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**D E C I S I O N**  
**of 16 April 1999**

**Case Number:** T 0499/97 - 3.2.1

**Application Number:** 90202993.3

**Publication Number:** 0430324

**IPC:** F16C 33/20, C08L 27/16,  
C08L 27/18, C08K 3/00 (C08K 3/00,  
3:04, 3:08)

**Language of the proceedings:** EN

**Title of invention:**  
Bearings

**Applicant/Patentee:**  
The Glacier Metal Company Limited

**Opponent:**  
Glyco-Metall-Werke Glyco B.V. & Co. KG  
Metallgesellschaft AG

**Headword:**  
-

**Relevant legal provisions:**  
EPC Art. 56

**Keyword:**  
"Inventive step (yes)"

**Decisions cited:**  
-

**Catchword:**

-

**Case Number:** T 0499/97 - 3.2.1

**D E C I S I O N**  
**of the Technical Board of Appeal 3.2.1**  
**of 16 April 1999**

**Appellant:**  
(Opponent 01)

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**Respondent:**  
(Proprietor of the patent)

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**Decision under appeal:**

**Interlocutory decision of the Opposition Division  
of the European Patent Office posted 28 February  
1997 concerning maintenance of European patent**

**Composition of the Board:**

**Chairman:** F. A. Gumbel  
**Members:** S. Crane  
J.-C. Saisset

## Summary of Facts and Submissions

- I. European patent No. 0 430 324 was granted on 7 September 1994 on the basis of European patent application No. 90 202 993.3.
- II. The granted patent was opposed by the present appellants (opponents 01) and the further party as of right under Article 107 EPC (opponents 02) on the ground that its subject-matter lacked novelty and/or inventive step with respect to the state of the art.

Of the prior art documents relied upon in the opposition proceedings only GB-A-1 338 234 (D1) and DE-A-2 928 081 (D2) have played any significant role on appeal.

- III. With its decision posted on 28 February 1997 the Opposition Division held that the patent could be maintained in amended form on the basis of a new set of claims 1 to 5.

Claim 1 reads as follows:

"A bearing comprising a backing material, a layer of rough or porous material bonded to the backing material, and a bearing lining impregnated into the rough or porous material, wherein the bearing lining is formed from PVDF plastics based bearing material comprising 20 to 27 weight % PTFE, 15 to 25 weight % bronze and 4 to 9 weight % graphite; balance PVDF."

Dependent claims 2 to 5 relate to preferred embodiments of the bearing according to claim 1.

IV. A notice of appeal against this decision was filed on 5 May 1997 and the fee for appeal paid one day later. The statement of grounds of appeal was filed on 7 July 1997.

The appellants requested that the decision under appeal be set aside and the patent revoked in its entirety.

V. The oral proceedings before the Board on 16 April 1999 were attended only by the appellants. The respondents (proprietors of the patent) had already announced their intention not to attend in their letter of 8 April 1999, as had opponents 02 in their letter of 12 April 1999. Opponents 02 had taken no active part in the appeal proceedings.

VI. The arguments put forward by the appellants in support of their request for revocation of the patent can be summarised as follows:

The closest state of the art was represented by document D2 which disclosed a bearing of the same basic structure set out in claim 1 with a PVDF based bearing lining material comprising 5 to 35 vol% of an additive material of density equal to or greater than 8 g/cm<sup>3</sup>. Bronze, which has a density of about 9 g/cm<sup>3</sup>, was a well known additive material for bearing liners and it was obvious for the person skilled in the art to replace the relatively soft lead-based additive materials particularly disclosed in document D2 by bronze if greater resistance to wear was required. Document D2 also proposed the inclusion of other friction reducing additives such as PTFE and graphite, which could be present in amounts up to 35 vol%. Again, it was a

routine measure for the person skilled in the art to use these material in an amount suitable to achieve the desired end result and to combine them if necessary. As could be seen from Example V of document D1 a bearing lining material consisting of the four components of PVDF, bronze, PTFE and graphite was already known. The compositional ranges contained in claim 1 were not indicated in the patent specification as being associated with any particular or surprising advantages and were essentially arbitrary. They could therefore make no contribution to an inventive step.

VII. The written submissions of the respondents in their letters of 17 October 1997 and 8 April 1999 can be summarised as follows:

The only high density additive material mentioned in document D2 were lead-based products. It would not be obvious to replace these by bronze since it was significantly harder and would lead to a bearing material having markedly different properties. Furthermore, document D2 did not propose the inclusion of both PTFE and graphite in combination and in any case not in the amounts required by claim 1. Although Example V of document D1 did indeed disclose a bearing lining material consisting of the four components specified in claim 1 their relative proportions were distinctly different. Furthermore, the basic structure of the bearing disclosed there did not correspond to that claimed. There was therefore nothing in the state of the art which could lead the skilled person to the claimed bearing.

The respondents therefore requested that the appeal be

dismissed and the decision of the Opposition Division to maintain the patent in amended form confirmed.

### **Reasons for the Decision**

1. The appeal complies with the formal requirements of Articles 106 to 108 and Rules 1(1) and 64 EPC. It is therefore admissible.
  
2. In order to allow a ready comparison between the bearing lining material specified in present claim 1 and that disclosed in document D2 the appellants have converted the weight % compositional ranges set out in the claim into corresponding volume % ranges.

The ranges are as follows:

PTFE 19 to 30 vol%  
Graphite 3.9 to 10 vol%  
Bronze 3.5 to 6.7 vol%  
PVDF 53 to 74 vol%

These values have been accepted as being accurate by the respondents. From them it can be clearly seen that PVDF is the main component of the bearing lining material, in other words that the material can be said to be PVDF-based. (The same is true if the comparison is made on the basis of the weight % composition ranges.) Since document D2 relates to a bearing of the same basic structure as set out in present claim 1, i.e. with a PVDF-based bearing lining material impregnated into a layer of rough or porous material bonded to the backing layer, see in particular claims 2

and 15 of the prior art document, the Board can agree with the appellants that this document should be considered as the closest starting point for evaluating inventive step. Example V of document D1 on the other hand, which the appellants had taken for the starting point in the arguments presented in their statement of grounds of appeal, although comprising a bearing lining material consisting of the four components required by present claim 1, cannot be said to be PVDF-based, this components being present only in a relatively minor proportion. Furthermore, that bearing lining material was not impregnated into the rough or porous layer bonded to the backing material. That rough or porous layer was instead impregnated with unfilled PVDF.

The main concern of document D2 is improving the bonding between the bearing support and the fluorinated polymer matrix (preferably PVDF) of the bearing lining material which by itself exhibits poor adhesive properties. This improved bonding is achieved by incorporating 5 to 35 vol% of a finely divided additive material having a density of equal to or greater than 8 g/cm<sup>3</sup>. The preferred range is from 10 to 25 vol% and the preferred high density materials are lead-based products. Other additives may be incorporated for improving the friction properties of the bearing lining material. These further additives may be organic, for example PTFE, see claim 7, or inorganic, for example graphite or molybdenum sulphide, see claim 8.

In claim 9 it is indicated that the total amount of the friction reducing additives may be 5 to 50 vol%, preferably 10 to 30 vol%, of the amount of high density additive material. The appellants have argued that

claim 9 is somewhat unclear in its terms and that particularly with reference to claim 12, which is dependent on claim 9 and requires 25 vol% of high density additive material (Pb/PbO) and 20 vol% of friction reducing additive (PPS/PTFE), claim 9 should be interpreted as meaning that between 5 and 50% of the total amount of all additives may be of the friction reducing class, in other words that the maximum amount of friction reducing additive extends up to 35 vol% of the bearing lining material considered as a whole, corresponding to the maximum amount of high density additive material.

Having regard to the inconsistency pointed out by the appellants the Board is prepared to make the interpretation of claim 9 advanced by them the basis for its further considerations. However, in the view of the Board it makes little difference to the evaluation of inventive step in the present case whether the theoretical maximum amount of friction reducing additive allowed by document D2 is 17.5 vol% (i.e. 50% of a maximum 35 vol% of high density additive material) or 35 vol% (i.e. 50% of a total quantity of 70 vol% of all additives considered together, 35 vol% thereof being the maximum permitted amount of high density material). The reason for this lies in the very fact that document D2 ties the maximum amount of friction reducing additive which may be present in the bearing lining material to the amount of high density additive material which is present. Thus, even on the interpretation preferred by the appellants, the maximum total amount of friction reducing additive which document D2 teaches in the context of a bearing lining material containing 6.7 vol% of high density additive

material (i.e. the maximum amount of bronze allowed by present claim 1) is also 6.7 vol%. This is less than one third of the minimum amount (19 vol% PTFE combined with 3.9 vol% graphite) required by present claim.

Thus even on the assumption that the person skilled in the art seeking to improve the frictional and wear resistance properties of the bearing disclosed in document D2 would in the first place recognise bronze as a suitable high density additive material and in the second place choose to operate at the lower end of the permitted range for the content of this material, i.e. outside the preferred range of 10 to 25 vol%, then he would also need to increase the content of friction reducing additives to more than three times the amount permitted by the teachings of the document in order to arrive at a bearing lining material which met the requirements of present claim 1 in this respect. Two further steps which would need to be taken in order to come to the subject-matter of the claim under consideration are the incorporation of both PTFE and graphite into the bearing lining material, instead of just one of them, and the choice of an appropriate relationship between the contents of these two components. Although those last two steps could perhaps in the light of document D1, which discloses a bearing lining material (Example V) comprising 40 wt% bronze, 10 wt% graphite, 30 wt% PTFE and 20 wt% PVDF, not be considered as justifying an inventive contribution in their own right, the preceding step, which is a prerequisite for those two further steps to be taken, represents such a radical departure from the teachings of document D2 that it cannot be seen as lying within the normal routine experimental freedom of the person

skilled in the art, as argued by the appellants, and was not an obvious one for him to take.

Accordingly the Board has come to the conclusion that the subject-matter of claim 1 cannot be derived in an obvious manner from the state of the art and therefore involves an inventive step (Article 56 EPC).

### **Order**

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

The appeal is dismissed.

The Registrar:

The Chairman:

S. Fabiani

F. Gumbel