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D E C I S I O N
of 17 December 2003

Case Number: T 1207/01 - 3.4.3

Application Number: 86303906.1

Publication Number: 0202943

IPC: H01J 49/42

Language of the proceedings: EN

Title of invention:
Method of operating an ion trap

Patentee:
Thermo Finnigan LLC

Opponent:
Bruker-Franzen Analytik GmbH
Franzen J., Dr

Headword:
Mass spectrometer/FINNIGAN

Relevant legal provisions:
EPC Art. 54, 56, 123(2) and (3), 113(1)
EPC R. 67, 72

Keyword:
"Novelty - main request (no)"
"Inventive step - first auxiliary request (yes)"
"Substantial procedural violation (no)"

Decisions cited:
-

Catchword:
-

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Case Number: T 1207/01 - 3.4.3

D E C I S I O N
of the Technical Board of Appeal 3.4.3
of 17 December 2003

Appellant: (Proprietor of the patent)
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Decision under appeal:
Decision of the Opposition Division of the European Patent Office posted 2 October 2001 revoking European patent No. 0202943 pursuant to Article 102(1) EPC.

Composition of the Board:

Chairman: R. K. Shukla
Members: G. L. Eliasson
J. P. B. Seitz
E. Wolff
M. B. Günzel

Summary of Facts and Submissions

I. European Patent No. 0 202 943 was revoked in a decision of the opposition division dated 2 October 2001. In the opposition proceedings, following documents were *inter alia* cited by the opponents:

D1: EP-A-0 113 207;

D6: Astrophysical Journal, volume 195, 1975, pages L89 to L91; and

D8: Physical Review Letters, Vol. 20, No. 2, 8 January 1968, pages 39 to 41.

There were allegations of public prior use in the opposition proceedings, of which the following are relevant to the present decision:

P1: Prior use No. 1: Apparatus at Bell Telephone Laboratories used by Dr E. Ensberg between 1972 and 1975 to isolate and study the ion CH_4^+; and

P3: Prior use No. 3: Apparatus at Bell Telephone Laboratories from 1963 to 1970 used by Dr K. Jefferts to measure the relative amounts of H_2^+ to H^+ in sample gases.

II. The patent proprietor (appellant) lodged an appeal on 7 November 2001, paying the appeal fee the same day. A statement of the grounds of appeal was filed on 4 February 2002.

III. Both opponents (respondents) withdrew their respective oppositions with the letter dated 6 December 2001.

IV. In response to a communication of the Board accompanying the summons to oral proceedings, the appellant filed amended claims with a letter dated 17 November 2003.

V. At the oral proceedings held on 17 December 2003, the patent proprietor (appellant) requested that the decision under appeal be set aside and that European patent No. 0 202 943 be maintained on the basis of one of the following requests:

Main Request:
Claims 1 to 4 as granted;

First Auxiliary Request:
Claim 1 according to the first auxiliary request as filed with the letter dated 17 November 2003,
Claims 2 to 4 as granted,

Description pages 2, 4, and 5 as filed during the oral proceedings,
other description pages and figures as granted;

Second to Fourth Auxiliary Request:
Claims 1 and 2 according to one of the second to fourth auxiliary request as filed with the letter dated 17 November 2003.

Furthermore, the appellant requested reimbursement of the appeal fee for reason of substantial procedural violations committed by the opposition division.

VI. Claim 1 as granted and forming the appellant's main request has the following wording:

"1. A method of mass analysing a sample by means of a quadrupole mass spectrometer, comprising the steps of defining a trap volume (16) within an electrode structure comprising a ring electrode (11) and two end caps (12, 13) at both sides of the ring electrode (11) to which a DC voltage and a fundamental RF voltage are applied to form a three-dimensional quadrupole field adapted to trap ions within a predetermined range of mass-to-charge ratio;

forming or injecting ions within said trap volume (16) such that those within said predetermined mass-to-charge range are trapped within said trap volume (16);

and utilising an RF generator (35) coupled to end caps (22, 23) to apply a supplementary AC field superposing said three-dimensional quadrupole field to form combined fields,

characterised by the steps of scanning said combined fields to cause ions of consecutive mass-to-charge ratio to escape said trap volume (16) for detection and analysis."

VII. Claim 1 according to the first auxiliary request differs from that of the main request in that the last paragraph reads as follows (emphasis added by the Board):

"characterised by the steps of scanning said combined fields **with the supplementary field turned on** to cause ions of **all mass-to-charge ratios in said range** to escape said trap volume (16) in consecutive mass-to-charge ratio order for detection and analysis."

VIII. The reasons given in the decision under appeal for revoking the patent, which are relevant for the present decision, can be summarized as follows:

(a) The subject matter of claim 1 as granted is not new with respect to each of document D6 and prior uses P1 and P3. In particular, the term "scanning said combined fields" in the claim does not exclude "discontinuous" scanning known from document D6 and employed in the prior uses P1 and P3.

(b) It is furthermore noted that in prior use P3, the combined fields with the supplementary field turned on was scanned by varying the intensity of the trapping field, and therefore took away the novelty of the subject matter of claim 1 according to auxiliary request 1.

(c) Claim 1 according to auxiliary requests 2 and 3 lacked clarity, since the terms "excluding scanning *only* H^+, H_2^+ and H_3^+" and "excluding scanning H^+, H_2^+ and H_3^+" were meaningless.

IX. The patent proprietor made essentially the following arguments in support of his requests:

(a) The finding of the opposition division that prior uses P1 to P3 were public was wrong, since there is no evidence that the apparatus itself could teach the invented method to a skilled observer. There is also no evidence that members of the public had access to operate the apparatus. Even if Drs Ensberg and Jefferts were free to speak about their experiments to members of the public, this does not make the invention available to the public. The evidence submitted fails to establish any incident of public oral disclosure of the invention. It is furthermore clear that Drs Ensberg and Jefferts did not have unfettered discretion to disclose their work.

(b) Document D6 does not disclose a continuous scanning of the field. Instead, a supplementary voltage is applied at a chosen frequency to drive particles of the selected mass-to-charge ratio out of the trap. This is evidenced from the testimony of Dr Ensberg in conjunction with prior use P1, from which it follows that the auxiliary field in the method of document D6 was switched off between the two pulses of ejecting CH_3^+ and CH_4^+.

In claim 1 according to the main request, on the other hand, the term scanning would be interpreted by the skilled person to mean a systematic change of the field to ensure that ions of all mass-to-charge ratio ratios are detected. In the method of document D6, only two selected types of ions are

sampled so that the scanning does not "cause ions of consecutive mass-to-charge ratio to escape" as in the claimed method. Finally, document D6 does not involve "mass analysing a sample", i.e. analysing to determine what masses are present in the sample, since the masses of the sample ions in document D6 are already known, and only the ratio of the amounts of the two ions at these known masses is determined.

(c) Prior use P1 also relates to a non-continuous scan, as in document D6. The opposition division stated that a larger range of masses (from C^+ to CH_5^+) was scanned. There is insufficient evidence that such a scan was conducted, and if such a scan ever was carried out, then only for calibration.

(d) The evidence relating to prior use P3 entirely depends on the written and spoken statements by Dr Jefferts, for which there is no other corroboration.

The opposition division was therefore wrong to accept the uncorroborated evidence based entirely on Dr Jefferts' memory of events more than 30 years ago, in particular the evidence in general terms of all the different combinations of varying the combined fields during scanning. It was also wrong to accept that these uncorroborated assertions constituted part of the state of the art. There was no evidence that Dr Jefferts had made any specific disclosure of any specific method at any particular time to a specific individual.

(e) It is requested to reimburse the appeal fee, since several procedural violations were committed by the opposition division:

(i) In the proceedings before the European Patent Office, the applicant/patentee is entitled to adequate prior notice of the "state of the art" upon which a decision prejudicing the patent is to be made. The patentee was given no such notice in the opposition proceedings, since the question of *what* technical features would be comprised in the alleged prior use was not determined until the announcement of the prior use decision of the opposition division during the oral proceedings. Moreover, in dealing with the question of what technical features were comprised in the alleged prior use, the opposition division failed to define precisely what was to be considered part of the state of the art, from the many, and sometimes conflicting, statements made by the various witnesses. The only statement made by the opposition division was a brief sentence in very general terms. As a result, the patent proprietor did not know which amendments, if any, could be made to the claims in order to render them patentable. As a result the patentee's rights, in particular according to Article 113 EPC were not respected.

(ii) In the decision under appeal, the opposition division sets out the technical features in prior uses P1 to P3 in the general terms of the language of the claims, thereby pre-judging the questions of novelty and inventive step. Only printed prior art can make a disclosure in general terms.

(iii) The summons and the decision for taking of evidence issued by the opposition division on 8 January 2001 were contrary to the requirements of Rule 72(1) EPC, since it was stated therein that the facts to be determined was whether "a method as claimed in claim 1" was used prior to the filing dated of the patent in suit. "A method as claimed in claim 1", cannot be a fact to be determined. Also, the actual taking of evidence went way beyond the subject matter which was specified in the summons.

(iv) In the decision under appeal, auxiliary request 2 is considered to lack clarity without any appropriate reasoning. If there was a clarity problem with the proposed amendment, it derived from the failure of the opposition division to properly identify what constituted the state of the art.

Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is therefore admissible.

Main Request

2. *Novelty*

2.1 Document D6 discloses experiments on the photodissociation of ionized methane (CH_4^+) using a Paul ion trap, i.e. a quadrupole mass spectrometer. A trap volume is defined within an electrode structure comprising a ring electrode and two end cap electrodes at both sides of the ring electrode (cf. Figure 1; page L89 "II. Apparatus"). A DC voltage and a fundamental RF voltage are applied to the ring electrode to form a three-dimensional quadrupole field which traps ions within a predetermined range of mass-to-charge ratio.

In order to eject ions having a given mass-to-charge ratio, a supplementary AC voltage is applied to the cap electrodes and the frequency of the supplementary AC voltage is varied around the orbit frequency of the ions to be ejected (cf. paragraph bridging pages L89 and L90). In the experiment reported on in document D6, after a sample of methane gas is injected in the ion trap, it is photo-dissociated in the trap and the numbers of CH_3^+ and CH_4^+ ions are counted by ejecting the ions sequentially from the trap volume (cf. page L90, section "III Results", second paragraph).

2.2 The appellant argued that document D6 does not disclose "mass analysing a sample" by "scanning said combined fields to cause ions of consecutive mass-to-charge ratio to escape said trap volume for detection and analysis", since in the method disclosed in document D6, the supplementary field is only turned on to eject ions with preselected mass-to-charge ratios, and no *continuous,* systematic scan of the fields is carried out in order to eject all ions of the sample (cf. item IX(b) above). In addition, since document D6 only measures two ion species, the method does not comprise the step of causing ions of *consecutive* mass-to-charge ratio to escape the trap.

The Board however does not agree with the appellant that the term "scanning" in claim 1 is limited to *continuous* scanning of the selected range of the mass-to-charge ratio (cf. item VIII(a) above). Also, the appellant was not able to indicate any passage in the patent specification which would provide support for such a narrow construction of the term "scanning". Since the frequency of the supplementary AC voltage applied to the cap electrodes is varied around the orbit frequency of the ions to be ejected, the combined electric field in the method of document D6 is scanned as in the method of claim 1.

As to the term "ions of *consecutive* mass-to-charge ratio", the Board does not follow the appellant's argument, since in the method according to document D6, the different ion species are made to escape from the trap one after the other, as compared to being ejected together at once. Moreover, since only two ion species

are ejected, ions of consecutive mass-to-charge ratio are necessarily ejected.

Therefore, the method of document D6 comprises the step of "scanning said combined fields to cause ions of consecutive mass-to-charge ratio to escape said trap volume."

2.3 Since the method disclosed in document D6 comprises all the steps of claim 1 according to the main request, the subject matter of claim 1 according to the main request is not new within the meaning of Article 54(1) and (2) EPC.

First Auxiliary Request

3. *Amendments*

With respect to the main request, claim 1 according to the first auxiliary request further specifies that in the steps of scanning said combined fields, the scanning is carried out with the supplementary field turned on, and the scanning is carried out to cause ions of **all** mass-to-charge ratios in said range (i.e. all ions which are trapped) to escape the trap volume in consecutive mass-to-charge ratio order for detection and analysis.

The features of claim 1 according to the first auxiliary request are disclosed on page 9, line 19 to page 10, line 13 of the application as filed (cf. column 6, line 56 to column 7, line 31 of the patent specification). Therefore, the requirements of Article 123(2) and (3) EPC are met.

4. *Novelty and inventive step*

4.1 Document D6

In the method of document D6 referred to above in connection with the main request, the scanning is carried out so that only CH_3^+ and CH_4^+ ions are caused to escape from the trap volume, after which the trap volume is emptied without counting the ions (cf. page L90, left hand column, third paragraph).

Furthermore, as mentioned above (cf. item 2.2 above), the auxiliary field is in the method of document D6 only turned on to eject ions with preselected mass-to-charge ratios and is otherwise turned off.

Consequently, the method of claim 1 differs from that of document D6 in that (i) the auxiliary field is kept turned on during scanning, whereas in the method of document D6, the auxiliary field is only turned on to eject ions with preselected mass-to-charge ratios; and (ii) the scanning is carried out to cause ions of all ions which are trapped to escape the trap volume in consecutive mass-to-charge ratio order for detection and analysis, whereas in the method of document D6, only selected ion species are caused to escape.

4.2 Prior use P1

Prior use P1 relates to the experimental work which led to the publication of document D6. Notwithstanding the question whether the experimental work according to prior use P1 was accessible to public or not (cf. item

IX(a) above), the experimental work is not more relevant than the disclosure of document D6, since the features (i) and (ii) referred to in item 4.1 above distinguishing the claimed method from that of document D6 were also not present in the experimental work.

4.3 Prior use P3

In the decision under appeal it was held that according to the prior use P3, an operation of a quadrupole mass spectrometer was disclosed to public, where during scanning the auxiliary field was kept turned on and the intensity of the trapping field was scanned to eject ions of specific charge-to-mass ratio from the trapping field (cf. item VIII(b) above).

The appellant has argued that at least some features of prior use P3 were not made public, and therefore, prior use P3 did not constitute prior art within the meaning of Article 54(2) EPC (cf. item IX(d) above).

Notwithstanding the question whether prior use P3 forms part of the state of the art or not, the Board finds for the following reasons that the disclosure of the operation of the quadrupole mass spectrometer, as documented in the minutes of the taking of evidence, is no more relevant than that of document D6, and therefore is not prejudicial to novelty of the subject matter of claim 1. Therefore, the Board will not address the question as to what extent, if at all, the experimental work according to prior use P3 forms part of the state of the art.

4.3.1 Prior use P3 relates to experimental work carried out at Bell Laboratories between 1963 and 1970 by Dr Jefferts. Some of the experimental details and results of these experiments were published in document D8. According to this document, a quadrupole ion trap was used for measuring the relative amounts of H_2^+ and H^+ ions in different samples. The quadrupole ion trap was operated by applying a DC voltage and a fundamental RF voltage to a ring electrode to form a three dimensional trapping field, and applying a supplementary AC field to two cap electrodes at each end of the ring electrode (cf. D8, Figure 2). Thus, the apparatus is of the same type as that disclosed in document D6.

4.3.2 As the appellant convincingly argued, it is apparent from the testimony of Dr Jefferts in relation to prior use P3 before the opposition division that two different techniques were employed by him for ejecting the selected ions from the trap. In the first technique, the DC part of the trapping field was varied to eject the ions from the trap. In the second technique, the frequency of the supplementary field applied to the cap electrodes was varied while the trapping field was kept constant (cf. Minutes of the taking of evidence, page 14, last three paragraphs).

The opposition division concluded from the testimony of Dr Jefferts that in the first technique (scanning mode) the supplementary field was also applied while the trapping field was varied to eject the ions (cf. item VIII(b) above) Thus, the opposition division concluded that in the prior use P3, the combined field was varied to eject the ions as in the method according to claim 1.

The Board however does not agree with this finding, since from the minutes of the testimony, it is evident that in the first scanning mode, there is no supplementary voltage applied to the cap electrodes during the ejection of the ions.

With regard to the second technique employed by Dr Jefferts to eject selected ions from the trap, as convincingly argued by the appellant, the supplementary field is turned on only to eject ions with preselected mass-to-charge ratios, as the case is for the method disclosed in document D6. This conclusion follows from the statement of Dr Jefferts that it was possible to eject different ion species H^+, H_2^+, H_3^+ in an arbitrary order. It was furthermore testified that Dr Jefferts used two separate integrators for counting the respective number of the different ion species (cf. the minutes of the taking of evidence, page 15, penultimate paragraph to page 16 second paragraph). As pointed out by the appellant, such an arrangement implies that the apparatus used in prior use P3 was only suitable for a non-continuous scan of the frequency of the supplementary field, in the sense that only preselected ions, and not all the ions in the trap volume, are ejected for detection.

4.3.3 In summary, the testimony relating to prior use P3 *neither* discloses that the scanning of the trapping field is carried out with the supplementary field turned on, *nor* that the scanning is carried out to cause ions of **all** mass-to-charge ratios in said range (i.e. all ions which are trapped) to escape the trap volume in consecutive mass-to-charge ratio order for detection and analysis.

4.4 Document D1

Document D1 was cited in the patent in suit and discloses a method of mass analysis of a sample using a quadrupole mass spectrometer comprising a ring electrode 11 and two cap electrodes 12, 13 (cf. abstract; Figure 1 with accompanying text). A fundamental AC voltage and a DC bias voltage are applied to the ring electrode producing a quadrupole trapping field, which traps ions within a given range of mass-to-charge ratio in the trap. The voltage parameters are varied continuously so that trapped ions of consecutive specific masses become sequentially unstable and leave the trapping field, where they are detected and counted (cf. claim 1; page 9, lines 1 to 26). The result is presented in form of mass spectrograms (cf. Figures 9 and 10 with accompanying text).

4.4.1 Thus, document D1 does not discloses an RF generator coupled to the cap electrodes applying a supplementary AC field superposed on the three-dimensional quadrupole field to form combined fields, since in document D1, the cap electrodes 12, 13 are grounded, and consequently, only the three-dimensional quadrupole trapping field is scanned (cf. D1, Figure 1).

4.5 It follows from the above discussion that document D1 should be considered the closest prior art, since it is the only prior art which discloses a method of mass analysis of a sample where the field in the ion trap is varied continuously so that ions of all mass-to-charge

in the preselected mass range escape consecutively from the trap volume.

4.6 As stated in the patent in suit, the method of document D1 has the problem that the mass range which can be selected is limited due to the limitation in the maximum fundamental voltage of the trapping field which can be applied to the ion trap (cf. patent in suit, column 7, lines 14 to 18).

4.7 A skilled person seeking to improve the device of document D1 would in the Board's opinion not consider document D6, since firstly it is not concerned with mass spectroscopy. Secondly, ion species investigated in document D6, CH_3^+ and CH_4^+, have relatively low mass-to-charge ratios, so that document D6 does not contain any hint that the use of a supplementary field is useful in order to extend the mass range of the mass spectrometer known from document D1.

4.8 For the above reasons, in the Board's judgement, the subject matter of claim 1 according to the first auxiliary request involves an inventive step within the meaning of Article 56 EPC.

5. Therefore, the claims according to the first auxiliary request meet the requirements of the EPC.

6. *Procedural Issues*

6.1 The appellant has requested reimbursement of the appeal fee for reasons of a substantial procedural violation as set out under item IX(e) above.

6.2 A reimbursement under Rule 67 EPC of the appeal fee can only take place when the appeal is allowable, and a reimbursement is equitable by reason of a substantial procedural violation. The Board finds for the following reasons that the opposition division did not commit any substantial procedural violation, and therefore, the request for reimbursement of the appeal fee has to be rejected.

6.2.1 Regarding the procedure concerning the taking of evidence for the prior uses (cf. item IX(e)(i) above), it appears from the file that the contents of the testimonies were discussed by the parties in the morning on the day after the testimonies had been given (see minutes of oral proceedings, pages 4 to 8). After hearing the parties, the opposition division decided whether the alleged prior uses were considered to be comprised in the state of the art, and whether the prior uses anticipated the claimed subject matter (cf. minutes, page 8, item II).

As to the alleged failure of the opposition division to exactly state in the oral proceedings which features were disclosed in the respective prior uses (cf. item IX(e)(ii) above), it is evident from the minutes of the oral proceedings (cf. pages 8 to 9, items II.2 and II.3) that the opposition division summarized each prior use which was considered to be comprised in the state of the art. The Board does not follow the appellant's argument that the opposition division at this stage was obliged to state in detail what was to be considered part of the state of the art from the statements made by the various witnesses. When discussing novelty, however, each party was given the opportunity to

present his case in respect of the features of the claimed method, which were known from a prior use in question, and which features (if any) were considered new with respect to this prior use. It is clear from the minutes of the oral proceedings that such a discussion on novelty took place (cf. minutes, item III), and that after hearing the parties and deciding on the meaning of certain terms of claim 1 (cf. item IV), the opposition division took a decision on this issue (cf. minutes, item V).

Also the decision under appeal contains a detailed discussion of each prior use when discussing novelty of the claimed subject matter (cf. decision under appeal, items 4.2 to 4.4).

Thus, the decision on lack of novelty in respect of the prior uses P1 and P3 was taken after the opposition division had heard the patentee's submissions in this respect so that the requirement of Article 113(1) EPC was not contravened.

Furthermore, according to the minutes of the oral proceedings before the opposition division, the patentee was given two opportunities to file amended claims during the oral proceedings - after the parties had presented their arguments with respect to the alleged prior uses and after that the opposition division had announced its decision that the subject matter of claim 1 according to the main request was not new with respect to each of documents D6 and prior uses P1 and P3 (cf. minutes of the oral proceedings, page 11, paragraph 2, and page 13, paragraphs 10 and 11). Thus, the appellant had the opportunity to submit new

requests in the light of the discussion on novelty. The appellant's submission in respect of adequate notice for filing amendments therefore cannot be followed (cf. item IX(e)(i) above).

Thus, contrary to the appellant's submissions, the Board cannot see any substantial procedural violation committed by the opposition division on this issue.

6.2.2 Regarding the form of the summons and the decision to take evidence (cf. item IX(e)(iii) above), the Board also cannot see any procedural violation. In the "decision and order to take evidence by hearing of witness" issued by the opposition division on 8 January 2001, it is stated that the evidence will be regarding the *assertions* of the opponents that the prior uses P1 to P3 anticipate the method of claim 1 as granted, and in particular the circumstances of the alleged prior uses and the question whether persons, which were not under the obligation of secrecy, could gain knowledge of the relevant features. Thus, the requirements of Rule 72(1) EPC were met.

6.2.3 In the decision under appeal, claim 1 according to auxiliary requests 2 and 3 was considered to lack clarity, for the reason that the terms "excluding scanning *only* H^+, H_2^+ and H_3^+" and "excluding scanning H^+, H_2^+ and H_3^+" were considered meaningless (cf. item VIII(c) above). Notwithstanding the question whether a disclaimer would be allowable with respect to prior use P3, the Board agrees with the finding of the opposition division that the term "excluding scanning (only) H^+, H_2^+ and H_3^+" is not clear in the context of a method of mass analysing a sample, since the method according to

claim 1 detects ions within a range of mass-to-charge ratios and cannot distinguish between ions having the same mass-to-charge ratio, such as H_3^+ and $(He^3)^+$. Consequently, it is unclear whether scanning for $(He^3)^+$ would be excluded or not. Furthermore, contrary to the appellant's submissions (cf. item IX(e)(iv) above), the Board does not see any reason why this lack of clarity would have any casual link with the alleged failure of the opposition division to properly identify what constituted the state of the art.

6.3 Thus, for the above reasons, the request for reimbursement of the appeal fee has to be rejected.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the opposition division with the order to maintain the patent with the following documents:

   Claim 1 according to the first auxiliary request as filed with the letter dated 17 November 2003,
   Claims 2 to 4 as granted,

   Description pages 2, 4, and 5 as filed during the oral proceedings, other description pages and figures as granted.

3. The request for reimbursement of the appeal fee is rejected.

The Registrar: The Chairman:

D. Meyfarth R. K. Shukla