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Datasheet for the decision of 14 March 2007

Case Number: T 1038/03 - 3.3.05

Application Number: 96941176.8

Publication Number: 0808652

IPC: B01D 53/94

Language of the proceedings: EN

Title of invention:
Method of controlling emission from gasoline engine

Applicant:
ICT Co., Ltd, et al

Opponent:
-

Headword:
Emission control /ICT

Relevant legal provisions:
EPC Art. 123(2), 84, 56

Keyword:
"Inventive step: no (all requests)"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 1038/03 - 3.3.05

D E C I S I O N
of the Technical Board of Appeal 3.3.05
of 14 March 2007

Appellants: ICT Co., Ltd.
Applicants: 1-1, Koraibashi 4-chome
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Decision under appeal: **Decision of the Examining Division of the European Patent office posted 22 May 2003 refusing European application No. 96941176.8 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: M. Eberhard
Members: B. Czech
S. Hoffmann

Summary of Facts and Submissions

I. The appeal is from the decision of the examining division posted on 22 May 2003 refusing European patent application No. 96941176.8, which is based on the international application in Japanese published under the number WO 97/20619.

II. The contested decision was taken "according to the state of the file", upon a corresponding request by the applicants. The refusal of the application by the examining division was based on the set of eight claims comprised in the translation of the international application into English, which translation ("application as filed" hereinafter) was received on 5 August 1997 upon entry into the regional phase before the EPO.

The prior art documents cited during the substantive examination of the application include the following:

D3: EP 0 665 048 A1
D5: EP 0 488 254 A1
D6: US 5 207 058 A

The examining division was of the opinion that the subject-matter of claim 1 as originally filed lacked novelty and was not based on an inventive step in view of the cited prior art.

III. In its statement of grounds of appeal, the appellants requested - as main request - that a patent be granted on the basis of claims 1 to 8 as on file (of the

application as filed). They also filed two amended sets of claims as auxiliary requests 1 and 2.

The reimbursement of the appeal fee was also requested in case it transpired that the arguments presented by the appellants in their earlier letter dated 12 March 2003 had not been taken into consideration by the examining division.

The appellants inter alia argued that D3 related to the treatment of diesel engine exhaust gases and that its objective and the catalysts described therein were different in functions and effects from the ones according to the present invention. D5 and D6 were not relevant since they did not provide specific descriptions of the catalysts used. The subject-matter of the claims on file was both novel and inventive over each and any combination of the documents cited.

IV. In the annex to the summons to oral proceedings, the board raised several objections concerning the clarity of the claims according to all the requests on file and an objection under Article 123(2) EPC concerning auxiliary request 2. The board inter alia indicated that each of D5 and D6 could be considered as representing the closest prior art, and that several of the documents cited in the contested decision, including D3, as well as document
D7: EP 577 879 A1, mentioned in the international search report, suggested the process of claim 1 according to the main request then on file. The board also set out why in its provisional view the reimbursement of the appeal fee did not appear to be justified.

V. In a further letter of 7 March 2007, the appellants submitted five fresh sets of amended claims as main request and auxiliary requests 1 to 4, respectively.

VI. During the oral proceedings on 14 March 2007, the appellants filed five sets of amended claims, replacing the ones previously on file, and withdrew their request for reimbursement of the appeal fee.

Independent claim 1 according to the main request reads as follows:

"*1. A process for purifying exhaust gas from a gasoline engine of a fuel-direct-injection type by using an exhaust-gas purifying catalyst that contains (i) at least one noble metal and (ii) at least one transition metal that is not a noble metal, wherein the exhaust gas varies between a first exhaust gas state and a second exhaust gas state that forms a more oxidizing, low-temperature atmosphere as compared with the first exhaust gas state, depending on changes in air-fuel ratio, and wherein the first exhaust gas state has an exhaust-gas temperature in the range of 350 to 800°C at the inlet of the catalyst and the second exhaust gas state has an exhaust-gas temperature in the range of 200 to 500°C at the inlet of the catalyst*".

Independent claim 1 according to the auxiliary request 1 reads as follows:

"*1. A process for purifying exhaust gas from a gasoline engine of a fuel-direct-injection type by using an exhaust-gas purifying catalyst that contains*

(i) at least one noble metal and (ii) at least one transition metal that is not a noble metal, and wherein the catalyst is prepared by coating onto a carrier 50 to 300 g of the catalyst composition for every litre of the carrier."

Independent claim 1 according to the auxiliary request 2 reads as follows:

"*1. A process for purifying exhaust gas from a gasoline engine of a fuel-direct-injection type by using an exhaust-gas purifying catalyst that contains (i) at least one noble metal and (ii) at least one transition metal that is not a noble metal, and wherein the catalyst is mounted on a monolith carrier having a volume of 0.1 to 10 litres and that carries a fire resistant inorganic oxide.*"

Independent claim 1 according to the auxiliary request 3 has the same wording as claim 1 according to the main request, but with the following phrase being additionally inserted between "*that is not a noble metal,*" *and* "*wherein the exhaust gas varies…*":

"*and wherein the catalyst is prepared by coating onto a carrier 50 to 300 g of the catalyst composition for every litre of the carrier,*"

Independent claim 1 according to the auxiliary request 4 has the same wording as claim 1 according to the main request, but with the following phrase being additionally inserted between "*that is not a noble metal,*" *and* "*wherein the exhaust gas varies…*":

"*wherein the catalyst is mounted on a monolith carrier having a volume of 0.1 to 10 litres and that carries a fire resistant inorganic oxide,*"

VII. The appellants requested that the decision under appeal be set aside and that a patent be granted on the basis of the claims according to the main request or, in the alternative, on the basis of the claims according to one of the auxiliary requests 1 to 4 taken in that order, all requests filed during oral proceedings.

VIII. The essential arguments of the appellants, as far as pertaining to the claims according to the five final requests presented during oral proceedings, can be summarised as follows:

All amendments were based on the application as filed. The claims were clear and their subject-matter was not disclosed by any of the documents cited. D5 was concerned with the construction of an engine and did not provide any information concerning the material of the catalyst. The other documents including D3 and D7 related to different kinds of engines and hence different exhaust gases and could thus not suggest the claimed invention. More particularly, whereas the present invention was concerned with removing HC, CO and NO_x, the exhaust gases had not even been tested for NO_x removal in the examples of D3. Neither D3 nor D7 suggested that the said three pollutants could be removed simultaneously from exhaust gases of gasoline direct-injection engines using a catalyst as defined in claim 1. Table 1 and 2 of the present application showed that the purification for all three pollutants, and in particular NO_x, was much better when the catalyst

contained noble metal than when it contained a non-noble transition metal. At the oral proceedings, the appellants stated that it could thus be assumed that a catalyst comprising a noble metal and a non-noble transition metal would also show the desired purifying effect under the specific conditions prevailing in the exhaust gas of gasoline direct-injection engines.

Reasons for the Decision

Main request

1. *Allowability of the amendments*

1.1 The wording of claim 1 has been amended to improve its clarity and conciseness, and is no longer objectionable under Article 84 EPC. In particular, claim 1 now clearly expresses that the catalyst comprises at least one noble metal and at least one transition metal which is not a noble metal.

1.2 Amended claim 1 is based on a combination of claims 1, 2 and 3 of the application as filed. Basis for the clarified definition of the catalyst composition can be found in the following passages of the application as filed: page 7, the last three lines; page 8, line 1 and last paragraph; page 9, lines 9 and 15; page 10, lines 3 to 4 and lines 21 to 22; page 12, last line; and page 13, lines 1 to 12. Claim 1 therefore meets the requirements of Article 123(2) EPC.

2. *Inventive step*

2.1 D5 discloses a process for purifying the exhaust gas from a direct-injection type internal combustion engine with spark plug ignition of the air-fuel mixture, the only fuel mentioned in D5 being gasoline. The exhaust gases are purified by passing them through a catalytic converter 9. D5 also refers to different loads (light - middle - heavy) under which the engine is operated and which correspond to changing amounts of fuel injected. Reference is made in particular to claims 1 and 7, Figures 1 (item 9) and 4A to 6, and column 6, line 7 to column 7, line 20). These different loads correspond to changing air/fuel ratios and to different operating temperatures. During the oral proceedings, the appellants acknowledged that the features of claim 1 relating to the different exhaust gas states and their temperatures do not establish a difference over the disclosure of D5. This is in conformity with the indications in the part of the description of the present application entitled "Background of the invention" (see pages 1 and 2 of the application as filed), according to which different exhaust gas states and temperatures as referred to in claim 1 are typical for the operation of engines of the gasoline direct-injection type. The only features not disclosed in D5 are thus those relating to the composition of the catalyst used.

In view of its similarity with the process of present claim 1, the process disclosed in D5 can be considered to constitute the closest prior art.

2.2 Since D5 contains no indications as to the chemical composition of the purifying catalyst used, the

technical problem, starting from D5, can be considered to consist in putting into practice the teaching of this document or, in other words, in providing a further catalytic process for purifying the exhaust gas from gasoline engines of a fuel-direct-injection type.

A more ambitious technical problem cannot be accepted for the following reasons. Firstly, claim 1 does not require that all three pollutants mentioned in the application, i.e. hydrocarbons, carbon monoxide and nitrogen oxides, are removed from the exhaust gas as pointed out by the board during the oral proceedings. This is only required according to dependent claim 2. Neither does claim 1 specify a degree of purification to be achieved concerning any of the said three pollutants. As acknowledged by the appellants during the oral proceedings, the application does not contain an example of a catalyst as defined in claim 1. Furthermore, there is no evidence on file showing that the results achievable with the only catalyst exemplified in the application (see page 19, last paragraph to page 20, line 3 from the bottom, and page 24, table 1, "Embodiment A" of the application as filed) which catalyst contains the two noble metals platinum and rhodium, would also be achieved with catalysts containing any kind of noble metal in combination with any kind of transitional metal other than noble metals. More particularly, in the absence of evidence to the contrary, it is not plausible that catalysts comprising a large amount of any kind of non-noble transition metal combined with a very small amount of a noble metal would give good results.

2.3 Confronted with the stated technical problem, i.e. providing a further catalytic process for purifying the exhaust gas from a gasoline engine of a direct-injection type as described in D5, the skilled person would consider the prior art relating to the purification of the exhaust gas from lean burn engines. As indicated in D7 (page 2, lines 19 to 25), diesel engines and lean burn gasoline engines both belong to the category of lean burn engines. Hence, contrary to the appellants' view, the board is convinced that the skilled person, confronted with the stated technical problem, would also contemplate consulting documents dealing with exhaust gas catalysts for diesel engines such as D3.

2.4 D3 discloses catalysts for the treatment of exhaust gases from internal combustion engines, more particularly diesel engines ("allumage par compression"), which catalysts contains inter alia platinum and iron, i.e. a noble metal and a transition metal other than a noble metal. These catalysts purify the exhaust gas by removing carbon monoxide and hydrocarbons by oxidation at varying temperatures; see D3, page 3, lines 7 to 24 and tables 1 to 3). Considering that diesel engines and gasoline direct-injection engines are both lean burn engines, the skilled person would expect that using the catalysts disclosed in D3 in the purifying process of D5 would lead to some extent to a purification of the exhaust gases. Confronted with the stated technical problem, the skilled person would thus envisage incorporating the catalysts of D3 into the exhaust gas treatment systems of D5, and would thereby arrive at a process

falling under present claim 1 without any inventive step being involved.

3. The appellants' main request can thus not be granted.

Auxiliary request 3

4. *Allowability of the amendments*

4.1 The board has strong reservations concerning the clarity of the added phrase "*the catalyst is prepared by coating onto a carrier 50 to 300 g of the catalyst composition for every liter of the carrier*". More particularly, it is not clearly disclosed in the application as filed to which of the catalyst components that are to be coated onto a carrier the indicated amounts are supposed to correspond. For instance, on the one hand, it can be understood from page 13, lines 2 to 3, that the noble metal and the transition metal "*serve as the catalyst composition*". On the other hand, the "*amount of coating of the catalyst composition*" referred to in line 16 of the same page could also be understood, as argued by the appellants, to include both the noble and the transition metals **and** the refractory inorganic oxide carrying them in view of e.g. lines 8 to 13 on the same page.

4.2 Moreover, the board has doubts concerning the allowability of the said amendment under Article 123(2) EPC since the application as filed does not appear to contain a clear and unambiguous basis for the amended wording of claim 1.

5. *Inventive step*

5.1 The amount of catalyst composition (in g per liter of carrier) coated onto a particular carrier such as a monolith carrier, be it in terms of the catalytically active metals or in terms of the sum of the catalytically active metals and the fire-resistant inorganic oxides carrying the former, required to achieve a purification of the exhaust gas will generally depend on factors including the geometry of the carrier and the flow conditions to be achieved within the catalyst. The appellants have not presented arguments which would permit to consider working within the claimed range as unusual or advantageous. On the other hand, D3 discloses the use of monolithic carriers carrying coatings comprising refractory oxides and catalytically active metals in amounts of roughly from about 20 to about 200 g per litre carrier (see D3, claims 1 and 7).

5.2 Even assuming in the appellants' favour, but purely for the sake of argument, that the numerical range in present claim 1 has to be understood as referring to the sum of catalytically active metals and fire-resistant inorganic oxides coated onto e.g. a monolith carrier, then this additional feature would not render the claimed process inventive. This is because the skilled person confronted with the stated technical problem would certainly envisage trying out coating amounts lying within the range of from 20 to 200 g/l of disclosed in D3. It lies within the competence of the skilled person to choose suitable coating amounts based on mere routine experimentation and/or routine engineering considerations. The skilled person would

thereby arrive at the claimed method without the exercise of inventive skills.

6. Auxiliary request 3 can thus not be allowed.

Auxiliary request 1

7. Claim 1 according to this request does not, as compared to claim 1 according to the auxiliary request 3, comprise the features of claims 2 and 3 as originally filed. However, present claim 1 contains the same features concerning the preparation of the catalyst as claim 1 according to auxiliary request 3. The board thus has the same strong reservations against the allowability (see point 4. herein above) of their incorporation into claim 1.

8. Claim 1 of the present request is broader than claim 1 of auxiliary request 3 and inter alia encompasses the processes according to claim 1 of the latter. Hence, even if present claim 1 were considered to meet the requirements of Article 123(2) EPC and clarity (Article 84 EPC), the reasoning under point 5. herein above would also apply to it. The subject-matter of claim 1 of auxiliary request 1 would thus not be based on an inventive step either.

9. Auxiliary request 1 can thus not be allowed.

Auxiliary request 4

10. *Allowability of the amendments*

Claim 1 of this request comprises all the features of claim 1 of the main request, for which the basis in the application as filed is indicated under point 1.2 herein above. Since a basis for the features additionally incorporated can be found on page 8, second paragraph, of the application as filed, claim 1 as amended meets the requirements of Article 123(2) EPC.

11. *Inventive step*

11.1 In the field of exhaust gas catalysts, it is usual to provide ceramic monolith carriers with a fire-resistant inorganic coating, which coating carries the catalytically active metal(s), see e.g. D3, page 2, lines 19 to 27). The dimensions of the monolith carrier will obviously depend inter alia on the amount of exhaust gases to be treated. D3 describes such monolith carriers coated with refractory inorganic oxides carrying the catalytically active metals (see claims 1, 3, 5 and 6). D3 inter alia discloses monolithic carriers with volumes of 0.03, 0.84 and 8 litres (see page 4, example 1, line 36; page 5, example 3, line 23; page 7, example 4, line 7; page 14, example 15; line 3). Claim 1 of the present request does not specify a particular field of application for the engines referred to, and the appellants have not presented arguments which would permit to consider the claimed range of volumes as unusual or advantageous. In view of the teaching in D3, the skilled person confronted with the stated technical problem would certainly envisage

trying the monolith carrier volumes as exemplified in D3. It lies within the competence of the skilled person to choose suitable monolith volumes based on mere routine experimentation and/or routine engineering considerations. The skilled person would thereby arrive at the claimed method without the exercise of inventive skills.

12. Auxiliary request 4 can thus not be allowed.

Auxiliary request 2

13. Claim 1 according to this request is based on claim 1 and page 8, second paragraph, of the application as filed. Concerning the features relating to the composition of the catalyst used, they find a basis in those passages of the application as filed which were already indicated under point 1.2 herein above with respect to claim 1 of the main request. Claim 1 thus meets the requirements of Article 123(2) EPC.

14. Claim 1 of this request is broader than claim 1 of the auxiliary request 4 and inter alia encompasses processes according to claim 1 of the latter. Therefore, the reasoning under point 11. herein above also applies to the claim 1 of the present request. The subject-matter of claim 1 of the auxiliary request 2 is thus not based on an inventive step either.

15. Auxiliary request 2 can thus not be allowed either.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar | The Chairman

C. Vodz | M. Eberhard