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D E C I S I O N
of 26 November 2001

Case Number: T 0373/98 - 3.2.2

Application Number: 89310703.7

Publication Number: 0365301

IPC: A61B 6/03

Language of the proceedings: EN

Title of invention:
Imaging apparatuses and methods

Patentee:
PICKER INTERNATIONAL, INC.

Opponent:
Siemens AG

Headword:
-

Relevant legal provisions:
EPC Art. 52(1),54, 56

Keyword:
"Novelty (yes)"
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0373/98 - 3.2.2

D E C I S I O N
of the Technical Board of Appeal 3.2.2
of 26 November 2001

Appellant: (Proprietor of the patent)
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Respondent: (Opponent)
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Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted 28 January 1998 concerning maintenance in amended form of the European patent No. 0 365 301 pursuant to Article 102(3) EPC.**

Composition of the Board:

Chairman: W. D. Weiß
Members: S. S. Chowdhury
J. C. M. De Preter

Summary of Facts and Submissions

I. The appellant (patent proprietor, Picker International, Inc) lodged an appeal against the decision of the opposition division to maintain the patent No. 0 365 301 in amended form. The decision was dispatched on 28 January 1998.

The appeal and the fee for the appeal were received on 6 April 1998. The statement setting out the grounds of appeal was received on 7 April 1998.

The opposition was filed against the whole patent and based on Article 100(a) EPC (lack of inventive step).

The opposition division had decided that the main request (set of claims A) was not allowable for lack of inventive step, but the amended claims (set of claims B) met all the requirements of the EPC, in particular those of Article 52(1) EPC.

The following prior art documents have been taken into account as relevant documents during the appeal proceedings:

D2: DE-A-2 932 182

D5: US-A-3 973 128

II. Oral proceedings took place on 26 November 2001, at the end of which the following requests forming the basis of the decision were put forward:

The appellant (Picker International Inc.) requested that the decision under appeal be set aside and that

the European patent be maintained on the basis of the set of claims C (main request), filed on 25 October 2001, or on the basis of the set of claims D or E (auxiliary request), filed on the same day.

The respondent (opponent) requested that the appeal be dismissed.

III. The independent claims 1 and 14 of the set of claims C read as follows:-

"1. An imaging apparatus comprising: means (18) defining an examination region (14) for accommodating a subject to be imaged therein; radiation source means (16) for rotating a beam of radiation about the examination region (14); means (30, 32, 34 or 30, 60) for receiving radiation that has traversed the examination region (14) including radiation that has passed through a region of interest of the subject and producing electrical signals indicative of the received radiation, said means (30, 32, 34 or 30, 60) for receiving including a plurality of segmented arrays (30) of radiation sensitive cells (A1 .... A24, B1 .... B24, C1 .... C24); and image reconstruction means (50) for reconstructing the electrical signals into an image representation of the region of interest, **characterised in that** each segmented array (30) comprises a two dimensional regular grid of radiation sensitive cells (A1 .... A24, B1 .... B24, C1 .... C24) on a common substrate, the grid having a plurality of columns (A, B, C) of radiation sensitive cells (A1 .... A24, B1 .... B24, C1 .... C24) which extend along a circumference of the examination region (14) and a plurality of rows (1 .... 24) of radiation sensitive cells (A1 .... A24, B1 .... B24, C1 .... C24)

which extend in a direction lengthwise of the examination region (14), each segmented array (30) including cells (A1 .... A24, B1 .... B24, C1 .... C24) of different sizes, the cells (A1 .... A24, B1 .... B24, C1 .... C24) of different sizes in each segmented array (30) receiving radiation that has passed through the region of interest of the subject."

"14. A method of imaging comprising: rotating a fan beam of radiation about an examination region (14) and thereby around a subject to be imaged disposed therein; detecting radiation which has traversed the examination region (14) including radiation that has passed through a region of interest of the subject using detection means (30) comprising a plurality of segmented arrays (30) of radiation sensitive cells (A1 .... A24, B1 .... B24, C1 .... C24); reading radiation absorption data from the detection means (30); and reconstructing an image representation of the region of interest from the read data, **characterised in that** each segmented array (30) used in said method comprises a two dimensional regular grid of radiation sensitive cells (A1 .... A24, B1 .... B24, C1 .... C24) on a common substrate, the grid having a plurality of columns (A, B, C) of radiation sensitive cells (A1 .... A24, B1 .... B24, C1 .... C24) which extend along a circumference of the examination region (14) and a plurality of rows (1 .... 24) of radiation sensitive cells (A1 .... A24, B1 .... B24, C1 .... C24) which extend in a direction lengthwise of the examination region (14), each segmented array (30) including cells (A1 .... A24, B1 .... B24, C1 .... C24) of different sizes, the cells (A1 .... A24, B1 .... B24, C1 .... C24) of different sizes in each segmented array (30) receiving radiation that has

passed through the region of interest of the subject."

Claims 2 to 13 are dependent on claim 1.

The set of claims D includes the feature "said image representation including the depiction of parts of said region of interest viewed by cells of different sizes" at the ends of the main claims.

The set of claims E includes the further feature that the region of interest may be an individual slice or group of slices.

IV. The appellant argued as follows:

A region of interest must inevitably be present otherwise claim 1 did not make sense. Normally the medical practitioner was interested only in a part of the body, and this was the region of interest and was implicit in apparatus of the type claimed. It was now mentioned explicitly in view of the decision under appeal, according to which the difference between the apparatus of claim 1 of the set of claims A and the disclosure of document D5 was not apparent. This amendment brought out the difference more clearly.

Document D5 was concerned only with the convolution technique, according to which only the image of the selected area was reconstructed. The independent method claim also clearly said that the narrow beams were used to construct an image of the selected area, and the broad beams were used only to correct the image of the selected area. The description also made it clear that the broad beams were not used to form an image but were used only to correct the image obtained from the narrow

beams.

V. The respondent argued as follows:

The sets of claims C and D were objectionable under Article 123(2) EPC since the application as originally filed did not mention a "region of interest", especially not one within an examination region.

Although the claims had been narrowed in scope, there was, nevertheless, also an objection under Article 123(3) EPC in view of the above objection.

The appellant's view, that in document D5 only the selected area 32 was imaged, was too narrow a reading of this document. A proper reading of this document as a whole suggested that it envisaged that the larger detectors could also be used for constructing the image. The selected area was imaged with high resolution but the larger detectors could be used to form a low resolution image, although only the first alternative was claimed in this document.

Reasons for the Decision

1. The appeal is admissible.

The set of claims C

2. *Amendments:*

After grant, the claims were amended as follows [highlighting in bold added]:

(i) In the preamble of the independent claims 1 and 14 it is specified that the means defining an examination region are for accommodating a subject to be imaged therein, and that the means for receiving receives radiation that has passed through a **region of interest** of the subject, and that the electrical signals are reconstructed into an image representation of the region of interest.

(ii) In the characterising part of the independent claims it is specified that each segmented array includes **cells of different sizes**, the cells of different sizes in each segmented array receiving radiation that has passed through the region of interest of the subject.

2.1 These amendments are allowable under Article 123(2) EPC for the following reasons:

(i) The apparatus of the patent in suit comprises a scan circle or patient aperture 14 within which the patient is accommodated and through which a fan shaped beam of radiation passes (column 3, lines 22, 23, 28 and 29) and impinges upon the detector array module 30. Any region of that part of the patient within both the scan circle and the fan shaped beam which impinges on the detector may be arbitrarily selected and examined, and termed a "region of interest".

Although "region of interest" is not explicitly mentioned in the application as originally filed it is clear from the context that the radiation passes through a specific body part to be examined in detail, which may be a slice of, for example a kidney, where a

tumour may be located. The image of this part is reconstructed whereas other body parts should not be irradiated unnecessarily. All such apparatus have a region of interest defined by the common volume between the radiation beam and the patient aperture, for example depicted as 32 in Figure 2 of document D5. The use of the term "region of interest" is, therefore, justified in the context.

(ii) This feature is found in claim 5 of the granted patent. The radiation passing through the aperture 14, and hence through the region of interest of the subject, falls on cells of different sizes, as also explained in column 4, lines 6 to 27

2.2 The dependent claims correspond to the dependent granted claims, with minor amendment consequent upon the amplification of granted claim 1 by the subject-matter of claim 5.

2.3 Moreover, the scope of the main claims has been narrowed by the addition of the features (i) and (ii), so that no objection arises under Article 123(3) EPC. The amendments were made so as to bring out more clearly the distinction from the disclosure of document D5, which distinction the opposition division did not perceive. The amendments comply with Rule 57a EPC, accordingly.

3. *Novelty*

The subject-matter of the independent claims is novel since no cited prior art document discloses the combination of the features thereof. Novelty of the

claimed subject-matter has not been doubted by the opponent.

4. *Inventive step*

The patent in suit relates to medical diagnostic imaging apparatus and method wherein an examination region for accommodating a subject to be imaged therein is defined, a radiation source rotates a beam of radiation about the examination region, a detector receives radiation that has traversed the examination region including radiation that has passed through a region of interest of the subject and produces electrical signals indicative of the received radiation, the detector including a plurality of segmented arrays of radiation sensitive cells, and image reconstruction means reconstruct the electrical signals into an image representation of the region of interest. Apparatus for carrying out the above method is described in document D2, which is the closest prior art document.

4.1 Technical problem to be solved

The apparatus of claim 1 of the patent in suit is characterised in that each segmented array comprises a two dimensional regular grid of radiation sensitive cells on a common substrate, the grid having a plurality of columns of radiation sensitive cells which extend along a circumference of the examination region and a plurality of rows of radiation sensitive cells which extend in a direction lengthwise of the examination region, each segmented array including cells of different sizes, the cells of different sizes in each segmented array receiving radiation that has

passed through the region of interest of the subject.

The appellant primarily relies upon the final feature of the claim, that the cells of different sizes in each segmented array receive radiation that has passed through the region of interest of the subject, for justifying the presence of inventive step. Therefore, it is necessary to investigate which technical problem it solves.

As a preliminary it is noted that there are two different ways in which this requirement of the claim is fulfilled by embodiments of the patent in suit, which are described in column 4 with reference to Figure 3. In one embodiment one column of cells may be narrower than an adjacent column of cells, and in another embodiment taller and shorter cells within one column may alternate with each other, these alternatives being claimed in granted claims 5 to 7. These different embodiments provide the following advantages:

In the first embodiment thinner and/or thicker slices of the body may be investigated, which provides for flexibility in that different slice thickness and combinations may be easily selected. In the second embodiment alternating taller and shorter cells within one column enable different transverse combinations of radiation sensitive cells to be selected. The manner in which these advantages are exploited is explained in column 6, lines 10 to 43.

To summarise, the main purpose of placing different sized detectors behind the region of interest according to the patent in suit is to gain flexibility in

obtaining varying slice thicknesses of a desired resolution and/or to obtain images within each slice having higher overall resolution than would be obtainable with uniform sized detectors.

4.2 Inventive step

It is to be investigated, therefore, whether document D5 discusses either an arrangement of detector cells as disclosed in the patent, or alludes to the above problems and their solution.

The document D5 discloses an arrangement in which the detector cells are arranged in a single column, ie there is no two dimensional regular grid as required by claim 1. Moreover, there is disclosed here neither an embodiment wherein one column of cells is narrower than an adjacent column of cells, nor an embodiment wherein taller and shorter cells alternate with each other within one column. The only arrangement of cells shown is that wherein a one dimensional array of cells includes an array of smaller cells arranged inwardly of an array of larger cells.

4.3 Contrary to the opinions of the respondent and the opposition division, the Board is satisfied that document D5 does not disclose the feature that each segmented array including cells of different sizes in order to provide a desired resolution.

As stated in point 2.1 above, the region of interest may be selected arbitrarily. If the region of interest is taken to be the area defined by the circle 32 (Figure 5), as is the intention in this document, then only detectors 43 of one size are involved in the image

reconstruction. If, contrary to the teaching of this document, the region of interest is taken to be the area defined by the circle 13', then detectors 43 and 44 of two different sizes are indeed involved, but not for the purpose of image reconstruction. The outer detectors 44 are provided only for providing information to be used in correcting that part of the image 32 viewed by the smaller cells 43.

4.4 The respondent's assertion, that the larger detectors 44 may also be used to form the image in document D5 and hence affect the resolution, is not acceptable since the tenor of this document is that the smaller detectors are used to form an image and the larger detectors only provide information to be used in correcting that part of the image viewed by the smaller detectors.

The argument, that passages such as the last part of column 1 and column 5, lines 48 to 53 of document D5 imply that while the selected area is imaged in fine resolution the other areas may be imaged in coarser resolution, is not supported by any other part of this document. The only specified purpose of the larger detectors, in column 10, lines 18 to 20 and at the end of the independent method claim 12, is for providing corrections signals.

The reason that such correction is necessary is that when reconstructing CT images, an assumption is that the attenuation of the material outside the region of interest is that of air. In practice, however, the material outside the region of interest, for example the region 32 in Figure 5 of document D5, is not air but the surrounding body, shown as 31 in Figure 3. It

is necessary to correct for this, which is the problem addressed in this document. Since this correction is indispensible, the use of the detectors 44 for correction is an essential feature of the invention in this document, and features in the main method claim, accordingly.

A practical arrangement would involve the detectors being hard wired or programmed to perform their function. If the intention of document D5 had been to use the larger detectors 44 for both correcting the image of the smaller detectors 43 and contributing to the overall image, then there would have been some mention of a selection means for selecting one of these modes of operation of the detectors 44. The absence of such selection means indicates that the intention was to use the larger detectors only for correction purposes.

Therefore, the document D5 does not suggest the arrangement of detectors as claimed in the patent in suit, or the use of detectors of different sizes for the purpose of resolution, so that claim 1 of the set of claims C involves an inventive step.

4.5. Similar considerations apply to method claim 14 of the set of claims C.

5. Since, in view of the above, the grounds of opposition raised by the respondent do not prejudice the maintenance of the patent in amended form, the patent in suit can be maintained on the basis of the set of claims C.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to maintain the patent in amended form with the following documents:

   - claims 1 to 14 according to set of claims C filed on 25 October 2001,

   - description column 1 and 2 as submitted at the oral proceedings, rest of the description as granted,

   - figures as granted.

The Registrar The Chairman

V. Commare W. D. Weiß