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Datasheet for the decision of 29 January 2014

Case Number: T 0587/10 - 3.4.02

Application Number: 05780156.5

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Title of invention:
METHOD AND APPARATUS FOR FLUORESCENT CONFOCAL MICROSCOPY

Applicant:
GE Healthcare Niagara Inc.

Headword:

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - (yes)

Decisions cited:

Catchword:

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Case Number: T 0587/10 - 3.4.02

D E C I S I O N
of Technical Board of Appeal 3.4.02
of 29 January 2014

Appellant: (Applicant)	GE Healthcare Niagara Inc. 2300 Meadowvale Boulevard Mississauga ON L5N 5P9 (CA)
Representative:	Sörby, Lennart GE Healthcare Bio-Sciences AB Patent Department Björkgatan 30 751 84 Uppsala (SE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 3 November 2009 refusing European patent application No. 05780156.5 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman: A. Klein
Members: F. Maaswinkel
D. Rogers

Summary of Facts and Submissions

I. The appellant lodged an appeal against the decision of the examining division, refusing the European patent application 05780156.5. This patent application relates to an apparatus for confocal fluorescent microscopy.

According to the decision, the subject-matter of method claim 1 did not involve an inventive step within the meaning of Article 56 EPC having regard to the disclosure in document D1 and ordinary skill:

D1: WO-A-2004/038461.

II. With the letter containing the grounds of appeal the appellant requested to set aside the decision. According to the appellant, the disclosure in document D1 did not represent a proper starting point for the discussion of inventive step since it taught away from the technique of line confocal microscopy. Instead document D2 (US2003/0036855-A1) should be selected as the closest prior art. This disclosure was reflected in the two-part form of claim 1 according to the First Auxiliary Request.

III. In a Communication pursuant to Rule 100(2) EPC the board concurred with the position of the appellant that document D2 disclosed the closest prior art and indicated several formal deficiencies in the application documents on file.

IV. With a subsequent letter dated 7 December 2013 the appellant filed amended description pages and confirmed that the claims of the First Auxiliary request should

replace the former Main Request. It was requested that a patent be granted based on the following documents:

Claims: 1 to 12 of the "Auxiliary request 1" filed with the Grounds of Appeal of 3 March 2010;
Description: pages 2, 4, 5, 7 to 9, 11 to 16, 18 to 23 as published;
page 1 filed with the letter of 11 December 2007;
pages 3, 3a, 6, 10, 17, 24 filed with the letter of 7 December 2013;
Drawings: sheets 1/2 to 2/2, as published.

V. The wording of independent claim 1 reads as follows:

" An apparatus for confocal fluorescent microscopy comprising:

at least one optical source (1.1, 1.2, 1.3) which provides excitation radiation to an illumination zone on a target (9),

a line forming element (4) and a scanning module (6) to illuminate and scan an illumination zone in the form of a line within an imaging area of the target (9),

and at least one detector (16) placed in a position optically conjugated to the imaging area which detects fluorescent emission from the target (9) and which comprises one or more two dimensional pixel-based optical receivers,

characterized in that,
the optical receiver is capable of independent reset and readout of the pixels and is arranged to be operated in a rolling shutter mode in synchronization with the scanning of the illumination zone, and

the rolling shutter is line shaped and has a width of less than or equal to the width of the illumination zone optically conjugated to the optical receiver ".

Claims 2 to 12 are dependent claims.

VI. The appellant's arguments may be summarised as follows:

In its decision the examining division has selected document D1 as the closest prior art on the basis that it has the most relevant features in common with claim 1. The technical difference between the apparatus of claim 1 and the one disclosed in D1 is that it comprises a line forming element and that the optical receiver is operated in a rolling shutter mode wherein the shutter is line shaped and has a width of less than or equal to the width of the illumination zone optically conjugated to the optical receiver. However, document Dl directly and unambiguously teaches away from using a line-scan confocal technique, as this "sacrifices flexibility in picking sites-of-interest" (see D1, page 1, line 30). Moreover, the wording "random access" in the title of document D1 and repeatedly stressed as a key feature of the microscope of D1 effectively teaches away from the line scanning technique, as such an approach eliminates random access of predetermined points or regions. Therefore this document does not relate to "the same purpose or effect" in the field of confocal microscopes and the person skilled in the art would not consider employing the teaching of D1 for designing a line confocal microscope. Therefore D1 should not be considered as the closest prior art.

Instead document D2, which discloses a conventional

line confocal microscope, should be selected as closest prior art, as it has more relevant features in common with claim 1 compared with D1. Moreover, D2 relates more closely to the same purpose or effect of providing full frame images by means of line confocal scanning. It should be noticed that D2 discloses in par. [0119] an embodiment wherein the physical spatial filter is omitted and "a line camera is used as a combined detection spatial filter and detection device".

The technical difference between the apparatus of claim 1 and the disclosure in document D2 is that it comprises an optical receiver that is capable of independent reset and readout of the pixels that is operated in a rolling shutter mode, and wherein the shutter is line shaped and has a width of less than or equal to the width of the illumination zone optically conjugated to the optical receiver. This eliminates the need to "descan" the radiation from the sample in order to direct the same on a stationary slit for reducing radiation from unwanted positions and the optics needed to achieve this. Starting from the disclosure in document D2, the objective technical problem may be formulated as how to reduce the complexity and increase the flexibility of the line scan apparatus.

Document D2 does not suggest to solve this problem in the manner as defined in claim 1, because the detection devices disclosed in D2 consist either of a rectangular 2d CCD sensor, see par. [0115], which is used as a line camera and which can also be used as a combined spatial filter and detector; or of a full 2d sensor (par. [0114]), but which is referred to as disadvantageous due to unnecessary complexity and the additional time required to read the sensor. Hence document D2 does not suggest to use an optical receiver that is capable of

independent reset and readout of the pixels that is operated in a rolling shutter mode, and wherein the shutter is line shaped and has a width of less than or equal to the width of the illumination zone optically conjugated to the optical receiver. Therefore the claimed subject-matter is novel and involves an inventive step.

VII. The response of the appellant to the board's communication - see points III and IV above - was filed outside of the time limit for responding. The appellant therefore filed requests for further processing under Article 121 EPC and for re-establishment of rights under Article 122 EPC and paid the appropriate fees.

Reasons for the Decision

1. The appeal is admissible.

2. Amendments

The board is satisfied that the present application documents comply with the formal provisions of the EPC.

3. Further processing

The remedy of further processing under Article 121 EPC applies to the appellant's failure to respond in due time to the board's communication - see points III and VII above. The board finds that the appellant has met all of the requirements for further processing. The appellant has therefore unnecessarily filed a request for re-establishment of rights - see point VII above. The board therefore orders the reimbursement of the fee for re-establishment of rights.

4. Patentability

4.1 Novelty

4.1.1 In the decision under appeal no objections pertaining to lack of novelty have been raised. The examining division based its analysis of patentability on the disclosure in document D1.

Referring to Figures 1 and 2 of document D1 and the description on page 4, lines 24 - 29 the examining division identified the following features of claim 1 in document D1:
- An apparatus for confocal fluorescent microscopy comprising an optical source (laser 10) which provides excitation radiation to an illumination zone (site-of-interest 35) on a target (specimen 30);
- a scanning module (AOD 20) to scan an illumination zone within an imaging area of the target (30);
- a detector (CMOS sensor 80, Figure 2) placed in a position optically conjugated to the imaging area which detects fluorescent emission from the target (30) and which comprises one or more two dimensional pixel-based optical receivers (page 6, lines 12 and 13); wherein
- the optical receiver is capable of independent reset and readout of the pixels and is arranged to be operated in synchronization with the scanning of the illumination zone.

The subject-matter of claim 1 differs from the apparatus disclosed in document D1 in that the apparatus comprises a line forming element to illuminate the illumination zone in the form of a line, and that the optical receiver is arranged to be operable in a rolling shutter mode which is line shaped

and has a width of less than or equal to the width of the illumination zone optically conjugated to the optical receiver.

4.1.2 Document D2, see figure 6 and para [0077], discloses an apparatus for confocal fluorescent microscopy comprising:
- an optical source (400 or 410) which provides excitation radiation to an illumination zone on a target (sample well 482);
- a line forming element (cylindrical lens 420) and a scanning module (well plate 482 movable in X and Y directions) to illuminate and scan an illumination zone in the form of a line within an imaging area of the target (482);
and at least one detector (520) placed in a position optically conjugated to the imaging area which detects fluorescent emission from the target (482) and which comprises one or more two dimensional pixel-based optical receivers (*one or two dimensional camera, see para [0080]*).

4.1.3 The subject-matter of claim 1 differs from this microscope by the features of the characterising portion of the claim:
- the optical receiver is capable of independent reset and readout of the pixels and is arranged to be operated in a rolling shutter mode in synchronization with the scanning of the illumination zone; and
- the rolling shutter is line shaped and has a width of less than or equal to the width of the illumination zone optically conjugated to the optical receiver.

4.1.4 Therefore the subject-matter of claim 1 is novel over the disclosures in documents D1 and D2. The further

documents cited in the International Search Report disclose remote subject-matter.

4.2 Inventive step

4.2.1 In its decision the examining division considered that, starting from the disclosure in document D1, the subject-matter of claim 1 did not involve an inventive step. In particular the technical problem to be addressed would be "providing a illumination technique that allows a fast data acquisition of a large area of interest". In the opinion of the examining division, the skilled person would, in order to solve this problem, implement a line-scan technique which was known in the field of confocal microscopes, for instance from document D2. Once he had decided to implement a line-scan illumination in the microscope of document D1 the further features of claim 1, in particular the rolling shutter mode, would necessarily be implemented too.

4.2.2 According to the appellant, document D1 did not represent a proper starting point for the discussion of inventive step for the present patent application since it taught against the use of a line-scan confocal technique and pursued a different technical problem of increasing the scan rate capability.

4.2.3 The board concurs with the appellant that the focus in the disclosure of document D1 is rather on the capability of random access and selectivity of sites of interest (*see: title of document D1; page 1, line 15: Field of the Invention; page 2, lines 14 - 17*). This random access possibility enables to use a faster scan rate (*page 2, lines 21 - 25*). According to D1, see page 1, lines 28 - 31 a line-scan technique, in which data

from pixels lying on a single line are recorded could be used but this still suffers from a rather slow scan technique and sacrifices flexibility in picking sites-of-interest. In fact, document D1 considers the use of a line-scan technique for its particular purpose as disadvantageous. Hence for the subject-matter of present claim 1 which defines an apparatus for confocal fluorescent microscopy including a line forming element and a scanning module to illuminate and scan an illumination zone in the form of a line this document D1 does not disclose an apparatus of the same type or pursuing a similar purpose, therefore in the board's opinion this document does not disclose a proper starting point for the discussion of inventive step.

4.2.4 Instead document D2 is regarded as the closest prior art, because it is related to a "laser linescan confocal microscope" (*see Abstract*). The board also concurs with the appellant that the objective technical problem may be formulated as how to reduce the complexity and increase the flexibility of the line scan apparatus.

4.2.5 In the opinion of the board, document D2 does not give any suggestions to modify the optical receiver/ detection device disclosed in that document to a receiver as defined in the characterising portion of present claim 1: as disclosed at page 17, 1st to 3d paragraphs of the published patent application, the detector is capable of independent reset and readout of pixels (*random access feature*). In particular because of the control mechanism of the rolling shutter (*or focal-plane shutter*) mode the readout of the line of illuminated pixels is carried out in synchronisation with the scanning line. This arrangement differs from the detector devices disclosed in para [0112] to [0121]

of document D2 which preferably employs a continuous-read line camera comprising a rectangular CCD (*para [0015], see also Fig.11a*).

4.2.6 This rolling shutter mode is also not disclosed or suggested in document D1, which rather relies on random access and readout of individual pixels (*page 6, lines 10* - 19).

4.2.7 Therefore the board finds that the subject-matter of claim 1 is novel and involves an inventive step.

5. Claims 2 to 12 are dependent claims and are equally allowable.

6. For the above reasons, the board finds that the appellant's request meets the requirements of the EPC and that a patent can be granted on the basis thereof.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to grant a patent based on the following documents:

Claims: 1 to 12 of the "Auxiliary request 1" filed with the Grounds of Appeal of 3 March 2010;
Description: pages 2, 4, 5, 7 to 9, 11 to 16, 18 to 23 as published;
page 1 filed with the letter of 11

December 2007;
pages 3, 3a, 6, 10, 17, 24 filed with the letter of 7 December 2013;
Drawings: sheets 1/2 to 2/2, as published.

3. The fee for re-establishment of rights under Article EPC is reimbursed.

The Registrar: The Chairman:

M. Kiehl A.G. Klein

Decision electronically authenticated