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D E C I S I O N
of 29 March 2000

Case Number: T 0877/96 - 3.3.1

Application Number: 92917162.7

Publication Number: 0550743

IPC: C07C 68/00

Language of the proceedings: EN

Title of invention:

Method for making aromatic organic carbonates

Applicant:

GENERAL ELECTRIC COMPANY

Opponent:

-

Headword:

Aromatic organic carbonates/GENERAL ELECTRIC

Relevant legal provisions:

EPC Art. 56, 123(2)

Keyword:

"Inventive step (yes) - non-obvious solution"

Decisions cited:

-

Catchword:

-



Case Number: T 0877/96 - 3.3.1

D E C I S I O N
of the Technical Board of Appeal 3.3.1
of 29 March 2000

Appellant: GENERAL ELECTRIC COMPANY
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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 22 March 1996
refusing European patent application
No. 92 917 162.7 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: A. J. Nuss
Members: P. F. Ranguis
S. C. Perryman

Summary of Facts and Submissions

I. The Appeal lies from the Examining Division's decision to refuse the European patent application No. 92 917 162.7 (publication No. 0 550 743) on the basis that the claims of the then pending request, i.e.

Claims 1 to 6 filed with the response of 3 October 1995,

did not involve an inventive step contrary to the requirement of Article 56 EPC in the light of the disclosure of the document:

(1) EP-A-0 350 700.

II. The Board will also refer to document:

(2) US-A-4 218 391

cited in the patent application as filed.

III. Independent claim 1 reads as follows:

"A method for making an aromatic organic carbonate which comprises,

(1) agitating and heating in a reactor to a temperature of between 40°C to 175°C, a mixture comprising an aromatic organic hydroxy compound, oxygen and carbon monoxide and an amount of a palladium catalyst which is sufficient to catalyse the carbonylation of the aromatic hydroxy compound, the mixture of carbon monoxide and oxygen is maintained in the reactor at a

substantially constant molar ratio and partial pressure to provide the conversion of the aromatic organic hydroxy compound to aromatic organic carbonate without interruption as a result of the use of a gas flow reactor system comprising the reactor, a reservoir for storing a mixture of carbon monoxide and oxygen having a carbon monoxide gas inlet and an oxygen gas inlet and outlet means for feeding the gas mixture to the reactor, a pressure reducing regulator, a mass flow controller, and a back pressure regulator, and

(2) recovering the aromatic organic carbonate from the resulting mixture of (1)".

IV. In its decision, the Examining Division held, in view of the disclosure of document (1), in particular example 5, that:

"it is obvious for the man skilled in the art that reaction rates and yield obtained in a batch process where the reacting gases consumed are not replaced may be improved by maintaining a substantially constant molar ratio and partial pressure of the reacting gases. It is also obvious, for achieving this requirement to feed without interruption the reacting gases in a flow reactor system. It is also obvious that this flow reactor system must comprise means for maintaining a pressure in the flow reactor, namely a pressure reducing regulator upstream and a back pressure regulator downstream. It is also obvious that for monitoring the reaction it is necessary to use a flow controller in the gas flow reactor system".

V. In a communication attached to the summon to oral proceedings, the Board informed the Appellant that the

question might arise whether the expression "without interruption" might be directly and unambiguously derived from the content of the application as filed pursuant to Article 123(2) EPC. It was also indicated that the inventive step would be discussed in view of the teaching of documents (1) and (2).

VI. At the oral proceedings which were held before the Board of Appeal on 29 March 2000, the Appellant filed a new set of claims 1 to 6, claims 2 to 6 remaining unchanged and claim 1 reading as follows (additions indicated in bold and omitted words by [...]):

"A method for making an aromatic organic carbonate which comprises,

(1) agitating and heating in a reactor to a temperature of between 40°C to 175°C, a mixture comprising an aromatic organic hydroxy compound, oxygen and carbon monoxide and an amount of a palladium catalyst which is sufficient to catalyse the carbonylation of the aromatic hydroxy compound **under constant flow conditions**, the mixture of carbon monoxide and oxygen **being continuously introduced into** [*is maintained in*] the reactor **to maintain** [*at*] a substantially constant molar ratio and partial pressure **of carbon monoxide and oxygen** to provide the conversion of the aromatic organic hydroxy compound to aromatic organic carbonate **by** [*without interruption as a result of*] the use of a gas flow reactor system comprising the reactor, a reservoir for storing a mixture of carbon monoxide and oxygen having a carbon monoxide gas inlet and an oxygen gas inlet and outlet means for feeding the gas mixture to the reactor, a pressure reducing regulator, a mass flow controller, and a back pressure regulator, and

(2) recovering the aromatic organic carbonate from the resulting mixture of (1)".-

VII. In support of the inventive step of the claimed process, the Appellant submitted that:

- document (1) disclosed a process of preparation of organic carbonates by oxidative carbonylation using palladium-cobalt catalyst comprising the steps of charging an autoclave with the reagents, pressurizing with carbon monoxide and oxygen, heating for various time, then cooling, venting and recovering the carbonate.
- during the course of the reaction the amount of oxygen decreased due, on the one hand, to the reaction with the aromatic alcohol and, on the other, to the complexation with the catalyst, said catalyst being only active in its oxidised form. It was, therefore necessary to repressurize the autoclave in order to pursue the reaction.
- example 5, disclosed such an embodiment.
- In the light of this disclosure, it was not obvious for the person skilled in the art to propose a process using a gas flow reactor system as mentioned in claim 1, enabling the reaction to be carried out under constant flow condition and at a substantially constant molar ratio and partial pressure of carbon monoxide and oxygen.
- Nor would the person skilled in the art have considered document (2) to get to the claimed process as this document related to a different

kind of reactant, namely aliphatic alcohol, and a different catalyst (copper salt).

VIII. The Appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of:

Claims 1 to 6 submitted at oral proceedings on 29 March 2000.

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

Reasons for the Decision

1. *Admissibility*

1.1 The appeal is admissible.

2. *Subject matter - fair basis* (Article 123(2) EPC)

2.1 Present claim 1 is supported by the application as filed. In particular the amendments proposed (see point VI above) find support in the description page 1, lines 17 to 20, page 3, lines 9 to 13 and page 5, line 33 to page 6, line 30.

3. *Novelty*

3.1 After examination of the cited prior art, the Board has reached the conclusion that the claimed subject-matter of the present claims, is novel. Since in the decision under appeal the Examining Division acknowledged the novelty of the subject-matter of the present claims, it

is not necessary to give detailed reasons for this finding.

4. *Inventive step*

4.1 The Board considers, in agreement with the Examining Division and the Appellant, that the closest state of the art to the claimed invention is document (1) which relates to a method of preparing an organic carbonate by oxidative carbonylation using palladium-cobalt catalyst.

4.2 In the light of this closest state of the art, the technical problem underlying the application with respect to this subject-matter is to be seen in providing an alternative process for preparing aromatic organic carbonate by effecting reaction between an aromatic organic hydroxy compound and carbon monoxide and oxygen in the presence of an effective amount of a palladium carbonylation catalyst.

4.3 In view of the examples and the general description, in particular the drawing, the Board is satisfied that the claimed process represents a solution to the above stated technical problem.

4.4 It remains to be decided whether or not the proposed solution to the problem underlying the patent in suit is obvious in view of the cited prior art.

4.5 The Board notes that the claimed process is closely related to the gas flow reactor system as mentioned in claim 1 in that the process features, namely the constant flow conditions and the constant molar ratio and partial pressure of carbon monoxide and oxygen

result directly from the use of such a gas flow reactor system.

4.6 Document (1), in particular example 5, discloses a process using a different reactor system:

- (a) the carbon monoxide and oxygen are separately and directly fed to the reactor (without a reservoir to mix the gases),
- (b) the reaction occurs in a closed autoclave and, therefore, does not take place under flow constant conditions and under constant molar ratio and partial pressure of carbon monoxide and oxygen, due to the consumption of the said gases during the reaction.
- (c) the other elements necessary to implement the claimed process, i.e. pressure reducing regulator, mass flow controller and back regulator are not present.

In the Board's judgment, the person skilled in the art could not have envisaged a reactor system such as mentioned in the claim 1 in view of the process disclosed in document (1).

4.7 Document (2) disclosed in example 7 a process involving the feeding of a reactor with a continuous flow of carbon monoxide and oxygen. No details of the apparatus used to achieve the continuous flow were given. The process would not have been considered without hindsight by the person skilled in the art when faced with the above stated problem, given the different kind of reactants (aliphatic alcohol) and catalysts (copper

salts).

- 4.8 Where a claim is directed to a specific process using a specific combination of apparatus, then a finding of lack of inventive step requires some chain of reasoning showing how both the process and the specific combination of apparatus can be derived in an obvious manner from cited prior art. The first instance has failed to provide such a chain of reasoning in its decision: it is not enough to state without substantiation that the process and the apparatus are obvious. The prior art on file contains no leads to either the process or the apparatus.
- 4.9 The Board comes to the conclusion, given the prior art on file, that it was not obvious to propose a process for preparing aromatic organic carbonates such as defined in claim 1 and, therefore, its subject-matter involves an inventive step within the meaning of Article 56 EPC.
- 4.10 For the same reasons, the Board concludes that the subject-matter of dependent claims 2 to 6 involves an inventive step.

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 grant a patent on the basis of claims 1 to 6 submitted at oral proceedings on 29 March 2000 and a description yet to be adapted.

The Registrar:

The Chairman:

N. Maslin

A. Nuss