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Datasheet for the decision of 2 February 2012

Case Number: T 0088/10 - 3.2.08

Application Number: 02007076.9

Publication Number: 1245846

IPC: F16C 33/46

Language of the proceedings: EN

Title of invention:
Tapered roller bearing

Patentee:
NTN Corporation

Opponents:
SKF GMBH
Schaeffler Technologies AG & Co. KG

Headword:
-

Relevant legal provisions:
EPC Art. 123(2), 54, 56, 111(1)

Keyword:
"Allowability of amendments - main request - no"
"Inventive step - 1st and 2nd auxiliary request - no"
"Remittal to the department of first instance"
"Opponent status - transfer - yes"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0088/10 - 3.2.08

D E C I S I O N
of the Technical Board of Appeal 3.2.08
of 2 February 2010

Appellant: (Patent Proprietor)
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 11 November 2009 revoking European patent No. 1245846 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman: T. Kriner
Members: P. Acton
E. Dufrasne

Summary of Facts and Submissions

I. The appellant (patent proprietor) filed a notice of appeal, received at the EPO on 13 January 2010, against the opposition division's decision, posted on 11 November 2009 by which European patent No. EP 1 245 846 was revoked. The appeal fee was paid on the same day and the statement of grounds was received on 22 March 2010.

II. The following document played a role for the present decision:

D6: US-A-4 700 443.

III. The appellant requested that the decision under appeal be set aside and that the patent be maintained as granted or, in the alternative, on the basis of the first, second or one of the sixth to eighth auxiliary requests filed with letter dated 28 December 2011. The third to fifth auxiliary requests were withdrawn.

The respondents requested that the appeal be dismissed.

IV. Claim 1 of the patent as granted reads:

"A tapered roller bearing comprising:

an inner ring (2) having a conical raceway and formed with flanges (1a, 1b) on both sides of said conical raceway,

an outer ring (3) having a conical raceway,

a plurality of tapered rollers (4) rollably mounted between the raceways of said inner and outer rings (2, 3) and having a conical surface,

a retainer (6) formed with a plurality of pockets (5) for retaining said tapered rollers (4) in said pocket (5) at predetermined circumferential intervals, and

pillars (7) circumferentially separating said pockets (5) from one another (feature A)

wherein each corner portion of said pocket (5) has a recess protruding outward of a reference trapezoid containing the circumferential end faces (13) on both sides of said pocket (5) (feature B),

said retainer (6) is formed of a metallic plate (feature C)

characterized in that,

circumferential end faces (13) on both sides of said respective pockets (5) are tapered so as to diverge axially from the small-diameter side toward the large-diameter side of said tapered rollers (4) (feature D), and

each end face of said pillar (7) has a protruding shape with a protruding portion having a length (Lc) which is 40 % or more of the overall length (L) of said end face of the pillar (7), whereby said protruding portion contacts the conical surface of said tapered roller (4) (feature E)."

Claim 1 according to the first auxiliary request differs from claim 1 of the patent as granted in that:

– feature B has been modified in such a way as to read (the changes with respect to claim 1 of the patent as granted are underlined):

"wherein the circumferential end faces of said pillars has [sic] on each corner portion of said pocket (5) a recess protruding outward in circumferential direction of a reference trapezoid containing the circumferential end faces (13) except the recesses on both sides of said pocket (5)",

– feature C has been modified in the following way:

"wherein said retainer (6) has a conical shape and is formed by pressing a metallic plate"; and

– "characterised in that" between features C and D has been omitted and

– features C, D and E start with the word "wherein".

Claim 1 according to the second auxiliary request differs from claim 1 according to the first auxiliary request in that:

– the following feature has been introduced after feature B:

"said pillars (7) are formed into an inwardly trapezoidal shape by bottoming both end faces of the pillars (7)"; and

– feature C has been arranged before feature A.

The definition of features A to E has been introduced by the Board.

Claim 1 according to the sixth auxiliary request reads:

"A method for manufacturing a tapered roller bearing comprising:
an inner ring (2) having a conical raceway and formed with flanges (1a, 1b) on both sides of said conical raceway, an outer ring (3) having a conical raceway, a plurality of tapered rollers (4) rollably mounted between the raceways of said inner and outer rings (2, 3) and having a conical surface, a retainer (6) formed with a plurality of pockets (5) for retaining said tapered rollers (4) in said pocket (5) at predetermined circumferential intervals, pillars (7) circumferentially separating said pockets (5) from one another, wherein each corner portion of said pocket (5) has a recess protruding outward of a reference trapezoid containing the circumferential end faces (13) on both sides of said pocket (5), said retainer (6) is formed of a metallic plate, circumferential end faces (13) on both sides of said respective pockets (5) are tapered so as to diverge axially from the small-diameter side toward the large-diameter side of said tapered rollers (4), each end face of said pillar (7) has a protruding shape with a protruding portion having a length (Lc) which is 40 % or more of the overall length (L) of said end face of the pillar (7), whereby said protruding portion contacts the conical surface of said tapered roller (4) wherein pillars (7) circumferentially

separating said respective pockets (5) of said retainer (6) from one another are formed by bottoming by means of a die and a mold, wherein end faces on both sides of the pillars (7), i.e. side walls of said die (9) used for bottoming the circumferential end faces (13) on both sides of said pocket (5) are formed into a protruding shape along their longitudinal direction, and wherein the recess shape of the side walls (10) of said die (9) is transferred to the end faces on both sides of said pillars (7)."

Claim 1 according to the seventh auxiliary request reads:

"A method for manufacturing a tapered roller bearing comprising:
an inner ring (2) having a conical raceway and formed with flanges (1a, 1b) on both sides of said conical raceway, an outer ring (3) having a conical raceway, a plurality of tapered rollers (4) rollably mounted between the raceways of said inner and outer rings (2, 3) and having a conical surface, a retainer (6) formed with a plurality of pockets (5) for retaining said tapered rollers (4) in said pocket (5) at predetermined circumferential intervals, pillars (7) circumferentially separating said pockets (5) from one another, wherein the circumferential end faces of said pillars has, on each corner portion of said pocket (5), a recess protruding outward in circumferential direction of a reference trapezoid containing the circumferential end faces (13) except the recesses on both sides of said pocket (5), wherein said retainer (6) has a conical shape and is formed by pressing a metallic plate wherein the circumferential end faces (13) on

both sides of said respective pockets (5) are tapered so as to diverge axially from the small-diameter side toward the large-diameter side of said tapered rollers (4), wherein each end face of said pillar (7) has a protruding shape with a protruding portion having a length (Lc) which is 40 % or more of the overall length (L) of said end face of the pillar (7), whereby said protruding portion contacts the conical surface of said tapered roller (4), wherein pillars (7) circumferentially separating said respective pockets (5) of said retainer (6) from one another are formed by bottoming by means of a die and a mold, wherein end faces on both sides of the pillars (7), i.e. side walls of said die (9) used for bottoming the circumferential end faces (13) on both sides of said pocket (5) are formed into a protruding shape along their longitudinal direction, and wherein the recess shape of the side walls (10) of said die (9) is transferred to the end faces on both sides of said pillars (7)."

Claim 1 according to the eighth auxiliary request reads:

"A method for manufacturing a tapered roller bearing comprising:
an inner ring (2) having a conical raceway and formed with flanges (1a, 1b) on both sides of said conical raceway, an outer ring (3) having a conical raceway, a plurality of tapered rollers (4) rollably mounted between the raceways of said inner and outer rings (2, 3) and having a conical surface, a retainer (6) formed with a plurality of pockets (5) for retaining said tapered rollers (4) in said pocket (5) at predetermined circumferential intervals, pillars (7) circumfe-

rentially separating said pockets (5) from one another, which comprise an inwardly trapezoidal shape formed by bottoming end faces of the pillars (7), wherein the circumferential end faces of said pillars has, on each corner portion of said pocket (5), a recess protruding outward in circumferential direction of a reference trapezoid containing the circumferential end faces (13) except the recesses on both sides of said pocket (5), wherein said retainer (6) has a conical ring-shape and is formed by pressing a metallic plate, wherein the retainer (6) has a small-diameter side, the diameter of which is expanded before integration of the inner ring (2), and wherein, after integration of the inner ring (2), the retainer (6) is caulked to prevent the tapered rollers (4) from coming off, wherein the circumferential end faces (13) on both sides of said respective pockets (5) are tapered so as to diverge axially from the small-diameter side toward the large-diameter side of said tapered rollers (4), wherein each end face of said pillar (7) has a protruding shape with a protruding portion having a length (Lc) which is 40 % or more of the overall length (L) of said end face of the pillar (7), whereby said protruding portion contacts the conical surface of said tapered roller (4), wherein the protruding portion and the recesses are formed by bottoming, wherein pillars (7) circumferentially separating said respective pockets (5) of said retainer (6) from one another are formed by bottoming by means of a die and a mold, wherein end faces on both sides of the pillars (7), i.e. side walls of said die (9) used for bottoming the circumferential end faces (13) on both sides of said pocket (5) are formed into a protruding shape along their longitudinal direction, and wherein the recess shape of the side

walls (10) of said die (9) is transferred to the end faces on both sides of said pillars (7)."

V. The respondents' arguments can be summarised as follows:

(a) Main request

Claim 1 of the patent as granted did not comply with the requirements of Article 123(2) EPC.

Throughout the whole application the retainer was described as being manufactured from a metal plate exclusively by pressing. Claim 1 as filed comprised the feature according to which the retainer was formed by pressing a metallic plate as well. Moreover, this feature was apparent from the retainer itself when mounted on the bearing.

Claim 1 of the patent as granted did specify that the retainer is formed of a metallic plate, but the feature according to which the retainer is made by pressing was omitted. Hence claim 1 of the patent as granted extended also to retainers formed of a metal plate by other methods than pressing. Therefore, claim 1 of the patent as granted encompassed retainers manufactured by methods which were not originally disclosed.

(b) First auxiliary request

Novelty

D6 disclosed all the features of claim 1. Particularly, it disclosed a retainer with pockets tapered in the axial direction (feature C). This was visible in

Figure 2, which showed that the two axial faces of the retainer's pockets had different lengths and therefore that the pockets were tapered.

Inventive step

Starting from the roller bearing according to D6 as the closest prior art and from the assumption that this document did not disclose feature D, the problem to be solved could only be considered as the provision of an alternative shape of the retainer's pockets.

Since retainers with pockets tapered in the axial direction were commonly used in tapered roller bearings, it would be obvious to the skilled person to apply such a shape to the retainer according to D6, thereby arriving at the subject matter of claim 1 without the need for any inventive skill.

(c) Second auxiliary request

The subject matter of claim 1 differed from the roller bearing according to D6 additionally in that the retainer's pillars are formed by bottoming.

The problem solved by the roller bearing according to claim 1 could be considered to be the provision of an alternative method of manufacture of the circumferential end faces of the retainer.

Since bottoming represented an established method of forming a metallic object with high quality surface properties, the provision of such a method could not render the subject matter of claim 1 inventive.

(d) Remittal to first instance

The respondent did not object to the remittal of auxiliary requests 6 to 8 to the first instance.

VI. The appellant's arguments can be summarised as follows:

(a) Main request

Claim 1 of the patent as granted represented a product claim. The subject matter of such a claim had to be defined by structural features and was not limited by a method step such as pressing. Therefore, the omission of this feature did not broaden the scope of the claim, especially since it was not possible to realise from the finished product whether it had been manufactured by pressing or not.

Moreover, the fact that the retainer was made by pressing was comprised in the term "to form", which hinted at manufacturing by deformation and in particular by pressing.

Hence claim 1 of the patent as granted complied with the requirements of Article 123(2) EPC.

(b) First auxiliary request

Novelty

The subject matter of claim 1 differed from the roller bearing of D6 by features B, D and E.

D6 did not disclose any circumferential recesses in the pockets of the retainer in the sense of the patent in suit (feature B) since the pockets' shape as shown in Figure 4 of D6 was based on a reference rectangle, and not on a reference trapezoid. Moreover, the pockets' shape in D6 was designed with the purpose of allowing the basically cylindrical roller elements (see column 2, line 61) to be free to execute relatively small swinging motions (see column 3, lines 3 to 5). On the contrary, in the patent in suit, the shape of the pockets was chosen specifically in order to avoid the rollers assuming a skewed position when the bearing is rotating (see column 2, lines 55 to 57).

Moreover, D6 did not disclose feature D since the description was silent on the shape of the retainer's pockets in the axial direction and their dimension could not be deduced from the figures, since these represented schematic drawings from which the exact dimensions of the pockets could not be taken.

Finally, D6 did not disclose feature E either, since Figure 2 showed pockets with straight circumferential end faces and hence no protruding portion. The pockets according to Figure 4 did show a protrusion, but it was evidently smaller than 40% of the overall length of the end faces.

Therefore, the subject matter of claim 1 was novel over the bearing according to D6.

Inventive step

The roller bearing according to D6 represented the most relevant prior art, since - like the patent in suit - it addressed the issue of mounting the retainer of a tapered roller bearing with an inner ring having two flanges. However, D6 solved the problem in a conceptually completely different way from the present invention. While D6 solved the problem by elastic deformation of the retainer, the retainer according to the patent in suit was mounted by plastic deformation, namely by first expanding its bottom and then caulking it when mounted in the bearing.

The two patents differed conceptually also in the objects to be achieved. While the aim of the patent in suit was to minimize the skew of the rollers when the bearing is rotating (see column 2, lines 55 to 57), the shape of the retainer's pockets according to D6 was designed deliberately in such a way as to allow swinging motions of the rollers (see column 3, lines 3 to 5).

Accordingly, the problem to be solved by the tapered roller bearing of claim 1 was to assure a uniform contact between the rollers and the retainer and thereby to improve the guidance of the rollers.

The prior art did not suggest such a shape of the retainer's pockets. Moreover, the skilled person would not improve the guidance of the rollers in the roller bearing according to D6, since this was against the teaching of that document.

(c) Second auxiliary request

The subject matter of claim 1 according to the second auxiliary request further differed from the bearing according to D6 in that the pillars were made by bottoming. Producing the end faces by bottoming led to improved surface properties of the contact surfaces with the rollers and hence to a reduction in wear.

Therefore, the problem solved by claim 1 according to the second auxiliary request was the provision of a roller bearing with improved wearing characteristics.

Since there was no evidence which suggested the manufacture of end faces by bottoming, it would not be obvious to the skilled person to apply such a method of manufacture to the retainer according to D6. Hence, the subject matter of claim 1 according to the second auxiliary request involved an inventive step.

(d) Remittal to first instance

The respondent did not object to the remittal of auxiliary requests 6 to 8 to the first instance.

Reasons for the Decision

1. The appeal is admissible

2. Transfer of opponent status

During the proceedings the opponent status of Schaeffler KG was transferred to Schaeffler Technologies AG & Co KG.

According to the jurisprudence of the Enlarged Board of Appeal (G 4/88, OJ EPO 1989, 480; G 3/97, OJ EPO 1999, 245; and G 2/04, OJ EPO 2005, 549), for an opponent status to be validly transferred the relevant business assets in the interests of which the opposition was filed must also be transferred.

In the present case, it appears from Schaeffler Technologies GmbH & Co KG's letter dated 20 December 2011 and its enclosures that:

- according to extract "HRA 2681 Amtsgericht Fürth", Schaeffler KG (entry 21) was partly transferred to Schaeffler Verwaltung Drei KG (entry 36) by agreement dated 31 December 2009 and, according to extract "HRA 9349 Amtsgericht Fürth", that Schaeffler Verwaltung Drei KG (entry 1) later changed into Schaeffler Technologies GmbH & Co KG (entry 4);
- according to extracts from the Ausgliederungs- und Übernahmevertrag of 31 December 2009 between Schaeffler KG and Schaeffler Verwaltung Drei KG, the transfer between these two companies encompasses the entire business operations

including all assets, liabilities and legal obligations of Schaeffler KG.

During the oral proceedings before the Board, respondent II (opponent II) further submitted a copy of "HRA 9349 Amtsgericht Fürth" dated 20 January 2012 showing that Schaeffler Technologies GmbH & Co KG changed its name into Schaeffler Technologies AG & Co KG (Entry 14 a).

In view of these documents, it is established, and undisputed by the Appellant, that the opponent status of respondent II was validly transferred to Schaeffler Technologies AG & Co KG.

3. Main request

The application as originally filed discloses, in the description and in claim 1, exclusively retainers manufactured from a metal plate by pressing.

Claim 1 as granted describes a tapered roller bearing with a retainer formed of a metallic plate. However, it does not specify by which process the metallic plate is formed into the desired shape. Therefore, it encompasses also retainers manufactured from a metallic plate by any other method than pressing.

It is correct that claim 1 is a product claim and that the claimed object should be described by structural features. However, since it can be deduced from the finished product whether it has been produced by pressing or by a different process, the manufacturing step of pressing results in a structural feature which

distinguishes the retainer manufactured by pressing from another manufactured in a different way. Hence, omitting the feature relating to the manufacture step of pressing leads to a broadening of the subject matter of the claim. Since no other methods of manufacturing the retainer were originally disclosed, the omission of the feature according to which the retainer is made by pressing leads to an intermediate generalisation.

Even if, as suggested by the appellant, the verb "to form" implied manufacturing by deformation and the claim was understood in the sense of "said retainer is made by deformation of a metallic plate", this could not change the findings above since pressing is not the only manufacturing method based on deformation. Therefore, in this case, too, the claim would encompass retainers manufactured by methods which were not originally disclosed.

Therefore, claim 1 as granted does not comply with the requirements of Article 123(2) EPC.

4. First auxiliary request

4.1 Novelty

D6 discloses undisputedly (see particularly Figures 1 and 4):

A tapered roller bearing comprising:

an inner ring (1) having a conical raceway and formed with flanges (shoulder 5, 6) an both sides of said conical raceway,

an outer ring (12) having a conical raceway,

a plurality of tapered rollers (2) rollably mounted between the raceways of said inner and outer rings (1, 12) and having a conical surface,

a retainer (3) formed with a plurality of pockets (19) for retaining said tapered rollers (2) in said pocket (19) at predetermined circumferential intervals,

said retainer (3) has a conical shape and is formed by pressing a metallic plate, and

pillars (10) circumferentially separating said pockets (19) from one another.

Contrary to the appellant's view, D6 discloses feature B as well. Neither a generally valid definition of a "reference trapezoid" of a geometric entity exists, nor is such a definition given in the patent in suit. Therefore, several "reference trapezoids" in the sense of quadrangles having two parallel and two non-parallel sides can be construed within the retainer's pockets shown in Figure 4 of D6 in such a way that recesses extend circumferentially between them and the circumferential end faces of the pockets.

For example the pockets shown in Figure 4 of D6 have recesses protruding circumferentially outward of a reference trapezoid having a major side slightly longer than the rollers' diameter and extending along the axial pocket's bottom, with the non-parallel sides starting from the two ends thereof and extending

towards the pocket's opposite axial end along the pocket's end faces.

Moreover, D6 discloses feature E as well. This feature specifies that the protruding portions of the circumferential end faces should extend over at least 40% of the length of the end faces of the pillars. However, it does not indicate the maximum extent thereof. Hence, the wording of the claim encompasses protruding portions which extend over the entire circumferential end face. The circumferential end faces shown in Figure 4 of D6 extend along a curve which juts out along the whole length of the straight lines connecting the pockets' corners. Therefore, the circumferential end faces according to D6 have a protruding shape with a protruding portion having a length which is more than 40% of the overall length of the end face in the sense of feature E.

However, D6 does not disclose that the retainer's pockets are tapered axially (feature D). On the one hand the description of D6 is silent on the pocket's shape in the axial direction. On the other hand the pocket's dimensions cannot be deduced from Figure 2 since this represents a schematic drawing which is sufficient to indicate essential elements of the invention but cannot be used to derive precise dimensions. Therefore, despite the fact that generally the retainer's pockets may be tapered axially in tapered roller bearings, this feature cannot be derived clearly and unambiguously from D6.

Hence, the subject matter of claim 1 according to the first auxiliary request is novel over D6.

4.2 Inventive step

4.2.1 D6 undisputedly represents the most relevant state of the art since it relates to a tapered roller bearing with an inner ring formed with two flanges.

4.2.2 As stated above, the subject matter of claim 1 according to the first auxiliary request only differs from the roller bearing of D6 in that the retainer's pockets are tapered in the axial direction (feature D).

It is correct that D6 solves the problem of assembling a roller bearing with two flanges differently from the invention according to the patent in suit, namely by an elastic deformation of the retainer while in the patent in suit the retainer's bottom is first expanded plastically and then caulked when mounted on the inner ring. However, since claim 1 according to the first auxiliary request is a product claim and does not contain any structural feature which leads to the solution of the problem relating to the mounting of the bearing, contrary to the appellant's argument, it is irrelevant for the assessment of inventive step whether D6 and the invention according to the patent in suit solve this in a different way.

Moreover, starting from the roller bearing according to claim 1, the problem cannot be defined as the assurance of a uniform contact between the rollers and the retainer either. As correctly pointed out by the appellant, the retainer according to D6 is designed in such a way as to allow for swinging motions of the rollers in its pockets. Therefore, the skilled person

would indeed not aim at modifying the retainer according to D6 in such a way as to achieve a better guidance of the rollers, since such a modification would lead away from the very teaching of D6.

Therefore, since shaping the pockets so that they diverge axially from the small-diameter to the large diameter side does not necessarily assure a better guidance of the rollers, the technical problem to be solved by the tapered roller bearing according to claim 1 is the provision of a retainer with an alternative shape of the retainer's pockets.

4.2.3 In tapered roller bearings the retainer's pockets are generally tapered in the axial direction so as to diverge towards the large diameter of the rollers.

Therefore, it would be obvious to the skilled person to provide the roller bearing according to D6 with a retainer with tapered pockets and arrive at the subject matter of claim 1 without the need for any inventive activity.

Hence the subject matter of claim 1 according to the first auxiliary request does not involve an inventive step.

5. Second auxiliary request

The subject matter of claim 1 further differs from the roller bearing according to D6 in that the retainer's pillars are formed by bottoming.

It is a common object in bearings to reduce the wear and hence increase their life. It is further well known that by providing better surface characteristics the wear is reduced. Since bottoming is a well-known method for forming metallic objects with high quality surfaces, for which the skilled person does not need any suggestion, it is obvious for the skilled person to apply this method in order to solve the problem posed and hence arrive at the subject matter of claim 1 without the need for any inventive skill.

Therefore, the subject matter of claim 1 according to the second auxiliary request does not involve an inventive step.

6. Remittal

Auxiliary requests 6 to 8 relate exclusively to process claims referring to a method for manufacturing tapered roller bearings. Since the decision of the first instance was based solely on apparatus claims relating to the roller bearings and since the parties did not raise any objection, the Board deems it appropriate to remit the case to the first instance for further prosecution.

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 for further prosecution on the basis of sixth to eighth auxiliary requests filed with letter dated 28 December 2011.

The Registrar: The Chairman:

V. Commare T. Kriner