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D E C I S I O N
of 14 May 1998

Case Number: T 0751/96 - 3.2.1

Application Number: 92850143.6

Publication Number: 0520968

IPC: F16C 23/06, F16C 33/46

Language of the proceedings: EN

Title of invention:
Cage for roller bearing

Patentee:
AB SKF

Opponent:
FAG Kugelfischer Georg Schäfer Aktiengesellschaft

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (yes)"

Decisions cited:
-

Catchword:
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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0751/96 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 14 May 1998

Appellant: (Opponent)
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Decision under appeal:
Decision of the Opposition Division of the European Patent Office posted 14 June 1996 rejecting the opposition filed against European patent No. 0 520 968 pursuant to Article 102(2) EPC.

Composition of the Board:

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

Summary of facts and submissions

I. European patent No. 0 520 968 was granted on 31 August 1994 on the basis of European patent application No. 92 850 143.6.

II. The granted patent was opposed by the present appellants on the ground that its subject-matter did not involve an invention step with regard to the state of the art (Article 100(a) EPC).

Of the prior art documents relied upon in the opposition proceedings only the following have played any significant role in the appeal:

(D1) DE-C-2 816 319
(D2) DE-U-1 910 791
(D6) EP-A-0 175 858

III. With its decision posted on 14 June 1996 the Opposition Division rejected the opposition.

IV. An appeal against this decision was filed on 14 August 1996 and the fee for appeal paid at the same time. The statement of grounds of appeal was received on 12 October 1996.

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

V. With a letter received on 14 April 1998 the appellants made further submissions in which they referred to two additional prior art documents, viz.

(D10) DE-B-1 252 475

(D11) DE-A-2 250 213

VI. At oral proceedings before the Board, held on 14 May 1998, the respondents (proprietors of the patent) submitted a new set of claims and a revised description on the basis of which, together with the drawings as granted, they requested maintenance of the patent in amended form.

New claim 1 reads as follows:

"Roller bearing incorporating an inner (14) and an outer (13) race track and a row of elongated rollers (16) provided between the race tracks (13, 14) in contact with the race tracks (13, 14) and received in pockets (17) in a cage (15), whereby the race tracks (13, 14) and the rollers (16) have curved longitudinal section profiles, and wherein the rollers (16) without hindrance of annular flanges at the race tracks are movable axially between the race tracks (13,14) relative to both of these for permitting a mutual angular tilting of the race tracks (13, 14), characterized therein,

that the cage (15) is manufactured in one single piece, that each cage pocket (17) is designed with opposed guiding surfaces (18, 19) intended to cooperate with a roller (16) contained in the pocket (17) at the axial middle portion of the roller for centering the cage (15), that the axial dimension of the pocket (17) is bigger than the length of the roller, so that there is axial clearance (24) between opposed surfaces (25, 26) on the axial side edges of the pocket and the end surfaces of the roller when the roller is centered axially, that the space between the axial bars (23) bordering the pockets, at the two opposed end portions of the pocket is bigger than the diameter of the roller (16), at the corresponding end portions of the roller, in such a manner that a relative radial movement is allowed between the roller (16) and the cage (15) at

said end portions (20, 21), and that the axial clearance between the roller and the pocket is of a size sufficient for allowing required angular tilting of the cage (15) relative to the roller (16) for permitting assembly and dismounting of the roller (16)."

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

VII. The arguments of the appellants in support of their request for revocation of the patent can be summarised as follows:

Document D6, which represented the closest state of the art, disclosed not only a roller bearing having all the features of the preamble of present claim 1 but also the fact that in such a bearing the rollers could be mounted between the races by inclining the races with respect to each other, without the need for a roller mounting opening. It was self-evident that tilting of the cage with respect to the rollers had to be possible in order to enable mounting of the rollers in this way. All that was defined in the characterising clause of claim 1 were trivial design features which were necessary to allow the cage to tilt sufficiently with respect to the rollers. Although it could be agreed that these features were not specifically disclosed in document D6, so that the subject-matter of claim 1 was novel, they were however well-known in the art as could be seen for example from documents D10 and D11. Document D10, in particular, disclosed a one-piece cage for a roller bearing wherein each pocket guided the roller only at the axial middle portion of the latter, was axially longer than the roller and wider at its ends than the corresponding diameter of the roller to allow relative radial movement between the roller and the case. Thus, this cage had all the features of the

cage defined in the characterising clause of the claim. The person skilled in the art would therefore have had no difficulty in constructing a cage to allow the implementation of the general teaching found in document D6.

VIII. The respondents replied substantially as follows:

The passage of document D6 particularly relied upon by the appellants had been taken out of context. In fact, this document clearly taught that if a cage were present then special measures would have to be adopted to allow mounting of the rollers. These measures precluded the use of a one-piece cage, which for manufacturing and structural reasons would have been advantageous.

The aim of the invention had therefore been to find a way to allow a one-piece cage to be used without preventing easy mounting of the rollers. The solution lay in the particular form of cage defined in the characterising clause of claim 1. The other state of the art documents relied upon by the appellants to show that this form of cage was known *per se* had nothing to do with the basic type of bearing with which the invention was involved or the technical problem which the invention addressed.

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. Present claim 1 consists of a combination of the features of granted claims 1, 4 and 7, which claims correspond in essence to the equivalent originally filed claims.

Present dependent claims 2 to 5 correspond to granted dependent claims 2, 3, 5 and 6 respectively.

The description of the granted patent specification has been revised only to the extent necessary to bring it into line with the amended set of claims.

There are therefore no objections under Articles 123(2) and (3) EPC to the amended documents on the basis of which maintenance of the patent is requested.

3. It is common ground between the parties and the Board that document D6 represents the closest state of the art. A family equivalent of this document was already mentioned in the introductory description of the original application and original claim 1 delimited with respect thereto.

Document D6 discloses a roller bearing having inner and outer raceways with rollers disposed therebetween, the axes of the rollers being substantially parallel to the axes of the raceways when the latter coincide and the rollers and raceways having curved longitudinal profiles. The radius of curvature of these profiles is substantially greater than the greatest distance between the central axis of the bearing and the surface of the raceways. The raceways do not have any annular

flanges which prevent axial movement of the rollers with the effect that the raceways can incline angularly and displace axially with respect to each other, thus giving the bearing self-aligning capabilities. A cage for the rollers may be provided (such a cage is visible in Figure 1) and if present must be designed so as not to hinder the axial movement of the rollers which occurs when the raceways incline with respect to each other, see the paragraph bridging pages 2 and 3 of document D6. In the same paragraph it is indicated that the maximum relative inclination permitted in use is 1/2 degree.

Since the interpretation of one passage (page 4, lines 4 to 12) of document D6 has played such an important role in the debate between the parties it is worth quoting it in full:

"In a bearing in which the races are inclined, a maximum number of rollers can be inserted between the raceways without the need for a roller mounting opening. As the rollers are self-guided, no cage is needed for roller guidance. Loose distance elements can be used to prevent mutual roller contact. If a conventional cage is desired, assembly of the bearing can take place if the cage has detachable end rings or a segment cage is used."

The appellants have placed all their weight on the first sentence of that passage. When however the passage is read as a whole, as it should be, the Board is convinced that the person skilled in the art would understand it as meaning that if no cage is present then the rollers can be inserted between the raceways when these are inclined with respect to each other and thereafter, if a cage is required, it can, if of a multi-piece form then be assembled around the rollers.

It can be agreed with the appellants that where a cage is present in the bearing of document D6 this must allow relative axial and radial movement of the rollers with respect to the cage pockets, otherwise the bearing would block the intended self-aligning movement of the raceways. Such movement is in fact derivable by comparing the upper and lower halves of Figure 1 of the drawings. However, the amount of this movement need not be more than is necessary to accommodate the degree of misalignment of the axes of the raceways encountered in normal use of the bearing. The raceways have to be tilted to a much larger extent to bring them into a position where the rollers can be mounted between them.

With a one-piece cage having the features defined in the characterising clause of claim 1 it is possible on the other hand to manoeuvre the raceways and the cage into such relative positions that the cage does not interfere with the mounting or disassembly of the rollers into the pockets of the cage.

It is true that document D10 discloses a one-piece cage for a needle roller bearing having in principle all of the structural features of the cage required by present claim 1: The rollers are contacted by the respective cage pocket only at their axial middle portion; the cage pocket is axially longer than the roller; the width of the end portions of the pocket is greater than the corresponding diameter of the roller at this position. However, the relative tilting of the rollers in the pockets intended to be allowed by the design taught by document D10 is in the plane of the pocket, with the rollers lying fully between the raceways of the bearing. The purpose of this is to reduce a singing noise associated with needle roller bearings of the type involved. It can thus be seen that there is nothing in document D10 which could have encouraged the person skilled in the art to adopt the particular form

of cage defined in present claim 1 in order to solve the technical problem associated with the provision of a one-piece cage in the special type of bearing known from document D6.

The same is true of the other documents relied upon by the appellants in this respect. Document D11 is concerned with roller bearings in which the inner and outer raceways each have at least one annular flange for absorbing axial loads. In bearings of this type a turning couple is exerted on the rollers which tends to bring them into excessive contact with the guiding surfaces of the roller cage. In order to prevent this the cage pockets are designed to allow the roller to tilt in the plane of the pocket. Document D1 is also directed to a one-piece cage for a roller bearing with annular flanges on the raceways for absorbing axial load and is concerned with problems encountered when the cage, complete with rollers inserted into its pockets, is mounted over the inner raceway. The pockets are designed so that a roller, if it encounters force from the end of the raceway, can tilt somewhat in the pocket so that the force will be absorbed by guiding surfaces of the pocket. Document D2 relates to a one-piece moulded plastics cage for a roller bearing, wherein the rollers can be clipped into the respective pockets of the cage. In order to facilitate stripping of the cage from the moulding tools, the radially outer side edges of the pockets are designed so that they only contact the axially middle portion of the roller.

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

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 maintain the patent on the basis of the set of claims 1 to 5 and the description filed at the oral proceedings and the drawings as granted.

The Registrar: The Chairman:

S. Fabiani F. Gumbel