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DECISION
of 23 January 2004

Case Number: T 0139/02 - 3.2.4

Application Number: 93913502.6

Publication Number: 0598917

IPC: F01N 3/28

Language of the proceedings: EN

Title of invention:

Exhaust emission control system for internal combustion engine

Patentee:

TOYOTA JIDOSHA KABUSHIKI KAISHA

Opponent:

PEUGEOT CITROEN AUTOMOBILES
Ford Global Technologies, Inc.

Headword:

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Relevant legal provisions:

EPC Art. 54, 56, 88, 111(1), 123(2),(3)

Keyword:

"Claims 1 of main and auxiliary requests: no right to
priority"

"Main request: subject-matter of claim 1 not originally
disclosed"

"Auxiliary request - claim 1: satisfies the requirements of the
EPC"

"Remittal to the first instance to examine the dependent
claims of the auxiliary request with respect to Article 123(2)
EPC"

Decisions cited:

G 0002/98

Catchword:

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Case Number: T 0139/02 - 3.2.4

D E C I S I O N
of the Technical Board of Appeal 3.2.4
of 23 January 2004

Appellant I: TOYOTA JIDOSHA KABUSHIKI KAISHA
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Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office posted
30 November 2001 concerning maintenance of
European patent No. 0598917 in amended form.

Composition of the Board:

Chairman: C. A. J. Andries
Members: T. Kriner
H. Preglau

Summary of Facts and Submissions

I. The appellant I (patent proprietor) lodged an appeal, received at the EPO on 2 January 2002, against the interlocutory decision of the opposition division posted on 30 November 2001 on the amended form in which the European patent No. 0 598 917 can be maintained. The appeal fee was paid simultaneously and the statement setting out the grounds of appeal was received at the EPO on 2 April 2002.

Likewise, both the appellant II (opponent I) and the now party as of right (opponent II) lodged an appeal, received at the EPO on 8 February 2002 (appellant II) and 4 February 2002 (party as of right) against the interlocutory decision of the opposition division. The fees for these appeals were paid simultaneously and the statements setting out the grounds of appeal were received at the EPO on 2 April 2002 (appellant II) and on 26 March 2002 (party as of right).

With the letter of 20 November 2003, the party as of right withdrew both its opposition and its appeal.

II. Opposition was filed against the patent as a whole and based on Article 100(a) EPC in conjunction with Articles 52(1), 54(1), 56 EPC, on Article 100(b) EPC in conjunction with Article 83 EPC, and on Article 100(c) EPC in conjunction with Article 123(2) EPC.

In its decision the Opposition Division held that

- the subject-matter of the claims 1 of the main and the auxiliary requests I and II then on file was not new with respect to the state of the art as represented by

FD1: EP-A-0 560 991;

- the subject-matter of claim 1 of the auxiliary request I then on file had not been disclosed in the application as filed; and
- the subject-matter of auxiliary request III then on file met the requirements of the EPC.

III. In addition to FD1 the following documents played a role in the appeal proceedings:

FD1': WO-A-93/07363

FD15: John B. Heywood, Internal Combustion Engine Fundamentals, McGraw-Hill Inc., 1988, ISBN 0-07-028637-X, pages 839 - 841, 896 - 898.

IV. Oral proceedings took place on 23 January 2004.

The appellant I requested that the decision under appeal be set aside and that the patent be maintained as granted (main request) or on the basis of the first auxiliary request filed during the oral proceedings. Since the first auxiliary request is the sole auxiliary request maintained by the appellant I, it will be

referred to in the following sections as the auxiliary request.

The appellant II requested that the decision under appeal be set aside and that the patent be revoked.

V. Claim 1 as granted (main request) reads as follows:

"An exhaust purification device of an internal combustion engine which has in an engine exhaust passage a NO_x absorbent which absorbs NO_x when the air-fuel ratio of the inflowing exhaust gas is lean and which releases the absorbed NO_x when the oxygen concentration in the inflowing exhaust gas is reduced and which is provided with a NO_x estimating means for estimating the amount of the NO_x absorbed by the NO_x absorbent and a NO_x releasing means for reducing the oxygen concentration in the exhaust gas flowing into the NO_x absorbent and releasing NO_x from the NO_x absorbent when the amount of the NO_x estimated to be absorbed in the NO_x absorbent by the NO_x estimating means exceeds a predetermined allowable value."

Claim 1 of the auxiliary request reads as follows:

"An exhaust purification device of an internal combustion engine (1) which has in an engine exhaust passage a NO_x absorbent (17) which absorbs NO_x when the air-fuel ratio of the inflowing exhaust gas is lean and which releases the absorbed NO_x when the oxygen concentration in the inflowing exhaust gas is reduced and which is provided with a NO_x estimating means for estimating the amount of the NO_x absorbed by the NO_x absorbent (17) and a NO_x releasing means for reducing

the oxygen concentration in the exhaust gas flowing into the NO_x absorbent (17) and releasing NO_x from the NO_x absorbent (17) when the amount of the NO_x estimated to be absorbed in the NO_x absorbent (17) by the NO_x estimating means exceeds a predetermined allowable value, wherein said NO_x estimating means estimates the amount of the NO_x absorbed in the NO_x absorbent (17) on the basis of the amount of NO_x discharged from the combustion chamber (4) to the engine exhaust passage, wherein said NO_x estimating means is comprised of a NO_x calculating means for calculating the amount of NO_x discharged per unit time from the engine (1) to the engine exhaust passage in accordance with the engine load and the engine rotational speed, and a cumulative adding means for cumulatively adding the amounts of NO_x calculated by the NO_x calculating means".

VI. In support of his requests the appellant I relied essentially on the following submissions:

Claims 1 of the main and the auxiliary requests did not explicitly define the predetermined allowable value which was used for the decision when the oxygen concentration in the exhaust gas had to be reduced. However, it was clear for the skilled person that this value had to be the maximum absorption capacity of the NO_x absorbent depending on the temperature of the NO_x absorbent. Consequently the corresponding features defining the predetermined allowable value, as disclosed in the first priority document (Japanese patent application JP 177666/92), were implicitly comprised in the present independent claims so that these claims were entitled to the claimed priority right.

The subject-matter of the present claims 1 according to the main and the auxiliary request was novel. FD1 and FD1' which represented the most relevant state of the art did not disclose an exhaust purification system which comprised a NO_x estimating means in the sense of the patent in suit. In accordance with FD1 and FD1' the amount of NO_x absorbed in the NO_x absorbent was estimated from the cumulative value of the engine speed. However, this way of estimating the amount of absorbed NO_x did not deliver a correct result. By comparison, the NO_x estimating means according to the patent in suit was suitable for delivering the exact value of the absorbed NO_x. Since a claim had to be read in the light of the description, the NO_x estimating means according to the present claims 1 was not disclosed in FD1 or FD1'. Furthermore, the NO_x estimating means according to FD1 and FD1' neither comprised a NO_x calculating means for calculating the amount of NO_x discharged per unit time from the engine to the engine exhaust passage in accordance with the engine load and the engine rotational speed, nor a cumulative adding means for cumulatively adding the amounts of NO_x calculated by the NO_x calculating means.

The subject-matter of claims 1 of the main and the auxiliary request was also based on an inventive step, since there was no suggestion for the use of a NO_x estimating means as defined in these claims. It was correct that FD15 showed that the NO_x amount contained in the exhaust gas of a combustion engine was dependent on the engine speed and the engine load. However, FD15 could not suggest the use of these two parameters for estimating the amount of NO_x absorbed by a NO_x

absorbent, in particular since the amount of NO_x in the exhaust gas was not only dependent on the engine speed and the engine load.

The new combinations of features according to the dependent claims of the auxiliary request were not literally disclosed in the originally filed documents of the patent in suit. However, the skilled person could read between the lines that the combinations of the dependent claims of the first auxiliary request had been at least implicitly disclosed in the originally filed documents.

VII. The appellant II disputed the views of the appellant I with arguments which can be summarized as follows:

The priority documents of the patent in suit referred to very specific embodiments of an exhaust purification device. Compared to these devices, the devices of claims 1 of the main and of the first auxiliary request constituted a generalisation. In particular, there was no disclosure in the priority documents for the general teaching that NO_x was released from the NO_x absorbent when the amount of the NO_x estimated by the estimating means exceeded a predetermined value. In accordance with the first priority document (Japanese patent application JP 177666/92), the predetermined value was not any predetermined value, but the NO_x absorption capacity of the NO_x absorbent determined by NO_x absorption capacity determining means which determined this capacity depending on the temperature of the NO_x absorbent temperature. Therefore the present claims 1 were not entitled to the claimed priority.

Each of the documents FD1 and FD1' disclosed an exhaust gas purification device which comprised all features of claims 1 of the main and the first auxiliary request. It was true that the NO_x estimating means were relatively simple means. Nevertheless, these means had to be regarded as NO_x estimating means as claimed in the present claims 1.

In a lean burn combustion engine as described in claims 1 of the present requests, the load was constant during lean burn phases so that the engine speed corresponded exactly to the amount of NO_x absorbed in the NO_x absorbent. Hence it could be said that the NO_x estimating means according to FD1 and FD1' comprised a NO_x calculating means for calculating the amount of NO_x discharged per unit time from the engine to the engine exhaust passage not only in accordance with the engine rotational speed but additionally in accordance with the constant engine load. Therefore the subject-matter of claims 1 of the main and the auxiliary request lacked novelty.

If the subject-matter of claim 1 of the auxiliary request should be considered as novel, it was at least not based on an inventive step. Starting from the state of the art disclosed in FD1', the object to be achieved by the claimed exhaust purification device had to be regarded as to improve the quality of the estimation of the NO_x absorbed by the NO_x absorbent. With respect to his general technical knowledge, the skilled person knew that the amount of NO_x contained in the exhaust gas of a combustion engine could be exactly calculated on the basis of the engine load and the engine rotational speed. This general knowledge was for example

documented by FD15. Therefore, the provision of a NO_x estimating means comprising NO_x calculation means which calculated the amount of absorbed NO_x not only in accordance with the engine rotational speed but additionally in accordance with the engine load was obvious for the skilled person dealing with the object of improving the quality of the estimation of the absorbed NO_x.

The new independent claim 1 according to the auxiliary request created new combinations of features when combined with the dependent claims, which combinations had not been disclosed in the originally filed documents of the patent in suit. Hence this request did not meet the requirements of Article 123(2) EPC. In particular there was no basis in the originally filed documents for the combinations according to the present claims 1 and 5, 1 and 6, 1 and 25 and 1 and 26.

Reasons for the Decision

1. The appeal is admissible.
2. *Priority*
 - 2.1 According to G 2/98 (OJ EPO, 2001, 413) the priority of a previous application in respect of a claim in a European patent application, and consequently also in respect of a claim in a European patent, in accordance with Article 88 EPC is to be acknowledged only if the skilled person can derive the subject-matter of the claim directly and unambiguously, using common general knowledge, from the previous application as a whole.

In the present case, the question arises whether or not the skilled person can derive the subject-matter of claims 1 of the main and of the auxiliary request from the priority documents cited in the patent in suit. In particular, whether or not he can derive from the priority documents an exhaust purification device according to these claims wherein a NO_x releasing means reduces the oxygen concentration in the exhaust gas and releases NO_x from the NO_x absorbent, when the amount of the NO_x estimated to be absorbed in the NO_x absorbent by the NO_x estimating means exceeds a predetermined allowable value.

- 2.2 The first priority document (Japanese patent application JP 177666/92) is the only document describing a device which is comparable with the devices described in claims 1 of the present main and first auxiliary request. This document exclusively refers to an exhaust purification device wherein a NO_x releasing means releases NO_x from the NO_x absorbent, when the NO_x absorption amount absorbed into the NO_x absorbent becomes the NO_x absorption capacity (NO_xCAP) of the NO_x absorbent, wherein the NO_x absorption capacity is determined by a NO_x absorption capacity determining means which takes the absorbent temperature into account (see translation of the Japanese patent application JP 177666/92 filed by the appellant I on 17 March 1994, for example the claim on page 1; page 4, section 0006; page 7, section 0012; Figures 4 and 5). It is quite clear that there is a difference between the specific value (NO_xCAP) mentioned in the first priority document on the one hand, and the general value (predetermined allowable value) in the present

claims 1 which is not disclosed in the first priority document on the other hand.

The second priority document (Japanese patent application JP 190213/92) refers to an exhaust purification device comprising a catalyst regeneration timing judgement means, a first and a second exhaust atmosphere changing means, and a catalyst regeneration adjustment means (see the claim on page 1). Furthermore, only a specific value (namely 70% of NO_xCAP) is disclosed to start the enrichment of the exhaust gas.

The third priority document (Japanese patent application JP 361575/92) refers to an exhaust purification device comprising a means which estimates the degree of completion of the releasing and reduction processing of NO_x released from the NO_x absorbent (see claim 1). According to this document the enrichment period starts under predetermined operating conditions, what is different to a start depending on a predetermined amount of absorbed NO_x.

Therefore, none of the priority documents of the patent in suit discloses an exhaust purification device as defined in claims 1 of the main and the auxiliary request, wherein a NO_x releasing means reduces the oxygen concentration in the exhaust gas and releases NO_x from the NO_x absorbent, when the amount of the NO_x estimated to be absorbed in the NO_x absorbent by the NO_x estimating means exceeds a predetermined allowable value (in its general form).

2.3 The argumentation of the appellant I according to which it was clear for the skilled person that this value had to be the maximum absorption capacity depending on the temperature of the NO_x absorbent, is not convincing. The skilled person could also consider a fixed value below the maximum absorption capacity (see for example the second priority document), for example for a simplification of the NO_x releasing means and/or for safety reasons.

2.4 Consequently the present claims 1 according to the main and first auxiliary requests of the appellant I are not entitled to the claimed priority right.

As a result of this finding, FD1' which is the originally published PCT-version in Japanese language of FD1, forms part of the state of the art according to Article 54(2) EPC.

3. *Amendments*

3.1 Claim 1 of the auxiliary request essentially corresponds to the combination of the originally filed or granted claims 1, 2 and 3. Only the feature of the originally filed (or granted) claim 2, according to which the NO_x estimating means estimates the NO_x absorbed in the NO_x absorbent has been amended in order to clarify that the NO_x estimating means estimates the amount of the absorbed NO_x. This feature is supported for example by the originally filed claim 1. Furthermore reference signs have been added to the claim.

The description has been adapted to the amended claim 1, and the document FD1' has been cited. The drawings have not been amended.

Therefore, claim 1, the description and the drawings of the request meet the requirements of Article 123(2) and (3) EPC.

- 3.2 The features of the dependent claims 2 to 35 of the auxiliary request correspond to the features of the originally filed claims 4 to 37. However, since a number of the originally filed dependent claims referred solely to the originally filed claim 1, the question arises whether or not the combinations defined in the new corresponding dependent claims (which still refer to claim 1, although the new claim 1 is the combination of originally filed claims 1 to 3) have been disclosed in the originally filed documents of the patent in suit.

Claims 2, 3 and 4 which refer to claim 1, correspond to originally filed claims 4, 5 and 6 which referred to the originally filed claim 3. Since this claim now forms part of the present claim 1, it is obvious that the combinations described in the present claims 2 to 4 have been disclosed in the originally filed claims 4 to 6. However, the combinations described in claims 5 to 35 have no counterpart in the originally filed claims. Hence it has to be assessed whether or not these combinations are comprised in the disclosure of the originally filed description and drawings.

4. *State of the art*

FD1' which forms part of the state of the art according to Article 54(2) EPC has been published in Japanese. FD1 which forms part of the state of the art according to Article 54(3) and (4) EPC has been published in English in accordance with Article 158(3) EPC. Since FD1 is the appellant I's own translation of FD1', and since FD1 is the European version of the Japanese PCT document FD1', the disclosure of FD1 is considered as being identical with the disclosure of FD1'. This has not been disputed by the appellant I. Therefore FD1' is cited in the following always together with FD1 which for the assessment of inventive step has only been used as a translation of FD1'.

5. *Novelty*

5.1 FD1'/FD1 discloses an exhaust purification device of an internal combustion engine (1) which has in an engine exhaust passage a NO_x absorbent (18) which absorbs NO_x when the air-fuel ratio of the inflowing exhaust gas is lean and which releases the absorbed NO_x when the oxygen concentration in the inflowing exhaust gas is reduced (see claim 1 of FD1) and which is provided with a NO_x estimating means for estimating the amount of the NO_x absorbed by the NO_x absorbent (see column 9, lines 39 to 43) and a NO_x releasing means for reducing the oxygen concentration in the exhaust gas flowing into the NO_x absorbent and releasing NO_x from the NO_x absorbent when the amount of the NO_x estimated to be absorbed in the NO_x absorbent by the NO_x estimating means exceeds a predetermined allowable value (see Fig. 8, steps 101 to 104, value SNE; and column 9, line 54 to column 10,

line 22), wherein said NO_x estimating means estimates the amount of the NO_x absorbed in the NO_x absorbent on the basis of the amount of NO_x discharged from the combustion chamber to the engine exhaust passage (see column 9, lines 26 to 43).

5.2 However, FD1'/FD1 does not disclose that said NO_x estimating means is comprised of

(a) a NO_x calculating means for calculating the amount of NO_x discharged per unit time from the engine to the engine exhaust passage in accordance with the engine load and the engine rotational speed, and

(b) a cumulative adding means for cumulatively adding the amounts of NO_x calculated by the NO_x calculating means.

5.3 The argumentation of the appellant I according to which claim 1 of the main request referred to a particular estimating means which was not disclosed in FD1 and FD1' is not convincing. Claim 1 of the main request merely requires - in general - that the claimed exhaust purification device comprises a NO_x estimating means without any further definition of this means. Such a further definition is only contained in the description of the patent in suit or in claim 1 of the auxiliary request which states that the NO_x estimating means comprises a specific NO_x calculating means and a specific cumulative adding means. Consequently the NO_x estimating means described in claim 1 of the main request is disclosed in FD1'/FD1. The fact that the NO_x estimating means defined in the description of the patent in suit differs from the NO_x estimating means

according to FD1'/FD1 is not relevant for the question whether or not the subject-matter of claim 1 of the main request is novel. Article 69 EPC, according to which the description shall be used to interpret the claims, may not be interpreted in such a way that the claims serve only as a guideline (see the Protocol on the Interpretation of Article 69 of the Convention).

5.4 The appellant II's argumentation that FD1'/FD1, in addition to the features cited in section 5.1 above, also disclosed features (a) and (b) (see section 5.2 above) is also not convincing. Even a lean burn combustion engine of an automobile does not work at a constant load. It is well known to the skilled person that the load changes depending on the status of the road and on the operation modus of the engine, such as acceleration, deceleration and so on. Therefore it is not correct that the NO_x estimating means according to FD1'/FD1 which estimates the amount of absorbed NO_x exclusively from the cumulative value of the engine speed, can be regarded as a NO_x estimating means which in principle estimates the amount of absorbed NO_x on the basis of the engine speed and the engine load.

5.5 With respect to the above findings, the board comes to the following conclusions:

- the subject-matter of claim 1 as granted (main request) lacks novelty; and
- the subject-matter of claim 1 of the auxiliary request 1 is novel.

6. *Inventive step*

6.1 The most relevant state of the art is undisputedly disclosed in FD1'(FD1)[FD1 being considered solely as the English translation of the Japanese PCT document FD1']. Starting from this state of the art, the object underlying the patent in suit is to provide an exhaust purification device which can reduce well the harmful components released into the atmosphere regardless of the magnitude of the amount of NO_x discharged from the engine (see column 2, lines 14 to 18 of the patent in suit).

This object is achieved by an exhaust purification device according to claim 1 of the auxiliary request which differs from the state of the art according to FD1'(FD1) by the features (a) and (b) cited in section 5.2 above. The board is convinced that this exhaust purification device does in fact achieve the given object, since it enables the avoidance of an overcharge of the NO_x absorbent and a release of a reducing agent into the atmosphere.

6.2 In accordance with FD1'(FD1), the amount of NO_x absorbed in the NO_x absorbent is correctly proportional to the amount of intake air and engine load, so that it can be estimated from the cumulative value of the product of the amount of the intake air with the engine load (see FD1, column 9, lines 35 to 39). However, for a simplification FD1'(FD1) suggests that the amount of NO_x absorbed in the NO_x absorbent is estimated only from the cumulative value of the engine speed (see column 9, lines 39 to 43 of FD1). Therefore, when intending to improve the quality of the NO_x estimating means

(simplified parameter: engine speed) of the exhaust purification device according to FD1'(FD1), the skilled person would prima facie fall back to the information already given in FD1'(FD1) and would provide a NO_x estimating means which estimates the NO_x absorbed in the NO_x absorbent on the basis of the amount of intake air and the engine load.

- 6.3 The opinion of the appellant II that it was obvious for the skilled person to provide for this purpose a NO_x estimating means which estimated the amount of NO_x absorbed in the NO_x absorbent on the basis of the engine load and the engine speed cannot be shared by the board. It is correct that the skilled person is aware of the fact that the amount of NO_x contained in the exhaust gas of a combustion engine is dependent on the engine speed and on the engine load (see for example FD15, in particular Figures 15 to 11). Therefore he could of course provide a NO_x estimating means which estimates the amount of NO_x absorbed in the NO_x absorbent on the basis of the engine load and the engine speed. However, these parameters are not the only ones which influence the amount of NO_x contained in the exhaust gas of a combustion engine, and therefore it is not likely that he really would select or would be guided to select such a means (based on speed and load) when intending to improve the quality of the NO_x estimating means according to FD1'(FD1), particularly since this would be against the teaching of this document. As already pointed out (see section 6.2 above) FD1'(FD1) teaches that the correct value of the amount of the absorbed NO_x can be derived from the cumulative value of the product of the amount of the intake air with the engine load. Consequently there is no reason for the skilled person

to estimate the amount of the absorbed NO_x on the basis of any other parameters if he intends to improve the quality of the NO_x estimating means according to FD1'(FD1), in particular since there is no suggestion to use such parameters for estimating the amount of NO_x absorbed in a NO_x absorbent. FD15 merely shows that the NO_x contained in the exhaust gas of a combustion engine is dependent on the engine speed and the engine load.

- 6.4 With respect to the above assessment the provision of an exhaust purification system as disclosed in FD1'(FD1) with NO_x estimating means comprising NO_x calculating means for calculating the amount of NO_x discharged per unit time from the engine to the engine exhaust passage in accordance with the engine load and the engine rotational speed, and a cumulative adding means for cumulatively adding the amounts of NO_x calculated by the NO_x calculating means, is not obvious in the light of the state of the art.

Therefore, the subject-matter of claim 1 of the auxiliary request also involves an inventive step.

7. *Further prosecution of the case*

Under Article 111(1) EPC, second sentence, the Board of Appeal may either exercise any power within the competence of the department which was responsible for the decision appealed or remit the case to that department for further prosecution.

In the present case, the board decides to deal only with the questions of priority, novelty, inventive step and allowability of the amendments to the independent

claims. With respect to the question whether or not the dependent claims 2 to 35 of the auxiliary request meet the requirements of Article 123(2) EPC (see section 3.2 above) the board decides however, to remit the case to the first instance for further prosecution, since this question arose for the first time at the end of the oral proceedings and cannot be answered without a substantial further examination of the claims 5 to 35 of the auxiliary request.

The board wants to emphasize that the case is remitted exclusively for the examination of the dependent claims of the auxiliary request as filed at the oral proceedings on 23 January 2004 with respect to Article 123(2) EPC, and that the present decision concerning the independent claims of the main and the auxiliary request is a final decision.

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 for further prosecution of the dependent claims of the first auxiliary request, i.e. the examination of the dependent claims with respect to Article 123(2) EPC.

The Registrar:

The Chairman:

G. Magouliotis

C. Andries