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**Datasheet for the decision
of 10 October 2012**

Case Number: T 1178/10 - 3.2.06

Application Number: 01660135.3

Publication Number: 1170472

IPC: F01N 3/08

Language of the proceedings: EN

Title of invention:

System and method for purifying exhaust gases

Patentee:

ECOCAT OY

Opponent:

Emitec Gesellschaft für Emissionstechnologie mbH

Headword:

-

Relevant legal provisions:

RPBA Art. 13(1)

Relevant legal provisions (EPC 1973):

EPC Art. 83, 54, 56, 84

Keyword:

"Sufficiency of disclosure (yes)"

"Novelty - (yes)"

"Inventive step - (yes)"

Decisions cited:

-

Catchword:

-



Case Number: T 1178/10 - 3.2.06

D E C I S I O N
of the Technical Board of Appeal 3.2.06
of 10 October 2012

Appellant: Emitec Gesellschaft für Emissionstechnologie
(Opponent) mbH
Hauptstrasse 128
D-53797 Lohmar (DE)

Representative: Rössler Matthias
KNH Patentanwälte
Kahlhöfer Neumann Rößler Heine
Postfach 10 33 63
D-40024 Düsseldorf (DE)

Respondent: ECOCAT OY
(Patent Proprietor) P.O. Box 20
FI-41331 Vihtavuori (FI)

Representative: Teipel Stephan
Lederer & Keller
Patentanwälte
Unsöldstrasse 2
D-80538 München (DE)

Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 31 March 2010 rejecting the opposition filed against European patent No. 1170472 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman: M. Harrison
Members: M. Hannam
W. Sekretaruk

Summary of Facts and Submissions

- I. The appellant (opponent) filed an appeal against the decision of the opposition division rejecting the opposition against European Patent No. 1 170 472, requesting that the decision of the opposition division be set aside and that the patent be revoked. The appellant also requested reimbursement of the appeal fee.
- II. The appellant's request for revocation was based on the following objections:
- a) the subject matter of claims 4, 5 and 6 of the patent contravened Article 123(2) EPC;
 - b) the invention according to claims 5 and 14 contravened Article 83 EPC;
 - c) the subject matter of claim 1 lacked novelty and an inventive step.
- III. The respondent (patentee) requested that the appeal be dismissed or auxiliarily that the patent be maintained in an amended form according to one of its first to fourth auxiliary requests.
- IV. The Board issued a summons to oral proceedings including a communication containing its provisional opinion. In regard to the main request, the Board indicated *inter alia* that the requirement of Article 123(2) EPC appeared not to be met by the subject matter of claims 4, 5 and 6, and that claim 14 appeared to meet the requirements of Article 83 EPC 1973. The Board furthermore gave a preliminary opinion on which features of claim 1 it saw as disclosed in the cited prior art. Regarding the request for

reimbursement of the appeal fee, the Board indicated its view that this did not appear justified.

- V. With letter of 6 September 2012, the respondent filed a new main request and a single auxiliary request replacing all previous requests.
- VI. In its letter of 9 September 2012, the appellant provided further arguments in support of its request for revocation.
- VII. Oral proceedings were held before the Board on 10 October 2012, during which the appellant confirmed its request for revocation of the patent.

The respondent replaced all previous requests with a (new) main request and withdrew its request for reimbursement of the appeal fee. It requested that the decision under appeal be set aside and the European patent be maintained on the basis of the main request filed during oral proceedings.

- VIII. Claim 1 of the main request reads as follows (after correction of the submitted claim so as to replace the first recitation of "characterised in that" with "wherein", such that the version is consistent with the discussed subject matter - in accordance with the parties' acknowledgement):

"Method for purifying exhaust gases of diesel or gasoline engines containing on average an excess of oxygen, wherein the exhaust gases to be purified are passed through a system for purifying exhaust gases of diesel or gasoline engines containing on average an

excess of oxygen, which system includes a combination of three operational units being an oxidation catalyst effective to promote oxidation of at least NO to NO₂ (3), a particle separator (4), and an NO_x adsorption catalyst (5,5"), and the order in said combination of the three operational units, in flow direction of the exhaust gas, is as follows: said NO_x adsorption catalyst (5,5") is arranged before said oxidation catalyst effective to promote oxidation of at least NO to NO₂ (3), or said NO_x adsorption catalyst (5,5") is arranged in the same structure with said oxidation catalyst (3); and that in said system: the order of the operational units in flow direction of the exhaust gas is as follows: an NO_x adsorption catalyst (5), a particle separator (4), and an oxidation catalyst (3), and that the NO_x adsorption catalyst and the particle separator are disposed in the same structure, this system reducing the amounts of hydrocarbons, carbon monoxide, nitrogen oxides and particles present in exhaust gas, wherein said NO_x adsorption catalyst (5,5") contains as a catalytic metal platinum and/or rhodium and at least one of the following elements: Ba, Sr, La, Y, Ce, Zr, and possibly at least one of the following elements: Li, Na, K, Rb, Cs, Be, Mg, Ca, characterized in that a mixing ratio of the engine is periodically adjusted from a lean mixing ratio to a more stoichiometric or rich mixing ratio with a λ value below 1.2."

IX. The arguments of the appellant may be summarised as follows:

(a) Article 84 EPC 1973

The subject-matter of claim 1 lacked clarity due to it being unclear whether coatings of the particle filter could be regarded as performing functions of the NO_x adsorption catalyst due to both operational units being disposed in the same structure. The terms system, operational unit and structure were also unclear.

(b) Article 54 EPC 1973

E3: JP-A-06159037, and its machine translation explicitly disclosed all the features of claim 1 save for "a mixing ratio of the engine is periodically adjusted from a lean mixing ratio to a more stoichiometric or rich mixing ratio with a λ value below 1.2" This feature was to be understood in such a way that the mixing ratio was either adjusted to a more stoichiometric mixing ratio than its normally running ratio, or to a richer mixing ratio with a λ value below 1.2. Thus, E3 simply needed to disclose the mixing ratio being adjusted to a more stoichiometric mixing ratio for the subject matter of claim 1 to lack novelty. This was achieved in E3 with a throttle valve 8 provided to adjust the mixing ratio of the air and fuel fed to the engine (see [0018] and Drawing 2), which was its normal operation. With the diesel engine of E3 normally running lean (see first two lines of [0017]), adjustment of the mixing ratio under normal driving conditions would always achieve a more stoichiometric mixing ratio. Even if the claim were interpreted to imply a value of λ below 1.2, this was also a value which would always occur during normal driving conditions.

(c) Article 56 EPC 1973

E3 was the closest prior art from which the subject matter of claim 1 differed in that a mixing ratio of the engine was periodically adjusted from a lean mixing ratio to a more stoichiometric or rich mixing ratio with a λ value below 1.2. The valve 12 in E3 achieved this adjustment by introducing reducing agent into the exhaust, so the objective technical problem was only to be seen as how to simplify and reduce the cost of the known method for purifying exhaust gases. It was well known to a skilled person, from general knowledge in this field, that enriching the exhaust gases could be effected by altering the mixing ratio fed to the engine at the inlet, thereby eliminating the need for the valve 12 in E3.

D6: EP-A-0 625 633

(see in particular col.13, lines 18-20 and 31-34 and col.15, lines 47-50) provided the evidence of the skilled person's knowledge in this respect. The skilled person would therefore either use general knowledge or the information from D6 to solve the problem. The embodiments of Figs. 1 and 10 of D6 also showed the alternative possibilities available to the skilled person for adjusting the richness of exhaust gases: either via direct injection of fuel into the exhaust or alternatively adjustment of the engine's mixing ratio. It follows that the skilled person would arrive at the subject matter of claim 1 without using inventive skill when solving the problem of finding an alternative to the method known from E3.

(d) Article 83 EPC 1973

The subject matter of claim 9 could not be carried out by a person skilled in the art. The patent described the regeneration of nitrates as being quicker than that of sulfates and particles by way of the NO_x adsorption catalyst being located close to the engine, upstream of the particle filter, which did not correspond to the claimed order of the operational units. Furthermore, the table on page 8 of the patent did not show that when λ was reduced to a value only slightly below 1.2, that regeneration occurred, whereas claim 1 included all values below 1.2. Thus claim 1 could also not be carried out by the skilled person across the whole scope of the claim.

X. The arguments of the respondent may be summarised as follows:

(a) Article 54 EPC 1973

E3 disclosed a method in which fuel was added to the exhaust gases in the exhaust pipe in order to enrich the mixture passing through the catalyst system. Claim 1 of the patent defined that this was achieved through adjusting the mixing ratio of the engine. E3 did not state which value of lean air/fuel ratio was used. Typical air/fuel ratios for lean engine diesels varied between 1.6 to 3.0. A value of λ below 1.2 was not disclosed in E3 and would also be unusual under normal driving conditions, such that this feature was not known from E3. Thus the subject matter of claim 1 was novel over E3.

(b) Article 56 EPC 1973

E3 disclosed a method for purifying exhaust gases of a diesel engine primarily through the ignition and combustion of collected particles. According to E3 [0005]-[0006], the main teaching concerned a reduction in the energy required for this combustion to take place. In trying to solve the problem of providing an alternative method of adjusting the mixing ratio, the skilled person would not revert to D6 since this document concerned a very different catalyst system with an SO_x absorber and no particle separator; a clear link between the two documents was thus lacking. D6 could therefore not provide a hint as to how to provide an alternative to the method known from E3. It was also to be noted that a mixing ratio with a λ value below 1.2 was not typical in diesel engines at the priority date of the patent such that this could not be considered obvious to the skilled person when evaluating what modifications might be made to E3.

(c) Article 83 EPC 1973

The attack against claim 1 had been made for the first time during oral proceedings. The change of case of the appellant should not be allowed. It was not *prima facie* prejudicial to maintenance of the patent anyway; the Table on page 8 could not be used to show that values just below $\lambda = 1.2$ did not work; the appellant had not provided any evidence to show that this was the case.

As regards claim 9 different temperatures in the exhaust gas can be obtained by varying the enrichment duration. As regeneration of nitrates, sulphates and

particles is temperature dependent, their regeneration can be controlled by changing the enrichment duration.

Reasons for the Decision

1. Amendments - Article 123(2)/(3) EPC and Article 84 EPC 1973

Claim 1 of the main request is a combination of granted claims 11 and 12 with granted claim 1, whereby granted claim 12 was directed to a method for purifying exhaust gases according to the system of *inter alia* granted claim 1, and whereby granted claim 11 was dependent on claim 1. By means of this combination of claims, the subject-matter of claim 1 of the main request has been restricted to a pure combination of granted claims. Granted claims 4, 5, 6, 11 and 12 were deleted and claims 2, 3 and 7 to 10 were redrafted as method claims dependent on claim 1 while claims 13 to 17 were renumbered accordingly. No objections were raised under Article 123(2) or (3) EPC against the subject-matter of these claims as amended, nor does the Board itself see any contravention of Article 123(2)/(3) EPC in this regard.

Although the appellant argued that the clarity requirement in Article 84 EPC 1973 was not met due to several terms in claim 1 which were allegedly not clear, none of these clarity objections relates to terminology which was not already in the granted claims (i.e. "system", "operational unit", "structure" and "arranged/disposed - in the same structure" were all in claim 1 as granted). Nor is it the case (and nor was it

argued so) that the alleged lack of clarity could be understood as caused by the particular way in which the granted claims had been combined. The appellant's objections in this matter are thus tantamount to an objection of lack of clarity of the granted claims, and since lack of clarity is not a ground of opposition, the appellant's objection in this regard is rejected.

2. Article 83 EPC 1973

2.1 According to Article 13(1) of the Rules of Procedure of the Boards of Appeal (RPBA), any amendment to a party's case after it has filed its grounds of appeal or reply may be admitted and considered at the Board's discretion. The discretion shall be exercised in view of inter alia the complexity of the new subject matter submitted, the current state of the proceedings and the need for procedural economy. The objection under Article 83 EPC to the subject matter of claim 1 was presented by the appellant for the first time during oral proceedings.

In view of the advanced stage of the appeal proceedings, together with the fact that the respondent objected to this matter being considered at a late stage, added to the fact that the matter to be considered was somewhat complex and notably the objection lacked any independent evidence in support thereof by the appellant (apart from reference to certain values in the patent itself, which by themselves were not conclusive), the Board exercised its discretion under Article 13(1) RPBA not to admit the change of case by the appellant to introduce this new objection into the proceedings.

2.2 The appellant argued that the subject matter of claim 9 could not be carried out by the skilled person since the patent failed to sufficiently disclose how regenerations of sulfates and particles could be controlled to last longer than the regeneration of nitrates.

With reference to paragraph [0022] of the patent, the Board understands that the regenerations of sulfates, nitrates and particles mentioned in claim 9 refers to the periods during which the conditions appropriate for the respective regenerations are provided. These periods may be of rich or of lean operation the dictating of which, and the duration of which, the skilled person has no difficulty in controlling. Through control of the mixing ratio, the skilled person can carry out a requirement for the regeneration of sulfates and particles (i.e. the period of time during which such regeneration occurs due to the selected instantaneous air-fuel ratio) to last longer than that of nitrates.

It should also be added that the appellant, beyond merely alleging that the requirement of Article 83 EPC 1973 was not met in this regard (based simply on the argument that no further information had been given in the patent to explain this), had itself not supplied any evidence which would substantiate its allegation further.

The Board thus concludes that the subject matter of claim 9 is sufficiently clear and complete in order to be carried out by a person skilled in the art.

3. Article 54 EPC 1973

It is undisputed by the parties that E3 discloses all features of claim 1 of the main request save for the feature that "a mixing ratio of the engine is periodically adjusted from a lean mixing ratio to a more stoichiometric or rich mixing ratio with a λ value below 1.2." (hereafter referred to as "feature A"). The Board also finds no reason to differ in this regard. The parties, however, differ in their interpretation of whether feature A is also known from E3.

3.1 Interpretation of claim 1

The appellant argued that the periodic adjustment of the mixing ratio to a λ value below 1.2 was merely one alternative within claim 1, since in feature A, the word "or" allegedly divided the two alternative conditions required to meet the scope of the claim, without requiring that both conditions necessarily reduce the λ value to below 1.2. Thus, according to the appellant any enrichment of the mixing ratio would allegedly meet the condition of being more stoichiometric (i.e. meeting the first alternative in feature A) as the diesel engine of E3 usually ran lean (see [0017] of E3) and merely by throttling (for example) would fulfil this condition by becoming more stoichiometric.

The Board however finds that feature A must be interpreted differently. First, a λ value of 1.0 defines a stoichiometric mixing ratio, a λ value above 1.0 is lean and a λ value below 1.0 denotes a rich

mixing ratio. Thus, the condition for the mixing ratio to have a λ value below 1.2 in claim 1 must define both lean and rich conditions, namely lean between 1.2 and 1.0, and rich below 1.0.

According to the appellant's interpretation of the two alternative conditions divided by the word "or" in feature A, only the second condition would require the mixing ratio to be adjusted to a rich mixing ratio with a λ value below 1.2. However, from the above discussion it is evident that only below a λ value of 1.0 does the mixing ratio become rich. The appellant's interpretation of feature A therefore makes no technical sense on a proper interpretation of the claim.

The only reasonable technically consistent and linguistically logical interpretation of feature A is that the mixing ratio is adjusted from a lean mixing ratio to a mixing ratio with a λ value always below 1.2 which, relative to the initial mixing ratio, is more stoichiometric (i.e. closer to stoichiometric conditions) or a more rich (richer) mixing ratio. It thus follows that the periodic adjustment of the mixing ratio to a λ value below 1.2, as defined in feature A of claim 1, is a condition to be met by both the alternatives in feature A.

3.2 Novelty over E3

E3 discloses a lean running diesel engine (see [0017]), since the air-fuel ratio in the exhaust is lean. In order to regenerate the catalyst in the exhaust, the air-fuel ratio in the exhaust gas is enriched (see [0016]). This enrichment is achieved through direct introduction of a reducing agent into the exhaust system. Enrichment of the air-fuel ratio introduced to the engine may also be adjusted via the throttle valve 8 (see [0018]). E3 however fails to explicitly disclose any specific λ values for the mixing ratios utilised in the engine.

The appellant argued that the λ value in E3 must be adjusted below 1.2, below 1.0 even, in order for the mixing ratio to be considered rich. The Board, however, finds no support, even implicit, for such a conjecture as no λ values are quoted in E3 for the mixing ratio under lean or enriched operation. Furthermore, the Board understands that under typical conditions a lean mixture diesel engine operates at a λ value between about 1.5 and 2.5 such that enriching the mixing ratio from any particular starting point in E3 would not necessarily result in the λ value achieving a value below 1.2. The Board therefore finds that the E3 fails to disclose a mixing ratio of the engine being adjusted such that the λ value is below 1.2.

The Board thus concludes that the subject matter of claim 1 is novel over the disclosure of E3 (Article 54 EPC 1973). No further attacks against lack of novelty of the subject-matter of claim 1 of the main request were raised.

4. Article 56 EPC 1973

4.1 As already discussed under point 2 above, the subject matter of claim 1 differs from the method known from E3 in that a mixing ratio of the engine is periodically adjusted from a lean mixing ratio to a more stoichiometric or rich mixing ratio with a λ value below 1.2. The technical effect of this characterising feature of claim 1 is to enable regeneration of the catalyst system through an enrichment of the exhaust gases. In E3 an enrichment of the exhaust gases, and thus the same technical effect as in claim 1, is achieved primarily through a direct introduction of a reducing agent into the exhaust system upstream of the catalyst/particle separator (see Drawing 2 and paragraph [0009] of E3). Starting from E3, therefore, and in regard to the technical problem solved by this characterising feature in the context of claim 1, the objective technical problem to be solved may be seen as providing an alternative method for enrichment of the exhaust gases.

4.2 The appellant argued that adjusting the mixing ratio in order to enrich the exhaust gases was obvious to the skilled person from common general knowledge in the area concerned and supported this argument with reference to D6 disclosing, in one embodiment, a mixing ratio adjustment and, in another embodiment, introduction of fuel directly into the exhaust. These two methods of enriching the exhaust gases could thus allegedly be seen as interchangeable alternatives.

4.3 The Board notes however that E3 is directed to a method for purifying exhaust gases of lean burn diesel engines and uses fuel injection directly into the exhaust in order to enrich the exhaust gases. Any hint as to an alternative method which would be applied to the method of E3 must therefore be applicable to such diesel engines. D6, similarly to E3, discloses in Fig. 10 an embodiment in which a diesel engine has a reducing agent feeding valve 60 arranged in the exhaust (see col.14, line 56 - col.16, line 7). In contrast, all other embodiments in D6 are directed to petrol engines in which enrichment of exhaust gases is achieved through adjustment of the mixing ratio of the engine (see for example Figs. 1, 9, 12 and 23). The Board can thus only deduce from D6 that, in order to enrich the exhaust gases, petrol engines utilise mixing ratio adjustment on the engine inlet side whereas diesel engines utilise introduction of a reducing agent directly into the exhaust. A hint as to how to provide an alternative method for enrichment of the exhaust gases in diesel engines sufficient for the purposes of regeneration and whereby the fuel/air ratio would be reduced to below a λ value of 1.2 (which has not been shown to be the case in such lean burn engines by normal throttling) was thus not to be found in D6. The appellant provided no evidence, from the cited art or elsewhere, showing that mixing ratio adjustment was a known method of enriching the exhaust gases in diesel engines to achieve regeneration prior to the opposed patent. The Board thus finds that, starting from E3 and combining this with the general knowledge of the skilled person as evidenced only by D6, the subject matter of claim 1 involves an inventive step.

The appellant further argued that claim 1 covered both diesel and gasoline engines, so that changing the mixing ratio at the engine inlet side was clearly applicable to the claim as a whole when considering inventive step in the knowledge that petrol engine technology was clearly applicable. However, this argument is not convincing since it does not take account of the closest prior art starting point chosen by the appellant for considering inventive step and the objective problem established in the light thereof, namely that that starting point is E3 which discloses a lean burn diesel engine with a catalytic system for this engine type.

- 4.4 Based on the evidence supplied and the arguments made in relation to inventive step, the Board thus concludes that the subject matter of claim 1 involves an inventive step (Article 56 EPC 1973).

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the opposition division with the order to maintain the European patent with the following documents:

Description: Pages 2,3,3A,4-9 as filed during oral proceedings on 10 October 2012;

Claims: 1-12 as filed during oral proceedings on 10 October 2012 wherein claim 1 is corrected so as to replace the first recitation of "characterised in that" with "wherein";

Drawings: Figs. 1-9 as granted.

The Registrar

The Chairman

M. Patin

M. Harrison