

Veröffentlichung im Amtsblatt  
Publication in the Official Journal  
Publication au Journal Officiel

Ja/Nein  
Yes/No  
Oui/Non



Aktenzeichen / Case Number / N° du recours : T 65/88 - 3.2.1

Anmeldenummer / Filing No. / N° de la demande : 83 850 204.5

Veröffentlichungs-Nr. / Publication No / N° de la publication : 0 100 761

Bezeichnung der Erfindung: Integral bearing system  
Title of invention:  
Titre de l'invention :

Klassifikation / Classification / Classement : F16C 27/02, F16C 17/12, F16C 17/00

**ENTSCHEIDUNG / DECISION**

vom / of / du 30 March 1989

Anmelder / Applicant / Demandeur : UNION CARBIDE CORPORATION

Patentinhaber / Proprietor of the patent /  
Titulaire du brevet :

Einsprechender / Opponent / Opposant :

Stichwort / Headword / Référence :

EPÜ / EPC / CBE Article 56

Schlagwort / Keyword / Mot clé : "Inventive step (yes)"

**Leitsatz / Headnote / Sommaire**

Europäisches  
Patentamt

European Patent  
Office

Office européen  
des brevets

Beschwerdekammern

Boards of Appeal

Chambres de recours

Case Number : T 65/88 - 3.2.1



**D E C I S I O N**  
of the Technical Board of Appeal 3.2.1  
of 30 March 1989

Appellant : UNION CARBIDE CORPORATION  
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Decision under appeal : Decision of Examining Division 115 of the  
European Patent Office dated 2 June 1987 refusing  
European patent application No. 83 850 204.5  
pursuant to Article 97(1) EPC

Composition of the Board :

Chairman : F. Gumbel  
Members : F. Brösamle  
F. Benussi

## Summary of Facts and Submissions

- I. European patent application No. 83 850 204.5 filed on 1 August 1983, and published under publication No. 0 100 761 was refused by decision of the Examining division dated 2 June 1987. That decision was based on Claims 1 to 7 filed with letter of 4 March 1987.

The reason given for the refusal was that particularly in view of the prior art documents

(D1) GB-A-1 478 582

(D2) US-A-4 097 094

the subject-matter of Claim 1 did not involve an inventive step within the meaning of Article 56 EPC, and that Claims 2 to 7 add nothing of inventive significance to the subject-matter of Claim 1.

- II. On 25 July 1987 a notice of appeal was filed and the appeal fee was paid in due time. The Statement of Grounds of Appeal was filed on 30 September 1987, together with new Claims 1 to 6 (4th amendment), Claim 1 being a combination of rejected Claims 1 and 4.

The Appellant argues that the features specified in the characterising portion of new Claim 1 render its subject-matter advantageous and inventive over the prior art documents D1 and D2 as neither of them discloses independently tunable shaft support, flexible support and viscous damping functions and in particular not the seal between shaft and bearing housing of Claim 1. He contends that the argumentation of the Examining Division concerning the "seal" - feature is incorrect, as the seal arrangement of the subject-matter of Claim 1 is unconventional. In addition, he pointed to the fact that

the viscous damper is completely unaligned with the bearings, which feature is contradictory to the teachings of D1 and D2.

III. In its communication dated 19 July 1988 the Board raised objections under Article 123(2), Article 84 and Rule 29(1) EPC and made suggestions how these objections could be overcome as far as Claim 1, the object of the invention and the description are concerned.

IV. In reply to the above mentioned communication of the Board the Appellant filed with letter of 14 September 1988 new Claims 1 to 6 and an amended description and requested grant of a European patent on the basis of the following documents:

- Claims 1 to 6 filed with letter of 14 September 1988;
- pages 1 to 3, 7, 8, 12 to 15 as originally filed
- pages 4, 5, 5a, 6, 6a, 9, 10, 11 filed with letter of 14 September 1988, pages 5a, 6, 6a being amended as agreed by telephone, see telex of 22 March 1989
- Drawing 1/1 as originally filed.

V. Claim 1 reads as follows:

"1. A bearing system comprising a stationary support housing (111) having a longitudinal opening therethrough for positioning a rotatable shaft (113) substantially aligned therein, an essentially non-rotatable bearing housing (116) positioned between the shaft (113) and the support housing (111) and comprising at least one pair of bearing means (117), each bearing means having a bearing surface for rotatably supporting said shaft (113), and a spacer portion (118) between said pair of bearing means (117), said spacer portion (118) not supporting said shaft, and viscous damping means (121) being unaligned with the bearings and comprising an annular space between

the support housing (111) and the bearing housing (116) along at least a portion of their axial length, said annular space being filled with a viscous material through said axial length portion, the axial length portion of the annular space being greater than the axial length of said bearing surfaces, characterized in that the viscous damping means comprises a generally uniform annular space (121) between the spacer portion (118) and the support housing (111); a plurality of spaced elastic supports (120) is in contact with the bearing housing (116) and the support housing (111); each elastic support (120) is so positioned that a force exerted on such elastic support is not aligned with a force exerted on the bearing means (117); shaft seals (132, 133) are formed by the opposing surfaces of the shaft (113) and the bearing housing (116) along at least a portion of the common axial length of the shaft and bearing housing."

#### Reasons for the Decision

1. The appeal is admissible.
2. Claim 1 is no longer open to formal objections under Articles 123(2), 84 and Rule 29(1) EPC.
3. The subject-matter of Claim 1 is novel in view of the prior art bearing systems disclosed in D1 and D2. Novelty was not disputed by the Examining Division or the Board so that no further argument is necessary in this respect.
4. The examination of the subject-matter of Claim 1 in view of an inventive step leads to the following result:
  - 4.1 Starting point of the invention is D1, over which document Claim 1 is now correctly delimited so that one of the reasons of the impugned decision of the Examining Division

(see pages 3 and 4) to refuse the application in suit is no longer existent.

- 4.2 In D1 a bearing system is realised where the viscous damping means between the spacer portion and the support housing is not of a generally uniform annular shape, but comprises interrupted annular spaces "17, 17a, 18, 18a". Elastic supports in contact with the bearing housing and the support housing as well as shaft seals between the opposing surfaces of the shaft and the bearing housing along at least a portion of the common axial length of the shaft and the bearing housing are not provided.
- 4.3 It is the object of the invention to provide an improved bearing system for rotary machinery which provides shaft, flexible support and viscous damping functions independently of one another, such that each function can be adjusted individually without affecting either of the other two functions, whereby a seal of the bearing system is realised, which is not negatively affected by the vibrations of the shaft and which in turn does not influence the above functions of the bearing system.
- 4.4 This object of the invention is to the Board's conviction solved by the features of the characterising clause of Claim 1, which can be listed as follows:
- (a) the annular space is arranged between the spacer portion and the support housing and is generally uniform;
  - (b) a plurality of spaced elastic supports is provided between the bearing housing and the support housing;
  - (c) the position of the elastic supports is such that the forces exerted on the elastic supports are unaligned with the forces exerted on the bearing means and

(d) shaft seals are formed by the opposing surfaces of the shaft and the bearing housing at least along a portion of the common axial length thereof.

4.5 With this construction a bearing system is realised where it is possible to independently tune the functions of the bearing system concerning shaft support, flexible support and viscous damping, see features (a) to (c) of 4.4. The shaft seals according to feature (d) allow the shaft and the bearing housing to oscillate in synchronism with the vibrations of the rotating shaft, see page 8 lines 20 to 24 and page 14 lines 32 to 34 of the description, without affecting the shaft seal, as the mutual gap between the shaft and the bearing housing is not affected by the vibrations of these parts (see page 16, lines 10 to 18). Furthermore, it is apparent that the shaft seals have no negative influence on the independent tuning of the above functions.

4.6 In the impugned decision of the Examining Division the features of the then counting Claim 1 were split up into features contributing to the solution of the then worded object and into those features which allegedly do not.

It is the Board's view, that this is - apart from the exceptional cases where a feature obviously is totally irrelevant - not the right approach for assessing the question of inventive step.

According to the permanent jurisdiction of the Boards of Appeal, the correct approach requires that the object of the invention as claimed has to be assessed in an objective way relative to the closest prior art; that is, the object should be formulated in a manner that all features of the characterising clause of the main claim contribute to its solution.

In the present case feature (d) of Claim 1 has not correctly been considered in the impugned decision, due to the fact that the Examining Division felt bound to the then worded object without modifying it in a way that feature (d) (shaft seals) of Claim 1 really contributes to the solution of the object respectively to the claimed invention.

- 4.7 In the Board's view, however, feature (d) is an essential feature of the invention. It clearly cannot be derived from D1 or D2, and the Board does not share the judgement in the impugned decision that for a skilled person it is a feature of trivial nature. Normal practice could as well be to arrange the seals of the shaft between the shaft and the support housing of the bearing system, which is a fixed point even when the shaft vibrates.

The invention did not follow this consideration, but arranged the shaft seals between the shaft and a bearing housing which is also exposed to vibration or oscillation. This arrangement has the technical effect that the gap between the shaft and the bearing housing remains essentially constant when the shaft vibrates due to the fact that the bearing housing oscillates in synchronism with it. The claimed seal does not at all negatively influence the other functions of the bearing system as shaft support, flexible support and viscous damping so that there is a correlation between this feature and the other features according to the claimed solution in the sense of a combinatory effect which is not suggested by any prior art. Moreover, there is no teaching in the prior art to conceive the shaft seals as integral parts of the opposing surfaces of shaft and bearing housing.

- 4.8 D1 is of no relevance for the finding of the claimed solution to the object of the invention, not only in view of feature (d) but also in view of features (a) to (c), as



there no uniform space for the damping means is realised, and no elastic supports for the bearing housing are existent. The question how to arrange the elastic supports in relation to the bearings can therefore not arise in the construction laid down in D1.

- 4.9 From D2 a person skilled in the art knows that satisfactory damping of the shaft vibrations can be attained by a plurality of spaced elastic supports "42" or "98", (see figures 1 and 4) together with a uniform annular space "56" or "100" between the bearing housing "10, 12" or "70, 74" and the support housing "28" or "92" which is filled with a viscous fluid and thus constitutes viscous damping means. Insofar features (a) (except for the arrangement of a spacer portion) and (b) of Claim 1 can be derived from D2. Feature (c) of Claim 1 is, however, not realised in the claimed way, as in the bearing system according to D2, only one single bearing means is present so that as a consequence thereof forces introduced to the elastic supports and to the bearing means necessarily are partly aligned and partly not aligned. A person skilled in the art can therefore not derive a clear teaching to apply these forces in a completely unaligned manner by specifically arranging the bearing means and the elastic supports as is required by the subject-matter of Claim 1, i.e. by applying a pair of bearing means connected by means of a spacer portion, and positioning the annular gap exclusively adjacent said spacer portion.

In D2 there exists an interrelationship between the axial length of the viscous damping means and the axial length of the bearing surface in that the damping means never can be longer than the bearing surface. This constitutes a severe restriction in the choice of viscous damping so that the functions viscous damping and shaft support are also not independent as is required by the object of the

present application and as achieved with the bearing system defined in Claim 1.

Summarising the Board comes to the result that the bearing system of D2 although disclosing some features of the subject-matter of Claim 1, does in the absence of a teaching how to structurally separate the critical functions of the bearing system not lead a person skilled in the art to the subject-matter of Claim 1, even when the teaching of D1 is considered at the same time, and including the general knowledge of a skilled person.

- 4.10 Consequently the subject-matter of Claim 1 is considered to be based on an inventive step in the light of the available prior art documents. This claim is thus allowable.
- 4.11 The dependent Claims 2 to 6 describe further embodiments of the invention and are not open to objection either.
- 5. The amendments to the description take account of the prior art and the scope of the claims in their present form. The thus amended description does not give rise to objections.

**Order**

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

- 1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to grant a European patent on the basis of the following documents:

(a) Claims 1 to 6 filed with letter of 14 September 1988, received on 16 September 1988.

(b) Description pages 1 to 3, 7, 8 12 to 15 as originally filed

and pages 4, 5, 5a, 6, 6a, 9 to 11 and 16 filed with letter of 14 September 1988, received on 16 September 1988 with the amendments on pages 5a, 6, 6a as agreed by the Appellant;

(c) Original drawing sheet 1/1.

The Registrar:

*S. Fabiani*

S. Fabiani

The Chairman:

*F. Gumbel*  
F. Gumbel

*Bv. 28.3. 89*

*[Handwritten signature]*

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