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D E C I S I O N
of 27 September 2000

Case Number: T 0247/99 - 3.4.2

Application Number: 96201959.2

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Language of the proceedings: EN

Title of invention:
Sample illumination for spectroscopic apparatus and method

Patentee:
RENISHAW plc

Opponent:
Former DILOR S.A.

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
"Novelty (no)"
"Inventive step (no)"

Decisions cited:
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Catchword:
-

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Case Number: T 0247/99 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 27 September 2000

Appellant: (Proprietor of the patent)
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 5 February 1999 revoking European patent No. 0 740 133 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman: E. Turrini
Members: M. A. Rayner
B. J. Schachenmann

Summary of Facts and Submissions

I. The present appeal is made by the patent proprietor (=appellant) against the decision of the opposition division revoking European patent No. 740 133 (application number 96 201 959.2) for lack of inventive step of the subject matter of the independent claims according to all of the requests before it. Reference is made inter alia to the following documents in the present decision:

D1 WO-A-90/07108

D3 EP-A 442 206

D4 "Holographic Notch Filter" Harry Owen SPIE Proceedings, 24-25.07.1991, San Diego,

D9 Treado et al. Applied Spectroscopy, vol. 44 (1990), No. 8, pp. 1270-1275,

D26 "A microscope for Fourier Transform Raman spectroscopy", Spectrochimica acta, vol. 46A, No. 2 1990, pp. 153-159.

II. In view of the huge advantages in performance promised by the holographic filters according to document D4, the opposition division considered in the decision under appeal that the skilled person would have used such a filter, which is specifically disclosed as replacing dichroic filters in for example section 4.1, in the Raman analysis method of document D1 and modified the angle of incidence correspondingly, this modification being straightforward and relatively simple. Moreover, the filters taught by document D4 are

made according to Figure 9 for an angle of incidence of 9 to 14 degrees and an angle of about 10° is thus advantageous in document D4. Furthermore, the use of the double angle for illumination is merely a consequence of the physical properties of the filters which reflect the beam at the same angle as its incident angle. In relation to the combination of documents D1 and D4 and the beam travel, the division considered it immaterial whether the word "directing" or "reflecting" is used, since according to document D1 the filter reflects.

III. The appellant requested maintenance of the patent as granted or according to one of four auxiliary requests as specified in the statement setting out the grounds of appeal. The respondent (=opponent) requested the board to dismiss the appeal of the appellant. Document D26 was filed with the reply of the respondent to the statement of grounds of appeal. Both parties requested oral proceedings on an auxiliary basis.

IV. According to the appellant, the invention in issue would require a significant rebuilding of the apparatus described in document D1 in order to achieve the appropriate injection angle. In fact an obvious combination of the teachings of documents D1 and D4 would have been simply to have kept the dichroic filter 18 as taught in document D4 and placed the holographic filter somewhere in the optical path, with its function being simply rejection of Rayleigh light as taught in document D4. The skilled person would have persevered with the forty five degree angle of the dielectric filter 18 and the consequent ninety degree beam deflection according to document D1 in order to avoid adjustment difficulties inherent to adjustment of the

beam steering optics. In the prior art generally, the purpose of a low angle of incidence is variability so as to enable filter tuning. An example can be seen in the case of filters 26 and 54 of document D1. In the case of document D4, the angle is also varied in use, one for the collection of Stokes and one for the collection of anti-Stokes data. In the invention however, the filter 18A and the mirror 18B must be aligned during the initial setup to ensure the incoming laser beam is correctly directed towards the sample. Thus, it is not tuning as in the prior art which is important for the patent, but steering the beam to avoid problems, such as polarisation, associated with a forty five degree incidence. Nowhere in the prior art is there any suggestion of directing the illuminating light at a non-ninety degree angle towards a filter which reflects it towards the sample. Moreover, the skilled person would have had doubts about whether holographic filters really could be used to reflect a laser beam, relating for example to whether the material thereof would be damaged, whether the optical quality would be sufficient and whether there would be multiple reflections.

V. According to the respondent, a skilled person would have been strongly incited to exchange the filter of document D1 for that of document D4, since the latter offers important advantages especially in rejection of Rayleigh scattered light and only simply routine adjustments to the optical system would have been necessary. Document D26 shows just such adjustment in beam steering optics as mentioned in the last complete paragraph on page 153, it being so routine as to only merit a few words.

VI. Oral proceedings were appointed, consequent to the auxiliary requests of the parties, on the date fixed by the summons. In the annex to the summons, the parties were informed that it was intended to take a decision at the end of the oral proceedings. In assessing the cases of the parties, the board identified document D26 as being particularly interesting in relation to incorporating a dielectric reflection filter into a Raman microscope.

VII. In advance of the oral proceedings, the respondent withdrew the opposition, notifying the board of its consequent non attendance at the oral proceedings. The appellant made no substantive reply following the summons but withdrew the request for oral proceedings and requested issue of a written decision based on the documents and arguments already on file.

VIII. The appellant thus requests issue of a decision to the effect that the decision under appeal be set aside and the patent maintained unamended, or as auxiliary requests 1 to 4, on the basis of one of the sets of claims filed as auxiliary requests 1 to 4. Independent claims 1 and 4 of the requests before the board are worded as follows:

Main request

1. A method of illuminating a sample (14) and rejecting Rayleigh scattered light in spectroscopic apparatus, comprising the steps of: directing illuminating light to a holographic filter (18A) such that the holographic filter directs said illuminating light along an optical path to the sample (14), so as to produce from the

sample a spectrum of scattered light for analysis, and
passing said scattered light back along said optical path to the holographic filter (18A), the holographic filter rejecting Rayleigh scattered light in said spectrum,
characterised in that said holographic filter (18A) is a notch filter or edge filter oriented at a low angle of incidence (ω) to said optical path, and in that the illuminating light is directed to the holographic filter (18A) at such an angle that the holographic filter still directs the illuminating light along said optical path towards the sample.

4. 4. A sample illumination and light rejection arrangement for spectroscopic apparatus, comprising:
means (10) for illuminating a sample (14) so as to produce therefrom a spectrum of scattered light for analysis,
an optical path for the scattered light from the sample (14),
a holographic filter (18A) in the optical path, which rejects Rayleigh scattered light received along said optical path from the sample,
illuminating light from the illuminating means (10) being directed to the holographic filter (18A) such that the filter directs said illuminating light along said optical path towards the sample (14), characterised in that said holographic filter (18A) is a notch filter or edge filter oriented at a low angle of incidence (ω) to said optical path, and in that the illuminating light is directed to the holographic filter (18A)

at such an angle that the holographic filter still directs the illuminating light along said optical path towards the sample.

First auxiliary request

According to this request, the characterising part of the independent claims is amended from the main request to read as follows:

characterised in that said holographic filter (18A) is a notch filter or edge filter oriented at a low angle of incidence to said optical path, and in that the illuminating light is directed to the holographic filter (18A) at an angle (2ω) which is twice said low angle of incidence (ω), such that the holographic filter still directs the illuminating light along said optical path towards the sample.

Second auxiliary request

According to this request, the characterising part of the independent claims is amended from the main request to read as follows:

characterised in that said holographic filter (18A) is a notch filter or edge filter oriented at a low angle of incidence (ω) of about 10° to said optical path, and in that the illuminating light is directed to the holographic filter (18A) at such an angle that the holographic filter still directs the illuminating light along said optical path towards the sample.

Third auxiliary request

According to this request, the word "directs" is changed to "reflects" in the independent claims as granted.

Fourth auxiliary reque*st*

This request is that the amendments requested for the second and third auxiliary request be combined.

IX. The oral proceedings proceeded in the absence of the parties according to Rule 71(2) EPC. At the end of the oral proceedings, the appeal board gave its decision.

Reasons for the Decision

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

Main request

2. *Novelty*

2.1 The board considers that, of all the documents now on file, Figure 1b of document D26 represents the closest prior art, in particular because it relates to Raman spectroscopy and discloses directing the illuminating light at a non-ninety degree angle by a filter which reflects it towards a sample. Other close documents, for example Document D1, which was taken as starting point for assessment of novelty and inventive step in the decision under appeal are silent on this feature. Likewise, although Figure 25 of document D3 or the last paragraph of document D9 both involve a holographic filter which also steers the input laser beam, they too

contain no disclosure of the "low angle" feature.

2.2 Consideration of Figure 1b of document D26 in detail reveals that there is disclosed a method of illuminating a sample (Sample at the bottom of the figure) and rejecting Rayleigh scattered light in spectroscopic apparatus, comprising the steps of: directing illuminating light (Laser from the right with mirror in its path) to a filter (middle of figure) such that the filter directs said illuminating light along an optical path (downwardly in the figure) to the sample, so as to produce from the sample a spectrum of scattered light for analysis (to spectrometer upper left of figure), and passing said scattered light back along said optical path to the holographic filter (now upwardly in the figure), the holographic filter rejecting Rayleigh scattered light in said spectrum (see the last but one line on page 153), said filter being oriented at a low angle of incidence to said optical path (see the orientation in the figure), and the illuminating light being directed to the filter at such an angle that the filter still directs (i.e. downwardly in the figure) the illuminating light along said optical path towards the sample.

2.3 The subject matter of claim 1 therefore differs from the disclosure of the closest prior art document D26 by virtue of the recitation of a holographic filter as edge or notch filter.

2.4 The subject matter of claim 1, and for corresponding reasons of corresponding apparatus claim 4, according to the main request is therefore novel in the sense of Article 54 EPC.

3. *Inventive step*

3.1 The main line of argument provided by the appellant in relation to inventive step relies on there being no disclosure in the prior art of a setup involving directing the illuminating light at a non-ninety degree angle by a filter which reflects it towards a sample. The appellant has stressed that in the prior art it was only realised that angular adjustment of a filter was generally to be used for tuning purposes. Furthermore, difficulties in setting up the Raman microscope using beam steering by the filter would in practice have led the skilled person to persevere with the established ninety degree angle change in beam direction as illustrated in document D1. This line of argument was advanced before document D26 was on file and is doomed to fail once its substance is taken away by just such a non-ninety degree direction change being demonstrated by the setup of the filter in the disclosure of Figure 1b of document D26, which document was never addressed in or dealt with by the arguments of the appellant. As results from the novelty analysis above, in this document, the filter plainly meets the feature concerned being used for steering the beam towards the sample and not tuning. Furthermore, no mention of difficulties in setting up is made in document D26 and since a forty five degree angle is not used, problems associated therewith do no arise. The result of consideration of document D26 in relation to the main line of argument of the appellant is thus that the board cannot be persuaded as to inventive step by arguments supported by the non-ninety degree angle.

3.2 Document D4, which was published around but before the priority applications of the patent in dispute, teaches

the skilled person, for example in the first sentence in section 4.1, that holographic notch filters were replacing dielectric filters in the field of FT-Raman spectroscopy. Document D4 advances good reasons for this in Table 1 thereof, for example improved system throughput. While the notch according to Figure 9 of document D4 is too wide simultaneously to collect both Stokes and anti-Stokes data at the same angle, a narrower notch version entailing use of just one angle was being developed according to the last paragraph of section 4.1. The board therefore has no doubt that in a general way the skilled person was motivated by document D4 to replace a dielectric filter by a holographic notch filter in the practice of Raman spectroscopy. That the skilled person would indeed have been interested in the use of the holographic filters of document D4 to replace dielectric filters seems per se to be accepted by the appellant who postulated an obvious combination of documents D1 and D4 without the low angle feature.

3.3 In the particular case of document D26, the board is convinced that it would have been obvious to the skilled person to have replaced the dielectric filter steering the input beam by a holographic filter. Document D26 explains that a specific reason for the adaptation of the beam optics according to Figure 1b is to achieve an improvement in throughput. It is immediately apparent from the teaching of document D4 that a further improvement will occur by using a holographic notch filter. Since both measures are directed to the same end, they fit together and lead in the same direction so that the resulting obvious combination of the teachings renders the replacement taught by document D4 obvious in the teaching of

document D26.

3.4 The board has posed itself the question of whether the skilled person might have been dissuaded from the combination of documents D26 and D4 because document D4 relates to filters where the Rayleigh scattered light is rejected without the illumination light from the laser also being steered by the filter, so that the holographic filter could be placed in transmissive mode somewhere else in the optical path. The board arrived at the answer that the skilled person would not have been so dissuaded because the steering property of holographic filters is as such known, as illustrated for example by Figure 25 of document D3, where the holographic filter 114 reflects the laser beam to scattering medium 116, before passing the waves from the scattering medium to detector 118. Similarly in document D9 reference is made to use of a holographic beam splitter (see the last paragraph) in place of the dichroic splitter (in Figure 1) which likewise steers the input beam. Therefore the skilled person would have had no doubts about simply replacing the dielectric filter in Figure 1b of document D26 by a holographic filter (just as in the case of document D9). The answer to the question posed by the board therefore reaffirms the obvious nature of the replacement.

3.5 The strength of any other technical doubts present must in the view of the board be gauged in context, since while some technical doubts are always present, this naturally does not mean that even when the doubts are weak in the context of the prior art teachings an inventive step must be recognised. In the present case, the doubts mentioned by the appellant about the material, optical quality or reflecting properties of

reflective holographic filters do not amount to a dissuasive teaching against use thereof for the skilled person when weighed against the advantages to be expected according to document D4 and the teachings of documents D3 and D9 indicating an expectation of successful use. The skilled person has merely in a routine way to choose and try the appropriate material to meet this expectation. Therefore after weighing up the doubts mentioned, the board remains of the view that it was obvious to the skilled person to have used a holographic filter to replace the dielectric filter in Figure 1b of document D26. When such obvious replacement does take place, the resulting arrangement demonstrates the sole feature providing novelty of claim 1 over this document alone, i.e. the skilled person arrives directly at the subject matter of claim 1. Corresponding arguments apply to the subject matter of the independent apparatus claim.

3.5 Therefore the subject matter of the independent claims according to the main request cannot be considered to involve an inventive step and thus does not satisfy Article 56 EPC.

4. *Auxiliary requests*

4.1 The independent claims according to the auxiliary requests contain restrictions in relation to those of the main request and must therefore also be directed to novel subject matter.

4.2 According to the normal laws of reflection (angle of incidence equal to angle of reflection), the skilled person expects the illuminating light to be directed to the filter at an angle (incidence) which is twice the

orientation angle of the filter (incidence plus reflection) to the optical path. While Figure 1b and related text of document D26 do not contain numerical details relating to the filter orientation and illumination angle, inspection of this figure gives a strong indication that it too is drawn in accordance with the normal laws of reflection. The board therefore sees no reason to diverge from the decision of the opposition division and thus considers this arrangement just what would be expected and thus obvious for the skilled person. Therefore the subject matter of the independent claims according to the first auxiliary request cannot be considered to involve an inventive step and thus does not satisfy Article 56 EPC.

4.3 It can be seen from Figure 9 of document D4 that 9 to 14° is the value of incident angle for the holographic filters disclosed therein. The value of about 10° claimed in the second auxiliary request lies in this small range and the board does not see any reason why it might be considered an inventive selection. Therefore the subject matter of the independent claims according to the second auxiliary request cannot be considered to involve an inventive step and thus does not satisfy Article 56 EPC.

4.4 Since the filter shown in document D26 reflects the incoming laser light, no inventive step is introduced into the subject matter according to the third auxiliary request by recitation of the word "reflecting". Therefore the subject matter of the independent claims according to the third auxiliary request cannot be considered to involve an inventive step and thus does not satisfy Article 56 EPC.

4.5 Combination of the amendments according to the second and third requests does not lead to any subject matter not dealt with in points 4.3 and 4.4. Therefore the subject matter of the independent claims according to the fourth auxiliary request cannot be considered to involve an inventive step and thus does not satisfy Article 56 EPC.

5. Therefore none of the requests of the appellant lead to independent claims directed to subject matter satisfying Article 56 EPC.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

P. Martorana E. Turrini