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Datasheet for the decision of 7 August 2014

Case Number: T 2109/10 - 3.2.02

Application Number: 04819588.7

Publication Number: 1706035

IPC: A61B6/14

Language of the proceedings: EN

Title of invention:
DENTAL RADIOLOGY APPARATUS AND SIGNAL PROCESSING METHOD USED THEREWITH

Patent Proprietor:
Carestream Health, Inc.

Opponent:
Sirona Dental Systems GmbH

Headword:

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - auxiliary request (yes)

Decisions cited:

Catchword:

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Case Number: T 2109/10 - 3.2.02

D E C I S I O N
of Technical Board of Appeal 3.2.02
of 7 August 2014

Appellant: (Patent Proprietor)	Carestream Health, Inc. 150 Verona Street, MC=01135 Rochester, New York 14608 (US)
Representative:	Santarelli 49, avenue des Champs Elysées 75008 Paris (FR)
Respondent: (Opponent)	Sirona Dental Systems GmbH Fabrikstrasse 31 64625 Bensheim (DE)
Representative:	Sommer, Peter PRIO Patentanwälte Augustaanlage 22 68165 Mannheim (DE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 5 August 2010 concerning maintenance of the European Patent No. 1706035 in amended form.**

Composition of the Board:

Chairman	E. Dufrasne
Members:	C. Körber
	D. Ceccarelli

Summary of Facts and Submissions

I. On 5 August 2010 the Opposition Division posted its interlocutory decision concerning maintenance of European patent No. 1706035 in amended form.

II. An appeal was lodged against this decision by the patent proprietor by notice received on 13 October 2010, with the appeal fee being paid on the same day. The statement setting out the grounds of appeal was received on 14 December 2010.

III. By communication of 18 March 2014, the Board forwarded its provisional opinion to the parties and summoned them to oral proceedings.

IV. Oral proceedings were held on 7 August 2014.

The final requests of the parties were as follows:

The appellant (patent proprietor) requested that the decision under appeal be set aside and that the patent be maintained as granted or, in the alternative, on the basis of one of auxiliary request I, filed during oral proceedings, and auxiliary requests II to VI, filed with letter dated 14 December 2010.

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

V. The following documents are of importance for the present decision:

E1: EP-A-0 858 111;
E2: US-A-5 912 942;
E3: US-A-5 434 418;

E4: M. Shinohara et al.: "A bipolar imager with bipolar field memory", Proc. 1997 IEEE Workshops on CCDs and Advanced Image Sensors, June 5-7, 1997, pages R8-1 to R8-4.

VI. Claim 1 of the patent as granted reads:

"Dental radiology apparatus, characterized in that it comprises an intraoral sensor intended to receive x-rays that have passed through at least one tooth, said sensor including:
- an x-ray to visible radiation converter,
- a detector comprising an active pixel array produced using biCMOS technology on a substrate made of semi-conductor material,
- a sequencer capable of generating several control signals to control the active pixel array, said sequencer being integrated on the same substrate as the array."

Claims 2 to 5 are dependent claims.

Claim 1 of auxiliary request I reads:

"Dental radiology apparatus, comprising an intraoral sensor (14) intended to receive x-rays that have passed through at least one tooth, said sensor including:
- an x-ray to visible radiation converter (18),
- a detector (22) comprising an active pixel array produced using biCMOS technology on a substrate made of semi-conductor material,
- a sequencer (30) capable of generating several control signals to control the active pixel array, said sequencer being integrated on the same substrate as the array, the sequencer being capable of receiving the signals Clk-x, Clk-y and Sync-y external to the sensor

and from which all the array control signals are generated by the sequencer, the signal Clk-x being a clock signal which acts to pilot the array's column shift registers (78), the signal Clk-y being the control signal of the array's row shift registers (72), the control signal Sync-y acting to initialize the reading of the array."

Claims 2 to 4 are dependent claims.

VII. The appellant's arguments are summarised as follows:

Document E2 did not disclose an intraoral dental sensor. In column 8, lines 44 to 46, mammographic and dental applications were mentioned, but the stated pixel sizes indicated that the array was not at all designed for an intraoral purpose. Moreover, the presence of an analog-to-digital converter as shown in Figure 6B rendered the sensor too bulky for intraoral applications. Similarly, the fact that the active pixel sensor (APS) array was self-scanning required the detector to include a microprocessor and a memory which also increased its bulkiness. The large number of pins mentioned in column 8, lines 53 to 55 was an indication that a large number of signals were transmitted, with the risk of signal pollution and deterioration of the signal-to-noise ratio (SNR), which was also undesirable for an intraoral sensor.

Furthermore, E2 failed to disclose that the sensor was produced using biCMOS technology. This made it possible to optimise the pixel's fill factor and the SNR and to reduce the x-ray doses to which the patients were exposed. Since the essence of the invention disclosed in E2 resided in replacing the then known charge-coupled devices (CCDs) by an active pixel sensor device

made by CMOS technology, as emphasised throughout the whole document and constituting a feature of all its independent claims, there was no incentive for the skilled person to replace this technology. Also, there was no reason for the skilled person to turn to documents E1 or E4. E1, which disclosed an APS array made with biCMOS technology, did not concern a dental detector and left it entirely open which type of electromagnetic radiation (UV, IR, x-rays, visible light etc.) was to be detected. E1 did not deal with the issue of devising a dental detector providing more accurate data signals and requiring reduced x-ray doses. Accordingly, claim 1 of the patent as granted was inventive.

The sequencer of claim 1 of auxiliary request I was capable of receiving the signals Clk-x, Clk-y and Sync-y external to the sensor and of generating all the array control signals from only these three signals. It was thereby possible to reduce the number of signals that had to be received from outside the sensor, thus reducing the risks of signal pollution and of deterioration in the detector's SNR. Moreover, since only these three signals had to be transmitted to the sensor, a more flexible cable could be used for their transmission, which was particularly advantageous for intraoral applications of the sensor. None of the cited documents gave a hint towards the claimed solution and the advantages achievable thereby.

VIII. The respondent's arguments are summarised as follows:

Document E2 contemplated intraoral imaging, at least to the extent that E3 was referenced in line 66 of column 1 to line 3 of column 2. Furthermore, claim 1 of the main request did not contain a single feature that

was particularly related to intraoral dentistry. The appellant's arguments that biCMOS technology permitted a less bulky dental sensor, better fill factor, or better sensitivity were not sufficiently supported by the disclosure to enable the skilled person to achieve these goals. And even if the arguments were to be considered as relevant, they only seemed useful as support for industrial utility, not inventive step. In any case, the selection of biCMOS was nothing more than a simple design choice.

Concerning auxiliary request I, a more flexible cable was not part of the main claim, which included no cable at all, and it was unclear what more flexibility meant.

Reasons for the Decision

1. The appeal is admissible.

2. Inventive step

2.1 Main request

2.1.1 Document E2 undisputedly represents the closest state of the art and discloses the features acknowledged in paragraphs 7 and 8 of the amended description of the patent in suit. In contrast to the appellant's view, the Board considers that the sensor disclosed in E2 is "intraoral" since in the paragraph bridging columns 1 and 2 reference is made to three documents all disclosing intraoral sensors, the first of which (US-A-160 997) is "incorporated by reference" and thus part of the disclosure of E2. There is nothing in E2 that would suggest that the disclosed sensor is not suitable for intraoral application. The respective

arguments presented by the appellant are not convincing. With a pixel size of less than 50µm (column 8, lines 42 to 45), the sensor is sufficiently small for this purpose. An integrated analog-to-digital converter is not necessarily required since it is only part of the preferred embodiment of Figure 6B referred to in the paragraph bridging columns 10 and 11, but it is not present in the embodiment of Figure 6A. Similarly, even if the event detection technique described in the passage from column 9, line 19 to column 10, line 35 might imply the presence of a microprocessor and a memory, this technique is also only part of the preferred embodiment according to Figure 4B. Also, the number of pins stated in column 8, lines 53 to 55, as providing an input/output interface, without giving any further details, cannot be seen as implying that the sensor is not suitable for intraoral applications.

Accordingly, the subject-matter of claim 1 differs from E2 only in that the active pixel array is produced using **bi**CMOS technology.

2.1.2 According to the appellant, using biCMOS technology for producing the active pixel array makes it possible to reduce the x-ray doses to which the patients are exposed, without compromising the image quality. However, the patent in suit does not mention any specific advantages when it addresses this feature in paragraphs [0038] and [0055] to [0058]. It is not apparent, and nor has it been demonstrated, that the claimed advantages over the CMOS technology known from E2 are actually achieved by using biCMOS. Accordingly, the technical problem underlying this feature is merely to find a further, alternative technology for producing the active pixel array.

2.1.3 Detectors for electromagnetic radiation with active pixel arrays made by biCMOS technology were generally known to the skilled person, for instance from E1 (paragraph bridging pages 6 and 7). The fact that E1 does not relate to dental detectors and fails to specify that x-ray radiation is detected does not mean that the skilled person would not turn to such a document, contrary to the appellant's view. When looking for alternative technologies for producing the active pixel array, the skilled person would not limit his search to the field of dental detectors but would consider further technical developments relating to its components, as disclosed in E1. For the skilled person it is also not necessary that the kind of electromagnetic radiation, i.e. x-ray radiation, is specifically addressed in this context in order to consider the teaching of this document.

2.1.4 The fact that the invention described in E2 starts from x-ray detectors with CCDs and attempts to overcome associated disadvantages by using CMOS APSs instead of CCDs does not mean that the skilled person would not consider APSs manufactured by a technology other than CMOS. The core of the invention of E2 resides in the use of APSs, and the fact that it is mentioned (column 3, lines 31 to 36) that standard CMOS techniques are available for their manufacture does not imply any limitation to only this technique.

2.1.5 Accordingly, the subject-matter of claim 1 of the main request is obvious from E2 in view of E1 and therefore does not involve an inventive step within the meaning of Article 56 EPC.

2.2 Auxiliary request I

Claim 1 requires the "sequencer (30) being capable of receiving the signals Clk-x, Clk-y and Sync-y external to the sensor and from which all the array control signals are generated by the sequencer". As correctly stated by the appellant, this implies that only these three external signals are needed for the array control. This feature is not disclosed in E2. E2 teaches that the APS is self-scanning and contains on-chip all of the circuitry required to control the exposure and readout of the image (column 8, 6th paragraph), either incorporating discrete event trigger diodes (Figure 4A and column 8, lines 56 et seq.) or without such diodes (Fig. 4B and column 9, lines 19 et seq.). From none of these embodiments (and from nowhere else in E2) can it be inferred that all the array control signals are generated by the sequencer from three signals (Clk-x, Clk-y and Sync-y as defined in claim 1) received externally to the sensor.

The technical effects underlying this distinguishing feature, i.e. the restricted number of transmitted external signals, are reduced noise due to cross-talk and thus an improved signal-to-noise ratio, and allowing the use of a more flexible cable with a small number of wires, as explained in paragraphs [0069] to [0073] of the patent in suit.

The objective technical problem is to provide a dental radiology apparatus with improved image quality and with an intraoral sensor which minimises inconvenience to the patient.

None of the available prior-art documents gives a hint towards a sequencer that is capable of receiving the signals Clk-x, Clk-y and Sync-y externally to the sensor and generating therefrom all the array control signals, let alone the underlying objective problem as mentioned above. Contrary to the respondent's view, it is not necessary that the advantages achieved by the distinguishing features, e.g. a more flexible cable with a small number of wires, are recited in the wording of the claim.

Accordingly, the subject-matter of claim 1 of auxiliary request I involves an inventive step within the meaning of Article 56 EPC.

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 4 of auxiliary request I filed during oral proceedings;

   - columns 1 to 22 of the adapted description filed during oral proceedings; and

   - figures 1a to 16 of the patent as granted.

The Registrar: The Chairman:

D. Hampe E. Dufrasne

Decision electronically authenticated