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**Datasheet for the decision  
of 14 February 2012**

**Case Number:** T 0925/09 - 3.2.04

**Application Number:** 06018887.7

**Publication Number:** 1739294

**IPC:** F02B 23/10

**Language of the proceedings:** EN

**Title of invention:**

Piston for a direct injection gasoline engine

**Applicant:**

NISSAN MOTOR CO., LTD.

**Headword:**

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**Relevant legal provisions:**

EPC Art. 123(2)

**Relevant legal provisions (EPC 1973):**

EPC Art. 76(1), 84

**Keyword:**

"No comments on the objections raised in the annex to summons to oral proceedings"

"Amendments (not admissible under Articles 76, 123(2) EPC)"

"Clarity (no)"

**Decisions cited:**

G 0001/05, G 0001/06, T 1067/97, T 0758/03

**Catchword:**

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Case Number: T 0925/09 - 3.2.04

**D E C I S I O N**  
of the Technical Board of Appeal 3.2.04  
of 14 February 2012

**Appellant:**  
(Applicant)

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**Representative:**

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**Decision under appeal:**

Decision of the Examining Division of the  
European Patent Office posted 21 November 2008  
refusing European patent application  
No. 06018887.7 pursuant to Article 97(2) EPC.

**Composition of the Board:**

**Chairman:** M. Poock  
**Members:** A. de Vries  
T. Bokor

## **Summary of Facts and Submissions**

- I. This appeal is against the decision of the examining division posted 21 November 2008 in which European patent application No. 06 018 887.7 was refused. It is a divisional application from application No. 00 121 497.2 which itself was a divisional application from the (root) application 98 109 111.9. Application No. 00 121 497.2 was subject of appeal decision T 758/03 of this board in a different composition in which the claimed subject-matter was held to lack an inventive step.
- II. In the present case, the examining division held that the subject-matter of claim 1 of all requests did not involve an inventive step for the reasons set out in appeal decision T 758/03 and specified that the amended features did not make any difference to the findings therein.
- III. The appellant (applicant) lodged the appeal against this decision on 28 January 2009 and paid the prescribed appeal fee simultaneously. The statement setting out the grounds of appeal was received on 31 March 2009.

The appellant requested that the decision of the examining division be set aside and a patent be granted on the basis of the claims of a main and four auxiliary requests filed with the statement setting out the grounds of appeal. The main and auxiliary request 1 correspond to auxiliary requests 1 and 2 of the impugned decision. Oral proceedings were requested as a subsidiary measure.

IV. Claim 1 of the main requests reads as follows:

"Direct injection type internal combustion gasoline engine having an ignition plug and an injector for injecting fuel directly into a cylinder, slidably accommodating a piston, said piston comprising a projection section (21), provided at a top surface of the piston (4) said projection section (21) is provided with a first inclined surface (22) approximately parallel to an intake side inclined surface of a cylinder head, a second inclined surface (23) approximately parallel to an exhaust side inclined surface of the cylinder head, and side surfaces (24, 25) connected to the first and second inclined surfaces, a cavity combustion chamber (12), recessed in the first inclined surface (22), said first and second inclined surfaces (22, 23), said side surfaces (24, 25) and the cavity combustion chamber (12) being formed symmetrically with respect to a line which is perpendicular to a piston pin, wherein a pair of valve recesses (31, 32) are recessed in the first inclined surface (22) and superposed on the cavity combustion chamber (12) and side sections of said valve recesses (31, 32) are surrounded by an outer peripheral section (21a) of the projection section (21) in the shape of an arcuate dam, suppressing gas flow into the valve recesses (31, 32), said valve recesses (31,32) are formed in a relatively shallow circular shape and along the valve inclination angle and are superposed on the cavity combustion chamber (12) such that each recess appears in a

crescent shape, the respective surfaces of the projection section (21) of the piston respectively approach the corresponding surfaces of the cylinder head (2) when the piston (4) comes near a top dead center position so that the cavity combustion chamber (12) is well sealed at its entire periphery, preventing the leakage of swirl and of the air-fuel mixture inside the cavity combustion chamber (12)."

Claim 1 of auxiliary request 1 is as in the main request with the additional features

- that the arcuate dam is "extending inclined towards the valve recesses (31, 32)", and
- that "said valve recesses (31, 32) are gradually lowered in accordance with the inclination of the intake valve-side inclined surface (22) in a direction towards the intake valve side of the piston (4), whereas a bottom surface of the cavity combustion chamber (12) is a plane perpendicular to the center axis of the piston (4)."

Claim 1 of auxiliary request 2 reads as follows:

"Direct injection type internal combustion gasoline engine having an ignition plug and an injector for injecting fuel directly into a cylinder, slidably accommodating a piston (4), said piston (4) comprising a projection section (21), provided at a top surface of the piston (4) said projection section (21) is provided with a first inclined surface (22) approximately parallel

to an intake side inclined surface of a cylinder head, a second inclined surface (23) approximately parallel to an exhaust side inclined surface of the cylinder head, and side surfaces (24, 25) connected to the first and second inclined surfaces, a cavity combustion chamber (12), recessed in the first inclined surface (22), said first and second inclined surfaces (22, 23), said side surfaces (24, 25) and the cavity combustion chamber (12) being formed symmetrically with respect to a line which is perpendicular to a piston pin, wherein

- a pair of valve recesses (31, 32) are recessed in the first inclined surface (22) and superposed on the cavity combustion chamber (12) and side sections of said valve recesses (31, 32) are surrounded by an outer peripheral section (21a) of the projection section (21) in the shape of an arcuate dam, suppressing gas flow into the valve recesses (31, 32),
- a flat plane (30) is provided between top ends of the first and second inclined surfaces (22,23), said flat plane (30) is perpendicular to an axis of the piston; said arcuate dam section (21a) is formed along the periphery of the valve recesses (31,32) with the first inclined surface (22) and said flat plane (30),
- a horizontal surface (26) formed at the outer periphery of the projection section (21), and
- a depth of the valve recesses (31,32) is not deeper than the horizontal surface (26)."

Claim 1 of auxiliary request 3 is as in the main request with the additional features that:

"- a flat plane (30) is provided between top ends of the first and second inclined surfaces (22,23), said flat plane (30) is perpendicular to an axis of the piston; said arcuate dam section (21a) is formed along the periphery of the valve recesses (31,32) with the first inclined surface (22) and said flat plane (30),  
- a horizontal surface (26) formed at the outer periphery of the projection section (21), and  
- a depth of the valve recesses (31 ,32) is not deeper than the horizontal surface (26)."

Claim 1 of auxiliary request 4 is as in auxiliary request 3 with the additional feature:

"the cavity combustion chamber (12) is formed with a substantially flat bottom, the bottom surface of the cavity combustion chamber (12) is in a plane perpendicular to the center axis of the piston."

V. The appellant identified a basis for the amendments in the original application documents and argued that the claimed subject-matter is inventive.

VI. With the summons to the oral proceedings, the board expressed the following:

"To assist the appellant in preparing for the requested oral proceedings, attention is drawn to the matters set out below. It is particularly indicated, that any views expressed herein are provisional and non-binding.

1. Main request

1.1. Inventive step - claim 1

1.1.1 The board has doubts whether the subject-matter of claim 1 involves an inventive step because it appears obvious for the skilled person to apply the teaching of EP-A-0 575 184 (D2) or any of the documents cited in the search report of this application except EP-A-0 851 102 on the direct injection type internal combustion gasoline engine of figures 63,64 or 1,12,13 known from document JP-A-09 079 038 (D1) for the reasons given in appeal case T 758/03 of 8 September 2006. The inevitable result of such approach would be a direct injection gasoline engine with all the features mentioned in claim 1.

1.1.2 It should be noted that EP-A-0 778 403 (D1') is used as the English translation of document D1 (as in appeal case T 758/03 cited above).

1.2 Amendments

1.2.1 The board has doubts whether the amendments made to the claims as filed originally, i.e. the root application, number 98 109 111.9 (publication number EP-A-0 879 942) meet the requirements of Articles 76(1) and 123(2) EPC. Examples of spotted deficiencies are:

(a) The following features of claim 1 of the root application are not present in current claim 1:



"an air intake assembly to inject air through the cylinder head into the cylinder to generate swirl flow for stratified charge combustion and to generate tumble flow for homogenous charge combustion",

"the cavity combustion chamber having an increasing cross sectional area as the top of the piston is approached".

These amendments do not appear to be admissible because no basis can be found in the root application that could justify these omissions.

- (b) It appears that the subject-matter of current claim 1 has been amended with isolated features from the 5th embodiment (see figures 19 - 22, 36).
  - (i) If a claim is to be restricted to a preferred embodiment, it is normally, according to the established jurisprudence of the boards of Appeal, not admissible under Article 123(2) EPC and 76(1) EPC to extract isolated features from a set of features which have originally been disclosed in combination for that embodiment. Such kind of amendment would only be justified in the absence of any clearly recognisable functional and structural relationship amongst said features (see

T 1067/97 of 4 October 2000, not published in OJ EPO).

- (ii) These requirements do not appear to be met by current claim 1 because at least the following features appear to have a functional and structural relationship with the isolated features:

"a flat plane between top ends of the first and the second inclined surfaces, the flat plane perpendicular to the axis of the piston",

"the cavity combustion chamber is a circle in plan view", and

"the conical sides or faces 24, 25 are contiguous with each other, extending through the lower edge of the exhaust valve side inclined surface 23".

Moreover, the particular form of the cavity combustion chamber of the 5th embodiment in the side view of figure 22 is not present in this claim and its position with respect to the horizontal surface formed at the outer periphery of the protection section.

Therefore, it does not appear that these amendments are admissible.

- (c) Current claim 1 mentions side sections of said valve recesses 31, 32 which are surrounded by an outer peripheral section 21a of the projection section 21 in the shape of an arcuate dam, suppressing gas flow into the valve recesses 31, 32. This appears to be a generalisation of the disclosure on page 20, line 26 to page 21, line 28 according to which the gas flow on the standard horizontal surface 26 can be prevented from entering the valve recesses 31, 32 by their particular form, i.e. that they are not depressed below the piston standard horizontal surface 26.

Since no basis for such generalisation can be found in the present application or in the root application, it does not appear that this amendment is admissible.

- (d) In view of the foregoing and as stipulated by Rule 137(4) EPC, the appellant is requested to clearly identify the disclosure of any feature of claim 1 in its claimed combination in the previous applications, i.e. in the root application identified above and the previous divisional application number 00 121497.2 (publication number 1 063 398). In this respect, G1/05 and G1/06 (OJ EPO 2008, 271 - 308) should be observed.

1.2.2 Finally, it does not appear that present claim 1 meets the requirement of Article 84 EPC.

(a) The line of symmetry between the first and second inclined surfaces, the side surfaces and the cavity combustion chamber is not unambiguously defined in claim 1 because it is only related to the piston pin. Therefore it is unclear which symmetry is claimed. It is assumed that line XXII-XXII in figure 21 is meant but this should be clear from the claim wording itself.

(b) The wording in the last part of claim 1 that the cavity combustion chamber "is well sealed at its entire periphery" appears to contradict what can be derived from the drawings regarding the 5th embodiment. At least on the right side, where the  $\theta$  angle is shown, the cavity combustion chamber is not sealed at all against the swirl flow on the horizontal surface 26.

2. Auxiliary requests 1 to 4

2.1 The majority of the foregoing observations also apply to claim 1 of these requests.

2.2 Moreover, the amendments in claim 1 of auxiliary request 1, do not appear to be clear. It is not evident what is meant with the wording "arcuate dam extending inclined towards the valve recesses", and that the "valve recesses (31,32) are gradually lowered in accordance with the inclination of the intake valve side inclined

surface (22) in a direction towards the intake valve side of the piston (4)".

It is emphasized that the claim wording has to be clear on its own, i.e. without the description.

- 2.3 The appellant is requested to clearly identify the disclosure of the particular advantages and effects upon which he relies for its argumentation on the presence of an inventive step.
3. For any further submissions, the appellant's attention is drawn to Articles 12, 13 and 15(6) of the Rules of Procedure of the boards of Appeal (RPBA)."

VII. In response, the appellant withdrew the request for oral proceedings and requested a decision in writing. No comments were made on any of the issues raised in the annex to the summons.

### **Reasons for the Decision**

1. The appeal is admissible.
2. However, none of the requests is allowable.

The appellant did not comment on the issues communicated with the annex to the summons to oral proceedings. Hence, the findings expressed therein remain unchallenged.

Therefore and after careful reconsideration of these issues, the board concludes, for the reasons set out in sections 1.2, 2.1 and 2.2 of the above mentioned annex, that the amendments in claim 1 of all requests do not comply with the requirements of Articles 76(1) and 84 EPC 1973 and 123(2) EPC.

## **Order**

### **For these reasons it is decided that:**

The appeal is dismissed.

The Registrar:

The Chairman:

G. Magouliotis

M. Poock