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D E C I S I O N
of 11 July 2002

Case Number: T 0624/00 - 3.2.1

Application Number: 92911772.9

Publication Number: 0586502

IPC: F16C 33/62

Language of the proceedings: EN

Title of invention:
Corrosion-resistant zinc-alloy plated rolling element bearing

Patentee:
MPB CORPORATION

Opponents:
INA-Schaeffler KG
SKF GmbH

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 123(2)

Keyword:
"Novelty, yes; inventive step, no (main request)"
"Added subject-matter, yes - inadmissible intermediate generalisations (auxiliary requests)"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0624/00 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 11 July 2002

Appellant: (Proprietor of the patent)
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Respondent: (Opponent)
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 12 April 2000 revoking European patent No. 0 586 502 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman: S. Crane
Members: M. Ceyte
G. Weiss

Summary of Facts and Submissions

I. European patent No. 0 586 502 was granted on 23 April 1997 on the basis of European patent application No. 92 911 772.9.

II. The granted patent was opposed by the present respondents (opponents 02) on the grounds that its subject-matter lacked novelty and/or inventive step (Article 100(a) EPC).

With its decision posted on 12 April 2000 the Opposition Division revoked the patent. It held that the subject-matter of claim 1 of the main request under consideration lacked novelty with respect to the article "How to Protect Bearings Against Corrosive Attack" by F. L. Jones in Plant Engineering, September 10, 1987, pages 80 to 82 (document D8). If novelty with respect to document D8 were however given, then the subject-matter of the claim would lack inventive step with regard to this document and the article "Zinc-Nickel Alloy plating" by N. Zaki in Metal Finishing, June 1989, volume 87, pages 57 to 60.

The wording of claim 1 on which the decision was based is as follows:

"A rolling bearing (10) comprising a first element (14) having a first race (18); a second element (12) having a second race (20), said first and second elements (14, 12) being positioned so that said first and second races (18, 20) form a channel; a first corrosion resistant layer (24) on said first race (18); a second corrosion resistant layer (22) on said second race (20); and a plurality of rolling elements (16)

disposed within said channel formed by said first and second races (18, 20), wherein within said channel there is received a liquid lubricant, preferably a grease characterized in that

a) said first corrosion resistant layer is formed by a first zinc alloy plated layer (24),

b) said second corrosion resistant layer is formed by a second zinc alloy plated layer (22)."

III. A notice of appeal against this decision was filed on 15 June 2000 and the fee for appeal paid at the same time.

The statement of grounds of appeal was received on 22 August 2000.

The appellants (proprietors of the patent) requested that the decision under appeal be set aside and the patent maintained in amended form on the basis of the claims of the main request underlying the contested decision or in the alternative on the basis of one of the sets of claims according to first to fourth auxiliary requests submitted at the oral proceedings.

They also requested reimbursement of the appeal fee.

Claim 1 of the first auxiliary request reads as follows:

"A rolling element bearing (10) comprising a first element (14) having a first race (18); a second element (12) having a second race (20), said first and second elements (14, 12) being positioned so that said

first and second races (18, 20), being the functional surfaces, form a channel; a first corrosion resistant layer (24) on said first race (18); a second corrosion resistant layer (22) on said second race (20); and a plurality of rolling elements (16) disposed within said channel formed by said first and second races (18, 20), wherein within said channel there is received a liquid lubricant, preferably a grease characterized in that

a) said first corrosion resistant layer is formed by a first zinc alloy plated layer (24),

b) said second corrosion resistant layer is formed by a second zinc alloy plated layer (22), wherein the thickness of the first and second zinc alloy plated layers on said functional surfaces is thinner than a controlled thickness of the plating on outboard faces (33, 28) of said elements."

Claim 1 of the second auxiliary has the following wording:

"A rolling element bearing (10) comprising a first element (14) having a first race (18); a second element (12) having a second race (20), said first and second elements (14, 12) being positioned so that said first and second races (18, 20) form a channel; a first corrosion resistant layer (24) on said first race (18); a second corrosion resistant layer (22) on said second race (20); and a plurality of rolling elements (16) disposed within said channel formed by said first and second races (18, 20), wherein within said channel there is received a liquid lubricant, preferably a grease in which said first element is an inner bearing ring (14) and said second element is an outer bearing

ring (12) characterized in that

a) said first corrosion resistant layer is formed by a first zinc alloy electro plated layer (24),

b) said second corrosion resistant layer is formed by a second zinc alloy electro plated layer (22), wherein the thickness on outboard faces (28; 33) of said rings is controlled to be within the range of 5,08 to 12,7 µm (0,0002 to 0,0005 inch) and wherein the thickness elsewhere on said inner ring (14) is less than said thickness and the thickness on the race of the outer ring (12) is less than said thickness."

Claims 1 of the third and fourth auxiliary requests have been derived from claims 1 of the first and second requests, respectively, by specifying in features (a) and (b) of the characterising clause that the "zinc alloy" is "zinc-nickel alloy".

In support of these requests the appellants argued substantially as follows:

The mention made in document D8 of the possibility of using a zinc coating to protect a rolling bearing against corrosion was of a purely theoretical nature and did not contain the information that the zinc coating was provided on each of the races, as required by the claims under consideration. Furthermore the reference to "zinc" could not be assimilated to "zinc alloy". The latter term would not be understood by the person skilled in the art as extending to zinc with the small amount of impurities normally found therein, as had been argued by the Opposition Division.

As for WO-A-9 207 117 (document D1) which belonged to the state of the art according to Article 54(3) EPC, proper account had already been of this by the incorporation into claim 1 of the features of granted claim 10 concerning the requirement for a liquid lubricant.

The subject-matter of claim 1 of the main request was also inventive with respect to the state of the art. Although it could be seen from document D9 for example that electroplated zinc alloy, in particular zinc-nickel, was known as a corrosion resistant coating for static constructional parts there was no suggestion in the art that such a zinc alloy could perform effectively under the high dynamic loads experienced in a rolling bearing. In this field the trend had been away from soft coatings with their associated wear problems towards very hard coatings, in particular thin dense chrome, so that it was very surprising that a relatively soft zinc alloy coating gave such good results.

The claims according to the auxiliary requests contained further features concerned with how the required thickness of zinc alloy was obtained on the crucial functional surfaces of the bearing elements. There was nothing comparable in the state of the art. The claims were fully supported by the description of the preferred embodiment.

The Opposition Division had handled the late introduction of the documents D8 and D9 unfairly, firstly by refusing to postpone the oral proceedings, secondly by not allowing the accompanying US attorney present at the oral proceedings to speak and the

appellants had thus been denied a proper right to be heard (Article 113(1) EPC). Reimbursement of the appeal fee was therefore justified.

V. The reply of the respondent was substantially as follows:

The subject-matter of claim 1 of the main request lacked novelty with respect to both of the documents D1 and D8. With regard to the former document the use of a lubricant in a rolling member was so conventional that its presence was implicit to the person skilled in the art. As for document D8 the reference in claim 1 to an unspecified "zinc alloy" was not capable of providing a distinction over the simple reference to "zinc" in the prior art.

Document D9 very clearly taught the advantages of a zinc-nickel alloy corrosion resistant coating over conventional cadmium or zinc coatings. There was nothing in the document that could suggest that such a zinc-nickel alloy coating would not be a suitable material in the context of providing corrosion resistance to rolling bearings and this was an obvious step for the person skilled in the art to take.

The claims according to the auxiliary requests did not find a proper basis in the original disclosure and had been inadmissibly generalised from the single preferred embodiment described there. In any case the features involved were either known *per se* or trivial automatic consequences of the galvanising process.

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. *Novelty*

2.1 Document D1 claims two priorities only the earlier of which (DE 40 33 459.7 of 20 October 1990 lies before the priority date to which the contested patent is entitled, ie 15 June 1991. The content of document D1 therefore belongs to the state of the art according to Article 54(3) EPC, but only in so far as it is supported by the first priority document. That document proposes rolling bearing elements having surfaces provided with a galvanically applied zinc-nickel alloy layer with a thickness of 0.1 to 3.0 µm. The document does however make no mention of the presence of a liquid lubricant in a channel defined between races of the elements. It cannot be denied of course that the use of such lubricants with rolling bearings is very well known, although other lubricating systems, for example solid lubricants, also exist and in some special cases rolling bearings are used without lubrication. The Board cannot therefore accept the contention of the respondents that the reference to a rolling bearing in document D1 already carries within it the implicit information that there is a liquid lubricant present. Accordingly, the approach to novelty in the European patent system being a strict one, the subject-matter of claim 1 of the main request must be considered novel with respect to document D1.

2.2 Document D8 is a relatively short but wide-ranging review of the possibilities of protecting bearings, in particular rolling bearings, against corrosive attack.

The alternatives are summarised in a table at the top of page 81 and include coatings of high-density chromium, cadmium and zinc. The performance of high density chromium is rated the highest, but it is the most expensive - cadmium and zinc coatings have similar ratings, both being marked down for poor abrasion resistance. In a passage under the sub-title "coatings" on page 82 it is said that the great advantage of coatings is that they can be used with standard bearing materials for races and rolling elements. It is then indicated that environmental regulations have curtailled the use of the traditional coatings of choice, cadmium, and that a better alternative with regards to both abrasion and corrosion resistance is electrodeposited chromium. Then comes the statement "Another excellent bearing coating for corrosion resistance is zinc. However, zinc's abrasion resistance is poor and the coating could be ruptured quickly in a dirty environment".

The appellants see in that statement, particularly the use of the verb "could", an indication that the use of a zinc coating is only a theoretical possibility, not one that had actually been put into practice. It is not clear to the Board how such a consideration should be of significance to the evaluation of novelty but in any case it is convinced that the person skilled in the art would understand the author of document D8, taking the whole context, as describing the use of zinc coating of rolling bearing races to prevent corrosion. Furthermore, there can be no genuine doubt that the zinc coating is engaged by the rolling elements and not, as suggested by the appellants, merely present elsewhere on the races as a sacrificial corrosion inhibitor. If this were not the case then the reference

to poor abrasion resistance would be meaningless. Lastly, the Board cannot accept that document D8 does not, as argued by the appellants, disclose the use of a zinc coating on the races in combination with the use of a liquid lubricant. The passage referring to the use of lubricants on page 82 of the document makes it clear that a liquid lubricant, eg grease, gives generally poor protection in itself and that a combination with a corrosion resistant coating is necessary to achieve the best results.

This far the Board therefore follows the reasoning of the contested decision. However it cannot agree with what is said there with respect to the ability of the restriction to a zinc alloy in claim 1 of the main request to distinguish over the reference to zinc in the prior art. In the opinion of the Board the fact that the nature of the zinc alloy is not further defined in the claim does not mean, as held in the decision, that the alloy may only comprise "negligible" amounts of alloying elements, which would also be present in a normal zinc coating. The inherent character of an alloy is however that the alloying elements are present in a quantity sufficient to change the properties of the base metal in some desired way. Thus, although the term zinc alloy as used in claim 1 of the main request is indeed very broad, it is not anticipated by the reference to zinc in the prior art under consideration. The subject-matter of the claim is thus novel with respect to document D8.

3. *Inventive step*

Starting from document D8 which refers to conventional zinc or cadmium coatings it is apparent from point 2.2

above that the object to be achieved by the claimed invention is to provide a bearing coating for corrosion resistance which shows an improved resistance to abrasion as well as an improved resistance to rupture in a dirty environment.

This object is achieved by the corrosion-resistance zinc-alloy plated rolling element bearing defined in claim 1.

Document D9 is an article specifically directed to the use of zinc-nickel alloy plating for the prevention of corrosion of steel parts. Under the sub-leading "conclusions" on page 60 it is said that zinc-nickel alloy plating offers substantial improvement in corrosion resistance over existing technology based on zinc and cadmium plating. In addition to solving serious ecological problems with cadmium it is readily adaptable to existing equipment and processes.

The appellants argue that this document is only concerned with the plating of static components so that it gave the person skilled in the art no hint that a zinc-nickel alloy coating would be of practical use under the dynamic loading experienced by the races of a rolling bearing. However, the advantages of the zinc-nickel alloy coating over conventional zinc or cadmium coatings is so clear from document D9 (better resistance after heat treatment, good resistance to mechanical deformation, improved effect of chromating, avoidance of ecological problems) that the person skilled in the art would at the very least have been given an incentive to consider replacing the known zinc or cadmium bearing race coatings by a zinc-nickel alloy coating.

The subject-matter of claim 1 of the main request therefore is derivable in an obvious manner from the state of the art and accordingly lacks inventive step (Article 56 EPC).

4. *Auxiliary requests*

The original application contains the following statement in the paragraph bridging pages 5 and 6. "In the described embodiment, inner ring (14) and outer ring (12) zinc-nickel is electroplated onto the entire ring including the races. During the plating process, however, inner ring (14) is oriented within the electroplating bath relative to the zinc and nickel anodes so as to control the thickness of the plating which is formed on the outboard faces (28) of inner ring (14) to be within the range of 0.0002 to 0.0005 inch. The thickness of the plating elsewhere on inner ring (14) is typically less than the controlled thickness. Similarly with outer ring (12), during the plating process, it is oriented within the electroplating bath relative to the zinc and nickel anodes so as to control the thickness of the plating which is formed on the outside surfaces (30) and outboard faces (33) of outer ring (12) to also be within the range of 0.0002 to 0.0005 inch. Thus, as with inner ring (14) the thickness of the plating elsewhere on outer ring (12) is also typically less than this controlled thickness."

The appellants rely on this passage as providing support for the feature added to claim 1 of the first and third auxiliary request that "the thickness of the first and second corrosion resistant layers on said functional surfaces is thinner than a controlled

thickness of the plating on outboard faces (33, 28) of said elements and for the feature added to claim 1 of the second and fourth auxiliary requests that "the thickness on outboard faces (28; 33) of said rings is controlled to be within the range of 5,08 to 12,7 µm (0,0002 to 0,0005 inch) and wherein the thickness elsewhere on said inner ring (14) is less than said thickness and the thickness on the race of the outer ring (12) is less than said thickness."

However, the fact that features added to a granted claim might be consistent with the terms of the original description does not mean necessarily that the amended claim is supported over its full ambit by the original disclosure. In the present case the description relied upon relates to one single particular form of ball bearing and the statements concerning what happens during electroplating of the inner and outer rings are specific thereto. There is no indication of any advantages which may be associated with the different plating thickness referred to and correspondingly no indication that such differential plating thickness should be strived for in other forms of rolling bearings. The claims under consideration are however framed very generally with respect to the form of rolling bearing involved. In other words the respective claim 1 of each of first to fourth auxiliary requests constitutes an inadmissible intermediate generalisation of the original disclosure which offends against the requirement of Article 123(2) EPC that the patent should not be amended in a way which introduces subject-matter extending beyond the content of the application as filed.

The auxiliary requests must therefore be refused.

5. According to Rule 67 EPC it is a first pre-requisite for reimbursement of the appeal fee that the appeal be allowed. Since this is not the case the corresponding request of the appellants need not be considered further.

Order

For these reasons it is decided that:

1. The appeal is dismissed.

2. The request for reimbursement of the appeal fee is refused.

The Registrar: The Chairman:

S. Fabiani S. Crane