BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

Internal distribution code:
(A) [ ] Publication in OJ
(B) [ ] To Chairmen and Members
(C) [X] To Chairmen
(D) [ ] No distribution

D E C I S I O N
of 11 November 2005

Case Number: T 0339/03 - 3.3.10

Application Number: 99105254.9

Publication Number: 0930289

IPC: C07C 37/20

Language of the proceedings: EN

Title of invention:
Method for making tris(hydroxyphenyl)compounds

Applicant:
GENERAL ELECTRIC COMPANY

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 52(1), 56, 111(1), 123(2)

Keyword:
"Amendments (allowable) - fresh features originally disclosed - no singling out"
"Inventive step (yes, after amendment) - determination of closest prior art for process claims - improvement - non-obvious"

Decisions cited:
T 0615/95; T 0641/89; T 0020/94

Catchword:
-

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0339/03 - 3.3.10

D E C I S I O N
of the Technical Board of Appeal 3.3.10
of 11 November 2005

Appellant: GENERAL ELECTRIC COMPANY
1 River Road
Schenectady
NY 12345 (US)

Representative: Szary, Anne Catherine
London Patent Operation
General Electric International, Inc.
15 John Adam Street
London WC2N 6LU (GB)

Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 14 October 2002 refusing European application No. 99105254.9 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: R. Freimuth
Members: P. Gryczka
D. Rogers

Summary of Facts and Submissions

I. The present appeal lies from the decision of the Examining Division to refuse the European patent application No. 99105254.9 (publication No. EP 0 930 289), filed as a divisional application to the European patent application No. 96306990.1 (publication No. EP 0 765 852), for lack of inventive step .

II. The decision under appeal was based on claim 1 of the then pending request submitted with a letter dated 22 March 2002. The Examining Division held that document

(1) EP-A 314 007

disclosed a process for the preparation of aromatic bisphenol compounds which involved the condensation of aromatic ketones with phenols in the presence of strongly acidic ion exchange resins. In examples 4 to 6 water was continuously removed from the reaction mixture. The claimed process differed from this prior art only by the chemical structure of the starting materials and final products. It was thus regarded as the adaptation of the process disclosed in document (1) to the preparation of similar final compounds, namely tris(hydroxyphenyl) compounds as defined in claim 1.

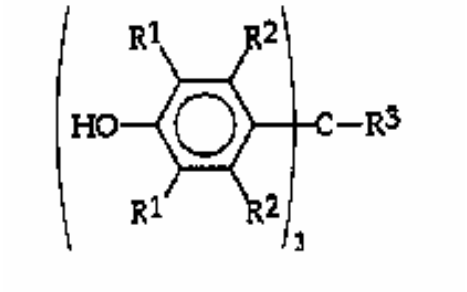
Document (1) disclosed the use of any aromatic ketone as starting material and was not limited to the use of diaryl ketones. Consequently, as the hydroxyphenyl ketones defined as starting compounds in the claimed process were also aromatic ketones, their reaction with phenols fell within the scope of document (1).

In addition, it could be deduced from the examples of document (1) that the removal of water from the reaction medium increased the reaction rate and the yield.

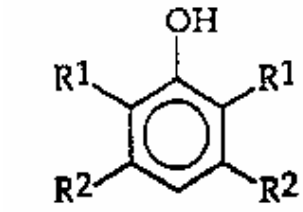
Therefore, the claimed process did not involve an inventive step.

III. During the oral proceedings which took place on 11 November 2005 before the Board, the Appellant (Applicant) filed, as sole request, a fresh claim 1 which reads as follows:

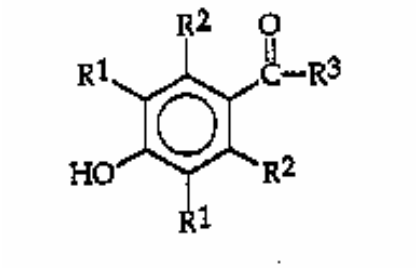
"1. A method of making a tris(4-hydroxyphenyl) compound of the formula:



which comprises heating a mixture comprising a phenol species of the formula:



and a hydroxyphenyl ketone material of the formula:



wherein each R^1 and R^2 is independently hydrogen, halogen, primary or secondary lower alkyl having from 1 to 7 carbon atoms, phenyl, or alkyl substituted phenyl and R^3 is a primary or secondary lower alkyl having from 1 to 7 carbon atoms, in the presence of an acid catalyst wherein the water of reaction is removed from the reaction mixture during reaction by sparging the reaction with a dry inert gas, azeotropic removal of the water with an inert solvent or mixtures of solvents capable of forming an azeotrope with water or using molecular sieves."

IV. The Appellant's arguments can be summarised as follows:

(a) The amended claim 1 found a basis in the application as filed which defined the adequate methods for removing water during the reaction (Article 123(2) EPC).

(b) For the assessment of inventive step document

(2) US-A 4 992 598

cited in the specification of the patent application, should be considered as the closest prior art, since it disclosed the preparation of tris(hydroxyphenyl) compounds whereas document (1) did not. The technical problem to be solved by the

claimed process was to improve the yield of the reaction disclosed in document (2). As shown by example 4 and comparative example 5, this problem was effectively solved by removing during the reaction the water which was produced as a by-product. Since document (2) on its own made no hint to the possibility of removing water and document (1) did not teach that water removal could result in an increased yield, the claimed subject-matter involved an inventive activity.

V. The Appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of claim 1 of the sole request submitted at the oral proceedings before the Board.

VI. At the end of the oral proceedings the decision of the Board was announced.

Reasons for the Decision

1. The appeal is admissible.

Amendments

2. Claim 1 was amended by deleting the possibility for the substituent R^3 to be a phenyl or an alkyl substituted phenyl group in the starting ketone material and in the final tris(4-hydroxyphenyl) compound. This deletion does not generate fresh subject matter since the substituents R^1 and R^2 still have several meanings, so that the deletion does not single out individual compounds or group of compounds but maintains the

remaining subject matter as a generic group of compounds (T 615/95, not published in OJ OEB).

The feature in claim 1, that the water is removed during the reaction, is based on page 9, lines 1 and 2 of the application as filed.

The methods for removing water defined in claim 1 are disclosed on page 8, lines 5 to 10 of the application as filed.

Consequently, the amended claim 1 fulfils the requirements of Article 123(2) EPC.

Novelty

3. Novelty of the claimed process was not objected to by the Examining Division. The Board on its own sees no reason to take a different view for the more restricted subject-matter of present claim 1.

Inventive step

4. The sole issue arising from the present appeal consists in deciding whether or not the claimed subject-matter involves an inventive step.

4.1 The present application is directed to a process for preparing tris(hydroxyphenyl) compounds by the condensation of a phenol species and an alkyl-hydroxyphenyl ketone. The examples are directed to the preparation of a specific tris(hydroxyphenyl) compound, namely 1,1,1-tris(4'-hydroxyphenyl)ethane (hereafter referred to as THPE).

This reaction already belongs to the state of the art, since document (2), which is acknowledged in the specification of the application as the starting point for the present invention, discloses a process for the preparation of THPE by the condensation of phenol with 4-hydroxyacetophenone in the presence of hydrochloric acid and beta-mercaptopropionic acid as co-catalyst (column 1, lines 6 to 18, column 3, lines 38 to 46). Hence, document (2) relates to the preparation of the same compounds as the present application by condensation of the same starting compounds and under the same catalytic conditions.

The Board observes that in the present case, where the claimed invention lies in a process for preparing a known product, in particular THPE, the closest prior art is that document which describes said compound together with a process for the preparation thereof (see decisions T 641/89, point 3.1 of the reasons; T 20/94, point 7.2 of the reasons; neither published in OJ EPO).

Document (1), which was the starting point for the assessment of inventive step in the appealed decision, relates to the preparation of different compounds, namely bis(hydroxyphenyl) compounds (document (1), claim 1). Thus, document (1) is considered to be less relevant than document (2).

In these circumstances, the Board considers in agreement with the Appellant, that document (2) represents the closest prior art and, hence, takes it as the starting point when assessing inventive step.

4.2 In view of this state of the art, the problem underlying the present application, as submitted by the Appellant and indicated in the specification of the application (page 2, line 56 to page 3, line 1), consists in providing a process for preparing tris(hydroxyphenyl) compound with an improved yield.

4.3 As a solution to this problem, the present application proposes a process for preparing tris(hydroxyphenyl) compounds in which the water of reaction is removed from the reaction mixture during the reaction by the means defined in claim 1.

4.4 Comparative example 5 of the specification describes the preparation of THPE by condensation of phenol with 4-hydroxyacetophenone in the presence of HCl and 3-mercaptopropionic acid in which the water of reaction is not removed. This process illustrates the closest prior art since it reproduces all the technical features disclosed in document (2) for the preparation of THPE. After a reaction time of 12 hours, THPE was obtained in a yield of 68%.

In example 4, the reaction was carried out under the same conditions as in comparative example 5, however, after 7 hours of reaction water was removed by formation and elimination under vacuum of an azeotrope with 1,2-dichloroethane. In this example, which was carried out in accordance with the process claimed in the present application since it includes the removal of water, the yield after the same reaction time as in comparative example 5 was 98% (page 10, lines 19 to 37; page 11, table IV).

The comparison of these two examples shows the impact of the process modification which distinguishes the claimed process from the closest prior art, namely the removal of the water during the reaction. Thus, it can be concluded from these experimental data that the claimed process effectively provides an improvement of the yield (98% compared to 68%) and that, consequently, the problem underlying the application has been successfully solved.

4.5 Finally, it remains to be decided whether or not the proposed solution to the problem underlying the patent application is obvious in view of the cited state of the art.

4.5.1 Document (2) makes no mention of any water removal step. Thus, the skilled person cannot get any hint from document (2) on its own, that an improvement of the yield could be achieved by this process step.

4.5.2 Document (1) relates to the preparation of bisphenols by the condensation of phenols with diarylketones (formula (II) on page 3) and discloses that the condensation can be carried out in the presence of an inert solvent which could also be used as water carrier during the reaction (page 4, lines 15 to 17). However, this process step is only given as an alternative for which no technical effect or advantage is explicitly taught in document (1).

The examples of document (1) are carried out with or without water removal. The yields obtained without water removal in examples 1 to 3 are 68,5%, 74% and

59,6%, respectively. The yields observed in examples 4 to 7 with water removal, i.e. 75%, 65%, 60% and 58%, respectively, are in part even lower than those achieved without water removal. Consequently, the skilled person cannot deduce from the analysis of the examples of document (1) the teaching, that removing the water of the reaction improves the yield.

Thus, the skilled person would not consider document (1) when looking for a solution to the technical problem underlying the present application, since that document does not address that problem: document (1) does not teach, either explicitly or implicitly, that removing the water during the reaction results in an increased yield when preparing tris(hydroxyphenyl) compounds.

Consequently, document (1) on its own or in combination with document (2), cannot point the skilled person to the claimed solution of the technical problem defined herein above (point 4.2).

4.6 In respect of obviousness, the Examining Division did not rely on any further documents in the decision under appeal. As the Board is not itself aware of any further relevant documents, the process according to claim 1 involves an inventive step within the meaning of Articles 52(1) and 56 EPC.

Remittal

5. Since substantial amendments to the description are required in order to bring it into conformity with claim 1 as amended, the Board considers it appropriate to exercise the power conferred to it by Article 111(1)

EPC to remit the case to the Examining Division for the purpose of properly adapting the description of the application to the present claim 1.

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 claim 1 submitted at the oral proceedings before the Board and a description yet to be adapted.

The Registrar: The Chairman:

C. Moser R. Freimuth