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**Datasheet for the decision
of 7 February 2008**

Case Number: T 1664/06 - 3.2.01

Application Number: 99302920.6

Publication Number: 0950824

IPC: F16D 3/223

Language of the proceedings: EN

Title of invention:

Constant velocity joint and rolling bearing unit for wheel

Applicant:

NSK LTD

Opponent:

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Headword:

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Relevant legal provisions:

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Relevant legal provisions (EPC 1973):

EPC Art. 54(1)(2), 56

Keyword:

"Novelty - measuring drawings"
"Inventive step - routine measures"

Decisions cited:

T 0204/83, T 0451/88, T 0748/91

Catchword:

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Case Number: T 1664/06 - 3.2.01

D E C I S I O N
of the Technical Board of Appeal 3.2.01
of 7 February 2008

Appellant:

NSK LTD
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Representative:

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Decision under appeal:

Decision of the Examining Division of the
European Patent Office posted 31 May 2006
refusing European application No. 99302920.6
pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: S. Crane
Members: J. Osborne
G. Weiss

Summary of Facts and Submissions

- I. The appeal is directed against the decision posted 31 May 2006 refusing European patent application no. 99 30 2920.6 (EP-A-0 950 824).
- II. The search report listed *inter alia*:
- D3: EP-A-0 802 341.
- III. The examining division found that the subject-matter of the single claim on file at that time was not new with respect to the disclosure of D3. The examining division further stated its opinion that that even if the subject-matter were new it would not involve an inventive step.
- IV. At oral proceedings before the board on 7 February 2008 the appellant requested that the decision under appeal be set aside and a patent granted on the basis of a single claim filed during the oral proceedings.
- V. The claim, which is unchanged from that before the examining division and was filed during the oral proceedings for administrative purposes only, reads:
- "A constant velocity joint comprising:
an inner race (102);
inner engagement grooves (107) each taking a circular arc in section and formed in eight locations in a circumferential direction on an outer peripheral surface of said inner race in a direction right-angled to a circumferential direction;
an outer race (141) provided along a periphery of said

inner race (102);
outer engagement grooves (108) each taking a circular arc in section and formed in positions facing to said inner engagement grooves (107) on an inner peripheral surface of said outer race (141) in the direction right-angled to the circumferential direction;
a cage (109) sandwiched in between an outer peripheral surface of said inner race (102) and an inner peripheral surface of said outer race (141) and formed with eight pockets each elongated in a circumferential direction in positions aligned with said inner engagement groove (107) and said outer engagement groove (108); and
eight balls made capable of rolling along the respective inner engagement grooves (107) and outer engagement grooves (108) one by one in a state of being held inwardly of the pockets;
wherein an axial crossing angle between a central axis of said inner race (102) and a central axis of said outer race (141) is bisected, said balls (104) are disposed within a bisected plane orthogonal to a plane including these two central axes,
characterised in that:
if a ratio D_c/d_m of a diameter D_c of the outer peripheral surface of said cage to a pitch circle diameter d_m of each of said plurality of balls (104) is set to R_1 , and if a ratio d_c/d_m of a diameter d_c of the inner peripheral surface of said cage to a pitch circle diameter d_m is set to r_1 , there are relationships such as $1.06 < R_1 < 1.11$ and $0.945 < r_1 < 0.998$, and further in that a ratio $r_t = t_c/D_a$ of an average thickness t_c of the cage (109) which is expressed by 1/2 of a difference between a diameter D_c of the outer peripheral surface of said cage (109) and a diameter d_c of the inner peripheral

surface of said cage to a major diameter D_a of said each ball (104), has a relationship such as $0.16 < r_t < 0.30$."

VI. The appellant's submissions in respect of inventive step may be summarised as follows:

The closest prior art is known from D3 which discloses the features contained in the preamble of the claim. D3 introduced the eight-ball constant velocity joint and disclosed the useful limits of some parameters. However, it is silent as regards the thickness of the cage. In the art of six-ball joints which preceded the disclosure of D3 it was conventional to determine the thickness of the cage in accordance with the pitch circle diameter of the balls. If the cage for an eight-ball joint had the same thickness as the cage of an equivalent six-ball joint, the torque capacity would be reduced due to insufficient engagement of the balls in the grooves. The present applicant realized that the thickness of the cage may be changed and has explored the limits within which the variation is beneficial. D3 provides no incentive to the skilled person in this respect. Case law in accordance with decision T 36/82 (not published in OJ EPO) is not applicable to this case since that concerns a situation in which it was already known that varying parameters could be advantageous.

Reasons for the Decision

1. The application relates generally to a constant velocity joint having eight torque transmitting balls and particularly to preferred ranges for relationships

of dimensions of the cage in order to ensure adequate performance of the joint.

2. For many years cars have been equipped with six-ball constant velocity joints. D3 set out to provide a constant velocity joint which in comparison with the conventional six-ball joint was more compact but nevertheless of equal capacity and durability. It achieved this by using eight balls and set out ranges for some parameters in the new joint. For instance, it disclosed that the ratio of the pitch circle diameter of the balls to the diameter of each ball should be within the range of 3.3 to 5. Outside of that range it was found that the joint suffered insufficient strength or durability.

- 2.1 The board agrees with the examining division's finding that all features of the preamble of the present claim were known from D3. That finding is not disputed by the appellant. The appellant does dispute, however, the examining division's finding that by measuring from figure 1A of D3 it could be derived that the values of the three ratios R_1 , r_1 and r_t as presently claimed had already been disclosed and that the subject-matter of the claim therefore was not new.

- 2.1.1 The boards of appeal have determined conditions under which measurement of drawings may be considered as a disclosure of the dimensions thus obtained. According to decision T 204/83 (OJ EPO 1985, 310): "Features shown solely in a drawing form part of the state of the art when a person skilled in that art is able, in the absence of any other description, to derive a technical teaching from them. Dimensions obtained merely by measuring a

diagrammatic representation in a document do not form part of the disclosure." In decision T 451/88 (not published in OJ EPO) the distinction was drawn between scaled construction drawings and the schematic drawings conventionally included in patent documents, the latter being sufficient to indicate the essential elements of the invention but not to manufacture the product. It was found that schematic drawings could not be used to derive a ratio between two dimensions.

2.1.2 Figure 1A of D3 is a part sectional view of the constant velocity joint intended to identify some parameters of relevance to that disclosure and is evidently no more than a schematic drawing. Of the parameters included in the ratios of present claim 1 only the pitch circle diameter of the balls and the ball diameter ("a major diameter" in the present claim) are common to the teaching of D3. However, even these are of relevance only in comparison with other dimensions which are of no consequence in the present case. In accordance with the case law mentioned above D3 discloses neither the dimensions of the outer and inner diameters of the cage specified in the present claim nor their size relative to other features and therefore cannot serve either directly or indirectly as a basis for determining the claimed ratios.

2.1.3 The examining division in its decision referred to decision T 748/91 (not published in OJ EPO) as regards measuring relative dimensions in drawings. In that case the board found that size ratios could under certain circumstances be inferred even from a schematic drawing. However, in contrast to the present case in which deriving the presently claimed ratios would require accurate measurement of the drawings, the relationship in question, namely that one dimension was larger than

another, was evidently visible in the figure. The finding of decision T 748/91 (*supra*) therefore is not relevant to the present case.

2.2 On the basis of the foregoing the board finds that the subject-matter of the present claim is new with respect to D3 (Article 54(1)(2) EPC 1973). The novel features are those contained in the characterising portion.

3. As set out above, D3 aimed to provide a more compact constant velocity joint than a conventional six-ball unit. Such a change evidently would involve substantial detail re-design of the component parts and the cage would need to accommodate two extra balls within similar space or less. The limits for each of the three ratios specified in the present claim define the useful ranges of dimensions of the cage outside of which performance of the joint deteriorates and therefore would be derivable from routine testing (see paragraphs [0048], [0053] and [0058] of the application as published). Even if the production of a 'new' joint were not sufficient motivation for the skilled person to take the opportunity to optimise the dimensions, inadequate performance during testing would be. It would fall within the normal activity of the skilled person to select the various dimensions accordingly. In accordance with case law such work does not involve an inventive step, see "Case law of the Boards of Appeal at the European Patent Office", I.D.8.15, particularly the 3rd paragraph.

3.1 The appellant argues that even having moved to the eight-ball joint D3 is still silent as regards dimensions of the cage. As a result the skilled person

would have had no motivation to explore the dimensioning of the cage. The board cannot accept this line of argumentation because, as set out above, the substantial change resulting from the inclusion of eight balls within a joint of no greater size would have forced the skilled person to investigate appropriate dimensions for the new cage. A further line of the appellant's argumentation is that conventionally the cages of constant velocity joints were dimensioned in accordance with the pitch circle diameter of the balls, and that the appellant has now been the first to appreciate the possibility of exploring the dimensioning of the cage. However, firstly it is to be expected that the dimensions for the cages selected in the conventional way were chosen on the basis of routine testing similar to that performed by the appellant in the present case. Secondly, it is not clear that the teaching of the present application differs from the conventional approach in as far as the ratios R_1 and r_1 also provide a direct relationship between outer and inner diameters of the cage and the pitch circle diameter of the balls, the ranges allowing variations of only 4.7% and 5.6% respectively. Indeed, the appellant has provided no evidence that the ratios R_1 , r_1 and r_t resulting from the conventional method would not fall within the specified ranges.

- 3.2 On the basis of the foregoing the board finds that the subject-matter of the claim does not involve an inventive step (Article 56 EPC 1973).

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

A. Vottner

S. Crane