

Veröffentlichung im Amtsblatt	J/Nein
Publication in the Official Journal	Yes/No
Publication au Journal Officiel	Oui/Non

Aktenzeichen / Case Number / N° du recours : T 140/88 - 3.4.1

Anmeldenummer / Filing No / N° de la demande : 80 304 272.0

Veröffentlichungs-Nr. / Publication No / N° de la publication : 0 030 135

Bezeichnung der Erfindung: Pacemaker with Hall effect element

Title of invention:

Titre de l'invention :

Klassifikation / Classification / Classement : A61N 1/36, H03K 17/90

ENTSCHEIDUNG / DECISION

vom / of / du 13 February 1990

Anmelder / Applicant / Demandeur :

Patentinhaber / Proprietor of the patent /
Titulaire du brevet :

MEDTRONIC, INC.

Einsprechender / Opponent / Opposant :

BIOTRONIK Meß- und Therapiegeräte GmbH
& Co.

Stichwort / Headword / Référence :

EPÜ / EPC / CBE Articles 84, 123 and 56 EPC

Schlagwort / Keyword / Mot clé :

"clarity of the claims (main and first
auxiliary requests - no)"
"inventive step (second auxiliary request -
yes)"

Leitsatz / Headnote / Sommaire

Europäisches
Patentamt
Beschwerdekammern

European Patent
Office
Boards of Appeal

Office européen
des brevets
Chambres de recours



Case Number : T 140/88 - 3.4.1

DECISION
of the Technical Board of Appeal 3.4.1
of 13 February 1990

Appellant : BIOTRONIK Meß- und Therapiegeräte GmbH & Co.
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Decision under appeal : Interlocutory decision of the Opposition Division of
the European Patent Office dated 8 February 1988
concerning maintenance of European patent
No. 0 030 135 in amended form.

Composition of the Board :

Chairman : K. Lederer
Members : E. Turrini
C. Payraudeau

Summary of Facts and Submissions

- I. European patent No. 0 030 135 was granted on the basis of European patent application No. 80 304 272.0.
- II. The Appellant (Opponent) filed opposition to the granted patent, requesting its revocation on the ground of lack of patentability of its subject-matter under Articles 52 to 57 EPC, in view of the following document:

GB-A-985 797 (D1).
- III. In a communication pursuant to Rule 58(4) EPC, the Opposition Division informed the parties of its intention to maintain the patent on the basis of an amended set of claims, of which Claim 1, the sole independent claim, reads as follows:

"1. A body-implantable pulse generator (10) for providing stimulating pulses to living tissue, said pulse generator having a circuit capable of being activated by a magnetic field, characterised by said circuit comprising a Hall effect element (210), means (220, 212, 218) for causing electric current to flow through said Hall effect element for time periods having a duration that is shorter than the time intervals between said periods, and means for monitoring the state of said Hall effect element."
- IV. In his letter dated 7 December 1987, the Appellant expressed disapproval of the text communicated by the Opposition Division for the reasons given in a statement attached to that letter. In the statement, the Appellant submitted in particular that the amendments made to

Claim 1 offended against the provisions of Article 123 EPC and that the subject-matter of Claim 1 was fully anticipated by the content of document D1.

- V. In an interlocutory decision in accordance with Article 106(3) EPC, the Opposition Division decided to maintain the patent in the amended form set out in the communication referred to in paragraph III above.

The Opposition Division held in particular that the claimed body-implantable pulse generator was distinguished from that known for example from the document:

GB-A-2 014 858 (D0)

and defined in the preamble of Claim 1 essentially by the use of a Hall effect element instead of, and for the same purpose as, the reed switch which was previously used to allow to change the mode of operation of the pulse generator upon application of an external magnetic field. Such use was neither disclosed nor suggested by document D1, since the Hall effect element described therein was not activated in the sense of being transferred from an inactive to an operative state but was active whether or not a magnetic field was present. The state of this prior art Hall effect element was not monitored either, but its variable resistance was simply used to control the pulse rate or amplitude in a continuous manner.

- VI. The Appellant lodged an appeal against the decision.

In a letter dated 27 May 1988, he briefly referred to his statement of 7 December 1987 (point IV above) which, in his opinion, was not overcome by the reasons of the appealed decision.

VII. Oral proceedings were held before the Board, at the end of which the Appellant (Opponent) requested that the decision under appeal be set aside and that the patent be revoked.

The Respondent (Patentee) requested that the appeal be dismissed and that the patent be maintained in amended form as set out in the communication pursuant to Rule 58(4) EPC dated 20 October 1987 (main request).

As a first auxiliary request, the Respondent requested that the patent be maintained on the basis of independent Claim 1 filed on 9 February 1990 as auxiliary request 1 and Claims 2 to 9 as granted of which Claim 1, the only independent claim, reads as follows:

"1. A body-implantable pulse generator (10) for providing stimulating pulses to living tissue, characterised by a circuit comprising a Hall effect element (210), and means (220, 212, 218) for causing electric current to flow through said Hall effect element for time periods having a duration that is shorter than the time intervals between said periods, said circuit being capable of being activated by a magnetic field applied to the Hall effect element to provide an output signal to control the operation of other circuits of the pulse generator."

As a second auxiliary request, the Respondent requested that the patent be maintained on the basis of amended Claims 1 and 5 presented at the oral proceedings, together with Claims 2 to 4 and 6 to 9 as granted. Claim 1, the only independent claim of the set of claims in accordance with Respondent's second auxiliary request, reads as follows:

"1. A body-implantable pulse generator (10) for providing stimulating pulses to living tissue, said pulse generator

having a circuit capable of being activated by a magnetic field, characterised by said circuit comprising a Hall effect element (210), means (220, 212, 218) for causing electric current to flow through said Hall effect element for time periods having a duration that is shorter than the time intervals between said periods, and latch means (265) responsive to the output of the Hall effect element and arranged to maintain its output in one state between said time periods substantially while the magnetic field is applied to said Hall effect element."

VIII. In support of his request, the Appellant essentially submitted that the various independent Claims 1 on file neither provided a clear definition of the subject-matter for which protection was sought, nor completely defined the actual technical teaching underlying the patent, that the amendments made to the claims were not allowable under Article 123(2) and (3) EPC, and that the claimed subject-matter was not patentable in view of document D1 and of the following further citation of the European Search Report:

US-A-3 661 089 (D2).

His arguments, as far as they are relevant to the present decision, can be summarised as follows:

A. Clarity of the claims

The reference in the claims to "means for monitoring the state of said Hall effect element" (Claim 1 of the main request) and to the controlling of "other circuits of the pulse generator" (Claim 1 of the first auxiliary request) cannot introduce any definite technical limitation to the scope of these claims, since any Hall effect element inherently induces some

effect modifying the functioning of the circuit in which it is placed, whereby monitoring of the state of the Hall effect element is necessarily achieved. In addition, any circuit can be considered as constituted by a plurality of notional circuit elements, so that the output of any Hall effect element mounted in a circuit necessarily controls the operation of other circuit elements.

Moreover, simply providing means for causing electric current to flow through the Hall effect element for time periods having a duration that is shorter than the time intervals between said periods does not yet achieve a solution to the technical problem underlying the invention, which is to avoid undue current consumption during operation of the pulse generator. To this effect, the circuit elements external to the Hall effect element, in particular the latch means set out in Claim 1 in accordance with the second auxiliary request and the specific timing of the current pulses through the Hall effect elements must still be selected in such a way that the current consumed by these circuit elements is less than the current which would flow in the Hall effect element when operated in a continuous mode. However, the present independent claims do not comprise these essential features and they fail therefore to completely define the teaching of the invention.

B. Allowability of the claims under Article 123(2) and (3) EPC

In comparison with Claim 1 as granted, Claim 1 in accordance with the Respondent's second auxiliary request has been supplemented by the inclusion of the last feature thereof relating to the provision of

latch means. Such latch means, however, has been originally disclosed only in connection with associated circuit elements, such as for example the operational amplifiers 233 and 234 and OR gate 236 shown in Figure 3. The latch means cannot, therefore, be claimed in isolation from these other circuit elements without offending against Article 123(2) EPC.

Moreover, in the patent as granted, the latch means 265 (which is also referred to by the alternative designation "flip-flop") has only been claimed in Claim 5, which is dependent both from Claim 3 and Claim 4, that is in combination with the comparators 233 and 234 and the OR gate 236. Accordingly, Claim 1 of Respondent's second auxiliary request, which comprises as a characterising feature the latch means alone without the comparators and the OR gate, has been amended in such a way as to extend the protection conferred by the patent as granted and, therefore, offends the requirement of Article 123(3) EPC.

C. Patentability

Document D1 discloses a body-implantable pulse generator which in the embodiment of Figure 3 comprises a cyclically operated Hall effect element VR which draws current only for a portion of the cycle. In this embodiment, transistors T1 and T2, the switching cycle of which depends on the magnetic field applied to the Hall effect element, constitute a means for monitoring the state of said element, and resistor R3, capacitor C4 and battery B1 form a means for causing electric current to flow through the Hall effect element for time periods having a duration that is shorter than the time intervals between said

periods. Accordingly, the subject-matter of Claim 1 in accordance with Respondent's main request is not novel.

The subject-matter of Claim 1 in accordance with Respondent's auxiliary requests, does not involve an inventive step. In particular, whilst the discrete component technology available when the device of document D1 was designed called for the use of few components for implementing complex functions, dedicating specific elementary circuits to the performance of simple functions was a natural procedure in the integrated circuit technology available at the date of the present invention. At this date, furthermore, latch means was a well known component of integrated circuits.

In addition, document D2 discloses a control circuit for sensing electromagnetic fields, comprising Hall effect devices. This circuit is disclosed in connection with the control of automated vehicles, but the system is explicitly said in the document not to be limited to such application. In this system, the coded control information at the output of the Hall effect elements is stored, as indicated for example in Claim 3. The storing means for the control information thus also form latch means in which the information is maintained in the sense of Claim 1 in accordance with Respondent's second auxiliary request.

- IX. For his part, the Respondent firstly questioned the admissibility of the appeal since, in his view, Appellant's letter dated 27 May 1988 could not be considered as a Statement setting out the Grounds of Appeal in the sense of Article 108, last sentence, EPC.

His arguments in response to the above Appellant's objections can be summarised as follows:

A. Clarity of the claims

The feature relating to the monitoring means has been introduced at the end of Claim 1 of the main request for clarifying a further distinction between the invention and the prior art, and it should be interpreted as meaning that a distinct additional circuit is provided for detecting whether the Hall effect element is subjected to a magnetic field or not.

The latch means referred to in Claim 1 of the second auxiliary request is necessarily a d-type latch, as indicated in the description, which inherently exhibits very low current consumption, in the order of 50 μA , which is indeed much less than the current consumption of available Hall effect elements.

B. Allowability of the claims under Article 123(2) and (3) EPC

The non-essential character of the OR gate connected upstream of the latch means is explicitly disclosed in the passage of the application documents as originally filed corresponding to column 6 of the patent as granted, so that claiming the latch means alone in Claim 1 of the second auxiliary request cannot offend against Article 123(2) EPC. In addition, the claim does not by itself suggest or disclose any alternative embodiment other than that described in the original application.

As concerns Article 123(3) EPC, the feature relating to the latch means in Claim 1 of the second auxiliary request is to be considered as taken from the description, not from any of the dependent claims as granted. There is, therefore, no point in alleging an extension of the scope of such dependent claims.

C. Patentability

The pulse generator disclosed in document D1 does not satisfy the requirement of the claims that electric current is caused to flow through the Hall effect element for time periods having a duration that is shorter than the time intervals between said periods, since, for example, current almost continuously flows through the Hall effect element shown in Figure 3, except for minutely small periods during switching of the cyclically operating transistors. In the embodiment of Figure 4, the current which flows through the Hall effect element located in the output circuit exponentially decreases after each pacing pulse, but never reaches a zero value before the next pulse.

In addition, most electronic circuits are constituted only by known elementary components, such as the latch means of Claim 1 of the second auxiliary request, and are not, for this sole reason, deprived of patentability. In the present case, the prior art gives no hint at selecting the claimed elements and using them in such a way as to solve the specific problem underlying the invention, which is to save energy during operation of the pulse generator.

Document D2 is not dedicated to achieving a solution to that problem, and it is not even related to the

field of body-implantable pulse generators. In addition, the storing operation set out in Claim 3 of document D2, on which the Appellant relies, does not relate to the operation of the circuit comprising the Hall effect element, but only to that of stationary coding magnets past which the Hall effect devices are intended to pass during movement of an automated vehicle.

Reasons for the Decision

1. Admissibility of the appeal

Appellant's submission dated 27 May 1988 refers to the statement which was filed before the Opposition Division on 7 December 1987, which clearly set out a number of grounds which were considered to prejudice maintenance of the patent in amended form, as envisaged by the Opposition Division in its communication pursuant to Rule 58(4) EPC, such as lack of novelty of the subject-matter of Claim 1 (page 6, point VI) or lack of support by the description of the feature added at the end of Claim 1 and relating to the monitoring of the state of the Hall effect element (page 5, point V). Thus, this statement already fulfilled the condition of Article 108, last sentence, EPC except that it had been prematurely filed, i.e. before the contested decision had effectively been given.

In these circumstances, the Board considers that the Appellant's above referred submission was intended to have the same effect as a postdating or a new filing of this prior statement and should be effectively given this effect.

The appeal, therefore, is admissible.

2. Main request

The pulse generator defined in Claim 1 inter alia comprises means for monitoring the state of the Hall effect element.

The Appellant, on the one hand, submits that the above feature does not introduce any definite technical limitation to the scope of the claim. On the other hand, the Respondent argues that this feature cannot but be considered to define an additional circuit specifically dedicated to detect whether the Hall effect element is subject to an external magnetic field or not.

Having regard to the facts that the expression "means for monitoring" has no counterpart in the description of the patent, which does not provide any clear teaching of the actual meaning of that expression either, and that, consequently, there is substantial doubt as to whether the prior art devices such as that disclosed in document D1 comprises or not such "means for monitoring" in the sense of Claim 1, as became apparent during the oral proceedings, the Board considers that Claim 1 fails to clearly define the matter for which protection is sought, as is required by Article 84 EPC.

For this reason, Respondent's main request cannot be allowed.

3. First auxiliary request

- 3.1 The technical problem to which the present invention achieves a solution in view of the prior art is, as will be explained more in detail in paragraph 4.3.1 below, to propose a body-implantable pulse generator of the type

described for instance in document D0, which is improved insofar as it does not exhibit the relative fragility and bulkiness inherent to the mechanical reed switch used in this known device.

3.2 However, replacing the known reed switch which is in either open or closed condition, depending on whether it is subjected to an external magnetic field, by a Hall effect element in which electric current is caused to flow for short periods of time only for controlling the operation of other circuits as defined in Claim 1 in accordance with Respondent's first auxiliary request, merely results in the production of an intermittent output signal even during sustained application of an external magnetic field. Accordingly, in order to achieve proper operation of the pulse generator, it is still necessary to produce a control signal for the pulse generator which is really representative of the presence or absence of an external magnetic field. To this effect, the description of the patent teaches that the output signal from the Hall effect element is supplied to latch means arranged to maintain its output in one state between the time periods when current flows through the Hall effect element while the magnetic field is applied to said Hall effect element. The description does not disclose any other means for producing a signal equivalent to that outputted by the known reed switch, and accordingly, the latch means is considered to constitute a feature which is essential to achieve a solution to the technical problem underlying the invention as actually disclosed in the description.

3.3 Since Claim 1 in accordance with Respondent's first auxiliary request does not include such means, it fails to meet the requirements of clarity and support by the description as set out in Article 84 EPC (cf. T 32/82, point 15 of the reasons, OJ EPO 1984, 354).

Appellant's first auxiliary request, therefore, cannot be allowed.

4. Second auxiliary request

4.1 Formal matters

Claim 1 in accordance with Respondent's second auxiliary request is distinguished from Claim 1 as originally filed in substance by the addition, firstly, of the feature setting out the proper timing of the current flow through the Hall effect element as defined in originally filed Claim 3 and, secondly, of the essential feature relating to the latch means, which is necessary for the sake of compliance of the claim with the requirements of Article 84 EPC, for the reasons indicated in relation with Claim 1 of Respondent's first auxiliary request.

- 4.1.1 The latter additional feature was defined in Claim 6 as originally filed, which became Claim 5 in the patent specification and in which the latch means is referred to by the alternative designation "flip-flop" used also in the patent specification (column 4, lines 50 and 51), albeit in combination with an OR gate connected to receive the output of a pair of comparators coupled across the Hall effect element, as set out in Claims 4 and 5 as originally filed, from which originally filed Claim 6 is dependent. As explicitly indicated in the description, the OR gate is intended to guarantee that the circuits shown respond properly whether a voltage from right to left or from left to right is developed through the Hall effect element, but making instead a difference between whether a north pole or a south pole magnet is held above the pacemaker may also be envisaged (column 6, lines 12-26). Such alternative embodiment clearly does not call for an

OR gate being placed upstream of the latch means and, accordingly, the description as originally filed provides a proper support for a claim in which the latch means is not defined in combination with such OR gate and associated comparators.

Claim 1 as amended in accordance with Respondent's second auxiliary request therefore meets the requirement of Article 123(2) EPC.

- 4.1.2 The only amendment made to Claim 1 as granted, namely the inclusion of the last feature relating to the latch means, does not extend the protection conferred. In this respect, the "protection conferred" referred to in Article 123(3) EPC and which cannot be extended by amendment of the claims during opposition proceedings, is the protection conferred by the European patent as a whole (see in particular Article 69(1), first sentence, EPC), interpreted in the light of the description and drawings.

In the present case, the Board is of the opinion that the man skilled in the art would have interpreted the granted Claim 1 as implicitly comprising some means for using in the pulse generator the signals intermittently produced by the Hall effect element.

The skilled technician would also have easily recognised that the latch means 265 described and shown in Figure 3 constituted such "means for using" and that the comparators and OR gate, claimed in the granted Claims 4 and 5, in combination with the latch means, were only necessary in the case one wanted to be able to use the magnet indifferently in both polar positions, but that the latch means could be directly connected to the output of the Hall effect element if one accepted that the magnet should always be positioned in one defined polar

orientation (see point 4.1.1 hereinabove). The latch means thus constitutes a feature obviously independent from the comparators and gate. The incorporation of this independent feature in Claim 1 to define clearly and limitatively the "means for using" cannot be, therefore, considered as capable of extending the protection of the European patent.

Thus, the conditions of Article 123(3) EPC are met by the present Claim 1 and the Board does not need to examine whether in other circumstances the inclusion in an independent claim of any isolated feature taken out from the description or from a dependent claim, covering only a combination of this feature with other features, could or could not infringe Article 123(3) EPC.

- 4.1.3 Having regard to Appellant's objection that Claim 1 failed to set out essential conditions as to the relative length of the time periods in which current flows through the Hall effect element or the latch means maintain their output at a determined level between these periods, in relation to the respective nominal current consumptions of the Hall effect element and latch means, the Board is satisfied on the one hand that logic circuits as used commonly in body-implantable pulse generators inherently consume less current than a Hall effect element and that, accordingly, operating the Hall effect element in a pulsed manner, in the way set out in Claim 1, necessarily achieves reduction of the current consumption.

4.2 Novelty

- 4.2.1 Document D0 discloses a body-implantable pulse generator for providing stimulating pulses to living tissue, said pulse generator having, as defined in the preamble of Claim 1, a circuit capable of being activated by a magnetic field (abstract, first and second sentences).

This activable circuit merely comprises a reed switch (20; Figure 1) which is closed when a permanent magnet is placed in proximity to the implanted pacemaker (page 3, lines 13 to 15; page 9, lines 71 to 74).

In contrast, the magnetically activable circuit of the pulse generator defined in Claim 1 comprises a Hall effect element, means for causing electric current to flow through said Hall effect element for time periods having a duration that is shorter than the time intervals between said periods, and latch means responsive to the output of the Hall effect element and arranged to maintain its output in one state between said time periods substantially while the magnetic field is applied to said Hall effect element, as is set out in the characterising portion of the claim.

- 4.2.2 Document D1 discloses a body-implantable pulse generator for providing stimulating pulses to living tissue, said pulse generator having, in the embodiments disclosed with reference to Figures 3 and 4, a circuit comprising a semiconductor Hall effect element (VR) capable of being activated by a magnetic field, in the sense that its resistance is increased in the presence of a magnetic field (page 2, lines 40 to 63).

In the embodiment of Figure 3, the Hall effect element is inserted in a RC network of an oscillating circuit for controlling the pulse rate of the generator, whilst in the embodiment of Figure 4 it is placed in series with the output electrodes for controlling the amplitude of the pulses. Accordingly, the Hall effect element of this known device does not control the operation of latch means, and the document does not explicitly disclose the variations

of the current flow through the Hall effect element, nor does it teach any specific measure for limiting the time periods for which electric current is caused to flow therethrough, as defined in Claim 1.

- 4.2.3 Document D2 discloses a control circuit which is capable of being activated by a magnetic field generated by external magnets, and comprises a Hall effect element (26; Figure 2) and means (pulse driving circuit 22 and pulse generator 86) for causing electric current to flow through said Hall effect element for time periods having a duration that is shorter than the time intervals between said periods (abstract, second and last sentences, Figure 3).

This known device is distinguished from the subject-matter of Claim 1 in that it is incorporated in an automatic vehicle (abstract, first sentence) instead of a body-implantable pulse generator and in that the pulsed output of the Hall effect element is directly supplied to a control system (20) for recognising the magnetic code transmitted by the external magnets instead of controlling the operation of latch means arranged to maintain its output in a certain state (column 4, lines 45-58; Figure 3).

- 4.2.4 The remaining documents on the file do not come closer to the subject-matter of Claim 1.
- 4.2.5 For the above reasons, the subject-matter of Claim 1 is novel in the sense of Article 54 EPC.

4.3 Inventive step

- 4.3.1 The nearest prior art is, in the Board's view, constituted by the pulse generator disclosed in document D0, because

the reed switch comprised in that pulse generator, which is either open or closed in dependence on the presence or absence of an external magnetic field, is functionally equivalent to the combination of a Hall effect element, current supply and latch means controlled also in such a way as to maintain an output representative of the presence or absence of an external magnetic field as set out in Claim 1.

In view of this nearest prior art, the technical problem to which the present invention achieves a solution is to propose an improved pulse generator, which does not exhibit the drawbacks of relative fragility and bulkiness inherent to the use of a mechanical reed switch (description column 1, line 57 to column 2, line 16).

In accordance with the present invention, this technical problem is solved partially by replacing the known reed switch by a Hall effect element, which, however, draws too much current when used as a switch for being directly usable in body-implantable pulse generators having only a limited supply of electrical energy. This difficulty is circumvented in accordance with the invention by driving the Hall effect element in a pulsed manner and providing an additional latch means arranged to maintain its output between the driving pulses of the Hall effect element, while the magnetic field is applied thereto.

- 4.3.2 This solution does not, in the Board's view, obviously result from the cited prior art, which fails to provide any evidence of the availability at the date the invention was made of any measure whatsoever for reducing the current consumption of Hall effect elements used as switches and does not, a fortiori, hint at the combined use of pulsed current driving and latch means as specifically set out in Claim 1.

In particular, the Hall effect devices of the pulse generators disclosed in document D1 merely form passive components, the resistance of which varies in accordance with the strength of the externally applied magnetic field and directly modify the operation of essential circuit portions of the pulse generator which already comprise resistive elements, such as the oscillating and pacing pulse output circuits. These devices do not produce a bistable output signal the state of which is representative of the presence or absence of a magnetic field and they do not, therefore, function as switches equivalent to the reed switch which the invention intends to replace. Moreover, the Hall effect devices of document D1 do not, in the absence of a magnetic field, cause additional current consumption, since they merely operate as resistive elements which anyway are necessary in the circuit portions in which they are mounted and their use does not, therefore, call for any current saving measure.

Document D2 relates to the technical field of vehicle automation, which is far away from that to which the invention pertains. In addition, whilst the circuit described in this document comprises a Hall effect element which indeed is driven in a pulsed manner and explicitly said to represent an alternative to magnetic reed switches (column 1, lines 22-30), pulse driving is effected only for the purpose of increasing the sensitivity of the Hall effect element (abstract, last sentence), in an application in which current saving is of no actual relevance, and no latch means is provided to maintain its output between the driving pulses.

- 4.3.3 For the above reasons, the subject-matter of Claim 1 is considered to involve an inventive step in the sense of Article 56 EPC.
- 4.4 Accordingly, the subject-matter of Claim 1 in accordance with Respondent's second auxiliary request is patentable (Article 52(1) EPC). So is the subject-matter of Claims 2 to 9 by virtue of their dependency on Claim 1.

For these reasons, taking into consideration the amendments made by the proprietor of the patent, the patent and the invention to which it relates meet the requirements of the Convention, and the patent, therefore, can be maintained as amended in accordance with Respondent's second auxiliary request (Article 102(3) EPC).

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 according to Respondent's second auxiliary request, i.e. on the basis of the following documents:
 - description, columns 1 and 2 presented at the oral proceedings and column 3, line 1 to column 18, line 40 as granted;

- Claims 1 and 5 presented at the oral proceedings and Claims 2 to 4 and 6 to 9 as granted;
- drawings as granted.

The Registrar:

The Chairman:

M. Beer

K. Lederer