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

Case Number: T 1181/07 - 3.2.08

Application Number: 01983129.6

Publication Number: 1328736

IPC: F16D 3/26

Language of the proceedings: EN

Title of invention:
Constant Velocity Joint of Tripod Type

Applicant:
Delphi Technologies, Inc.

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 52, 56

Relevant legal provisions (EPC 1973):
-

Keyword:
"Inventive step after amendment - yes"

Decisions cited:
-

Catchword:
-



Case Number: T 1181/07 - 3.2.08

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

Appellant:
(Applicant)

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Decision under appeal:

Decision of the Examining Division of the
European Patent Office posted 26 March 2007
refusing European application No. 01983129.6
pursuant to Article 97(1) EPC.

Composition of the Board:

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

Summary of Facts and Submissions

- I. The appellant (applicant) lodged appeal on 16 April 2007 against the examining division's decision, posted on 26 March 2007, refusing the European patent application No. 01 983 129.6 (publication No. WO-A-02/33276). The appeal fee was paid simultaneously and the statement of grounds was received on 25 June 2007.
- II. The examining division held that the subject-matter of claim 1 then on file did not involve an inventive step in the sense of Article 56 EPC with respect to document
- D1: DE-A-44 08 812
- in conjunction with
- D2: WO-A-00/53944.
- III. The applicant requests that the decision under appeal be set aside and that a patent be granted on the basis of the following version of the application:

Claims: 1 to 3 filed with the letter dated 24 June 2010;

Description: pages 1 to 3 as originally filed;
pages 4 to 7, 10, 12, 13 and 15 filed with the letter dated 4 June 2009;
pages 8, 9, 11 and 14 filed with letter dated 24 June 2010

Drawings: sheets 1/22, 3/22 to 22/22 as originally filed;
sheet 2/22 filed with letter dated 1 December 2009.

Auxiliarily, the applicant requests oral proceedings.

IV. In addition to the documents D1 and D2 the following documents cited in decision of the first instance have been considered in the proceedings:

D2': EP-A-1 108 910 (European patent application corresponding to the international application D2, published in English language after the priority date of the application in suit, also referred to by the appellant himself when citing D2),

D3: DE-A-40 34 806.

V. Claim 1 reads as follows:

"A constant velocity joint comprising:
a hollow housing (2) having an opening at one end, and being secured at its opposite end to a first rotating shaft (8) such that a central axis of the housing (2) is aligned with that of the first rotating shaft (8), an inner face of the housing (2) being provided with three guide grooves extending in an axial direction of the housing (2) and being spaced apart equally in a circumferential direction, each groove having a pair of side faces (2a) opposed to each other, extending in the axial direction, and a bottom portion (2b) connecting between the side faces (2a), and

a tripod (5) provided at an angle normal to a second rotating shaft (4) and secured to one end of the second rotating shaft (4), the tripod (5) having three trunnions (5a) positioned in the grooves, the trunnions (5a) being spaced apart equally in a circumferential direction and extending radially outwardly of the tripod axis along respective trunnion axes and with respective inner rollers (6b) being mounted to outside end portions of respective trunnions (5a), and with respective outer rollers (6a) being mounted on the outer faces of inner rollers (6b) through needle bearings (7), the inner faces of the inner rollers (6b) being of generally concave shape, the outer faces of the outer rollers (6a) being shaped so as to allow movement only in an axial direction of the guide grooves, the side faces (2a) receiving a load, and a part of the bottom portion (2b) guiding the rolling of the outer roller (6a), the inner rollers (6b) having a spherical inner circumferential surface, respectively characterised in said trunnions (5a) having an elliptical shape in the sectional view normal to said respective trunnion axis, and said trunnions (5a) being positioned so that the short diameter of said elliptical shape is substantially parallel to the second rotating shaft (4)."

Claims 2 and 3 are dependent on claim 1.

VI. The appellant put forward that the subject-matter of claim 1 as on file is novel, since:

D1 did not disclose the elliptical shape of the trunnions, D2 disclosed inner rollers with convex surfaces, and D3 did not disclose an elliptical shape of the trunnion itself but rather of the supporting part of the trunnion.

Moreover, it would not be obvious to combine the teaching of D1 and D2, since the problem solved by D1 was to provide a maximised contact surface between the outer surface of the trunnion and the inner ring, while D2 aimed at reducing the contact surface between these two parts.

Reasons for the Decision

1. The appeal is admissible.

2. *Novelty*

2.1 D1 discloses (see particularly Figures 1 and 2, column 4, line 9 - column 5, line 1)

a constant velocity joint (18) comprising:
a hollow housing (5) having an opening at one end, and being secured at its opposite end to a first rotating shaft such that a central axis of the housing (5) is aligned with that of the first rotating shaft, an inner face of the housing (5) being provided with three guide grooves (12) extending in an axial direction of the housing (5) and being spaced apart

equally in a circumferential direction, each groove (12) having a pair of side faces opposed to each other, extending in the axial direction, and a bottom portion connecting between the side faces, and a tripod (2) provided at an angle normal to a second rotating shaft and secured to one end of the second rotating shaft, the tripod (2) having three trunnions (3) positioned in the grooves (12), the trunnions (3) being spaced apart equally in a circumferential direction and extending radially outwardly of the tripod axis along respective trunnion axes, with respective inner rollers (6) being mounted to outside end portions of respective trunnions (3), and with respective outer rollers (9) being mounted on the outer faces of inner rollers (6) through needle bearings (8), the inner faces of the inner rollers (6) being of generally concave shape, the outer faces of the outer rollers (9) being shaped so as to allow movement only in an axial direction of the guide grooves (12), the side faces receiving a load, and a part of the bottom portion guiding the rolling of the outer roller (9), the inner rollers (6) having a spherical inner circumferential surface, respectively.

Since the outer surface of the trunnions of D1 is made of two spherical parts (14) having a radius r_1 connected by two flattened parts (17), this document does neither disclose that the trunnions have an elliptical shape in the sectional view normal to each axis, nor that they are positioned so that the short diameter of said elliptical shape is substantially parallel to the second rotating shaft.

2.2 D2 and D3 are more remote from the joint according to the invention, since they have fewer features in common with it.

D2 does neither disclose that the inner faces of the inner rollers are of a generally concave shape nor that the inner rollers have a spherical inner circumferential surface. On the contrary, the inner surface of the inner rollers according to D2 is convex as can be seen e.g. in Figures 2A and 3C.

The trunnions according to D3 have a spherical shape (see column 2, lines 31-33, "kugeligen Zapfenkopf"), and only the neck portion between the trunnions and that part of the tripod which is connected to the second shaft has an elliptical cross section (see column 2, lines 33-38). Moreover, D3 is silent about the shape of the inner surface of the inner rollers, as well as on the relative movement between the inner and outer rollers.

2.3 Therefore, the subject-matter of claim 1 is novel with respect to all D1-D3.

3. *Inventive step*

3.1 Starting from D1 which, as pointed out above, represents the most relevant prior art, the object to be achieved by the present invention can be seen in providing a constant velocity joint which can diminish the spin moment acting on the contact ellipse between trunnion and inner roller and which can minimise the rolling resistance when the joint is rotating at an

angle (see the original application, page 4, lines 2 to 8).

- 3.2 D2 does indeed disclose a tripod with trunnions of elliptical cross-section (see e.g. Figure 3B). This shape is chosen in order to reduce the contact surface between the trunnion and the inner surface of the inner ring (see Figure 1C, page 5, lines 41-45 of D2').

In contrast to this purpose, the object to be achieved by the present application and by D1 is to maximise the contact surface between the trunnion and the inner surface of the inner ring (see D1 column 1, lines 43-44), or at least to provide a relative large contact area between the trunnion and the inner ring (see the application, page 9, lines 16-18).

Moreover, in order to achieve the reduction of the contact surface, the inner surface of the inner ring in D2 has a generally convex shape, as opposed to the concave shape shown in the present application and in D1.

- 3.3 Therefore, the skilled person aware of D1 and aiming at achieving the object above would not be looking for the solution in a document with a different geometry of the inner ring and whose aim is to minimise instead of to maximise the contact surface, hence leading in a direction opposite to the one taught by D1.

For these reasons, it would not be obvious for the skilled person to combine the teaching of D1 and D2 in order to get to the subject-matter of claim 1.

3.4 Since D3 does not suggest the provision of trunnions of elliptical shape, the subject-matter of claim 1 cannot be derived in an obvious manner from the available prior art and accordingly involves an inventive step with respect to these documents.

3.5 Therefore, the subject-matter of claim 1 involves an inventive step in the sense of Article 56 EPC in view of the cited prior art.

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 for grant on the basis of the following version of the application:

Claims: 1 to 3 filed with the letter dated
24 June 2010;

Description: pages 1 to 3 as originally filed;
pages 4 to 7, 10, 12, 13 and 15 filed
with the letter dated 4 June 2009;
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dated 24 June 2010

Drawings: sheets 1/22, 3/22 to 22/22 as originally
filed;
sheet 2/22 filed with letter dated
1 December 2009.

The Registrar:

The Chairman:

V. Commare

T. Kriner