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# D E C I S I O N
# of 20 May 2003

**Case Number:** T 0252/99 - 3.4.1

**Application Number:** 92311171.0

**Publication Number:** 0549180

**IPC:** G01T 1/29

**Language of the proceedings:** EN

**Title of invention:**
Segmented detector for computer tomography scanner

**Applicant:**
GENERAL ELECTRIC COMPANY

**Opponent:**
-

**Headword:**
-

**Relevant legal provisions:**
EPC Art. 54, 56

**Keyword:**
"EPC Art. 54 main request - novelty (no)"
"EPC Art. 56 auxiliary request - inventive step (no)"

**Decisions cited:**
-

**Catchword:**
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**Case Number:** T 0252/99 - 3.4.1

**D E C I S I O N**
**of the Technical Board of Appeal 3.4.1**
**of 20 May 2003**

**Appellant:** GENERAL ELECTRIC COMPANY
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Schenectady, NY 12345 (US)

**Representative:** Goode, Ian Roy
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**Decision under appeal:** **Decision of the Examining Division of the European Patent Office posted 16 September 1998 refusing European patent application No. 92 311 171.0 pursuant to Article 97(1) EPC.**

**Composition of the Board:**

**Chairman:** G. Davies
**Members:** G. Assi
R. Q. Bekkering

## Summary of Facts and Submissions

I. The appellant (applicant) lodged an appeal, received on 23 November 1998, against the decision of the examining division, dispatched on 16 September 1998, refusing the European patent application No. 92 311 171.0 (publication number 0 549 180). The fee for the appeal was paid on 23 November 1998. The statement setting out the grounds of appeal was received on 25 January 1999.

In its decision, the Examining Division had held that the application did not meet the requirements of Articles 52(1) and 54 EPC having regard to the following document:

(D1) US-A-4 965 726.

II. Oral proceedings were held on 20 May 2003.

At the oral proceedings, the appellant requested that the decision under appeal be set aside and a patent be granted on the basis of the following documents:

*Main request*:

*Claims*: 1 to 6 filed in the oral proceedings,

*Description*: pages 1 to 19 of the application as filed,

*Drawings*: sheets 1/5 to 5/5 of the application as filed,

*Auxiliary request*:

*Claims*: 1 to 6 filed in the oral proceedings,

*Description*: pages 1 to 19 of the application as filed,

*Drawings*: sheets 1/5 to 5/5 of the application as filed.

III. The wording of claim 1 of the main request reads as follows:

*"An x-ray CT Scanner comprising:*
*means (13) for producing an x-ray beam (50) which passes through an aperture (11) and has a width in the plane of an image to be produced and a thickness orthogonal to the plane of the image;*
*detector means (14) mounted to intercept the x-ray beam in the plane of the beam, the detector means including a set of detector sub-elements (41-49, 60) which are disposed along the main beam thickness direction and in the plane of the beam and which intercept successive portions of the x-ray beam along its thickness direction to produce a corresponding set of thin slice attenuation signals, and means (25, 36, 37) for reconstructing an image from the produced attenuation signals; characterised in that*
*the x-ray beam (50) is collimated by a collimator (75) to define the basic aperture of the beam but is otherwise uncollimated*
*a preprocessor is provided having a plurality of separate channels, one for each thin slice attenuation signal prior to summing the signals for reconstructing*

*an image (Fig. 7 or 9) comprising*
*(a) a corresponding plurality of logarithm means (53, 64) for receiving an attenuation signal from the detector sub elements and producing a corresponding plurality of logarithmic thin slice attenuation signals; and*
*(b) means (56, 58) for summing together plurality of logarithmic thin slice attenuation signals to produce a single slice attenuation signal (57, 69);*
*and wherein*
*the image reconstruction means (25, 36, 37) receives the single slice attenuation signal.*"

The wording of claim 1 of the auxiliary request corresponds to that of claim 1 of the main request with the addition of the following feature between "*... is otherwise uncollimated*" and "*a preprocessor is provided ...*":

"*the set of detector elements comprise separate detector sub elements (41-49, 60) which are of the same size and arranged to detect thin slices of the same width as those detected by the other sub elements*".

Claims 2 to 6 of both requests are dependent.

## Reasons for the Decision

1. The appeal is admissible.

2. *Main request*

2.1 Document D1 discloses an x-ray CT scanner comprising

means 16 for producing a fan-shaped x-ray beam which passes through a patient aperture 14 and has a width in the plane of an image to be produced and a thickness orthogonal to the plane of the image (see column 2, lines 56 to 68, Figure 1).

2.2 A collimator 20 defines the dimensions of the beam, in particular its width and thickness (see column 3, lines 1 to 4, Figures 1, 2). The beam is "*otherwise uncollimated*" in the sense that no further collimator is provided.

In the oral proceedings, the appellant submitted that the CT scanner according to D1 comprises two collimators 22 and 24 (see Figure 2) and not a single one as claimed.

The Board does not agree with this argument. Indeed, in D1 (see column 3, lines 1 to 21), it is clearly stated that, for defining the dimensions of the beam, "*a collimator*" is provided, which consists of an outer collimator 22 and an inner one 24. This structure of the collimator 20 cannot support the interpretation that two separate collimators are provided.

2.3 The CT scanner further comprises detector means 30 arranged to intercept the x-ray beam, the detector means including a set of detector sub-elements A, B, C ("*rows*", "*segments*" or "*rings*" using the terminology of D1), in particular three, five or more, each consisting of a plurality of x-ray sensitive cells. The sub-elements are disposed in the plane of the beam and intercept the beam along its thickness direction so as to produce a corresponding set of thin slice attenuation signals (see column 3, lines 22 to 25 and

29 to 36, Figures 2 to 4).

2.4 Having regard to Figure 1 (see column 4, lines 17 to 40), the signals produced by the sub-elements A, B, C are fed to a sampler 40 and stored in buffers 42. They are then converted into digital form and processed by front end processor means 44. At the outputs of the processor means 44, three thin slice signals are thus obtained, which correspond to the detector sub-elements A, B and C. Each of the thin slice signals is processed in parallel by means 46a for "*intraring*" weighting and filtering the data and logarithm means 48 for converting the data to logarithmic values. The thin slice data from the three processing channels, each for a sub-element A, B, C, are then summed by combining means 46b and reconstructed into a thick slice image by means 50.

2.5 In the statement of grounds of appeal (see paragraph bridging pages 2 and 3), the appellant submits that D1 does not show a "*preprocessor*" in the sense claimed in claim 1. In particular, considering that the outputs of the detector sub-elements are fed serially to the sampler 40, that the sampled outputs are stored in buffers 42, the number of which is greater than that of the sub-elements, and that the stored signals are fed to a front end processor means 44 where they are processed and divided into three channels, the appellant considers that, in the "*preprocessing part*" of the circuitry of D1, separate channels for each thin slice signal are not provided.

The Board is not convinced by this interpretation. According to Figures 7 and 9 of the present application, the preprocessor receives signals from a

number of detector sub-elements producing thin slice signals. It is essential to note that, according to claim 1, the preprocessor has "*separate channels, one for each thin slice attenuation signal prior to summing the signals for reconstructing an image*", which means that the data corresponding to each thin slice are transmitted in parallel, as it indeed follows from Figures 7 and 9. Thus, the claimed preprocessor has only to be compared with the part of the processing means according to Figure 1 of D1, which performs operations on the thin slice signals prior to the summing step, namely from the output of the front end processor means 44 to the input of the summing means 46b. The means 40, 42, which constitutes a sample-and-hold circuit interconnecting the detector sub-elements 30 and the front end processor means 44, is irrelevant for the scope of the claim because, at this stage, thin slice signals are not yet available. Hence, the CT scanner according to D1 includes a preprocessor having the same features of the preprocessor recited in claim 1.

2.6 In conclusion, the CT scanner according to document D1 comprises all the features of the claimed scanner. Therefore, the subject-matter of claim 1 of the main request is not novel having regard to document D1.

The main request is not allowable.

3. *Auxiliary request*

3.1 As regards the thickness of the detector sub-elements A, B, C of the CT scanner of document D1, the centre sub-element B is preferably narrower than the side sub-elements A and C (see column 3, lines 36 to 37).

Figures 3 and 4 show this choice in a qualitative way. A quantitative example is given by the particular embodiment mentioned in column 4, lines 61 to 65, according to which the centre detectors are three millimetres and the outer ones four millimetres wide.

By operating the CT scanner in a multiple slice mode (see column 5, lines 3 to 10), three thin slices are produced by processing separately the data from each of the three sub-elements. The centre slice has the width of the central sub-element B or the width defined by the inner collimator, whereas the width of the outer slices is separately adjusted by the outer collimator. For many applications, it is advantageous to have the same width for all three slices.

Thus, although D1 addresses the question concerning the size of the detector sub-elements and the width of the thin slices, it does not disclose the claimed feature that the detector sub-elements are of the same size and arranged to detect thin slices of the same width as those detected by the other sub-elements. Therefore, the subject-matter of claim 1 is novel.

3.2 In the oral proceedings, the appellant submitted that, in the claimed CT scanner, the problem of controlling the thin slice width is entirely solved by the provision of sub-elements having the same size. In his opinion, a clear advantage over the disclosure of D1 would consist in that the collimator 20, which is essential for the operation of the known CT scanner and constitutes a technical complication, is no longer necessary. This advantage should justify the presence of an inventive step.

With regard to D1, the Board agrees with the appellant that the collimator 20 is essential for achieving thin slices of the same width, if the sub-elements A, B, C do not have the same thickness. However, it is clear to the skilled person that thin slices of the same width can be obtained either by the provision of detector sub-elements having the same size or, should this not be the case for any reason, by the use of a collimator like the one disclosed in Figure 2, by means of which separate beams with the same thickness may be obtained. The former case is at least implicitly suggested by the sentences in column 3, lines 36 to 37, and column 4, lines 61 to 65, the latter sentence concerning a particular embodiment with the outer sub-elements of the same size. The collimator in the former case may then have a simpler structure because it would only have the function to define the overall dimensions of the beam, as in the present application.

In conclusion, starting from the CT scanner of D1, which works according to the same principle as the scanner of the present application, *ie* information in a thick slice is obtained by combining data from a set of thin slices separately processed, the novel feature added with respect to claim 1 of the main request represents an obvious solution to the problem of controlling the thin slice width. Such a solution would not render superfluous the collimator of the known scanner, as submitted by the appellant, but have the effect of simplifying its structure. This would be the advantage achieved, quite evident for the skilled person, and not that alleged by the appellant.

3.3 Therefore, the subject-matter of claim 1 of the auxiliary request does not involve an inventive step

having regard to document D1.

The auxiliary request is not allowable.

## Order

## For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

R. Schumacher G. Davies