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Datasheet for the decision of 16 January 2014

Case Number: T 0482/12 - 3.2.08

Application Number: 02021798.0

Publication Number: 1321687

IPC: F16C33/36

Language of the proceedings: EN

Title of invention:
Bearing assembly for axle shaft pinion and final reduction gear for vehicle

Patent Proprietor:
JTEKT Corporation

Opponent:
Schaeffler Technologies GmbH & Co. KG

Headword:

Relevant legal provisions:
EPC Art. 114(2), 100(a)
RPBA Art. 12(4)

Keyword:
Late submitted material - document admitted (no)
Isolated information clearly wrong and in contradiction with the rest of the disclosure - not part of prior art
Inventive step - (yes)

Decisions cited:

Catchword:

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Case Number: T 0482/12 - 3.2.08

D E C I S I O N
of Technical Board of Appeal 3.2.08
of 16 January 2014

Appellant: (Opponent)	Schaeffler Technologies GmbH & Co. KG Industriestrasse 1-3 91074 Herzogenaurach (DE)
Representative:	Dörr, Matthias FDST Patentanwälte Nordostpark 16 90411 Nürnberg (DE)
Respondent: (Patent Proprietor)	JTEKT Corporation 5-8, Minamisemba 3-chome Chuo-ku, Osaka-shi Osaka 542-8502 (JP)
Representative:	Grünecker, Kinkeldey, Stockmair & Schwanhäusser Leopoldstrasse 4 80802 München (DE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 27 December 2011 concerning maintenance of the European Patent No. 1321687 in amended form.**

Composition of the Board:

Chairman: T. Kriner
Members: M. Alvazzi Delfrate
D. T. Keeling

Summary of Facts and Submissions

I. By decision posted on 27 December 2011 the opposition division decided that European patent No. 1 321 687, in amended form according to the auxiliary request 1 then on file, and the invention to which it related met the requirements of the EPC.

II. The appellant (opponent) lodged an appeal against this decision on 24 February 2012, paying the appeal fee on the same day. The statement setting out the grounds for appeal was filed on 30 April 2012.

III. Oral proceedings before the Board of Appeal were held on 16 January 2014.

IV. 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.

V. Claim 1 underlying the decision of the opposition division reads as follows:

"A bearing assembly of a pinion shaft (1) supported in a cantilever manner to a fixed part (4) by a double row tapered roller bearing comprising:

- the pinion shaft (1) at which a pinion (6) is provided;

- a first row of tapered rollers (7) adjacent to the pinion (6); and

- a second row of tapered rollers (8) remote from the pinion (6) with respect to the first row of tapered rollers (7),
wherein an inner ring (2, 3) defining first track faces (2C, 3C) is fixed to the pinion shaft (1), and an outer ring (5) defining second track faces (5A, 5B) is fixed to the fixed part (4), and the first row of tapered rollers (7) and the second row of tapered rollers (8) are arranged between the first (2C, 3C) and second track faces (5A, 5B),
wherein the contact angle of the first row of tapered rollers (7) is defined by an acute contact angle (α) between the first row of tapered rollers (7) and the second track face (5A), on the one hand, and the axis of the pinion (6), on the other hand, and the contact angle of the second row of tapered rollers (8) is defined by an acute contact angle (β) between the second row of tapered rollers (8) and the second track face (5B), on the one hand, and the axis of the pinion (6), on the other hand, and
wherein the contact angle (α) of the first row of tapered rollers (7) on the pinion shaft (1) is set to be larger than the contact angle (β) of the second row of tapered rollers (8) on the pinion shaft (1),
characterized in that
the contact angle of the first row of the tapered rollers (7) is set to be a value larger than 23°, and the contact angle of the second row of the tapered rollers (8) is set to be a value smaller than 23°."

VI. The following documents played a role for this decision:

D1: Drawing number FAG 568228B of FAG Automobiltechnik AG;

D2: Drawing number IKM-568288B of FAG Automobiltechnik AG;
D4: sketch relating to the mounting of a bearing unit;
D5: "Schalten oder schalten lassen", mot-Technik, 12/1990, pages 128-129;
D6: JP -A- 11-247848 (and English computer translation);
D8: F. Meinck "Wälzlager Moderne Ritzellagerungen für die Achsen von Nutzfahrzeugen", Walzlagertechnik-Industrietechnik (FAG) 1990 -501, pages 49 to 51;
D10: US -A- 5 492 419;
D11: EP -A- 0 279 888;
F1: Brandlein et al. "Die Wälzlagerpraxis", 1995, pages 18,19, 78,79, 166 to 169, 572 to 577; and
D15: US -A- 5 711 738.

VII. The arguments of the appellant can be summarised as follows:

Introduction of document D15 into the proceedings

It was true that document D15 was cited for the first time during the appeal proceedings. However, this document, whose importance had become apparent in view of the amendments carried out during the opposition proceedings, was highly relevant, as it was clear from the fact that it had been cited as closest prior art during the prosecution of the US application corresponding to the patent in suit.

As a matter of fact, D15 was prima facie novelty-destroying, because it disclosed all the features of claim 1. In particular, it was a fact that although the rest of the document described bearings wherein the angles of the two rows of rollers were the same, on column 8, lines 19 to 24, a combination of rollers A/E

was disclosed, which exhibited contact angles of the two rows, whose values were different from each other and in accordance with claim 1.

In any event, D15 was at least highly relevant for inventive step, since it disclosed a bearing wherein the rollers near the the pinion exhibited a contact angle greater than 23°.

Accordingly, D15 should be introduced into the proceedings.

Inventive step

If D15 was not admitted into the proceedings the closest prior art was represented by the bearing assembly which was depicted in the drawings of D1 and D2 which comprised two rows of rollers having different contact angles of 15° and 20°, respectively.

It was true that these drawings did not explicitly show how the assembly was to be arranged on a pinion shaft. However, as evidenced by documents D6, D8, D10, D11 and D5 it was common general knowledge that the pinion was to be arranged on the side where the bigger rollers were situated. Therefore, it was clear to the person skilled in the art that the bearing was to be arranged with the bigger roller, which exhibited a contact angle of 20°, larger than the other 15° contact angle, adjacent to the pinion. Moreover, it was standard to support the pinion shaft in a cantilever manner, whenever the space was limited, as disclosed in F1. Summarising, the use of the bearing of D1/D2 for bearing a pinion shaft as shown in D4 was obvious.

The assembly of claim 1 differed from this arrangement solely in that the limit of 23° was chosen for the value of the contact angles.

However, claim 1 did not specify a minimum value for the difference between the contact angles of the first and second rows of the tapered rollers, so that their difference could be negligible. Therefore, no effect could be associated with this feature and the selection of the limit value of 23° was an arbitrary one, which could not justify an inventive step.

Moreover, it was known from D8, page 50 and Figure 2 that, for a hypoid pinion gear, a contact angle for the row of the rollers adjacent to the pinion of 25° was advantageous. Therefore, it was obvious to modify the bearing shown in D1/D2 to have a larger contact angle of 25° instead of 20°, thus obtaining an assembly in accordance with claim 1. Accordingly, the subject-matter of claim 1 did not involve an inventive step.

VIII. The arguments of the respondent can be summarised as follows:

Introduction of document D15 into the proceedings

D15 was cited for the first time during the appeal proceedings without any reason for the delay. Although the document had been cited as closest prior art during the prosecution of the US application corresponding to the patent in suit, that application was not rejected on the basis of D15, since it had been abandoned.

Indeed, D15 was neither relevant to novelty nor to inventive step, since it related to a bearing assembly wherein the contact angles of the two rows of rollers

had the same values. The reference in column 8, lines 19 to 24 concerning a combination of rollers A/E was clearly an error, immediately apparent to the reader.

Accordingly, D15 should not be introduced into the proceedings.

Inventive step

The drawings of D1 and D2 showed a bearing assembly with two rows of rollers with different contact angles. However, these drawings did not show how this bearing was to be arranged on a pinion shaft. Hence, they could not prove that an assembly comprising the bearing depicted in D1/D2 arranged on a pinion shaft so that the row of rollers with a larger contact angle was adjacent to the pinion had been made available to the public before the priority date. Nor was this fact proven by D6, D8, D10, D11, D5 or F1.

In any event, the largest contact angle shown in D1/D2 was 20°, while according to claim 1 the contact angle of the row adjacent to the pinion was greater than 23°. The effect of this feature was disclosed in paragraph [0023] of the patent. The appellant had not submitted any evidence to disprove the existence of this effect.

The prior art did not render it obvious to achieve this effect in accordance with claim 1. In particular, D8 proposed the solution commonly adopted in the art, which was, in contrast to the claimed device, to choose a contact angle for the row of rollers adjacent to the pinion smaller than the angle of the row remote from the pinion.

Therefore, the subject-matter of claim 1 involved an inventive step.

Reasons for the Decision

1. The appeal is admissible.

2. Introduction of document D15 into the proceedings

2.1 Document D15 was cited for the first time during the appeal proceedings. Hence, it is within the discretionary power of the Board to admit or to disregard this document (see Article 114(2) EPC and Article 12(4) RPBA).

2.2 No objective reason can be seen for the delay in the submission of D15, since claim 1 as maintained by the opposition division is a combination of claims 1 and 2 as granted.

2.3 Moreover and most importantly, this document is not prima facie highly relevant.

2.3.1 It is true that D15 discloses a bearing assembly of a pinion shaft supported in a cantilever manner to a fixed part by a double row tapered roller bearing comprising the pinion shaft at which a pinion is provided, a first row of tapered rollers (6b) adjacent to the pinion and a second row of tapered rollers (6a) remote from the pinion with respect to the first row of tapered rollers (see Figure 1). However, this document consistently refers to the contact angle α of the rollers (see for instance abstract), so that it is

clear that the contact angles of the rows of rollers have the same value.

The appellant referred to column 8, lines 19 to 24, where mention is made of "the combination of the conventional types A and E" of bearings, which types according to table 2a, exhibit contact angles of 20° (A) and 23° (E). However, Figures 9 and 10, to which this passage refers, do not disclose a combination of A and E but rather a combination of A and D bearings, both conventional bearings with an angle of 20°. This is also in accordance with the passage on column 7, lines 55 to 62, according to which the selected pairs for the tests were A/D , B/E, C/F, all pairs wherein the contact angles of the two rows of rollers are the same. Indeed a combination of "conventional types of bearings" with angles of 20° and 23° would be in contradiction to the disclosure according to which roller bearings incorporated in a conventional gear have a contact angle of 20° (column 1, lines 47 to 51), while angles of 23° are exhibited by the roller bearings in accordance with the invention of D15 (see claim 1). Hence, it is clear that the reference in column 8, lines 19 to 24 to a combination of bearings A and E is a mistake. Accordingly, the person skilled in the art would disregard this information.

Therefore, D15 does not disclose that the contact angle of the first row of tapered rollers on the pinion shaft is set to be larger than the contact angle of the second row of tapered rollers on the pinion shaft, let alone that they are respectively larger and smaller than 23°. Hence, it is not prima facie novelty-destroying for the subject-matter of present claim 1.

2.3.2 Nor is D15 prima facie relevant for inventive step, since the teaching of this document, which relates to a bearing assembly wherein the contact angles of the rows of rollers are the same, is at odds with the gist of the claimed invention, which requires them to be different (see claim 1 and paragraphs [0016] to [0019] of the patent in suit).

2.3.3 According to the appellant, the relevance of D15 would be apparent from the fact that it was cited in the prosecution of the corresponding US application. However, there is no evidence that the corresponding US application was rejected on the basis of this document (see letter of respondent of 12 September 2012, page 2, first full paragraph) and that its claims corresponded to the claims under consideration. Therefore, this argument cannot demonstrate the relevance of D15 either.

2.4 Under these circumstances, the Board decided not to admit D15 into the proceedings.

3. Inventive step

3.1 It is undisputed in the present appeal proceedings that the bearing assembly shown in D1/D2 belongs to the prior art, having been made available to the public by sale before the priority date of the application in suit. This assembly, which according to the appellant represents the most relevant prior art, comprises a double row tapered roller bearing suitable for mounting a shaft comprising a first row of tapered rollers (side 1 in the drawing of D1) and a second row of tapered rollers (side 2 in the drawing of D1), wherein an inner ring defines first track faces, and an outer ring defines second track faces, and the first row of

tapered rollers and the second row of tapered rollers are arranged between the first and second track faces, and wherein the contact angle of the first row of tapered rollers is defined by an acute contact angle α between the first row of tapered rollers and the second track face, on the one hand, and the axis of the shaft, on the other hand, and the contact angle of the second row of tapered rollers is defined by an acute contact angle β between the second row of tapered rollers and the second track face, on the one hand, and the axis of the shaft, on the other hand (see drawings of D1).

Moreover, as depicted in the drawings of D1 and explicitly disclosed in D2, the contact angle α of the first row of tapered roller is set to be 20° while that of the second row of tapered rollers is set to be 15°. Hence, the contact angle α of the first row is larger than the contact angle β of the second row.

3.2 However, neither D1 nor D2 shows a pinion shaft supported by this bearing, let alone how such pinion shaft would be arranged in the bearing according to D1 and D2.

Moreover, as acknowledged by the appellant itself, in the assembly shown in D1/D2 both contact angles are smaller than 23°, whereas in the claimed assembly the contact angle of the row of rollers adjacent to the pinion is set to a value greater than 23°.

3.3 According to paragraph [0023] of the patent in suit, "with this arrangement, high supporting rigidity and long life which have been required in a bearing assembly for an axle shaft pinion can be attained", while, "in case where the contact angle of the row of the tapered rollers adjacent to the pinion has been

made smaller than 23°, the life and the rigidity have been decreased to almost a half".

The appellant submitted that no effect could be associated with the limit of 23° chosen for the value of the contact angles, because the difference between the contact angles of the first and the second row could be negligible, but failed to provide any evidence in support of this submission. Indeed, there is no reason to believe that a change from a contact angle of 20°, as shown in D1/D2, to a contact angle greater than 23°, as stipulated by claim 1 for the first row of rollers, would not provide an effect in terms of supporting rigidity and bearing life.

Therefore, the Board is satisfied that the assembly of claim 1 achieves the object of providing a bearing assembly with improved supporting rigidity and life (see paragraph [0006] of the patent in suit).

3.4 Even accepting that it was common general knowledge to support a pinion shaft in a cantilever manner and arrange it on the side of the bearing where the bigger rollers are, as shown in D6, D8, D10, D11, D5 and F1, the prior art, in particular D8, cannot render it obvious to achieve this object by a bearing assembly with contact angles in accordance with claim 1.

It is true that D8 discloses that it is possible to connect a pinion shaft in a cantilever manner to a fixed part by a double row tapered roller bearing wherein the first row of tapered rollers, i.e. the row adjacent to the pinion, comprises the bigger rollers (see page 49, left-hand column, last paragraph) and that in the case of hypoid pinion gears a contact angle of this first row is advantageously chosen to be 25°

(see page 49, first full paragraph of right-hand column to page 50, first paragraph and Figure 2). However, D8 teaches in the same passages that, in order to improve supporting rigidity, the angle of the second row, i.e. the row remote from the pinion, is 28 to 30°.

Therefore, the teaching of D8 leads to an assembly wherein, contrary to the claimed one, the contact angle α of the first row of tapered rollers on the pinion shaft is set to be smaller than the contact angle β of the second row of tapered rollers on the pinion shaft. Accordingly, this teaching does not lead to the subject-matter of claim 1 in an obvious way.

As a consequence, the subject-matter of claim 1 involves an inventive step.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

V. Commare T. Kriner

Decision electronically authenticated