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BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

Publication in the Official Journal ~~Yes~~ / No

File Number: T 553/91 - 3.4.2

Application No.: 86 905 881.8

Publication No.: 0 238 602

Title of invention: Electrophoresis method and apparatus for separating particles in a separations medium

Classification: G01N 27/26

# D E C I S I O N
of 11 February 1992

Applicant: The Chancellor, Masters and Scholars of the University of Oxford

Headword:

EPC Article 123(2), 56

Keyword: "main request: additional subject-matter (yes)" - "auxiliary request: additional subject-matter (no)" - "inventive step (yes)"

## Headnote

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

**Case Number : T 553/91 - 3.4.2**

# D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 11 February 1992

**Appellant :** The Chancellor, Masters and Scholars
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**Decision under appeal :** Decision of Examining Division of the European Patent Office dated 11 February 1991 refusing European patent application No. 86 905 881.8 pursuant to Article 97(1) EPC.

**Composition of the Board :**

**Chairman :** E. Turrini
**Members :** M. Chomentowski
C.V. Payraudeau

## Summary of Facts and Submissions

I. At the end of the examination proceedings, the European patent application No. 0 238 602 (86 905 881.8) was refused by the Examining Division on the grounds that the subject-matter of the valid Claim 1 lacked an inventive step with regard i.e. to

D1 = US-A-4 061 561.

D2 = WO-A-84/02001 (& US-A-4 473 452) was also mentioned in the decision.

II. The Appellants (Applicants) filed an appeal against this decision and requested that the decision under appeal be set aside and that a patent may be granted according to a main request (Claims A) or, auxiliarily, according to a second or third request (Claims B and C, respectively).

III. The Board expressed, in a communication to the Appellant for preparing the oral proceedings requested by the Appellants, the provisional opinion that the amendments of the application resulting in the set of Claims A introduced additional subject-matter, but that an application based on an amended text of the set of Claims B could be formally allowable and patentable having regard to the available prior art.

IV. In a written statement, the Appellants submitted new arguments in support of their main request and withdrew their request for oral proceedings, which were cancelled accordingly.

V. In a further written statement, the Appellants requested that the decision under appeal be set aside and that a patent be granted on the basis of the main request, with the set of Claims A, or auxiliarily, with the text of the application and claims as proposed by the Board.

VI. Main request (Set of Claims A)

Claim 1 and Claim 6 read as follows:

"1. Electrophoresis method for separating DNA particles in a separation medium, the particles being driven in the separation medium by an electric field, wherein relative rotation between the separation medium and the electric field is effected at predetermined intervals in a plane between different rotary positions, whereby the particles are driven alternately first in one direction and then in another direction transverse to the first, characterised in that the angle between different rotary positions is larger than 90°."

"6. Electrophoresis apparatus for separating DNA particles in a separation medium (15), comprising means for driving the particles alternately first in one direction and then in another direction transverse to the first in the separation medium, said means comprising field generating means (11, 12) for generating an electric field, a support plate (14) for supporting the separation medium (15), said support plate (14) being provided between said field generating means, and a time controlled driving means (17) for effecting relative rotation between the support plate (14) and the field generating means at predetermined intervals in a plane between different rotary positions, characterized in that the angle between the rotary positions is larger than 90°."

Claims 2 to 5 and 7 to 12 are dependent claims.

Auxiliary request

Claim 1 and Claim 5 read as follows:

"1. Electrophoresis method for separating DNA particles in a separation medium, the particles being driven in the separation medium by an electric field, wherein the separation medium is rotated at predetermined intervals in a plane between different rotary positions in one and the same electric field, whereby the particles are driven alternately first in one direction and then in another direction transverse to the first and the angle between the rotary positions is larger than 90°."

"5. Electrophoresis apparatus for separating DNA particles in a separation medium (15), comprising means for driving the particles alternately first in one direction and then in another direction transverse to the first in the separation medium, said means comprising field generating means (11, 12) for generating an electric field, a support plate (14) for supporting the separation medium (15), said support plate (14) being provided between said field generating means, and a time controlled driving means (17) for rotating the support plate (14) at predetermined intervals in a plane between different rotary positions in the electric field, whereby the angle between the rotary positions is larger than 90°."

Claims 2 to 4 and 6 to 10 are dependent claims.

VII. The Appellants submitted the following arguments in support of their main request. A comparison of Articles 123(2) and 123(3) EPC shows that amendments of the claims resulting in broadening of their scope is

allowable, as long as said amendments do not introduce additional subject-matter. In particular, Article 123(2) EPC contains restrictions on amendments at any stage of proceedings before the EPO, whereas Article 123(3) EPC contains further restrictions during opposition proceedings. It is thus a fair inference that amendments outside opposition proceedings are not subject to the additional restrictions of Article 123(3) EPC, i.e. that broadening amendments are in principle allowable.

Indeed, the Applicants' recitals of the disadvantages of the prior art and the objects of the invention is stressed in the application as filed. But at the time of filing, the Applicants did not know all the relevant prior art and could therefore not be expected to place the invention accurately in the context of the prior art. The invention should be judged on the technical features disclosed in the specification as filed.

As now seen, the problem addressed by the invention is to improve the electrophoretic separation of DNA molecules, in particular to permit the separation of larger molecules; this problem is solved according to the invention by using a magnetic field to drive the molecules alternately first in one direction and then in another direction transverse to the first, the angle between the two directions being larger than 90°; the way in which magnetic field is applied to the electrophoresis gel is not material.

Indeed, the application as filed notes the disadvantages of the two electrode pairs and switching devices of the prior art, and the advantages of the rotating the separation medium relative to a stationary magnetic field; if the Applicants had wanted to make a specific disclaimer, they could have done so; it is submitted

that the comments were included in the application as filed as a basis for a possible limitation of the claims to a rotating gel; but this is a limitation which, so far as set A of the claims are concerned, the Applicants have currently chosen not to make.

Therefore, the broadening of the claims in the set of Claims A is allowable and, since the claimed method and apparatus are not suggested by the available prior art, they are patentable.

Auxiliarily, the set of Claims B, which is not broadened, is allowable for the same reasons.

**Reasons for the Decision**

1. The appeal is admissible.

2. Main request (Set of Claims A)

2.1 Allowability of the amendments

2.1.1 Claim 1 mentions that relative rotation between the separation medium and the electric field is effected in a plane between different rotary positions, but does not specify that

(a) it is the separation medium which is rotated, and that
(b) this is done "in one and the same electric field",

as specified in Claim 1 as originally filed.

Thus, it is to be examined whether these two amendments, i.e.

- the replacement of "the separation medium which is rotated" by "relative rotation between the separation medium and the electric field is effected", and

- the excision of "in one and the same electric field",

introduce additional subject-matter, or not.

2.1.2 In accordance with the decision T 331/87, OJ EPO 1991, 22 (see point 3 of the reasons) referred to by the Appellants, for the determination whether an amendment of a claim does or does not extend beyond the content of the application as filed, it is necessary to examine if the overall change in the content of the application originating from this amendment (whether by way of addition, alteration or excision) results in the skilled person being presented with information which is not directly and unambiguously derivable from that previously presented by the application, even when account is taken of matter which is implicit to a person skilled in the art in what has been expressly mentioned. In particular, according to the above-mentioned decision (see point 6 of the reasons),

(A) the replacement or removal of a feature from a claim may not violate Article 123(2) EPC provided the skilled person would directly and unambiguously recognise that

(1) the feature was not explained as essential in the disclosure,
(2) it is not, as such, indispensable for the function of the invention in the light of the technical problem it serves to solve, and

(3) the replacement or removal requires no real modification of other features to compensate for the change;

(B) moreover, any replacement by another feature must, of course, be examined for support in the usual manner.

2.1.3 The feature that the separation medium or that the rotary support plate which supports it are rotated is specified in Claim 1 and in independent Claim 6, both as originally filed, respectively, i.e. in all the main claims of the application as filed. The application as filed (see point 1, line 30 to page 2, line 15) specifies that the object of the invention is to bring about a method and an apparatus which are less expensive than such methods and apparatuses known so far, and which, moreover, enable a better separation, this being attained by the method according to the invention in that the separation medium is rotated at predetermined intervals in a plane between different rotary positions in one and the same electric field; moreover, the apparatus according to the invention is mainly characterised in that it comprises a rotary support plate for supporting the separation medium, which support plate is provided between field generating means for generating an electric field, and a time controlled driving member for rotating the support plate at predetermined intervals in a plane between different rotary positions in the electric field. Moreover, the description as filed (see page 3, lines 27-30) mentions that, by rotating the separation medium in accordance with the invention, a simplified and improved design from an electric point of view is obtained in comparison with the apparatuses known so far. It is also to be noted that there is no hint at a method or at an

apparatus according to the invention wherein the separation medium would not be rotated during the electrophoresis process. The Appellant's argument that the rotation of the separation medium in a stationary electric field is not explained as being essential but merely as having advantages over the alternative (of rotating the electric field around a stationary separation medium) is not considered as relevant since said second possibility mentioned by the Appellant is not presented in the application as filed as an alternative solution to the problems of the prior art but as the prior art itself. Therefore, the Board is of the opinion that the feature that the separation medium is rotated was indeed explained as essential in the disclosure.

2.1.4 It is to be noted that, since rotation of the separating medium is derivable (see for instance page 3, lines 27-30) as being essential for the function of the invention in the light of the technical problems to be solved, i.e. in particular reducing the cost of the device and avoiding the difficulty for the mutual positioning of the electrodes, the Board is of the opinion that the above mentioned condition (2) of paragraph 2.1.2 is not met for an amendment wherein the separating medium would not be rotating and the field would be obtained by alternately switching between electrode pairs.

2.1.5 Since Claim 1 states that a relative rotation between the separation medium and the electric field is effected and does not specify, as in original Claim 1, that "the separation medium is rotated", this means that interacting features of the method such as the electric field could also possibly be rotated. However, as mentioned here above, the application as filed discloses in relation with the prior art a technique for obtaining

electric fields by switching alternately pairs or electrodes but excludes the use of said known techniques. Thus, since the application as filed does not disclose any other method wherein the electric field is rotated at predetermined intervals in a plane between different rotary positions, whereby the particles are driven alternately first in one direction and then in another direction transverse to the first, and wherein the angle between different rotary positions is larger than 90°, a real modification of other features to compensate for the change, for instance by providing means of the apparatus different from switching means and which allow to rotate the electric field in accordance with these angular requirements would be needed; however, the necessary teaching for this modification cannot be derived from the application as filed.

2.1.6 Consequently, the overall change in the content of the application originating from the amendment results in the skilled person being presented with information which is not directly and unambiguously derivable from that previously presented by the application, even when account is taken of matter which is implicit to a person skilled in the art in what has been expressly mentioned. Therefore, the requirement of Article 123(2) EPC is not met.

3. Auxiliary request

3.1 Allowability of the amendments

3.1.1 Claim 1 results from original Claim 1, which has been amended in particular on the basis of features disclosed in original dependent Claim 4 (angle >90°) and in the original description, page 4, line 6 (the DNA), and

whereby the feature "other direction transverse to the first "is derivable from Figure 1-2 and from the description, page 3, lines 23-26 and page 4, lines 13-16 and 24-31, mentioning rotary positions more than 90° and through 110°. Valid Claim 5 results from original Claim 6 has been amended in particular on the basis of features disclosed in original dependent Claim 10 (angle >90°) and in the above mentioned text locations in the original description. Therefore, the Board is satisfied that the European patent application meets the requirement of Article 123(2) EPC.

3.2 Claim 1

3.2.1 Novelty

3.2.1.1 An electrophoresis method for separating DNA particles in a separation medium, the particles being driven in the separation medium by an electric field at predetermined intervals in a plane, alternately first in one direction and then in another direction transverse to the first, whereby in particular the angle between the directions is 90°, close to said angle or is another substantial angle of intersection, is known from D2 (see page 1, lines 10-26; page 3, lines 14-33; page 6, line 19 to page 10, line 18; page 16, line 31 to page 19, line 6; Figure 1-8). Contrary to the method of the present Claim 1, in the method of D2

- the separation medium is not rotated,
- the electric field is not one and the same electric field, and
- the angle of intersection is not selected as being larger than 90°.

3.2.1.2 An electrophoresis method for separating particles in a separation medium, the particles being driven in the separation medium by an electric field, wherein the separation medium is rotated in a plane between different rotary positions in one and the same electric field, whereby the particles are driven alternately first in one direction and then in another direction transverse to the first, is known from D1 (see column 1, lines 57-60; column 1, line 65 to column 2, line 18; column 5, lines 27-39; Figure 8). However, in the method of D1,

- the particles are not DNA particles,
- the separation medium does not appear to be rotated at predetermined intervals, but only once,
- the angle between the rotary positions of the separating medium is not larger than 90°, but is exactly 90°.

3.2.1.3 The other documents of the available prior art are neither concerned with an electrophoresis method for separating DNA particles in a separation medium whereby the separation medium is rotated nor with an electrophoresis method wherein the particles in the separation medium are submitted in different directions to one and the same electric field and, thus, are considered as less relevant.

3.2.1.4 Therefore, the Board is of the opinion that the subject-matter of Claim 1 is novel in the sense of Article 54 EPC.

3.2.2. Inventive step

3.2.2.1 The Board is of the opinion that since D2 discloses an electrophoresis method for separating DNA particles in a separation medium, and since the angle between the

directions of the electric field can be close to but different from 90°, it is the closest prior art document. In D2, the electric field is rotated by being switched between alternate positions around a stationary separation medium; the known apparatus requires more than two electrodes and a switching device; it is thus a comparatively expensive apparatus whereby mutual positioning of the electrodes will be critical (see the present application, page 1, lines 10-24). The presently claimed method and apparatus intend to solve this problem, in particular by a simplified and improved design from an electric point of view.

3.2.2.2 D2 (see page 3, line 14 to page 4, line 2) discloses a method which is based on electrophoresis through deliberately varied electric fields, in particular by switching, and which is thus distinguished over the therein acknowledged methods using uniform fields. No method based on a rotation of the separation medium in one and the same electric field is derivable from D2. Indeed, the person skilled in the art of D2 could be incited by D1 to substitute a rotating separation medium for a rotating field; D1 (see column 1, lines 57-60; column 1, line 65, column 2, line 18, column 5, lines 12-39; Figure 5A-5B and 8; see also Claims 1 and 10) discloses an electrophoresis method for separating particles in a separation medium, the particles being driven in the separation medium by an electric field, whereby the separation medium is rotated and whereby the particles are driven alternately first in one direction and then in another direction transverse to the first, resulting in greater resolution; however, this mentioned possibility of rotation of the gel tray is closely related with the specific feature that this gel tray supporting the sample (the gel) is square shaped, whereby, taking into account in particular the retainers 82 and 84 on the plate 80, only angles of

rotation of 90° are possible. Other angles of rotation are not disclosed in D1 and cannot be practiced because of the structure. Thus, the technique of "rotation" of D1 can be substituted for the switched fields of D2 only when the transverse directions of the fields applied successively form an angle of exactly 90°. Other angles of rotation of the separation medium would necessitate a teaching which is available neither in D1 nor in D2.

3.2.2.3 Moreover, although D2 mentions transverse angles of intersection which can be close to 90° or can be other substantial angles, it does not disclose any specific effect resulting from an angle different from 90°, and especially from an angle greater than 90°. In this respect, the Appellant's arguments about his coming to the realisation that a real enhancement of separation for rotary angles higher than 90° could be achieved and about the related explanations concerning the particular structure of DNA, are considered as credible.

3.2.2.4 Therefore, the Board is of the opinion that, since the claimed method does not result from a substitution of the rotation of the separation medium of D1 for the rotation of the electric field of D2, and since there is no incitation in the prior art to select a transverse angle of successive fields greater than 90°, with the advantageous effect mentioned by the appellant, the subject-matter of Claim 1 implies an inventive step in the sense of Article 56 EPC.

3.3 Claim 5

3.3.1 The Board is also of the opinion that, since the apparatus claimed in Claim 5 comprises means for carrying out the method of Claim 1, and in particular comprises a rotating support for rotating a separation medium in an electric field in successive directions

with an angle greater than 90°, and since said means are not suggested in the available prior art, the subject-matter of Claim 5 is also novel in the sense of Article 54 EPC and also implies an inventive step in the sense of Article 56 EPC.

4. Therefore, the subject-matter of the claims being novel and implying an inventive step, the claims are allowable (Article 52(1) EPC) and a European patent may be granted on the basis of the present European patent application in accordance with Article 97(2) EPC.

**Order**

**For these reasons, it is decided that:**

1. The decision under appeal is set aside.

2. The file is remitted to the first instance with the order to grant a patent on the basis of the following documents, proposed by the Board of Appeal in the communication dated 24 January 1992 and formally accepted as auxiliary request by the Appellant:

Description: Pages 1 to 5,

Claims: Nos. 1 to 10 and

Drawings: Sheet 1/1 (Figure 1-2).

The Registrar

P.Martorana

The Chairman

E.Turrini

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