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**Datasheet for the decision
of 25 November 2008**

Case Number: T 1467/06 - 3.4.02

Application Number: 92911842.0

Publication Number: 0581871

IPC: G01B 9/02

Language of the proceedings: EN

Title of invention:

Apparatus for optical imaging and measurement

Patentee:

MASSACHUSETTS INSTITUTE OF TECHNOLOGY, et al

Opponent:

Herbert Schwind GmbH & Co. KG

Headword:

-

Relevant legal provisions:

RPBA Art. 13(1), 13(2)

Relevant legal provisions (EPC 1973):

EPC Art. 54(2), 56

Keyword:

"Objections of added subject-matter raised during oral proceedings in respect of claims defended unamended on appeal - admissibility (no)"

"Late filed documents - admissibility (yes)"

"Novelty and inventive step (yes)"

Decisions cited:

T 0030/01

Catchword:

see point 2



Case Number: T 1467/06 - 3.4.02

DECISION
of the Technical Board of Appeal 3.4.02
of 25 November 2008

Appellant: Herbert Schwind GmbH & Co. KG
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Representative: Nöth, Heinz
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Respondent: MASSACHUSETTS INSTITUTE OF TECHNOLOGY
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Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office posted
14 July 2006 concerning maintenance of European
patent No. 0581871 in amended form.

Composition of the Board:

Chairman: A. Klein
Members: F. Narganes-Quijano
B. Müller

Summary of Facts and Submissions

I. The appellant (opponent) lodged an appeal against the interlocutory decision of the opposition division finding European patent No. 0581871 (based on the European application No. 92911842 published as International publication No. WO 92/19930) as amended according to the second auxiliary request of the respondent (patent proprietor) to meet the requirements of the EPC 1973.

The opposition filed by the appellant against the patent as a whole was based on the grounds of lack of novelty and lack of inventive step (Article 100(a) EPC 1973 together with Articles 52(1), 54 and 56 EPC 1973).

In its decision the opposition division held *inter alia* that the subject-matter of claims 1 to 13 amended according to the second auxiliary request of the respondent was novel and involved an inventive step with regard to the prior art considered during the proceedings and including, among others, the following documents:

E4 : "Optical coherence tomography" D. Huang *et al.*,
Science, Vol. 254 (November 1991), pages 1178 to
1181

E6 : "Optical coherence-domain reflectometry: a new
optical evaluation technique" R. C. Youngquist *et al.*,
Optics Letters, Vol. 12 (1987); pages 158 to
160

- E9 : "Interferometric laser rangefinder using a frequency modulated diode laser" A. J. den Boef, *Applied Optics*, Vol. 26 (1987); pages 4545 to 4550
- E10: "Polarization-independent interferometric optical-time-domain reflectometer" M. Kobayashi *et al.*, *Journal of Lightwave Technology*, Vol. 9 (May 1991); pages 623 to 628.

Although documents E4 and E10 were published between the claimed priority date (29.04.1991) and the filing date (29.04.1992) of the patent in suit, these two documents were considered as constituting prior art within the meaning of Article 54(2) EPC 1973 in view of decision T 30/01 issued at a previous stage of the present opposition proceedings and in which the Board found that the claimed invention was not entitled to the claimed priority under Article 87(1) EPC 1973 (point 2 of the reasons of the mentioned decision).

II. During the written appeal proceedings the appellant filed the two following documents:

- E12: "OFDR diagnostics for fibre and integrated-optic systems" S. A. Kingsley *et al.*, *Electronic Letters*, Vol. 21, No. 10 (1985); pages 434 and 435
- E13: "Optical frequency domain reflectometry in single-mode fiber" W. Eickhoff *et al.*, *Applied Physics Letters*, Vol. 39, No. 9 (1981); pages 693 to 695

and the respondent filed further amended versions of the patent as auxiliary requests.

III. Oral proceedings were held before the Board, as requested by the parties on an auxiliary basis.

The appellant requested setting aside of the decision under appeal and the revocation of the patent in its entirety. The respondent requested the dismissal of the appeal as a main request or the maintenance of the patent as amended according to the auxiliary requests filed during the appeal proceedings and, as a further auxiliary request, the remittal of the case to the department of first instance for further prosecution.

At the end of the oral proceedings the Board gave its decision.

IV. The patent documents amended according to the main request of the respondent correspond to those of the second auxiliary request on which the interlocutory decision under appeal was based. The set of claims of this request include independent claims 1 and 13 which are worded as follows:

" 1. Apparatus for interferometrically imaging or measuring of the internal structure of a sample comprising:

- a two beam interferometer having a reference beam path (30) with a reference reflector (44) and a measuring beam path (26) leading to the sample (84),
- an optical radiation source (12, 12a, 12b, 79) providing light to the two beam interferometer (30, 26, 44),
- a probe module (28) arranged in said measuring beam path (26) at its terminating portion, the probe module (28) comprising means (86, 100, 110, 95) for scanning the sample (84) by steering the direction of light propagation applied to the sample (84),

- means (22) for combining light reflected at said reference reflector (44) and light reflected within the sample (84),
- a detector (52, 52') detecting the superimposed light,
- means (46, 46') for changing the longitudinal depth within said sample (84) for which the light reflected within the sample (84) interferes with light reflected at the reference reflector (44) and
- means for processing the output signal of said detector (52, 52') to generate a longitudinally resolved image or measurement of said sample (84) including information received from reflections or scatterings in various depths within said sample (84),
- wherein the optical radiation source (12, 12a, 12b) is a short coherence length optical source,
- wherein the means (46) for changing the longitudinal depth are designed to change the relative length of the reference beam path (30) and the measuring beam path (26) in accordance with a predetermined velocity profile having an instantaneous velocity V at each point on the profile, wherein interference fringes occur at length matched points of the reference and measurement beam paths (26, 30), wherein the output signal has an instantaneous modulating frequency and wherein said modulating frequency includes a Doppler shift frequency at a frequency of $f_D = NV/\lambda$, where λ is the wavelength of the radiation source,
- wherein the apparatus further comprises
 - means for polarizing the optical radiation from the source in a selected first direction,
 - means for altering the polarization of the radiation differently for radiation applied to the reflector and to the sample, said means for altering causing reflected radiation from the

reflector to be polarized in a selected second direction and causing reflected radiation from the sample to be polarized in a direction dependent on birefringence of the sample, the polarized reflected radiation from the reflector and sample being interferometrically combined,

- means (216; 52C, 52D) for splitting and detecting the interferometrically combined output as two outputs having orthogonal polarization states, means (56) for separately processing the two outputs to obtain separate interferometric signals and means (72) for combining said interferometric signals to provide a selected indication of a birefringent profile of the sample."

" 13. Apparatus for interferometrically imaging or measuring of the internal structure of a sample comprising:

- a two beam interferometer having a reference beam path (30) with a reference reflector (44) and a measuring beam path (26) leading to the sample (84),
- a frequency modulated spectrally coherent optical radiation source (12, 12a, 12b, 79) providing light to the two beam interferometer (30, 26, 44),
- a probe module (28) arranged in said measuring beam path (26) at its terminating portion, which probe module (28) comprises means for scanning the sample by steering the direction of light propagation applied to the sample (84),
- means for changing the longitudinal depth within said sample (84) for which the light reflected within the sample (84) interferes with light reflected at the reference reflector (44) which means for changing the

longitudinal depth include means (78) for modulating the frequency of the source (79) output with interference resulting in a signal having a frequency proportional to the difference between the path lengths of the measuring and the reference beam paths (26, 30),
- means (22) for combining light reflected at said reference reflector (44) and light reflected within the sample (84),
- a detector (52, 52') detecting the superimposed light, and
- means for processing the output signal of said detector (52, 52') which means generate a longitudinally resolved image of the internal structure of said sample (84) which image includes information obtained from reflected or scattered radiation received from various depths within said sample (84)."

The set of claims of the main request also includes dependent claims 2 to 12 all referring back to claim 1.

The wording of the claims amended according to the auxiliary requests of the respondent is not relevant for the present decision.

V. The arguments submitted by the appellant in support of its request, as far as they concern the claims of the main request and are relevant for the present decision, may be summarised as follows:

The features of claim 1 relating to the polarizing means and to the polarization altering means do not appear to be supported by the international application as published and/or by the patent as granted. There would not appear to be a basis in the international

application as published either for combining the modulation of the frequency of the source output with the change of the longitudinal path within the sample for which the reflected reference and the measurement light beams interfere with each other as defined in claim 13.

The apparatus disclosed in document E10 anticipates all the features of claim 1. In particular, the light source of the apparatus is constituted by a superluminescent diode as it is the case in the contested patent, and the movable mirror causes a Doppler shift frequency (Figure 1). In addition, the skilled person would understand that the measurements carried out according to the document includes the scanning of the sample with the light incident thereon, the use of light steering means being a well known scanning technique as shown in documents E4 and E6. As regards the claimed polarization means, these means are anticipated by the polarization arrangement disclosed in the document (Figure 1 and the paragraph bridging the two columns on page 626). In particular, the linear polarizer P1 polarizes the light from the source, the polarized light is then reflected by the movable reference mirror, which changes the state of polarization of the light, and the reflected light is subsequently combined with the light reflected by the sample and then detected after being separated into two polarized components, the detected signals being processed separately (legend to Figures 1 and 6) to obtain the birefringence profile of the sample (sections V and VII). The polarization arrangement includes in addition single-mode fibres and polarization maintaining fibres having different

polarization characteristics, the latter fibres being of the type used in the embodiment disclosed in the patent specification with reference to Figure 11. In addition, the document also discloses the use of a polarization controller (page 626, second column, lines 1 to 5).

Document E9 discloses the measurement of profiles by means of an optical frequency-domain reflectometer (Figure 1). The light emitted by the laser diode is modulated in frequency and the detected interference signal (equation (4)) exhibits a frequency proportional to the difference in optical path between the reference and the measurement light beam paths. The subject-matter of claim 13 is therefore obvious in view of the teaching of document E9 and the disclosure of document E6.

Alternatively, document E12 discloses the determination of the internal structure of an optical fibre by means of optical frequency-domain reflectometry using a light source emitting coherent light modulated in frequency (Figure 1 and paragraph bridging the two columns on page 434). The detected interference signal has a frequency proportional to the difference in optical path length between the reference and the measurement optical paths (Figure 2c and page 434, last paragraph). An analogous technique is disclosed in document E13 (abstract). Documents E4 (Figure 1) and E6 (Figure 1) disclose interferometric techniques involving scanning of the sample and document E6 refers to OFDR and states that description is made of the OCDR instead of the OFDR technique. In view of these disclosures and teachings, claim 13 does not involve an inventive step.

Claim 13 also results in an obvious way from the three-dimensional scanning tomographic technique disclosed in document E4 (Figure 1). There are different known techniques to carry out scanning along the depth direction of a sample, such as the frequency-domain interferometric technique disclosed in document E12, these techniques being interchangeable as disclosed in document E6. It is in addition obvious to adjust the parameters so as to obtain the suitable characteristics and in particular the appropriate resolution as taught in documents E6 and E12.

VI. The arguments submitted by the respondent in support of its request for the dismissal of the appeal are essentially the following:

The appellant's allegations of added subject-matter constitute new objections raised for the first time during the oral proceedings and should not be considered at such a late stage of the proceedings.

The opposition period began almost ten years ago and there is no reason why the appellant did not file documents E12 and E13 during the first-instance opposition proceedings. In addition, the documents are not relevant. Consequently, documents E12 and E13 should not be admitted into the proceedings.

Document E10 fails to specify scanning means and the separate processing of the interference signals as required by claim 1. In addition, the document deals with polarization-independent optical time-domain reflectometry (title and last sentence of section III)

and fails to disclose the claimed polarization altering means. In particular, the apparatus of document E10 does not include means for altering the polarization of the reference and the measurement light beams as claimed. The polarizers P2 and P3 are used in document E10 only to eliminate undesirable crosstalk, and there is no indication in the document where the polarization controller is located. Thus, the adjustable elements 204 and 210 in the embodiments represented in Figure 11 of the patent specification lack a counter-part in the setup of document E10. Therefore, while claim 1 requires two different selected directions of polarization for the light from the light source and the light from the mirror, in document E10 the polarization state of the light emerging from the linear polarizer P1 is fixed and preserved by the linear polarizers P2 and P3 and also by the reflector; thus, there is no degree of freedom remaining to compensate for the polarisation changes in the sample path or to alter the polarization as claimed. The claimed feature relating to the two different polarization directions prevents situations in which the two beams have a polarization orthogonal to each other, i.e. situations in which the two beams would not interfere.

Document E9 describes a range-finder which evaluates the signal power at a harmonic of the interference signal and there is no mention of a signal frequency proportional to the optical path difference between the measuring and the reference beam paths. In addition, document E6 relies on a different interferometric technique. Therefore, documents E9 and E6 cannot be

combined and in any case the combination would not suggest the apparatus of claim 13.

While document E4 relates to the tomography of biological samples such as the eye which requires a high resolution, documents E12 and E13 pertain to the measurement of optical fibres having the property of guiding back-scattered light back to the apparatus and, in addition, the approaches followed in these documents achieve resolutions of only 3 mm and 0.2 m, respectively. Thus, documents E12 and E13 are unsuitable for being combined with document E4.

Reasons for the Decision

1. The appeal is admissible.
2. *Late allegations of added subject-matter*
 - 2.1 During the oral proceedings before the Board, the appellant made for the first time allegations with regard to the subject-matter of each of independent claims 1 and 13 of the main request (see second paragraph of point V above) that amounted to objections under Article 123(2) EPC and possibly also under Article 100(c) EPC 1973. The respondent for its part argued against consideration of the opponent's objections at such a late stage of the procedure.
 - 2.2 The patent documents amended according to the present main request of the respondent correspond with those of the second auxiliary request already filed by the

respondent during the first-instance proceedings. Furthermore, it is on this amended version of the patent that the interlocutory decision now under appeal was based. In these circumstances, the Board considers that, before the oral proceedings in the present appeal proceedings were held, the appellant has had, both during the first-instance proceedings and the written phase of the present appeal proceedings, ample opportunity to raise any objection of added subject-matter with regard to the patent documents amended according to the present main request or at least to contest the reasoned finding of the opposition division in the decision under appeal that the amended patent documents complied with the requirements of Article 123(2) EPC 1973.

In view of the above, and since the case presented by the appellant during the appeal procedure preceding the oral proceedings - and in particular presented in its statement setting out the grounds of appeal and in its two subsequent letters of reply - was confined to the issues of novelty and inventive step, the Board considers that the new objections raised by the appellant during the oral proceedings under Article 123(2) - and possibly also falling in part under Article 100(c) EPC 1973 - with regard to claims that have been remained unamended during the previous relevant steps of the proceedings constitute a very late amendment to its case on appeal within the meaning of Article 13(1) of the Rules of Procedure of the Boards of Appeal (RPBA).

According to the second sentence of Article 13(1) RPBA the amendment to the appellant's case, i.e. the new

objections of added subject-matter, may be admitted at the Board's discretion taking into account *inter alia* the complexity of the issues raised, the current state of the proceedings and the need for procedural economy. In the present case, the Board found during the oral proceedings that the admission of the appellant's objections at such a late stage would not meet these criteria. Firstly, consideration of the objections raised by the appellant would have required a complex and detailed analysis of the different disclosures in the application as published relating to the intricate polarization and interferometric arrangements disclosed therein. Secondly, the objections were raised at the latest stage of the proceedings, i.e. during the oral proceedings held before the Board and after the appellant and the respondent have had - and have repeatedly used - the opportunity to reply to their respective letters of reply and to the Board's communication annexed to the summons to oral proceedings, the present appeal constituting in addition the second appeal in the opposition filed by the appellant in September 1999 against the patent in suit which (if maintained) would expire in about three and a half years. And thirdly, the new issues raised by the appellant might possibly have required the remittal of the case or certainly at least considerable extra time for a careful consideration of the new issues raised which neither the Board nor the respondent could possibly have dealt with without adjournment of the oral proceedings; therefore, consideration of the amendments to the appellant's case would have been not only contrary to the need for procedural economy mentioned in Article 13(1) RPBA, but also contrary to the criteria set forth in Article 13(3) RPBA.

Finally, the appellant has failed to identify any particular reason or change of circumstance - such as an amendment to the respondent's case (Article 13(2) RPBA) or a direction given by the Board (Article 12(1)(c) RPBA) - that would have justified as a legitimate reaction raising the objections of added subject-matter for the first time during the oral proceedings held before the Board.

- 2.3 In view of the above considerations, the Board, without even considering the potential relevance of the issues raised, decided during the oral proceedings not to admit into the proceedings the objections raised by the appellant at such a late stage of the proceedings.

3. *Late filed documents*

Documents E12 and E13 were filed by the appellant after oral proceedings had been arranged. The respondent for its part disputed the admissibility of these documents into the proceedings on the grounds that they had been filed too late, that they had been known by the appellant long before its filing and that in any case they were not relevant.

However, as submitted by the appellant with reference to the subject-matter of claim 13, these two documents disclose optical frequency-domain reflectometric techniques based on the detection of an interference signal having a frequency proportional to the difference in optical path length between the reference and the measurement light beam paths (document E12, paragraph bridging the two columns on page 434, and

document E13, second paragraph on page 693), and the filing of these documents can therefore be considered as a reaction to the respondent's previous submissions that the prior art did not involve interference signals having such characteristics and to the comments of the Board in the communication annexed to the summons to oral proceedings that this issue should be particularly addressed during the oral proceedings. It cannot therefore be denied that documents E12 and E13 were of relevance for the issues to be discussed and decided. Furthermore, the pertinent disclosures of these two documents were not complex and, in addition, as acknowledged by the respondent itself, both parties became already aware of the disclosure of these two documents during negotiations between the parties before the documents were filed in the present appeal proceedings, so that the respondent could reasonably be expected to deal - as it actually did - with the documents without risk of adjournment of the oral proceedings.

In view of the above considerations, the documents were considered by the Board of a sufficient - although, in view of the course of the discussion during the oral proceedings (see point 4.2 below), not of a decisive - relevance. The complexity of the new subject-matter submitted, the current state of the proceedings and the need for procedural economy did not weigh against their admission into the proceedings (Article 13 RPBA). Therefore, the documents were admitted into the proceedings (Article 114(2) EPC 1973).

4. Main request

4.1 Claim 1

4.1.1 Novelty

The appellant has submitted that the reflectometer disclosed in document E10 anticipates all the features of the apparatus defined in claim 1. In particular, according to the appellant the polarization characteristics of the reflectometer would anticipate the claimed polarization arrangement and the document would also inherently disclose scanning means as claimed.

The reflectometer disclosed in document E10 is arranged to determine the reflectance profile and the birefringence characteristics of a sample constituted by a single-mode fibre or a waveguide sample (sections V and VII) and consists essentially of a two-beam interferometric reflectometer having a measurement and a reference light beam path and a movable reference reflector for changing the longitudinal depth within the sample for which the measurement light beam reflected by the sample interferes with the reference light beam reflected by the reflector. In its letter of reply to the grounds of appeal the respondent submitted that while the reflectometer of document E10 (title, abstract, Figure 1 and section "Introduction") is based on OTDR (optical time-domain reflectometry), the claimed apparatus relies on OCDR (optical coherence-domain reflectometry). However, as noted by the Board in the communication annexed to the summons to oral proceedings, the light source used in the reflectometer

of document E10 is constituted by a superluminescent diode (abstract and legend to Figure 1), i.e. a continuous-wave low-coherence light source as it is the case in the patent in suit (column 9, lines 35 to 42), and consequently the reflectometer of document E10 does not appear to rely on the standard OTDR technique, but rather on an interferometric technique that would not appear to be excluded by that underlying the subject-matter of claim 1. This opinion expressed by the Board in the aforementioned communication on a preliminary basis was not subsequently contested by the respondent.

The reflectometer of document E10 also comprises means for polarizing the light emitted by the light source in a predetermined direction (linear polarizer P1 in Figure 1) as required by the subject-matter of claim 1. In addition, the document discloses other features influencing the relative polarization characteristics of the light transmitted along the measurement and the reference light beam paths. In particular, the reflectometer includes a linear polarizer P3 arranged in the reference light beam path to contribute to the elimination of orthogonal crosstalk components which cause satellite measurement signals (Figure 1 and page 623, second column, lines 10 to 14), a polarization-maintaining fibre forming the reference light beam path and a single-mode fibre forming the measurement light beam path (legend to Figure 1 and the last paragraphs of each of the two columns on page 623), and this arrangement would have an effect on the relative polarization characteristics of the reference and the measurement light beams that are brought into interference; in particular, document E10 specifies that the output reference light beam is

linearly polarized in a predetermined direction (E_0 in Figure 1 and page 624, first column, lines 3 to 5) and that the measurement light beam input into the sample is generally elliptically polarized (section V, last sentence of the first paragraph).

Nonetheless, claim 1 not only requires polarizing the light from the light source in a first direction and altering differently the polarization of the light beams applied to the reflector and to the sample, but also requires causing the light reflected from the reflector to be polarized in a selected second direction, i.e. in a direction distinct from the first direction of polarization of the input light as supported by the embodiment disclosed in the patent specification with reference to Figure 11 in which the mentioned technical function is achieved by means of a quarter-wavelength retardation plate 210 arranged in the reference light beam path so as to rotate the linear polarization state of the reference light beam (column 27, lines 32 to 39).

The appellant has submitted that the claimed technical function mentioned above would be achieved in document E10 by the reference reflector itself or by the polarization controller referred to in the last paragraph of section V of the document. However, the claimed polarization altering means are required to cause reflected radiation from the reflector to be polarized in the selected second direction and, as submitted by the respondent, the reflector alone would be technically insufficient to carry out the technical function required by the claimed subject-matter. As regards the polarization controller mentioned in the

document, its function is to control the polarization state of the light applied to the sample (page 626, second column, lines 1 to 5); accordingly, the controller would have to be arranged either in the measurement light beam path between the coupler and the sample, in which case the controller would not affect the polarization of the reference light beam, or in the common light beam path between the light source and the coupler, in which case the controller would not affect differently the polarization of the measurement and the reference light beams, and consequently none of the two possible alternative arrangements of the controller would allow carrying out the claimed technical function of differently altering the polarization of the measurement and the reference light beams and causing the light reflected from the reflector to be polarized in a selected second direction as claimed.

It follows that none of the different means of the reflectometer disclosed in document E10 would allow altering differently the polarizations of the reference light beam applied to the reference reflector and of the measurement light beam applied to the sample so as to cause the reflected light from the reference reflector to be polarized in a selected second direction distinct from the first direction of polarization of the input light beam from the light source as required by claim 1. Consequently, the subject-matter of claim 1 is novel over the disclosure of document E10 at least by virtue of this distinguishing feature (Article 54(1) EPC 1973).

In view of this distinguishing feature - and since, as concluded in point 4.1.2 below, this distinguishing

feature alone allows for a decision concerning the issue of inventive step -, there is no need for the present Board to address the question of whether or not the claimed apparatus differs from the interferometer of document E10 in other respects as submitted by the respondent.

4.1.2 Inventive step

According to the respondent, the distinguishing feature identified in point 4.1.1 above relating to the polarization altering means prevent situations in which the two beams have a polarization orthogonal to each other, i.e. situations in which the two beams would not interfere with each other. Indeed, as explained by the respondent during the oral proceedings, the measurement light beam reflected by the sample can, depending on the birefringence properties of the sample, be polarized in a direction orthogonal to the reference light beam, with the result that the two light beams would not interfere with each other and no measurement would be possible. Altering the polarization of the two light beams and causing the reflected reference light beam to be polarized in a selected direction as claimed allows avoiding the situation described above.

Accordingly, the claimed apparatus solves at least the problem of providing a more reliable measurement of the internal structure of the sample.

Document E10 does not provide any teaching that would suggest solving the problem formulated above by the claimed means. In particular, the disclosure relating to the provision of a polarization controller for

controlling the polarization of the light directed to the sample would not result in the claimed polarization altering means for the reasons already given in the fifth paragraph of point 4.1.1 above.

In addition, during the written and the oral proceedings the appellant did not make any submission relating to the possible obviousness of the provision of the claimed means under consideration.

In view of the above, the Board concluded during the oral proceedings that the subject-matter of claim 1 involves an inventive step (Article 56 EPC 1973) with regard to the documents considered by the opponent.

4.2 Claim 13 - Inventive step

Independent claim 13 is essentially directed to an apparatus for scanningly imaging or measuring the internal structure of a sample by means of a two-beam interferometer technique in which the light source is a frequency-modulated spectrally-coherent light source and the interference signal has a frequency proportional to the difference between the reference and the measuring light beam paths.

Novelty of the subject-matter of claim 13 has not been disputed by the appellant and during the written phase of the appeal proceedings the appellant made reference to the disclosure of documents E4, E6, E9, E12 and E13 and disputed the conclusion of the opposition division that the subject-matter of independent claim 13 involves an inventive step.

During the discussion that took place between the parties during the oral proceedings the respondent submitted that modulation of the frequency of the light source does not allow changing the longitudinal depth within the sample for which the light reflected within the sample interferes with light reflected by the reference reflector, and that for this reason the formulation of claim 13 according to which the "means for changing the longitudinal depth within said sample for which the light reflected within the sample interferes with light reflected at the reference reflector [...] include means for modulating the frequency of the source output" defines in fact two distinct means, even if the second means are considered to be included in the first means. The respondent did not contest the appellant's submissions in this respect, and the Board accepted that claim 13 requires both the modulation of the frequency of the light source output and changing the longitudinal depth within the sample for which the reflected reference and the measurement light beams interfere with each other.

Subsequently, after the Board had noted that the issue of inventive step of claim 13 in respect of the double requirement mentioned above had not been previously addressed by the parties, the appellant did not make any substantive submission on this specific issue.

In these circumstances, the appellant, on whom the burden of proof rests, has failed to address the combined use of a frequency-modulated optical radiation source and means for changing the longitudinal path as claimed in the assessment of inventive step and has therefore failed to substantiate sufficiently its

allegation of lack of inventive step of the subject-matter of claim 13. In particular, the case presented by the appellant relies on prior art disclosures dealing with optical frequency-domain reflectometry involving the modulation of the frequency of the light emitted by the light source (document E9, title and Figure 1, document E10, first paragraph, document E12, paragraph bridging the two columns on the first page, and document E13, second paragraph of the introduction) and dealing with optical coherence-domain reflectometry involving means for changing the point of the sample for which the reflected measurement and the reference light beams interfere with each other (document E4, Figure 1, document E6, Figure 1 and title, and document E10, Figure 1), but none of the disclosures teaches or suggests the combined use of these two interferometric techniques. In addition, the appellant has submitted by reference to document E6 (page 158, first paragraph and, page 159, first column, middle paragraph) that the two interferometric techniques mentioned above are interchangeable, but has presented no case as to why the person skilled in the art confronted with the problem of improving, or at least providing an alternative to the known interferometric techniques would have considered combining the two interferometric techniques mentioned above as required by the claimed subject-matter.

In view of the above, the Board concluded during the oral proceedings that the appellant's case was insufficient to cast doubt on inventive step of the subject-matter of independent claim 13 (Article 56 EPC 1973).

5. Except for the submissions considered in points 1 to 3 above, the appellant has not contested the remaining findings of the opposition division with respect to the compliance with the EPC of the patent documents amended according to the present main request of the respondent.

In view of the above conclusions and considerations, the Board found at the end of the oral proceedings that the appellant's case did not prejudice the maintenance of the patent as amended according to the interlocutory decision and that there was no need to consider the auxiliary requests of the respondent. Accordingly, the Board decided that the appeal was to be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

M. Kiehl

A. G. Klein