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**Datasheet for the decision  
of 7 December 2016**

**Case Number:** T 2458/13 - 3.3.09

**Application Number:** 06841035.6

**Publication Number:** 2097254

**IPC:** B32B15/01, F16C33/12,  
F16C33/14, C22C13/00

**Language of the proceedings:** EN

**Title of invention:**  
SLIDING BEARING

**Patent Proprietor:**  
Mahle International GmbH

**Opponent:**  
Federal-Mogul Wiesbaden GmbH

**Headword:**

**Relevant legal provisions:**  
EPC Art. 54

**Keyword:**  
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**Decisions cited:**

**Catchword:**



**Beschwerdekammern**  
**Boards of Appeal**  
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Case Number: T 2458/13 - 3.3.09

**D E C I S I O N**  
**of Technical Board of Appeal 3.3.09**  
**of 7 December 2016**

**Appellant:** Federal-Mogul Wiesbaden GmbH  
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**Representative:** BRP Renaud & Partner mbB  
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**Decision under appeal:** **Decision of the Opposition Division of the European Patent Office posted on 18 October 2013 rejecting the opposition filed against European patent No. 2097254 pursuant to Article 101(2) EPC.**

**Composition of the Board:**

**Chairman** W. Sieber  
**Members:** M. O. Müller  
E. Kossonakou

## Summary of Facts and Submissions

- I. This decision concerns the appeal filed by the opponent against the decision of the opposition division to reject the opposition against European patent No. 2 097 254.
- II. With its notice of opposition, the opponent had requested revocation of the patent in its entirety on the ground that the claimed subject-matter was not inventive (Article 100(a) EPC). In the course of the written opposition proceedings, the opponent additionally relied on lack of novelty as a ground for opposition.

The documents submitted during the opposition proceedings included:

E1: WO 2005/015036 A1.

- III. The claims as granted and found allowable by the opposition division contained one independent claim which reads as follows:

"1. Sliding bearing (10) comprising a back metal layer (12), a bearing layer (14) applied to the back metal layer (12), at least one intermediate layer (16) applied to the bearing layer (14) and an overlay (18) applied to the at least one intermediate layer (16), characterized in that the overlay consists of a tin matrix (20) and silver-tin intermetallic phases (22) distributed in the tin matrix, wherein silver-tin intermetallic phases (22) are distributed homogeneously in the tin matrix (20) and wherein silver-tin intermetallic phases (22) consist of particles, more of 50% of them having a particle size  $\leq$  1 micron."

IV. In its decision, the opposition division admitted the ground for opposition of lack of novelty into the proceedings, but acknowledged novelty over E1. This document did not disclose the claimed particle size distribution of the silver-tin intermetallic phases. It could also not be assumed that the product prepared according to the teaching of E1 inherently had this particle size distribution, since the process parameters in E1 only overlapped with those to be applied according to the patent. The opposition division also acknowledged that the claimed subject-matter was inventive.

V. This decision was appealed by the opponent (hereinafter the appellant).

VI. In its response dated 24 April 2014, the proprietor (hereinafter the respondent) filed first and second auxiliary requests.

VII. On 7 December 2016, oral proceedings were held before the board, at which the parties maintained their requests as submitted during the written proceedings:

The appellant requested that the decision under appeal be set aside and that European patent No. 2 097 254 be revoked.

The respondent requested that the appeal be dismissed (main request) or, alternatively, that the patent be maintained on the basis of the claims of either the first or the second auxiliary request filed with letter dated 24 April 2014.

VIII. The respondent's main request, i.e. dismissal of the appeal, implies maintenance of the patent on the basis of the claims as granted (for claim 1, see point III above).

Claim 1 of the auxiliary requests reads as follows (amendments to claim 1 as granted are highlighted):

First auxiliary request: "1. Sliding bearing (10) comprising a back metal layer (12), a bearing layer (14) applied to the back metal layer (12), at least one intermediate layer (16) applied to the bearing layer (14) and an overlay (18) applied to the at least one intermediate layer (16), characterized in that the overlay (18) consists of a tin matrix (20) and silver-tin intermetallic phases (22) distributed in the tin matrix (20), wherein silver-tin intermetallic phases (22) are distributed homogeneously in the tin matrix (20) and wherein more than 99% of the silver-tin intermetallic phases (22) consist of particles ~~more of 50% of them~~ having a particle size of  $\leq 1$  micron."

Second auxiliary request: "1. Sliding bearing (10) comprising a back metal layer (12), a bearing layer (14) applied to the back metal layer (12), at least one intermediate layer (16) applied to the bearing layer (14) and an overlay (18) applied to the at least one intermediate layer (16), characterized in that the overlay (18) consists of a tin matrix (20) and silver-tin intermetallic phases (22) distributed in the tin matrix (20), wherein silver-tin intermetallic phases (22) are distributed homogeneously in the tin matrix (20) ~~and~~ wherein more than 99% of the silver-tin intermetallic phases (22) consist of particles ~~more of 50% of them~~ having a particle size of  $\leq 1$  micron and wherein the silver-tin intermetallic phases (22)

contain the  $\epsilon$ -phase of a silver-tin binary phase of the compound  $\text{Ag}_3\text{Sn}$ ."

IX. So far as relevant to the present decision, the appellant's arguments can be summarised as follows:

The subject-matter of claim 1 of the main request lacked novelty over E1, in particular example 7 of this document. The only features not explicitly disclosed were the claimed homogeneity and particle size distribution of the intermetallic phases in the sliding layer ("overlay" in claim 1). The way the sliding layer was prepared in example 7 of E1 was however very similar to that taught in the patent and it could therefore be assumed that the resulting sliding layer was as claimed. More specifically, in the same way as taught in the patent, E1 applied a silver-tin bath for the galvanic deposition of the sliding layer. Further, the ranges given in E1 for the bath temperature and current density overlapped with the ranges taught in the patent, and any difference in temperature or current density affected only the silver content, which was not a feature of claim 1. The same applied to the method of agitation, which according to the description of the patent only had an impact on the silver content. As regards comparative examples 1 and 3 referred to by the respondent, these applied an agitation as in E1 and resulted in an allegedly irregular distribution of intermetallic phases. However, the sliding bearings of E1 were very hard, which presupposed at least some degree of homogeneity. Since claim 1 did not define the degree of homogeneity, the homogeneity obtained in example 7 of E1 had to be assumed to be as required by this claim.

The same logic applied to the first auxiliary request. There was no teaching whatsoever in the patent that a special process feature not disclosed in E1 was needed to obtain the particle size distribution now required by claim 1. It therefore had to be assumed that, in the same way as for the main request, the way the sliding layer was prepared in example 7 of E1 led to the claimed particle size distribution.

As regards the second auxiliary request, example 7 of E1 already disclosed the claimed composition  $\text{SnAg}_3$  of the intermetallic phases and these were inherently present in the form of an  $\epsilon$ -phase as required by claim 1. Therefore the feature added to claim 1 did not lead to any additional distinction, with the result that the subject-matter of claim 1 still lacked novelty over E1.

- X. So far as relevant to the present decision, the respondent's arguments can be summarised as follows:

The subject-matter of claim 1 of the main request was novel over E1. Contrary to the appellant's argument, it could not be assumed that the way the sliding layer was prepared in E1 led to the claimed homogeneity and particle size distribution. More specifically, the electrolyte system on page 7 of E1 was a mixed tin/copper/silver bath, whereas a silver/tin bath was needed to obtain the claimed intermetallic tin-silver phases. The conditions used for the tin/copper/silver bath in E1 did not necessarily need to be the same as for a tin/silver bath (this argument was put forward only in the written proceedings). Furthermore, the type of agitation in E1 was not as taught in the patent and this had an impact on particle size distribution and homogeneity. In fact, comparative examples 1 and 3,



which applied the same type of agitation as E1, resulted in non-homogeneously distributed intermetallic phases.

## **Reasons for the Decision**

Main request (claims as granted)

1. Novelty

1.1 The appellant attacked novelty on the basis of E1.

1.2 E1 (claim 1 and the third paragraph on page 4, and in particular example 7) discloses a sliding bearing comprising

- a support layer made of steel, corresponding to the back metal layer (12) of claim 1,
- a metal-bearing layer  $\text{CuPb}_{22}\text{Sn}$ , corresponding to the bearing layer (14) of claim 1,
- a nickel layer, corresponding to the intermediate layer (16) of claim 1, and
- a sliding layer made of a tin matrix and silver-tin intermetallic phases  $\text{SnAg}_3$ , corresponding to the overlay (18) with the tin matrix (20) and intermetallic phases (22) of claim 1.

1.3 It was common ground between both parties that E1 disclosed all features of claim 1 except for those that the silver-tin intermetallic phases in the sliding layer were homogeneously distributed and had the claimed particle size distribution.

It was a matter of dispute whether these two features could be assumed to be inherently present in the sliding layer of example 7 of E1, due to the way it was produced according to this document.

- 1.4 In order to decide on this point, it needs first to be examined how the sliding layer is prepared in example 7 of E1.

E1 provides on page 7 a general manufacturing process for the sliding layers of all examples according to the invention of E1 (examples 5 to 8):

The sliding layer is formed by galvanic deposition of an electrolyte system applying a bath temperature of 20 to 40°C and a current density of 1.5 to  $3.0 \times 10^{-2}$  A/m<sup>2</sup> and by circulating the electrolyte through a filtration system (second and fourth paragraphs on page 7). The following composition is disclosed for the electrolyte system (third paragraph on page 7):

|                               |               |
|-------------------------------|---------------|
| Tin methansulphonate:         | 30-45 g/l,    |
| Copper methansulphonate:      | 2-8 g/l,      |
| Silver methansulphonate:      | 0.1-2 g/l,    |
| Methansulphonic acid:         | 80 - 140 g/l, |
| Additive "N" (Cerolyt BMM-T): | 30 - 45 g/l,  |
| Resorcin:                     | 1.5 - 4 g/l.  |

As convincingly argued by the appellant, the skilled person would read this disclosure as providing a recipe from which the tin, copper and/or silver methansulphonates are chosen as required for the desired intermetallic phases. That is, silver and tin methansulphonate were chosen to obtain the silver-tin

intermetallic phases  $\text{SnAg}_3$  of example 7, while e.g. copper and tin methansulphonate were used for example 6 (intermetallic phases  $\text{SnCu}_6$ ) and copper, silver and tin methansulphonate were used for example 8 (intermetallic phases  $\text{SnCu}_3\text{Ag}_2$ ). This was not disputed by the respondent.

- 1.5 It needs now to be examined whether this preparation process is different from that taught in the patent, and whether any differences imply that the resulting sliding layer does not have the claimed homogeneity and/or particle size distribution.
- 1.5.1 As set out above, the bath used in E1 contains tin and silver methansulphonate. In the patent, the sliding layer ("overlay") is prepared with a commercial tin-silver bath (column 5, lines 40 to 45). Hence, both the bath used in E1 and the one to be used according to the patent are silver-tin baths. Even assuming that there is nevertheless a difference between the two baths, it has not been argued by the respondent that, due to any such difference, the sliding layer of example 7 of E1 does not have the claimed homogeneity and particle size distribution.
- 1.5.2 E1 applies a bath temperature of 20 to 40°C, while the patent teaches a bath temperature of 30 to 50°C. Hence, the bath temperature in E1 might be lower than that to be used according to the patent. It is stated in the patent (column 6, lines 41 to 45) that a lower temperature will lead to a lower silver content in the sliding layer. The silver content is however not a feature of claim 1. An effect of the temperature on homogeneity or particle size distribution is described in the patent (see comparative example 2 and paragraph [0026]) only for temperatures above 50°C,

which are not applied in E1. Hence, in view of the teaching of the patent, it must be assumed that no matter what temperature within the range disclosed in E1 is chosen, the homogeneity or particle size distribution in the resulting sliding layer will always be as required by claim 1.

1.5.3 The current density applied in E1 is 1.5 to  $3.0 \times 10^{-2}$  A/m<sup>2</sup>, while the patent teaches 1.0 to 2.5 A/dm<sup>2</sup> (corresponding to 1.0 to  $2.5 \times 10^{-2}$  A/m<sup>2</sup>). Hence, the current density in E1 might be higher than that to be used according to the patent. It was not argued by the respondent that a higher current density leads to any difference in homogeneity or particle size distribution. In fact, if anything, it can only be assumed that too high a current density has an impact on the silver content (column 6, lines 32 to 34 of the patent), which, as stated previously, is not a feature of claim 1. Hence, even if a current density at the upper end of the range disclosed in E1, and thus outside the range taught by the patent, is chosen, the homogeneity and particle size distribution in the resulting sliding layer will still be as required by claim 1.

1.5.4 Lastly, the bath in E1 is circulated by a filtration system. According to the patent (column 6, lines 14 to 23), the bath should not be agitated by a conventional bath circulation and filtering system but by an external stirrer immersed in the bath or asperging tubes immersed in the bath or a mechanical agitation of the holder.

The respondent argued that it was due to this difference in process conditions that the resulting

sliding layer of E1 did not have the claimed homogeneity and particle size distribution.

The respondent in this respect relied on column 6, lines 1 to 13 of the patent. According to this passage, the type of agitation affects the silver content, which is, as stated previously, not a feature of claim 1. This passage contains no indication at all that the type of agitation has an impact on homogeneity or particle size distribution.

As regards the claimed homogeneity, the respondent furthermore relied on comparative examples 1 and 3 of the patent. In these comparative examples the same type of agitation as in E1 (regular agitation with conventional bath circulation) is applied, and this is said to lead to an overlay with irregularly distributed silver-tin hard phases. Indeed, in the corresponding figures 3 and 5, the phases appear to some extent less homogeneously distributed in the tin matrix than in figure 1, showing the sliding bearing of example 1 according to the invention. The board therefore acknowledges that in view of these comparative examples it could indeed be assumed that the type of agitation applied in E1 leads to a lower degree of homogeneity. However, it cannot be assumed that the intermetallic phases in the sliding layer in example 7 of E1 are not homogeneously distributed at all. More specifically, the sliding layer of E1 is very hard (see the penultimate sentence of the third paragraph on page 4 and the measurement values given in table 1 on page 10 of E1) and, as has been convincingly argued by the appellant, that presupposes at least some degree of homogeneity. So, if anything, there could be a difference in the degree of homogeneity between the sliding layer of E1 and that as required by claim 1,

which is however not defined in this claim. Hence, also in view of comparative examples 1 and 3 of the patent, there is no reason to assume that the homogeneity obtained in the sliding layer of example 7 of E1 is not as required by claim 1.

- 1.6 The sliding layer in example 7 of E1 must thus inherently have the claimed homogeneity and particle size distribution. Therefore, the subject-matter of claim 1 lacks novelty over E1.

#### First auxiliary request

2. Claim 1 of the first auxiliary request requires that, rather than more than 50% (claim 1 as granted), more than 99% of the silver-tin intermetallic phases (22) consist of particles having a particle size of at most 1  $\mu\text{m}$ . The patent does not contain any indication that a specific process feature not applied in example 7 of E1 is necessary in order to obtain this particle size distribution. Therefore, the same logic as above with regard to the main request applies, namely that in view of the way the sliding layer is prepared in example 7 of E1, the particle size distribution must be as claimed. This was in fact not disputed by the respondent. Therefore also the subject-matter of claim 1 of the first auxiliary request lacks novelty over E1.

#### Second auxiliary request

3. The second auxiliary request differs from the first auxiliary request in that it specifies that the phase morphology of the intermetallic phases contains the  $\epsilon$ -phase of  $\text{Ag}_3\text{Sn}$ . As set out above, the intermetallic phases in example 7 of E1 have the same composition

("SnAg<sub>3</sub>"). It was not disputed by the respondent that Ag<sub>3</sub>Sn phases are inherently present in the form of an ε-phase. Therefore the feature added to claim 1 does not lead to any additional distinction over E1 and hence cannot confer novelty on the claim. Consequently, also the subject-matter of claim 1 of the second auxiliary request lacks novelty over E1.

## Order

### For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chairman:



M. Cañueto Carbajo

W. Sieber

Decision electronically authenticated