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D E C I S I O N
of 26 July 1994

Case Number: T 0295/94 - 3.2.4

Application Number: 89500032.1

Publication Number: 0333623

IPC: F01L 1/28

Language of the proceedings: EN

Title of invention:
Double - flow valve for internal combustion engines

Applicant:
Gonzalez Hernandez, Angel

Opponent:
-

Headword:
-

Relevant legal norms:
EPC Art. 56

Keyword:
"Inventive step - no"

Decisions cited:
T 0079/82

Catchword:
-



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Boards of Appeal

Chambres de recours

Case Number: T 0295/94 - 3.2.4

D E C I S I O N
of the Technical Board of Appeal 3.2.4
of 26 July 1994

Appellant: Gonzalez Hernandez, Angel
c/Ramonet
num. 12 - 3 A
E-28033 Madrid (SP)

Representative: -

Decision under appeal: Decision of the Examining Division of the European Patent Office dispatched on 1 December 1993 refusing European patent application No. 89 500 032.1 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: C. A. J. Andries
Members: H. A. Berger
J. P. B. Seitz

Summary of Facts and Submissions

I. The Appellant (Applicant) lodged an appeal, received on 1 February 1994, against the decision of the Examining Division, dispatched on 1 December 1993, to refuse the application No. 89 500 032.1, published under the publication No. 0 333 623. The fee for appeal was paid on 1 February 1994. The statement setting out the grounds of appeal was received on 30 March 1994.

II. The Examining Division held that the application did not meet the requirements of Articles 52(1) and 56 EPC, having regard to the following prior art documents:

(D1): US-A-2 303 324

(D2): GB-A- 577 740

(D3): GB-A- 150 457

III. In a communication the Board drew attention to the additional documents

(D4): GB-A- 104 130

(D5): GB-A- 816 392

Oral proceedings were held on 26 July 1994 during which the Appellant filed several documents (1. letter of Mr Patterson: University of Michigan, dated 18 February 1994; 2. letter of Laboratorios Industriales, dated 15 October 1991; 3. page 6 of a Spanish technical booklet) to show the importance of the application and to support the arguments for inventive step.

IV. The wording of Claim 1 according to the main request is as follows:

"A two-way valve for internal combustion engines, wherein there is a main body which is bowl shaped, and containing a cylindrical hollow, wherein at the top of said hollow, it connects with two cylindrical bars placed symmetrically, and at the bottom of said hollow, inside, there is a truncated cone shaped seating area which receives the adjustment of a standard design valve, outside said hollow at the bottom there is an area which extends outwardly from the bowl, and which is machined on top into a truncated cone, which serves to adjust into the body of the cylinder head, said symmetrical cylindrical bars projecting toward the top of the cylinder head, to receive the thrust from two cams on a camshaft, this two-way valve also having a cylindrical area with at least one circular groove into which an expansion ring is adjusted and which expands against a cylindrical zone in the cylinder head."

The wording of Claim 1 of the auxiliary request is as follows:

"Internal combustion engine with a cylinder head and a double-flow valve, whereby the double-flow valve comprises a hollow body (5) with a large head comprising a first truncated cone shaped outer seating zone (1) and a first truncated cone shaped inner seating zone (2), and an internal valve (3) coaxially arranged within the hollow body (5) and the head of which comprises a second truncated cone shaped outer seating zone (3a), whereby the first truncated cone shaped outer seating zone (1) of the hollow body (5) cooperates with a corresponding second truncated cone shaped inner seating zone provided on the cylinder head and the second truncated cone

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shaped outer seating zone (3a) of the internal valve (3) cooperates with the first truncated cone shaped inner seating zone (2) of the hollow body (5) for opening and closing the two passages respectively defined between the outer periphery of the hollow body (5) and the cylinder head and in the substantially cylindrical through the cavity of the hollow body (5), the hollow body (5) comprising an upper cylindrical area in sliding contact with a corresponding inner surface of the cylinder head, two opposingly arranged rods (8,9) projecting from the top portion of this upper area through cylindrical guides made in the cylinder head, each of which serving as a bearing zone to simultaneous action cams (15,16) provided on a camshaft (14), whereby the stem of the internal valve serves as a bearing zone to a third cam (17) disposed on the camshaft (14) between the outer cams (15,16), characterized in that the upper cylindrical area of the hollow body is provided with at least one groove into which a sealing ring (4) is fitted, the two rods (8,9) are formed with the hollow body (5) and each of the two rods (8,9) and of the internal valve stem (10) is provided at its upper end with a washer against which a separate coil spring (11,12,13) supported on the upper deck of the cylinder head, is based, subjected the hollow body (5) and the internal valve (3) to a returning action without interference of the springs within the respective flows of gas."

- V. The Appellant argued as follows: It might be true that some of the features of the invention are known per se, however the prior art documents, in particular document D4, disclose valves which would not function in modern high speed engines. Document D4 is a patent based on an application of 1916.

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To prove the functioning of the valve device of the application the appellant placed at the Board's disposal a video film about an engine provided with said valve device. The appellant points out that a lot of details must be considered when constructing a two flow valve for an engine which guarantees correct functioning for a realistic time period. One of the problems in a fuel combustion engine is the increased temperature and the heat transfer during operation. The guides for the valves must prevent leakage between the inlet and outlet passages on the one hand and must reliably function during all engine running conditons without sticking on the other hand.

With regard to documents D1 and D3 the appellant argues that the positions of the springs disclosed therein render the valve devices less reliable than that of the application. The springs shown in document D2 are hair pin type springs provided in the flow passage of one of the gases and impede the separation of the two flows. These springs are of a completely different design and installation to those of the application.

VI. The appellant requested that the decision under appeal be set aside and a patent be granted on the basis of the following documents:

Main request:

Claims: 1 to 7 filed with the letter of 18 May 1992;

Description: Pages 2 to 9 as originally filed;

Drawings: Figures 1 to 6 as originally filed.

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Auxiliary request:

Claims: 1 to 3 filed with the letter of 25 March 1994.

Reasons for the Decision

1. The appeal is admissible.

2. *Closest State of the Art*

2.1 Claim 1 of the main request

The expression "two way valve" used in Claim 1 of the main request must be interpreted as a double-flow valve, according to the disclosure of the originally filed application.

Document D4 discloses a double-flow valve for internal combustion engines wherein the main body (housing 7) is bowl shaped, containing a cylindrical hollow body (hollow tubular exhaust valve 2), wherein at the top of said hollow body (2) two cylindrical bars (see drawing at reference number 5) are located (see description line 9, "rods"), which are placed symmetrically with regard to the center line of the hollow body. At the bottom of said hollow body (2), inside, there is a truncated cone shaped seating area (3A) which receives the adjustment of a standard design valve (1). Outside said hollow body (2), at the bottom, there is an area (at 3B) which extends outwardly from the bowl, and which is machined on top into a truncated cone (see drawing) which serves to adjust into the body of the cylinder head (see description lines 17 and 18). Said symmetrically located cylindrical bars (5) project toward the top of the cylinder head (housing 7 is part

of the cylinder head), to receive the thrust from a driving mechanism (see description line 6, "exhaust valve of the beat or lift type").

The subject-matter of Claim 1 of the main request differs therefrom in that the driving mechanism is realized by a camshaft with cams and in that the double-flow valve has a cylindrical area with at least one circular groove into which an expansion ring is adjusted and which expands against a cylindrical zone in the cylinder head.

2.2 Claim 1 of the auxiliary request

The double-flow valve disclosed in document D4 is part of an internal combustion engine (see description, line 5) with a cylinder head. The double-flow valve comprises a hollow body (2) with a large head comprising a first truncated cone shaped outer seating zone (3B) and a first truncated cone shaped inner seating zone (3A), and an internal valve (1) coaxially arranged within the hollow body (2) and the head of which comprises a second truncated cone shaped outer seating zone (see drawing). The first truncated cone shaped outer seating zone (3B) cooperates with a corresponding second truncated cone shaped inner seating zone provided on the cylinder head (description lines 17 and 18), whereas the second truncated cone shaped outer seating zone of the internal valve (1) cooperates with the first truncated cone shaped inner seating zone (3A) of the hollow body (2) for opening and closing the two passages respectively defined between the outer periphery of the hollow body (2) and the cylinder head and the substantially cylindrical through-passage of the hollow body (2). The hollow body (2) comprises an upper cylindrical area in sliding contact with a corresponding

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inner surface of the cylinder head (7). Two opposingly arranged rods (5) project from the top portion at that upper cylindrical area through cylindrical guides (see drawing) made in the cylinder head (description, line 20), each of which serving as a bearing zone to the action of a driving mechanism. The driving mechanism also acts onto the stem of the internal valve (1). The two rods (5) are formed with the hollow body (2) (see drawing). Each of the two rods (5) and the internal valve stem are provided at their upper ends with a washer against which a separate coil spring supported on the upper part of the cylinder head (7), is based, subjecting the hollow body (2) and the internal valve (1) to a returning action without interference of the springs within respective flows of gas.

The subject-matter of Claim 1 of the auxiliary request differs therefrom in that the driving mechanism is realized by a cam shaft with two cams and a third cam therebetween and in that the upper cylindrical area of the hollow body is provided with at least one groove into which a sealing ring is fitted.

- 2.3 The valve devices disclosed in documents D1, D3 and D5 comprise only one spring for the outer valve (hollow body) positioned concentrically to the shaft of the inner valve. The valve device of document D2 comprises hair pin springs positioned in a passage of one of the gases. The valve device of the present application however comprises three separate coil springs positioned outside the gas passages. The appellant sees therein an essential difference with respect to documents D1, D2, D3 and D5.

2.4 Since document D4 discloses a valve device in which the outer valve (hollow body) is provided with two symmetrically arranged rods and each of the rods and the shaft of the inner valve is provided with a separate coil spring outside of the gas flow, the Board considers document D4 as the closest state of the art document having regard to the content of the application.

3. *Problem and Solution*

3.1 Problem

Using document D4 as the most relevant prior art document, the objective problem is to improve sealing of the guide device of the outer valve.

3.2 Solution

The above stated sealing problem is solved by a cylindrical area with at least one circular groove into which a sealing ring is fitted.

3.3 With regard to the cam shaft which is part of the embodiment as claimed and which is not shown or described in document D4 a further problem may deal with a particular engine construction which however is independent of the sealing problem stated above.

4. *Inventive Step*

4.1 It is generally known to actuate the inlet and outlet valves directly by cams of a cam shaft (see for instance document D2) or by rocker arms (see for instance document D3). Though a cam shaft is not expressly mentioned in document D4, it must be considered that the selection of one of these generally used possibilities

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is normal practice in the technical field of internal combustion engines. Such a selection is made according to circumstances when designing an engine. There is nothing in the valve device of document D4 which would hinder the use of the direct cam drive. On the contrary, the presence of three independent coil springs in combination with the specific construction shown in the drawing rather points to the use of a cam actuation for each rod, be it a direct actuation or an indirect actuation. Therefore, the provision of a cam shaft with a cam for each of the rods of the outer valve and a cam for the inner valve which cam is positioned between the cams of the outer valve, which is known from document D2, is obvious for the skilled person. The selection of the cam drive is independent from the sealing problem stated in section 3.1 above.

- 4.2 The necessity to prevent uncontrolled mingling of the exhaust gas with the incoming gas is obvious to a person skilled in the art having in mind a reliable proportion of air/fuel mixture and therewith an acceptable fuel combustion. Also this is known from document D4 (see lines 22 to 25) which provides therefor a tubular stem as part of the exhaust valve. If the necessary clearance between the cooperating parts, i.e. a guide skirt member of the housing (7) and the tubular stem of the outer valve, does not guarantee sufficient sealing between the inlet and outlet passages, it is obvious for the skilled person to search for other solutions and to provide in accordance with the disclosure of documents D3 (sealing ring 18) and D5 (see page 2, lines 45 to 51) an usually elastic sealing ring in a groove of the cylindrical sliding area (tubular stem) of the hollow body.
- 4.3 The argument of the appellant that document D4 does not show an orifice in the ring chamber surrounding the

outlet valve which allowed gas flow, is not pertinent since in document D4 the outer valve is referred to as an exhaust valve (2). An exhaust gas outlet port is an implicit part of an exhaust device otherwise the engine would not function.

The age of document D4 pointed out by the appellant may only be an indication for inventive step if a need for the solution of an unsolved problem had existed for the whole time between the date of the document D4 and that of the invention. The documents which are available to the Board however do not show such a need (see decision T 79/82, paragraph 4), on the contrary they disclose the possibility to solve the sealing problem by the use of a sealing ring.

The argument of the appellant that the valve device of the application functions without difficulties in modern engines is not disputed by the Board, however it cannot overcome the objection of the Board with regard to lack of inventive step. The valve device on which the application is based may comprise an optimization of parts which are already known or are obvious in the field of internal combustion engines. Such a general optimization using modern technical possibilities is normal practice and cannot be patentable without inventive features thereof. Such features however are not disclosed in the originally filed application.

Furthermore, the Board wants to emphasize that the existence of an inventive step is examined with respect to the wording of Claim 1 (in view of the description and drawings of the application) and not with respect to existing and functioning embodiments. It is possible that there is a clear distinction between the more generalized wording of the application as filed on the

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one hand and the very specific construction of the working embodiments on the other hand, which are provided with a number of sophisticated details.

5. Claims 1 of the main and of the auxiliary request do not involve an inventive step (Art. 56 EPC) and are therefore not allowable under Article 52(1) EPC. Claims 2 to 7 of the main request and Claims 2 and 3 of the auxiliary request which are dependent on the corresponding Claims 1 fall with these Claims 1.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:



N. Maslin

The Chairman:



C. Andries

Brj
M 8/85

