

**Internal distribution code:**

- (A) [ ] Publication in OJ  
(B) [ ] To Chairmen and Members  
(C) [X] To Chairmen  
(D) [ ] No distribution

**Datasheet for the decision  
of 7 November 2006**

**Case Number:** T 1118/03 - 3.2.01  
**Application Number:** 96119945.2  
**Publication Number:** 0779206  
**IPC:** B63H 20/26, F01N 3/28,  
F01N 7/12  
**Language of the proceedings:** EN

**Title of invention:**

Engine exhaust emission control system in outboard engine system

**Applicant:**

HONDA GIKEN KOGYO KABUSHIKI KAISHA

**Opponent:**

-

**Headword:**

-

**Relevant legal provisions:**

EPC Art. 56

**Keyword:**

"Inventive step - no"

**Decisions cited:**

-

**Catchword:**

-



Case Number: T 1118/03 - 3.2.01

**D E C I S I O N**  
of the Technical Board of Appeal 3.2.01  
of 7 November 2006

**Appellant:**

HONDA GIKEN KOGYO KABUSHIKI KAISHA  
1-1, Minami-Aoyama 2-chome  
Minato-ku,  
Tokyo (JP)

**Representative:**

Melzer, Wolfgang  
Patentanwälte  
Mitscherlich & Partner  
Sonnenstraße 33  
D-80331 München (DE)

**Decision under appeal:**

Decision of the Examining Division of the  
European Patent Office posted 29 April 2003  
refusing European application No. 96119945.2  
pursuant to Article 97(1) EPC.

**Composition of the Board:**

**Chairman:** S. Crane  
**Members:** J. Osborne  
G. Weiss

## Summary of Facts and Submissions

I. The appeal is directed against the decision posted 29 April 2003 refusing European patent application 96 11 9945.2 (EP-A-0 779 206) which claims a priority date of 12 December 1995.

II. The following prior art was cited in the European search report:

D1: US-A-5 100 351

D2: US-A-5 118 316.

During the examination procedure the applicant additionally brought the following state of the art to the attention of the examining division:

D3: JP-A-7172392, published 11 July 1995

& D3': US-A-5 554 060, published 10 September 1996

D4: JP-A-6159054, published 7 June 1994

& D4': US-A-5 546 748, published 20 August 1996.

III. During oral proceedings held 7 November 2006 the appellant requested that the decision under appeal be set aside and a patent granted on the basis of the documents according to the main request or first or second auxiliary requests filed with a letter received 9 October 2006.

IV. Claim 1 according to the main request reads as follows:

"A 4-cycle outboard engine (0) comprising an engine exhaust emission control system, said engine (0) including a mounting member (10), an engine block (14) mounted on said mounting member (10), an extension housing (11) coupled to said mounting member (10) and extending downward therefrom, an engine oil pan (15) mounted under said mounting member (10) within said extension housing (11), and an exhaust gas expansion chamber (34) formed in said extension housing (11) for receiving exhaust gas from said engine block (14), said engine exhaust emission control system comprising: an exhaust gas purifying passage (P;P';P") and a catalyst assembly (C;C';C") positioned in said exhaust gas expansion chamber (34), said catalyst assembly (C;C';C") extending down from an upper portion in said extension housing (11) at one lateral side thereof in front and rear directions of the engine, toward a laterally center portion of the extension housing (11) while inclining laterally inwardly, wherein said oil pan (15) has a recess (15<sub>1</sub>) formed in a side wall thereof in the lengthwise direction of the cross section of said outboard engine (0) corresponding to the forward-rearward center line (L-L), and said catalyst assembly (C;C';C") has a catalyst case (55;155;255) which is aligned with said oil pan (15) in said lengthwise direction, and wherein at least a portion of said catalyst case (55;155;255) is disposed in the recess (15<sub>1</sub>) formed in said side wall of said oil pan (15), wherein said engine exhaust emission control system further comprises:

- an exhaust gas introduction pipe (56;156;256) extending from a laterally offset exhaust manifold of said engine into said catalyst case; and

- an exhaust gas discharge pipe (57;157;257) extending from said catalyst case into said exhaust gas expansion chamber,

said introduction pipe (56;156;256) and said discharge pipe (57;157;257) being axially oriented in the lengthwise direction of said engine (0);

wherein said exhaust gas purifying passage (P;P';P") is disposed within said catalyst case and has a catalyst (51;151;251) therein, and said introduction pipe (56;156;256) and said discharge pipe (57;157;257) form at least a portion of said exhaust gas purifying passage (P;P';P"), and

wherein said exhaust gas discharge pipe (57;157;257) is located forwardly of said exhaust gas introduction pipe (56;156;256) in the front and rear directions of the engine, with the inlet (57i; 157i; 257i) of the discharge pipe (57;157;257) being disposed above the outlet (56o; 156o; 256o) of the introduction pipe (56;156;256)."

Claim 1 according to the first auxiliary request has the following wording additional to that of the main request:

"and wherein the catalyst (51;151;251) is located within the exhaust gas purifying passage (P;P';P") either within an end of said exhaust gas introduction pipe (56;156;256) or between the end of the introduction pipe (56;156;256) and the inlet of the discharge pipe (57;157;257)".

Claim 1 according to the second auxiliary request has the following wording additional to that of the main request:

"and wherein the catalyst assembly (C;C';C'') has a closed catalyst case (55,155,255) the inside of which is partitioned into a first chamber (60,160,260) and a second chamber (61,161,261)".

- V. The appellant's submissions as regards inventive step of the subject-matter of the respective claims 1 may be summarised as follows:

D2 discloses a four-stroke, inline outboard motor having a laterally offset exhaust manifold. However, it does not disclose an exhaust gas introduction pipe extending from the manifold and an exhaust gas discharge pipe extending into the exhaust gas expansion chamber. D2 teaches surrounding the exhaust discharge pipe by the oil pan and a water jacket for cooling the exhaust gas but without any emission control apparatus. Introduction of exhaust emission control apparatus reduces the space available in the expansion housing, resulting in an increase in exhaust noise. The side-by-side arrangement of the pipes in the catalyst case as claimed helps to reduce the space requirement. The space which nevertheless is lost is compensated for according to claim 1 of the main request by the arrangement of pipes in the catalyst case to cause the exhaust gas to twice change direction.

The disclosure of D3 is incompatible with the teaching according to D2 and is limited to providing a catalytic converter in a recess in the oil pan in an arrangement

having no expansion chamber. D3 does not teach that the catalyst material should be close to the exhaust manifold so that if the skilled person were to combine the teaching of D2 and D3 he would provide the catalyst case beneath the oil pan. The V-configuration of the engine means that the exhaust is centrally located so there is no teaching regarding lateral placement of the catalyst case. Moreover, there is no disclosure of separate introduction and discharge pipes in the catalyst case. D1 and D4 both relate to two-stroke engines which have no oil pan. The greater space available in the extension housing means that these documents contain no teaching relevant to the problem addressed by the present application. None of the cited prior art documents teaches the particular arrangement of introduction and discharge pipes being aligned in order to improve the reduction of exhaust noise.

The additional features according to claim 1 of the first auxiliary request result in reduced overall length of the catalyst assembly. Placing the catalyst material in the introduction pipe ensures that it is as close as possible to the manifold. D3 gives no detail as regards the interior of the catalyst case. Both D1 and D4 employ the entire space available within the extension housing to provide a silencer so that those arrangements are not of any relevance to the present application. D4 only discloses the sidewalls of a flow path being covered with catalytic material.

The division of the interior of the catalyst case into two chambers as specified by claim 1 according to the second auxiliary request results in expansion and subsequent compression of the exhaust gas to thereby

further reduce the noise level. None of the cited documents discloses such a feature.

## **Reasons for the Decision**

### *Evidence*

1. D3' and D4' both were published after the priority date for the present application. D3 and D4 are in the Japanese language but the drawings are substantially identical with those in D3' and D4' respectively and the appellant has not challenged the equivalence of the respective disclosures. Indeed, it was they who brought all of D3, D4, D3' and D4' to the attention of the examining division. The board therefore relies on the documents D3' and D4' when assessing the respective disclosures of D3 and D4.

### *Inventive step*

2. The application relates to a four-stroke outboard motor having an in-line cylinder arrangement and a laterally offset exhaust manifold. An extension housing mounted beneath the engine houses the drive shaft and the oil pan which forms a reservoir for the engine oil. Exhaust gases are piped from the manifold and released into the extension housing which acts as an expansion chamber to reduce noise. The gases pass through the expansion chamber and are discharged into the water, adjacent the propeller. The application deals with the problem of accommodating a catalytic converter for the exhaust gases within the limited space available in the extension housing.



*Main request*

3. D2 discloses a four-stroke, in-line outboard motor having a laterally offset exhaust manifold and an exhaust pipe which extends shortly beyond the base of the oil pan and then discharges the gases into a downwardly tapering extension housing which thereby functions as an expansion chamber. In order to permit a compact arrangement it was already known to surround at least a portion of the exhaust system with the oil pan, thereby requiring the provision of a cooling jacket to avoid excessive heating of the oil. The teaching of D2 relates to a particular arrangement of this type. However, the exhaust system according to D2 is essentially a simple pipe and no catalytic converter is provided. Of the state of the art available to the board D2 is the most appropriate starting point for consideration of inventive step and its disclosure corresponds to the following wording of claim 1:
- a 4-cycle outboard engine comprising an engine exhaust emission control system, said engine including a mounting member, an engine block mounted on said mounting member, an extension housing coupled to said mounting member and extending downward therefrom, an engine oil pan mounted under said mounting member within said extension housing, and an exhaust gas expansion chamber formed in said extension housing for receiving exhaust gas from said engine block.

3.1 The remaining features of present claim 1 may be summarised as:

- those defining the general layout of the exhaust system extending from the manifold (up to the final four lines); and
- the internal arrangement of the catalyst case (the final four lines).

These features together solve the problem of providing a catalytic converter for a four-stroke, in-line outboard motor.

4. D3 discloses an outboard motor having a four-stroke V-engine. The oil pan is located in the upper portion of the extension housing and because of the narrow V-configuration of the cylinders the exhaust manifold is laterally central. D3 sets out to solve the problem of placing a catalytic converter within the limited space within the extension housing and mentions that the width of this should be minimized in order to reduce resistance to its passage through the water. It solves this problem by locating a catalyst case in a recess in the oil pan and states that this provides the benefit that it allows the catalyst to be housed in the upper portion of the extension housing where it is relatively large. The catalyst case is provided between aligned, vertically oriented introduction and discharge pipes 53 and 62 respectively (the latter reference numeral being evidently incorrectly allocated to the reservoir in figure 6 of D3') which are offset in the fore-and-aft direction. No details are given of the inside of the catalyst case and the discharge pipe 62 extends through

the extension housing to the discharge region adjacent the propeller.

4.1 D3 sets out to solve a problem very similar to that of the present application, namely to provide a catalytic converter for a four-stroke outboard motor. Its teaching is therefore highly relevant to the present application and the skilled person charged with the problem solved by the present application would take it into consideration. The essential teaching of D3 is to locate the catalytic converter adjacent the oil pan, see column 1, lines 49 to 58, column 5, lines 10 to 15 and claim 1. In the detailed embodiment a portion of it is accommodated in a recess in the oil pan. It is clearly visible from the drawing figure 1 that the catalyst case together with the introduction and discharge pipes are positioned so as to be accommodated within the envelope of the downwardly tapering extension housing.

4.2 The detailed solution disclosed in D3 is not directly applicable to the offset location of the exhaust manifold of D2 and the skilled person would have to modify it in order to apply the essential teaching of D3 to an in-line engine. The question is whether the present claim results from modifications which extend beyond the normal activity of the skilled person. In the board's judgement they do not. Determination of the optimum route for the run of an exhaust system from the manifold past the oil pan would be a normal activity of the skilled person. In view of the laterally offset location of the manifold in D2 and the relatively central location of the discharge pipe demanded by the desirable limited width of the extension housing, the

presently claimed laterally inward inclination would be the automatic result of the skilled person's deliberations and he would select a preferred position for the recess accordingly. Similarly, alignment of the catalyst case with the oil reservoir and an offset arrangement of the introduction and discharge pipes, as in D3, would be the normal result of consideration of space requirements. In the detailed embodiment of D3, contrary to that of D2, the discharge pipe extends to the base of the extension housing. However, the location of the catalyst case according to D3 is fully compatible with the arrangement of D2 in as far as it extends no further than the base of the oil reservoir and there is no teaching in D3 as regards any relevance of the length of the discharge pipe to the operation of the catalytic converter. The skilled person would have no reason to modify D2 more than necessary for installation of the catalytic converter. However, since D3 is silent as regards the interior of the catalyst case the skilled person would be forced to search further for a complete solution and thereby would become aware of D1.

- 4.3 D1 relates to the provision of a catalytic converter for an outboard motor and discloses that it is important to avoid water contacting the catalytic material, a condition which can occur under certain circumstances of use of an outboard motor, see column 1, line 56 to column 2, line 2. It teaches that this may best be avoided by an arrangement according to the second and third embodiments in which the introduction pipe extends into a first expansion chamber and the discharge pipe extends from a second expansion chamber separated from the first by a partition which

effectively forms the inlet to the discharge pipe positioned above the outlet of the introduction pipe. This arrangement has the double benefit of improving noise reduction and safeguarding against water reaching the catalytic material (column 5, lines 13 to 17). The skilled person aware of this teaching would use it to complement the combination of D2 and D3. This combination of documents together with the normal activity of the skilled person would result in the subject-matter of present claim 1.

- 4.4 The appellant takes the view that the skilled person when combining the teachings of D2 and D3 would simply place the catalyst housing beneath the oil reservoir. However, that would be contrary to the teaching of D3 which is that the catalyst housing be positioned in the area in which the extension housing is at its widest. Moreover, the skilled person would be aware from his general technical knowledge that the catalyst should be placed close to the exhaust manifold to ensure an elevated temperature for the treatment of gases. This requirement is better satisfied by placing it adjacent the oil pan than below it. The appellant argues that the feature of the inlet of the discharge pipe being above the outlet of the introduction pipe has the effect of improving silencing, thereby compensating for the reduced volume of the extension housing available as expansion room and that this benefit is not derivable from D1. However, the skilled person would be encouraged to follow the teaching of D1 by the effect which is disclosed therein, of avoiding water ingress. Any effect which may additionally be achieved would be a mere bonus which, in accordance with consistent case law of the boards, does not confer inventiveness on an

otherwise obvious solution (see Case Law of the Boards of Appeal, 4<sup>th</sup> Edition 2001, I.D.7.7.1, first paragraph). The appellant furthermore argues that the skilled person when considering the disclosure of D1 would simply apply that teaching to the motor according to D2 and thereby not use the teaching of D3 to provide a catalyst case in addition to a subsequent expansion chamber. The board cannot agree with this view since the particular embodiment according to D1 is directed towards a two-stroke engine for which the space limitations within the extension housing are less severe. When using the teaching of D1 in conjunction with a four-stroke engine, which is explicitly mentioned in column 3, lines 5 to 8, the space required for the oil reservoir would require that the arrangement according to D1 be provided in a smaller space, thereby needing to employ the teaching of D3.

5. On the basis of the foregoing the board concludes that the subject-matter of claim 1 according to this request does not involve an inventive step (Article 56 EPC).

*First auxiliary request*

6. The subject-matter of claim 1 according to this request has the additional features that the catalyst is located within the exhaust gas purifying passage either within an end of the exhaust gas introduction pipe or between the end of the introduction pipe and the inlet of the discharge pipe. These features further specify the arrangement of the interior of the catalyst housing as dealt with in respect of the main request. The board has already explained in respect of the main request why the skilled person would turn to the teaching of D1.

This same reasoning applies equally in respect of choosing where in the catalyst housing the catalyst material is to be placed. In all embodiments of D1 it is placed in the inlet end of the introduction pipe. The additional subject-matter according to this request therefore is rendered obvious for the reasons already given in respect of the main request.

*Second auxiliary request*

7. The subject-matter of claim 1 according to this request differs from that of the main request by the addition of the features that the catalyst assembly has a closed catalyst case, the inside of which is partitioned into a first chamber and a second chamber. D1 already discloses these features as having the effect of improving both protection of the catalyst material from water contamination and reduction of exhaust noise (column 5, lines 13 to 17). These additional features are therefore also rendered obvious for the reasons already given in respect of the main request.

**Order**

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

The appeal is dismissed.

The Registrar:

The Chairman:

A. Vottner

S. Crane