BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

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File No.: T 0261/90 - 3.2.4

Application No.: 82 103 323.0

Publication No.: 0 063 385

Classification: F01L 1/04

Title of invention: Four-cycle internal combustion engine

D E C I S I O N
of 20 October 1993

Applicant: -

Proprietor of the patent: Yamaha Motor Co., Ltd.

Opponent: Audi AG

Headword:

EPC: Art. 123(2), 84

Keyword: "Amended claims" - "Features taken from drawings" - "Sufficiency of disclosure (no)"

Headnote
Catchwords

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0261/90 - 3.2.4

D E C I S I O N
of the Technical Board of Appeal 3.2.4
of 20 October 1993

Appellant: (Proprietor of the patent)
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office dated 16 November 1989 and posted on 26 January 1990 revoking European patent No. 0 063 385 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman: H.J. Seidenschwarz
Members: P. Alting van Geusau
J.P.B. Seitz

Summary of Facts and Submissions

I. European patent No. 0 063 385 was granted with effect from 31 July 1985 on the basis of European patent application No. 82 103 323.0, filed on 20 April 1982.

II. In a notice of Opposition filed on 25 April 1986 the Respondent filed an Opposition against the European patent on the grounds that the subject-matter of the patent lacked an inventive step.

III. By its decision delivered at oral proceedings on 16 November 1989, with written reasons posted on 26 January 1990, the Opposition Division revoked the patent.

The Opposition Division held that the subject-matter of Claim 1 filed during oral proceedings in the opposition proceedings, which claim had been objected to by the Respondent for reasons of added subject-matter, did not give rise to objections under Article 123(2) and (3) EPC and was novel, but that it did not involve an inventive step in accordance with Article 56 EPC, having regard to the disclosures of the following documents:

D3: Journal "MTZ", 41. Jahrgang/10 October 1980, pages 427 to 434,
D6: GB-A- 296 125, and
D7: DE-A-1 401 239.

IV. Notice of appeal was filed against this decision on 26 March 1990 with payment of the appeal fee on the same day. The Statement of Grounds of appeal was filed on 31 May 1990 which included new sets of claims in

accordance with a main request and an auxiliary request as well as an adapted description.

V. In a communication, notified with a summons for oral proceedings, the Board expressed in particular the provisional opinion that further amendments of the claims in accordance with the requests appeared to be necessary in order to comply with the requirements of clarity.

The Board also raised the question of whether the characterising features of the newly filed claims derived from drawings which appeared to be schematic illustrations rather than constructional drawings were sufficiently clearly derivable from the application as originally filed when taking into account the conclusions of the decisions T 169/83 (OJ EPO 1985, 193), T 204/83 (OJ EPO 1985, 310) and T 451/88 (not published in the OJ of the EPO).

Furthermore, the Board referred to three new prior art documents (D15, D16 and D17) which it considered particularly relevant for deciding whether the subject-matter of the newly filed claims should be considered to involve an inventive step.

VI. With letter of 23 September the Appellant filed new Claims in accordance with a main request and three auxiliary requests.

VII. Oral proceedings were held on 20 October 1993.

At the oral proceedings the Appellant formulated his definitive requests according to which he requested setting aside the impugned decision and maintenance of the patent in amended form in accordance with a:

Main request:
On the basis of a sole patent claim according to the main request of 23 September 1993 and on the basis of a description as submitted with the appeal substantiation of 31 May 1990 with adaptation to the sole claim according to the main request and on the basis of Figures 1-4 of EP-B1-0 063 385;

First subsidiary request:
On the basis of a sole patent claim according to the main request of 23 September 1993 and on the basis of a description as submitted with the appeal substantiation of 31 May 1990 with adaptation to the sole claim according to the main request and with an addition of a discussion of the state of the art of documents D15, D16 and D17, and on the basis of Figures 1-4 of EP-B1-0 063 385;

Second subsidiary request:
On the basis of a sole patent claim according to the subsidiary request of 23 September 1993 and on the basis of a description as submitted with the appeal substantiation of 31 May 1990 with adaptation to the sole claim according to the auxiliary request of 23 September 1993 and on the basis of Figures 1-4 of EP-B1-0 063 385;

Third subsidiary request:
On the basis of a sole patent claim according to the subsidiary request of 23 September 1993 and on the basis of a description as submitted with the appeal substantiation of 31 May 1990 with adaptation to the sole claim according to the subsidiary request of 23 September 1993 and with an addition of a discussion of the state of the art of documents D15, D16 and D17, and on the basis of Figures 1-4 of EP-B1-0 063 385; and

Fourth subsidiary request:
On the basis of a single claim in accordance with any of the preceding requests with the replacement of the respective feature (a) by the following wording:

"the apex of the combustion chamber (3) of which the two slanted walls are partly composed by the heads of the intake and outlet valves in the closed position thereof is offset from the cylinder bore center axis (l_1) and the center line (l_3) toward the side where the exhaust valves (6) are situated."

The single claim of the main request and of the first subsidiary request reads as follows:

"A four-cycle internal combustion engine of the type having for each of its cylinders three intake valves (5, 5') and a plurality of exhaust valves (6), both types of valves being driven by a respective camshaft (9, 10) provided just above said intake and exhaust valves respectively, a combustion chamber (3) being disposed at one end of each cylinder bore having an axis (l_1), said three intake valves (5, 5') being arranged such that the intermediate intake valve (5') is offset further towards the outside with respect to a centre line (l_3) dividing the cross section of the cylinder into two halves, than the two intake valves (5) which are arranged at both sides of said intermediate intake valve (5') such that said intermediate intake valve is arranged to face the combustion chamber at a smaller angle of inclination (α_1) with respect to the centre axis (l_1) of said cylinder bore than the angle of inclination (α_2) of the two remaining intake valves (5) at both sides of that intermediate intake valve; the entirety of intake valves (5, 5') having their respective axes (l_2) extending to intersect the axis (0_1) of the cam shaft (9) driving said intake valves,

characterized in that

(a) The apex of the combustion chamber (3) of which the two slanted walls include the faces of the heads of the intake and outlet valves in the closed position thereof is offset from the cylinder bore centre axis (l_1) and the centre line (l_3) toward the side where the exhaust valves (6) are situated;

(b) two of the intake valve heads extend over the centre line (l_3) and into the side where the exhaust valves (6) are situated;

(c) the camshaft (9) for the intake valves (5, 5') is disposed closer to the cylinder bore axis (l_1) than the camshaft (10) for the exhaust valves (6);

(d) the two intake valves (5) arranged at both sides of the intermediate valve (5') have their heads disposed closer to the cylinder bore wall than said intermediate valve (5') viewed in the cylinder axis direction;

(e) the cylinder head area around the intermediate intake valve (5') facing the combustion chamber (3) has a shallow inclination in approximate accordance with the angle of inclination ($\alpha 1$) of the face of the head of the intermediate intake valve (5');

(f) each cylinder comprises two exhaust valves (6)."

The single claim of the second and third subsidiary requests comprises all the features of the single claim of the main request with the addition of the feature

"(g) wherein the intake valves (5, 5') and the exhaust valves (6) are disposed generally on

opposite sides of the centre line (l_3) with the proviso that said centre line (l_3) extends in parallel with both camshafts (9, 10)."

For the content of each claim of the fourth subsidiary request reference is made to the text of this request itself.

VIII. In support of his requests the Appellant submitted essentially the following arguments:

The current claims, of which a number of features are taken from the drawings, are in full compliance with the conditions set forth in Article 123(2) and (3) EPC in view of the following considerations.

Figures 1-4 of the patent are not schematic drawings but constructional drawings comprising all the essential elements of the specific embodiment of the engine claimed, which follows immediately from the text in column 1, lines 52 to 55 of the patent. Since further no relative measurements are derived from the drawings, the rulings of the decisions T 204/83 and T 451/88 do not apply in the present case.

Even if the drawings were schematic, the definition of relative positions are related to reference lines in the engine, which are precisely defined - such as the axis l_1 and the centre line l_3 - and which therefore have general validity. Moreover, the conditions set out in the decision T 169/83, in particular that the features in question should be unmistakably and fully derivable from the drawing in terms of structure and function are fully complied with.

Feature (a) is formulated on the basis of the disclosure of Figures 1 to 4 in combination with the description in column 2, lines 15 to 19 and 50 to 60. From these disclosures it is unmistakably evident for the skilled person that the pent-shaped roof of the combustion chamber has two walls extending from the apex - which has the shape of a straight line - in opposite directions with small angles of inclination and is offset with respect to the cylinder in the direction of the exhaust valves.

Feature (b) defines the specific construction of the embodiment of the engine shown in the drawings and this feature provides free movability of the valve heads without interference, which function is immediately recognisable by the skilled person and follows also directly from the text in column 3, lines 1 to 7 and lines 41 to 46.

Feature (c) is immediately apparent from Figure 1 and the text in column 2, lines 22 to 28, 61 to 64 and column 3, lines 8 to 12 which makes it clear that the arrangement of the valves is such that the camshaft for the intake valves lies nearer to the central axis l_1.

The formulation of feature (d) follows from the geometrical disclosure given in Figure 2 of the drawings which must be seen together with the reference in column 1, lines 52 to 58. In column 2, line 65 to column 3, line 7 it is explicitly stated that the intake valves are arranged as shown in Figure 2, such that the intermediate intake valve 5' is more offset to the outside with respect to the centre line l_3 than the two intake valves 5 whereby the entirety of intake valves does not interfere with one another.

In column 3, lines 41 to 46 it is again stated that the intermediate intake valve 5' is more offset to the outside, which can only mean that this intermediate intake valve is more offset with respect to the outside than the other intake valves.

From these disclosures seen in combination it can be concluded that feature (d) is not only disclosed with respect to its structure but also with respect to its function.

The skilled person would not encounter any difficulty in deriving feature (e) in view of the disclosures in Figures 1 and 4 and the related text according to which the face of the head of the intermediate intake valve 5' is inclined with respect to a horizontal plane under an angle α_1 which is smaller than the angle of inclination α_2 of the heads of the intake valves 5. The wall portions of the roof of the combustion chamber surrounding the head of the intermediate intake valve 5' have approximately the same inclination as the valve head and must consequently be of "shallow" inclination.

Feature (f) follows directly from the disclosed embodiment, which has three inlet and two outlet valves.

Feature (g) is immediately apparent from Figures 1 and 3.

From the above explanations it follows that the revised claims are in compliance with the conditions of the EPC with respect to disclosure and clarity.

In order to achieve good breathing without obstruction of the cylinder wall in the open position of the valves, a good filling and a high compression ratio in a five-valve engine, all characteristic design parameters as

set out in the claims are conceived and correlated to each other such that by the combination of these conditions the desired results are obtained.

IX. The Respondent requested dismissal of the appeal.

His submissions can be summarised as follows:

In the present case the subject-matter of the new characterising parts of the claims is exclusively based on the drawings. Although these drawings may be considered adequate for illustrating the invention as originally claimed in the patent, these drawings are not sufficiently clear and detailed to form a basis for the subject-matter now claimed. From the five conditions as set out in the decision T 169/83 to be met, the conditions that the features must be directly and unmistakably derivable in terms of their construction and function are not complied with, in particular because the drawings comprise a number of inconsistencies and are not sufficiently clear in themselves in respect of the now claimed features.

Having regard to feature (a) the drawings neither give any clear evidence that the apex of the combustion chamber is formed by a straight intersection line of two slanted walls nor is it evident that such line shaped apex is offset with respect to the cylinder centre bore axis.

Admittedly, features (b), (c) and (g) are shown in the drawings. However, these drawings cannot be considered sufficiently accurate to draw definitive conclusions from them. In particular because of the simplified image of the valve heads as circles instead of ellipses and the uncertainty of the position of the intake valves and exhaust valves with respect to the cylinder centre line,

it cannot be said that these features are unmistakably derivable from the drawings in respect of their structure and function. Figure 2 is clearly not sufficiently accurate to be used as the sole basis for the disclosure of feature d) because of apparent inconsistencies between the distances of the exhaust valves and intake valves with respect to the cylinder wall. The text of the description referred to by the Appellant in support of his submission that the intermediate intake valve 5' has its head nearer to the cylinder wall than the intake valves 5, in fact discloses exactly the contrary of what he derived from this text.

No disclosure whatsoever of feature (e), which is not only unclear in itself but also of indeterminate scope, can be derived from the drawings because no details concerning the shape of the combustion chamber between the valves are derivable therefrom.

In view of these deficiencies in respect of the disclosure of the application as filed, none of the claims is acceptable for reasons of Article 123(2) EPC.

Reasons for the Decision

1. The appeal complies with the requirements of Articles 106 to 108 and Rules 1(1) and 64 EPC. It is admissible.

2. *Amendments*

2.1 The amended single claim according to the main and subsidiary requests comprises in its precharacterising part all the features of the single claim of the patent

as granted with the restriction of the number of intake valves to three and the addition of the feature of "a combustion chamber being disposed at one end of each cylinder bore having an axis (l_1)".

These further limitations are immediately apparent from the originally filed description in combination with the drawings of the preferred embodiment relating to a five valve engine with two exhaust and three intake valves. In this respect also feature (f) of the characterising part of the claim, which specifies two exhaust valves, is thus supported by the original disclosure.

2.2 The features (a) to (e) of the characterising part are essentially taken from the drawings without there being a direct reference to these features in the description of the application as filed.

2.3 With respect to the question of whether these features may be considered as clearly disclosed so that the requirement of Article 123(2) EPC is met, the Board considers that in particular the conclusions arrived at in the earlier Boards of Appeal decisions T 169/83 (OJ EPO, 1985, 193), T 204/83 (OJ EPO, 1985, 310) and T 451/88 (not published in the OJ) referred to in the present proceedings, which conclusions are fully supported by the present Board and the principles of which are considered applicable to the present case, should be taken into account when assessing the extent of disclosure which may be attributed to the drawings.

In accordance with the decision T 169/83 the claims may be limited by features which are clearly shown in the drawings as originally filed and are also clearly, unmistakably and fully derivable from the drawings in terms of structure and function by a person skilled in

the art and must, further, in no way contradict the other parts of the disclosure or be the subject of any waiver (see reasons point 3.5).

From the decisions T 204/83 and T 451/88 it follows that dimensions obtained merely by measuring a diagrammatic representation in a document do not form part of the disclosure (see T 204/83 reasons points 4, 6 and 7 and T 451/88, reasons point 2.4).

2.4 According to the description of the patent, the drawings "illustrate" merely one specific embodiment of the invention (see column 1, lines 52 to 55), which in the Appellant's view should be seen as proof that the drawings are not schematic or diagrammatic representations but constructional drawings so that the conclusion of the decisions T 204/83 and T 451/88 would not apply.

Since "illustrations" cannot be regarded as exact representations of a subject-matter (cf. T 204/83, Reasons, point 7), this term does not necessarily imply, as submitted by the Appellant, that the corresponding figures are constructional drawings. Furthermore, because the Figures themselves contain a number of simplifications, such as the representation of the valve heads as circles instead of ellipses, and no clear designation of the exact position of the longitudinal section of the engine shown in Figure 1, in particular as regards the position of the section plane between the intake and outlet valves as well as the omission of valve seat inserts, the Figures of the patent cannot be considered to meet the required accuracy of detail of constructional drawings.

2.5 However, no condition is derivable directly from the EPC and no exclusion is implied in any of the above-mentioned decisions that features may be taken only from constructional drawings. The principal question as regards a disclosure based on drawings to be decided in the present case is therefore whether the conditions set out in the above decisions, in particular T 169/83, are met with respect to the features (a) to (e) and (g) of the claims of the present requests.

According to the Appellant's explanations, feature (a) of the five requests defines the combustion chamber to have an essentially pent-roof shape with a straight line apex which is offset from the cylinder bore axis l_1 and the centre line l_3 towards the exhaust valve side.

However, the significance of the term "apex" is not limited to a straight line but it may also represent a single point. Furthermore, the exact structure of the wall portions between the valve heads, which form part of the slanted walls and have different angles with respect to each other, is not clear. For this reason none of the claims meets the requirements of Article 84 EPC with respect to clarity.

It is evident that the faces of the heads of the intake and outlet valves are included in the "walls", which define the combustion chamber surface, wherein the term "walls" was considered by the Appellant to mean in the present case "surfaces" rather than a more or less fixed plane. However, even when taking into account the Appellant's interpretation of the term "walls", feature (a) does not necessarily imply for mathematical reasons that the combustion chamber surface between the valve heads follows essentially the same inclination as the intake and exhaust valve heads and that there is a straight line of intersection between these two slanting

walls. Many other combustion chamber surface shapes are possible, for example more rounded symmetrical or even asymmetrical combustion chamber shapes without conflicting with the content of the drawings.

Considering Figure 1, the highest point of the combustion chamber lies between an intake and exhaust valve but because the intake and exhaust valve depicted in Figure 1 are not in the same plane, it is not clear from the drawing or description where exactly the change of section from exhaust to intake valve takes place. Therefore, no conclusions as to the position or shape of the "apex" can be based on this detail of Figure 1.

Also considering Figure 4, relied upon by the Appellant in combination with the text in column 2, lines 7 to 9, to disclose that the highest point of the combustion chamber, positioned at one side of the sparkplug hole, is displaced in the direction of the exhaust valves, this Figure does not allow any conclusion as to whether the "apex" defined in feature (a) of the requests is a line or point (of course with the usual radius to avoid sharp transition).

Furthermore, as was submitted by the Respondent, the height of the highest point shown in Figure 4 when compared to the height of the highest point of the combustion chamber in Figure 1 is different, which would indicate if the drawings were exactly in scale, which was maintained by the Appellant, that the combustion chamber highest point is a point rather than a straight line having a constant height.

Therefore, feature (a) of each of the five requests is not **clearly and unmistakably** derivable from Figures 1-4 as regards structure and function.

2.6 When one feature of a claim does not meet the formal requirements of the EPC, the unacceptability of the claim as a whole already results from this fact alone. Therefore, further considerations with respect to the features (b) to (e) and (g) are, strictly speaking, not necessary.

Nevertheless, the Board considers it to be justified in the present case to draw attention to the fact that it is not only feature (a) that lacks clarity and sufficient support in the application as originally filed but that such a deficiency applies at least also to the features (d) and (e) of all requests and that therefore possible further amendment of the feature (a) alone to bring it in agreement with the requirements of Article 84 and 123(2) EPC would not have rendered the claim acceptable.

From the above considerations in point 2.5 with respect to the lack of any clear disclosure as to the shape of the combustion chamber surface between the valves and lack of disclosure of the technical function of the claimed shape, it follows immediately that also feature (e), relating to the cylinder head wall area around the intermediate valve, has no antecedent in the application as originally filed, in respect of both shape and technical function intended to be achieved by this shape.

Although feature (d) is indeed shown in Figure 2, in view of discrepancies of the distances with respect to the cylinder bore wall of the valve heads of the exhaust valves which are also clearly different when compared to each other, this feature cannot be considered as **unmistakably** derivable from the drawing. Even considering that the skilled person would immediately recognise that the drawing comprised errors he would not

be able to distinguish whether the exhaust valves have the right distances with respect to the cylinder wall or rather the inlet valves because the technical function of the different distances is neither disclosed in the application as filed nor immediately apparent to the skilled person.

As regards function, the Appellant considered it to be clear that avoidance of interference of the intermediate intake valve or inlet gas stream with the cylinder bore wall, for which function reference was made to the description in column 3, lines 1 to 7 and lines 41 to 46, would give the skilled person the required information for interpretation of the different distances of the valve heads with respect to the cylinder wall in Figure 2 in the manner as claimed in feature (d).

However, as will be apparent from the embodiment described in the present patent (see in particular Figure 4) the intermediate intake valve 5' is at an angle α_1 with respect to the cylinder bore centre axis l_1 and thus when this valve is opened the valve head will move **away** from the cylinder wall. Considering the opening of the intake valves 5, which are positioned near the centre line l_3 and are positioned at a larger angle α_2 to the cylinder centre bore axis l_1, a different situation occurs: when these valves are opened the valve heads stay more or less parallel with the cylinder bore wall (at some stage they move even closer to the cylinder bore wall). Therefore, if the larger distance of the valve heads with respect to the cylinder wall were needed with a view to avoiding interferences, it would be the intake valves 5 which should be placed nearer to the centre of the cylinder than the intermediate intake valve 5', a submission also made by the Respondent.

In the absence of any other plausible technical reason derivable from the application as filed, or apparent to the skilled person for other obvious reasons, as to why the intake valves 5 should be positioned nearer to the cylinder bore wall than the intermediate intake valve 5', the condition set out in the decision T 169/83 that the feature in question should be derivable also in respect of its function is not fulfilled. As a consequence, the skilled person did not have any **clear** disclosure to interpret the different side distances of the intake valves shown in Figure 2 in the manner as defined in feature (d).

2.7 In view of the above conclusions with respect to the claim of the main request and the fact that each of the independent claims in accordance with the subsidiary requests includes the same features (a) to (e) of the main request, also the claims in accordance with these subsidiary requests thus comprise subject-matter which has no basis in the application as originally filed, within the meaning of the aforementioned decision T 169/83. Consequently, none of the claims is acceptable for reasons of Article 123(2) EPC and, therefore, the patent cannot be maintained as amended.

Order

For these reasons, it is decided that:

1. The appeal is dismissed.

The Registrar: The Chairman:

N. Maslin H. Seidenschwarz

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