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**Datasheet for the decision
of 6 February 2020**

Case Number: T 1993/16 - 3.2.06

Application Number: 05790571.3

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F01N3/24, B01D53/94, B01J29/74

Language of the proceedings: EN

Title of invention:

METHOD AND DEVICE FOR CONTROLLING EXHAUST EMISSION FROM
INTERNAL COMBUSTION ENGINE

Patent Proprietors:

Umicore Shokubai Japan Co., Ltd.
Umicore Shokubai USA Inc.

Opponents:

BASF SE
Forstmeyer, Dietmar

Headword:

Relevant legal provisions:

EPC Art. 100(a), 123(2)

Keyword:

Inventive step - main request (no)

Amendments - added subject-matter - auxiliary request 19 (yes)

Decisions cited:

G 0002/10, T 1404/14

Catchword:



Beschwerdekammern

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Case Number: T 1993/16 - 3.2.06

D E C I S I O N
of Technical Board of Appeal 3.2.06
of 6 February 2020

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Decision under appeal: **Interlocutory decision of the Opposition
Division of the European Patent Office posted on
7 July 2016 concerning maintenance of the
European Patent No. 1820945 in amended form.**

Composition of the Board:

Chairman W. Ungler
Members: M. Dorfstätter
 P. Cipriano

Summary of Facts and Submissions

I. The appellant (patent proprietors), the appellant (opponent 1) and the appellant (opponent 2) each filed appeals against the interlocutory decision of the opposition division in which it found that European patent No. 1 820 945 in an amended form met the requirements of the EPC.

As all parties are appellants (and thus also respectively respondents), they will be referred to in the following as "the (patent) proprietors", "opponent 1" and "opponent 2".

II. With the statement of grounds of appeal and in reply to the opponents' statements of grounds of appeal, the proprietors filed in total twenty-seven auxiliary requests. In their reply to the opponents' grounds of appeal the proprietors referred *inter alia* to a document D30, which was submitted actually with letter of 24 July 2017.

III. The proprietors requested that the decision under appeal be set aside and the patent be maintained as granted, auxiliarily that the decision under appeal be set aside and the patent be maintained in amended form on the basis of one of auxiliary requests 1 to 27.

IV. Both opponents requested that the decision under appeal be set aside and that the patent be revoked. Furthermore, opponent 1 requested that auxiliary requests 2 to 27 not be admitted into the proceedings and opponent 2 requested that auxiliary requests 3, 4 and 7 to 27 not be admitted into the proceedings. Both opponents requested that D30 not be admitted into the proceedings.

V. The following documents, referred to by the parties in their submissions, are relevant to the present decision:

- D9 EP 1 387 071 A1
- D28 Doctoral thesis "Strukturelle Charakterisierung bimetallischer Pt/Pd-Dieseloxydationskatalysatoren", Alexander Morlang
- D30 Experimental evidence submitted by the proprietor

VI. The Board issued a summons to oral proceedings and a subsequent communication in which it indicated *inter alia* that Article 56 EPC appeared to prejudice maintenance of the patent as granted. The Board also gave its preliminary opinion on the twenty-seven auxiliary requests and indicated that it had discretion to hold D30 inadmissible.

VII. Oral proceedings before the Board were held on 6 February 2020. During the oral proceedings the proprietor withdrew auxiliary requests 1 to 18 and 20 to 27.

VIII. At the end of the oral proceedings the requests were as follows:

The proprietors requested that the decision under appeal be set aside and the patent be maintained as granted (main request), auxiliarily that the patent be maintained in amended form on the basis of auxiliary request 19 filed with letter dated 3 April 2017.

The opponents maintained their requests that the decision under appeal be set aside and the patent be revoked.

IX. Claim 1 according to the main request reads as follows:

"A purification method for exhaust gas from an internal combustion engine (1), wherein said purification method uses an exhaust gas purification apparatus comprising an oxidation zone (5) installed with an oxidation catalyst supporting both platinum and palladium, and a filtering zone (6) installed with a particulate filter, along exhaust gas flow at the exhaust gas passage (2) of an internal combustion engine (1), **characterized in that** hydrocarbon-based liquid is supplied to the inflow side of the exhaust gas of said oxidation zone (5) at the time when 2 to 10 g of particulates per 1 liter of said particulate filter are caught, to raise temperature of said exhaust gas up to equal to or higher than 550°C by said oxidation catalyst so as to make the residue of said particulate filter combusted, wherein said oxidation catalyst is refractory inorganic oxide powders containing platinum and palladium, coated on 3-dimensional refractory structure, and a mass ratio of platinum/palladium being 20/1 to 1/1, a total amount, of palladium and platinum being 0.3 to 20g per 100g of the refractory inorganic oxide, and said refractory inorganic oxide being at least one selected from the group consisting of alumina, silica-containing alumina, zirconia and titania."

X. Claim 1 according to auxiliary request 19 differs from claim 1 according to the main request by defining the mass ratio of platinum/palladium to fall within a narrower range from 5/1 to 2/1.

XI. The arguments of the proprietors relevant to the decision may be summarised as follows:

D30 was to be considered in the appeal proceedings.

The purification method defined in claim 1 according to the main request involved an inventive step. D9 did not disclose a catalyst based on both platinum and palladium. Furthermore, the differences between claim 1 of the patent as granted and the method described in D9 were threefold. Each of the three distinguishing features contributed to the inventiveness of the claimed subject-matter. They solved the same technical problem which was to be formulated as to provide an improved method for regeneration of a diesel particulate filter in an internal combustion engine exhaust gas system. For this reason, the formulation of partial problems was not appropriate. The claimed mass ratios of platinum and palladium represented an optimal range. The results shown in Table 1 of the patent could be used to draw a curve that could be extrapolated in both directions. Thereby, it was evident that mass ratios outside the claimed range provided for remarkably lower temperatures. Evidence for the validity of such extrapolation was to be seen in the test results contained in D30. The skilled person would not have combined the method of D9 with the teaching of D28. There was no incentive for the skilled person to use the claimed mass ratio. Although stating that the catalysts in D28 were "optimised", this was for a different purpose. The claimed range of the total amount of platinum and palladium was not arbitrary. Triggering the regeneration of the particulate filter when the claimed amount of particulates were caught in the filter was done with a view to balance the conflicting objectives of avoiding a too frequent

regeneration of the filter while ensuring that a clogged filter would not negatively affect the operation of the engine. Either had a negative impact on fuel economy. There was no evidence that the skilled person would have considered these conflicting objectives at the time of filing the priority application underlying the patent which dated back to the year 2004. As the claimed mass ratio of platinum and palladium and the feature concerning triggering of the regeneration of the filter were linked and solved the same problem, it was not obvious to both change the catalyst and choose the claimed weight range of filter loading to trigger the regeneration thereof.

Claim 1 according to auxiliary request 19 did not define subject-matter extending beyond the content of the application as filed. The section headed "Best mode for carrying out the invention" in the application as originally filed was to be seen as a reference to the detailed description. It was not to be misinterpreted as referring to a single embodiment having necessarily all features that are described in the following in common. The narrower range defined therein was originally disclosed in paragraph [0035] of the publication of the application. The first sentence of paragraph [0035] was to be seen as a general statement that could be combined with any other feature described in the application. The same was true for the weight range described in paragraph [0038]. The list of materials for the refractory inorganic oxide found its basis in originally filed claim 3.

XII. The arguments of the opponents relevant to the decision may be summarised as follows:

The skilled person would use an oxidation catalyst according to D28 in a process according to D9. Therefore, the purification method defined in claim 1 did not involve an inventive step.

XIII. Additionally, opponent 1 put forward the following arguments that are relevant to the decision:

D30 should not be considered in the appeal proceedings.

The results shown in D30 did not appear to correspond to what would be expected when comparing the examples in Table 1 of the patent and example a of D30. Additionally, comparative example b was far removed from the claimed range. It was hence still not possible to determine whether the range of 1/1 to 20/1 was arbitrary or would be linked to a particular effect.

In view of the assessment of inventive step, partial problems should be formulated. As the range of mass ratios of Pt/Pd was arbitrary, the partial problem for this feature was to find an alternative regeneration method for a filter in an internal combustion engine exhaust gas purification system. The total amount of Pt and Pd did not achieve an effect over the whole claimed range. The end points of the range claimed in the third distinguishing feature had no specific effect.

XIV. Additionally, opponent 2 put forward the following arguments that are relevant to the decision:

D30 did not show that a temperature of 550°C is only achieved within the claimed range. On the contrary, a mass ratio of Pt/Pd of 49/1 (well outside the claimed range) still achieved 548°C. None of the three distinguishing features contributed to the

inventiveness of the claimed subject-matter. The mass ratios of Pt/Pd were arbitrarily chosen. Still, the skilled person would combine the teaching of D28 with the method described in D9, as D28 discussed a mass ratio that was denominated as being "optimal". For the total mass of Pt and Pd it was not clear whether the claimed amount served any purpose. The trigger point for regeneration also appeared not to have a particular effect.

Auxiliary requests 7 to 27, and hence also auxiliary request 19, constituted an amendment to the proprietors' appeal case and were not to be admitted into the appeal proceedings.

Reasons for the Decision

1. *Admittance of D30*

The issue of possibly holding D30 inadmissible under Article 12(4) RPBA 2007 can be left unanswered since it is not decisive for the outcome of the proceedings. As explained to the parties during the oral proceedings, the Board took D30 into account for the purpose of inventive step but did not follow the proprietors' arguments based on it (cf. Reasons no. 2.4.3).

2. *Main request - Article 100(a) EPC - inventive step*

2.1 D9 represents the closest prior art to the purification method defined in claim 1, which was not contested by the parties.

2.2 The subject-matter of claim 1 differs from D9 by the following distinguishing features:

- the mass ratio of platinum/palladium (=Pt/Pd) in the catalyst is between 20/1 and 1/1 (feature 1),
- the total amount of Pd and Pt is 0,3 to 20g per 100g of the refractory inorganic oxide(feature 2),
- regeneration of the filter is started when the filter is loaded with 2-10g/l filter volume (feature 3).

The parties did not contest these differences and the Board sees no reason to find otherwise. However, the proprietors questioned whether D9 disclosed the use of the combination of Pt and Pd at all. They interpreted the expression "for example, Pt and Pd are supported to γ -alumina" in the second sentence of paragraph [0032] of D9 as referring to potential examples of noble metals. As there is no other mention of platinum and palladium in D9, interpretation must be based on this single passage. However, the Board finds that there is no room for the proprietors' interpretation. The sentence introduces a "noble metal based catalyst" for which an example is then given in parentheses, which reads "Pt and Pd are supported to γ -alumina". The Board finds this to refer to a specific, single example comprising both Pt and Pd in combination with a carrier made from γ -alumina. Reading it (as the proprietors do) as referring to two alternatives in which platinum or palladium could be supported to γ -alumina, neither the word "and" nor the plural form "are" appear to be appropriately used. The Board concludes that the expression in parentheses should be read giving it its literal meaning. A bimetallic catalyst made from Pt and Pd is hence already known from D9. Therefore, the use of a combination of these precious metals does not establish a further difference over D9. The

distinguishing features are hence threefold as set out above.

- 2.3 As there are three differences, it has to be determined whether these act together so as to achieve a synergistic effect or whether, if otherwise, partial problems should be defined. The proprietors' argument put forward in the oral proceedings that, despite not achieving a synergistic effect, the three distinguishing features solved the same technical problem, which was hence to be regarded as the objective technical problem for the invention as a whole, is not accepted. With no synergistic effect being apparent, each distinguishing feature has to be examined in relation to which effect can be attributed thereto. If all features result in the same problem being solved, it will be necessary to consider whether the problem was formulated in too general a way.
- 2.4 With regard to feature 1 (the mass ratio of Pt/Pd being between 20/1 and 1/1), the proprietors argued that this constituted an optimal range for achieving high temperatures, or that at least an improvement was to be seen for ratios of Pt/Pd within the claimed range as compared to ratios outside the range. The Board does not accept that such an improvement has been demonstrated, even less that the claimed range constituted the peak of effectiveness.
- 2.4.1 Table 1 of the patent specification shows different achieved temperatures for different mass ratios within the claimed range. The achieved temperatures are not only all above the claimed 550°C but come in fact very close to each other. The comparative examples in Table 1 do not comprise Pd at all.

The proprietors argued that the achieved temperatures were highest within the claimed range. Although no comparative example having both Pt and Pd was given, the proprietors argued that it was justified to conclude by extrapolation that the achievable temperatures drop significantly on either side of the range.

The Board does not accept this. Table 1 of the patent specification presents temperature values for four different Pt/Pd mass ratios, each for a sample amount of 2, 5 and 10g/liter. The four given values can hence be seen to represent four data points of three curves. These four data points achieve, however, temperatures at a similar level with only minor deviations. It cannot hence be determined how these curves evolve beyond the lower and the upper end. Due to the very small differences in temperature, it appears already difficult to perform a meaningful interpolation within the claimed range, i.e. between the explicitly given values. An extrapolation beyond the lower and upper limit of the range is even less feasible. It thus cannot be ascertained that the temperature achieved with any mass ratio below or above the claimed range would be lower than the temperatures achievable when working within the claimed range. The Board hence concludes that the examples in Table 1 of the patent specification are no evidence for the claimed range constituting improved mass ratios.

2.4.2 In this context, the proprietors argued that it was not required to prove that the objective technical problem is solved *exclusively* within the claimed range. When an improvement compared to the closest prior art was demonstrated, it was sufficient to show that the technical effect occurs in the claimed range. It was

not incumbent on the proprietor to prove that such effect did not appear in the known range, i.e. anywhere outside the claimed range. To support this assertion, the proprietors referred to T 1404/14.

However, the Board does not follow the proprietors' argument. Other than in the cited decision, there is no "known range" to compare, nor is there evidence for an effect that would not be achieved in the "known range". In the present case, we have D9, from which the combined use of platinum and palladium is generally known, but D9 is silent on their specific mass ratio. Still D9 (see paragraph [0011]) assumes that a temperature of 550°C is achievable, albeit on conditions that are not stated in this document.

Furthermore, it is unknown which temperatures would be achieved, were the exact conditions underlying the examples in Table 1 of the patent specification applied to the catalyst of D9. Therefore, it is uncertain whether there is an effect at all achieved by the claimed range vis-à-vis any potential mass ratios that could be used in D9.

- 2.4.3 With no improvement being plausible from the data in Table 1 of the patent specification itself (since the data therein cannot be extrapolated), and no effect being apparent from a comparison of D9 and this table, the Board has to decide whether D30 can prove that the claimed range covers the peak of effectiveness, or at least shows an improvement over the prior art known from D9.

The test results of D30 only show a single data point within the claimed range. A single value does not define a curve. It can neither be extrapolated to

values below the claimed range, nor to values above. The comparative examples in D30 are too far removed from the single value within the claimed range to conclude which shape a curve of temperatures could have and hence which temperature values would be achieved with mass ratios between the three data points.

The Board finds D30 to show that a high temperature is not achieved with a mass ratio far below the claimed range. However, it also shows that a temperature close to the claimed 550°C, namely 548°C, is still achieved even far above the claimed range at a mass ratio of 49/1. The Board hence concludes that temperatures around the claimed 550°C can be achieved also outside the claimed range. It further concludes that it is not clear how the temperatures would evolve if the mass ratio were changed beyond the borders of the claimed range. D30 cannot hence prove that the claimed range covers the peak of effectiveness, or at least shows an improvement over D9.

2.4.4 The claimed range is hence a selection of possible mass ratios without any particular effect. The objective technical problem solved by this selection is to choose particular mass ratios from similarly suitable mass ratios of platinum and palladium in the catalyst. This mass ratio must achieve a temperature that is high enough for the purpose already mentioned in D9, namely 550°C in order to regenerate the particulate filter.

2.4.5 The skilled person would look for catalysts in the prior art such as D28. This document shows a catalyst comprising platinum and palladium at a mass ratio of 2/1 (see section 3.1.1). It constitutes a promising choice for the skilled person looking for a suitable catalyst to be used with the method of D28, not least

as it is described to have an "optimal" mass ratio (see section 2).

The argument of the proprietors that it was optimised for a different purpose is not convincing. The catalyst of D28 being a Diesel oxidation catalyst, the Board construes the term "optimal" to refer to the catalyst's capability to oxidise hydrocarbons. This is also in line with the statement in D28, section 2, second sentence, to which opponent 1 referred and which discusses an optimal ratio Pt/Pd in view of the thermal stability and the catalytic activity ("optimalen Verhältnis Pt/Pd ... hinsichtlich der thermischen Stabilität und der katalytischen Aktivität"). A catalyst having a high catalytic activity that performs well in removing, *i.e.* oxidising, unburnt hydrocarbons will inevitably achieve at least good conversion rates when a hydrocarbon-based liquid is supplied to its inflow side as claimed. With a high conversion rate, *i.e.* a great amount of hydrocarbons being oxidised per unit of time, high temperatures will arise. The skilled person looking for a catalyst that can achieve a temperature of 550°C will be tempted to try the mass ratio of 2/1 declared to be optimal in D28. Thereby, the skilled person will work within the range of feature 1 without the necessity of inventive skills.

2.4.6 The teaching of D28 would thus lead the skilled person to solve the partial problem of feature 1 when starting from D9 without the use of inventive skills.

2.5 With regard to feature 2 (the total amount of palladium and platinum being 0.3 to 20g per 100g of the refractory inorganic oxide), the proprietors did not argue that it was linked with the other distinguishing features or achieved a particular technical effect not

present in the prior art. However, they asserted that the defined range was still not arbitrary.

The Board does not accept this. No reason is apparent why the claimed values should define a range in which an effect is achieved except the known technical requirement to provide sufficient catalytic activity. Nor can the Board identify an effect associated with the claimed end points. With no technical effect attributable to feature 2, the claimed range merely represents an arbitrary selection of possible total amounts within the framework of D9 that does not solve any (partial) problem.

2.6 With regard to feature 3 (regeneration of the filter is started when the filter is loaded with 2-10g/l filter volume), the proprietors argued that there is a link between the type of catalyst and the definition of the trigger. If a more effective catalyst were chosen, the trigger point for starting the regeneration process could be set to a later time. There was a need to balance two conflicting objectives, *i.e.* not to perform the regeneration too often while ensuring that the filter did not become fully loaded and hence clogged. The claimed range was considered optimal for the particular oxidation catalysts recited in the claim.

However, the Board finds this range of filter loading to be arbitrary, in particular as the filter type is not defined in the claim. The trigger to be chosen not only depends on the particular catalyst that is used to provide the heat, but just as much on the capacity of the filter to capture particulate matter. Whether 2 to 10g of particulates per liter of particulate filter constitutes an optimal or less than optimal range, or whether it might even lead to clogging, also depends on

which type of filter is used. This, however, is not defined in claim 1. With the same range of filter loading applied to any type of filter, the alleged effect will not be achieved over the whole breadth of the claim. The claimed range is hence an arbitrary selection of trigger criteria for the purification method known from D9.

2.7 With no synergistic effect being present and no inventive step being involved in the provision of any of the distinguishing features, the subject-matter of claim 1 lacks an inventive step. Article 100(a) in conjunction with Article 56 EPC hence prejudices maintenance of the patent as granted. The main request is thus not allowable.

3. *Auxiliary request 19*

3.1 As all other auxiliary requests were withdrawn during the oral proceedings before the Board, auxiliary request 19 is the only remaining auxiliary request to decide upon.

3.2 *Admittance*

The issue of admittance of auxiliary request 19 can be left unanswered. Since the Board found that it cannot provide a basis for maintenance of the patent (cf. Reasons 3.3), its admittance was not decisive for the outcome of the proceedings.

3.3 *Article 123(2) EPC*

3.3.1 Contrary to the requirement of Article 123(2) EPC, claim 1 of auxiliary request 19 introduces subject-

matter extending beyond the content of the application as filed.

- 3.3.2 The proprietors argued that the combination of originally filed claims 1 to 3 in combination with paragraphs [0035] and [0038] of the published application provided a basis for the subject-matter of claim 1.
- 3.3.3 Whilst paragraph [0035] of the application as published specifically discloses mass ratios of Pt/Pd between 5/1 and 2/1 as the preferred range, the Board cannot find a direct and unambiguous disclosure for the particular combination of features defined in claim 1 of auxiliary request 19. Paragraph [0035] belongs to the section "Best mode for carrying out the invention" which encompasses paragraphs [0022] to [0046]. This "best mode for carrying out the invention" further discloses the claimed use amount of noble metal of 0.3 to 20g per 100g of refractory inorganic oxide (see paragraph [0038]) as well as a list of refractory inorganic oxides (see paragraph [0037]). The use amount and the refractory inorganic oxides as claimed are, however, only possibilities among the several disclosed. The Board finds that, without a specific pointer, the skilled person would not directly and unambiguously derive a purification method with the features of claim 1 comprising the combination of the specific mass ratio of Pt/Pd stated as preferred in paragraph [0035] with the non-preferred use amount of noble metal in paragraph [0038] and with the claimed refractory inorganic oxides selected from the several possibilities disclosed in paragraph [0037].
- 3.3.4 As regards originally filed claims 2 and 3, claim 3 was dependent on claims 1 or 2 and already defined the

claimed list of refractory inorganic oxides. However, claim 2 only defined a broader range of mass ratios of Pt and Pd but not the more specific one that is claimed, which is only disclosed in paragraph [0035]. Thus, the combination of features of claims 1 to 3 as originally filed does not provide a basis for a purification method comprising the claimed mass ratio of Pt and Pd. The Board also finds that even if the skilled person were to consider paragraph [0035] as a pointer to the more specific mass ratio of Pt and Pd instead of the one defined in claim 2 as originally filed, they would still not be able to directly and unambiguously derive a purification method being further specified by comprising a total amount of Pd and Pt of 0.3 to 20g per 100g of the refractory inorganic oxide, which is one of the possible amounts disclosed in paragraph [0038].

No basis is hence apparent in the application as filed from which a combination of features could directly and unambiguously be derived, which comprises one parameter being selected from a preferred range, another parameter from a more general range and a further parameter from a list at an intermediate level of preference. Nor would such a combination be pointed at in any other location in the application as filed.

- 3.3.5 The proprietors' argument that the first sentence of paragraph [0035] was applicable in a general way and hence combinable with all other features is not convincing. The statement in this paragraph cannot be seen in isolation but must be read together with the whole section in which it was presented. Even if one understood the heading "Best mode for carrying out the invention" just before paragraph [0022] as a reference to the detailed description, the statements following

thereafter cannot form a disclosure covering all the possible combinations of the features described in that section.

- 3.3.6 In this context, the proprietors' argument that it was not EPO practice that a preferred range could only be combined with all the other preferred ranges cannot change this finding.

The basic principle when assessing whether the claimed subject-matter extends beyond the content of the application as originally filed can be found in the case law of the Enlarged Board of Appeal as summarised in G 2/10 (see reasons 4.3). The question to be answered is hence what a skilled person can derive directly and unambiguously, using common general knowledge, and seen objectively and relative to the date of filing, from the whole of the documents as filed. This is known as the gold standard. In order to be allowable under Article 123(2) EPC, any amendment must hence meet this standard.

Upon amendment of a claim by introducing a more restricted feature, there is hence not generally an obligation to include all other ranges and materials in their preferred form. However, in the present case, the particular claimed combination does not fulfil the "gold standard" as set out above, as the skilled person would not directly and unambiguously derive that a purification method comprising the combination of the narrower range of the mass ratio of Pt/Pd (feature 1) with the broader range of the total mass of Pt and Pd (feature 2) and with the list of materials given in claim 3 as originally filed, which list was only presented with the broader range of mass ratios of Pt/

pd by its reference to claim 2 as originally filed was disclosed in the application as filed.

3.3.7 The Board thus concludes that claim 1 according to auxiliary request 19 introduces subject-matter extending beyond the content of the application as filed. The requirement of Article 123(2) EPC is hence not fulfilled. Auxiliary request 19 is thus not allowable.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chairman:



A. Chavinier-Tomsic

W. Ungler

Decision electronically authenticated