BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

Publication in the Official Journal Yes / No

File Number: T 950/90 - 3.4.1

Application No.: 85 112 938.7

Publication No.: 0 177 973

Title of invention: Method of recording and reproducing images produced by an electron microscope

Classification: H01J 37/22

D E C I S I O N
of 2 July 1992

Applicant: FUJI PHOTO FILM CO., LTD.

Headword:

EPC Articles 56, 111, 114

Keyword: "Inventive step - yes in respect of document considered by the Examining Division"
"Non-obvious application of a known material"
"Relevant documents from companion application introduced into these proceedings"
"Remittal for further examination"

Headnote

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number : T 950/90 - 3.4.1

D E C I S I O N
of the Technical Board of Appeal 3.4.1
of 2 July 1992

Appellant : FUJI PHOTO FILM CO., LTD.
210 Nakanuma
Minamiashigara-shi
Kanagawa-ken, 250-01 (JP)

Representative : Kador & Partner
Corneliusstrasse 15
W - 8000 München 5 (DE)

Decision under appeal : **Decision of Examining Division of the European Patent Office dated 20 June 1990 refusing European patent application No. 85 112 938.7 pursuant to Article 97(1) EPC.**

Composition of the Board :

Chairman : G.D. Paterson
Members : R.K. Shukla
Y. van Henden

Summary of Facts and Submissions

I. European patent application No. 85 112 938.7, was filed on 11 October 1985 and claims multiple priority dates, the earliest priority date of 12 October 1984 being based on Japanese patent applications JP 214680/84 and JP 214681/84, respectively. The above application was refused by a decision of the Examining Division on the ground that the claimed subject-matter did not involve an inventive step having regard to the disclosure in the prior art document D1 - EP-A-0 077 677.

II. The Applicant lodged an appeal against this decision and presented essentially the following arguments in support of the patentability of the subject-matter of Claim 1 in the Statement of Grounds of Appeal filed on 20 October 1990:

In the impugned decision the problem addressed by the present application has not been correctly identified, and also the assessment of the disclosure in the prior art document D1 is incorrect.

Document D1 is mainly concerned with an X-ray image read-out method for medical diagnosis in which a first read-out of the as-taken picture of a patient is carried out using a stimulating ray having energy lower than that used for the final read- out. The method thus enables optimum setting of read-out parameters for high diagnostic efficiency and accuracy. The application in suit, on the other hand, concerns setting of focus or field of an electron microscope, both of which pertain to features upstream of the phosphor sheet in the electron microscope.

In document D1 reference is made to beta rays in connection with stimulable phosphors. However, this in itself does not suggest to a skilled person that the conventional image sensor of an electron microscope might be replaced by a stimulable phosphor sheet.

The Appellant requested that the decision of the Examining Division be set aside and that a patent be granted on the basis of the application documents forming the basis of the contested decision (main request), or that as an auxiliary request, Claim 1 filed on 11 December 1990, replacing Claim 1 of the main request, should be considered for the grant of a patent.

III. During an oral hearing held on 5 March 1992 in respect of European patent application No. 85 115 653.9 (appeal No. T 747/90) before the present Board, the present Appellant, who is also the Applicant/Appellant in the above mentioned appeal case, filed the following document, which had been published after the filing date of the application in suit, to demonstrate high sensitivity of an imaging plate, similar to the one employed in the present invention, to an electron beam in a transmission electron microscope, in comparison with a conventional photographic film which is normally used in a conventional transmission electron microscope:

A2: Proc. XIth Int. Cong. on Electron Microscopy, Kyoto, 1986; "Application of "Imaging Plate" For Recording Transmission Electron Microscope Image", T. Oikawa et al., pp. 439-440.

A further document

A3: Journal of Electron Microscopy, Vol. 33, No. 3, 1984, pp. 255-257, S. Ichihara et al.," Usefulness of a

Scanning Laser Stimulated Luminescence (SLSL) System for Electron Microscopy - A New Image Recording System"

was cited in a footnote in document A2; in view of its possible relevance as prior art in that case, the above mentioned appeal proceedings were suspended in order that this document should be supplied by the Appellant. This was duly done.

IV. Independent Claim 1 of the main request reads as follows:

"A method of recording and reproducing an image produced by an electron microscope, which microscope is provided with means for adjusting focus and field, comprising the steps of:

i) exposing a two-dimensional stimulable phosphor sheet under vacuum to an election beam having passed through a specimen to record at least one first magnified image of the specimen on the phosphor sheet;

ii) applying a stimulating energy to said phosphor sheet for discharging light therefrom which represents said first magnified image or images;

iii) photoelectrically detecting the light discharged from said phosphor sheet to produce a first electric signal and processing said first electric signal to produce said first magnified image or images;

iv) adjusting the focus and/or field of the electron microscope in response to observation of said first magnified image or images;

v) thereafter exposing a two-dimensional stimulable phosphor sheet under vacuum to an electron beam having passed through said specimen to record a second magnified image of the specimen on the phosphor sheet;

vi) applying a stimulating energy to said phosphor sheet for discharging light therefrom which represents said second magnified image; and

vii) photoelectrically detecting the light discharged from said phosphor sheet to produce a second electric signal and processing said second electric signal to produce said second magnified image as a final image obtained with the adjusted focus and/or field."

In the auxiliary request, the only change in Claim 1 is that the feature (i) after the wording "through a specimen" reads as follows:

"...to record a plurality of first magnified images of the specimen on the phosphor sheet with different focused conditions and/or different fields;"

Reasons for the Decision

1. Procedural matters

In the present appeal documents A2 and A3 have been examined by the Board of its own motion pursuant to Article 114(1) EPC, and since they are both considered to be relevant for the examination of the patentability of the present invention, they are introduced in the present proceedings, and are considered further below. Document A2 even though not part of the prior art is relevant to the assessment of inventive step having regard to the disclosure in D1 (this being the ground on which the application was refused by the Examining Division). Document A3 may be a further relevant prior art document.

2. The principal issue initially raised in this appeal is the question of inventive step in the light of document D1.

2.1 As acknowledged in the description of the present application on pages 2 and 3, in a known method of recording and reproducing images produced by an electron microscope, a transmitted magnified image of a specimen is recorded on a photographic film, and the recorded image is then subjected to tone processing, frequency emphasis, density processing or additive processing. Also, as is well known, a conventional transmission electron microscope is normally provided with a viewing fluorescent screen so that in order to record a focused image of a certain feature of interest of the specimen on a photographic film, the image needs to be first focused and the field of observation selected on the viewing screen.

2.2 The method as defined in Claim 1 of the main request differs from the above state of the art in that (a) a first non focused image of the specimen is recorded on a stimulable phosphor sheet; (b) the recorded image is read using stimulating energy and then reproduced, as set out in paragraphs (ii) and (iii) of the claim, and (c) a stimulable phosphor sheet is used to record the final focused image, and the final read out of the stored image and its reproduction as set out in paragraphs (vi) and (vii) are then carried out.

2.3 As is evident from the description on page 4, lines 7 to 11 and 15 to 19 of the application in suit, the present invention has the advantage over the prior art in that the stimulable phosphor sheet exhibits high sensitivity to an electron beam so that it is possible to focus an image or select a field without damaging the specimen.

In document A2 (which was published shortly after the date on which the application in suit was filed) results of comparative tests using a conventional photo film,

namely, FUJI FG film, employed in a conventional transmission electron microscope and an imaging plate (IP) developed by FUJI and comprising a coating of photostimulable phosphor are reported. It is evident from the results that the IP has a sensitivity to an electron beam about three orders higher than that of a then currently conventional photo film. The document does not explicitly disclose that the FUJI FG film represents a typical or best prior art film in so far as sensitivity to an electron beam is concerned. Nonetheless, for a scientific experimental investigation of the type reported in the document, this is normally the case, so that the Board has no reason to doubt that the FUJI FG film represents the best prior art. In the present invention a stimulable phosphor sheet similar to the one used in document A2 is employed as an imaging plate, so that the Board accepts that the two-dimensional stimulable phosphor sheet employed in the present invention also exhibits a high degree of sensitivity to an electron beam.

2.4 Starting with the above prior art, the objective problem facing the skilled person can, therefore, be seen as providing a method of recording and reproducing electron microscope images, wherein an imaging or recording means having high sensitivity to an electron beam (such as described in document A2) is employed so that delicate biological specimens are not damaged during focusing or field search.

2.5 Document D1 relates, in general, to an image read-out method in which a stimulable phosphor sheet is used to record a radiation image. Although various types of radiation, including Beta-rays, are mentioned in connection with certain kind of phosphors in the introduction of the document, the image read-out method specifically described in the document deals exclusively

with recording of an X-ray image. In the preliminary image read-out operation, an X-ray image stored in a stimulable phosphor sheet (103, Figure 1) is scanned with a stimulating radiation to obtain a visible image. The image input information obtained from the preliminary visual image is then used to set the conditions for the final read-out of the residual image in the phosphor sheet. The stimulating radiation in the final read-out has a higher energy than in the preliminary read-out operation. The X-ray images obtained using this method are stated to exhibit a high contrast, high sharpness and low noise (page 3, lines 4 to 5). However, the sensitivity of the phosphor sheet to X-rays is not mentioned.

Admittedly, a person skilled in the art would have learnt from document D1 that certain kind of phosphors when exposed to Beta-rays store a part of the energy of the incident radiation, and subsequently emit light when stimulated by a suitable radiation. Further, the energy of Beta rays is known to vary over a wide range, for example, between 0.018 MeV (for tritium) and 1.4 MeV (for sodium-24), so that the energy of an electron beam normally employed in a transmission electron microscope falls within this range. In the Board's view, therefore, the skilled person would have also expected that the stimulable phosphor would be sensitive to an electron beam in a transmission electron microscope. Nevertheless, in the Board's view, the degree of sensitivity reported in document A2 is about three orders higher than that of a conventional photo film and is truly surprising, and it was not obvious to the skilled person that such a high sensitivity could be achieved by the use of a stimulable phosphor sheet in a transmission electron microscope.

2.6 Thus the ground on which the Examining Division refused the application in suit cannot be supported by the Board

of Appeal, and the decision under appeal will therefore be set aside.

3. Document A3 has not been considered by the Examining Division in connection with the application in suit. It appears to the Board that it may (or may not) form part of the state of the art under Article 54(2) EPC, and therefore, may (or may not) be relevant when considering whether the requirements of Article 52 to 57 EPC have been met. The Board, in exercise of its power under Article 111(1) EPC, has therefore decided to remit the case to the first instance for further examination in this respect.

Order

For these reasons, it is decided that:

1. The decision of the Examining Division dated 25 June 1990 is set aside.

2. The case is remitted to the first instance for further examination.

The Registrar: The Chairman:

M. Beer G.D. Paterson