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D E C I S I O N
of 16 February 2005

Case Number: T 0084/03 - 3.4.2

Application Number: 96116486.0

Publication Number: 0764866

IPC: G02B 21/00

Language of the proceedings: EN

Title of invention:
Confocal microscope

Patentee:
OPTISCAN PTY LTD

Opponent:
Lange Wilhelm
Carl Zeiss Jena GmbH

Headword:
-

Relevant legal provisions:
EPC Art. 100(b), 83, 54, 56

Keyword:
"Sufficiency - yes"
"Inventive - yes (claim 1 of main request)"

Decisions cited:
-

Catchword:
-



Case Number: T 0084/03 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 16 February 2005

Appellant: OPTISCAN PTY LTD
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 7 November 2002
revoking European patent No. 0764866 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: A. G. Klein
Members: M. A. Rayner
M. J. Vogel

Summary of Facts and Submissions

I. The patent proprietor lodged an appeal against the decision of the opposition division revoking European patent 764 866 (application number 96 116 486.0, date of filing 1 August 1989, divided from 89 908 678.9, priority date 1 August 1988, published application WO90/01716), which relates to a diffraction limited confocal microscope. In the decision under appeal, the opposition division found that the subject matter of claim 1 before it lacked an inventive step within the meaning of Article 56 EPC, which led to the revocation of the patent.

II. In the proceedings, reference has been made, amongst others, to the following documents, of which the documents referenced as D12 and E15 were published after the priority date of the patent:

D1 GB-A-2 181 539

D2 "Size of the detector in confocal imaging systems"
Wilson et al., Optics. Letters., April 1987,
vol. 12, no. 4, pp. 227-229

D7 US-A-4 410 235 (document also referred to E9)

D12 "Fibre-optic confocal microscope: FOCON", Dabbs et
al., Applied Optics, 1 June 1992, Vol. 31, No. 16,
pages 3030-3035

E5 W.G. Ophey und J.P.H. Benschop:

"Laser-to-Fibre Couplers in Optical Recording
Applications", SPIE, Vol. 839, Pages 166 to 171

E15 Handbook of biological confocal microscopy, 1989,
Pawley, pages 101 and 102.

III. The wording of the only independent claim as presented to the opposition division is as follows.

"1. A diffraction limited confocal microscope (30) comprising:
an energy source (31) to provide focussable illuminating energy with a wavelength in the range of and including far UV to far IR;
a first focuser (36, 39) to focus at least a portion of the illuminating energy into a diffraction limited spot pattern volume having a central portion which in use intersects an object (40);
a second focuser (39, 41) operatively associated with the first focuser (36, 39), to collect outgoing energy from the volume resulting from interaction between the illuminating energy in the volume and the object (40) whereby the second focuser (39, 41) images the central portion of the diffraction limited spot pattern onto a spatial filter (42) defining an aperture;
a detector (45) having a detecting element, the detector (45) being operatively associated with the spatial filter (42) to detect a portion of the outgoing energy whereby the image of the central portion is detected by the detecting element wherein the confocal microscope (30) has a substantially reduced depth of field thereby enabling out-of-focus information to be substantially excluded from the image of the central portion;
characterized in that the microscope (30) further comprises a single mode optical fibre (34) for the illuminating energy from the energy source (31), comprising a core, an energy receiver (33) and an energy exit (35);

the optical fibre (34) being operatively associated with the energy source (31) so that the illuminating energy from the energy source (31) is received by the energy receiver (33) and coupled into the core and guided to the energy exit (35) so as to emerge from the core at the energy exit(35); and

the optical fibre (34) being operatively associated with the first focuser (36, 39) to direct the illuminating energy emerging from the energy exit (35) to the first focuser (36, 39);

wherein the numerical aperture, NA, of the outgoing energy originating from the central portion focussed onto the aperture; the wavelength of the outgoing energy, λ , and the average diameter, d, of the aperture fulfil the condition:

$$NA = < 0.6 \times \lambda/d."$$

- IV. In its decision, as part of its consideration of sufficiency, the opposition division postulated accepting that the numerical aperture (NA), as defined by the strict literal wording used in the independent claim of the patent, may not refer to NA at the aperture side only, but could also refer to NA at the object side. The division explained that a person skilled in the art would, however, necessarily be aware from the disclosure of the patent as a whole that for the purposes of spatial filtering, it is the energy that is being focused which is directly associated with the aperture. Thus, the only meaningful interpretation is that there is a direct relationship between the average diameter of the aperture and second focuser numerical aperture at the aperture side.

In relation to sufficiency, the division also considered that documentary evidence shows that several meanings can be given to the word confocal, and that in the claims in dispute ambiguity as to the word "confocal" cannot be resolved. The division thus considered that reliance cannot be placed on this word for a definition of a microscope, other than that of a class of scanning microscopes, which uses for the purpose of spatial filtering, some kind of aperture whose physical size is selected, in accordance with the personal interests of the author of a publication. The matter at issue is not whether the word "confocal" has been used in a subjective manner, but it is the interpretation of the claim language that causes controversy. The patent specification describes in the word "confocal" with reference to Figure 2, in terms that identify the physical size of a spatial filter, which may be constituted by a pinhole, as an element of a scanning microscope. The opposition division thus reached the view that a diffraction limited "confocal" microscope, within the terms of the patent, means a diffraction limited scanning microscope which includes at least all the features of Claim 1. The division observed that the patentee had argued with respect to method claim 17 {for information, the board observes this claim is not present in the statement of claim decided upon} that it is not necessary to use the term "confocally" to express the intention of the author. The division went on, still in the context of sufficiency, to consider that selection of components in accordance with a numerical aperture consideration would not extend beyond the competence of a person skilled in the art. Selection of components in accordance with a disclosed relationship can, as a

matter of skill, not determine any contribution over the prior art.

- V. In considering patentability, the opposition division was of the view there was no dispute about document D1 not providing detailed information about numerical aperture NA, laser diode wavelength λ , and average core diameter of single mode fibre. It thus saw no need to go further into the question of novelty of the subject matter of the claim before it. In the view of the division, document D1 contains a prior disclosure of a diffraction limited confocal microscope, this simply meaning a diffraction limited scanning microscope in the form of a fibre optic scanning system. According to the minutes of oral proceedings before the opposition division (point 5, third from last sentence), the patentee no longer disputed that document D1 disclosed a confocal microscope. Document D1 shows it was a problem to make images of objects that feature a minute phase structure and this problem was solved by using a diffraction limited scanning microscope for making images of such objects. However, this does not mean that there was no further technical problem in reproducing a fibre optic scanning system, as disclosed in D1, because the document does not provide detailed information about the novel features of the claim in dispute. As the division had, in the context of sufficiency, accepted that a selection of components, according to the numerical aperture condition, was obvious, it was obvious without further proof to select components in a way that combines optimal resolution with a maximum signal. In other words, the subject matter of Claim 1 is obvious.

VI. The appellant requests that the patent be maintained in accordance with a main or one of first to fifth auxiliary requests. Respondents I and II (= Opponents I and II) requests that the appeal be dismissed. Oral proceedings were requested on an auxiliary basis by all the parties, which led to appointment thereof by the board.

VII. The arguments of the appellant can be summarised as follows.

With respect to submissions alleging the teaching of the patent is insufficient to determine the value of NA, this objection is one of clarity, not insufficiency. As such the objection should be withdrawn as impermissible. During the oral proceedings the patentee observed that NA relates to a receiving end of the system, i.e. the numerical aperture of the fibre. Reference was made to Figure 3 and the end of the fibre on the receiving side, the numerical aperture of lens 41.

With respect to substantive patentability, document D1 is not the correct starting point for assessing the invention and does not disclose a diffraction limited confocal microscope. The Opposition Division misdirected themselves in interpreting the independent claim as not requiring confocality. This point had not been conceded by the appellant in the proceedings before the opposition division. The skilled person would not regard D1 as a confocal microscope. It does not deal with fluorescence or biological samples. Put another way, would a consumer, wishing to perform confocal microscopy, actually purchase the D1 system? In the view of the appellant - clearly not. The

possibility of using a confocal microscope to obtain surface profile information does not mean the presently claimed subject matter is a differential phase microscope.

Document D2 is the starting point for the invention and presents a detailed analysis of the size of detector pinholes in, non-fibre optic, confocal microscopes. Problems to be solved are that dirt can lodge in mechanical apertures thereby creating a problem of beam asymmetry and aberrations; it is difficult to align a mechanical pinhole with a light source accurately, non-alignment causing resolution problems and anomalous diffraction spot geometries; and each of the light source and detector are required to be aligned very accurately in the optical path and this causes a delicate and bulky arrangement. The invention solves these problems in an elegant and inventive manner using single mode optical fibres. Specifically the use of the end of an optical fibre as the aperture prevents dirt from lodging in the aperture. Even if dirt were to be present, such ends can be readily cleaned or re-cleaved. The alignment problems also fall away by the use of a single mode optical fibre. The number of optical components is reduced and their specific alignment is no longer needed. The light source and detector can also be moved out of the optical alignment path and positioned more conveniently. In the light of document D2, the claimed invention is therefore inventive. The question is then whether any of the other cited prior art documents would in reality lead the skilled person, in the knowledge of document D2, to arrive at the present invention without any inventive input on their part.

The teaching of document D1 is that, where the system is to be used as a differential microscope then the fibre structure is treated simply as the transmission medium for the light. If document D1 were indeed a confocal microscope then it is reasonable to suggest that the author of document D1 would have described this new use of an optical fibre as more than simply as the transmission medium. The teaching is not in the same field, and, even if it were, it would fail the "could not would" test. The skilled person would only understand the optical fibres in document D1 as being there for the purposes of providing separate paths for light so as to allow one path to be delayed and its polarisation qualities to be controlled where necessary. The system of document D1 is not described as, and would not perform as, a confocal microscope. In order to modify it to do so would require a rebuild, ab initio. The system of document D1 in fact constitutes an extremely sensitive interferometer. Concerning other documents in the file, it is observed that documents D12 and E15 are not prior art and document D7 pertains to complete fields of optics, and is thus no solution to the problem presented in the light of document D2. Document E5 is nothing to do with confocal microscopy, but concerns optical microscopy.

VIII. The arguments of respondent I can be summarised as follows.

Since document D1 discloses use of the confocal principle and a monomode fibre as a point light source and also the processing of information, this document is the closest prior art document for consideration of

inventive step. There is no reason for it not to be used at the limit of resolution. The subject matter of claim 1 of the main request therefore distinguishes from the disclosure of document D1 by virtue of the inequality recited, there being no specific advantage disclosed in related thereto. The technical problem addressed is thus defining conditions for designing the dimensions of the optical system when a finite aperture detector is involved. Document D2 is an idealised disclosure, dealing with such problems. Figure 2 shows optical details and the curve visible for V_p teaches the skilled person to choose values smaller than 4 and greater than 0.5 in optical units. The limiting value NA-value 0.6 in the patent in dispute corresponds to a value of 2 in optical units, which is thus covered by the teaching of document D2. Therefore the inequality specified in the claim in dispute is met by the disclosure of document D2. The skilled person would therefore have reached the subject matter of claim 1 of the patent in dispute by applying the solution of document D2 to the teaching of document D1 without any inventive step. It can also be observed that page 168 of document E5, illustrates that an NA of 0,16 fits best to the fundamental mode.

Alternatively, document D2 can be taken as starting point, in which case use of a single mode fibre is obvious, for example, from any one of documents D1, D7, or E5. Thus, the subject matter of claim 1 of the main request is rendered obvious by the cited prior art.

The subject matter of claim 1 according to the main request therefore lacks an inventive step within the meaning of Article 56 EPC.

IX. The arguments of respondent II can be summarised as follows.

The teaching of the patent in dispute is insufficient to determine which value of numerical aperture NA is meant in the claim. In the claim the terminology "numerical aperture, NA, of the outgoing energy originating from the central portion focussed onto the aperture" is used. It is not clear whether NA of the "outgoing energy" or of "energy focussed onto the aperture" is meant in the claim. The teaching is not sufficient for both possibilities. Therefore, the skilled person is not in a position to carry out the invention. Even if it is assumed the detector side is meant, there is no teaching how the values are determined, there is no explanation about choosing a lens and subsequent fibre in the patent (Figure 3, items 41 and 43). Therefore, the requirements of Article 100(b) EPC (Article 83 EPC) are not met.

Document D1 is the closest prior art document. Document D1 is entitled a fibre optical scanning system, a confocal microscope is an example of scanning and thus the term does not necessarily have to be mentioned. Use of a single as opposed to two spots is not a criterion for a confocal microscope, so that document D1 is not different in this respect. Moreover, an image is also created according to document D1 as there is diffraction limited point for point sampling using diffraction difference as opposed to reflection or fluorescence. Fluorescence is not specified in claim 1 and the resolution specified in document D1 is theoretical. The claim in dispute is, in any case,

drafted too broadly to define a limitation, as the patent teaches that not only biological specimens but also surface profiling is a major application of confocal microscopy. There is certainly confocality, in document D1, as objective 14 on probe 13 is focussed on the fibre, i.e. in conjugate plane. The fibre is specified as single mode, which entails the lens matching. Novelty is not only explicit but also implicit. The inequality claimed is implicitly known from document D1 because use of single mode fibre as available at the priority date of the patent would have met the inequality. A suitable fibre has $V=2$ as known from document D12 for typical single mode fibres, which will automatically meet the inequality claimed.

If the inequality is, nevertheless, considered novel, then assessment of inventive step starts from a confocal microscope with a single mode fibre, as already realised in D1. The skilled person knows that a smaller aperture will increase the confocal resolution, and when this obvious step is taken the inequality is met and the subject matter of claim 1 reached in the light of document D1 alone. Document D2 teaches satisfying the inequality so that the subject matter of claim 1 is undoubtedly reached by combining its teaching with that of document D1.

The subject matter of claim 1 was also obvious starting from document D2, from which it differs by virtue of the optical fibre. Document D1 then teaches the use of an optical fibre in confocal microscopy, thus rendering this difference obvious. Alternatively, document D7, which mentions a broad spectrum of application and that a single mode glass fibre comes very close to an ideal

point light source provides an obvious combination with document D2 leading to lack of inventive step. The drawings of D7 and document D2 can simply be put together to show the alleged invention. Moreover, document E5 also shows use of fibre to be routine and thus, in combination with document D2, renders the claimed subject matter obvious. The right column on page 101 of document E15 contains a paragraph about the use of single mode fibres with in confocal microscopy.

It must therefore be concluded, that even if novel, the subject matter of claim 1 according to the main request lacks an inventive step within the meaning of Article 56 EPC.

- X. The wording of claims according to the auxiliary requests of the appellant is not given as these are not subject of the present decision. The wording of independent claim 1 according to the main request of the appellant is unchanged from that presented to the opposition division (see section III, above).

- XI. The board gave its decision at the end of the oral proceedings.

Reasons for the Decision

- 1. The appeal complies with the provisions referred to in Rule 65(1) EPC and is therefore admissible.

2. *Sufficiency (Article 83, Article 100(b) EPC)*

Sufficiency is not clarity. Thus, whatever doubts the board might have about the clarity of the wording of the claim, clarity was settled during the examination proceedings and cannot be subject of opposition proceedings or appeal proceedings resulting therefrom. The board considers the opposition division correct in its view that the skilled person understands it is the energy that is being focused which is associated with the aperture for the purposes of spatial filtering. The board also concurs with the opposition division that the skilled person had the knowledge to choose and arrange the components to meet the claim, sufficient teaching being provided by the Figures and the associated description. The board is therefore satisfied as to compliance with Article 100(b), (83) EPC.

3. *Patentability (Articles 54 and 56 EPC)*

3.1 The board, like respondent I, the appellant and the opposition division, is not able to find a disclosure of the inequality recited in the claim in document D1. Respondent II has not shown that the inequality was implicitly understood as present in the disclosure of document D1 by the skilled person, in particular, the approach that available single mode fibres had fibre parameter $V=2$ as evidenced by line 2 of the right column on page 3034 of document D12 was not persuasive as this document is not prior art. The subject matter of claim 1 in dispute is also novel over the disclosure of any of the other prior art documents.

3.2 The decision on inventive step turns on identification of the closest prior art document. Respondent II remarked that the claim in dispute was not limited to application with biological specimens or fluorescence. This remark is not inconsistent with a further remark of the respondents that a diffraction limited confocal microscope can be used for surface profiling. However, there is no basis for implying from either remark that a differential phase microscope as disclosed in document D1 is a confocal microscope. The view of the board is in fact that while equipment may have components which work in a way which can be called confocal, it cannot be concluded that presence of these components alone means that such equipment is what the skilled person would understand to be a diffraction limited confocal microscope. On the contrary, the appellant persuaded the board that if a skilled person went out to purchase a confocal microscope, this person would not purchase, for example, the differential phase microscope of document D1. In this situation, the board was thus persuaded by the appellant that the closest prior art should properly be that explicitly relating to confocal microscopes, document D2 can be taken as suitable in this context.

3.3 The subject matter novel with respect to document D2 relates therefore to the single mode optical fibre as defined in the claim. Problems relating to dirt, alignment and size as extensively developed in the submissions of the appellant are solved by the novel features. Although there are disclosures of single mode fibres, for example as in documents D1, D7, and E5 as discussed below, there is no obvious way for the skilled person to connect these to the aforementioned

problems associated with a diffraction limited confocal microscope mentioned and, therefore, the subject matter of claim 1 can be considered to involve an inventive step within the meaning of Article 56 EPC.

- 3.4 The approach taken by the opposition division referred obliquely to a method claim, no longer at issue, which did not use the word confocal, and looked outside the patent in the context of insufficiency to find occurrences of terms relating to confocality in the prior art, which permitted it to argue it was unable to ascribe a meaning to "confocal" in the independent claim distinguishing a diffraction limited confocal microscope from the system disclosed in document D1. The division implied that the appellant concurred with this appraisal, but in the appeal proceedings it turned out this was not the case. The approach of the division led it to start consideration of inventive step from the statement that a diffraction limited confocal microscope simply means a diffraction limited scanning microscope in the form of a fibre optic scanning system. However, in the context of sufficiency, the patent itself explains what is meant by a confocal microscope in the introduction thereof, and looking outside the patent in the context of patentability, document D2 explains some issues involved with a confocal microscope. The board thus considers the division became confused in reaching the view that because the teaching of the patent was obviously sufficient for the skilled person to carry out the invention taught in the patent, features concerned were obvious in the sense of Article 56 EPC. The approach of the opposition division therefore does not convince the board because it amounts to no more than clouding the inventive step

issue with sufficiency considerations so as to permit document D1 to become not only relevant, but also to render features of the claim in dispute obvious not on the basis of document D1 but on the basis of the patent itself.

- 3.5 Unlike the opposition division, the respondents were able to ascribe a meaning to confocal and thus had a more coherent approach to inventive step, pointing to confocal functioning in relation to lenses 13, 14 in document D1 and then relying not essentially on what was alleged to be obvious from the patent itself but either on the knowledge of the skilled person that a smaller aperture increases confocal resolution or on Figure 2 of document D2 for showing values satisfying the inequality claimed. However, such an argument fails ab initio because document D1 is really about probes for use with surface acoustic waves and differential phase optical microscopy. A single mode optical fibre is used as delay line or simply to transmit light. Even if the light emitting end of the fibre is arranged at one focal point and the light then focused at a second focal point on the surface of the object analysed, this is not what the skilled person understands a diffraction limited confocal microscope to be. The differential microscope according to document D1 is not therefore a suitable starting point for assessing inventive step of the subject matter of claim 1 in dispute. Arguments starting from document D1 based on the knowledge of the skilled person being used to reach the subject matter of the claim in dispute did not persuade the board because these do not relate to what would have been done but just to what could have been done. Since the board does not accept that the skilled

person considers document D1 to disclose a diffraction limited confocal microscope, it does not accept that thus disclosure would have been combined with that of document D2, which does, in an obvious way. The lines of argument of the respondents therefore failed to convince the board as to lack of inventive step.

- 3.6 A number of other documents have also been taken into consideration, these concern optical fibres and, starting from document D2, which can be considered the closes prior art, were alleged by the respondents to render the claimed subject matter obvious. However, the proliferation of documents showing optical fibres and their properties yet not mentioning confocal microscopes tends more to weaken than to strengthen the case of the respondents, as no reason going beyond "could have done it", i.e. no convincing reason why one of these documents would have been selected in an obvious way has been presented. The approach taking document D2 with document D1 is no more convincing than taking document D1 with document D2 mentioned in point 3.5. Looking briefly at the documents, one can note that documents D12 and E15 are not prior art and do not therefore offer a serious challenge as to inventive step. As noted by respondent II, document D7 mentions that a device disclosed has a broad spectrum of uses. It is also true that document D7 discloses that an embodiment with monomode fibre exhibits the properties of an ideal point light source, but the reference to a broad spectrum of uses does not offer an obvious reason to associate this teaching particularly with a diffraction limited confocal microscope. Discussion of single mode fibre increasing coupling efficiency of laser light as in document E5 is also

insufficient to suggest use of a single mode fibre in diffraction limited confocal microscope.

- 3.7 The board was also presented with the simplistic approach that the skilled person could easily fit the drawings in documents D2 and D7 together as demonstrated by moving the drawings close together. However, easy to fit together does not mean obvious to fit together in patent law, as a convincing reason for combining the particular documents in a particular way is a pre-requisite to the actual fitting together. No such convincing reason was offered.
4. The remaining claims of the main request are in dependent form and therefore are also directed to subject matter which can be considered to involve an inventive step.
5. Since the board was satisfied as to inventive step of the subject matter of the claims according to the main request, there was no reason to consider the auxiliary requests in the present decision.

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 maintain the patent on the basis of the following documents:
 - claims 1 to 14,

 - description pages 2-5, 8,

both as filed during the oral proceedings before the Opposition Division on 25 September 2002,

 - pages 6, 7 as granted;

 - drawings Figures 1-6 as granted.

The Registrar:

The Chairman:

P. Martorana

A. G. Klein