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Datasheet for the decision of 27 October 2017

Case Number: T 1400/16 - 3.2.02

Application Number: 10164299.9

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Language of the proceedings: EN

Title of invention:
Dental extraoral x-ray imaging system and method

Patent Proprietor:
Oy Ajat Ltd.

Opponent:
Clara Sattler de Sousa e Brito

Headword:

Relevant legal provisions:
EPC Art. 87(1), 54(1), 54(2), 84, 123(2), 123(3)

Keyword:
Clarity (yes)
Right of priority (main request - no; auxiliary request 4 - yes) - earlier application for the same invention
Novelty (main request - no)
Added subject-matter (auxiliary request 4 - no)
Extension of scope of protection (auxiliary request 4 - no)

Decisions cited:
T 1001/16, T 1921/16, G 0002/98, G 0001/03

Catchword:

Europäisches Patentamt
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Office européen des brevets

Beschwerdekammern

Boards of Appeal

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Case Number: T 1400/16 - 3.2.02

D E C I S I O N
of Technical Board of Appeal 3.2.02
of 27 October 2017

Appellant: (Opponent)	Clara Sattler de Sousa e Brito Schönfeldstr. 19 80539 München (DE)
Representative:	Ostertag & Partner Patentanwälte mbB Epplestraße 14 70597 Stuttgart (DE)
Respondent: (Patent Proprietor)	Oy Ajat Ltd. Tekniikantie 4B 02150 Espoo (FI)
Representative:	Seppo Laine Oy Itämerenkatu 3 B 00180 Helsinki (FI)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 18 March 2016 concerning maintenance of European Patent No. 2223653 in amended form**

Composition of the Board:

Chairman	E. Dufrasne
Members:	M. Stern
	D. Ceccarelli

Summary of Facts and Submissions

I. The opponent lodged an appeal against the decision, posted on 18 March 2016, concerning maintenance of European patent No. 2 223 653 in amended form.

II. The following documents are relevant for the present decision:

D4: US-A-2006/0203959 (US 11/277,530)
USPRE: US 60/677,020
E1: Shorter Oxford English Dictionary, sixth edition, 2007, Vol. 2, page 2964.

III. Notice of appeal was filed on 27 May 2016, and the fee for appeal was paid the same day. A statement setting out the grounds of appeal was received on 28 July 2016.

IV. Oral proceedings were held on 26 and 27 October 2017, during which appeals T 1001/16 and T 1921/16 were also heard; these concerned the patents granted on the parent and another divisional application respectively.

The appellant (opponent) requested that the decision under appeal be set aside and that the patent be revoked.

The respondent (patent proprietor) requested that the appeal be dismissed or, in the alternative, that the decision under appeal be set aside and that the patent be maintained on the basis of auxiliary request 4, filed with letter dated 21 December 2016. Auxiliary requests 1 to 3 and 5, filed with letter dated 21 December 2016, and auxiliary request 6, filed with letter dated 26 September 2017, were withdrawn.

V. Claim 1 of the **main request** (which was held allowable by the Opposition Division) reads as follows:

"An extra-oral dental x-ray imaging system comprising:
(a) an x-ray source (16) adapted for generating x-rays for exposure of such x-rays to an object to be imaged (19), which x-ray source (16) is adapted to move for the duration of the exposure;
(b) an x-ray imaging device (14) adapted for producing multiple overlapping frames (40) during at least part of the exposure;
(c) at least one rotational axis around which the x-ray source and imaging device move along a predetermined geometric path, the axis being located between the x-ray source (16) focal point (36) and the x-ray imaging device (14) and the predetermined geometric path being a spline, which is a non-circular trajectory;
(d) a preset program according to which said x-ray source and imaging device rotate along the predetermined geometric path and with a predetermined speed profile; and
(e) a processing device for utilising the produced multiple overlapping frames to compose by using a shift-and-add algorithm (26) both
i) an image of a predetermined panoramic layer (52) corresponding to said predetermined geometric path and predetermined speed profile, and
ii) an image of a different panoramic layer (99) or a part thereof, at least a portion in the different panoramic layer (99) having a focus depth different from a focus depth of a corresponding portion in the predetermined panoramic layer (52),
characterized in that, for the different panoramic layer (99) or the part thereof, the processing device is adapted to modify a shifting amount (76) between consecutive frames (40) in the shift-and-add algorithm

and automatically calculate a layer-of-best-focus (192) such that the system is adapted to select the layer-of-best-focus based on a sharpness measure (1130)."

VI. Claim 1 of **auxiliary request 4** reads as follows (amendments to claim 1 of the main request highlighted by the Board):

"An extra-oral dental x-ray imaging system comprising:
(a) an x-ray source (16) adapted for generating x-rays for exposure of such x-rays to an object to be imaged (19), which x-ray source (16) is adapted to move for the duration of the exposure;
(b) an x-ray imaging device (14) adapted for producing multiple overlapping frames (40) during at least part of the exposure;
(c) at least one rotational axis around which the x-ray source and imaging device move along a predetermined geometric path, the axis being located between the x-ray source (16) focal point (36) and the x-ray imaging device (14) and the predetermined geometric path being a spline, which is a non-circular trajectory;
(d) a preset program according to which said x-ray source and imaging device rotate along the predetermined geometric path and with a predetermined speed profile; and
(e) a processing device for utilising the produced multiple overlapping frames to compose by using a shift-and-add algorithm (26) both

i) an image of a predetermined panoramic layer (52) corresponding to said predetermined geometric path and predetermined speed profile with an original velocity v_{orig}, and

ii) an image of a different panoramic layer (99) or a part thereof, at least a portion in the different panoramic layer (99) having a focus depth different

from a focus depth of a corresponding portion in the predetermined panoramic layer (52),

characterized in that, for the different panoramic layer (99) or the part thereof, the processing device is adapted to modify a shifting amount (76) between consecutive frames (40) in the shift-and-add algorithm and automatically calculate a layer-of-best-focus (192) using an algorithm comprising the steps of:

setting a speed modifier Δv;

reconstructing the image of the different panoramic layer (99) or the part thereof with a new speed obtained by adding the speed modifier Δv to the original velocity v_{orig};

calculating a sharpness measure S(n) for the image of the reconstructed panoramic layer;

calculating a difference ΔS by deducting a previous sharpness measure S(n-1) from the sharpness measure S(n);

comparing the magnitude of the difference ΔS against a limit; and

if the magnitude of the difference ΔS is less than the limit, then showing the image of the reconstructed panoramic layer; and

if the magnitude of the difference ΔS is not less than the limit, then calculating a new speed modifier ΔV and returning to the step of reconstructing the image of the different panoramic layer (99) or the part thereof,

whereby ~~such that the~~ system is adapted to select the layer-of-best-focus based on a sharpness measure (1130)."

Claims 2 to 7 are dependent claims.

VII. The arguments of the appellant which are relevant for the present decision may be summarised as follows:

Main request

- Clarity (Article 84 EPC)

The expression "a spline, which is a non-circular trajectory" was unclear as it could be understood in different ways. On the one hand, it could be understood as limiting spline trajectories to those which were non-circular. On the other hand, it could be interpreted as providing a "legal definition" of the term spline, identifying a spline with a non-circular trajectory. Moreover, the claimed expression was unclear since it did not specify whether the entire trajectory, or merely a portion of it, should be a spline.

- Priority right

Priority could not be validly claimed from D4 since the same applicant had already disclosed the same invention in the previous application US 60/677,020 (USPRE). In particular, USPRE directly and unambiguously disclosed that the trajectory of the x-ray source and imaging device was a non-circular spline trajectory. The panoramic layers shown in Figures 3 and 7 were smooth curves without sharp turns or kinks, thus having continuous derivatives. The direction of radiation was disclosed to be perpendicular to the panoramic layers (page 16, paragraphs 4 and 5; Figure 3). Hence, the x-ray source and imaging device moved on a non-circular spline trajectory. It followed that D4 was comprised in the state of the art. It was undisputed that D4 anticipated the subject-matter of claim 1 of the main request.

Auxiliary request 4

- Article 123(2), (3) EPC

The selection of the layer of best focus had been defined in claim 1 of auxiliary request 4 on the basis of what Figure 8d disclosed. However, the claim did not include the step of selecting a region of interest ROI of Figure 8d.

In claim 1 of the patent as granted (feature (e)), the shift-and-add algorithm was defined as composing a predetermined panoramic layer and a different panoramic layer. In claim 1 of auxiliary request 4, instead, the shift-and-add algorithm was defined as composing *an image of* a predetermined panoramic layer and *an image of* a different panoramic layer. These amendments created an aliud which shifted the scope of protection, contrary to Article 123(3) EPC.

- The priority claim to D4 was not disputed and thus no novelty objection was based on D4. There were no objections regarding the novelty and inventive step of the claimed subject-matter.

VIII. The arguments of the respondent which are relevant for the present decision may be summarised as follows:

Main request

- Clarity (Article 84 EPC)

According to E1, the mathematical meaning of the term "spline" was "a continuous curve constructed so as to pass through a given set of points and have continuous first and second derivatives". The term had been

claimed in the patent as granted and was therefore not to be objected to for lack of clarity. The presently claimed expression "a spline, which is a non-circular trajectory" could be given no meaningful reading other than that of a non-circular spline trajectory.

- Priority right

Priority was claimed from US 11/277,530, i.e. document D4. This was the first application for the claimed subject-matter within the meaning of Article 87(1) EPC. The earlier provisional application US 60/677,020 (USPRE) did not directly and unambiguously disclose that the trajectory of the x-ray source and imaging device was a non-circular spline trajectory. USPRE was therefore not the first application for which full priority was claimed. The relevant criteria for establishing which was the first application were given in G 3/93, G 2/98 and G 1/03. The question of "partial priority" addressed in the impugned decision with reference to G 1/15 was of no relevance in the present case since no partial, but full priority was being claimed from D4.

USPRE did not disclose whether the layers illustrated in Figures 3 and 7 were formed using a smooth non-circular trajectory. USPRE did in particular not rule out that the panoramic images of Figure 7 could have been obtained with a circular trajectory, which was one of the alternatives specified in claim 1 of USPRE. According to page 16, paragraph 5, the transversal layer did not have to be strictly parallel to the direction of radiation, but could also be "close to parallel". Figure 3 and its description on page 3, paragraphs 4 and 5 did not describe an embodiment of

the invention, but referred to prior-art orthopantomographs (OPG).

It followed that USPRE did not directly and unambiguously disclose that the trajectory of the x-ray source and imaging device was a non-circular spline. Consequently, D4 was the first application within the meaning of Article 87(1) EPC, from which the patent validly claimed its priority. D4 therefore did not constitute prior art.

Auxiliary request 4

- Article 123(2), (3) EPC

The characterising portion of claim 1 defined the algorithm as calculating the layer of best focus based on page 20, lines 20 to 28 of the application as filed, with each of the steps shown in the flow diagram in Figure 8d. The step of reconstructing the image of a part of a different panoramic layer included the step of selecting a region of interest ROI of Figure 8d. There was therefore no addition of subject-matter. Moreover, the fact that the claim added the limitation of "an image of" panoramic layers resulted in a restriction, rather than an extension of the scope of protection.

Reasons for the Decision

1. The appeal is admissible.

2. Main request

2.1 Clarity (Article 84 EPC)

2.1.1 The invention concerns a dental panoramic x-ray imaging system having an x-ray source and an imaging device which move around the patient’s head according to a predetermined geometric path and speed profile (paragraph [0010] of the patent; Figure 3). The movement is such that an image of a predetermined layer of interest is formed. The invention allows the x-ray scan to be performed by moving the x-ray source and imaging device in a continuous movement around the patient’s head (paragraph [0030]).

The movement is defined in claim 1 (feature (c)) by specifying a "rotational axis around which the x-ray source and imaging device move along a predetermined geometric path, the axis being located between the x-ray source focal point and the x-ray imaging device and the predetermined geometric path being a spline, which is a non-circular trajectory".

2.1.2 The appellant objected that the definition of the motion along a path being "a spline, which is a non-circular trajectory" lacked clarity. However, since claim 1 of the granted patent already defined the motion along a path being "a spline", the notion of a "spline" by itself cannot be objected to as lacking clarity. Only the qualification of a spline as one "which is a non-circular trajectory", which was added during opposition proceedings, may be challenged as lacking clarity. Hence, the appellant's contention that the claim lacked clarity because it did not specify whether the entire trajectory, or merely a portion of it, should be a spline is not to be examined as it refers exclusively to the feature of a spline trajectory, not to the added qualification that it should be a non-circular one.

2.1.3 It is common general knowledge that a "spline" is a continuous curve having continuous derivatives. This concept corresponds, for example, to the definition in the Shorter Oxford English Dictionary (E1) and the Wikipedia article "Spline (mathematics)" filed with the statement of grounds of appeal. In essence, "spline" designates a smooth curve, without sharp turns or kinks (as in a "V"-shaped curve).

Hence, a "spline" has an established recognised mathematical meaning in the field. The appellant has nevertheless argued that the claimed expression "a spline, which is a non-circular trajectory" could be interpreted as providing a "legal definition" of the term spline such that a spline is a trajectory which is non-circular.

The Board views this interpretation, however, as a contrived interpretation of the term "spline", at odds with its established recognised mathematical meaning in the field. The skilled person would consequently not read the claimed expression in such a way. As explained in the patent as granted (page 8, lines 26 to 28), the movement along a spline can be either a circular or a non-circular trajectory, and in the presently pursued claim 1 the movement of the x-ray source and imaging device is limited to a non-circular trajectory. Hence, the claimed expression of "a spline, which is a non-circular trajectory" can be given no meaningful reading other than that of a non-circular spline trajectory.

2.1.4 The Board therefore concludes that the qualification of a spline as one "which is a non-circular trajectory", added during opposition proceedings, does not infringe the clarity requirements of Article 84 EPC.

2.2 Priority right

2.2.1 It is undisputed by the parties that application US 11/277,530, from which the patent claims its priority, is represented by document D4. It is likewise undisputed that if the claim to priority fails, D4 is comprised in the state of the art within the meaning of Article 54(2) EPC (as it was published on 14 September 2006, before the 10 November 2006 filing date of the parent of the divisional application leading to the patent in suit) and that, in that case, D4 is novelty-destroying.

2.2.2 What was disputed, however, is whether priority could be validly claimed from D4 since the same applicant had already disclosed the same invention in the earlier previous application US 60/677,020 (USPRE). USPRE had been filed on 2 May 2005, i.e. before the 27 March 2006 filing date of D4 and about 18 months before the 10 November 2006 filing date of the parent of the divisional application leading to the patent in suit.

2.2.3 According to Article 87(1) EPC, only the first application filed in a state party to the Paris Convention or a member of the WTO can form the basis for a priority right. Therefore, if apart from the application whose priority is being claimed in the patent (in this case D4), an earlier previous application had also been filed (in this case USPRE), in order to check the validity of the priority claim it must be established whether the invention claimed in the patent was already disclosed in the earlier previous application (USPRE).

To establish whether the invention claimed in the patent was already disclosed in the earlier previous application, USPRE, the same principles have to be applied as when establishing identity of invention between the application forming the basis for priority and the application claiming priority. The question is whether the person skilled in the art could derive the subject-matter of the claim of the patent directly and unambiguously, using common general knowledge, from the earlier previous application USPRE (G 2/98, OJ 2001, 413). As confirmed in G 1/03, point 4 of the Reasons, the disclosure as the basis for the right to priority under Article 87(1) EPC and as the basis for amendments to an application under Article 123(2) EPC has to be interpreted in the same way.

2.2.4 The respondent disputed that USPRE directly and unambiguously disclosed that the trajectory of the x-ray source and imaging device was a non-circular spline trajectory.

2.2.5 In the Board's view such a trajectory is disclosed in USPRE for the following reasons:

USPRE discloses in claim 1 that the x-ray source and imaging device rotate on a circular or non-circular trajectory. USPRE does not explicitly mention that the trajectory is a spline, i.e. essentially a smooth curve without sharp turns or kinks, as explained under point 2.1.3 above.

However, the Board considers that from what is disclosed on page 16, paragraphs 4 and 5 in connection with Figure 7, such a trajectory inevitably occurs in USPRE as well. This passage explains that a transversal layer is obtained, the layer being transversal to the

panoramic images which follow the contour of the jaw and parallel to the direction of radiation. Thus, the direction of radiation will be perpendicular to the panoramic images or layers which are illustrated in Figure 7. This is what Figure 3 illustrates too, albeit with reference to prior-art orthopantomographs (OPG), in which the perpendicularity of the center of the x-ray beam to the panoramic layer is expressly indicated by a graphical symbol denoting perpendicularity. Moreover, in the description of Figure 3, on page 3, paragraphs 4 and 5, it is mentioned that the movement of the x-ray source and imaging device is synchronised so that the imaging device surface normal is perpendicular to the layer of interest, i.e. the panoramic layer.

The respondent held the view that USPRE disclosed on page 16, paragraph 5, that the transversal layer did not have to be strictly parallel to the direction of radiation, but could be just "close to parallel". In the Board's view, this possibility (mentioned in parentheses after the feature "parallel") addresses the fact that for a fan-type x-ray beam, as depicted in Figure 3, only the center ray will be strictly perpendicular to the panoramic layer, while the rays of the periphery of the beam will be only substantially perpendicular to it.

The jaw of a patient has a roughly horseshoe-shaped contour, which is clearly non-circular, particularly in its lateral portions. Hence, if a circular trajectory of the x-ray source and imaging device were used, as suggested by the respondent, the direction of the x-rays would not be perpendicular to the panoramic layers which follow the contour of the jaw. Moreover, the panoramic layers shown in Figure 7 of USPRE, as well as

in Figure 3, are undoubtedly smooth curves without sharp turns or kinks, thus having continuous derivatives. Hence, since the x-rays are emitted perpendicularly to these curves, the x-ray source and imaging device will likewise move along a smooth trajectory.

2.2.6 The Board therefore finds that from the explicit direct and unambiguous disclosure of the movement of the x-ray source and imaging device in USPRE, the skilled person would conclude that the movement inevitably occurs along a non-circular spline. This is consequently no new information over what is explicitly disclosed. The respondent has identified no other feature in claim 1 of the main request which goes beyond the subject-matter disclosed in USPRE.

2.2.7 As the person skilled in the art derives the subject-matter of claim 1 of the main request directly and unambiguously, using common general knowledge, from the earlier previous application USPRE, D4 is not the first application within the meaning of Article 87(1) EPC and thus does not form the basis for a priority right.

Consequently, D4 is comprised in the state of the art within the meaning of Article 54(2) EPC.

2.3 Novelty

As it is undisputed that D4 discloses the subject-matter of claim 1 of the main request, the novelty requirement of Article 54(1) EPC is not fulfilled.

3. Auxiliary request 4

3.1 Article 123(2), (3) EPC

3.1.1 Claim 1 of auxiliary request 4 in its characterising portion defines the algorithm as calculating the layer of best focus disclosed on page 20, lines 20 to 28 of the application as filed with each of the steps shown in the flow diagram in Figure 8d. Consequently, the objection of an unallowable intermediate generalisation of the disclosure of original page 20, lines 20 to 28, as raised with regard to the subject-matter of claim 1 of the main request is hereby overcome.

3.1.2 Claim 1 of auxiliary request 4 explicitly includes the step of reconstructing the image of either a different panoramic layer or a part thereof. According to page 20, lines 23 to 27, selecting a part (98) of an image involves the selection of a region of interest by the dentist. Hence, contrary to the appellant's assertion, the step of selecting a region of interest, as included in the flow diagram of Figure 8d, is likewise contained in the step of reconstructing a part of the different panoramic image recited in claim 1.

3.1.3 Hence, the requirements of Article 123(2) EPC are complied with.

3.1.4 In claim 1 of the patent as granted (feature (e)), the shift-and-add algorithm is defined as composing a predetermined panoramic layer and a different panoramic layer. In claim 1 of auxiliary request 4, instead, the shift-and-add algorithm is defined as composing *an image* of these panoramic layers.

However, in the Board's view, the skilled person would naturally understand the "panoramic layers" defined in the patent as granted as the panoramic *images* of these layers. The Board therefore considers that specifying an image of these layers does not extend the scope of protection of the patent as granted.

Hence, the requirements of Article 123(3) EPC are complied with.

3.2 The appellant explicitly stated during the oral proceedings that there were no objections concerning the novelty and inventive step of the subject-matter claimed in auxiliary request 4. In particular, for this request the appellant did not contest the priority claim to document D4, admitting that D4 did not constitute prior art. The Board sees no objections either.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance with the order to maintain the patent on the basis of:

   - claims 1 to 7 of auxiliary request 4 filed with letter dated 21 December 2016;

   - description pages 2 to 7, 10 and 11 of the patent as granted and pages 8, 8A and 9 filed during oral proceedings; and

   - Figures 1 to 8h (12 pages) of the patent as granted.

The Registrar: The Chairman:

D. Hampe E. Dufrasne

Decision electronically authenticated