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**Datasheet for the decision
of 20 September 2022**

Case Number: T 1566/17 - 3.2.02

Application Number: 09015316.4

Publication Number: 2196147

IPC: A61B6/03, G06T11/00

Language of the proceedings: EN

Title of invention:

X-ray computed tomography apparatus, medical image processing apparatus, X-ray computed tomography method, and medical image processing method

Applicant:

Toshiba Medical Systems Corporation

Relevant legal provisions:

EPC Art. 84

Keyword:

Claims - clarity (no)



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Case Number: T 1566/17 - 3.2.02

D E C I S I O N
of Technical Board of Appeal 3.2.02
of 20 September 2022

Appellant: Toshiba Medical Systems Corporation
(Applicant) 1385, Shimoishigami,
Otawara-Shi, Tochigi-Ken 324-8550 (JP)

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Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted on 20 December
2016 refusing European patent application No.
09015316.4 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman M. Alvazzi Delfrate
Members: A. Martinez Möller
Y. Podbielski

Summary of Facts and Submissions

- I. The appeal is directed against the decision of the examining division to refuse European patent application No. 09 015 316.4. In that decision, the examining division found that the only request then on file did not fulfil the requirements of Articles 123(2), 84 or 83 EPC.
- II. In its statement of grounds of appeal, the appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the main request filed with the statement of grounds of appeal. The appellant requested oral proceedings as an auxiliary measure.
- III. In a communication under Article 15(1) RPBA 2020 dated 29 April 2022, the board indicated that among other issues, claim 1 of the main request contained subject-matter extending beyond the content of the application as filed. The communication highlighted that the wording "positions corresponding to centers of X-ray detection elements (5a)" as recited in the original claim 1 was not suitable for overcoming the objection of added subject-matter because it was unclear (see point 2.1 of the communication, in particular the third and fourth paragraphs).
- IV. In a submission dated 11 July 2022, the appellant filed a new set of claims to replace those of the previous main request and withdrew its request for oral proceedings.

V. Claim 1 of the main request (as filed on 11 July 2022) reads as follows:

"A medical image processing apparatus comprising:
a storage unit (12a) which is adapted to store data acquired by an X-ray CT apparatus;
a reconstruction unit (12) which comprises a back-projection unit (13) which is adapted to obtain back-projection data relating to each of a plurality of voxels defined in an imaging area by performing back projection of the acquired data and an interpolation unit (14) which is adapted to interpolate the data, and to perform reconstruction processing for an image;
and
a setting unit (16) which is adapted to, if a pitch of X-ray detection elements in a slice direction is equal to a pitch of the voxels in the slice direction, set central positions of the plurality of voxels in the imaging area in the reconstruction processing to positions offset from positions corresponding to centers of the X-ray detection elements (5a) of the X-ray CT apparatus in the slice direction by $1/4$ to $1/2$ the pitch of the voxels in the slice direction."

VI. The appellant's arguments, as far as they are relevant to the decision, can be summarised as follows:

Clarity

Claim 1 clearly defined how the Z-coordinate of the centre of each voxel was shifted in the event the pitch dZ of the voxels was the same as the pitch of the detection elements. It was evident that the "positions corresponding to centers of the X-ray detection elements" were the positions at which a centre of each voxel had the same Z-coordinate as a corresponding

detection element. This was the only sensible interpretation that would be taken into consideration by the person skilled in the art.

Reasons for the Decision

1. The invention

In cone beam computed tomography (CT), an X-ray beam with a conical shape is emitted towards a two-dimensional X-ray array detector, as shown in Figure 3 of the application which is reproduced below. Projection data is acquired while the X-ray source and the detector rotate around an object.

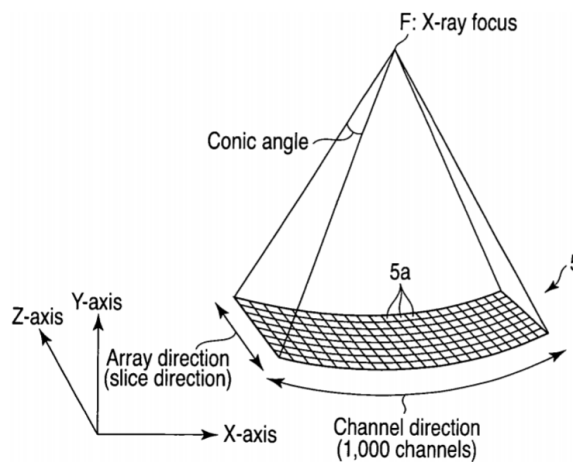


FIG. 3

In order to obtain a three-dimensional image from the acquired projection data, the projection data can be reconstructed using an image reconstruction method such as the Feldkamp (FDK) reconstruction method. This method is an approximate reconstruction algorithm in

which the degree of interpolation varies depending on the position of each detection element (reference sign 5a in Figure 3) in the slice direction. This may produce degradation of the reconstructed images manifesting as a cross-shaped artifact at the central position of maximum intensity projection (MIP) images.

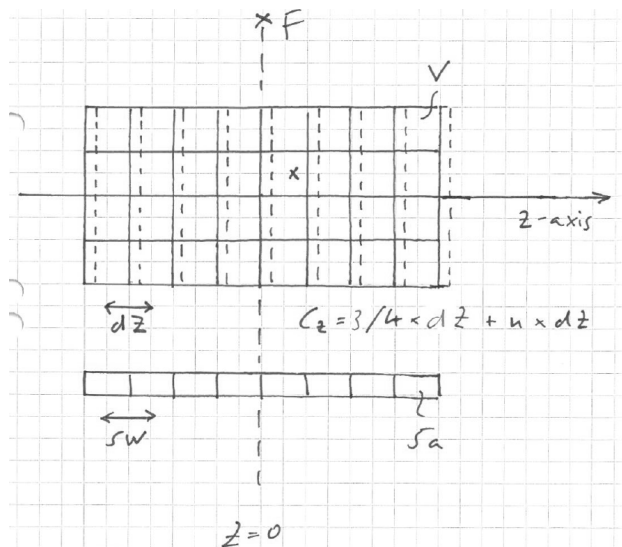
The invention addresses this issue in the reconstruction processing by determining whether the pitch of X-ray detection elements in the slice direction is equal to the pitch of the voxels in the slice direction and, if so, by setting central positions of the plurality of voxels in the imaging area to positions offset (in the slice direction) from positions corresponding to centres of the X-ray detection elements.

2. Clarity

2.1 As explained in point 2.1 of the communication of the board dated 29 April 2022, the meaning of "positions corresponding to centers of the X-ray detection elements" in claim 1 is not clear. The wording of the claim does not explain what is to be understood by "corresponding".

2.2 The appellant argued that the only sensible interpretation is that the "positions corresponding to centers of the X-ray detection elements" are the positions at which a centre of each voxel has the same Z-coordinate as a corresponding detection element 5a. This would be the voxel positions shown with solid lines in the figure reproduced below, which was filed by the appellant in the appeal proceedings, i.e. it does not form part of the application itself. It reflects a case where the pitch in the Z-axis of the

voxels is equal to the pitch in the Z-axis of the detector elements 5a.



2.3 However, this is not actually the only sensible interpretation of the wording in question. Indeed, as pointed out under point 2.1 of the board's communication, the description provides another possible definition for "positions corresponding to centers of the X-ray detection elements". In the introductory part thereof, the paragraph bridging pages 2 and 3 describes the correspondence between the central position of each voxel and the central position of a corresponding X-ray element as meaning that "the center of each voxel is defined on a line connecting a corresponding X-ray detection element and the X-ray focus".

2.4 The application provides a teaching along this same line when describing Figure 6, reproduced below. The position of the centre of a voxel corresponding to the centre of a corresponding X-ray detection element is described as being a position "located on a line segment passing through the center of a corresponding X-ray detection element 5a and the X-ray focus F, and

at the position where the line segment intersects the axis of rotation Z" (page 9, line 35, to page 10, line 3; see also page 9, lines 22-28, and the reference to Figure 4).

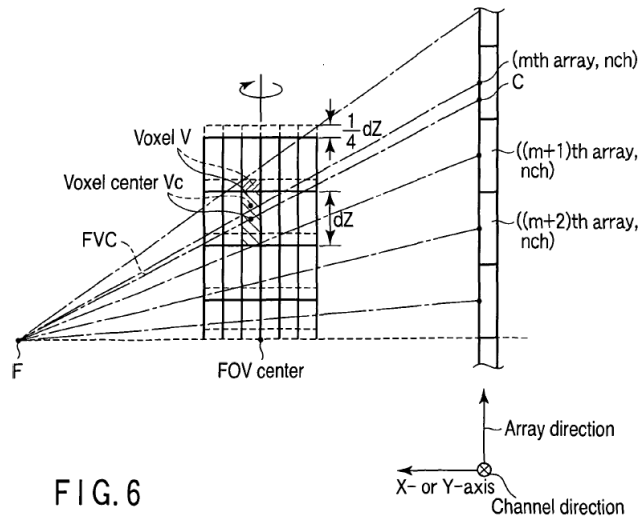


FIG. 6

2.5 Thus, the two parts of the description cited above describe the correspondence of positions using the imaging geometry with diverging X-rays from the focus towards the detector elements. In other words, whether the centre of a voxel is in a position corresponding to the centre of a detection element would depend not only on the respective Z-coordinates but also on the distance between the focus and the voxel and the distance between the focus and the detection element (see also Figure 14 and page 12, lines 23-33). The appellant's argument is not convincing also for this reason.

2.6 Since the meaning of "positions corresponding to centers of the X-ray detection elements" in claim 1 is not defined in the claim and can be interpreted in different ways, the claim lacks clarity.

3. It follows from the lack of clarity of claim 1 above that the main request does not comply with the requirements of Article 84 EPC and thus cannot be granted. Since it is the only request on file, the appeal is to be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



D. Hampe

M. Alvazzi Delfrate

Decision electronically authenticated