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D E C I S I O N
of 11 December 1997

Case Number: T 0490/94 - 3.4.2
Application Number: 90312093.9
Publication Number: 0427494
IPC: B01D 53/36, B01J 37/04,
B01J 23/56

Language of the proceedings: EN

Title of invention:

Staged three-way conversion catalyst and method for using the same

Patentee:

ENGELHARD CORPORATION

Opponent:

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Headword:

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Relevant legal provisions:

EPC Art. 54, 84
EPC R. 29(1), (3)

Keyword:

"Requirements of Article 84 and Rule 29(1) and (3) (after amendments - yes)"
"Novelty (after amendments - yes)"

Decisions cited:

-

Catchword:

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Boards of Appeal

Chambres de recours

Case Number: T 0490/94 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 11 December 1997

Appellant: ENGELHARD CORPORATION
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Representative: Fisher, Adrian John
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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 4 February 1994
refusing European patent application
No. 90 312 093.9 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: E. Turrini
Members: R. Zottmann
L. C. Mancini

Summary of Facts and Submissions

I. The Appellant (Applicant) lodged an appeal against the decision of the Examining Division to refuse European patent application No. 90 312 093.9 with the publication No. 0 427 494.

II. The reasons given for the refusal were that the subject-matters of some claims do not meet the requirements of Article 84 EPC and the subject-matters of the independent claims, as far as understandable in terms of concrete technical features, are not novel with respect to document

D1: EP-A-0 313 434

in the meaning of Article 54 EPC.

III. In communications pursuant to Article 110(2) EPC, the Board of Appeal expressed its preliminary opinion that the application did not meet the provisions of the EPC and informed the Appellant by which amendments the existing deficiencies probably could be removed.

To meet these objections, the Appellant reformulated the claims, thereby largely adopting the suggestions of the Board.

IV. The Appellant requested that the decision under appeal be set aside and that the application be allowed to proceed to grant on the basis of the claims of main request or three auxiliary requests filed with the letter dated 4 June 1997.

V. The independent claims of the main request read as follows:

"1. A catalyst composition for converting HC, CO and NO_x in a gaseous stream flowed therethrough, the composition comprising an upstream catalyst member and a downstream catalyst member, as sensed in the direction of flow of the gaseous stream through the catalyst composition, wherein:

- (a) the upstream catalyst member comprises a first catalytic material characterised by having an ignition temperature for substantially simultaneous conversion of HC, CO and NO_x which is significantly lower than that of a second catalytic material, defined below, the ignition temperature of a catalyst being defined as the lowest temperature at which a stoichiometric exhaust gas stream introduced into the catalyst will undergo conversion of at least 50% of each of HC, CO and NO_x, and a stoichiometric exhaust gas stream being an exhaust gas from a gasoline-fuelled spark-ignition automobile engine operated at a stoichiometric air-to-fuel ratio; and
- (b) the downstream catalyst member comprises a second catalytic material characterised by having a significantly higher percent conversion than the first catalytic material for substantially simultaneous conversion of each of HC, CO and NO_x at operating temperatures above the ignition temperature of the first catalytic material."

"14. A method of substantially simultaneously converting HC, CO, NO_x pollutants contained in a gaseous stream, the method comprising:

- (a) flowing the gaseous stream through a first catalyst zone and therein contacting the gaseous stream with a first catalyst member comprising a first catalytic material having an ignition temperature for substantially simultaneous conversion of HC, CO and NO_x, when the gaseous stream is a substantially stoichiometric exhaust gas mixture, which is significantly lower than the corresponding ignition temperature of a second catalytic material, defined below, the gaseous stream being introduced into the first catalyst zone at a temperature at or above the ignition temperature of the first catalytic material but below an operating temperature range, defined below, to convert within said first catalyst zone some of each of the HC, CO and NO_x content of the gaseous stream to innocuous substances and thereby increase the temperature of the gaseous stream, the ignition temperature of a catalyst being defined as the lowest temperature at which a stoichiometric exhaust gas stream introduced into the catalyst will undergo conversion of at least 50% of each of HC, CO and NO_x, and a stoichiometric exhaust gas stream being an exhaust gas from a gasoline-fuelled spark-ignition automobile engine operated at a stoichiometric air-to-fuel ratio, and
- (b) flowing the gaseous stream from the first catalyst zone to a second catalyst zone and therein contacting the gaseous stream with a second catalyst member comprising a second catalytic material having a significantly higher percent conversion for substantially simultaneous conversion of each of HC, CO and NO_x at temperatures within the operating temperature range than does the first catalytic material, the gaseous stream being contacted with the second

catalytic material at a temperature within the operating temperatures range to substantially convert at least some of the remaining HC, CO and NO_x, to innocuous substances."

Claims 2 to 13 and 15 to 20 are dependent on claims 1 or 14.

VI. The arguments of the Appellant are summarized as follows:

Several board of appeal decisions have held that an apparatus can be defined by functional technical features. The parameters ignition temperature and percent conversion of the catalyst members are such features and they do not serve to define the invention simply in terms of the intended end result. Moreover, these parameters are defined in terms which are meaningful to the skilled person and can be objectively determined by appropriate empirical means.

The expression "zirconia/dispersed ceria support" objected to by the Examining Division is replaced by the perfectly clear expression "ceria-impregnated zirconia support" disclosed on page 10, line 9 and page 11, lines 8 to 9 of the original specification.

There is no disclosure of D1 that the catalytic members have said parameters of the independent claims.

Reasons for the Decision

1. The appeal is admissible.

2. *Main request*

2.1 Amendments (requirements of Article 123(2) EPC)

The Board of Appeal is satisfied that the independent claims do not contain subject-matter extending beyond the content of the application as originally filed.

In particular, the reference of the conversion to **each** of HC, CO and NO_x and the details of the determination of the ignition temperature are supported by the paragraph bridging pages 6 and 7. The insertions of "significantly" before "lower ignition temperature" and "higher conversion" have its basis on page 21 third paragraph.

The features of (added) claims 11 and 20 are disclosed on page 10, lines 28 to 32.

2.2 Requirements of Article 84 EPC

The catalytic materials of the two catalyst members of the independent claims are defined by one inequation for each of the two technical parameters (" ... first catalytic material ... having an ignition temperature ... significantly lower than that of the second catalytic material"; " ... second catalytic material ... having a significantly higher percent conversion than the first catalytic material ... within the operating temperature range ... "), without indicating the composition or components of the catalytical material. They are thus defined by functional technical

features.

It is established case law that functional features are permissible in a claim if such features cannot otherwise be defined more precisely without restricting the scope of the invention, and if these features provide instructions which are sufficiently clear for the expert to reduce them to practice without undue burden, if necessary with reasonable experiments (see e.g. the decisions in sections B.1.2.2 (a) of "Case Law of the Boards of Appeal of the EPO", Munich 1996). Said parameters and their measurement conditions are (now) defined in detail and in a sufficiently clear manner in said claims. They are defined in terms that are meaningful for the skilled person. To attain the benefits of the invention - an improvement of the conversion efficiency for HC, CO and NO_x by improving its conversion rate in the start-phase - , it is, according to page 21 paragraph 3 as originally filed, necessary that the ignition temperatures of the catalytic material of the two catalyst members and the percent conversion (in other words: the conversion efficiency) at operation temperatures of the two catalyst members differ significantly; this feature is (now) contained in the independent claims.

Taking into account that, at the application date of the application-in-suit, catalysts for gasoline-fuelled spark-ignition automobile engines belonged to a far-developed technical domain and that only said inequations of said two measurable parameters have to be satisfied, the Board of Appeal takes the view that the person skilled in said art would have been able to find and to produce catalyst members according to the independent claims with reasonable experiments and/or by mere selection of known catalytical materials. An indication of materials and/or production steps in the claims, which would restrict their scope, is not

necessary.

Therefore, the independent claims comply with Article 84 EPC. This applies, due to the amendments of the former dependent claims, also to the dependent claims.

2.3 Novelty

Neither D1 nor the remaining documents of the Search Report disclose said conditions for the parameters for the catalyst materials of the two catalytic members. The problem underlying the subject-matter of D1 is to obtain excellent activity and remarkable stability over prolonged periods of time for catalysts having different catalytic phases deposited onto distinct sites of the support (see there for example page 2 lines 46 to 50, page 7 lines 44 to 45, page 8 lines 21 to 22 and page 9 lines 30 to 31). The problem underlying the subject-matter of the application-in-suit - improving a catalytic converter with more than two catalytic members by improving its conversion rate in the start-up phase - is thus not disclosed there, neither is it in the remaining documents of the Search Report where different catalyst members mainly serve to convert different noxious exhaust gas components. It is thus very improbable that the catalysts of these prior art documents are such that they fall within the wording of the independent claims [as a consequence, an independent claim containing only the indication of the components and structure of the catalyst members as for example disclosed in one or more of the dependent claims, but not the features defining said parameters as in (sections (a) and (b) of) the independent claims and/or further details e.g. of the examples, would not forcibly yield a converter with the relations of said parameters as disclosed in the independent claims; such an independent claim would be incomplete within the meaning of Article 84 and Rule 29(1) and (3) EPC].

However, it cannot be totally excluded that what is disclosed in the prior art on file accidentally falls within the wording of the independent claims. Moreover, the Board cannot resort to experiments with catalysts of the prior art. In this situation, it is usual practice of the boards of appeal to decide the case in favour of the Appellant.

Thus the subject-matters of the independent claims are considered as being novel in the meaning of Article 54 EPC. Novelty of the independent claims confers novelty also on the dependent claims.

3. Since the claims of the main request comply with Articles 123(2), 84 and 54 EPC, it is not necessary to deal with the auxiliary requests.
4. As the reasons for which the Examining Division refused the application no longer apply, the Board must set aside the decision under appeal. However, the Board cannot order grant of a patent on the basis of the claims of the main request, because the Examining Division has not yet considered whether the present application meets all the other requirements of the EPC, among others those of Article 56 (inventive step).

In order to avoid loss of an instance, the Board of Appeal considers it appropriate, in accordance with Article 111(1) EPC, to remit the case to the Examining Division for further prosecution.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the Examining Division for further prosecution on the basis of the claims of the main request and taking into account the provisions of paragraph 2.

The Registrar:

The Chairman

P. Martorana

E. Turrini

