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Aktenzeichen / Case Number / N° du recours : T 206/89 - 3.5.1

Anmeldenummer / Filing No / N° de la demande : 83 102 787.5

Veröffentlichungs-Nr. / Publication No / N° de la publication : 0 089 665

Bezeichnung der Erfindung: Subtraction processing method and apparatus for radiation images
Title of invention:
Titre de l'invention :

Klassifikation / Classification / Classement : H04N 5/32

## ENTSCHEIDUNG / DECISION
vom / of / du 11 July 1990

Anmelder / Applicant / Demandeur :

Patentinhaber / Proprietor of the patent / Titulaire du brevet : Fuji Photo Film Co., Ltd.

Einsprechender / Opponent / Opposant : Siemens AG

Stichwort / Headword / Référence :

EPÜ / EPC / CBE Article 56

Schlagwort / Keyword / Mot clé : "inventive step - no (main request)"
"remittal to Opposition Division (auxiliary requests)"

**Leitsatz / Headnote / Sommaire**

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Case Number : T 206/89 - 3.5.1

# D E C I S I O N
of the Technical Board of Appeal
of 11 July 1990

Appellant : (Opponent)
Siemens Aktiengesellschaft
Berlin und München
Postfach 22 16 34
D-8000 München 22

Representative :
Siemens Aktiengesellschaft
Berlin und München
Postfach 22 16 34
D-8000 München 22

Respondent : (Proprietor of the patent)
Fuji Photo Film Co., Ltd.
No. 120, Nakanuma
Minawi Ashigara-shi
Kanagawa
Japan

Representative :
Patentanwälte Grünecker, Dr. Kinkeldey
Dr. Stockmaier, Dr. Schumann
Jakob, Dr. Bezold
Meister, Hilgers, Dr. Meyer-Plath
Maximilianstrasse 58
D-8000 München 22

Decision under appeal : **Decision of the Opposition Division of the European Patent Office dated 19 January 1989 rejecting the opposition filed against European patent No. 0 089 665 pursuant to Article 102(2) EPC.**

**Composition of the Board :**

Chairman : P.K.J. van den Berg
Members : W.J.L. Wheeler
F. Benussi

## Summary of Facts and Submissions

I. The grant of European patent No. 89 665 on the Respondent's European patent application No. 83 102 787.5, which was filed on 21 March 1983 claiming priority from six previous applications in Japan (of which the earliest are JP 45473/82 and JP 45475/82, both dated 20 March 1982), was published on 8 October 1986.

II. Claim 1 of the granted patent is worded as follows:

"1. A subtraction processing method for radiation images according to which at least one stimulable phosphor sheet (A, B) is exposed to a radiation (2) transmitting through an object (1), so as to form a radiation image of said object on said phosphor sheet (A, B), scanning said stimulable phosphor sheet with stimulating rays (11) to convert said radiation image into light (13) emitted from said stimulable phosphor sheet (A, B) upon stimulation thereof, photoelectrically reading out (15) the amounts of said emitted light and converting (15) them into image signals, characterised in that two or more stimulable phosphor sheets (A, B) are exposed to the radiation transmitting through the object (1) under conditions different from one another to have at least two radiation images (4A, 4B) of said object (1), wherein at least a part of image information is different among said radiation images (4A, 4B) recorded on said stimulable phosphor sheets (A, B), converting (15, 16) the amounts of light emitted from at least two stimulable phosphor sheets (A, B) into digital image signals, and conducting subtraction (17) of said digital image signals between the corresponding picture elements of said radiation images to obtain a signal for forming an image of a specific

structure contained in at least one of said radiation images."

The patent as granted includes further method claims 2 to 15, all of which are dependent on claim 1, and apparatus claims 16 and 17.

III. On 30 June 1987 the Appellant filed an admissible opposition, requesting revocation of the patent on the ground that its subject-matter was not patentable within the terms of Articles 52 to 57 EPC. Of the prior art documents cited during the proceedings before the Opposition Division, only the following are relevant to the present appeal:

D1: DE-Buch Das Röntgenfernsehen von A. Gebauer et al, Georg Thieme Verlag Stuttgart 1974, pages 119 - 123, Subtraktion;
D2: EP-A-0 031 952.

IV. By a decision dispatched on 19 January 1989, the Opposition Division rejected the Opposition. In the reasons for that decision, it was considered that D1 related to subtraction radiography (two different images) using normal photographic film, which normally required high doses of radiation, whereas D2 related to single image radiography using a stimulable phosphor sheet, which normally required low doses of radiation. The Opposition Division concluded that it was not obvious to combine the teachings of D1 and D2.

V. On 17 March 1989 the Appellant filed a notice of appeal against that decision and paid the appeal fee. A written statement setting out the grounds of appeal was filed on 17 May 1989. Further prior art was cited, which, however, as noted in paragraph 4 below, does not need to be considered in the present decision.

VI. In a letter dated 22 December 1989, the Respondent requested that the further prior art be disregarded as being belatedly filed and that oral proceedings be appointed if the patent could not be maintained as granted.

VII. Oral proceedings were held before the Board on 11 July 1990.

The Appellant showed the Board a copy of the book from which D1 was taken, to confirm that it was published in 1974, and argued essentially as follows: the method claimed in Claim 1 of the patent in suit differed from Borgman's flying spot method, as described in D1, only in that stimulable phosphor sheet was used instead of photographic film and in that the image signals were digitalised. Stimulable phosphor sheet was not in practical clinical use in radiography at the time when D1 was written. D2 disclosed that it was advantageous to use stimulable phosphor sheet as an alternative to photographic film in radiography. According to D2 the phosphor sheet was scanned with a flying spot to obtain an image signal which was then digitalised. A blurred version (Sus) of the original image signal (Sorg) was then derived and subtracted from the original image signal. This was subtraction radiography with digitalised image signals. It was obvious to the skilled man to update the teaching of D1 with that of D2 and thereby arrive at the method claimed in Claim 1 of the patent in suit.

The Respondent argued essentially that conventional X-ray film had an exponential sensitivity characteristic, which adversely affected the quality of the subtraction image. The present invention exploited the linear sensitivity

characteristic of phosphor sheet to give a better subtraction image. None of the documents cited concerning phosphor sheet mentioned the advantage of its linear characteristic. The Respondent demonstrated the improved quality by showing the Board examples of subtraction images obtained using film and phosphor sheet. In support of a first auxiliary request, according to which the features of Claim 8 as granted would be incorporated in Claim 1, see paragraph X below, the Respondent pointed out that the images stored on the phosphor sheets could not be seen with the human eye, causing difficulty in alignment of the images. The respondent was prepared to cancel the apparatus claims if necessary.

VIII. The Appellant requested that the decision under appeal be set aside and that the patent be revoked.

IX. The Respondent requested that the appeal be dismissed and that the patent be maintained as granted (main request), or maintained on the basis of claims 1 to 16 filed during the oral proceedings (first auxiliary request), or maintained on the basis of claims 1 to 14 filed during the oral proceedings (second auxiliary request). It was noticed that in claim 1 filed during the oral proceedings, part of claim 1 as granted (see lines 9 to 19 of the second column on page 23 of the printed patent specification) had been accidentally omitted. The auxiliary requests are to be construed as if the omitted passage were present.

X. Claim 1 of the auxiliary requests is worded as follows:

"1. A subtraction processing method for radiation images according to which at least one stimulable phosphor

sheet (A, B) is exposed to a radiation (2) transmitting through an object (1), so as to form a radiation image of said object on said phosphor sheet (A, B), scanning said stimulable phosphor sheet with stimulating rays (11) to convert said radiation image into light (13) emitted from said stimulable phosphor sheet (A, B) upon stimulation thereof, photoelectrically reading out (15) the amounts of said emitted light and converting (15) them into image signals, characterised in that two or more stimulable phosphor sheets (A, B) are exposed to the radiation transmitting through the object (1) under conditions different from one another to have at least two radiation images (4A, 4B) of said object (1), wherein at least a part of image information is different among said radiation images (4A, 4B) recorded on said stimulable phosphor sheets (A, B), converting (15, 16) the amounts of light emitted from at least two stimulable phosphor sheets (A, B) into digital image signals, and conducting subtraction (17) of said digital image signals between the corresponding picture elements of said radiation images to obtain a signal for forming an image of a specific structure contained in at least one of said radiation images, said method further comprising the steps of:

i) when each radiation image to be subtraction processed is recorded on each stimulable phosphor sheet (105), simultaneously recording a marker (102A, 102B) having such a shape as to provide a reference point (102A', 102B') or a reference line to said stimulable phosphor sheet (105) in a position fixed with respect to said radiation image (103'),

ii) scanning said stimulable phosphor sheet (105) carrying said radiation image (103') stored therein with stimulating rays, and detecting the spacial

coordinate of said reference point (102A', 102B') or said reference line provided by said marker (102A, 102B) from the digital image signal of said image detected from the light emitted from said stimulable phosphor sheet (105),

iii) conducting the steps i) and ii) for said two or more radiation images to be subtraction processed,

iv) calculating a rotation and a shift among said two or more radiation images based on the respective reference points (102A', 102B') or reference lines corresponding to said two or more radiation images (103') to be subtraction processed,

v) when said rotation exists, rotating digitally either one of said radiation images to be subtraction processed, and/or
when said shift exists, moving digitally either one of said radiation images to be subtraction processed, and
conducting a subtraction processing of the image signal value among the corresponding picture elements of said two or more radiation images to be subtraction processed."

**Reasons for the Decision**

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is, therefore, admissible.

2. The first substantive point to be decided is whether the method claimed in claim 1 of the opposed patent involves an inventive step over the prior art according to D1 and D2.

2.1 D1 discloses several methods for subtraction X-ray radiography using photographic film. In particular, it appears that Borgman's flying spot method, described in D1 on page 119, second column, paragraph 2, with reference to figure 101 b on page 120 (and noting the reference to the previous paragraph for the details of the signal processing), and at page 119, second column, 4th paragraph, to page 121, first column, line 3, is the best starting point from which to consider the present invention.

2.2 In Borgman's method two sheets of X-ray photographic film are exposed to radiation transmitting through an object under conditions different from one another to form respective radiation images of the object on the sheets, wherein at least a part of the image information is different between the images recorded on the sheets (compare the images shown on the two sheets in figure 101 b). The sheets are scanned with flying spot light beams to convert the radiation images into intensity-modulated light beams, which are photoelectrically detected and converted into analog image signals. Subtraction is performed on the image signals between corresponding picture elements of the radiation images to obtain a signal for forming an image of a specific structure contained in one of the radiation images.

2.3 D1 does not mention that stimulable phosphor sheet might be used as an alternative to photographic film, or that the image signals might be digital.

2.4 It therefore appears to the Board that the method claimed in claim 1 of the patent in suit differs from Borgman's method in that (a) stimulable phosphor sheet is used instead of photographic film, the scanning being

appropriately adapted, and (b) the image signals are digitalised.

2.5 D2 discloses that it is advantageous to use stimulable phosphor sheet as an alternative to photographic film in radiography, see D2, page 1, line 21 to page 2, line 6, where it is said that the image is recorded over a very wide range of radiation exposure, which is particularly valuable for medical diagnosis. In the method disclosed in D2 the phosphor sheet is scanned with a flying spot to obtain an image signal which is then digitalised by an A/D converter (6, Figure 1). An unsharp version (Sus) of the digitalised image signal (Sorg) is then derived (8a) and subtracted from the original digitalised image signal (Sorg). The resulting difference signal is subjected to further digital processing before being converted to an analog signal by a D/A converter (9). Finally the difference image is recorded on photographic film (13).

2.6 Although the method disclosed in D2 may be regarded as a sort of subtraction radiography with digitalised image signals, it is noted that both the signals Sorg and Sus are derived from one and the same radiation image, and not from respective different radiation images as required by claim 1 of the opposed patent.

2.7 Nevertheless, the Board agrees with the Appellant that, in view of the advantages of stimulable phosphor sheet stated in D2, it would be obvious to the skilled person to try to obtain those advantages in Borgman's method by adapting it to use stimulable phosphor sheets instead of photographic film, even though he may not have appreciated the significance of the linear sensitivity characteristic of phosphor sheet. Furthermore, given the widespread use of digital processing, it is obvious to digitalise the image

signals before subtraction and possible further processing. This is done in the method disclosed in D2.

2.8 The Opposition Division apparently attached some importance to the different radiation doses required by phosphor sheet and conventional film, arguing that this made it less obvious to apply the teaching of D2 to that of D1.

However, in the opinion of the Board, if a lower X-ray dose is possible with stimulable phosphor sheet, that would provide an additional incentive to use it, rather than a reason not to use it, since it is obviously desirable to expose the patient to the lowest X-ray dose possible. The desirability of low doses is mentioned in D2, page 2, lines 8 to 13.

2.9 The Board therefore concludes that it was obvious to update the teaching of D1 in the light of D2, resulting in a method falling within the scope of claim 1 of the opposed patent. Thus, the method claimed in claim 1 as granted does not involve an inventive step within the meaning of Article 56 EPC and ground (a) in Article 100 EPC prejudices maintenance of the opposed patent in the form in which it was granted. The Respondent's main request must therefore be rejected.

3. Regarding the Respondent's auxiliary requests, it appears that they raise matters which have not been considered by the Opposition Division, in view of their decision to reject the opposition. In order to avoid loss of an instance, the Board makes use of its power under Article 111(1) EPC to remit the case to the first instance for further prosecution on the basis of the Respondent's auxiliary requests.

4. Given the findings expressed in paragraphs 2.9 and 3 above, it is not necessary for the Board to consider in the present decision any of the other documents cited by the opponent.

**Order**

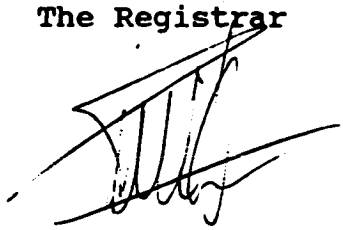
**For these reasons, it is decided that:**

1. The decision under appeal is set aside.

2. The Respondent's main request is rejected.

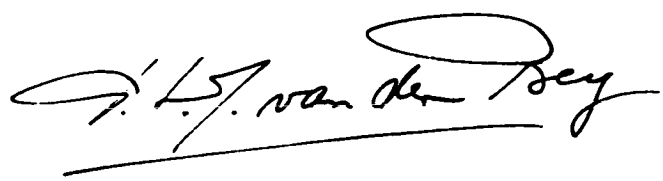
3. The case is remitted to the first instance for further prosecution on the basis of the Respondent's auxiliary requests (paragraphs IX and X above).

The Registrar



M. Kiehl

The Chairman



P.K.J. van den Berg