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**Datasheet for the decision  
of 19 October 2010**

**Case Number:** T 1573/08 - 3.2.08

**Application Number:** 00917462.4

**Publication Number:** 1098099

**IPC:** F16C 33/49

**Language of the proceedings:** EN

**Title of invention:**  
Cage for double row roller bearing

**Patent Proprietor:**  
NSK LTD.

**Opponent:**  
SKF GmbH

**Headword:**  
-

**Relevant legal provisions:**  
EPC Art. 100(b), 54, 56

**Relevant legal provisions (EPC 1973):**  
-

**Keyword:**  
"Sufficiency of disclosure (yes)"  
"Novelty (main and first auxiliary request - no)"  
"Inventive step (second auxiliary request - yes)"

**Decisions cited:**  
-

**Catchword:**  
-



Case Number: T 1573/08 - 3.2.08

**D E C I S I O N**  
of the Technical Board of Appeal 3.2.08  
of 19 October 2010

**Appellant:** SKF GmbH  
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**Representative:** Kohl, Thomas  
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**Respondent:** NSK LTD.  
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**Representative:** Klingseisen, Franz  
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**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 20 June 2008  
rejecting the opposition filed against European  
patent No. 1098099 pursuant to Article 102(2)  
EPC.

**Composition of the Board:**

**Chairman:** T. Kriner  
**Members:** M. Alvazzi Delfrate  
E. Dufrasne  
P. Acton  
A. Pignatelli

## **Summary of Facts and Submissions**

- I. With its decision posted on 20 June 2008 the opposition division rejected the opposition against European patent No. 1 098 099.

The appellant (opponent) lodged an appeal against this decision on 11 August 2008, paying the appeal fee on the same day. The statement setting out the grounds for appeal was filed on 24 October 2008.

- II. Oral proceedings before the board were held on 19 October 2010.

The appellant requested that the decision under appeal be set aside and that the patent be revoked.

The respondent (patent proprietor) requested that the appeal be dismissed or, in the alternative, that the decision under appeal be set aside and that the patent be maintained on the basis of auxiliary request I, filed with letter dated 14 September 2010, or of auxiliary request II, filed during the oral proceedings.

- III. The patent as granted comprises independent claims 1 and 6 which read as follows:

"1. A comb-shaped cage (4) for use in a roller bearing having one circular portion (5) axially opposed to the end surface (3a) of each of rollers (3) and a plurality of bar portions (7) protruding from one or both axial sides of the circular portion (5) and arranged

circumferentially opposed to the rolling surface (3b) of each of the rollers, which satisfies the condition:  $0.2 \leq (I_1' / I_3') \leq 2.5$ , wherein  $I_1'$  expresses the moment of inertia of area for the circular portion (5) relative to a neutral axis parallel with the longitudinal direction of the bar portion (7) and  $I_3'$  expresses the moment of inertia of area for the bar portion (7) relative to a neutral axis parallel with the circumferential direction of the cage (4)."

"6. A comb-shaped cage (4) for use in a roller bearing having one circular portion (5) axially opposed to the end surface (3a) of each of rollers (3) and a plurality of bar portions (7) protruding from one or both axial sides of the circular portion (5) and arranged circumferentially opposed to the rolling surface (3b) of each of the rollers, which satisfies the condition:  $0.3 \leq (I_1 / I_3) \leq 1.6$ , wherein  $I_1$  expresses the moment of inertia of area for the circular portion (5) relative to a neutral axis vertical to the longitudinal direction of the bar portion (7) and  $I_3$  expresses the moment of inertia of area for the bar portion (7) relative to a neutral axis vertical to the circumferential direction of the cage (4)."

IV. Auxiliary request I comprises one independent claim, which departs from claim 1 of the main request in that the cage additionally satisfies the condition

" $0.3 \leq (I_1 / I_3) \leq 1.6$ , wherein  $I_1$  expresses the moment of inertia of area for the circular portion (5) relative to a neutral axis

vertical to the longitudinal direction of the bar portion (7) and  $I_3$  expresses the moment of inertia of area for the bar portion (7) relative to a neutral axis vertical to the circumferential direction of the cage (4)."

V. Auxiliary request II comprises four independent claims which read as follows:

"1. A comb-shaped cage (4) for use in a roller bearing having one circular portion (5) axially opposed to the end surface (3a) of each of rollers (3) and a plurality of bar portions (7) protruding from only one axial side of the circular portion (5) and arranged circumferentially opposed to the rolling surface (3b) of each of the rollers, and the cage (4) is assembled into a self-aligning roller bearing, which satisfies the condition:

$$0.3 \leq (I_1' / I_3') \leq 2.5,$$

wherein  $I_1'$  expresses the moment of inertia of area for the circular portion (5) relative to a neutral axis parallel with the longitudinal direction of the bar portion (7) and  $I_3'$  expresses the moment of inertia of area for the bar portion (7) relative to a neutral axis parallel with the circumferential direction of the cage (4)."

"2. A comb-shaped cage (4) for use in a roller bearing having one circular portion (5) axially opposed to the end surface (3a) of each of rollers (3) and a plurality of bar portions (7) protruding from only one axial side of the circular portion (5) and arranged circumferentially opposed to the rolling surface (3b) of each of the rollers, and the cage (4) is assembled

into a self aligning roller bearing, which satisfies the condition:

$$0.5 \leq (I_1/I_3) \leq 1.5,$$

wherein  $I_1$  expresses the moment of inertia of area for the circular portion (5) relative to a neutral axis vertical to the longitudinal direction of the bar portion (7) and  $I_3$  expresses the moment of inertia of area for the bar portion (7) relative to a neutral axis vertical to the circumferential direction of the cage (4).

"3. A comb-shaped cage (4) for use in a roller bearing having one circular portion (5) axially opposed to the end surface (3a) of each of rollers (3) and a plurality of bar portions (7) protruding from both axial sides of the circular portion (5) and arranged circumferentially opposed to the rolling surface (3b) of each of the rollers, and the cage (4) is assembled into a self-aligning roller bearing, which satisfies the condition:

$$0.2 \leq (I_1'/I_3') \leq 1.0,$$

wherein  $I_1'$  expresses the moment of inertia of area for the circular portion (5) relative to a neutral axis parallel with the longitudinal direction of the bar portion (7) and  $I_3'$  expresses the moment of inertia of area for the bar portion (7) relative to a neutral axis parallel with the circumferential direction of the cage (4)."

"4. A comb-shaped cage (4) for use in a roller bearing having one circular portion (5) axially opposed to the end surface (3a) of each of rollers (3) and a plurality of bar portions (7) protruding from both axial sides of the circular portion (5) and arranged circumferentially opposed to the rolling surface (3b) of each of the

rollers, and the cage (4) is assembled into a self-aligning roller bearing, which satisfies the condition:

$$0.3 \leq (I_1/I_3) \leq 1.0,$$

wherein  $I_1$  expresses the moment of inertia of area for the circular portion (5) relative to a neutral axis vertical to the longitudinal direction of the bar portion (7) and  $I_3$  expresses the moment of inertia of area for the bar portion (7) relative to a neutral axis vertical to the circumferential direction of the cage (4)."

VI. The following documents are relevant for the present decision:

E1: US-A-2 611 670;

E6: Technical drawing number CS-NN 3030 M/VG066 of SKF Kugellagerfabriken dated 1984-12-21;

E6a: Technical drawing number NN 3030 K/SPW33VG066 of SKF dated 84-12-21;

E7: "Eidesstattliche Versicherung" of Rutgerus Heemskerk, dated 8 May 2006; and

E15: SKF catalogue "Lager für den Groß- und Schwermaschinenbau", Copyright SKF 1984, Katalog 3300/II T, Reg. 47 1989-09.

VII. The appellant's arguments may be summarised as follows:

*Sufficiency of disclosure*

The claimed invention required the ratios  $I_1'/I_3'$  and  $I_1/I_3$  to fall within the ranges defined in the claims. While it was undisputed that the patent provided sufficient instructions for calculating  $I_1', I_3', I_1$  and  $I_3$  for cages whose bar portion and circular portion had

constant cross-sectional shapes, the same could not be said for cages where these cross-sectional shapes were not constant.

No instruction at all was provided for cages with a variable cross-section of the circular portion. This was the case for instance of the cage shown in E6, for which it was not clear which cross-section had to be considered.

For cages with a variable cross-section of the bar portion, the patent in suit (paragraphs [0020] and [0028]) merely said that  $I_3'$  and  $I_3$  were to be calculated "at the connection portion C" of the bar portion with the circumferential portion. Since the term "connection portion" indicated a volume, the exact position of the section chosen for calculating  $I_3'$  and  $I_3$  was not clear. The figures of the patent in suit did not clarify this point either, since they showed the region C of the bar portion in a generic position in the vicinity of the connection of the bar portion with the circumferential portion. These ambiguous instructions rendered unreliable the calculations of  $I_3'$  and  $I_3$  for a cage of the type depicted in Figure 9 of E1. This cage exhibited a bar portion with a step in the region connecting it with the circular portion. From the patent in suit it was not clear if this step was to be taken into account or not.

Since the moments of inertia of area were calculated by integrating on the surface of the relevant cross-sections, the above ambiguities could lead to significant variations in the calculated moments. Therefore, for cages whose cross-sectional shapes of

the bar portion and the circular portion were not constant, the person skilled in the art did not know when he was working within the claimed scope. Accordingly, it was not possible to carry out the invention and the requirements of Article 100(b) EPC were not met.

### *Novelty*

The catalogue E15 from 1989 showed on page 90 a bearing having the number NN 3030 K/SPW33. Hence, this bearing was available to the public before the priority date of the patent in suit. Details of this prior art bearing and of its cage could be seen in E6a and E6. Since these documents were technical drawings, they enabled the moments  $I_1'$ ,  $I_3'$ ,  $I_1$  and  $I_3$  of the cage to be calculated. The values calculated with the aid of software resulted in ratios  $I_1'/I_3'$  and  $I_1/I_3$  being respectively 0.87 and 0.76, i.e. falling within the ranges defined in claim 1 of both the main request and auxiliary request I. Since the bearing number NN 3030 K/SPW33 exhibited also the remaining features of the claimed cage, the subject-matter of claim 1 of both these requests lacked novelty.

### *Inventive step*

The subject-matter of claim 1 of auxiliary request II was distinguished from the cylindrical roller bearing shown in E6 solely in that the cage was assembled into a self-aligning roller bearing. However, the patent itself acknowledged that it was common general knowledge to use both cylindrical roller bearings and self-aligning roller bearings when extremely large

loads were applied to the bearings (paragraph [0093]). Therefore, they were technically equivalent and it was obvious to modify the cage of the bearing of E6 so that it could be used in a self-aligning roller bearing such as that shown in E1. While performing this modification the person skilled in the art would have maintained the ratios  $I_1'/I_3'$  and  $I_1/I_3$  unchanged, since they were advantageous. Accordingly, he would have arrived at the subject-matter of claim 1 without the need for an inventive step.

VIII. The respondent's arguments may be summarised as follows:

*Sufficiency of disclosure*

The ratios  $I_1'/I_3'$  and  $I_1/I_3$  could be calculated without any problem, if necessary with the aid of software, as had been done by the appellant itself for the cage shown in E6. Moreover, for cages with variable cross-sectional shapes of the bar portion the patent taught for which section the moments of inertia of area were to be assessed, namely at the connection between the bar and the circular portion. Therefore, the patent in suit disclosed the claimed invention sufficiently.

*Novelty*

It was not proven that the bearing shown in E15 had been delivered to a client before the priority date of the patent in suit.

Moreover, drawing E6a was from 1984, while the catalogue E15 was from 1989. As mentioned in E7, fourth paragraph, new cages were developed for the same

applications. Therefore, it was possible that in five years a new bearing number NN 3030 K/SPW33 had been developed. Accordingly, it was not sure that the bearing offered for sale in catalogue E15 was the same as that depicted in drawing E6a. Additionally, drawings E6 and E6a had not made the bearing and its cage available to the public, since they were internal documents.

In addition, even considering said bearing as prior art, it had not been proven that its ratios  $I_1'/I_3'$  and  $I_1/I_3$  fell within the ranges of claim 1 of the main request and claim 1 of the auxiliary request I. The drawing E6 did not indicate, and was not sufficiently precise to provide, all the necessary measurements for calculating these ratios. Therefore, the calculations of the respondent could not be considered reliable.

Accordingly, the subject-matter of claim 1 of both the main request and auxiliary request I was novel.

*Inventive step*

Although cylindrical roller bearings and self-aligning roller bearings could be used in similar conditions, they could not use the same cages. The cage shown in E6 could not be used in a self-aligning roller bearing without modifying it. Moreover, there was no indication in the prior art that the ratios  $I_1'/I_3'$  and  $I_1/I_3$  of the cage shown in E6 provided any advantage. Therefore, on the basis of the bearing according to E6a it was not obvious to arrive at the subject-matter claimed in auxiliary request II.

## Reasons for the Decision

1. The appeal is admissible.
2. Sufficiency of disclosure

According to the appellant, the patent in suit contravened the requirements of Article 100(b) EPC, since it was not clear which cross-section had to be considered for calculating the moments of inertia of area  $I_1'$ ,  $I_3'$ ,  $I_1$ ,  $I_3$ .

Since the appellant itself agreed that this objection did not apply to cages wherein the cross-sectional shapes of the bar portion and the circular portion were constant, it is undisputedly possible to carry out the invention for a cage of this type.

Moreover, the appellant itself had no difficulty in calculating  $I_1'/I_3'$  and  $I_1/I_3$  for the cage shown in E6, whose circular portion has a variable cross shape. Therefore, no hurdle to carrying out the invention can be seen for this type of cage either.

As a consequence, the alleged lack of sufficient disclosure could be relevant solely for those cages wherein a variation of the cross-sectional shape occurs in the vicinity of the connection of the bar portion with the circular portion. However, the appellant has not shown the significance of such variations with respect to the calculations of the moments of inertia of area. Therefore, it has not convincingly shown that it is impossible to carry out the invention for this type of cages.

Under these circumstances it cannot be said that the person skilled in the art cannot reproduce the invention of the patent in suit. Therefore, the requirements of Article 100(b) EPC are met.

3. Novelty

3.1 Novelty of the subject-matter of claim 1 of both the main request and auxiliary request I has been questioned in view of the cage of bearing number NN 3030 K/SPW33.

Bearing number NN 3030 K/SPW33 is a cylinder rolling bearing (Zylinderrollenlager) mentioned on page 90 of E15. This document is a catalogue in the version dated September 1989 which lists different bearings offered for sale by the company SKF, together with their main dimensions.

3.2 The dimensions of bearing NN 3030 K/SPW33 disclosed in E15 are not sufficient to decide whether its cage falls within the scope of claim 1. However, more details about the cage's geometry can be found in the drawings E6a and E6.

E6a is a technical drawing dated 84-12-21 and carrying the number NN 3030 K/SPW33VG066. The code VG066 is an internal specification valid for different products and without any significance for the measurements (see minutes of the hearing of the witness Rutgerus Heemskerk on 8 April 2008, page 1, answer to the fifth question). Therefore, E6a effectively shows a bearing

with the number NN 3030 K/SPW33, i.e. the same as the bearing shown in the catalogue E15.

It is true that E6a is dated 1984 while E15 is a catalogue from 1989. However, precise dimensions of a bearing are crucial to its application. Therefore, a customer ordering a bearing from a catalogue must be able to rely on the fact that a given number consistently corresponds to a given bearing. Accordingly, a change of geometry or dimensions of the bearing or its cage would usually result in a different number being assigned to the component. This is in accordance with the fourth paragraph of E7, cited by the respondent, according to which a newly developed cage is designated by its own number. Moreover, the measurements of bearing NN 3030 K/SPW33 disclosed in E15 are identical with the corresponding measurements in E6a. Therefore, under the circumstances of the present case, there is no reason for the board to doubt that the bearing number NN 3030 K/SPW33 offered for sale in E15 is the same bearing as shown in E6a.

Accordingly, in 1989 the public was in position to obtain the bearing NN 3030 K/SPW33 shown in E6a, which was offered for sale in catalogue E15. Hence, this bearing was made available to the public before the priority date of the patent in suit and belongs to the prior art under Article 54(2) EPC. Whether it was actually delivered or not is immaterial in this case, since the possibility of having access to it rendered it available to the public.

- 3.3 The bearing shown in E6a comprises cage number CS-NN 3030 M/VG066, which is depicted in detail in drawing E6.

It is undisputed that this cage is a comb-shaped cage for use in a roller bearing having one circular portion axially opposed to the end surface of each of the rollers and a plurality of bar portions protruding from one or both axial sides of the circular portion and arranged circumferentially opposed to the rolling surface of each of the rollers.

Since E6 is a technical drawing, all the measures and tolerances necessary to produce the cage are either explicitly indicated or directly derivable from it. Therefore, contrary to the respondent's submission, this drawing provides all the measurements needed to calculate  $I_1'$ ,  $I_3'$ ,  $I_1$  and  $I_3$ . The appellant submitted that the ratios of  $I_1'/I_3'$  and  $I_1/I_3$  which can be calculated from the drawing E6 are respectively 0.87 and 0.76. No other calculations have been submitted by the parties. Therefore, the board is satisfied that for the cage shown in E6, which is the same as that made available to the public before the priority date of the patent, the values of said ratios fall within the ranges according to claim 1 of the main request and claim 1 of the auxiliary request I.

3.4 In view of the above, the subject-matter of claim 1 of both the main request and auxiliary request I lacks novelty.

4. Inventive step

4.1 The appellant submitted that the subject-matter of claim 1 of auxiliary request II lacked an inventive step, since it was obvious to modify the cage of bearing NN 3030 K/SPW33, while maintaining its ratios

$I_1'/I_3'$  and  $I_1/I_3$ , to use it in a self-aligning roller bearing.

- 4.2 Claim 1 of auxiliary request II concerns a comb-shaped cage which "... is assembled into a self-aligning roller bearing ..." Therefore, the claim relates in principle to a self-aligning roller bearing comprising said cage.

Bearing number NN 3030 K/SPW33 shown in E15 is however a cylinder roller bearing. The board sees no reason why the person skilled in the art would modify such a bearing so that it become a self-aligning roller bearing, in particular since E15 itself offers both cylinder roller bearings and self-aligning roller bearings (see first page of E15). There was also no reason to modify the cage number CS-NN 3030 M depicted in E6 so that it could be used in a self-aligning roller bearing. This cage was particularly designed for cylinder roller bearing number NN 3030 K/SPW33 and cages for self-aligning roller bearings were available (see for instance E1).

- 4.3 It is true that double row cylindrical roller bearings and self-aligning roller bearing can both be used in places where extremely large loads are applied to the bearings (see paragraph [0093] of the patent in suit). However, this does not imply that it was obvious to modify a specific cage developed for cylindrical roller bearings to apply it in a self-aligning roller bearing.

Moreover, a significance of the ratios  $I_1'/I_3'$  and  $I_1/I_3$  of bearing number NN 3030 K/SPW33 was neither evident from the bearing itself nor disclosed by E15. Therefore, even assuming that the person skilled in the

art tried to modify the cage of this bearing to apply it in a self-aligning roller bearing, he would have had no motivation to maintain said ratios.

- 4.4 Under these conditions a modification of the cage shown in E6 so that it can be used in a self-aligning roller bearing while maintaining its ratios  $I_1'/I_3'$  and  $I_1/I_3$  cannot be regarded as obvious. Therefore, the subject-matter of claim 1 of auxiliary request II involves an inventive step.

The same applies, *mutatis mutandis*, to the subject-matter of independent claims 2-4 of auxiliary request II.

**Order**

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

1. The decision under appeal is set aside.
  
2. The case is remitted to the department of first instance with the order to maintain the patent according to claims 1 to 7 of auxiliary request II filed during the oral proceedings and the description and the figures to be adapted accordingly.

The Registrar:

The Chairman:

V. Commare

T. Kriner