

BESCHWERDEKAMMERN
DES EUROPÄISCHEN
PATENTAMTS

BOARDS OF APPEAL OF
THE EUROPEAN PATENT
OFFICE

CHAMBRES DE RECOURS
DE L'OFFICE EUROPEEN
DES BREVETS

Internal distribution code:

- (A) Publication in OJ
(B) To Chairmen and Members
(C) To Chairmen

D E C I S I O N
of 13 October 1995

Case Number: T 0012/94 - 3.2.4

Application Number: 87200489.0

Publication Number: 0238146

IPC: F02F 3/00

Language of the proceedings: EN

Title of invention:
Pistons

Patentee:
AE PLC

Opponents:
Klöckner-Humboldt-Deutz AG
MAHLE GMBH

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Closest prior art"
"Inventive step - no"

Decisions cited:
T 0439/92

Catchword:
-



Case Number: T 0012/94 - 3.2.4

D E C I S I O N
of the Technical Board of Appeal 3.2.4
of 13 October 1995

Appellant:
(Proprietor of the patent) AE PLC
Cawston House
Cawston
Rugby
Warwickshire CV22 7SB (GB)

Representative:
Hadfield, Robert Franklin
T&N plc
Group Patent Department
Bowdon House
Ashburton Road West
Trafford Park
Manchester M17 1RA (GB)

Respondent:
(Opponent 01) Klöckner-Humboldt-Deutz AG
Patentwesen PR-P
D-51057 Köln (DE)

Representative: -

Respondent:
(Opponent 02) MAHLE GMBH
Pragstrasse 26 - 46
D-70376 Stuttgart (DE)

Representative: -

Decision under appeal: Decision of the Opposition Division of the
European Patent Office dispatched on 22 November
1993 revoking European patent No. 0 238 146
pursuant to Article 102(1) EPC.

Composition of the Board:

Chairman: C. A. J. Andries
Members: M. G. Hatherly
J. P. B. Seitz

Summary of Facts and Submissions

I. The decision of the opposition division to revoke European patent No. 0 238 146 (resulting from application No. 87 200 489.0) was dispatched on 22 November 1993.

An appeal against this decision was received on 11 January 1994 and the fee was paid the same day. The statement of grounds of appeal was received on 17 March 1994.

II. Claim 1 filed with the letter of 17 March 1994 reads as follows:

"A piston for an internal combustion engine, the piston including a crown portion (11), and a skirt portion (12), the crown portion comprising a steel or a cast iron and having gudgeon pin bosses (18), the skirt portion (12) is articulated to the crown portion (11), and has in combination gudgeon pin bosses (30,50) located radially outwardly of the crown gudgeon pin bosses (18), together with two pairs of axially spaced, and circumferentially extending bearing lands (32,33;51,52), the circumferential extremities of the bearing lands are supported by struts (34,35;53,54) extending from the skirt gudgeon pin bosses (30,50), and each pair of axially spaced apart bearing lands has therebetween a circumferentially extending aperture through the skirt portion."

III. Oral proceedings were held on 13 October 1995.

IV. The following publications played a part in the appeal proceedings:

D1: H. Hitziger "Zur Frage der Entwicklung eines Stahlkolbens für Hochleistungsdieselmotoren", 1981, Fortschritt-Berichte der VDI Zeitschriften, Reihe 6, Nr. 91, VDI-Verlag GmbH Düsseldorf (ISSN 0506-3116)

D2: GB-A-163 863

D4: GB-A-2 164 419

V. The opposition division found that the subject-matter of claim 1 was novel but not inventive, based on the obvious combination of documents D2 and D4.

In the statement of grounds of appeal the appellants argued essentially as follows:

- Compared with the fully skirted piston of document D2, the axially and circumferentially spaced skirt bearing lands of the present piston mean less rubbing area and thus lower friction, the apertures between the bearing lands allow oil passage for better bearing land lubrication, and the more conformable skirt construction allows a closer fit in the cylinder thus reducing noise.
- On the other hand, compared with the unitary piston of document D4 with its axially and circumferentially spaced skirt bearing lands, the articulated construction of the present piston diminishes the heat transfer from crown to skirt and removes significant side thrusts, allowing a closer fit of the skirt in the cylinder and thus less noise.

- The piston of document D2 is not light-weight in modern terms and differs constructionally, e.g. in the mode of lubrication, from the piston of document D4 so that the person skilled in the art would not be led to combine them.

- There is a compromise between lightness and closeness of fit because an articulated piston is heavier than a unitary piston. If the sole objective were lightness then the piston of document D4 would be adopted and that of document D2 rejected.

In the oral proceedings all the parties accepted the board's preliminary opinion expressed in a communication that it was document D1 (e.g. Figure 47), not document D2, which disclosed pistons closest to the present invention. The appellants then argued that, for similar reasons to those presented against the combination of documents D2 and D4, the combination of the teachings of documents D1 and D4 would not be made by the skilled person.

The latter view was opposed by respondents I and II.

- VI. The appellants request that the decision be set aside and the patent maintained on the basis of claims 1 and 2 filed with the letter of 17 March 1994 and a description and drawings amended in line therewith.

Both respondents I and II request dismissal of the appeal.

Reasons for the Decision

1. The appeal is admissible.

2. *Novelty*

After examination of the cited documents, the board is satisfied that none of them discloses a piston having all the features set out in claim 1. This was not in dispute in the appeal proceedings. The subject-matter of claim 1 is thus to be considered as novel within the meaning of Article 54 EPC.

3. *Closest prior art, problem and solution*

3.1 The board considers that to start from the old piston construction of document D2 from 1921 to develop a modern piston would be the result of an ex post facto analysis.

The piston closest to that of the present invention (i.e. a realistic starting point for the present invention) is, in the board's view, that shown in Figure 47 on page 73 of document D1. It is described on page 73, line 5 to page 74, line 7 and shown in more detail on page 91 ("Anlage 6"). Its trial ("Versuch 3") is set out on page 77, line 22 to page 78, line 15. The piston has a steel crown articulated by a gudgeon pin to an aluminium shaft.

3.2 The board sees the objective problem addressed by the invention as being to develop the piston of the starting point to arrive at a better piston.

The solution contained in the present claim 1 involves axially and circumferentially spaced skirt bearing lands which reduce weight, reduce skirt friction, improve skirt lubrication and make the skirt more conformable allowing a closer fit in the cylinder for reducing noise.

The board is thus satisfied that the objective problem can be solved by the features of the present claim 1 and in particular by the features of its lines 8 to 16.

3.3 When considering inventive step it should be emphasised that a person skilled in the art can start from any realistic starting point (i.e. one of the existing pistons). After weighing up the advantages and disadvantages of the different basic piston types, he chooses as his starting point one piston of a specific basic piston type. However he is thereafter bound in the development of his starting point piston by the choice of the basic piston type he has already made. It does not seem to be obvious but rather seems to be the result of an ex post facto analysis to choose first a specific basic piston type, thereby rejecting the other types, and then during its development to switch back to one of the basic piston types which he had rejected as a starting point (see decision T 439/92, sections 6.2.1 to 6.2.4). However during the development the skilled person is not prevented from using a solution proposed for a piston of a different basic type to solve a problem which occurs generally in other basic piston types.

4. *Inventive step*

4.1 The starting point for the present invention is an articulated piston. Section 4.2.2.3 on page 41 of document D1 explains the advantages of articulated

pistons. The separation of crown and skirt separates their functions and allows them to be made of different materials. The crown is thermally separated from the skirt so that the latter can have a close fit in the cylinder. Side thrusts on the shaft are not transmitted to the crown thus benefiting the piston rings.

- 4.2 In the second paragraph of page 13 of document D1 the author states that in Chapter 4 the requirements for a piston are analyzed and assigned to individual piston parts, the respective most suitable constructions are worked out and the individual solutions are then combined into a piston whose testing is set out in Chapter 5.

This method of working is precisely how the person skilled in the art is expected to work. Since in an articulated piston the functions of the crown and shaft are separated, he will view them separately and will feel free to try to modify either one or both of them. It is worthwhile to note that Figure 38 on page 58 of document D1 shows various possibilities for the bearing areas once the piston has been separated into gas force and side thrust carrying parts. Thus it is already clear from document D1 itself that the skilled person would not feel himself bound by the specific skirt arrangement shown in Figure 47.

- 4.3 One disadvantage of an articulated piston compared with a unitary piston is repeatedly emphasised by the appellants, namely that, size for size and material for material, it necessarily has a higher weight e.g. for the piston of Figure 47 the increase is given in line 3 of page 74 as being 7%. Nevertheless the knowledge of this weight increase would not lead the skilled person starting from the articulated piston of document D1 to make it into a unitary piston because this would mean

that he would lose the many advantages given by an articulated piston (see section 4.1 above). Moreover he would realise that an articulated piston allows the use of a heavier, heat resistant material for the crown and a lighter material for the skirt.

As already put forward in section 3.3 above, a person skilled in the art is free to take into account as a starting point each existing piston. However, this said, weight reduction of pistons is one of the constant wishes of the person skilled in the art so he would closely examine any proposal which might achieve this.

4.4 Figures 1 and 2 of document D4 show two pairs of axially spaced, and circumferentially extending arcuate skirt portions 22a,b whose circumferential extremities are supported by struts 21a-d extending from skirt gudgeon pin bosses 12a,b, each pair of axially spaced apart arcuate skirt portions 22a,b having therebetween a circumferentially extending aperture through the skirt.

4.5 The piston of document D4 is clearly stated on page 2, lines 33 to 35 to be "light in weight because the traditional full cylindrical skirt is dispensed with." The skilled person would thus be led to try to modify the piston of document D1 using the teachings of document D4.

4.6 Moreover document D4 contains several other passages comparing fully skirted pistons with pistons having axially and circumferentially spaced skirt bearing lands:

- Lines 14 to 22 of page 1 state that the generally cylindrical skirt "has the disadvantage that the oil film between the skirt and the associated cylinder or liner is of substantial area and so the

frictional forces generated by such film are also substantial". Concerning the D4 piston, lines 39 to 43 on page 2 state that "the arcuate skirt portions provide a reduced area of contact between the piston and the associated cylinder or liner, in comparison with a piston having a cylindrical skirt".

- Lines 44 to 50 on page 2 state that the "arcuate skirt portions are adequately lubricated at all times ... due partly to the provision of wide gaps 25 which allow oil ... to pass onto the cylinder liner wall."
- Lines 35 to 39 on page 2 state that "Due to its conformability, the piston can be fitted more closely within an associated cylinder or liner and this tends to reduce the noisiness of the engine."

4.7 Document D4 thus discusses weight and three other problems associated with fully skirted pistons, it gives the features which solve these problems and explains why these features solve these problems.

Thus the document would be of great interest to the piston designer wishing to improve the piston of Figure 47 of document D1 in one or more aspects, particularly those linked with its cylindrical skirt. He would be led to apply, or at least to try to apply, the skirt design of document D4 to the articulated piston of document D1 in order to obtain the advantages linked to that specific skirt design and which are already set out in document D4, thereby arriving at a piston satisfying the definition in the present claim 1 and having the advantages of the invention.

4.8 The appellants argue that the pistons of documents D1 and D4 are not combinable because they are in different fields. However the board considers that the skilled person knows each basic type well (indeed they are both discussed in one and the same document, namely D1) and will choose one or the other according to need and how he weighs their relative advantages and disadvantages.

The appellants further argue that the invention is a compromise between light-weight and close fit and that it is due to the weight saving skirt construction that the weight penalty due to the use of an articulated piston can be accepted. However, starting from the piston of document D1, the document D4 teaches the skilled person that, if he uses its skirt construction, he can both lower the weight and improve the fit.

4.9 For these reasons, the board concludes that the subject-matter of claim 1 lacks an inventive step within the meaning of Article 56 EPC.

5. The appellants' request must therefore be refused.

Order

For these reasons it is decided that:

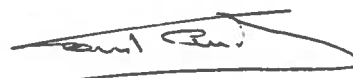
The appeal is dismissed.

The Registrar:



N. Maslin

The Chairman:



C. Andries

