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**Datasheet for the decision of 15 May 2024**

**Case Number:** T 0471/22 - 3.3.05

**Application Number:** 13818724.0

**Publication Number:** 2935918

**IPC:** F16C33/62, F16C33/64, B22F3/10, B22F3/24, B22F5/00, C22C38/22, C22C38/24, C22C38/30, C22C38/36

**Language of the proceedings:** EN

**Title of invention:**

A METHOD FOR MANUFACTURING A BALL BEARING, NOTABLY FOR A BUTTERFLY VALVE IN AN AERONAUTICAL ENVIRONMENT

**Patent Proprietors:**

SKF Aerospace France
Liebherr-Aerospace Toulouse SAS

**Opponent:**

MinebeaMitsumi Technology Center Europe GmbH

**Headword:**

Butterfly valve/Aerospace Liebherr

**Relevant legal provisions:**

EPC Art. 83, 123(2), 123(3), 56
RPBA 2020 Art. 13(2)

**Keyword:**
Sufficiency of disclosure - (yes)
Amendments - allowable (yes)
Inventive step - (yes)
Amendment after summons - exceptional circumstances (no)

**Decisions cited:**
T 0574/17

**Catchword:**

Europäisches Patentamt
European Patent Office
Office européen des brevets

**Beschwerdekammern**

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**Case Number: T 0471/22 - 3.3.05**

# D E C I S I O N
# of Technical Board of Appeal 3.3.05
# of 15 May 2024

| | |
|---|---|
| **Appellant:** (Opponent) | MinebeaMitsumi Technology Center Europe GmbH<br>Minebea-Weg 1<br>78052 Villingen-Schwenningen (DE) |
| **Representative:** | Riebling, Peter<br>Patentanwalt<br>Postfach 31 60<br>88113 Lindau (DE) |
| **Respondent:** (Patent Proprietor 1) | SKF Aerospace France<br>1 avenue Marc Seguin<br>26240 Saint-Vallier (FR) |
| **Respondent:** (Patent Proprietor 2) | Liebherr-Aerospace Toulouse SAS<br>408 avenue des Etats-Unis<br>31200 Toulouse (FR) |
| **Representative:** | Lavoix<br>62, rue de Bonnel<br>69448 Lyon Cedex 03 (FR) |
| **Decision under appeal:** | **Interlocutory decision of the Opposition Division of the European Patent Office posted on 27 January 2022 concerning maintenance of the European Patent No. 2935918 in amended form.** |

**Composition of the Board:**

| | |
|---|---|
| **Chairman** | T. Burkhardt |
| **Members:** | G. Glod |
| | S. Fernández de Córdoba |

## Summary of Facts and Submissions

I. The opponent's (appellant's) appeal lies from the decision of the opposition division finding that European patent No. 2 935 918 B1 in amended form based on then auxiliary request 2 met the requirements of the EPC.

II. Claim 1 of this request is as follows.

"*1. A method for manufacturing a butterfly valve, notably for an application in aeronautics, the butterfly valve including a conduit body with a circular section, a valve of circular shape mating that of the conduit body section, the valve being rotatable around a pivot connection of an axis diametrically crossing the circular section of the conduit body, the pivot connection including at least one ball bearing including an annular outer ring (18) and an annular inner ring substantially coaxial with each other, and balls extending radially between the outer ring and the inner ring, characterized in that the method comprises the manufacturing of the ball bearing, the manufacturing of the ball bearing including:*
*- a step (110) for sintering a steel powder (10), the chemical composition of which includes in mass percent, 2.3% of carbon, 4.2% of chromium, 7% of molybdenum, 6.5% of tungsten, 10.5% of cobalt and 6.5% of vanadium, so as to obtain a sintered steel (12) and*
*- shaping of the sintered steel (12), for forming at least one of the outer (18) and inner rings, preferably both rings.*"

Claims 2 to 6 directly or indirectly incorporate the subject-matter of claim 1.

III. The following documents cited in the decision are of relevance here.

D1: ERASTEEL powder metallurgy HSS ASP®2060, published in 2012

D2: Introduction to Powder Metallurgy, European Powder Metallurgy Association, published 1992 & 2008

D5: US 7 571 742 B2

D8: J.R. Davis, Alloying: Understanding the Basics, ASM International, 2001, 210-33

D9: WO 2007/021243 A1

D10: Olle Grinder, The HIP way to make cleaner, better steels, metal-powder.net, October 2007, 16-22

D15: M. A. Gomes et al., Fatigue & Fracture of Engineering Materials & Structures, vol. 18, 1, 1995, 1-18

D16: Lizhi WU, in Y. Weng et al. (eds.), Advanced Steels, 2011, 453-61

D19: Olivier Laurent, Updated Materials for Hardened Steel Bearing Components", Aubert & Duval, Handout of the presentation held on 13 April 2011 at the ASTM International Symposium on Rolling Element Bearings, Anaheim, CA, 1-26

D21: G. Totten et al., Handbook of Residual Stress and Deformation of Steel, 2002, 396-423

D22: George Roberts et al., Tool Steels: 5th edn., 1998, 1-6

D23: João Mascarenhas, submitted for the degree of Doctor of Philosophy, Department of Mechanical and Manufacturing Engineering, University of Bradford, 1997

D25: Aubert & Duval, Eramet Alliages, Eramet Alloys, Request for AMS designations for PM-manufactured high wear resistance steels

IV. With the statement of grounds of appeal, the appellant submitted the following document.

D30: Assab Steels ASP 60 Cold Work Steel, retrieved from the Internet on 24 March 2022

V. In reply to the communication pursuant to Article 15(1) RPBA, the appellant submitted the following documents.

D31 Excerpt from the Book "Stahlschlüssel", Verlag Stahlschlüssel Wegst GmbH, 19th edn., 2001, ISBN 3-922599-17-6, 17

D32 Data Sheet, Robert Zapp Werkstofftechnik GmbH, Powder metallurgy HSS, ASP®2060, published in 2008

VI. The appellant's arguments relevant to the present decision can be summarised as follows.

The requirements of Articles 83, 123(2) and (3) EPC were not met in view of the category change of claim 7 as granted.

In addition, the requirements of Article 56 EPC were not met. D5 was the closest prior art. The skilled person was looking for a suitable bearing having high hardness and wear resistance. The skilled person knew that ASP 60 and ASP 2060 were identical. D1 and D32 referring to standards confirmed that their compositions could vary within the ranges given in D31. The following documents or combination of documents therefore rendered the subject-matter of claim 1 obvious when starting from D5: D8 alone; D9 alone; D10 alone; D15 alone; D15 and common general knowledge based on D22 and D30; D16 alone; D19 alone; D19, when considering D23 and/or D25; D19 and possibly D2 and common general knowledge; D21 alone; D23 alone.

Although the inventive-step objection based on D5 in combination with only D25 had not been raised before, it should be admitted into the proceedings in view of its *prima facie* relevance.

VII. The respondents' (patent proprietors') arguments are reflected in the reasoning below.

VIII. The appellant (opponent) requested that the decision under appeal be set aside and that the patent be revoked.

The respondents (patent proprietors) requested that the appeal be dismissed.

## Reasons for the Decision

1. Article 83 EPC

The appellant contested sufficiency of disclosure. The ground for opposition under Article 100(b) EPC was not part of the notice of opposition. An objection under Article 83 EPC had not been raised later during opposition proceedings and was not part of the impugned decision. The question of admissibility of the objection can be left open since, in any case, it is not convincing.

The skilled person working in the field of butterfly valves knows how to produce a conventional valve (paragraph [0037] of the patent). The valve produced by the method of claim 1 only differs from such a conventional valve in that a ball bearing produced by the method of claim 1 as granted is used. There is no reason why the skilled person cannot produce such a

ball bearing by carrying out the comprehensible sintering and shaping steps of claim 1. This is confirmed by the fact that the manufacturing method of claim 1 as granted was not objected to under Article 100(b) EPC.

The requirements of Article 83 EPC are met.

2. Article 123(3) EPC

Notwithstanding whether the objection under Article 123(3) EPC, apparently raised for the first time in the appellant's letter of 14 September 2022, is to be considered part of the proceedings, it does not seem to be convincing. Under established case law, a product claim confers protection to all processes for making that product, such that the replacement of a claim directed to a product with a claim directed to a specific process or method for making that product does not extend the protection conferred (Case Law of the Boards of Appeal of the EPO, 10th edn., 2022, II.E. 2.7.3)). A butterfly valve was the subject-matter of claim 7 as granted so that current claim 1 directed to a method for manufacturing a butterfly valve does not extend the protection conferred.

3. Article 123(2) EPC

The appellant contests that the method for manufacturing a butterfly valve is directly and unambiguously derivable from the application as originally filed.

This document discloses on page 5, lines 7 to 9 that the ball bearing may be used for manufacturing a butterfly valve for an aeronautical application. This

means that the butterfly valve is manufactured with the ball bearing, which is manufactured as defined in claim 1 as filed. Current claim 1 is therefore directly and unambiguously derivable from claims 1, 5 and 7 and page 5, lines 7 to 9 of the application as originally filed.

The board sees no reason to deviate from the opposition division's conclusion.

4. Article 56 EPC

4.1 The invention relates to a method for manufacturing a butterfly valve with a ball bearing obtained by powder metallurgy (PM).

4.2 D5 is the closest prior art. As indicated in paragraph 49 of the impugned decision, D5 discloses a method for manufacturing a butterfly valve for an application in aeronautics (see for example column 1, lines 10 to 17). D5 does not disclose at least the sintering of a steel powder, the chemical composition of which includes in mass percent 2.3% carbon, 4.2% chromium, 7% molybdenum, 6.5% tungsten, 10.5% cobalt and 6.5% vanadium so as to obtain a sintered steel.

The appellant's argument that sintering was implicitly disclosed in D5 is not convincing since D5 is silent about the composition of the alloy used and its production process. There is consequently no reason that the sintering step could be assumed to be implicit.

4.3 The problem to be solved by the current patent is to provide an enhanced method (see paragraphs [0001] and [0009] of the patent) for producing a butterfly valve.

4.4 It is proposed to solve the problem by a method according to claim 1 characterised in that (i) the manufacturing of the ball bearing includes a step for sintering a steel powder, the chemical composition of which includes in mass percent 2.3% carbon, 4.2% chromium, 7% molybdenum, 6.5% tungsten, 10.5% cobalt and 6.5% vanadium so as to obtain a sintered steel and (ii) the sintered steel is shaped for forming at least one of the outer and inner rings.

4.5 It is accepted that the problem is solved since the combination of the specific composition with the sintering process leads to less defects (paragraph [0009] of the patent). There is no evidence that casts doubt on this conclusion. There is, consequently, no need to define the problem in other terms such as providing bearings of a high-strength material adapted to different temperatures and having good wear resistance.

4.6 It needs to be established whether the proposed solution is obvious or not in view of the prior art.

4.6.1 D5 only discloses that suitable ball bearings may be used (column 4, line 13) but does not define what is considered suitable. Furthermore, the composition of the steel and the method of manufacturing the ball bearings are not disclosed.

4.6.2 D8 discloses PM tool steels, which are high-speed steels that contain about 4% chromium (page 224, lines 1 to 3). In Table 3 several compositions of such high-speed steels are listed, including ASP60 steel. The high-speed steels are mentioned in the context of the cutting tool industry (page 223, penultimate paragraph). No reference is made to the production of a

butterfly valve. The reference to special-purpose valves and bearings on page 210 is not linked to high-speed steels obtained by PM. Again, no butterfly valve is mentioned. Furthermore, the exact composition of ASP 60 in Table 3 is not known. Chromium is not mentioned but its content is probably about 4%. The reference to standard 1.3241 in Table 3 indicates that the steels listed in that row, namely ASP60, APM60 and KHA 60, fulfil this standard. D31 gives the ranges for carbon, silicon, manganese, phosphorus, sulfur, cobalt, chromium, molybdenum, vanadium and tungsten allowed for a composition to qualify for the standard 1.3241. Within these ranges, many different compositions are possible which cannot be claimed to be identical. The skilled person knows that it is the exact amount of the different components that ultimately determines the properties and processability. One of the compositions falling within the standard 1.3241 is the one used in the process under debate. Therefore, the appellant's argument that the compositions of D1 and D32, which deal with alloy ASP 2060, had to be considered identical within the ranges of the standard 1.3241 (D31) is not convincing. D8 does not provide any pointer to the butterfly valve, the exact composition of ASP 60 or any pointer to use ASP 60, which is one of numerous compositions presented in D8. D8 cannot render obvious the proposed solution.

4.6.3 D9 is silent about butterfly valves and only discloses ASP 2060 in the section on the prior art (page 2, lines 5 to 13). Even if the skilled person considered D9 when trying to solve the posed problem, there is no reason to select a composition which is not even part of the invention. D9 does not render obvious the proposed solution either.

4.6.4 D10 relates to the high-speed steels produced by PM. D10 does not relate to the production of ball bearings but only generally to wear resistance, bending strength and hardness (page 18, left-hand column). D10 discloses numerous compositions of high- speed steels including ASP 2060 comprising 4% chromium (Table 1), which is different from 4.2% chromium. As indicated above (point 4.6.2), the standard 1.3241 (shown in D31) is interpreted such that numerous different compositions fall within the standard, but these compositions are not identical. There is also no proof that the measurement deviations were such that no distinction could be made between 4.2% and 4% chromium. In any case, there is no pointer in D10 to use ASP 2060 to solve the posed problem. The proposed solution is not obvious in view of D10 either.

4.6.5 D15 discloses high-speed steels. ASP 60 containing 4.0% chromium was processed by hot isostatic pressing (HIP) and compared to a vacuum sintered alloy of a different composition (see Table 1). D15 does not relate to a butterfly valve. Even if the skilled person turned to D15, firstly, there is no explanation why the skilled person should use ASP 60 instead of the other material for the production of butterfly valves and, secondly, ASP 60 (HIP) only contains 4.0% chromium. The appellant's argument that there would not be a difference between 4.0% and 4.2% chromium (as present in D1 and D32) is not corroborated by evidence. As mentioned above, D31 is not helpful in this respect. The reference to D22 and D30 only confirms that different compositions are classified as standard 1.3241. D30 shows that ASP 60 steels containing 4.2% chromium exist, but this is not the same steel as the one used in D15. D22 (Table 3-2) shows that ASP 60 steels containing 4.25% chromium exist, but this is

again not the same steel as the one used in D15. To conclude, D15 does not render obvious the proposed solution either.

4.6.6 D16 generally discloses high-speed steels. It indicates that they have excellent high temperature hardness, wear resistance and toughness, and are fully machinable (first paragraph of chapter 1.2.1). ASP 2060 is disclosed among numerous other high-speed steels in Table 3 (last line), but its exact composition is not given. Even if the skilled person trying to solve the posed problem turned to D16, there is no teaching to the specific composition of claim 1. D16 does not render obvious the proposed solution either.

4.6.7 D19 discloses two high-speed steels produced by PM (page 22). Below the table, reference is also made to "[s]peciality bearing components". It is indicated that they constitute an upgrade from conventional M50 bearing steel. This is also confirmed on page 25. The appellant argues that M50 was widely used for high load bearing applications in the aerospace industry and refers to D23. Therefore, it would have been obvious to replace it with the upgrade disclosed in D19.

However, D23 does not refer to a butterfly valve. In addition, with respect to valves, D23 indicates that PM processed high-speed steels are under development (page 12). M50 is presented as a material for aero-gas turbine engine bearings but not for bearings for valves. D23 does not disclose that M50 and PM processed high-speed steels were commonly used for the production of ball bearings.

The appellant also referred to D25 in their objection based on D5 with D19. Notwithstanding the question

whether D25 is prior art, D25 confirms that ASP 2060 is an upgrade compared to M50 for speciality bearing components (page 9). However, there is no teaching in D25 about the processing of ASP 2060 for the production of ball bearings for butterfly valves. There is no reason, besides an *ex post facto* analysis, why the skilled person trying to solve the posed problem, which relates to an enhanced processing, would turn to D19 and specifically choose the alloy ASP 2060 instead of ASP 2062.
D2 was also referred to, but D2 does not disclose the claimed chemical composition.

As D31 indicates concentration ranges (and not precise values), it cannot lead to the composition of claim 1 either (see point 4.6.2 above).

Therefore D19, even when considering documents D23, D25, D31 and D2, does not teach the proposed solution.

4.6.8 D21 discloses that PM has emerged as an advanced manufacturing technology for the production of high-performance components for aerospace industries. Even when considering D1 and D32, D21 does not mention the composition used in the process of claim 1 of the current request (see also point 4.6.5 above).

As D31 indicates concentration ranges (and not precise values), it cannot lead to the composition of claim 1 either (see point 4.6.2 above).

Furthermore, D21 is silent about bearings for butterfly valves. Therefore, D21 does not render the claimed process obvious.

4.6.9 D23 discloses an ASP60 alloy in PM but not the exact complete composition.

As D31 indicates concentration ranges (and not precise values), it cannot lead to the composition of claim 1 either (see point 4.6.2 above).

Moreover, as indicated above, D23 does not relate to a butterfly valve.

4.6.10 Consequently, the subject-matter of claim 1 is based on an inventive step.

4.7 In agreement with the appellant (see last paragraph on page 7 of the statement of grounds of appeal), a similar argument applies to claim 5.

4.8 Claims 2 to 4 directly or indirectly incorporate the subject-matter of claim 1, and claim 6 incorporates the subject-matter of claim 5. They also involve an inventive step.

4.9 The requirements of Article 56 EPC are met.

5. Article 13(2) RPBA

During oral proceedings, the appellant raised a further objection based on the combination of D5 with D25. As admitted by the appellant, such an objection had not been raised before. D25 had been cited in the appellant's letter of 14 September 2022, but only for an inventive-step attack based on D5 and D19 to corroborate its position that D19 taught that ASP 2060 was an upgrade to the steel alloy M50. The inventive-step attack based on D5 in combination with D25 alone

is therefore undisputedly a new attack that qualifies as a change in the appellant's case.

Under Article 13(2) RPBA 2020, any amendment to a party's appeal case made after notification of a communication under Article 15(1) RPBA 2020 is, as a rule, not to be taken into account unless there are exceptional circumstances justified with cogent reasons by the party concerned.

*Prima facie* relevance cannot *per se* constitute exceptional circumstances at this stage of the proceedings (Case Law of the Boards of Appeal, 10th edn., V.A.4.5.8 i)).

Under the circumstances of the case at hand and with no new considerations in the communication pursuant to Article 15(1) RPBA, there is no need to assess the *prima facie* relevance of the objection to conclude that there are no exceptional circumstances under Article 13(2) RPBA 2020 (see, for example, T 574/17, Reasons 2.3.3). No exceptional circumstances can be recognised justifying yet another attack of inventive step at this stage of the proceedings.

Consequently, this new line of attack cannot be admitted into the proceedings (Article 13(2) RPBA 2020).

6. Since the objections fail, there is no need to decide whether D30 to D32 should be considered as part of the proceedings.

## Order

## For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

C. Vodz T. Burkhardt

Decision electronically authenticated