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**Datasheet for the decision
of 5 May 2009**

Case Number: T 0877/08 - 3.3.10

Application Number: 00962683.9

Publication Number: 1240134

IPC: C07C 245/16

Language of the proceedings: EN

Title of invention:

Process for the preparation of diazomethane

Patentee:

Phoenix Chemicals Limited

Opponent:

Dynamit Nobel GmbH

Headword:

Process for the preparation of diazomethane/PHOENIX

Relevant legal provisions:

EPC Art. 56

Keyword:

"Inventive step (no) - determination of the closest prior art
- obvious to try - reasonable expectation of success - no
deterrent teaching in the art"

Decisions cited:

T 0249/88, T 1053/93, T 0318/02

Catchword:

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Case Number: T 0877/08 - 3.3.10

D E C I S I O N
of the Technical Board of Appeal 3.3.10
of 5 May 2009

Appellant: Phoenix Chemicals Limited
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Respondent: Dynamit Nobel GmbH
(Opponent) Explosivstoff- und Systemtechnik
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Representative: Pochart, François
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 22 February 2008
revoking European patent No. 1240134 pursuant
to Article 102(1) EPC 1973.

Composition of the Board:

Chairman: R. Freimuth
Members: J.-C. Schmid
D. S. Rogers

Summary of Facts and Submissions

- I. The Appellant (Proprietor of the patent) lodged an appeal on 21 April 2008 against the decision of the Opposition Division posted on 22 February 2008 revoking European patent No. 1240134 and on 11 June 2008 filed a written statement setting out the grounds of appeal.
- II. Notice of Opposition had been filed by the Respondent (Opponent) requesting revocation of the patent in suit in its entirety on the ground of lack of inventive step (Article 100(a) EPC), citing *inter alia* documents
- (1) US-A-5 854 405,
 - (4) Houben Weyl (1968), Vol. 10(2), pages 552-553 and
 - (6) Paolo Lombardi "A rapid, safe and convenient procedure for the preparation and use of diazomethane", Chemistry & Industry, 1990, page 708.
- III. In the decision under appeal the Opposition Division held that claim 1 as granted complied with Article 123(2) EPC and that the invention as claimed was sufficiently disclosed in the patent in suit. Although the subject-matter of claim 1 to 41 was novel over the cited prior art documents it lacked an inventive step with respect to document (6). This document disclosed a batch process for the production of diazomethane wherein diazomethane was removed as a gas with the aid of a diluent gas. The technical problem was seen in the provision of a further process for the production of diazomethane. The only difference between the claimed process and that of document (6) was carrying out the process in a continuous way.

Transforming a batch process into a continuous process belonged to the routine tasks of the skilled person and did not require inventive skills. Hence it was obvious for the skilled person to adapt the batch process of document (6) to a continuous process.

- IV. At the oral proceedings before the Board, held on 5 May 2009, the Appellant defended the maintenance of the patent in suit in amended form on the basis of a main request submitted during these oral proceedings superseding any previous requests. The main request consisted of a set of forty claims, independent claim 1 reading as follows:

"1. A continuous method for the production of diazomethane comprising the steps of feeding :
a diazomethane precursor dissolved in a first solvent,
and
a base dissolved in a second solvent into a reactor vessel where they react to generate diazomethane, and removing the resulting diazomethane as a gas substantially free of solvents and contaminants with the aid of a sparge diluent gas."

- V. The Appellant submitted that the closest prior art was document (1) dealing with an industrial and continuous process for the preparation of diazomethane. Document (1) was concerned with the same objectives as the patent in suit, i.e. production of diazomethane on a large scale, provision of a safe process and above all was, like the claimed process, a continuous process. Document (4) was not a suitable starting point for the assessment of inventive step, since it was a very old document which did not disclose a continuous process.

The method of production of gaseous diazomethane was disclosed only *inter alia* in this document. Hence, it was a necessary preliminary to specifically choose this process among all other processes disclosed therein. Furthermore the process of document (4) was not safe and was only applicable to small scales while the patent in suit aimed at a safe process on a large industrial scale.

Even starting from document (4) as the closest prior art, the claimed process would be inventive, since document (4) failed to suggest that the batch process disclosed therein could be adapted to be operated in a continuous manner. Furthermore, it was unpredictable whether this process could be adapted to be operated continuously. Moreover, the skilled person would not have operated the process of document (4) continuously, since he would have believed there to be a significant risk of detonation due to the presence of diazomethane vapours, as pointed out in document (1), column 2, lines 12 to 15. Document (6) also taught that the process of document (4) was not safe.

- VI. The Respondent submitted that document (4) represented the closest prior art. The process of claim 1 was not restricted to a continuous process wherein the waste was continuously removed. In the process of document (4) the diazomethane was continuously produced, thus maintaining a low inventory. Furthermore the diazomethane precursor was continuously added to the reaction mixture. No inventive step could be seen in achieving a continuous process starting from a batch process, since it was merely routine to do so. There was no unpredictability with regard to the explosive

tendencies of diazomethane. Diazomethane was stable if diluted in nitrogen. The process of document (4) producing diazomethane diluted in nitrogen was safe. There was no dissuasive teaching of the risk of explosion when converting a batch process producing diazomethane diluted in nitrogen into a continuous one. The passage in document (1) referred to by the Appellant concerned only pure vapour of diazomethane, not diluted in nitrogen. There was no reason at all why diluted diazomethane which was stable in the process of document (4) would not be stable in a process differing only by the fact that the base was added in a continuous fashion to the reactor. The Appellant's argument that the patent in suit is dedicated to large scale production of diazomethane was not reflected in the claims.

VII. The Appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of the main request.

The Respondent requested that the appeal be dismissed.

VIII. At the end of the oral proceedings the decision of the Board was given orally.

Reasons for the Decision

1. The appeal is admissible.

2. *Amendments*

Claim 1 is based on the combination of claims 1, 5, 6, 8 and on page 12, lines 7 and 8 of the application as filed. Furthermore, the scope of granted claim 1 has been restricted in that the recovered diazomethane was further free of contaminant and that the diluent gas was a sparge diluent gas.

Therefore, there are no formal objections to present claim 1 under Article 123(2) and (3) EPC.

3. *Novelty*

The Board found that the subject-matter of the main request was novel in view of documents (1), (4) and (6).

In view of the negative outcome with respect to the issue of inventive step in the present decision, it is unnecessary to go into more detail with respect to this issue.

4. *Inventive step*

According to the established jurisprudence of the Boards of Appeal it is necessary, in order to assess inventive step, to establish the closest state of the art, to determine in the light thereof the technical problem which the invention addresses and successfully solves, and to examine the obviousness of the claimed solution to this problem in view of the state of the art. This "problem-solution approach" ensures that inventive step is assessed on an objective basis and avoids an *ex post facto* analysis.

4.1 *Closest prior art*

In the context of the problem-solution approach, the Boards of Appeal have developed certain criteria that should be adhered to in order to identify the closest state of the art to be treated as the starting point. The crucial criteria are that the "closest prior art" is normally a prior art document disclosing subject-matter conceived for the same purpose as the claimed invention and additionally having the most relevant technical features in common.

- 4.1.1 The patent in suit relates to the production of gaseous diazomethane. Furthermore, the patent in suit aims at a safe large-scale continuous process obviating the need for volatile and flammable solvents (see patent specification, paragraph [0011]).

In relation to these objectives and to the relevant technical features in common, a decision as to whether document (1) or document (4) is to be considered as the "closest prior art" has to be made, since the Appellant and the Respondent had divergent views on which of these documents should be treated as the closest prior art.

- 4.1.2 The Appellant argued that document (1) represented the closest prior art. This document describes a continuous process for the production of diazomethane comprising continuously contacting a N-methyl-N-nitroso amine (diazomethane precursor) dissolved in an organic solvent with an aqueous solution of an inorganic base to generate diazomethane. The diazomethane is recovered

being dissolved in the organic solvent by continuously isolating the organic phase (see claim 1). Furthermore document (1) aims at a safe process (see column 1, lines 64 to 66; column 2, lines 36 to 39).

4.1.3 The Respondent argued that document (4) represented the closest prior art. This document discloses a process for the production of gaseous diazomethane comprising reacting p-tolylsulphonylmethylnitrosamide, (diazomethane precursor) dissolved in carbitol with potassium hydroxide dissolved in a mixture of carbitol and water. Gaseous diazomethane is recovered with the aid of a gentle flow of nitrogen passing through the apparatus (see the second paragraph headed Diazomethane (gasförmig) on page 553).

4.1.4 Thus, in the process according to document (1), the diazomethane is recovered being dissolved in an organic solvent, it is therefore not substantially free of solvent and there is no step of removing the diazomethane with the aid of a sparge diluent gas while document (4) discloses all the process characteristics of claim 1, but is operated batchwise. Furthermore document (4) obviates the need for volatile and flammable solvents.

4.1.5 Hence, the Board considers that document (4) which discloses a safe process for the production of gaseous diazomethane and which differs from the claimed process only by the way of operating the process represents the closest state of the art and, hence, the Board takes it as the starting point in the assessment of inventive step.

4.1.6 According to the Appellant document (4) could not be the closest prior art since it does not disclose a continuous process. As mentioned in paragraph 4.1.4, the way of operating the process is the sole feature which differs from the claimed process. However, the process disclosed in document (1) has less features in common with the claimed process, i.e. the diazomethane is recovered being dissolved in an organic solvent, it is not substantially free of solvent and there is no step of removing the diazomethane with the aid of a sparge diluent gas (see point 4.1.4 above). Hence the process of document (1) is further away from the process of the patent in suit than that of document (4).

The Appellant further argued that since document (4) disclosed various processes for the production of diazomethane a preliminary choice within document (4) should be made to select precisely the process for the production of gaseous diazomethane. However, the section headed "Diazomethane (gasförmig)" on page 553 of document (4) specifically describes a process for the production of gaseous diazomethane. This section of document (4) *per se* represents the closest prior art. No "selection" within this disclosure has to be made to arrive at this process which is directly and unambiguously disclosed therein. This disclosure cannot be ignored simply because document (4) additionally discloses different embodiments in other sections.

The Appellant also argued that the skilled person would not have chosen document (4) as the closest prior art, because it was a very old document. However, Article 56 EPC refers to the state of the art as it stands. State of the art within the meaning of Article 56 EPC

comprises everything made available to the public irrespective of the date of publication as long as it was before the date of filing of the application (Article 54(2) EPC). Thus, the EPC makes no difference between "old" documents and more recent documents. Accordingly, document (4) cannot be discarded only because it was published some years before document (1).

The Appellant further alleged that the process disclosed in document (4) was not safe and was only applicable on a small scale. The Appellant, however, did not provide any data showing a lack of safety of the process of document (4). Accordingly, in the absence of any substantiating facts and corroborating evidence, the Board considers the Appellant's allegation as a mere speculation. In the absence of evidence to the contrary, document (4) is considered to disclose a safe process for the production of gaseous diazomethane. Furthermore, the process of document (4) uses nitrogen as a sparge diluent gas, as does the process claimed, with the consequence that it is not plausible that, while using the same safety measure, the claimed process is safe and that of document (4) is not. The argument relating to the scale of production is not relevant in the present case, since the production of diazomethane on a large scale is not a requirement in claim 1 of the patent in suit.

For these reasons, document (1) is not closer to the claimed invention than document (4). Thus, document (4) represents the closest prior art and hence is the correct starting point for assessing inventive step.

4.2 *Technical problem underlying the patent in suit*

In view of document (4), the Appellant submitted during the oral proceedings that the technical problem underlying the patent in suit was to adapt the known process to generate diazomethane on an industrial scale in a safe manner.

However, the Appellant's formulation of the problem ignores the fact that the closest prior art document (4) already describes a safe process (see point 4.1.6 above). Accordingly to modify the process of the closest prior art to obtain diazomethane in a safe manner cannot be part of the technical problem to be solved vis-à-vis document (4).

4.3 The proposed solution is the process according to claim 1 characterized by being "continuously" operated.

Claim 1 is directed to a process on any scale, i.e. not restricted to a process wherein the diazomethane is necessarily produced on an industrial scale, since claim 1 does not comprise any feature restricting the claimed process to a particular scale. Hence, the aspect of industrial scale should be discarded from the technical problem underlying the patent in suit.

According to the Appellant, the continuous operation of the process is tantamount to the feature of an "industrial scale". Nevertheless, the feature "continuous" indicates merely a mode of operating the process without restriction to any scale while the expression "industrial scale" is only related to its size. Accordingly, the continuous operation of a

process and the scale of that process are two different concepts.

4.4 In view of the above the technical problem needs to be reformulated into the provision of an alternative process for producing diazomethane.

4.5 *Success*

The example described in paragraphs [0061] to [0063] of the patent in suit makes credible that the reformulated less ambitious technical problem is solved. Hence, the Board is satisfied that the technical problem is solved by the proposed solution, i.e. the process of claim 1. This finding was not contested by the Respondent.

4.6 *Obviousness*

Finally, it remains to be decided whether or not the proposed solution to this objective technical problem is obvious in view of the cited state of the art.

To operate a process in a continuous way is basic knowledge for the skilled person. Operating a process continuously for the production of diazomethane is also taught (see claim 1 of document (1)). It is thus within the ambit of the skilled person, seeking to solve the problem of merely providing a further preparation process, to consider routine modifications of the closest prior art process, including operating the known process in a continuous way, as suggested in document (1). Thus, the person skilled in the art seeking an alternative process and following the teaching of document (1) would modify the process known

from document (4) by operating it in a continuous mode, thus arriving at the process of claim 1 without exercising any inventive ingenuity. Accordingly, the subject-matter of claim 1 lacks an inventive step (Article 56 EPC).

- 4.7 The Appellant argued that the skilled person would not operate the process of document (4) continuously following the teaching of document (1), since he would have been afraid of a significant risk of detonation due the presence of diazomethane vapours.

However, document (1) nowhere advises of a risk of detonation when processing diazomethane diluted in nitrogen. The passage on column 2, lines 10 to 13 cited by the Appellant in this respect is concerned with stages of a process conducted in liquid phases wherein diazomethane is dissolved in an organic solvent. Document (1) advocates to limit the temperature below 15°C in order to avoid the formation of diazomethane vapour. It does not teach that there is a risk of detonation with gaseous diazomethane diluted in nitrogen. The Appellant's argument is construed on the inadmissible generalisation of the very specific teaching of document (1) only advising against the formation of gaseous diazomethane from liquid solutions to any process operating with gaseous diazomethane, including that of document (4) wherein diazomethane is safely dissolved in inert nitrogen.

According to the Appellant, document (6) taught that the process of document (4) was not safe. This argument is irrelevant in the present case, since it is the combination of document (4) with document (1) which is

contemplated to assess inventive step. Moreover, this argument is not supported by the facts. Document (6) only refers to methods which employ dangerous distillations and collection of the gaseous reagent without addressing a process where gaseous diazomethane is produced dissolved in nitrogen as in the present case. Furthermore the process of document (4) is safe (see point 4.1.6 above).

Thus, nothing was submitted by the Appellant from which the Board could reasonably conclude that the skilled person would have been advised not to operate the process of document (4) in a continuous fashion. In the absence of substantiating facts and corroborating evidence, the Appellant's argument on a deterrent teaching in the art does not convince the Board.

The Appellant further argued that it was unpredictable whether a continuous process for the production of gaseous diazomethane could be successfully operated, so that that there was no certainty of success. However, when assessing inventive step it is not necessary to establish that the success of an envisaged solution of a technical problem was certain. In order to render a solution obvious it is sufficient to establish that the skilled person would have followed the teaching of the prior art with a reasonable expectation of success (see decisions T 249/88, point 8 of the reasons; T 1053/93, point 5.14 of the reasons; and T 318/02, point 2.7.2 of the reasons, neither published in OJ EPO). In the present case, the Board cannot agree with the Appellant's argument that due to some purported uncertainty about the predictability of success, the skilled person would not have contemplated a continuous

process in order to provide an alternative to the batch process disclosed in document (4). The skilled person has a clear incentive from document (1) to do so (see point 4.6 above). It was only necessary for him to confirm it experimentally by routine work, thus arriving at the claimed invention without inventive ingenuity.

According to the Appellant there was no motivation in the prior art to conduct the process of document (4) continuously. However, the problem underlying the patent in suit is merely to provide an alternative process and document (1) gives a clear incentive on how to solve this problem, namely by operating a process continuously.

4.8 Accordingly, none of the Appellant's arguments in support of inventive step is convincing. As a result, the Appellant's sole request is not allowable for lack of inventive step pursuant to Article 56 EPC.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar

The Chairman

C. Rodríguez Rodríguez

R. Freimuth