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**Datasheet for the decision  
of 11 February 2016**

**Case Number:** T 2344/10 - 3.4.02

**Application Number:** 06784541.2

**Publication Number:** 1889037

**IPC:** G01N21/47, G01N21/45,  
G01N21/49, G01B9/02

**Language of the proceedings:** EN

**Title of invention:**

APPARATUS, METHOD AND SYSTEM FOR PERFORMING PHASE-RESOLVED  
OPTICAL FREQUENCY DOMAIN IMAGING

**Applicant:**

THE GENERAL HOSPITAL CORPORATION

**Relevant legal provisions:**

EPC 1973 Art. 84, 54(1)  
EPC Art. 123(2), 52(1)

**Keyword:**

Clarity and novelty - (main request: no)  
Added subject-matter - (auxiliary request: yes)



**Beschwerdekammern**  
**Boards of Appeal**  
**Chambres de recours**

European Patent  
Office  
D-80298 MUNICH  
GERMANY  
Tel. +49 (0) 89 2399-0  
Fax +49 (0) 89  
2399-4465

Case Number: T 2344/10 - 3.4.02

**D E C I S I O N**  
**of Technical Board of Appeal 3.4.02**  
**of 11 February 2016**

**Appellant:** THE GENERAL HOSPITAL CORPORATION  
(Applicant) 55 Fruit Street  
Boston, MA 02114 (US)

**Representative:** Lawrence, John  
Barker Brettell LLP  
100 Hagley Road  
Edgbaston  
Birmingham B16 8QQ (GB)

**Decision under appeal:** **Decision of the Examining Division of the  
European Patent Office posted on 14 July 2010  
refusing European patent application No.  
06784541.2 pursuant to Article 97(2) EPC.**

**Composition of the Board:**

**Chairwoman** T. Karamanli  
**Members:** F. Maaswinkel  
F. J. Narganes-Quijano

## Summary of Facts and Submissions

- I. European patent application No. 06784541.2 relating to phase-resolved optical frequency domain imaging was refused in the decision, posted on 14 July 2010, of the examining division on the ground that the subject-matter of claim 1 of the main request then on file lacked novelty (Article 54 (1) EPC) over the disclosure in document D1 (WO2005/047813) and that the claims of the auxiliary request did not meet the requirement of inventive step (Article 56 EPC) in view of the obviousness of their subject-matter over the disclosure of document D1.
- II. Against this decision the applicant (appellant) lodged an appeal which was received on 14 September 2010. The fee for the appeal had been paid on the same day. In the letter of 18 November 2010 setting out the grounds of appeal the appellant requested that a patent be granted on the basis of the Main Request or the Auxiliary Request. Alternatively, oral proceedings were requested.

The documents of these Requests are:

Main Request: Claims 1 to 26, filed with the letter of 19 May 2010 (labelled in the letter "*Second Auxiliary Request*");

Auxiliary Request: Claims 1 to 16, filed with telefax on 22 June 2010 (labelled in the telefax "*Third Auxiliary Request*");

for both Requests:

Description:

pages 1, 2, 4 - 11 as published;

pages 12 - 18, filed with telefax on 8 October 2009;

pages 3, 3a and 3b, filed with telefax on 19 May 2010;

Drawings:

sheets 2/15 - 10/15 and 15/15 as published;  
sheets 11/15- 14/15 filed with telefax on  
8 October 2009;  
sheet 1/15 filed with telefax on 19 May 2010.

III. The wording of claim 1 according to the Main Request reads as follows:

"An apparatus comprising:

at least one first arrangement (560) configured to provide a radiation which includes at least one first electro-magnetic radiation directed to a sample and at least one second electro-magnetic radiation directed to a reference, wherein a frequency of the radiation provided by the at least one first arrangement varies over time; and

at least one second arrangement (575, 580) configured to detect an interference between at least one third radiation associated with the at least one first radiation and at least one fourth radiation associated with the at least one second radiation, wherein the at least one second arrangement (575, 580) is configured to obtain a particular signal associated with at least one phase of at least one frequency component of the interference, and compare the particular signal to at least one particular information."

IV. The wording of claim 1 according to the Auxiliary Request reads as follows:

"An apparatus comprising:

at least one first arrangement (85, 135; 550, 560; 600, 605) configured to provide a radiation which includes at least one first electromagnetic radiation directed to a sample (590; 650) and at least one second

electro-magnetic radiation directed to a reference, wherein a frequency of the radiation provided by the at least one first arrangement varies over time; and

at least one second arrangement (185, 190a, 190b, 195; 575, 580; 635, 640) configured to detect an interference between at least one third radiation associated with the at least one first radiation and at least one fourth radiation associated with the at least one second radiation,

wherein the at least one second arrangement is configured to obtain a particular signal associated with at least one phase of at least one frequency component of the interference, and compare the particular signal to at least one particular information;

characterised in that the apparatus further comprises a third arrangement (165a, 145, 150, 155, 160; 595, 596; 610, 615, 620) configured to generate an intensity-modulated optical signal from a portion of the first radiation, to generate a calibration signal from the intensity-modulated optical signal and to output the calibration signal to the second arrangement, the second arrangement being configured to obtain the particular signal using the calibration signal."

The wording of the remaining claims is not relevant for the purpose of the present decision.

V. In support of its requests the appellant developed the following arguments in its grounds of appeal:

In the Decision, the Examining Division refused the application on the basis of the main request (originally submitted as the second auxiliary request) on the ground of lack of novelty. The Examining Division concluded that a system disclosed in D1, specifically the system shown in Figure 10A of D1 and described in the

associated text, had all the features recited in claim 1 of the main request, and that D1 also anticipated the method of claim 14 of the main request. However, it was submitted that this conclusion was incorrect at least because the system of Figure 10A of D1 did not possess the structure recited in the final limitation of that claim 1. This document did not disclose any comparison of a particular signal that was associated with at least one phase of at least one frequency component of the detected interference, much less such comparison with at least one particular information, as specified in claim 1 of the main request. Although the term "particular information" could be construed broadly, nonetheless D1 had absolutely no mention of a comparison of a signal associated with at least one phase of at least one frequency component of the detected interference to any signal or information whatsoever.

Furthermore the system of D1, Figure 10A, identified the phase difference between electromagnetic radiations, and not the frequency components of the detected interference. Thus, D1 compared the radiations irrespective of whether any interference of such signals occurred, and therefore D1 did not disclose the comparison of at least one phase of at least one frequency component of any detected interference with any particular information, as required by claim 1 of the main request.

Further, in the Decision, the Examining Division contended that the comparison of the particular signal associated with at least one phase of at least one frequency component of the interference to some information was carried out by the comparator 360 of D1. Indeed, the Examining Division alleged that such comparison was performed by this comparator 360.

However, that comparator 360 only compared two different interferences in a time domain. In contrast, independent claim 1 of the main request recited a comparison of a particular signal associated with at least one phase of at least one frequency component of the interference with at least one particular information. It was clear that the comparison performed by the second arrangement as recited in these independent claims was performed in a frequency domain. In contrast, the comparator 360 of D1 could not perform any comparison in a frequency domain, much less the comparison of at least one phase of a frequency component of the interference with anything else. It was therefore submitted that independent claims 1 and 14 of the main request defined subject-matter which was both novel and which involved an inventive step.

According to the Examining Division the claims of the first auxiliary request lacked an inventive step. The Division stated that the third arrangement recited in the characterising portion of claim 1 solved two objective technical problems, namely improving the significance of measurement signals and improving signal-to-noise measurements. It further stated that the provision of a calibration signal, particularly of a calibration signal derived from the light source (first radiation), was obvious and that "in order to eliminate or diminish unwanted variations of the final sample signal [...] it is common practice to modulate the corresponding signals." However, it was submitted that this conclusion was incorrect and that the reasoning given in the Decision in order to arrive at this conclusion was flawed. The objective technical problem addressed by the third arrangement was not to improve the significance of the measurement signals, nor to eliminate/diminish unwanted variations of the final

signal sample, but to reduce timing-induced phase errors (synchronisation errors) in the particular signal obtained by the second arrangement (application as filed, page 3, lines 7-10, page 13, lines 6-13 (Figure 6 embodiment), and page 14, line 30 to page 15, line 10 (Figure 7 embodiment)). According to claim 1 of the first auxiliary request this was achieved by using a portion of the first radiation to generate an intensity-modulated signal, generating a calibration signal from the intensity-modulated signal, and providing the calibration signal to the second arrangement, which was configured to obtain the particular signal using the calibration signal. The calibration signal might be used as clock signal in recording the particular signal (Figure 7 embodiment), or it might be recorded together with the particular signal, so that both might be post-processed to eliminate or reduce timing-induced phase errors (Figure 6 embodiment). A structure corresponding to the third arrangement was not disclosed in the prior art. It could therefore not be obvious on the basis of the prior art to modify or adapt the system of Figure 10A of D1 so that it included such an arrangement. The problem of timing-induced phase errors within a system such as that shown in Figure 10A of D1 was not even mentioned in the prior art, either in D1 itself or elsewhere. It was therefore submitted that there was nothing in the prior art that would prompt the skilled person to modify the system of Figure 10A of D1 to provide any kind of arrangement that would eliminate timing-induced phase errors, much less the third arrangement recited in claim 1 of the first auxiliary request. Therefore, claims 1 and 10 of the first auxiliary request were novel and defined subject-matter involving an inventive step with respect to the prior art.



VI. In a communication pursuant to Article 15(1) RPBA, accompanying the summons to oral proceedings scheduled for 26 November 2015, the board gave a preliminary assessment of the appellant's case on appeal. The relevant passages in this communication read as follows:

"Main Request

[...]

- 1.1.1 Claim 1 of this Request is directed to an apparatus configured to provide a radiation having a time-varying frequency and directed to a sample ("*first radiation*") and to a reference ("*second radiation*"); and a second arrangement configured to detect an interference between a third radiation "associated with the first radiation" and a fourth radiation "associated with the second radiation".
- 1.1.2 From the claim wording in lines 3 - 10 it is not clear whether the "third" and the "fourth" radiation components have interacted at all with the sample and the reference, in particular since the term "associated" merely implies that these respective radiations are merely related or connected (*Article 84 EPC 1973*).
- 1.1.3 Furthermore the expression in lines 13 - 16 of claim 1 appears equivocal since the second arrangement is configured to obtain a "particular" (*but not further defined*) signal "associated" (*i.e. somehow related or connected*) with "at least one" phase (*i.e. this could be any phase or all phases*) of "at least one" frequency component (*i.e. this could include all components or the total signal*) of the interference. Furthermore the

"particular" signal should be compared to "at least one particular" information.

- 1.1.4 In the opinion of the board, the objected expression covers the condition that a signal associated with the interference (*i.e. the total signal, covering all phases and frequency components*) is obtained and is compared with any information, for instance a zero-level signal.
- 1.1.5 Therefore the board tends to concur with the position of the first-instance department at page 6, second paragraph of the Decision, that the wording of this claim is so broad that it reads on the prior art apparatus shown in Figure 10A of document D1. In this respect, the appellant's arguments at page 1, last paragraph and page 2, first to third paragraphs in the letter of 18 November 2010 that the system of D1 did not identify the frequency components of the detected interference and only compared two different interferences in a time domain is not considered persuasive, since the wording in claim 1 appears so indeterminate and unclear (*Article 84 EPC 1973*) that it does not allow a clear distinction of the claimed apparatus from the prior art and hence includes any balanced detection in an interferometer, for instance the PDBD circuit in Figure 10A of document D1. Hence, in the board's opinion, claim 1 does not define patentable subject-matter (*Article 52(1) EPC*).
- 1.2 For similar reasons method claim 14 is considered to define indeterminate (*Article 84 EPC 1973*) method steps which do not allow a non-equivocal distinction over the prior art (document D1).
- 1.3 Therefore the Main Request does not appear allowable.

2. Auxiliary Request

2.1 Claim 1

2.1.1 The set of claims according to this Request had been filed with the telefax of 22 June 2010. According to the accompanying letter, the basis for the amended claims is at page 10, lines 1 - 16; page 12, line 28 to page 13, line 19, and page 14, line 21 to page 15, line 10 of the published patent application. The board observes that these passages relate to the embodiments in Figures 2 (*calibration mirror 310*), 6 (*calibration signal generator 562*) and 7 (*sample clock generator 606*) and provisionally concurs with the applicant's argument in this letter that neither documents D1 nor D2 show or suggest the claimed calibration arrangement.

[...]

2.2 [...]

2.3 With respect to the further application documents:

2.3.1 It appears that description pages 12 to 18 filed with telefax on 8 October 2009 do not merely concern the correction of errors as specified by Rule 139 EPC but include larger editorial amendments. Such amendments are not allowed under the EPC (*provisions of Article 123(2) EPC*).

2.3.2 The expressions "incorporated by reference" (*page 1, line 6; page 18, lines 18 and 24*) should be deleted from the description, see Guidelines for Examination, November 2014, Part F, Chapter III.8.

- 2.3.3 This similarly applies to the statements relating to the "spirit" of the invention (*page 7, line 17; page 18, line 13*), see Guidelines for Examination, November 2014, Part F, Chapter IV 4.4."
- VII. In a letter of 30 September 2015 the appellant withdrew its request for oral proceedings and instead requested a decision on the state of the file. Furthermore it stated that it would not submit any further arguments.
- VIII. Subsequently, the oral proceedings were cancelled by the board.

### **Reasons for the Decision**

1. The appeal is admissible.
2. *Main Request*

With the statement of grounds of appeal the appellant submitted reasons in support of its view that, contrary to the finding of the examining division in its decision, claim 1 of the Main Request was new over the disclosure of document D1 by virtue of the last of the features of the claim (cf. point V above). The appellant also submitted arguments in support of inventive step of the claimed subject-matter.

In the communication annexed to the summons to oral proceedings, however, the board gave detailed reasons in support of its preliminary view that

- the subject-matter of claim 1 was not clear within the meaning of Article 84 EPC 1973 (see point VI above, sub-points 1.1.1 to 1.1.3), that

- as a consequence of this lack of clarity the claimed subject-matter could be interpreted in such broad terms that the claimed apparatus, and in particular the last of the features of claim 1 referred to by the appellant, was anticipated by the disclosure of document D1 (Article 52(1) EPC and Article 54(1) EPC 1973) (see point VI above, sub-points 1.1.4 and 1.1.5), and that

- for similar reasons the method of independent claim 14 was not clear (Article 84 EPC 1973) and was not novel over the disclosure of document D1 (Article 52(1) EPC and Article 54(1) EPC 1973) (see point VI above, sub-point 1.2).

The arguments of the appellant in the statement of grounds of appeal in support of novelty and inventive step have no impact on the subsequent findings of the board relating to lack of clarity and lack of novelty, and in its letter of reply dated 30 September 2015 the appellant declined to submit counter-arguments in reply to the reasons given by the board in support of its preliminary assessment (cf. point VII above).

After consideration of the preliminary assessment of the board given in the communication in respect of the Main Request, and in the absence of any attempt by the appellant to refute or overcome the objections raised by the board in respect of this request, the board sees no reason to depart from the preliminary opinion expressed in its communication, which therefore becomes final.

### 3. *Auxiliary Request*

With the statement of grounds of appeal the appellant also submitted reasons in support of its view that, contrary to the finding of the examining division in its decision, the subject-matter defined in the claims of the Auxiliary Request involved an inventive step (cf. point V above).

In its communication the board expressed its positive preliminary view on the patentability of the claimed subject-matter of the Auxiliary Request (see point VI above, sub-point 2.1.1). However, in the communication the board also noted that pages 12 to 18 of the description contained amendments that did not merely concern the correction of errors within the meaning of Rule 139 EPC and expressed its view that the amendments would be contrary to Article 123(2) EPC (see point VI above, sub-point 2.3.1). The board also noted other deficiencies in the description (see point VI above, sub-points 2.3.2 and 2.3.3).

In its letter of reply dated 30 September 2015 the appellant declined to comment on the objections raised by the board in respect of the Auxiliary Request (cf. point VII above).

After consideration of the objections raised by the board in the communication in respect of the Auxiliary Request, and in the absence of any attempt by the appellant to refute the objections or to file amendments in response to them, the board concludes that the application documents of the Auxiliary Request are not in conformity with the requirements of the EPC and that therefore the Auxiliary Request is not allowable.

4. In the absence of any allowable request, the appeal is to be dismissed.

**Order**

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

The appeal is dismissed.

The Registrar:

The Chairwoman:



M. Kiehl

T. Karamanli

Decision electronically authenticated