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DECISION
of 27 January 2000

Case Number: T 0712/97 - 3.3.1

Application Number: 90111169.0

Publication Number: 0402887

IPC: C07F 9/38

Language of the proceedings: EN

Title of invention:
A method for the preparation of N-phosphonomethyl glycine

Patentee:
FINCHIMICA S.p.A

Opponent:
Monsanto Company

Headword:
Phosphonomethylation/FINCHIMICA

Relevant legal provisions:
EPC Art. 56, 84, 104, 113, 123,
EPC R. 67, 71a

Keyword:
"Clarity and support within the meaning of Article 84 EPC (yes, after amendment)"
"Support by the application as filed (yes, after amendment)"
"Extension of the scope of the claims as granted (no)"
"Procedural violation (yes) - refusal to admit a test-report into the proceedings"
"Substantial procedural violation (no) - outcome of decision not affected"
"Reimbursement of the appeal fee (no)"
"Apportionment of costs (no)"
"Inventive step (yes) - non-obvious alternative"

Decisions cited:

T 0094/84, T 0682/91

Catchword:
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Case Number: T 0712/97 - 3.3.1

DECISION
of the Technical Board of Appeal 3.3.1
of 27 January 2000

Appellant:
(Opponent)

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Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted 2 May 1997 concerning maintenance of European patent No. 0 402 887 in amended form.**

Composition of the Board:

Chairman: J. M. Jonk
Members: P. F. Ranguis
S. C. Perryman

Summary of Facts and Submissions

I. The appeal is against an interlocutory decision of the Opposition Division maintaining European patent No. 0 402 887 (European patent application No. 90 111 169.0) in amended form.

II. The decision was based on Claim 1 filed on 17 April 1997 and Claims 2 to 6 of the patent as granted, said Claim 1 reading as follows:

"A method for the preparation of N-phosphonomethyl glycine by the phosphonomethylation of glycine comprising the reaction of glycine with formaldehyde and trialkylphosphite, characterised in that it comprises the steps of:

- reacting glycine in methanol with an aqueous-alcoholic solution of formaldehyde in the presence of a base selected from the group consisting of alkali and alkaline-earth metal hydroxides, wherein said aqueous alcoholic solution of formaldehyde consists of 55% wt. formaldehyde, 35% wt. methanol and 10% wt. water and is added in a glycine/formaldehyde molar ratio between 1:1 and 1:2,

- reacting the thus obtained solution with trialkylphosphite, and

- effecting hydrolysis in an aqueous medium and recovering the N-phosphonomethyl glycine by crystallisation."

III. The opposition and the appeal were supported by numerous documents including:

(1) PL-A-136276 and translation into English,

(2) US-A-4 237 065,

(3) Merck Index, Tenth Edition, 1983, page 604, item 4120: "Formaldehyde solution. Formalin; formol",

(7) Kirk-Othmer, Encyclopedia of Chemical Technology, third Edition (1980), vol. 11, pages 231 to 245,

(8) US-A-3 629 997,

(12) CN-A-85-1-02988 and translation into English,

(24) US-A-4 486 359,

(25) US-A-4 065 491,

(46) PL-A-141 981 and translation into English,

(47) US-A-4 439 373,

(48) US-A-4 548 759,

(49) US-A-4 491 548,

(52) "Bayer Inorganic Chemicals Business Group, DIN Safety Data Sheet 006495/08 (20/4/89)-Trimethylphosphite",

(53) "Albright and Wilson Inc. Product Information Bulletin (1984), Dialkyl and Trialkylphosphites",

and

(54) "Bull. Acad. Science USSR, Chemical Sciences (English Translation) 2427-2428, (1967)".

IV. During the opposition proceedings, in a communication according to Rule 71a(1) EPC accompanying the summons to attend oral proceedings, the Opposition Division had given its preliminary opinion that it was not convinced that a methanol medium possessed unexpected advantages over an aqueous medium, and that therefore the claims might not be regarded as meeting the requirements of inventive step in view of document (1). The Respondent reacted to this by filing a report of comparative experiments on the last day of the period set for filing comments pursuant to Rule 71a(1) EPC. The Opposition Division allowed this experimental report into the proceedings, but did not react to the Appellant's (Opponent's) request for an assurance that it be given an opportunity to file an experimental report in response, or that the oral proceedings be postponed. At the oral proceedings before the Opposition Division the Appellant submitted an experimental report, but the Opposition Division, having considered it, refused to take this into the proceedings.

Furthermore, the Opposition Division held in its decision that the amendments made to Claim 1 of the patent in suit as granted satisfied the requirements of Articles 83, 84 and 123 EPC and that its subject-matter was novel and involved an inventive step.

Concerning inventive step, the Opposition Division considered that the closest state of the art was document (1) and that in the light of this prior art the technical problem underlying the patent in suit was the provision of an alternative process for the preparation of N-phosphonomethyl glycine. Moreover, it held that the solution of this problem as claimed in Claim 1, and in particular by using the specific 55% formaldehyde solution and methanol as solvent, was not obvious in view of the cited prior art. In this context, it also considered that the skilled person would not combine the teaching of document (1) with that of document (2) and/or document (12), since the reaction media and the reaction mechanisms were not comparable.

The Opposition Division also held in its decision that the Appellant's experimental report submitted during the oral proceedings was disregarded because it was late filed and because it was not relevant enough to change the outcome of the opposition procedure.

V. The Appellant firstly argued that the Claim 1, which was considered to be allowable by the Opposition Division, did not meet the requirements of Articles 84 and 123 EPC, because:

- by introducing the expression "reacting glycine in methanol" it was not clear whether a solution or suspension of glycine in methanol was applied or that the entire reaction was carried out in methanol implying the absence of water, so that the claim did not meet the requirement of clarity within the meaning of Article 84 EPC,

- said introduced expression was not supported by the application as filed contrary to the requirement of Article 123(2) EPC,

- the added expression "weight %" in relation to the formaldehyde solution could not be considered as a correction in accordance with Rule 88 EPC and therefore also contravened Article 123(2) EPC, and

- by deleting the essential feature "in an aqueous-alcoholic solution" in the preamble of the Claim 1 as granted, the protection conferred by the patent in suit was extended contrary to the provision of Article 123(3) EPC.

Concerning inventive step, and having regard to the fact that according to the amended Claim 1 the reaction was carried out in methanol as solvent instead of an aqueous-alcoholic solution, the Appellant introduced into the appeal proceedings documents (46), (47), (48) and (49). These documents, as well as documents (1) and (46) in combination and documents (25) and (24) in combination showed that there was a clear trend in the prior art to use methanol as reaction medium. Furthermore, he introduced documents (52), (53) and (54) into the appeal proceedings in order to show that there was also a clear trend to use trialkyl phosphites instead of dialkyl phosphites, since the last mentioned phosphites showed more tendency to hydrolysis under alkaline conditions. He concluded that, starting from document (24) as the closest prior art and in view of these cited documents, it would have been obvious to the skilled person to use trialkyl phosphites instead of dialkyl phosphites and the claimed formaldehyde solution instead of paraformaldehyde.

Alternatively, the Appellant argued lack of inventive step starting from document (1) as the closest state of the art, and by submitting that it would have been obvious to the skilled person in the light of documents (46), (2) and (12) to use a methanol-rich reaction medium and therefore also the claimed formaldehyde solution in order to suppress the occurrence of hydrolysis of trialkyl phosphites known from documents (52), (53) and (54). Concerning document (1) he observed by relying on, amongst others, document (3) that the Opposition Division had erred in interpreting the term "formalin" used in the examples of document (1) as an aqueous solution of formaldehyde which did not contain methanol. Moreover, he observed that the phosphonomethylation itself generated methanol as a by-product. Conversely, the process of the patent in suit used a medium substantially based on methanol with some water present, because water was generated early on in the course of the reaction, i.e. by the reaction of the glycine with the caustic used. Therefore, the Opposition Division should have taken into account that the process of document (1) and the process of the patent in suit both used an aqueous-alcoholic reaction medium, albeit one (the claimed process) contained appreciably more alcohol than water. Thus, it would have been obvious in the light of documents (52), (53) and (54) to substitute the 36% formaldehyde solution (formalin) with a 55% formaldehyde solution known from e.g. document (8).

The Appellant also argued that there were substantial procedural violations entitling the Appellant to reimbursement of the appeal fee. Firstly, the Opposition Division should not have allowed the Respondent's experimental evidence into the proceedings just one month before the oral proceedings. Secondly, that having allowed this in, the Opposition Division were then obliged either to allow in the Appellant's experimental report in response filed only at the oral proceedings, or to postpone the oral proceedings as suggested by the Appellant. Finally, the filing of the Respondent's experimental report just one month before the oral proceedings before the Opposition Division was a tactical abuse of the procedure by the Respondent, entitling the Appellant to an award of costs.

VI. Oral proceedings before the Board were held on 27 January 2000. The Appellant, who had been duly summoned, had previously informed the Board that he would not attend the oral proceedings. The oral proceedings thus took place in the absence of the Appellant (Rule 71(2) EPC).

VII. At the oral proceedings, the Respondent filed a new Claim 1 differing from Claim 1 upon which the decision of the Opposition Division was based only in that the expression "in methanol" was transferred and inserted after "metal hydroxides" so that the reaction step in the claim read

"...reacting glycine with an aqueous-alcoholic solution of formaldehyde in the presence of a base selected from the group consisting of alkali and alkaline-earth metal hydroxides in methanol...".

He also filed appropriately adapted pages of the description.

Furthermore, the Respondent denied that the subject-matter of the present claims had the formal deficiencies indicated by the Appellant in view of

Articles 84 and 123 EPC by arguing that it was clearly indicated in present Claim 1 that the glycine was reacted in methanol with an aqueous-alcoholic solution of formaldehyde and that it was common general knowledge as supported by document (7) and document

(27) American Chemical Society Monograph Series, No. 159, third Edition (1964), "Formaldehyde", J. Frederic Walker, Chapter 3, "State of Dissolved Formaldehyde", New York Reinhold Publishing Corporation, pages 52-57, 78-79, 83-85 and 90-95,

that the amounts of the components of the formaldehyde solution were expressed in weight percentages. He also pointed out that the phrase "in an aqueous-alcoholic solution" in the preamble of Claim 1 as granted was merely deleted as superfluous, so that the scope of the claim had been reduced rather than extended.

The Respondent defended inventive step by starting from each of documents (1), (46) or (24) in turn. In this context, he argued that document (1) disclosed, as an essential feature, the use of an aqueous reaction medium and nowhere suggested the use of methanol as solvent or the use of the formaldehyde solution according to the patent in suit. Furthermore, he emphasised that all the prior art literature which carried out the reaction in methanol aimed at achieving anhydrous conditions and that there was no equivalence between trialkyl phosphites and dialkyl phosphites, because they showed in the phosphonomethylation reaction a different reaction mechanism.

VIII. The Appellant (Opponent) requested in writing that the decision under appeal be set aside and that the patent in suit be revoked. He also requested an apportionment of costs in his favour and reimbursement of the appeal fee.

The Respondent (Patentee) requested that the decision under appeal be set aside and that the patent be maintained on the basis of:

Claims:	Claim 1 as filed at the oral proceedings on 27 January 2000 before the Board, Claims 2 to 6 as granted.
Description:	pages 2 and 3A as filed on 27 January 2000 before the Board, pages 2A and 3 as filed on 17 April 1997 before the Opposition division, page 4 as granted.

IX. At the conclusion of the oral proceedings, the Board's decision was announced.

Reasons for the Decision

1. *Admissibility*

1.1 The appeal is admissible.

2. *Request for reimbursement of the appeal fee*

2.1 According to Rule 67 EPC the reimbursement of the appeal fee shall be ordered where the Board of Appeal deems an appeal to be allowable and if such reimbursement is **equitable** by reason of a **substantial procedural violation**.

2.2 In the present case, the Opposition Division in its preliminary opinion in the communication according to Rule 71a(1) EPC accompanying the summons to attend oral proceedings, indicated that it was not convinced that the invention as claimed possessed unexpected advantages over the prior art, and that therefore the claims might not be regarded as meeting the requirements of inventive step in view of document (1). The Respondent (Patentee) could reasonably be expected to react to this, and actually did so, in filing a report of comparative experiments on the last day of the period set for filing comments pursuant to Rule 71a(1) EPC. The Opposition Division allowed this experimental report into the proceedings. The board cannot here see any procedural violation by the Opposition Division, nor any abuse of procedure by the Respondent. Rather it would seem strange to deny the Respondent the right to react to the comment by the Opposition Division.

2.3 However, the Opposition Division did not allow the Appellant's experimental report, in response to the Respondent's experimental report, into the proceedings. In this context, it stated in the decision under appeal that the report was disregarded because it was late filed and because it was not relevant enough to change the outcome of the opposition procedure.

2.4 However, the Board considers that by admitting into the proceedings the Respondent's experimental report, **the subject of the proceedings had changed** in the sense of Rule 71a(1) EPC. Thus both on general principles of even-handedness between the parties, and on the specific wording of Rule 71a(1) EPC (see its first paragraph, last sentence), the Appellant's experimental report should have been admitted into the proceedings as a response to the Respondent's experimental report. That the Appellant's report would not affect the outcome of the proceedings was in these circumstances not a consideration that should have been taken into account when deciding on its admission into the proceedings. After hearing the Respondent's comments on its report, the Opposition Division might perhaps have wished to cut short the Appellant's comments on its report, by stating that these were unnecessary because the Opposition Division was already of the opinion which the Appellant was arguing for on this point. However the Opposition Division did not do this, but rather refused to let the Appellant's report into the proceedings at all, on the grounds that it was belated and irrelevant, leaving the Appellant aggrieved.

2.5 A party is entitled to know that its response is part of the documents admitted into the proceedings, even if it turns out not to be decisive for the outcome before that instance. To let in the experimental report of one party, but not the response of the other party gives the appearance of discriminatory treatment.

2.6 This view of the Board is confirmed by the reasons which persuaded the Administrative Council to introduce Rule 71a EPC, as set out in the Explanatory Memorandum CA/012/94- Rev. 1 dated 17 October 1994 from the President of the European Patent Office (published, with slight editorial changes, in OJ EPO 1995, pages 418 and 419, but the original text being quoted here) which, in particular, states that (underlining by the Board):

7.3 Proposed new Rule 71a(1) would therefore introduce into the law the existing practice of issuing a summons and require a deadline to be set for any written submissions. It also makes it clear that new facts and evidence put forward after that date need only be taken into account if based in a change in the subject of the proceedings, **for example because the other party has raised new material in his own preparatory papers**.

2.7 In the present case, wherein the Appellant had only received the Respondent's experimental report some four weeks earlier, and had difficulty in completing any counter-experiments at all, the Appellant cannot be faulted for any delay. The Appellant had further notified the Opposition Division and the Respondent that he wished to file a response, and had asked that the oral proceedings be postponed if this would cause problems. Thus any difficulties the Respondent might have had with dealing with an experimental report filed only at the oral proceedings, could not be attributed to any fault of the Appellant, and could not be a reason for not allowing the response into the proceedings.

2.8 The Board thus concludes that the Opposition Division committed a procedural violation in not allowing the Appellant's experimental report into the proceedings.

2.9 However, the existence of a procedural violation is not by itself sufficient for reimbursement. The requirement of Rule 67 EPC is - as indicated above - that the reimbursement must be equitable by reason of a substantial procedural violation.

2.10 From the decision under appeal it is clear that the Opposition Division here actually considered the

Respondent's experimental report, but did not rely on it in a way adverse to the Appellant. Therefore, the refusal to allow the Appellant's experimental report into the proceedings, while a violation of the Appellant's right under Article 113(1) EPC to present comments on the experimental report of the Respondent, had no influence on the decision reached by the Opposition Division. Nor did this exclusion have any relevance to the arguments on the substantive issues in the appeal. The Appellant has not argued the contrary on appeal. This contrasts with the situation in decision T 94/84 (OJ EPO 1986,337), relied on by the Appellant, where the very document which it was held to be a substantial procedural violation by the Opposition Division not to allow into the proceedings, was relied on by the Board deciding that case to deny existence of inventive step and thus to reverse the decision of the Opposition Division.

2.11 As the refusal, though amounting to a procedural violation, has had no **substantive effect** on the outcome of the proceedings, it does not amount to a **substantial** procedural violation such as would make it equitable to reimburse the appeal fee pursuant to Rule 67 EPC (cf. decision T 682/91 of 22 September 1982 (not published in OJ EPO) at § 4.2). Accordingly, the request for reimbursement of the appeal fee must be refused.

3. *Request for apportionment of costs*

3.1 The Appellant has asked for an "appropriate award of costs" essentially because the Respondent's evidence was submitted only one month before the date of the oral proceedings, and the Appellant had to produce their counter-experiments in a great hurry, and had to have available at the Oral Proceedings an expert who could comment if needed. The Appellant also complained that the Respondent had provided no explanation why they provided the experimental evidence so late, and the Opposition Division had demanded no explanation.

3.2 Apportionment of costs is governed by Article 104(1) EPC which provides that each party to the proceedings shall meet its own costs, unless for reasons of equity a different apportionment of costs incurred during the taking of evidence or in oral proceedings is ordered. This has consistently been interpreted as requiring that the party against whom costs are ordered must have been guilty of some inequitable conduct. Here the Respondent in response to a comment made in the communication accompanying the summons to oral proceedings submitted further experimental evidence to try and change the Opposition Division's mind on a particular point, and made the submission on the last day of the period set for submitting such material. This appears a normal exercise of its rights: there is no evidence that he delayed the submission to embarrass the Appellant. The Board cannot see any inequitable conduct here such as would justify an apportionment of costs against the Respondent.

3.3 Thus, the Board sees no reason to depart from the general rule that each party should bear its own costs.

3.4 The request for an apportionment of costs must therefore be refused.

4. *Compliance with Article 123(2) EPC*

4.1 Present Claim 1 is supported by (i) Claim 1, (ii) page 5, first paragraph, and the examples (concerning the use of methanol as solvent), (iii) page 4, fourth paragraph (concerning the composition of the formaldehyde solution), and (iv) page 5, penultimate paragraph (concerning the glycine/formaldehyde molar ratio) of the application in suit as originally filed.

Furthermore, the specification of the percentages of the components of the composition of the formaldehyde solution into weight percentages is implicitly supported by the originally filed patent application, since the person skilled in the art would have directly and unambiguously understood at the date of filing of the application in suit, on the basis of his common general knowledge, that nothing else could have been meant.

Support for this common general knowledge can, for instance, be found in document (7) (see in particular pages 243 and 244, Tables 8 and 9) and document (27) (see page 83, last paragraph, showing that the volume percent measure of formaldehyde concentration had already been generally abandoned in 1964 both in Great Britain and United States for the more accurate weight percent measure).

4.2 Claims 2 to 6 correspond to Claims 2 to 6 as originally filed.

4.3 Therefore, the requirements of Article 123(2) EPC have been met.

5. *Compliance with Article 123(3) EPC*

5.1 The deletion of the expression "in an aqueous-alcoholic solution" from the preamble of Claim 1 as granted does not extend the protection conferred by the patent in suit, because the characterising part of present Claim 1 requires the process step of reacting glycine with an aqueous-alcoholic solution of formaldehyde containing 10% wt. of water.

5.2 Furthermore, the features introduced in Claim 1 indicating the use of methanol as solvent and the application of the specific formaldehyde solution in particular amounts clearly restrict the scope of Claim 1 as granted.

5.3 Therefore, the requirements of Article 123(3) EPC have been met too.

6. *Clarity and support (Article 84 EPC)*

6.1 The Board has also no objections concerning the requirements of "clarity" and "support" within the meaning of Article 84 EPC. Since the only objection by the Appellant in this respect has been removed by indicating in Claim 1 that **the reaction** is carried out in methanol, further comments not are needed.

7. *Novelty*

7.1 After examination of the cited prior art documents, the Board has reached the conclusion that the subject-matter as defined in the present claims is novel. Since novelty is no longer in dispute, it is not necessary to give detailed reasons for this finding.

8. *Inventive step*

8.1 It remains to be decided whether or not the subject-matter of the present claims involves an inventive step as required by Article 56 EPC.

8.2 In accordance with the "problem-solution approach" consistently applied by the Boards of Appeal to assess inventive step on an objective basis, it is necessary to establish (a) the closest prior art being the starting point, (b) to determine in the light thereof the technical problem which the invention addresses, (c) to verify that the technical problem is solved by all the embodiments encompassed within the claimed solution and (d) to examine whether the claimed solution is obvious or not in view of the state of the art.

8.3 In this context, the Boards of Appeal have developed certain criteria that should be adhered to in order to identify the closest state of the art. One of such criteria is that the closest prior art is normally a prior art document disclosing subject-matter aiming at the same objective as the claimed invention and having the most relevant technical features in common.

8.4 In the present case, the Opposition Division considered document (1) as the closest prior art.

This document relates to a method of producing N-phosphonomethyl glycine comprising (i) reacting glycine with formalin in an aqueous medium in the presence of NaOH, (ii) adding a trialkyl phosphite to the obtained reaction mixture containing N-hydroxymethyl glycine salt, and (iii) hydrolysis of the obtained N-phosphonomethyl glycine dialkylester to produce the desired N-phosphonomethyl glycine (see page 3, fourth and fifth paragraph). Thus this document aims at the same objective as the patent in suit, but the source of formaldehyde is **formalin** and **the use of an aqueous reaction medium represents an essential feature**.

However, Claim 1 as granted has been **restricted** to a method of producing N-phosphonomethyl glycine in a reaction medium essentially consisting of methanol. Moreover, the Appellant emphasised that at the filing date of the patent in suit there was **a clear trend** in the prior art **to use methanol as reaction medium**.

In these circumstances, the Board concludes that a more appropriate starting point for considering inventive step should be a prior art document, which discloses a similar process for preparing N-phosphonomethyl glycine in methanol as reaction medium.

8.5 According to the Appellant's submissions, such a more appropriate starting point would be document (24), because this document related to the most successful processes for preparing N-phosphonomethyl glycine on an industrial scale at the filing date of the patent in suit.

Said document (24) discloses a process for preparing N-phosphonomethyl glycine by (i) reacting glycine with paraformaldehyde in a glycine/formaldehyde ratio of 1.25 to 5, preferably 1.8 to 2, in an anhydrous reaction medium consisting of a C_{1-4} alcohol, preferably methanol, and in the presence of a base such as an alkali metal hydroxide, (ii) reacting the thus obtained solution with a dialkyl phosphite and (iii) hydrolysing the reaction mixture in the presence of hydrochloric acid to produce the desired N-phosphonomethyl glycine (see Claim 1, column 2, lines 7 to 22, 39 to 43, 53 to 57 and 61 to 68; and the Examples 4, 5 and 8).

Therefore, the Board agrees with the Appellant that this document can be considered as the closest prior art. This point of view was also shared by the Respondent as follows from his submissions in this respect.

8.6 In this context, the Board observes that during the appeal proceedings the Appellant filed document (46) arguing that this document was relevant prior art in view of the use of methanol as reaction medium too.

However, the process for the preparation of N-phosphonomethyl glycine as disclosed in this document is characterised by a **quite different sequence of addition of the reaction components** comprising the addition of formaldehyde to a mixture of a trialkyl phosphite and a glycine derivative, and by **a specific temperature regime**, allowing the conversion of formed N-hydroxymethyl glycine *in statu nascendi* with a trialkyl phosphite (see page 3, second paragraph, and page 4, second paragraph). Moreover, this document teaches that the use of an **alcohol as reaction medium is not a mandatory feature** (see page 3, second and third paragraph, Examples 1 to 3, and 6 using water as reaction medium, and Examples 4 and 5 using methanol as solvent).

Therefore, in the Board's judgment, it is clear in view of the above considerations that this document (46) is a less appropriate starting point for assessing inventive step than document (24).

8.7 Since the Appellant did not provide any evidence that the process of the patent in suit provided any improvement compared to the process of document (24), the technical problem underlying the patent in suit in the light of the closest state of the art can only be seen in the provision of an alternative efficient process for preparing N-phosphonomethyl glycine. This point of view was accepted by the Respondent.

8.8 The patent in suit suggests, as the solution to this technical problem, a process according to present Claim 1 of the patent in suit, which is characterised by reacting the glycine with a **particular methanolic solution of formaldehyde containing 10% wt. water** and the **mandatory** use of an **alkali metal hydroxide** as a base and **trialkyl phosphite** as a phosphorus source.

8.9 Having regard to the technical information given by way of the examples in the patent in suit, the Board is satisfied that the technical problem underlying the patent in suit has successfully been solved.

8.10 Therefore, it remains to be decided, whether or not the proposed solution to this problem is obvious in the light of the cited prior art.

8.11 As indicated above, document (24) discloses a process for preparing N-phosphonomethyl glycine, which essentially differs from that of the patent in suit by using solid **paraformaldehyde**, a **dialkyl phosphite** and an **anhydrous** alcoholic reaction medium.

In particular, it teaches that by using an **anhydrous** alcoholic reaction medium the reaction of the glycine with formaldehyde gives a **new intermediate compound**, namely N,N-bis-hydroxymethyl glycine, and that by the conversion of this new intermediate compound with **dialkyl phosphite** in the presence of a base the possibility of side-reactions may be increasingly eliminated (see column 2, lines 7 to 22, 39 to 42, and 61 to 65).

It is true, that the conversion of glycine with an alkali metal hydroxide as a base leads to some water as a reaction by-product (see Examples 4, 5 and 8). However, as calculated by the Respondent and not contested by the Appellant, the amounts of by-product water are small, e.g. 2% wt. according to Example 4. Moreover, at least in the beginning of the reaction, anhydrous reaction conditions and preferably a trialkyl amine as a base, i.e. a compound which does not form reaction water should be used (see column 2, lines 39 to 42, column 3, lines 1 to 13, as well as the Examples 1, 2 and 3 showing substantially higher yields by using such a tertiary amine). Therefore, this document rather points away from the use of a by-product water forming alkali metal hydroxide as a base.

Thus, this document as such does not give an incentive to the skilled person to the solution of the above defined technical problem as claimed in the patent in suit, which as indicated above, comprises the use of a formaldehyde solution containing a considerable amount of water, the mandatory use of an alkali metal hydroxide as a base, and the application of a trialkyl phosphite as a phosphorus source.

8.12 The Appellant argued that the skilled person would have understood in view of documents (47), (48) and (49) that the process of document (24) using an alkali metal hydroxide as a base as indicated in Example 4, could be modified by replacing the paraformaldehyde by the formaldehyde solution as defined in Claim 1 of the patent in suit and by replacing the dialkyl phosphite compound by a trialkyl phosphite. In this context, he also argued by referring to documents (52), (53) and (54) that there existed even a trend to use a trialkyl phosphite instead of a dialkyl phosphite, since trialkyl phosphites were less prone to hydrolysis in alkaline media, and by referring to documents (2) and (12) that it would not be necessary to use completely anhydrous conditions when applying an alcoholic reaction medium.

On the other hand, the Respondent contested these submissions. In particular, he argued that the skilled person would understand that dialkyl phosphites and trialkyl phosphites reacted in a different way and, consequently, were not equivalent. Moreover, he submitted that the skilled person would derive from the prior art that a phosphonomethylation using methanol as solvent aimed at achieving anhydrous conditions.

8.13 Cited documents (47), (48) and (49) have in common that they disclose processes for preparing N-phosphonomethyl glycine, which are characterised in that, in a first step, a glycine salt or ester is converted to a specific **N-protected** glycine derivative in order to prevent the forming of diphosphonomethylated by-products, in a second step, the obtained protected glycine derivative is phosphonomethylated with formaldehyde and a phosphorus source to give a phosphonomethylated N-protected glycine compound, and, finally, the protecting group is removed by hydrolysis whereby the desired N-phosphonomethyl glycine is obtained (see document (47), column 2, lines 22 to 65; document (48), column 2, lines 11 to 47; and document (49), column 1, line 25 to column 2, line 34).

In particular, said documents disclose that a suitable phosphorus source can be selected from numerous specified phosphorus compounds **including dialkyl phosphites and trialkyl phosphites**, and that the formaldehyde can be used in the form of **an aqueous formaldehyde solution** or solid **paraformaldehyde** (see document (47), column 3, lines 32 to 45, and column 5, lines 47 to 50; document (48), column 3, lines 13 to 26, indicating the preferred use of phosphorous acid, and column 3, lines 27 to 30; and document (49), column 4, lines 19 to 32, and column 6, lines 5 and 6).

Furthermore, documents (47) and (48) disclose that the phosphonomethylation reaction can be carried out in the presence of an **organic solvent**, such as methanol, instead of water, whereby it **may** be necessary to make the reaction mixture **basic** (see document (47), column 5, line 65 to column 6, line 4; and document (48), column 3, lines 35 to 42), whereas document (49) discloses that the reaction can be performed in the presence of a suitable **acid or acid anhydride** (see column 5, last line to column 6, line 5, and the examples).

Thus, these documents essentially teach that the amino group of the glycine must be protected by certain protecting groups in order to avoid the forming of by-products. Moreover, they generally teach that the phosphonomethylation can be carried out by using a formaldehyde solution or solid paraformaldehyde, one or more of the numerous indicated phosphorus sources, and various reaction conditions, including aqueous, anhydrous, basic and/or acid conditions.

However, it is the Board's position that it cannot be derived from this general teaching that dialkyl phosphites and trialkyl phosphites are equivalent phosphonomethylation agents under the same reaction conditions, such as those indicated in document (24) or those of the patent in suit. Furthermore, the Board observes that the only examples given in said documents (47), (48) and (49) relating to the use of a basic alcoholic reaction medium as applied in accordance with document (24), namely Example 2 of document (47) and Example 2 of document (48), indeed make use of a **trialkyl phosphite** as a phosphorus source. However, yields of the desired N-phosphonomethyl glycine are not indicated in said examples. Moreover, even if said examples would have indicated comparable or even higher yields compared to those of document (24), the skilled person would have primarily attributed such results to the use of the particular protecting groups in the glycine starting compounds. In any case, the skilled person would not derive from said examples an incentive that a trialkyl phosphite would be a suitable alternative for a dialkyl phosphite in the process of document (24) either.

8.14 Furthermore, the same conclusion can be drawn from the teaching of documents (52), (53) and (54).

In this context, the Board observes that it can indeed be derived from these documents (i) that dialkyl phosphites and trialkyl phosphites tend to hydrolyse, (ii) that dialkyl phosphites are normally less prone to hydrolyse than trialkyl phosphites, and (iii) that trialkyl phosphites are **relatively** stable in alkaline solutions (see, in particular, document (53), page 8, last paragraph, page 10, second paragraph under "BASIC CHEMISTRY", and page 47, first paragraph; and document (54), page 2428, third paragraph).

However, in the Board's judgment, this common general knowledge as such does not provide any help to the skilled person for answering the question whether or not trialkyl phosphites are equivalent to or even better than dialkyl phosphites **as a phosphorus source in a phosphonomethylation process in accordance with document (24)** or Claim 1 of the patent in suit, since he would have appreciated from the prior art specifically related to phosphonomethylation reactions of glycine derivatives, such as the above discussed prior art documents, that the phosphonomethylation involves a complex reaction and that **its efficiency rather depends on numerous reaction conditions**, including the use of an aqueous reaction medium (document (1)), the presence of a particular anhydrous solvent (document (24)), the use of a specific order of addition of the reaction components and a particular temperature regime (document (46)), the use of N-protected glycine derivatives (documents (47), (48) and (49)), the presence of an acid (document (49)), and/or the use of a particular phosphorus source (a trialkyl phosphite according to documents (1) and (46), and a dialkyl phosphite in accordance with document (24)).

8.15 Thus, in view of the above considerations, the Appellant, who has in accordance with the established jurisprudence of the Boards of Appeal in cases like this the burden of proof for his allegation that dialkyl phosphites and trialkyl phosphites would be equivalent reagents in phosphonomethylation reactions, provided insufficient evidence. Consequently, the Board cannot accept his submissions in this respect.

8.16 Furthermore, the Appellant relied on documents (2) and (12) with respect to his submission that **completely** anhydrous conditions would not be necessary if a basic alcoholic reaction medium were used.

However, in the Board's judgment and in contradiction to the Appellant's point of view, these two documents actually provide a clear incentive to the skilled person to use anhydrous reaction conditions, because both documents concern phosphonomethylation processes, in which an alcohol is used as reaction medium and the presence of water is avoided by the application of solid paraformaldehyde and a tertiary amine as a base (see document (2), column 1, lines 43 to 65, and the examples; and document (12), page 4, page 5, first paragraph, and the examples).

In this context, the Board observes, that it is true that the passage in document (12), referred to by the Appellant, indicates that the use of water still allows the reaction to proceed, but that in doing so only low yields are obtained (see column 3, lines 49 to 52). Thus, in view of the clear warning that in the presence of water only low yields can be achieved, it is the Board's position that the skilled person interested in providing an efficient process for preparing N-phosphonomethyl glycine would rather consider this passage in the light of the teaching of document (12) as a whole as a clear pointer to avoid the presence of water.

Thus, in view of these considerations, the Board cannot accept the Appellant's point of view that the skilled person would have understood that the process of document (24) could be carried out in the presence of a considerable amount of water either. Instead, the Board finds that, as submitted by the Respondent, the skilled person rather would derive from this prior art that a phosphonomethylation using methanol as solvent and a **dialkyl phosphite** as a phosphorus source **aims at achieving anhydrous conditions**.

8.17 Furthermore, all the specific disclosures of phosphonomethylation processes using a **trialkyl phosphite** and a basic alcoholic reaction medium, namely Example 4 in document (46), Example 2 in document (47) and Example 2 in document (48), all teach the application of essentially anhydrous conditions by using solid paraformaldehyde instead of an aqueous formaldehyde. Therefore, the Board concludes in accordance with the Respondent's submissions, that the cited prior in relation to phosphonomethylation processes in an alcoholic reaction medium using a **trialkyl phosphite** as a phosphorus source aims at using anhydrous reaction conditions too.

8.18 Therefore, in view of the above considerations, the skilled person would not have had any reason to expect that by replacing in the process of document (24) a dialkyl phosphite by a trialkyl phosphite and paraformaldehyde by a specific formaldehyde solution leading to the presence of a limited but considerable amount of water an efficient phosphonomethylation process could be realised.

8.19 Thus, the Board concludes that, starting from the disclosed process of document (24), the cited prior art does not give an incentive to the claimed solution of the above defined technical problem.

8.20 In view of the above considerations, the Board has also come to the conclusion that the alternative line of arguments put forward by the Appellant concerning inventive step, starting from document (1) and combining the teaching of this document with that of the documents (2), (12), (46), (47), (48), (49), (52), (53) and (54), cannot be accepted either.

In this context, the Appellant argued essentially that the skilled person would have understood in the light of the cited prior art that an efficient alternative process for preparing N-phosphonomethyl glycine could be achieved by replacing the aqueous reaction medium used in accordance with document (1) (see point 8.4 above) by a methanolic reaction medium.

However, even if this point of view would be accepted, in the Board's judgment, the claimed process comprising the use of a particular formaldehyde solution containing a considerable amount of water would not have been obvious to the skilled person, because - as indicated above - the cited prior art in relation to phosphonomethylation processes in a basic alcoholic reaction medium using a trialkyl phosphite as a phosphorus source rather aims at using anhydrous reaction conditions.

8.21 Thus, it follows from the above considerations, that the subject-matter of present Claim 1 involves an inventive step within the meaning of Articles 52(1) and 56 EPC.

Furthermore, for the same reasons, the Board also concludes that the subject-matter of dependent Claims 2 to 6 involves an inventive step too.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The requests of the Appellant for an apportionment of costs and reimbursement of the appeal fee are refused.

3. The matter is remitted to the first instance with the order to maintain the patent on the basis of the Respondent's (Patentee's) request made at the oral proceedings on 27 January 2000.

The Registrar:	The Chairman
E. Görgmaier	J. Jonk