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Veröffentlichung im Amtsblatt	Ja/Nein
Publication in the Official Journal	Yes/No
Publication au Journal Officiel	Oui/Non

Aktenzeichen / Case Number / N° du recours : T 726/89 - 3.2.2

Anmeldenummer / Filing No / N° de la demande : 81 107 992.0

Veröffentlichungs-Nr. / Publication No / N° de la publication : 0 049 519

Bezeichnung der Erfindung: Cylinder block of engine
Title of invention:
Titre de l'invention :

Klassifikation / Classification / Classement : F02F 7/00, F16M 1/021

ENTSCHEIDUNG / DECISION

vom / of / du 16 October 1990

Anmelder / Applicant / Demandeur :

Patentinhaber / Proprietor of the patent /
Titulaire du brevet : Nissan Motor Co., Ltd.

Einsprechender / Opponent / Opposant : I: Klöckner-Humboldt-Deutz AG
II: Daimler-Benz AG

Stichwort / Headword / Référence :

EPÜ / EPC / CBE Art. 56

Schlagwort / Keyword / Mot clé : "Inventive step (yes)"

Leitsatz / Headnote / Sommaire

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Case Number : T 726/89 - 3.2.2

D E C I S I O N
of the Technical Board of Appeal 3.2.2
of 16 October 1990

Appellant : (Opponent II)
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Respondent : (Proprietor of the patent)
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Representative :
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Decision under appeal :
Decision of Opposition Division of the European Patent Office dated 7 September 1989 and dispatched on 14 September 1989 rejecting the opposition filed against European patent No. 0 049 519 pursuant to Article 102(2) EPC.

Composition of the Board :

Chairman : G. Szabo
Members : C. Andries
C. Holtz

Summary of Facts and Submissions

I. European patent No. 49 519 comprising seven claims was granted to the Respondent on 16 September 1987 in response to European patent application No. 81 107 992.0 filed on 6 October 1981.

Claim 1 reads as follows:

"A cylinder block (10), comprising:
an upper section having first and second oppositely disposed wall members (12A, 12B);
cylinder barrels (16) located in said upper section and integral with said upper section, each cylinder barrel having a cylinder bore (B); and
a skirt section (20) having a cavity defining a crankcase for an engine crankshaft, said skirt section having first and second oppositely disposed walls (20a, 20b) which are integral with said first and second wall members (12A, 12B) of said upper section, respectively, wherein the distance between the first and second wall members (12A, 12B) of said upper section is smaller than that between the first and second walls (20a, 20b) of said skirt section, and a bearing beam structure (30) including a plurality of bearing cap sections (32) each of which is secured to a bearing support section (23) integral with said skirt section (20), said engine crankshaft being rotatably supported by each bearing support section (23) and each bearing cap section (32) both being secured with each other, and a beam section (34) which securely connects said plurality of bearing cap sections (32) with each other, said beam section (34) extending along the axis of said engine crankshaft, characterized in that said first and second walls (20a, 20b) are in straight alignment with said first and second wall members (12A, 12B), respectively, to form said cylinder block generally

into the isosceles trapezoid shape. (Figs. 2 (3,4) and 5 (6,7,8,9))."

II. Oppositions were filed against the European patent requesting that it should be revoked on the ground that the claimed subject-matter lacked an inventive step.

III. By its decision dated 7 September 1989 and dispatched on 14 September 1989, the Opposition Division rejected the oppositions.

IV. The Appellant (Opponent II) lodged an appeal against the decision on 11 November 1989, paying the appeal fee and submitting the Statement of Grounds on the same date.

To support his arguments with respect to Claims 1 and 3 the Appellant cited the following documents:

D1: DE-A-2 839 885;
D4: H. Güldner "Das Entwerfen und Berechnen der Verbrennungskraftmaschinen und Kraftgas-Anlagen" 1914, Julius Springer Verlag, Berlin, pages 94 and 95;
D5: R. Bussien "Automobiltechnisches Handbuch" 13th edition, 1931, Technischer Verlag, Berlin pages 707 to 709; and
D6: DE-A-2 851 179 (not taken into consideration by the Opposition Division in accordance with Article 114(2) EPC).

According to the Appellant, the subject-matter of Claim 1 did not involve an inventive step with respect to a combination either of the teachings of documents D1 and D4 or of the teachings of document D6 and common general knowledge.

V. The oral proceedings were held on 16 October 1990, at which the party to the appeal proceedings as of right (Opponent I), although duly summoned, did not appear (cf. Rule 71(2) EPC).

The Appellant stressed the following arguments:

- document D6 should be considered by the Board (Article 114(1) EPC) since it was the closest prior art;
- the subject-matter of Claim 1 could not be considered as involving an inventive step, if compared with the combination of the teachings of documents D1 and D3 (i.e. DE-A-2 834 089, cited in the opposition procedure) or with the teaching of document D6; and
- in view of the wording of dependent Claim 3, the relevance of the isosceles trapezoid form, as suggested in Claim 1, should disappear as a proper basis for the inventive step.

The Respondent contested the above arguments.

VI. The Appellant requested that the decision under appeal be set aside and that the patent be revoked.

The Respondent requested that the appeal be rejected.

Reasons for the Decision

1. The appeal is admissible.

2. According to the Board, document D6, which has been submitted after the nine-month opposition period, should nevertheless be taken into consideration since it discloses pertinent subject-matter (Article 114(1) EPC).

3. Interpretation

To assess the subject-matter of Claim 1 properly, the following considerations appear to be relevant.

(i) Although in Claims 1 to 4 and 6 a reference is given to the embodiment according to Figs. 2 to 4, this embodiment does not represent the invention as claimed in these claims, since the corresponding figures do not contain any bearing beam structure as defined in Claim 1 (column 7, lines 4 to 14), or more particularly any beam section securely connecting the plurality of bearing cap sections with each other. However, lack of clarity itself due to the inconsistency between the wording of the claims and the drawings is no ground for opposition and the Board is, therefore, of the opinion that there is no need in the present case to correct the published patent accordingly, since this lack of clarity does not influence the issues in the case.

(ii) The cylinder block, as claimed in Claims 1 to 7, means the total combination (entity) of the cylinder block (proper) and of the bearing beam structure as defined in Claim 1.

(iii) The expression "said first and second walls are in straight alignment with said first and second wall members respectively" should be interpreted as defined in the patent description (column 4, lines 10 to 17), namely that the straight alignment covers that area of the outer wall near the imaginary connecting section C (cf. Fig. 3) at which both the walls and the wall members are integrally connected with each other.

(iv) The expression "to form said cylinder block generally into the isosceles trapezoid shape" should be understood as being the cross-section of the cylinder block taken along a vertical plane to which the axis of the cylinder block is perpendicular (cf. patent description: column 4, lines 20 to 24).

4. The Board is satisfied that the present patent complies with Article 123(2) and (3) EPC.

5. Novelty

After examination of the cited documents the Board is convinced that none of them discloses a cylinder block having all the features as defined in Claim 1. The subject-matter as set forth in Claim 1 is to be considered novel within the meaning of Article 54 EPC.

6. Closest state of the art

6.1 In the opinion of the Board the cylinder block according to document D1 reveals the closest prior art. It also discloses a cylinder block comprising all the features present in the precharacterising portion of Claim 1.

6.2 Such a kind of cylinder block, having a skirt section which is generally bulged outwardly to form therein a crankcase for an engine crankshaft is, according to the Respondent, normally provided for long piston stroke engines.

The cylinder block according to document D6, on the other hand, is suggested to be part of a short piston stroke engine (the piston stroke is smaller than the diameter of

the cylinder), which implicates quite different conditions with respect to rigidity (smaller height of the cylinder block) and generation of vibration (smaller piston stroke - less inert forces). Thus, said blocks have different vibration characteristics.

It is true, as emphasised by the Appellant, that the first feature of the characterising portion of present Claim 1 is also disclosed by the arrangement according to Figure 1 of document D6, but that arrangement does not show a feature present in the precharacterising portion of Claim 1, namely that the distance between the first and second wall members of said upper section is smaller than that between the first and second walls of said skirt section (column 6, line 65 to column 7, line 4). The Board is therefore of the opinion that the embodiment according to document D1 comprising a cylinder block of the same type as defined in present Claim 1, should be considered as representing the closest prior art.

7. Problem and Solution

7.1 As put forward by the Appellant, the skirt section in the cited art, which generally bulges outwardly, is caused to vibrate due to the cylinder block vibration, thereby emitting a considerable high-level noise from the surface of the skirt section. The vibrations of the cylinder block are considered to result from a shortage in torsional and flexural rigidities of the cylinder block.

7.2 The technical problem to be solved therefore consists in providing a cylinder block which is formed in such a way that torsional and flexural vibration is further suppressed in order to achieve engine noise reduction.

7.3 The problem is solved by the features mentioned in Claim 1, particularly by the shaping of the cylinder block in such a manner that not only the first and second walls are in straight alignment with said first and second wall members, respectively, and also by forming said cylinder block generally into an isosceles trapezoid shape.

With the above alignment, the weak connecting point and the area surrounding this connecting point between the upper cylinder block section and the skirt section is avoided and the surface area of that skirt section is decreased when compared with that of a conventional cylinder block.

According to the Respondent an improved rigidity and noise result is thereby obtained. The Board has no reason to doubt the statement of the Respondent, that a synergistic effect, which sharply suppresses the rightward and leftward flexures, is obtained by the combination of the specific bearing beam structure, the isosceles trapezoid shape of the cylinder block and the integral structure of cylinder barrels with the cylinder block. This is particularly supported by test results showing the influence of the bearing beam structure, the isosceles trapezoid formed cylinder block and the combination of these two features, respectively.

7.4 The Board cannot follow the argument of the Appellant that in view of the preferred embodiment of the invention as defined in Claim 3, the isosceles trapezoid shape is proved to be of no value to solve the mentioned problem. It is clear from the disclosure that only the upper part of the upper section might be made cylindrical in sections where the necessary width for the water jacket is not provided for (e.g. Fig. 7). The remaining lower part of the upper section and the skirt are in straight alignment

to form, generally, the "cylinder block into an isosceles trapezoid shape". This is particularly supported by the fact that in all alignments shown (cf. Figs. 7 and 8) where the necessary width is given, this shape is demonstrated. The feature, therefore, remains important for the solution of the above-mentioned problem in all the embodiments according to Claim 3.

8. Inventive step

8.1 As confirmed by the Respondent during the oral proceedings, no contribution to the inventive step can be seen in the recognition of the problem to be solved (cf. above Point 7.2).

8.2 However, a person skilled in the art, starting from a cylinder block according to document D1, who would try to obtain a cylinder block allowing the solution of the above problem, could find no indication or encouragement in the cited documents themselves to use the combination of features as defined in Claim 1.

8.3 Document D1 discloses an already "noiseless" combustion engine and suggests a number of further measures to increase cylinder block rigidity and/or to decrease noise. For example, rigidity can be increased by prolonging downwardly the bulged skirt section (page 8, last paragraph), and noise can be decreased by deleting that bulged skirt section completely (page 13, third paragraph). No suggestion to any other kind of skirt form, different from the bulged one, can be found in this disclosure, let alone any proposal to have a straight one which is, in addition, in alignment with the upper cylinder block.

8.4 Document D3, on the other hand, is relevant since it shows a cylinder block having an isosceles trapezoid form. However, document D3 mentions a completely different problem (i.e. problem related to the lubricating oil system). The only indication in document D3 with respect to the present problem to be solved, is the statement that due to the oil filled space between the trapezoidal cylinder block on the one hand and the additional covering plates (24) on the other hand, an improved noise damping is obtained. Thus, the form itself, without an oil insulation, was clearly insufficient to reduce the noise in that case.

Therefore the Board finds that a skilled person would not have been led towards the claimed invention by the teaching of this document, particularly since no emphasis at all had been put on the specific construction of the cylinder block in any respect.

8.5 Document D4 describes an A-shaped frame for stationary engines. According to the Board this very old document, describing a trapezoidal supporting frame fixed to the floor and providing "stiffness" of construction, cannot be compared to modern cylinder blocks suspended in a vehicle and does not give any hint to solve the above-mentioned problem. Taking this document into account would be rather the result of an ex-post-facto analysis than of indications in this document towards a possible solution of a problem in analogous situations.

According to the established case law of the Boards of Appeal, the question to be answered when assessing inventive step is not whether the skilled person could have used features disclosed in document D4, but whether he would have done so in expectation of some improvement or advantage (cf. T 2/83 "Simethicone Tablet/RIDER", OJ

EPO 1984, 265). Since there is no indication in this document towards a solution for the above problem without knowing the present application, the skilled person would not have been guided by it to provide a solution.

8.6 Not even document D5, which in the appeal proceedings was only cited against Claim 3, and which reveals the actuation and the location of valves, does mention the problem or an analogous one to be solved, so that also here the skilled person cannot find, without an ex-post-facto analysis, a link to the problem to be solved.

8.7 Document D6 shows a cylinder block for a noiseless combustion engine wherein the vertical skirt section (40) is in straight alignment with the cylinder block walls. Numerous measures are suggested in this document to suppress or to dampen engine noise. One of these measures revealed to a person skilled in the art consists of making the skirt sections straight in order to avoid the disadvantage of outwardly bulged skirt sections.

Applying this teaching to the cylinder according to document D1 would only result, according to the Board, in a construction having a conical skirt section. Such a conical skirt section, which is obtusely connected to the normal cylindrical upper cylinder block section, cannot be compared with the claimed isosceles trapezoid shaped block when it comes to an evaluation of rigidity and noise. As maintained by the Respondent during the oral proceedings, the claimed construction is advantageous over the closest prior art cylinder block modified in accordance with the above teaching.

Again, this document does not suggest either explicitly or implicitly that a noise or a vibration reduction can be obtained by bringing the upper cylinder block section

outside wall and the straight skirt section into a straight alignment. If that had been the intention of document D6, the information would have been made clearer. For example, it would have been expected in that case to refer to the straightness of the whole cylinder block wall instead of solely to the straightness of the skirt section.

Considering the content of document D6, the Board cannot, therefore, find a hint for a person skilled in the art towards the claimed specific cylinder block configuration.

8.8 The Appellant's statement that a skilled design engineer would obviously come to the claimed cylinder block construction if an increased crank circle is used, cannot be followed by the Board either. The teaching of the whole document D6 relates exclusively to short-stroke piston engines, which implies particular rigidity and noise conditions (cf. above point 6.2). Any increase of the crank circle means an increase of the piston stroke and thereby of the noise level. This not only goes against the scope of disclosure in document D6, but also against the aim of reducing noise level in the absence of a real need.

Furthermore, even if the skirt section should be widened there is according to the Board no obvious reason why the person skilled in the art would come to the claimed cylinder block configuration involving aligned higher and lower parts. With Figure 1 of document D6 in mind it is possible to maintain that configuration even with a larger crank circle, or it is possible to take a conical skirt section, which in fact is, according to the Board, implicitly described in this document (cf. straight skirt section). As explained above there is no suggestion in

document D6 that there should always be an entirely straight cylinder block wall. However, there is a clear indication that only a straight skirt section should be used.

8.9 The Board has also considered the further available documents which were not referred to in the oral proceedings before it, and found them not prejudicial to Claim 1, either alone or in combination with the documents cited above.

8.10 The subject-matter as set forth in Claim 1 therefore is considered to involve an inventive step within the meaning of Article 56 EPC.

9. Claim 1 being acceptable, the same applies to dependent Claims 2 to 7 which are merely preferred embodiments of the independent claim.

Order

For these reasons, it is decided that:

The appeal is rejected.

The Registrar: **The Chairman:**

N. Maslin **F. Szabo**