's general knowledge.

4.3 As acknowledged by the opposition division, D1, which could be regarded as the closest prior art, related to signal, noise and readout considerations of a-Si photodiode array for radiotherapy and diagnostic x-ray imaging. It showed several devices comprising signal conversion means, switching means and electronic circuit means as recited in claim 1 of the contested patent. Two of the three examples given on page 117, table 1, had a pitch P and an array length L falling within the claimed ranges.

Further features of the claim which, according to the decision of the opposition division, were not disclosed in D1 concerned the frame rate IFPS for sampling the signals of the array, the signal-to-noise ratio SN and

the time constant τ_{RC} defined as the capacitance of a pixel sensor multiplied by the resistance of an associated transistor, whereby τ_{RC} was smaller than a value defined by the equation given in claim 1.

4.4 Hence, contrary to the opponent, the opposition division did not base its decision on the consideration that D1 disclosed either explicitly or implicitly an imaging device having values of the frame rate IFPS and of the signal-to-noise ratio SN as specified in claim 1 of the patent in suit, or that the inequality recited in claim 1 between the time constant τ_{RC} , the sensor array parameters P, L, IFPS and the desired SN was, as such, a direct and necessary consequence of the teaching of D1.

5.1 As far as the ground of lack of inventive step is concerned, the opposition division defined the problem addressed by the contested patent as selecting values for IFPS, SN and τ_{RC} "*for putting a device as disclosed in D1 into practice*" (contested decision, item 9.3).

5.2 Having defined the above problem, the opposition division sought to argue in the contested decision that it would have been obvious to a person skilled in the art to select parameter values within the claimed ranges on the basis of the teaching of D1 and common general knowledge. The opposition division's arguments can be summarised as follows:

(a) It was obvious that high refresh rates were desirable in real-time applications but this required probably more expensive components. The appropriate refresh rate was therefore determined

by the skilled person in accordance with the requirements of its application and the available material. Choosing a value within the very broad range of 1 to 500 frames per second was therefore not regarded as inventive.

- (b) The desired signal-to-noise ratio SN depended on the particular application for which the sensor array was used. Since the range specified in claim 1 was so broad, the person skilled in the art would certainly have considered values within this range. Furthermore, D1 gave an example of an application within the limits defined in the claim.
- (c) From D1, page 115, it was clear that contrast and therefore the sensor's reinitialisation time were important aspects of an a-Si array for radiotherapy and imaging. The skilled person could be expected to consider all the factors which were relevant for imaging performance and, thus, also the reinitialisation time. In cases where the image requirements demanded a high refresh rate, the skilled person would not only try to improve characteristics such as the speed of the readout electronics, but also make sure that the reinitialisation time remained low enough and did not become the limiting factor for readout speed.
- (d) It was therefore regarded as obvious to the skilled person, constructing a device in line with the teachings of D1, to select reasonable values for IFPS and SN which lay within the limits defined in claim 1, and to make sure that the

reinitialisation time did not become too high. According to the teaching of D1, this meant that the "*moderated time constant*" of the RC-combination should be sufficiently low. As the moderated time constant contained the time constant τ_{RC} specified in claim 1, also the latter had to be as small as necessary to obtain sufficient read-out speed.

- (e) Some numerical examples based on an initialisation time equal to $7\tau_{RC}$, as indicated in D1, an assumed IFPS equal to 50 and P and L corresponding to an example given in D1 showed that the resulting time constant τ_{RC} had values corresponding to the normal time constant of FET/PIN combinations. For the latter, the opposition division referred to assumed numerical values for the capacity and the resistance of "current PIN-diodes".

6.1 The appellant specifically contested some assertions made by the opposition division when formulating the reasons for revoking the patent, since they represented the core of the decision itself and the patentee never had the possibility to comment thereon.

Thus, the essential question to be considered is whether the assertions objected to by the appellant can be regarded as a mere reformulation of arguments already presented by the opponent in the notice of opposition, or whether they reflect a substantial departure from the opponent's submissions and, in effect, add up to a new line of argument for revoking the patent.

6.2 As to the reasons given in item (a) above, the Board considers that they are not essentially different from the opponent's submissions in the notice of opposition. The opponent considered that it would have been implicit for a person skilled in the art reading D1 to assume that the disclosed imaging devices would be operated with a frame rate between 1 and 500. The opposition division, however, concluded that it would have been obvious to a skilled person wishing to implement the device of D1 to use a frame rate within the claimed range. In one case, the skilled person would have relied on common general knowledge to understand the operation of the disclosed device, whereas, in the other case, the same general knowledge would have made the skilled person select an appropriate frame rate for the device known from D1.

6.3 As to item (b) above, the opponent did not make any assumption as to how the desired signal-to-noise ratio would be selected by the skilled person but assumed that the particular value disclosed in D1 applied to the claimed examples. The opposition division's approach, however, shows that the disclosed value for the signal-to-noise ratio was not directly associated to the examples of sensor arrays given in D1. In fact, the opposition division referred in particular to the "broadness" of the SN range of claim 1 to infer that the skilled person would necessarily arrive at values within such range. In this respect, the opposition division appears to have departed from the submissions made by the opponent.

6.4 As to item (c) above, there is no suggestion in the notice of opposition that, according to D1, the

reinitialisation time should remain "*low enough*". In fact, it was argued that the reinitialisation time had to be sufficient to guarantee that the capacitors of the sensor array are recharged to the desired degree. In the opponent's opinion, this concept was known from D1 which thus taught that the time constant τ_{RC} of a sensor should not be higher than a certain maximum value depending on the array parameters and on the desired SN according to the inequality recited in claim 1 of the contested patent. Thus, the opposition division's reasoning summarised above under (c) represents a departure from the line of argument developed by the opponent, and in essence reflects a different interpretation of D1.

- 6.5 As to item (d), this reasoning is a consequence of the opposition division's assumption that the skilled person would "*make sure that the reinitialisation time remains low enough*". Whereas the opponent argued that the definition of the upper limit for a suitable time constant necessarily resulted from the desire to guarantee a sufficient degree of reinitialisation, the opposition division sought to prove that it was the desire of the skilled person to have a low reinitialisation time which resulted in the selection of a time constant below the upper boundary specified in claim 1 of the contested patent. In particular, the opposition division stated in the contested decision that the definition of a particular value for this time constant depended on the application requirements (for example the required refresh rate and a signal to noise ratio) and would be done by the skilled person without exercise of any inventive skill.

In order to prove its point, the opposition division referred to some numerical examples (see item (e) above) which find no correspondence in the notice of opposition.

- 7.1 In summary, a comparison between the notice of opposition and the contested decision indicates that the opposition division did not accept the opponent's lack of novelty objection, chose not to follow *in toto* the opponent's arguments against the inventive step of the claimed subject-matter and based its reasoning for revoking the patent in suit on a combination between some examples given in D1 and what was considered to be the general teaching of this document and the skilled person's general knowledge.
- 7.2 The development of a new line of argument based on a different assessment of the closest prior art document D1 and of the skilled person's knowledge is, in the opinion of the Board, tantamount to providing new evidence for revoking the patent. As the opposition division failed to inform the parties about its intention to revoke the patent on the basis of such evidence, it denied the parties an opportunity to present their comments and, in particular, violated the patentee's right to be heard pursuant to Article 113(1) EPC.
- 7.3 For the above reasons the Board finds that the opposition division's handling of the case constitutes a substantial procedural violation which justifies the remittal of the case to the first instance for further prosecution and the reimbursement of the appeal fee according to Rule 67 EPC.

Order

For these reasons it is decided that:

1. The opposition is admissible.
2. The decision under appeal is set aside.
3. The case is remitted to the opposition division for further prosecution.
4. The appeal fee shall be reimbursed.

The Registrar:

The Chairman:

R. Schumacher

B. J. Schachenmann