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# Datasheet for the decision of 19 November 2024

**Case Number:** T 1934/22 - 3.2.06

**Application Number:** 17870625.5

**Publication Number:** 3406865

**IPC:** F01L3/02, B22F5/10, B22F7/00, B22F7/02, C22C1/05, C22C9/00, C22C9/02, C22C19/07, C22C27/04, C22C38/00, C22C38/12, C22C38/22, C22C38/24, C22C38/36

**Language of the proceedings:** EN

**Title of invention:**
SINTERED VALVE SEAT

**Patent Proprietor:**
Kabushiki Kaisha Riken

**Opponent:**
MAHLE International GmbH

**Headword:**

**Relevant legal provisions:**
EPC Art. 56, 100(a)

**Keyword:**

Inventive step - main request (yes)
Late-filed objection - admitted in first-instance proceedings (yes) - error in use of discretion at first instance (no)

**Decisions cited:**

**Catchword:**

Europäisches Patentamt
European Patent Office
Office européen des brevets

**Beschwerdekammern**

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**Case Number: T 1934/22 - 3.2.06**

# D E C I S I O N
## of Technical Board of Appeal 3.2.06
## of 19 November 2024

| | |
|---|---|
| **Appellant:** (Opponent) | MAHLE International GmbH<br>Pragstrasse 26-46<br>70376 Stuttgart (DE) |
| **Representative:** | BRP Renaud & Partner mbB<br>Rechtsanwälte Patentanwälte<br>Steuerberater<br>Königstraße 28<br>70173 Stuttgart (DE) |
| **Respondent:** (Patent Proprietor) | Kabushiki Kaisha Riken<br>8-1, Sanbancho<br>Chiyoda-ku, Tokyo 102-8202 (JP) |
| **Representative:** | SSM Sandmair<br>Patentanwälte Rechtsanwalt<br>Partnerschaft mbB<br>Joseph-Wild-Straße 20<br>81829 München (DE) |
| **Decision under appeal:** | **Decision of the Opposition Division of the European Patent Office posted on 23 June 2022 rejecting the opposition filed against European patent No. 3406865 pursuant to Article 101(2) EPC.** |

**Composition of the Board:**

| | |
|---|---|
| **Chairman** | M. Harrison |
| **Members:** | P. Cipriano |
| | W. Ungler |

## Summary of Facts and Submissions

I. An appeal was filed by the appellant (opponent) against the decision of the opposition division rejecting the opposition to European patent No. 3 406 865. It requested that the decision under appeal be set aside and the patent be revoked. It also requested oral proceedings.

II. With its reply, the respondent (patent proprietor) requested that the appeal be dismissed or, as an auxiliary measure, that the patent be maintained in amended form according to one of auxiliary requests 1 to 4.

III. The following documents are relevant to the present decision:
D2 DE 10 2006 042 950 A1
D3 DE 10 2012 013 226 A1
D8 Wikipedia article regarding "Ventilsteuerung" from 22 October 2010.

IV. The Board issued a summons to oral proceedings and a subsequent communication containing its provisional opinion, in which it indicated *inter alia* that it saw no legal basis for excluding the inventive step attack based on D3 and D2 from the proceedings and that the subject-matter of claim 1 of the main request involved an inventive step.

V. Oral proceedings were held on 19 November 2024.

At the close of the proceedings the requests of the parties remained unchanged.

VI. Claim 1 of the main request reads as follows:
"A sintered valve seat press-fitted into a cylinder head of an internal engine;

said valve seat having a two-layer structure comprising a seat layer repeatedly abutting a valve face, and a support layer abutting bottom and inner peripheral surfaces of a valve-seat-press-fitting opening of a cylinder head;

said seat layer containing at least one selected from Co-based hard particles and Fe-based hard particles in a matrix of Cu or its alloy; and

said support layer containing at least one selected from Fe particles and Fe alloy particles in a matrix of Cu or its alloy."

VII. The appellant's arguments relevant to the present decision may be summarised as follows:

*Inventive step - admittance*

Contrary to the respondent's request, there was no legal basis on which the Board could overturn the opposition division's decision to admit an attack, i.e. a lack of inventive step attack based on the combination of D2 and D3, into the proceedings when the reasons for rejecting the opposition were based on that attack.

*Main request - inventive step*

D3 disclosed all the features of claim 1 with the exception of press-fitting and that the particles of the seat layer were hard particles.

The missing features had no functional relationship or synergistic effect since press-fitting did not provide any additional technical effect and was merely a suitable fixing method for the valve seat and which did not require additional fastening means.

The use of press-fitting was a common technical measure obvious to the skilled person.

The use of hard Fe particles improved at least the wear resistance in the seat layer if not also heat resistance.

The skilled person would take D2 into consideration, since it concerned a material which improved wear resistance. Cladding directly on the element was not the only option contemplated in D2 as was evident from dependent claim 6 or paragraph [0061] thereof.

The skilled person would not then change the sintering method of D3 as this would be too complex, but would adopt the specific step of adding hard particles *only* to the alloy of the seat layer.

The skilled person would not use sintering to produce the functional layer and cladding for the seat layer. The skilled person would sinter both layers together as taught in D3, as sintering and cladding were simply equivalent processes.

The skilled person would know, as confirmed in paragraphs [0015] and [0018] of the patent, that Cu provided for good thermal conductivity, and that Fe provided for good heat resistance, such that it would be obvious for the skilled person faced with the teaching of D2 to harden the Fe particles in an obvious manner.

VIII. The respondent's arguments relevant to the present decision may be summarised as follows:

*Inventive step - admittance*

The obviousness attack based on D3 and D2 which was late-filed during opposition proceedings should not have been admitted into the proceedings since it was ultimately not relevant, as the opposition division decided that the subject-matter of claim 1 was inventive anyway.

*Main request - inventive step*

In addition to the missing features of press-fit and hard particles, D3 also failed to disclose the feature that the agglutinated constituents of the seat layer were particles.

The missing features of press-fit and hard particles had a functional relationship and a synergistic effect.

The objective problem was to provide a valve seat suitable for being press-fitted, having excellent heat resistance, wear resistance and high thermal conductivity as well as excellent detachment resistance.

D2 disclosed a material with the features of claim 1 but only in respect of its suitability for use with cladding, not with press-fitting. The skilled person would therefore not take D2 into consideration.

Even if the skilled person were to consider D2, they would not use a different manufacturing method for each layer of a valve seat as in D3, but would change both materials for the single one of D2 and use cladding for manufacturing the whole ring as also taught in D2.

The process taught in D2 (see e.g. [0019]) resulted in a dense microstructure in the cladded material in which fine hard phase particles (average particle diameter: 10µm, particle size distribution width: 0.1 to 100 µm, see paragraph [0066]) were precipitated as shown in Figure 2. A person skilled in the art would learn from D2 that the wear resistance exhibited in D2 could be achieved only where such microstructure was obtained as a result of cladding.

The skilled person had no reason to believe that such a microstructure could be obtained by sintering, since sintering did not involve fully melting of the mixed powder and precipitation of the fine hard phase particles.

## Reasons for the Decision

1. Main request - admittance

1.1 The respondent requested in its reply to the grounds of appeal to overturn the opposition division’s decision to admit the late-filed obviousness attack based on D3 and D2, and reject the attack, as admitting the attack contradicted the final conclusion of the opposition division that the subject-matter of claim 1 involved an inventive step.

1.2 The Board stated in its preliminary opinion that it saw no legal basis on which it could remove from the decision an attack on which the opposition division based its reasons to reject the opposition. This was not challenged by the respondent and is confirmed herewith.

1.2.1 In addition, in regard to use of the opposition division's discretion, the Board also stated in that opinion that the opposition division had anyway argued that D2 disclosed the missing feature (Co-based hard particles or Fe-based hard particles in a matrix of Cu) and the effect of resistance to abrasion resulting in the combination of D3 and D2 having been considered *prima facie* relevant for admitting the documents, and implicitly the attack, into the proceedings. The opposition division had therefore applied the correct criteria and in a reasonable way when admitting the attack into the proceedings.

1.2.2 A *prima facie* assessment may well differ from the final conclusion of the opposition division since, as the name suggests, a *prima facie* assessment is an initial provisional assessment to determine the likelihood that (in this case) an attack may succeed. It is irrelevant which conclusion the opposition division ultimately arrives at.

1.3 In response to the Board's preliminary opinion, the respondent filed no substantive reply and during the oral proceedings merely referred to its written submissions, such that the Board sees no reason to change its preliminary opinion and confirms same herewith.

1.4 The opposition division's decision to admit the inventive step objection based on D3 and D2 into the proceedings is consequently not overturned, such that the inventive step objection based on D3 and D2 is part of the proceedings.

2. Main request - inventive step

*Disclosure of the starting point D3*

2.1 It has not been disputed that D3 fails to disclose press-fitting and that the seat layer described in paragraphs [0014] and [0017] of D3 discloses Fe-based particles in a matrix of Cu or its alloy, but these particles are not hard particles.

2.1.1 Although these are not hard particles, D3 discloses Fe-based particles in the seat layer (which corresponds to the "Funktionsschicht" in D3). As described in paragraphs [0014], [0015] and [0017], the seat layer in D3 is produced by sintering, with an infiltration of Cu during the process in order to form a matrix. Such a sintering process necessarily results in the formation of Fe particles (resulting from the original powder) dispersed in the Cu matrix.

2.1.2 It was not contested that D3 discloses the remaining features of claim 1 and the Board also sees no reason to find otherwise.

*Objective problem(s)*

2.2 The two differing features (press-fit and hardened particles, see item 2.1 above) do not have a functional relationship or a synergistic effect.

2.3 The invention as a whole relates to detachment resistance and the detachment resistance is linked to the press-fitted arrangement defined in claim 1, as the appellant argued. However, the use of hard particles in the seat layer is not associated with any resistance to detachment of the press-fitted valve seat, since this layer is made for repeatedly abutting a valve face (as defined in claim 1) and is not the layer associated with the press-fit attachment to the cylinder head. Paragraph [0015] of the patent also mentions resistance to detachment only in association with the material of the support layer, which is also the layer defined in claim 1 as abutting the bottom and inner peripheral surfaces of an opening of the cylinder head, and not the seat layer.

2.4 There is thus no functional relationship or synergistic effect between press-fitting and the presence of hardened Fe particles in the seat layer. The Board thus finds that the consideration of partial problems is the correct way to deal with the two differing features when using the problem-solution approach for concluding on inventive step.

2.5 In the absence of any functional link to the material of the seat layer or any other additional effect, press fitting provides simply a suitable fixing method for the valve seat. Whilst it is true that there are other methods of attachment, such as shrinking, no specific advantage of press fitting over other methods of attachment can be recognised in the context of the invention.

2.6 On the other hand, it was not contested that the use of hard Fe particles improves at least the wear resistance in the seat layer (see e.g. paragraph [0018] of the patent).

2.7 With regard to the first partial problem, the use of press-fitting is a common technical measure of attachment which is obvious to the skilled person in the art (see e.g. D8, page 6, 5th paragraph). The skilled person would thus consider a press-fit valve seat according to claim 1 as obvious.

2.8 As regards the second partial problem, the appellant argued that the skilled person would take D2 into consideration, since D2 dealt with wear resistance (e.g. paragraphs [0005], [0006] and [0013]) and was not restricted to the manufacturing process of cladding - e.g. paragraphs [0004], [0061] as well as claim 1, which did not define a method to manufacture the alloy, this method being defined only in dependent claim 6. According to the appellant, D2 therefore taught the skilled person in paragraph [0013] that Fe hard particles improved the wear resistance of the alloy, regardless of the manufacturing method employed.

The Board is not persuaded by these arguments. D2 does mention wear and wear resistance in paragraphs [0005], [0006] and [0013], and D2 also discloses a specific composition for obtaining an alloy comprising hard Fe particles in a matrix of Cu with increased wear resistance in paragraphs [0012] and [0013]. However, these are disclosed in D2 in the context of a method for obtaining the alloy with this specific composition in paragraphs [0018] and [0019] ("Wenn die oben beschriebenen Schritte durchgeführt werden, so ist es möglich, auf leichte und einfache Weise die oben beschriebene Teilchendispersions-Kupferlegierung zu erhalten.") translated by the Board as "When the above-mentioned steps are carried out, it is possible to obtain the aforementioned particle dispersion copper alloy in an easy and simple way".

Contrary to the appellant's argument, D2 does not teach the skilled person that Fe hard particles generally improve an alloy's wear resistance. Paragraph [0004] mentions sintering and cladding processes but that is only a description of the processes used in the prior art ("bislang eingesetzt"). It is also clear from this that sintering and cladding are distinct processes; no suggestion is given in D2 that they are equivalent processes, contrary to the appellant's argument. Indeed the nature of sintering and cladding processes would be expected to produce entirely different microstructures, as also argued by the respondent.

In addition, although cladding directly onto a metal element is only defined in dependent claim 6, claim 6 is dependent on independent method claim 5, the latter already defining heating of a powder mix by laser or plasma, which in the context of D2 are method steps of an (implicit) cladding process and not of a sintering process. Claim 6 only further defines that the heating (cladding) process takes place directly onto the metal element with which it is joined.

The same is true of paragraph [0061], which alludes to the possibility of it not being necessary to clad the piece 14 *on the element* and not to the possibility of using a process other than cladding.

Therefore, even if independent product claim 1 of D2 does not define any method of producing this alloy, since the only method disclosed in the description and defined in the claims to produce the alloy is cladding, and in the absence of any passage suggesting that the alloy could be produced otherwise, the skilled person would not derive from the teaching of D2 that the wear resistance provided by the hard phase Fe particles could be obtained by a method other than the one disclosed in D2, let alone specifically by sintering (i.e. the method used in D3 and defined in claim 1 under consideration).

2.9 The appellant also argued that the skilled person would know that, as confirmed in paragraphs [0015] and [0018] of the patent, Cu provides good thermal conductivity and that Fe provides good heat resistance, such that it would be obvious to the skilled person confronted with the teaching of D2 to provide hard Fe particles in an obvious way and arrive at a (sintered) alloy for the seat layer with the properties envisaged by the patent and as defined in claim 1 of the main request. The Board is, however, not convinced by this argument.

The skilled person would not derive from the teaching of D2 that hard Fe particles would improve wear resistance irrespective of the method of manufacture. Also, paragraphs [0015] and [0018] of the patent disclose these properties of Cu and Fe (good thermal conductivity and good heat resistance) only in the context of sintering, since both paragraphs refer to "the sintered valve seat of the present invention" such that even in the patent such effects are not detached from the structural features resulting from the manufacturing process used. Nowhere, therefore, is it suggested that any of the envisaged properties mentioned by the appellant are obtainable simply due to the constituents of the alloy and independently of the process by which the components are made.

2.10 As the appellant itself states (see last paragraph on page 11 of the grounds of appeal), any hybrid solution involving each layer being made by a different method would involve significant complication for the skilled person, as also argued by the respondent in relation to the coherence of layers in items 6.1 to 6.3 of its reply to the grounds. Therefore, even if the skilled person could harden the Fe particles, they would apply the method of D2 (cladding) to the entire seat ring and not only to the seat layer, thus arriving at a valve seat made of a single material. Contrary to the appellant's argument, the skilled person would not attempt to modify the composition of D3 without also altering the method.

2.11 Therefore, starting from the sintered valve seat of D3, and trying to improve at least the wear resistance, the skilled person would not derive from the teaching of D2 that the Fe particles of the seat layer (i.e. the "Funktionschicht" in D3) in a sintered component should be hardened.

3. The appellant's objections in regards to the grounds for opposition under Article 100(a) in combination with Article 56 EPC therefore do not prejudice maintenance of the patent as granted.

## Order

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

The appeal is dismissed.

The Registrar: The Chairman:

D. Grundner M. Harrison

Decision electronically authenticated