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Datasheet for the decision of 7 May 2013

Case Number: T 1030/11 - 3.2.08

Application Number: 04250524.8

Publication Number: 1450059

IPC: F16D 3/22

Language of the proceedings: EN

Title of invention:
Fixed type constant velocity joint

Patent Proprietor:
NTN Corporation

Opponent:
GKN Driveline International GmbH

Headword:
-

Relevant legal provisions:
EPC Art. 54, 84, 100(a)
RPBA Art. 13(1)

Keyword:
"Main request (novelty - no)"
"Auxiliary request 1 (clarity - no)"
"Auxiliary request 2' (not admitted into the proceedings)"
"Auxiliary requests 2 to 8 (novelty - no)"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 1030/11 - 3.2.08

D E C I S I O N
of the Technical Board of Appeal 3.2.08
of 7 May 2013

Appellant: (Patent Proprietor)
NTN Corporation
3-17, Kyomachibori 1-chome
Nishi-ku
Osaka-shi, Osaka-fu (JP)

Representative:
Grünecker, Kinkeldey
Stockmair & Schwanhäusser
Leopoldstraße 4
D-80802 München (DE)

Respondent: (Opponent)
GKN Driveline International GmbH
Hauptstraße 130
D-53797 Lohmar (DE)

Representative:
Rössler, Matthias
KNH Patentanwälte
Kahlhöfer Neumann Rößler Heine
Postfach 10 33 63
D-40024 Düsseldorf (DE)

Decision under appeal:
Decision of the Opposition Division of the European Patent Office posted 14 March 2011 revoking European patent No. 1450059 pursuant to Article 101(3)(b) EPC.

Composition of the Board:

Chairman: T. Kriner
Members: M. Alvazzi Delfrate
C. Schmidt
P. Acton
D. T. Keeling

Summary of Facts and Submissions

I. By decision posted on 14 March 2011 the opposition division revoked the European Patent No. 1 450 059.

II. The appellant (patent proprietor) lodged an appeal against this decision on 10 May 2011, paying the appeal fee on the same day. The statement setting out the grounds for appeal was filed on 25 July 2011.

III. Oral proceedings before the board of appeal took place on 7 May 2013.

IV. The appellant (patent proprietor) requested that the decision under appeal be set aside and the patent be maintained on the basis of the main request filed with letter dated 5 April 2013, or on the basis of auxiliary request 1 or auxiliary request 2' filed at the oral proceedings, or one of the auxiliary requests 2 to 8, all submitted with letter dated 5 April 2013.

The respondent (opponent) requested that the appeal be dismissed.

V. Claim 1 of the **main request** reads as follows:

"A fixed type constant velocity joint comprising an outer joint member (10,10a) having axially extending guide grooves (14,14a) formed in the spherical inner peripheral surface (12) thereof, the number of which is eight, an inner joint member (20,20a) having axially extending guide grooves (24,24a) formed in the spherical outer peripheral surface (22) thereof, the number of which is eight, torque transmitting balls

(30) disposed one by one in ball tracks defined by cooperation between the guide grooves (14,14a,24,24a) of the outer and inner joint members (10,10a,20,20a), and a cage (40) holding the torque transmitting balls (30), characterized in that the angle (α) defined by a straight line connecting a contact point (A) between the cage (40) and the outer joint member (10,10a) and a contact point (B) between the cage (40) and the inner joint member (20,20a), and the cage center line is not more than 10° when the angle of displacement (θ) between the outer and inner joint members (10,10a,20, 20a) is at a maximum."

Claim 1 of **auxiliary request 1** reads as follows:

"A fixed type constant velocity joint comprising an outer joint member (10,10a) having axially extending guide grooves (14,14a) formed in the spherical inner peripheral surface (12) thereof, the number of which is eight, an inner joint member (20,20a) having axially extending guide grooves (24,24a) formed in the spherical outer peripheral surface (22) thereof, the number of which is eight, torque transmitting balls (30) disposed one by one in ball tracks defined by cooperation between the guide grooves (14,14a,24,24a) of the outer and inner joint members (1O,10a,20,20a), and a cage (40) holding the torque transmitting balls (30), characterized in that the angle (α) defined by a straight line connecting a contact point (A) between a spherical outer peripheral surface (42) of the cage (40) being positioned in the vicinity of the torque transmitting ball (30) positioned outermost outside of the outer joint member (10, 10a) when taking a maximum angle of displacement (θ) between the outer and inner

joint members (10, 10a; 20, 20a) and a spherical edge of the spherical inner peripheral surface (12) of the outer joint member (10, 10a) and a contact point (B) between a spherical inner peripheral surface (44) of the cage (40) and a spherical edge of the spherical outer peripheral surface (22) of the inner joint member (20, 20a), in the same vertical plane and the cage center line is not more than 10° when the angle of displacement (θ) between the outer and inner joint members (10, 10a, 20, 20a) is at a maximum."

Claim 1 of **auxiliary request 2'** reads as follows:

"A fixed type constant velocity joint comprising
- an outer joint member (10,10a) having eight axially extending guide grooves (14,14a) formed in the spherical inner peripheral surface (12) thereof,
- an inner joint member (20,20a) having eight axially extending guide grooves (24,24a) formed in the spherical outer peripheral surface (22) thereof,
- torque transmitting balls (30) disposed one by one in ball tracks defined by cooperation between the guide grooves (14,14a,24,24a) of the outer and inner joint members (10,10a,20,20a), and
- a cage (40) holding the torque transmitting balls (30),
- said cage (40) has a spherical outer peripheral surface (42) and a spherical inner peripheral surface (44),
- the spherical outer peripheral surface (42) of the cage (40) is spherically fitted on the spherical inner peripheral surface (12) of the outer joint member (10,10a), while the spherical inner peripheral surface (44) of the cage (40) is spherically fitted on the

spherical outer peripheral surface (22) of the inner joint member (20,20a),
characterized in that the angle (α) defined by a straight line connecting a contact point (A) between the spherical outer peripheral surface (42) of the cage (40) and a spherical edge of the spherical inner peripheral surface (12) of the outer joint member (10,10a) and a contact point (B) between the spherical inner peripheral surface (44) of the cage (40) and a spherical edge of the spherical outer peripheral surface (22) of the inner joint member (20,20a), when seen in the articulation plane of the joint comprising the joint center and the center of the torque transmitting ball (40) positioned outermost outside and the cage center line is not more than 10° to mitigate shear stress in a cage column when the angle of displacement (θ) between the outer and inner joint members (10,10a,20,20a) is at a maximum."

Claim 1 of **auxiliary request 2** reads as follows:

"A fixed type constant velocity joint comprising
- an outer joint member (10,10a) having eight axially extending guide grooves (14,14a) formed in the spherical inner peripheral surface (12) thereof,
- an inner joint member (20,20a) having eight axially extending guide grooves (24,24a) formed in the spherical outer peripheral surface (22) thereof,
- torque transmitting balls (30) disposed one by one in ball tracks defined by cooperation between the guide grooves (14,14a,24,24a) of the outer and inner joint members (10,10a,20,20a), and
- a cage (40) holding the torque transmitting balls (30),

- said cage (40) has a spherical outer peripheral surface (42) and a spherical inner peripheral surface (44),
- the spherical outer peripheral surface (42) of the cage (40) is spherically fitted on the spherical inner peripheral surface (12) of the outer joint member (10,10a), while the spherical inner peripheral surface (44) of the cage (40) is spherically fitted on the spherical outer peripheral surface (22) of the inner joint member (20,20a),

characterized in that the angle (α) defined by a straight line connecting a contact point (A) between the spherical outer peripheral surface (42) of the cage (40) and a spherical edge of the spherical inner peripheral surface (12) of the outer joint member (10,10a) and a contact point (B) between the spherical inner peripheral surface (44) of the cage (40) and a spherical edge of the spherical outer peripheral surface (22) of the inner joint member (20,20a), and the cage center line is not more than 10° to mitigate shear stress in a cage column when the angle of displacement (θ) between the outer and inner joint members (10,10a,20,20a) is at a maximum."

Claim 1 of **auxiliary request 3** reads as follows:

"A fixed type constant velocity joint comprising an outer joint member (10) having axially extending arcuate guide grooves (14) formed in the spherical inner peripheral surface (12) thereof, an inner joint member (20) having axially extending arcuate guide grooves (24) formed in the spherical outer peripheral surface (22) thereof, torque transmitting balls (30) disposed one by one in eight ball tracks defined by

cooperation between the arcuate guide grooves (14,24) of the outer and inner joint members (10,20), and a cage (40) holding the torque transmitting balls (30), wherein the number of guide grooves (14) of the outer joint member (10) is eight and so is the number of guide grooves (24) of the inner joint member (20), characterized in that the angle (α) defined by a straight line connecting a contact point (A) between the cage (40) and the outer joint member (10) and a contact point (B) between the cage (40) and the inner joint member (20), and the cage center line is not more than 10° when the angle of displacement (θ) between the outer and inner joint members (10,20) is at a maximum."

Claim 1 of **auxiliary request 4** reads as follows:

"A fixed type constant velocity joint comprising an outer joint member (10,10a) having axially extending guide grooves (14,14a) formed in the spherical inner peripheral surface (12) thereof, an inner joint member (20,20a) having axially extending guide grooves (24,24a) formed in the spherical outer peripheral surface (22) thereof, torque transmitting balls (30) disposed one by one in ball tracks defined by cooperation between the guide grooves (14,14a,24,24a) of the outer and inner joint members (10,10a,20,20a), and a cage (40) holding the torque transmitting balls (30), the number of guide grooves (14,14a) of the outer joint member (10,10a) is eight and so is the number of guide grooves (24,24a) of the inner joint member (20,20a), characterized in that the angle (α) defined by a straight line connecting a contact point (A) between the cage (40) and the outer joint member (10,10a) and a contact point (B) between the cage (40)

and the inner joint member (20,20a), and the cage center line is not more than 10° and not less than 0° when the angle of displacement (θ) between the outer and inner joint members (10,10a,20,20a) is at a maximum."

Claim 1 of **auxiliary request 5** reads as follows:

"A fixed type constant velocity joint comprising
- an outer joint member (10,10a) having eight axially extending guide grooves (14,14a) formed in the spherical inner peripheral surface (12) thereof,
- an inner joint member (20,20a) having eight axially extending guide grooves (24,24a) formed in the spherical outer peripheral surface (22) thereof,
- torque transmitting balls (30) disposed one by one in ball tracks defined by cooperation between the guide grooves (14,14a,24,24a) of the outer and inner joint members (10,10a,20,20a), and
- a cage (40) holding the torque transmitting balls (30),
- said cage (40) has a spherical outer peripheral surface (42) and a spherical inner peripheral surface (44),
- the spherical outer peripheral surface (42) of the cage (40) is spherically fitted on the spherical inner peripheral surface (12) of the outer joint member (10,10a), while the spherical inner peripheral surface (44) of the cage (40) is spherically fitted on the spherical outer peripheral surface (22) of the inner joint member (20,20a),
characterized in that the angle (α) defined by a straight line connecting a contact point (A) between the spherical outer surface (42) of the cage (40) and a

spherical edge of the spherical inner peripheral surface (12) of the outer joint member (10,10a) and a contact point (B) between the spherical inner peripheral surface (44) of the cage (40) and a spherical edge of the spherical outer peripheral surface (22) of the inner joint member (20,20a), and the cage center line is not more than 10° and not less than 0° when the angle of displacement (θ) between the outer and inner joint members (10,10a,20,20a) is at a maximum."

Claim 1 of **auxiliary request 6** reads as follows:

"A fixed type constant velocity joint comprising an outer joint member (10) having axially extending arcuate guide grooves (14) formed in the spherical inner peripheral surface (12) thereof, an inner joint member (20) having axially extending arcuate guide grooves (24) formed in the spherical outer peripheral surface (22) thereof, torque transmitting balls (30) disposed one by one in eight ball tracks defined by cooperation between the arcuate guide grooves (14,24) of the outer and inner joint members (10,20), and a cage (40) holding the torque transmitting balls (30), wherein the number of guide grooves (14) of the outer joint member (10) is eight and so is the number of guide grooves (24) of the inner joint member (20), characterized in that the angle (α) defined by a straight line connecting a contact point (A) between the cage (40) and the outer joint member (10) and a contact point (B) between the cage (40) and the inner joint member (20), and the cage center line is not more than 10° and not less than 0° when the angle of

displacement (θ) between the outer and inner joint members (10,20) is at a maximum."

Claim 1 of **auxiliary request 7** reads as follows:

"A fixed type constant velocity joint comprising an outer joint member (10,10a) having axially extending guide grooves (14,14a) formed in the spherical inner peripheral surface (12) thereof, an inner joint member (20,20a) having axially extending guide grooves (24,24a) formed in the spherical outer peripheral surface (22) thereof, torque transmitting balls (30) disposed one by one in ball tracks defined by cooperation between the guide grooves (14,14a,24,24a) of the outer and inner joint members (10,10a,20,20a), and a cage (40) holding the torque transmitting balls (30), the number of guide grooves (14,14a) of the outer joint member (10,10a) is eight and so is the number of guide grooves (24,24a) of the inner joint member (20,20a), characterized in that the angle (α) defined by a straight line connecting a contact point (A) between the cage (40) and the outer joint member (10,10a) and a contact point (B) between the cage (40) and the inner joint member (20,20a), and the cage center line is not more than 10° and not less than 8° when the angle of displacement (θ) between the outer and inner joint members (10,10a,20,20a) is at a maximum."

Claim 1 of **auxiliary request 8** reads as follows:

"A fixed type constant velocity joint comprising an outer joint member (10a) having axially extending guide grooves (14a) formed in the spherical inner peripheral

surface (12) thereof, an inner joint member (20a) having axially extending guide grooves (24a) formed in the spherical outer peripheral surface (22) thereof, wherein the guide grooves (14a,24a) of the outer and inner joint members (10a,20a) are provided with straight sections having a straight grooved bottom, torque transmitting balls (30) disposed one by one in ball tracks defined by cooperation between the guide grooves (14a,24a) of the outer and inner joint members (10a,20a) and a cage (40) holding the torque transmitting balls (30), wherein the number of guide grooves (14a) of the outer joint member (10) is eight and so is the number of guide grooves (24a) of the inner joint member (20a), characterized in that the angle (α) defined by a straight line connecting a contact point (A) between the cage (40) and the outer joint member (10a) and a contact point (B) between the cage (40) and the inner joint member (20a), and the cage center line is not more than 10° and not less than 8° when the angle of displacement (θ) between the outer and inner joint members (10a,20a) is at a maximum."

VI. The following document plays a role for the present decision:

E3: EP -A- 0 802 341

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

Main request

E3 did not disclose the features according to the characterising portion of claim 1, since it was

completely silent as to the angle α. It was true that also in E3 an angle was defined by the contact points of the inner joint member, the cage and the outer joint member and that that angle took different values during the rotation of the joint. However, it was clear to the person skilled in the art that claim 1 addressed the situation wherein the contact points applied shear forces. As a consequence the value of α to be considered was the maximum value to be taken during the rotation of the cage. Since E3 did not disclose that that value was in the range of claim 1 of the main request its subject-matter was novel.

Auxiliary requests 1 and 2'

Auxiliary request 1 clarified the position of the contact points A and B to be considered and the definition of the angle α. Since the importance of this issue had become apparent as a result of the discussion during the oral proceedings, this request should be admitted into the proceedings.

The definition of the angle α introduced in claim 1 was clear, since it stipulated that the ball was in the outermost position and, by doing so, unequivocally defined the position of the contacts points A and B, which were in the same vertical plane.

Auxiliary request 2' was a further way to clarify the definition of the angle α. Therefore, it should also be introduced into the proceedings.

Auxiliary requests 2 to 8

The subject-matter of claim 1 of auxiliary requests 2 to 8 was novel for the reasons given in respect of the main request. Moreover, the restriction of the values of the angle α to the ranges of 0°-10° or 8-10° further clarified the difference in respect of E3, which did not even mention that angle.

Therefore, the subject-matter of claim 1 of auxiliary requests 2 to 8 was novel, too.

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

Main request

E3 discloses a fixed type constant velocity joint with the features according to the preamble of claim 1. Although E3 did not mention the angle α it was possible to define it considering the cage center line and a straight line connecting a contact point between the spherical outer peripheral surface of the cage and the spherical edge of the spherical inner peripheral surface of the outer joint member and a contact point between the spherical inner peripheral surface of the cage and a spherical edge of the spherical outer peripheral surface of the inner joint member. Upon rotation of the cage that angle α took different values. The maximum of those values was in the range of 10° to 34°, as confirmed by paragraph [0028] of the patent in suit, while their minimum was in the range of large negative values. Therefore, the angle α took also

values of not more than 10°. Accordingly, the subject-matter of claim 1 of the main request lacked novelty.

Auxiliary requests 1 and 2'

Auxiliary requests 1 and 2' were submitted at a very late stage of the proceedings. Moreover, they were not allowable for formal reasons. In particular auxiliary request 1 contravened the requirements of both Articles 84 and 123(2) EPC. Therefore those auxiliary requests should not to be admitted into the proceedings, or should at least be dismissed on formal grounds.

Auxiliary requests 2 to 8

Auxiliary requests 2 to 8 did not add any distinguishing features in view of E3. In particular, the angles α of the joints known from this document also took values in the ranges 0° to 10° or 8° to 10°. Therefore, the subject-matter of claim 1 of auxiliary request 2 to 8 lacked novelty too.

Reasons for the Decision

1. The appeal is admissible.

2. Main request

2.1 E3 undisputedly discloses a fixed type constant velocity joint comprising an outer joint member (1) having axially extending guide grooves (1b) formed in the spherical inner peripheral surface thereof, the number of which is eight (see abstract), an inner joint

member (2) having axially extending guide grooves (2b) formed in the spherical outer peripheral surface thereof, the number of which is eight (see abstract), torque transmitting balls (3) disposed one by one in ball tracks defined by cooperation between the guide grooves of the outer and inner joint members, and a cage (4) holding the torque transmitting balls.

2.2 It is true that E3 does not mention the angle α defined by a straight line connecting a contact point between the cage and the outer joint member and a contact point between the cage and the inner joint member.

However, since there is not a single contact point between the cage and the outer and inner joint respectively but rather a contact surface, the joint of E3 exhibits an infinite number of contact points between the cage and the outer and inner joint members, an infinite number of first contact points (A) between the spherical outer peripheral surface of the cage and the spherical edge of the spherical inner peripheral surface of the outer joint member and an infinite number of second contact points (B) between the spherical inner peripheral surface of the cage and the spherical edge of the spherical outer peripheral surface of the inner joint member. Each couple of the infinite number of these first and second contact points which can be connected by a straight line intersecting the cage center line inevitably defines an angle α between these intersecting lines.

Moreover, when the angle of displacement θ between the outer and inner joint members is at a maximum, the position of the cage with respect to the cutting edges

of the outer and inner joint members at the area of the cage columns changes during rotation. Consequently, the value of the angle α also changes depending upon the angular position of the contact points on the circle described by the rotation of the cage from a maximum which, according to the patent in suit, is typically in the range of 10° to 34° (see paragraph [0028]) to large negative values. Therefore, it is inevitable that the angle α also takes values of not more than 10°.

Contrary to the appellant's view, the wording of claim 1 of the main request does not define the value of the angle α as the maximum value to be taken during the rotation of the cage. Rather, it leaves the selection of the contact points and their angular position on the circle described by the rotation of the cage open.

Therefore, the device according to E3 inevitably comprises an angle α defined by a straight line connecting a contact point between the cage and the outer joint member and a contact point between the cage and the inner joint member, and the cage center line which is not more than 10° when the angle of displacement between the outer and inner joint members is at a maximum.

2.3 Accordingly, the subject-matter of claim 1 of the main request lacks novelty.

3. Introduction of auxiliary request 1 into the proceedings

3.1 According to Article 13(1) of the Rules of Procedure of the Boards of Appeal (OJ EPO 11/2007, page 536), any

amendment to a party's case after it has filed its grounds of appeal or reply may be admitted and considered at the Board's discretion. That discretion is to be exercised in view of inter alia the complexity of the new subject-matter submitted, the current state of the proceedings and the need for procedural economy.

3.2 In the present case auxiliary request 1 was submitted at an extremely late stage of the proceedings. Moreover, it was the second request submitted during the oral proceedings, since a previous version of auxiliary request 1 had been submitted and withdrawn during the oral proceedings, after a discussion of its formal allowability.

Nonetheless, auxiliary request 1 represents an attempt to clarify the definition of the angle α, an issue whose importance had become evident as a result of the discussion of the main request. Moreover, the nature of the amendments, intended to clarify a feature already present in the main request, was such that this request could be dealt with without the need to adjourn the proceedings.

3.3 Under these circumstances auxiliary request 1 was admitted into the proceedings.

4. Auxiliary request 1 - Article 84 EPC

4.1 Claim 1 of auxiliary request 1 has been amended to refer, for the definition of the angle α, to a contact point A between a spherical outer peripheral surface of the cage being positioned in the vicinity of the torque transmitting ball positioned outermost outside of the

outer joint member when taking a maximum angle of displacement between the outer and inner joint members and a spherical edge of the spherical inner peripheral surface.

4.2 This definition places the contact point A in one of the two cage columns which delimit the cage window containing the torque transmitting ball positioned outermost outside of the outer joint member. However, the claim does not specify which of those two cage columns, whose angular positions on the circle described by the rotation of the cage may be different, is to be considered. Nor does it define how the contact point is to be chosen among the plurality of contact points of each cage column, which also exhibit different angular positions. Indeed also the angular position of the torque transmitting ball itself is not completely defined, since the claim merely requires that it is the ball positioned outermost outside of the outer joint member, a condition which is not satisfied only when it is at the outermost possible position but for a number of angular positions of that ball on the circle described by the rotation of the cage. Hence, the position of the contact point A and, as a consequence, the angle α are not clearly defined.

Therefore, a lack of clarity has been caused by the amendment, and auxiliary request 1 does not meet the requirements of Article 84 EPC.

5. Auxiliary request 2'

Auxiliary request 2' was filed after the discussion of auxiliary request 1, i.e. at an even later stage of the

proceedings than the already late-filed auxiliary request 1.

Moreover, its claim 1 merely requires that the angle α is seen in the articulation plane, without defining the plane in which the contact points lie and, as a consequence, their angular position. Hence it still fails to clearly define the angle α. Therefore, claim 1 of auxiliary request 2' lacks clarity prima facie.

Under these circumstances, auxiliary request 2' was not admitted into the proceedings.

6. Auxiliary requests 2 to 8

The additional features introduced in claim 1 of auxiliary requests 2 to 8 also fail to provide a distinction in respect of E3.

6.1 The cage shown in E3 (see for instance in Figures 1a, 1b, 15a and 15b) has a spherical outer and a spherical inner peripheral surface, spherically fitted on respectively the spherical inner peripheral surface of the outer joint member and the spherical outer peripheral surface of the inner joint member (see for instance in Figures 1a, 1b, 15a and 15b). Moreover, the shear stress in the cage columns can be considered to be somehow mitigated. Hence, the subject-matter of claim 1 of **auxiliary request 2** also lacks novelty in view of E3.

6.2 E3 discloses embodiments comprising an outer and an inner joint member with arcuate guide grooves (see

Figure 1a). Therefore, the subject-matter of claim 1 of **auxiliary request 3** lacks novelty too.

6.3 As already explained above, the joint of E3 comprises angles α ranging from a maximum in the range of 10° to 34° to large negative values. Hence, it exhibits also angles α in the ranges of not more than 10° and not less than 0° and not more than 10° and not less than 8°. Therefore, the subject-matter of claim 1 of each of the **auxiliary requests 4 and 7** lacks novelty.

The same applies to the subject-matter of claim 1 of **auxiliary request 5**, which corresponds to a combination of claim 1 of auxiliary requests 2 and 4, and to the subject-matter of claim 1 of **auxiliary request 6**, which corresponds to a combination of claim 1 of auxiliary requests 3 and 4.

6.4 Finally, E3 discloses also embodiments comprising an outer and an inner joint member with guide grooves with a straight section (see column 17, lines 2 to 5 and Figure 20a). Therefore, the subject-matter of claim 1 of **auxiliary request 8** lacks also novelty.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

V. Commare T. Kriner