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D E C I S I O N
of 22 March 2002

Case Number: T 1221/01 - 3.4.2

Application Number: 96104835.2

Publication Number: 0798559

IPC: G01N 30/74, G01N 30/86, G01J 3/20

Language of the proceedings: EN

Title of invention:
Method of detecting sample substances

Applicant:
Agilent Technologies, Inc. (a Delaware corporation)

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
Novelty, Inventive step - claim 1 (yes, after amendment)

Decisions cited:
-

Catchword:
-



Case Number: T 1221/01 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 22 March 2002

Appellant: Agilent Technologies, Inc. (a Delaware corporation)
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Representative: Harbach, Thomas
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Decision under appeal: Decision of the Examining Division of the European Patent Office posted 20 August 2001 refusing European patent application No. 96 104 835.2 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: E. Turrini
Members: M. A. Rayner
G. E. Weiss

Summary of Facts and Submissions

- I. The applicant (appellant) has appealed against the decision of the examining division dated 20 August 2001 refusing European patent application number 96 104 835.2. The notice of appeal was lodged on 29 October 2001 and the prescribed fee paid on the same day. On 21 December 2001 a statement of grounds of appeal was filed. The patent application relates to a method of detecting sample substances.
- II. During the proceedings before the examining division, reference was made inter alia to:-

US-A-3 637 310 (=document **D3**)

EP-A-0 674 160 (=document **D6**)

US-A-4 732 476 (=document **D7**).

In the decision under appeal, the examination division did not admit requests filed during oral proceedings and involving reference to quantification and qualification measurements being made in an alternating manner because they were not filed by the final date specified according to Rule 71a EPC. The division nevertheless remarked that it saw the problem solved by alternation of qualification and quantification measurements as being how to provide more accurate quantification data. In the view of the division, a similar solution had already been disclosed in document D7, wherein, in a similar measuring method, light of two wavelengths is used, one where there is absorbance and one where there is no absorbance. According to

document D7 "a complete spectrum can be collected in the fraction of a second" by reading "the detector output as a function of time". Therefore, bearing in mind that for scattering correction, only the information of two different wavelengths is needed, the person skilled in the art would consider recording with each rotation the intensities measured at these two wavelengths only instead of recording complete spectra. He would thus record these measurements in an alternating manner and arrive at the claimed invention without using inventive ingenuity. A similar argument could start from documents D3 or D6.

- III. According to the appellant, consequent to the "alternating manner" as recited in claim 1 of the application as amended during the appeal proceedings, the invention involves more quantification measurements being made than in closest prior art document D3, thus increasing reliability of the chromatogram produced. The same argument applies to document D6. The spectrometer of document D7 also performs wavelength scans over a continuous wavelength range

- IV. The appellant requested grant of a patent in the statement of appeal, expressing agreement during the appeal proceedings to proceeding to grant on the basis of documents annexed to a communication of the Board dated 22 January 2002.

- V. The wording of the independent claim of the application is as follows:-
 - 1. A method of detecting sample substances separated by an analytical separation technique, for example liquid chromatography or capillary electrophoresis, using

electromagnetic radiation, wherein a plurality of quantification measurements for determining the amounts of sample substances are made with a detection means at a predetermined wavelength of the electromagnetic radiation at different points in time during passage of the sample substance through a flow cell, wherein the detection means is a single channel detection element, and wherein quantification information indicative of the quantity amounts of the sample substances, respectively, is derived from said plurality of quantification measurements made at said predetermined wavelength,

c h a r a c t e r i z e d in that the same single channel detection element with which said quantification measurements are made is used to make additional measurements for determining the type of a sample substance, the additional measurements comprising measurements at wavelengths different from said predetermined wavelength, wherein said additional measurements are made at points in time different from those at which said quantification measurements are made wherein said quantification measurements and said additional measurements are made in an alternating manner, and wherein spectral information about the sample substances to be detected is derived from said additional measurements.

Reasons for the Decision

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

Amendments

2. Support for claim 1 can be seen in the documents as filed, for example claim 1, lines 7 to 11 on page 12 and page 4, line 10 of the description as filed (= lines 7 to 9 on page 6 and page 3, line 8, respectively, of the published "A" specification). Consequential amendments have been made to the dependent claims and description, wherein the prior art has been acknowledged. The amendments made do not give rise to objection under Article 123(2) EPC.

Documents D3, D6 and D7

- 3.1 Document D3 concerns chromatography and identifying chemical components by means of a spectrometer. Figure 1 shows a liquid chromatograph including a dispersing element arranged to rotate for continuously scanning a sample cell. An absorption spectrum is recorded as shown in Figure 3. Sampling of the absorption spectrum takes place at fixed periods (for example i , j along the spectrum) determined by the time it takes for the dispersing element to complete one rotation. The dispersing element is provided with a switching means to select a specific wavelength in order to detect the absorption degree at this wavelength upon arrival at the corresponding position. The absorption spectrum at that wavelength is thus obtained as shown in the sampled chromatogram of Figure 2 (points i and j are shown as successive points in Figure 2).
- 3.2 Document D6 concerns a fluorescence spectrometer in which a sample to be analysed is irradiated by excitation light causing the sample to emit fluorescence light at characteristic wavelengths. The fluorescence light is measured by a detector to derive

information about the sample, in particular the composition of the sample and the quantities of the individual components present therein. According to Figure 2, a grating directs a converging light beam into a sample cuvette. The wavelength of the beam can be adjusted by appropriate rotation of the excitation grating. The sample cuvette contains the sample substances to be analysed. Typically, the sample cuvette is a flow-through cuvette through which sample substances are continuously flowing. Light originating from the sample in the cuvette is transmitted to the detector via an emission grating. The entire spectrum of the beams of different wavelengths emitted by the emission grating can be shifted by rotation thereof across the detector. Using an array of avalanche photodiodes, the entire emission spectrum can be recorded simultaneously since beams of different wavelengths impinge on different photodiodes. With a single photodiode, however, the grating has to be rotated (or the photodiode has to be moved) to ensure that the detector detects beams of different wavelengths. Use of the fluorescence spectrophotometer for quantitative measurement in liquid chromatography, where completion of measurement has to be completed in a short time, is mentioned as advantageous. With an array of avalanche photodiodes, it is possible to record a wavelength spectrum as sample substances are moving through the cuvette.

- 3.3 Document D7 concerns the speed with which rapid-scan spectrophotometers can scan the relevant spectra. A grating is rotated at a predetermined and selected angular velocity. The optical region of interest is approximately 15 degrees of the rotational sweep, therefore means are provided to select and coordinate

the scanning with the angular position of the grating. An analog to digital card is programmed to take sufficient samples to accurately cover the wavelength range of interest and to repeat the sampling with each rotation of the optical grating. For routine measurements and slow scan, the rapid scan of the instrument permits each spectral element to be represented as a value and corresponding statistical uncertainty. In kinetics, wherein the concentrations of various species are followed as a function of time, to study their dynamic behaviour, the spectrophotometer is capable of acquiring at least ten complete spectra per second (200 nm to 800 nm) with one nm resolution. The instrument can be used for spectroelectrochemistry, stop flow kinetics and as a detector for liquid chromatography (HPLC) or gas chromatography (see column 5, middle). Measuring changes in absorbance in samples that are highly heterogeneous is difficult due to scattering. To correct for the scattering effect, light of two different wave lengths is used, one where there is absorbance in the sample and one where there is no absorbance to thereby detect the attenuation caused by scattering. Because a complete spectrum can be collected in a fraction of a second, information coming from two different wave lengths can be considered to be acquired virtually simultaneously, and the dual wave length spectroscopy correction can be applied with a minimum of error.

Novelty

- 4.1 Each of documents D3, D6 and D7 discloses quantitative and qualitative measurements. However, the making of additional spectral information measurements according to the characterising features of claim 1 at points in

time different from quantification measurements in an alternating manner is not disclosed in any of documents D3, D6 or D7.

- 4.2 None of the other prior art documents in the file is more relevant in relation to novelty. The subject matter of claim 1 is therefore novel in respect of the disclosures of any one of documents D3, D6 or D7.

Inventive Step

- 5.1 The problem solved by the novel features of claim 1 can be considered to be that of improving the reliability of the chromatogram and thus quantitative accuracy. This is because making of additional spectral information measurements at points in time different from quantification measurements in an alternating manner enables relatively more quantification measurements to be made.
- 5.2 All of the prior art references involve recording of a complete spectrum and make no suggestion towards "making measurements in an alternating manner". In particular, while the Board recognises a general desiratum pertaining to increasing spectral scanning speed in documents D6 (avalanche photodiodes) and D7 (rapid scan), it does not consider this approach to offer a solution to the specific problem of improving the reliability of the chromatogram. The Board therefore formed the view that there is no convincing challenge to inventive step based on documents D3, D6 or D7 or any combination thereof. The line of argument of the examining division that, following the teaching of document D7, the skilled person "would consider" recording at two intensities only per rotation instead

of complete spectra and "thus record" in an alternating manner did not persuade the Board to the contrary. This is because there is no reason on the face of the documents either for the "would consider" step or for jumping from this step to the further "thus record" step. Moreover, since in the putative configuration argued by the examining division, the two intensities are instead of complete spectra, the Board cannot see how spectral information within the meaning of claim 1 could be considered derived from the additional measurements. The submission of the appellants that more quantitative measurements are made according to the invention as claimed in claim 1 than are contemplated by the prior art therefore convinced the board as to inventive step.

- 5.3 None of the other prior art documents in the file comes closer to the subject matter of claim 1. Accordingly, the subject matter defined by claim 1 is considered to involve an inventive step within the meaning of Article 56 EPC. The same applies to the remaining claims, since they include the subject matter of claim 1.

Article 111(1) EPC

- 5.4 In view of the foregoing, the Board considers it, having regard to Article 111(1) EPC, appropriate to exercise favourably the power of the examining division. In doing so, the Board has convinced itself that the application documents meet the requirements of the Convention.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to grant a patent based on the amended specification attached to the communication of the Board dated 22 January 2002.

The Registrar:

The Chairman:

P. Martorana

E. Turrini