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Datasheet for the decision of 25 November 2011

Case Number: T 1530/09 - 3.2.06

Application Number: 01115291.5

Publication Number: 1167711

IPC: F01N 3/10, F02D 41/02

Language of the proceedings: EN

Title of invention:
Emission control method and apparatus of an internal combustion engine

Applicant:
Toyota Jidosha Kabushiki Kaisha

Opponent:
PEUGEOT CITROEN AUTOMOBILES SA

Headword:
-

Relevant legal provisions:
EPC Art. 123(2), 84
RPBA Art. 13(1)

Keyword:
"Main request - feature shown only in isolation in a flowchart leads to subject-matter not directly and unambiguously derivable from application as filed - not allowable (Art. 100(c) EPC)"
"Auxiliary requests - late-filed - not admitted"

Decisions cited:
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Catchword:
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Case Number: T 1530/09 - 3.2.06

D E C I S I O N
of the Technical Board of Appeal 3.2.06
of 25 November 2011

Appellant I: (Patent Proprietor)
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Decision under appeal:
Interlocutory decision of the Opposition Division of the European Patent Office posted 19 June 2009 concerning maintenance of European patent No. 1167711 in amended form.

Composition of the Board:

Chairman: M. Harrison
Members: G. de Crignis
R. Menapace

Summary of Facts and Submissions

I. With its interlocutory decision posted on 19 June 2009, the opposition division found that European Patent No. 1 167 711 in an amended form met the requirements of the European Patent Convention.

Claim 1 of the patent in that amended form corresponds to claim 1 as granted and reads as follows:

"An emission control apparatus of an internal combustion engine (10) having a storage device (22) provided in an exhaust passage (18) of the internal combustion engine (10) that stores a threshold level of NOx, and control means (40) that reduce NOx stored in the storage device (22) to recover a NOx storing level of the storage device (22) by performing a rich spike control by temporarily shifting during a lean burn operation of the internal combustion engine (10) an engine air-fuel ratio to a fuel-rich ratio,
wherein the control means (40) limit an execution time of the rich spike control, and perform a stoichiometric burn operation in which the engine air-fuel ratio is stoichiometric, after the execution time limited by the control means (40) elapses,
wherein the control means (40) switch to the stoichiometric burn operation when the limited execution time of the rich spike control elapses without recovering the NOx storing level and switch from the rich spike control to the lean burn operation when the NOx storing level is recovered,
wherein the control means switch from the rich spike control to the lean burn operation when the limited execution time of the rich spike control set by the

control means (40) is not achieved but the NOx storing level is recovered."

Independent claim 8 concerns a corresponding method for controlling an emission of an internal combustion engine.

II. The opposition division held that the subject-matter of granted dependent claims 4, 5 and 9 corresponded to the subject-matter of originally filed independent claims 5 and 11 and that such subject-matter was not originally linked to claim 1 as filed but referred instead to alternatives to what was defined in claim 1. Therefore, the requirement of Article 123(2) EPC was not met. In the first auxiliary request before the opposition division (i.e. the amended form which was found to meet the requirements of the EPC), dependent claims 4, 5 and 9 of the main request had been deleted and the opposition division considered the previous objection under Article 123(2) EPC to have been overcome.

The subject-matter of claim 1 was also considered to be novel with respect to the disclosure of each one of

A2 EP-A-0 581 279 and
A5 US-A-5 778 666.

and to involve an inventive step since there was no hint in the prior art concerning a determination of whether the NOx level had been recovered (i.e. whether the purge of NOx was complete) before the rich spike control (or purge time) had elapsed.

III. On 23 July 2009 the appellant (opponent) filed an appeal against the opposition division's decision and paid the appeal fee. A statement setting out the grounds of appeal was received at the European Patent Office on 19 October 2009, in which the appellant (opponent) objected that the invention in the patent in suit was insufficiently disclosed (Article 100(b) EPC), that its subject-matter extended beyond the content of the application as originally filed (Article 100(c) EPC) and that its subject-matter was not patentable (Article 100(a) EPC).

IV. On 25 August 2009 the appellant (patent proprietor) also filed an appeal against the opposition division's decision and paid the appeal fee. A statement setting out the grounds of appeal was received at the European Patent Office on 12 October 2009, in which the appellant (patent proprietor) requested maintenance of the patent as granted.

V. With its communication of 13 October 2011 annexed to a summons to oral proceedings, the Board indicated *inter alia* that claim 1 as granted appeared to define subject-matter which was not disclosed in the application as originally filed (Article 100(c) EPC).

VI. With its letter of 14 November 2011, the appellant (patent proprietor) submitted auxiliary requests 1 to 4, wherein the first auxiliary request was dismissal of the opponent's appeal (i.e. a request for maintenance of the patent in the form considered allowable by the opposition division).

VII. Oral proceedings were held on 25 November 2011.
The appellant (patent proprietor) 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 amended claim 1 as filed as a first auxiliary request during the oral proceedings. Auxiliary requests 2 to 4 were withdrawn.

The appellant (opponent) requested that the decision under appeal be set aside and that the European patent be revoked.

Claim 1 of auxiliary request 1 was amended compared to claim 1 of the main request such that each of its last two features now include the wording "followed by the stoichiometric burn operation" to thereby define that the control means "switch from the rich spike control followed by the stoichiometric burn operation to the lean burn operation".

VIII. The arguments of the appellant (patent proprietor) may be summarised as follows:

The subject-matter of claim 1 of the main request including the additional wording compared with the subject-matter of claim 1 as originally filed was disclosed in the flowchart of Figure 2.

Although the sub-sequence of the steps of switching directly from rich to lean burn was only present in this flowchart, the skilled person would consider such a flowchart to represent an additional disclosure and would not be limited by the description merely because this emphasised the advantages of stoichiometric burn.

The skilled person would acknowledge from the flowchart that the stoichiometric burn operation could be omitted and that such omission would be applicable to all embodiments.

The core of the invention was represented by the feature concerning the control means which switched from rich spike control to the lean burn operation when the limited execution time of the rich spike control set by the control means was not achieved but the NOx storing level was recovered. Such concept of switching directly from a rich spike operation to a lean burn operation if the NOx storing level was recovered was a measure which avoided unnecessary HC and CO emissions. The skilled person directly understood such an advantage and recognized immediately that this was also specifically provided in the flowchart of Figure 2. No additional disclosure in the description was necessary. It was also immediately evident to a skilled person that e.g. atmospheric or other conditions might exist in which, due to a particular rich spike duration time set (which was anyway unspecified in claim 1), the rich burn alone during part of that time would cause the NOx storage level to be fully recovered and that a switch to stoichiometric burn would then be meaningless. Therefore a written description of a direct switch from rich to lean burn was not necessary as the flowchart alone sufficed.

Claim 1 of auxiliary request 1 overcame the objections raised with respect to the main request. Due to the comments and arguments made during the oral proceedings, the significance of the Board's comments in its communication could only be fully recognized for

the first time during the oral proceedings and hence, could not have been overcome earlier. The subject-matter of claim 1 included the subsequence of the steps of rich burn -> stoichiometric burn -> lean burn, which the Board considered to be lacking in the main request. Such subsequence of steps was clearly illustrated in Figure 2 and no further features of either the flowchart of Figure 2 or the description were either essential or required so that the requirements of Article 84 EPC and Article 123(2) EPC were met. Therefore, the request should be admitted into the appeal proceedings.

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

The subject-matter of claim 1 as granted was not disclosed in the application as originally filed (Article 100(c) EPC). The entire application as filed made no reference to a direct switch from rich burn to lean burn, but only to the prevention of deterioration of CH and CO emissions (itself caused by prolonged rich spike control) by using a stoichiometric burn operation between rich and lean burn modes. Such operation should not be understood as omitted by the flowchart of Figure 2. Although the flowchart included a logic pathway seemingly indicating a possible omission of stoichiometric burn, this would not be considered correct by the skilled person as it would not be consistent with the timing chart of Figure 3 which highlighted the step of stoichiometric burn as the distinguishing feature with respect to the prior art process shown in Figure 4.

The subject-matter of claim 1 of the first auxiliary request was inconsistent with the flowchart of Figure 2 (Article 84 EPC). The procedure set up in this flowchart included, when the limited execution time of the rich spike control had elapsed, a switching to stoichiometric burn (S270, S280). Such step was independent of the NOx storing level as the question of whether it was recovered was only to be answered subsequently in step S290. Hence, there was no clear and unambiguous disclosure for the now claimed procedure (Article 123(2) EPC). In view of the late filing, this request should not be admitted into proceedings (Article 13(1) RPBA).

Reasons for the Decision

1. *Main request*

1.1 Claim 1 includes a combination of the features of originally filed claims 1, 2 and 7, whereby claim 7 as filed however did not depend on claim 1 but only on independent claim 5. Furthermore, the following feature has been added to the wording of claim 1:
"wherein the control means switch from the rich spike control to the lean burn operation when the limited execution time of the rich spike control set by the control means (40) is not achieved but the NOx storing level is recovered."

1.2 Hence, the subject-matter of claim 1 is directed to the embodiment disclosed in the patent in suit which concerns a control apparatus arranged to perform the sub-sequence of the steps: lean burn - rich burn -

stoichiometric burn - lean burn, but wherein the control apparatus is arranged also to include an alternative of omitting stoichiometric burn under certain conditions. Claim 1 as originally filed however required the control means to be arranged to perform a stoichiometric burn operation between the rich burn and the lean burn.

1.3 Figure 2, which was cited by the appellant (proprietor) as disclosing both options, is a flowchart illustrating a processing procedure of the NOx storing capability recovering process. It is correct that this flowchart includes the logic pathway of omitting the step of stoichiometric burn. Such option depends on whether the time duration set for the rich spike burn has elapsed or not (S270). The option of switching directly from rich burn (S260) to lean burn (S310) concerns the case where the rich spike duration is shorter than the set value (i.e. S270 "NO") and additionally where the NOx has been recovered (i.e. S290 "YES"), in which case step S300 follows and sets the XRICHS flag to the OFF position, whereupon the procedure continues with a switch to lean burn (S310) and then ends the program.

1.4 Hence, the question of whether the skilled person would consider the omission of the stoichiometric burn as an option which was disclosed in the application as filed has to be assessed on the basis of the whole contents of the specification and thus taking into account the disclosure in the description.

1.5 The description of the patent in suit highlights as the basic issue (see paragraph [0007] of the A-publication) the control of HC and CO emissions effectively by

avoiding prolonged rich spike control and thus switching from the rich spike control to a stoichiometric burn operation. The underlying concept therefore includes the complete recovery of the NOx storing level of the storage device during stoichiometric burn operation to thereby curb deterioration of NOx emissions while at the same time avoiding deterioration of HC and CO emissions even when the amount of exhaust gas becomes great. It is consistently disclosed (see e.g. paragraphs [0006], [0007], [0010] - [0015] of the A-publication) to set the duration time for the rich burn to be sufficiently short so as to obtain recovery of the NOx storing level during the stoichiometric burn operation. Such consistent timing chart is complementarily shown in Figure 3 which shows that it is precisely the presence of a stoichiometric burn period directly subsequent to the rich burn duration which distinguishes the process and control means of the patent in suit from the process of the related art shown in Figure 4. Thus for a skilled person, the flowchart of Figure 2 has to be read in line with this underlying concept of the process steps and not in isolation.

1.6 In this regard it is undisputed between the parties, that there is no disclosure whatsoever in the description that the step of stoichiometric burn should or could be omitted. According to the general references in the description, there is no doubt about the skilled person being aware of the various interactions in the emission procedure (e.g. type of combustion engine, materials, temperatures, velocities) and being capable of correctly calculating and determining a time interval for the duration of rich

burn. This duration period has to be calculated on the basis of the amount of the stored NOx, and has to be set sufficiently short in order to curb HC and CO-emissions via a subsequent stoichiometric burn operation even though no details of such calculation or determination are disclosed. However the skilled person is well-trained and has experience in such field such that setting a suitable time period to achieve this would be well within his knowledge.

1.7 Concerning the logic pathway possibility shown in the flowchart of Figure 2 of seemingly omitting the switch to the stoichiometric burn by directly changing from a rich spike to lean burn, the purpose of that pathway is however unambiguously evident from the description (see paragraph [0035] of the A-publication, which states: *"At this moment, the rich spike control has just started, and the rich spike duration Tr is less than the set value. Therefore, the unit 40 proceeds to step S290, in which the unit 40 determines whether the amount of NOx stored has become "0"."*). Thus, that pathway is intended to be used only for the time at the beginning of the rich spike duration when the rich spike duration is less than the set value and hence, directly after switching to rich burn. At such time neither the rich spike duration Tr can have elapsed nor the amount of stored NOx can be zero and the procedure must, evidently, remain in the rich burn (sub-sequence of steps S270 "NO", S290 "NO", "END", return to S220, and rich burn is continued (paragraph [0036] of the A-publication). Hence, this sequence of steps is entirely in line with the general concept given in the description of the application as filed.

1.8 There are no conditions disclosed in the patent in suit (concerning the determination and setting of the duration time of the rich burn or the amount of stored NOx) which would even suggest to a skilled person another possibility or other purpose of the steps disclosed in the flowchart than the one described which includes a step of stoichiometric burn.

1.9 Thus, although there is a logic possibility within the flowchart of Figure 2 not to enter the step of stoichiometric burn, the description of the patent in suit discloses clearly and unambiguously to the skilled person that the value for the duration of the rich burn must be set correctly, which means in the present case being sufficiently short in order to allow the step of stoichiometric burn to be entered. Although it might be the case that if the rich spike control duration were set to be sufficiently long, a direct switch from rich to lean burn might occur if the flowchart were considered in isolation, nothing in the application as filed discloses in an unambiguous manner that such a duration would be set. Indeed, avoidance of the stoichiometric burn operation (which is not disclosed) would in fact only be the result of an unintended and thus incorrect setting of the rich spike duration by a skilled person.

1.10 Claim 1, however, defines a control means which is specifically arranged to include this alternative option disclosed in isolation only as a logic pathway in Figure 2, namely switching directly from the rich spike control to the lean burn operation without requiring a stoichiometric burn operation to be included. When considering the whole contents of the

application as filed however, there is no unambiguous disclosure of the control means being arranged in such a manner that it could ever switch from rich to lean burn directly.

Although the appellant (proprietor) argued that e.g. atmospheric conditions might exist under which the control system would switch directly from rich to lean burn, this is not disclosed anywhere in the application as filed. More importantly however, since the flowchart of Figure 2 is used together with the description to aid understanding thereof (notably also together with Figure 3), it may even be the case that other sub-routines not shown in the flowchart would account for any such conditions. Without any disclosure in the application as filed to indicate that a switch from rich burn to lean burn might indeed occur under a specific set of conditions, the appellant's (proprietor's) argument is nothing more than mere speculation.

The subject-matter of claim 1 of the main request thus extends beyond the content of the application as originally filed (Article 100(c) EPC), whereby the main request is not allowable.

2. *Auxiliary request 1 - Non-admittance*

2.1 Auxiliary request 1 was filed during the oral proceedings, hence at the latest stage in the proceedings. According to Article 13(1) of the Rules of Procedure of the Boards of Appeal (RPBA), it lies within the discretion of the Board to allow an appellant to amend its case after filing the grounds of

appeal and thus to admit such a request into proceedings. This discretion is to 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.

2.2 The subject-matter of claim 1 of this request has been amended by inserting into the two last features mandatorily a step of stoichiometric burn operation [*amendments in italics*]:

"wherein the control means (40) switch to the stoichiometric burn operation when the limited execution time of the rich spike control elapses without recovering the NOx storing level and switch form the rich spike control *followed by the stoichiometric burn operation* to the lean burn operation when the NOx storing level is recovered, wherein the control means switch from the rich spike control *followed by the stoichiometric burn operation* to the lean burn operation when the limited execution time of the rich spike control set by the control means (40) is not achieved but the NOx storing level is recovered,".

2.3 Such a claim 1 was submitted in order to overcome the aforegoing objection to the main request. The appellant (proprietor) submitted that these objections were raised only during the oral proceedings and stated that the amendments limited the invention to the procedure consistent with the embodiment described with regard to the timing chart of Figure 3. Concerning the disclosure of such sub-sequence of steps, the appellant

(proprietor) considered the flowchart of Figure 2 as a further disclosure.

2.4 Such an amendment changed the course of the proceedings significantly in a way which could not be dealt with at that stage of the proceedings. The amendments would lead to new aspects concerning the sub-sequence of the steps (leading from rich spike to stoichiometric burn under the condition that the NOx storing level is recovered) and thus concerned aspects (not least with regard to the prior art) which had not been taken into account previously.

2.5 The argument that the filing of such a request was only possible during the oral proceedings is not considered persuasive. The communication of the Board contained a statement in item 1b in relation to the matter of Article 100(c) EPC and claim 1 as originally filed pointing to the necessity of a stoichiometric burn operation as a mandatory step after rich burn. Hence, at least in response to the Board's communication a corresponding set of claims to deal with this aspect could have been filed. Instead the appellant (proprietor) chose to file requests containing different amendments.

2.6 Additionally, there is no clear and unambiguous disclosure of the now claimed sequence of steps in the flowchart of Figure 2 or in the description. The now claimed sequence refers to a procedure of subsequent steps

S270 rich spike duration elapsed: Yes ->
S290 NOx recovered: Yes ->
S280 stoichiometric burn - S300 - S310 (lean burn);

as well as to a procedure of subsequent steps

S270 rich spike duration elapsed: No ->

S290 NOx recovered: Yes ->

S280 stoichiometric burn - S300 - S310 (lean burn);

whereas the flowchart in Figure 2 directs the procedure from step S270 when answered with YES directly to step S280 (stoichiometric burn) and hence no dependence on a NOx recovering (S290) is illustrated therein. Such dependence also goes against the teaching of the description set out for the main request above (see point 1.5).

2.7 Accordingly, the subject-matter of the claim was not clearly and unambiguously disclosed (Article 123(2) EPC) in the application as originally filed. In view of the inconsistency set out above, the claimed features also lacked clarity and the requirements of Article 84 EPC were thus also not met. Since no other basis for the amendment had been indicated and none was immediately apparent to the Board, this request was not clearly allowable and was thus not admitted into the proceedings.

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

M. Patin M. Harrison