Internal distribution code:

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

Datasheet for the decision of 25 September 2025

Case Number: T 0963/23 - 3.2.05

Application Number: 16761436.1

Publication Number: 3273113

IPC: F16J9/26, F02F5/00, C23C14/06

Language of the proceedings: EN

Title of invention:
Piston ring

Patent Proprietor:
Kabushiki Kaisha Riken

Opponent:
Mahle International GmbH

Relevant legal provisions:
EPC Art. 100(a), 54, 56
RPBA 2020 Art. 12(3), 12(5)

Keyword:

Novelty - main request (yes)
Inventive step - main request (yes)
Statement of grounds of appeal - reasons set out clearly and concisely (no)
Discretion not to admit submission - requirements of Art. 12(3) RPBA met (no) - submission admitted (no)

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

Boards of Appeal

Chambres de recours

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0

Case Number: T 0963/23 - 3.2.05

D E C I S I O N
of Technical Board of Appeal 3.2.05
of 25 September 2025

Appellant: (Opponent)	Mahle International GmbH Pragstr. 26-46 70376 Stuttgart (DE)
Representative:	Einsiedler, Johannes PM&L Patentanwaltskanzlei Dr. Einsiedler Am Herrnberg 34 83209 Prien am Chiemsee (DE)
Respondent: (Patent Proprietor)	Kabushiki Kaisha Riken 8-1, Sanbancho Chiyoda-ku Tokyo 102-8202 (JP)
Representative:	Arnold & Siedsma Bezuidenhoutseweg 57 2594 AC The Hague (NL)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 5 April 2023 rejecting the opposition filed against European patent No. 3273113 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	P. Lanz
Members:	C. Kujat
	B. Burm-Herregodts

Summary of Facts and Submissions

I. The appeal lies from the decision of the opposition division of the European Patent Office rejecting the opposition against the European Patent No. 3 273 113 (the patent) pursuant to Article 101 (2) EPC.

In the decision under appeal, the opposition division came to the conclusion that the grounds for opposition under Article 100(a) EPC in conjunction with Articles 54 and 56 EPC did not prejudice the maintenance of the patent as granted. The opposition division inter alia relied on the following pieces of evidence:

D1 DE 10 2012 005 174 A1
D2 DE 198 25 860 A1
D3 DE 10 2011 089 284 A1
D8 US 6,161,837

The following further pieces of evidence from the examination proceedings were mentioned in the statement of grounds of appeal:

D9 US 2012/205876 A1
D10 US 2009/226756 A1
D11 US 2011/100318 A1
D12 US 2014/137733 A1

II. In preparation for oral proceedings, the Board issued a communication pursuant to Article 15(1) RPBA dated 25 March 2025 setting out its provisional opinion on the relevant issues. Oral proceedings were duly held in the presence of both parties on 25 September 2025.

III. The appellant (opponent) requested that
- the decision under appeal be set aside and that the patent be revoked,
- the auxiliary requests not be admitted into the proceedings.

IV. The respondent (patent proprietor) requested that
- the appeal be dismissed,
- or alternatively that the decision under appeal be set aside and the case be remitted to the opposition division for further prosecution,
- or further alternatively that the decision under appeal be set aside and the patent be maintained as amended on the basis of the claims of auxiliary requests 1 to 23 filed with the reply to the notice of opposition of 19 February 2022 or on the basis of the claims of the auxiliary requests 0A to 23A filed with the letter of 8 February 2023,
- documents D9 to D12 not be admitted into the proceedings.

V. Claim 1 of the main request (patent as granted) reads as follows (the feature references used by the board are indicated in square brackets):

"**[M1]** A piston ring (1) comprising:
[M2] an annular main body (2) having
[M2.1] a pair of side faces (2a, 2b),
[M2.2] an outer peripheral face (2d), and
[M2.3] an inner peripheral face (2c); and
[M3] a hard coating (11)
[M3.1] provided on the outer peripheral face (2d),
[M4] wherein the piston ring satisfies a following Formula (1) $0.003 \leq (L * h_1)/W \leq 0.151$ (1)

[M4.1] wherein a width of the main body (2) in a first direction (D1) perpendicular to the pair of side faces (2a, 2b) is set to h_1 mm,
[M4.2] a width of the hard coating (11) in the first direction (D1) is set to W mm, and
[M4.3] a maximum thickness of the hard coating (11) in a second direction (D2) perpendicular to the outer peripheral face (2d) is set to L mm, and
[M5] wherein the thickness of the hard coating (11) from a vertex (11a) of the hard coating (11) in the second direction (D2) to a position (11b, 11c) 0.3 mm away from the vertex (11a) is 3 µm or more and 10 µm or less."

Claim 15 of the main request (patent as granted) reads as follows:

"Method of forming the piston ring according to claim 14 comprising the following steps:
- providing the barrel face shape and an inlaid protrusion on the outer peripheral surface (2d) of the main body (2);
- forming the hard coating (11) on said outer peripheral surface (2d) by a physical vapour deposition (PVD) method;
- thereafter, removing the inlaid protrusion and performing barrel face finishing of the hard coating (11), therewith bringing the hard coating (11) into a substantially convex shape and forming the end portion of the outer peripheral surface (2d)."

VI. The parties' relevant arguments can be summarised as follows.

Main request - Novelty

Appellant (opponent)

With regard to feature M5 of claim 1 of the main request, the thickness of the piston ring is irrelevant and also not claimed. Document D1 discloses a thickness of the piston ring within the claimed range, because a skilled person reads the typical sizes of piston rings for automotive engines of 1.0 to 1.2 mm or 0.77 to 2 mm into that document. Further, paragraph [0035] of document D1 discloses a thickness of the hard coating within the range of 5 µm to 30 µm. Assuming that the thickness of the hard coating is relatively constant in an area between the vertex and a position 0.3 mm away from the vertex, the thickness of the hard coating of 5 µm discloses feature M5 in document D1. During the oral proceedings before the board, the appellant argued that paragraph [0035] of document D1 discloses a preferred thickness of the hard coating of 20 µm. During the oral proceedings before the board, the appellant also argued that the thickness of the piston ring is implicitly disclosed in document D1 due to the references to an internal combustion engine or a compressor in paragraphs [0001], [0014], [0016], [0026], the substantial forces mentioned in paragraph [0002], the millions of strokes according to paragraph [0003], the resistance to fatigue and cracks in paragraphs [0010] to [0012], and due to the test conditions of running a diesel engine for 500 hours according to paragraph [0021] of the document. During the oral proceedings before the board, the appellant

also argued that the opposition division had acknowledged on page 7 of the impugned decision that typical motor car engine piston rings have thicknesses between 1 and 1.2 mm or between 0.77 and 2 mm, as stated in paragraph [0040] of the patent. With regard to the intermediate layer 1 in figure 6 of document D1, the appellant declared during the oral proceedings before the board that they had nothing to add.

In the statement of the grounds of appeal the appellant, by way of a mere reference, pointed to its novelty objections in view of documents D2 or D3 as set out in its notice of opposition of 31 August 2021 and its letter to the opposition division of 9 December 2022.

Document D8 discloses an upper layer 20 as hard coating on the outer surface of the piston ring, and thus, this coating must be located at a position 0.3 mm away from the vertex. Further, document D8 discloses a thickness of the hard coating layer within the range of 4 µm to 50 µm in column 1, lines 60 to 62. A thickness of the hard coating of 5 µm is within the range of features M4 and M5. During the oral proceedings before the board, the appellant argued that document D8 discloses a thickness of the hard coating layer 20 of between 5 µm and 30 µm in column 4, line 32. With regard to the intermediate layer 18 in figure 3 of document D8, the appellant declared during the oral proceedings before the board that they had nothing to add.

Respondent (patent proprietor)

Feature M5 is not disclosed in document D1, because the document fails to disclose the relevant dimensions of the piston ring. No evidence was provided by the

appellant that piston rings for internal combustion engines are thicker than 1 mm. During the oral proceedings before the board, the respondent argued with regard to the intermediate hard chromium layer 1 in figure 6 in document D1 that the outer layer 3 is not provided on the outer peripheral face of piston ring body 10.

With regard to documents D2 and D3, the previous argumentation in oppostion is maintained.

Document D8 also fails to disclose the relevant dimensions of the piston ring, and thus, a position 0.3 mm away from a vertex is not disclosed in that document. During the oral proceedings before the board, the respondent argued with regard to the intermediate layer 18 in figure 3 of document D8 that the upper layer 20 is not provided on the outer peripheral face of piston ring body 10.

Main request - Inventive step

Appellant (opponent)

The subject-matter of claim 1 of the main request differs from the disclosure of document D2 by feature M5. According to paragraph [0043] of the patent, this feature guarantees a good compromise between wear resistance and heat conduction. Starting from document D2, the objective technical problem may be defined as reducing wear of the piston ring while maintaining heat conduction at an acceptable level. Feature M5 is directed to a central annular area of the piston ring which is 0.6 mm wide and where the coating has a thickness between 3 and 10 µm. According to column 4, lines 9 or 14 of document D2, the thickness is 10 µm

or 5 µm, and therefore within the ranges of features M4 and M5. The subject-matter of claim 1 of the main request is rendered obvious by the routine practice of a development engineer. During the oral proceedings before the board, the appellant referred to their written submissions.

Respondent (patent proprietor)

Document D2 fails to disclose any relevant dimension of the ring such that a position 0.3 mm away from the vertex cannot be identified. Accordingly, combining document D2 with the common general knowledge of those skilled in the art would not and could not lead to the subject-matter of claim 1 of the main request. During the oral proceedings before the board, the respondent referred to their written submissions.

Reasons for the Decision

1. Pursuant to Article 12(2) RPBA, the primary object of the appeal proceedings is to review the decision under appeal in a judicial manner. In the present case, the opposition division concluded that feature M5 (*"wherein the thickness of the hard coating (11) from a vertex (11a) of the hard coating (11) in the second direction (D2) to a position (11b, 11c) 0.3 mm away from the vertex (11a) is 3 µm or more and 10 µm or less"*) in claim 1 of the main request was not directly and unambiguously derivable from any of documents D1, D2, D3 and D8, because none of these documents disclosed the axial height of the piston ring, see paragraphs 3.1.2, 3.2.2, 3.3.2 and 3.4 of the impugned decision. In order to reverse the impugned decision, the appellant therefore had to convince the board that the axial height of the piston ring was indeed

disclosed, either explicitly or implicitly, in any of these documents, or that it was rendered obvious by the cited prior art. The appellant failed to do so, as will be explained in the following.

2. Main request - Novelty

The appellant disputes the opposition division's decision finding that the subject-matter of claim 1 of the main request is novel over the disclosure of each of documents D1, D2, D3 or D8. None of these novelty objections convince the board for the following reasons.

2.1 With regard to **document D1** it is common ground that the document discloses a piston ring according to features M1 to M4 of claim 1 of the main request. In fact, figure 6 of the document shows piston ring 100 with an annular main body 10. On the peripheral face of the main body, a lower layer 1, a binder layer 2 and an outer layer 3 form a hard coating. The thickness of outer layer 3 in a second radial or horizontal direction of the piston ring varies between 5 and 30 micrometers, see paragraph [0035] of the document. In figure 6, outer layer 3 is curved in a first axial or vertical direction of the piston ring. Due to this curvature, the board can identify a vertex of outer layer 3, which is located right below reference numeral 3 in figure 6.

2.2 The point of contention is whether document D1 also discloses feature M5, i.e. that the thickness of the hard coating - the outer layer 3 - from a vertex of the hard coating in the second direction - the radial or horizontal direction in figure 6 - to a position 0.3 mm away from the vertex is 3 µm or more and 10 µm or less.

In that respect, the opposition division did not find any indication of the axial height, and in particular no implicit disclosure of the size of the piston ring in document D1 and concluded that the point 0.3 mm away from the vertex cannot be located, see paragraph 3.1.2 of the impugned decision. While the board concurs with the appellant in that there is no feature in claim 1 of the main request directed to the thickness of the piston ring, the thickness is still relevant for the assessment of novelty. If the piston ring in document D1 was too thin, a point at a position 0.3 mm away from the vertex would not be located on its peripheral surface. Instead, that point would lie outside the piston ring, e.g. above or below its upper and lower side face. The board must therefore examine whether document D1 implicitly discloses the thickness of the piston ring.

2.3 The appellant essentially argues that a skilled person would read the typical sizes of piston rings for automotive engines of 1.0 to 1.2 mm or 0.77 to 2 mm into document D1. The board is not convinced by this argument because the document does not contain any explicit reference to automotive engines. Instead, document D1 only discloses internal combustion engines for unspecified purposes or compressors, see paragraph [0001] of the document. During the oral proceedings before the board, the appellant argued with reference to paragraphs [0001] to [0003], [0010] to [0012], [0014], [0016], [0021] or [0026] of document D1 that a piston ring for a motor car such as an automobile or a light utility vehicle is implicitly disclosed in that document. The board disagrees. According to established jurisprudence (see "Case Law of the Boards of Appeal of the European Patent Office" (CLBoA), 11th edition, 2025, I.C.4.3), an alleged disclosure can only be

considered "implicit" if it is immediately apparent to the skilled person that nothing other than the alleged implicit feature forms part of the subject-matter disclosed. In the present case, the references to an internal combustion engine or a compressor in paragraphs [0001], [0014], [0016] and [0026] of document D1 are not linked to any specific size of the combustion engine / the compressor or to that of its components, and therefore do not implicitly disclose a piston ring having the typical thickness for use in an automobile or a light utility vehicle. This also applies to the "substantial forces", the millions of strokes and the resistance to fatigue and cracks mentioned in paragraphs [0002], [0003] and [0010] to [0012], because these criteria are equally relevant for small engines such as the model aircraft engines according to paragraph 3.1.2 of the impugned decision.

2.4 The appellant also refers to paragraph [0021] of document D1, according to which the piston ring in figure 4 of that document had been tested in a diesel engine for about 500 hours. Even if this diesel engine were larger than that of a model aircraft, and thus, a position 0.3 mm away from the vertex would still lie on the peripheral face of the piston ring, paragraph [0021] of document D1 does not disclose the thickness of the hard coating. Feature M5 requires that the thickness of the hard coating from the vertex to a position 0.3 mm away from the vertex is 3 µm or more and 10 µm or less. In that respect, paragraph [0035] of document D1 discloses that the thickness of the outer layer varies between 5 and 30 µm, preferably 20 µm (*"besitzt eine Stärke die zwischen 5 und 30 Mikrometern variiert, vorrangig 20 Mikrometern"*). The prioritized value of 20 µm clearly lies outside the range in feature M5. Contrary to the appellant's assertion, the

statement "varies between 5 and 30 µm" in paragraph [0035] of document D1 may not be considered disclosing a thickness range of from 5 to 30 µm, or an overlapping range of from 5 to 10 µm, from which the value of 5 µm could be extracted in order to arrive at feature M5. Instead, this statement may only be construed in the sense that the thickness of outer layer 3 in document D1 is less uniform than that of the hard coating according to feature M5. The board considers the appellant's assumption that the thickness of the hard coating in document D1 is relatively constant in an area between the vertex and a position 0.3 mm away from the vertex and lies in the order of 5 µm a mere speculation, because paragraph [0035] of the document does not contain any information on the actual thickness at the location of the vertex shown in figure 6.

2.5 With regard to **document D8** it is equally common ground that the document discloses a piston ring according to features M1 to M4 of claim 1 of the main request. Figure 3 of the document shows a piston ring with an annular steel base body 10. On the peripheral face of the main body, a lower layer 18 and an upper layer 20 form a hard coating. The upper layer 20 in a second radial or horizontal direction of the piston has a thickness of from 4 to 50 µm, see column 1, lines 60 to 62 of the document. Upper layer 20 may have a convex surface profile between 5 and 30 µm, see column 4, lines 29 to 32 of the document. Due to this curvature, the board concludes that apex 24 or lower or upper transition point 26 according to column 4, lines 29 to 34 of document D8 may be considered a vertex on upper layer 20.

2.6 The appellant essentially argues that the hard coating is inevitably located at a position 0.3 mm away from the vertex because it is applied on the outer peripheral face of the piston ring, see the second paragraph on page 10 of the statement of grounds of appeal. The board is not convinced by this assertion, because the opposition division had concluded that there is no direct and unambiguous disclosure of the axial height of the piston ring, see paragraph 3.4 of the impugned decision. In the absence of such a disclosure in document D8, it is not possible to determine whether a point at a position 0.3 mm away from the apex 24 - the vertex according to feature M5 - is located on the piston ring, or whether it lies outside the piston ring. The appellant's assertion that the hard coating is inevitably located at a position 0.3 mm away from the vertex therefore does not convince the board that the opposition division's conclusion is wrong.

2.7 In addition to that, feature M5 requires that the thickness of the hard coating from the vertex to a position 0.3 mm away from the vertex is 3 µm or more and 10 µm or less. Concerning the hard coating, the passage in column 4, lines 29 to 33 of document D8 discloses that the application of upper layer 20 on lapped lower layer 18 results in an outer surface 22 having a preferred convex surface profile between 0.005 millimeters and 0.03 millimeters, i.e. between 5 and 30 µm. Even if this convex surface profile could be construed as a thickness of the upper layer of between 5 and 30 µm, this does not disclose a thickness range of from 5 to 30 µm, or an overlapping range of from 5 to 10 µm, from which the value of 5 µm could be extracted in order to arrive at feature M5. Instead, this statement may only be construed in the sense that

the thickness of upper layer 20 in document D8 is less uniform than that of the hard coating according to feature M5. In addition to that, document D8 does not contain any information on the actual thickness of upper layer 20 at the location of the apex 24 (or at lower or upper transition point 26), i.e. the vertex according to feature M5.

2.8 For these reasons, the board concludes that none of documents D1 or D8 discloses feature M5 of claim 1 of the main request. In the light of this conclusion, it is immaterial whether lower layer 1 in document D1 or lower layer 18 in document D8 would prevent that the respective hard coating "is provided on the outer peripheral face" of the respective annular main body. In the respondent's view, this would imply a direct application of the hard coating on the annular main body, i.e. without any intermediate layer.

2.9 In the statement of grounds of appeal, the appellant also raised novelty objections against the subject-matter of claim 1 of the main request based on each of **documents D2 and D3**, see the last paragraph on page 13 of the statement of grounds of appeal. As substantiation for these objections, the appellant referred to the notice of opposition and to the letter of 9 December 2022 to the opposition division, see the second paragraph on page 9 of the statement of grounds of appeal. In its communication, the board presented the following preliminary view on these novelty objections (see paragraph 3.3 of the communication):

"3.3 With regard to documents D2 or D3, the appellant refers in a sweeping manner to their respective submissions made before the opposition division, which they would like to maintain in appeal. The board is

inclined not to consider such references, see Case Law of the Boards of Appeal of the European Patent Office, 10th edition 2022, V.A.2.6.5. The board draws the parties' attention to Article 12(3) RPBA for the requirement for the parties to present their complete appeal case in the statement of grounds of appeal and the reply. According to Article 12(5) RPBA, the board has discretion not to admit a submission which does not meet this requirement."

As the appellant refrained from further comments, the board re-assessed the appellant's written submissions and confirms its provisional opinion that the general reference to earlier submissions on page 9, second paragraph of the statement of grounds of appeal does not meet the requirements of Article 12(3) RPBA. In particular, this passage of the statement of grounds of appeal does not contain any arguments as to where or why the opposition division erred in the impugned decision. Therefore, the board exercised its discretion pursuant to Article 12(5) RPBA and did not admit the objections of lack of novelty in view of documents D2 and D3.

2.10 In the statement of grounds of appeal, only the novelty objections against claim 1 of the main request were substantiated, see the references to feature M5 of claim 1 in sections III.1 and III.3 on page 8, third and fifth paragraphs, and page 10, third and fourth paragraphs of the statement of grounds of appeal. In its communication, the board presented the following preliminary view on the novelty objection against claim 15 (see paragraph 3.5 of the communication):

"3.5 On page 13, last paragraph, of its statement of grounds appeal the appellant submits that the subject-

matter of claim 15 lacked novelty in view of documents D1 to D3 and D8. The board notes that no reasons are provided for this allegation."

As the appellant refrained from further comments, the board re-assessed the appellant's case and confirms its provisional opinion that the statement of grounds of appeal does not contain any reasoning against novelty of the subject-matter of independent method claim 15 of the main request. In view of this, the board does not need to take a decision on novelty of that claim.

3. Main request - Inventive step

The appellant disputes the impugned decision's finding that the subject-matter of claim 1 of the main request involves an inventive step starting from document D2 in combination with the common general knowledge. This objection does not convince the board for the following reasons.

3.1 In the statement of grounds of appeal, the appellant considered feature M5 to be the distinguishing feature. The appellant argued with reference to column 4, lines 9 to 14 of document D2 that the thickness of the coating is 5 µm or 10 µm, and therefore within the ranges of features M4 and M5. During the oral proceedings before the board, the appellant referred to the written submissions.

3.2 In its communication, the board was of the preliminary opinion that this objection is not convincing. The board presented the following preliminary view (see paragraph 4 of the communication):

"Claim 1 according to the main request seems to involve an inventive step:

4.1 In their statement of grounds of appeal, see the second paragraph on page 12, the appellant essentially argues that a vertex and a point at a position 0,3 mm away from the vertex does not make technical sense and is not claimed. In view of feature M5, the board does not share the appellant's view.

4.2 Concerning inventive step starting from document D2, the appellant puts forward that the subject-matter of claim 1 is rendered obvious by the routine practice of a development engineer, see the third paragraph on page 12 of their statement of grounds of appeal. In the absence of any explanation why that is the case, the board is presently not convinced that the impugned decision should be set aside. In particular, the opposition division had concluded that there is no direct and unambiguous disclosure of the axial height of the piston ring in document D2, see paragraph 3.5 of the impugned decision."

3.3 As the appellant refrained from further comments, the board re-assessed the appellant's written arguments. In the statement of grounds of appeal, the appellant relied on the disclosure in column 4, lines 9 to 14 and 10 to 20 of document D2. As this passage neither mentions the thickness of the piston ring nor refers to a particular application of the piston ring which could imply a certain thickness of the piston ring for the skilled person, the board confirms its provisional opinion that the objection is not convincing. Therefore, the subject-matter of claim 1 of the main request meets the requirements of Article 56 EPC starting from document D2.

3.4 No inventive step objection was raised against method claim 15 of the main request. The only objection concerned product claim 1, see the references to feature M5 of claim 1 in section IV.1 of the statement of grounds of appeal. The board therefore does not need to take a decision on inventive step for the subject-matter of claim 15 of the main request.

4. The appellant did not refer to any of documents D9 to D12 in their argumentation against novelty or against inventive step. The present decision is therefore not based on any of these documents, and thus, the board does not need to decide on the contentious issue of their admittance.

5. For these reasons, the board finds that
- the subject-matter of claim 1 as granted meets the requirements of Article 54 EPC because it is novel over documents D1 and D8,
- the objections of lack of novelty in view of documents D2 and D3 are not admitted under Article 12(3) and 12(5) RPBA,
- the subject-matter of claim 1 as granted meets the requirements of Article 56 EPC starting from document D2.

In conclusion, the grounds for opposition under Article 100(a) EPC in conjunction with Articles 54 and 56 EPC do not prejudice the maintenance of the patent as granted. The appeal thus fails on all points.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

N. Schneider P. Lanz

Decision electronically authenticated