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Datasheet for the decision of 17 May 2024

Case Number: T 0026/23 - 3.2.08

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Title of invention:
CONSTANT-VELOCITY UNIVERSAL JOINT

Patent Proprietor:
erae AMS Co., Ltd.

Opponent:
NTN Corporation

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
Novelty - main request (no)
Inventive step - auxiliary request (no)

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Chambres de recours

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0
Fax +49 (0)89 2399-4465

Case Number: T 0026/23 - 3.2.08

D E C I S I O N
of Technical Board of Appeal 3.2.08
of 17 May 2024

Appellant: (Patent Proprietor)	erae AMS Co., Ltd. 664, Nongong-ro, Nongong-eup Dalseong-gun Daegu 42981 (KR)
Representative:	Manitz Finsterwald Patent- und Rechtsanwaltspartnerschaft mbB Martin-Greif-Strasse 1 80336 München (DE)
Respondent: (Opponent)	NTN Corporation 3-17 Kyomachibori 1-chome Nishi-ku Osaka, Osaka 550-0003 (JP)
Representative:	Grünecker Patent- und Rechtsanwälte PartG mbB Leopoldstraße 4 80802 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 24 October 2022 revoking European patent No. 3045754 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairwoman	P. Acton
Members:	M. Foulger
	C. Schmidt

Summary of Facts and Submissions

I. The appeal lies against the decision of the opposition division posted on 24 October 2022 revoking the European patent No. 3 045 754 B1.

II. The opposition division found that the subject-matter of claim 1 of the patent was not new with regard to D1: JP 2001-97063 A, moreover the auxiliary request did not fulfil the requirements of Article 123(2) EPC and Rule 80 EPC.

III. The appellant (patent proprietor) requests that the decision under appeal be set aside and that the patent be maintained as granted, or in the alternative, that the patent be maintained in the form according to the auxiliary request filed on 10 February 2021.

IV. The respondent (opponent) requests that the appeal be dismissed.

V. The following document is relevant for this decision:

D1: JP 2001-97063 A

VI. Main request

Claim 1 as granted reads:

"A constant-velocity universal joint comprising:
an outer joint member (10) having a plurality of outer ball grooves (11);
an inner joint member (20) having a plurality of inner ball grooves (21) respectively corresponding to the plurality of the outer ball grooves (11);

a plurality of torque transmitting balls (30) which are respectively guided by a pair of the outer ball groove (11) and the inner ball groove (21); and
a ball cage (40) containing the plurality of the torque transmitting balls (30),
wherein the outer ball groove (11) and the inner ball groove (21) respectively have a double shape which is formed by a connection of different shapes (S1, S2),
characterized in that
wherein a ratio (O/H) of an offset value (O) which is a distance between an inflection point (C) of the outer ball groove (11) and a line connecting centers (BC) of the torque transmitting balls (30) in a state that the outer joint member (10) and the inner joint member (20) form 0 angle and a distance (H) between a center line of the inner joint member (20) and a center (BC) of the torque transmitting ball (30) in a state that the outer joint member (10) and the inner joint member (20) form 0 angle is within a range of 0.07 to 0.11,
wherein the inflection point (C) is offset toward an open side of the outer joint member (10) from a line connecting centers (BC) of the torque transmitting balls (30)."

Auxiliary request:

The following features are added to claim 1 of the main request (feature numbering added in bold by the Board):

"**1.9** wherein the torque transmitting ball (30) moves in an 8-shape on an axial contacting surface of a window of the ball cage (40) to form an 8-shape locus of a contact point on the axial contacting surface of the window of the ball cage (40) in response to a rotation of inner joint member in an articulated state between the inner joint member (20) and the outer joint member

(10), and

1.10 wherein the ball cage is formed such that a contact point of the axial contacting surface contacting the torque transmitting ball is positioned at a point between 1/8 and 1/12 from an inner end to an outer end of a contacting surface."

VII. The appellant argued essentially the following:

(a) D1 did not disclose an inflection point as required by claim 1.

Moreover, it was not unambiguously disclosed that the outer joint groove of the constant velocity joint was parallel to the groove centre-line. This groove could equally be tapered outwards as was known in the art. Therefore, no conclusion could be drawn about the ratio O/H from the value of the angle Φ.

Fig. 2 of D1 seemed to relate to a joint wherein the angle Φ was 7°. This lead to the ratio O/H being outside the claimed range. It was not disclosed whether all the geometrical relationships in Fig. 2 would be retained with the other values of Φ disclosed in [0028].

The subject-matter of claim 1 was thus new with respect to D1.

(b) Auxiliary request - inventive step

The further features of this request were not an arbitrary selection. The constant-velocity universal joint of the auxiliary request provided the technical effect of improving the articulation

angle, as described in the patent, paragraph [0028].

The subject-matter of claim 1 therefore involved an inventive step.

VIII. The respondent argued essentially the following:

(a) D1 disclosed a constant-velocity joint in which there was change in the shape of the ball groove from curved to straight. This change occurred at the inflection point.

The further features of claim 1 of the main request were also known from D1.

(b) The subject-matter of claim 1 of the auxiliary request did not involve an inventive step. The added features did not solve any particular problem and were merely arbitrary selections.

Reasons for the Decision

1. Novelty - main request

1.1 D1 discloses a constant velocity joint of the undercut-free type (paragraph [0007] of the English language translation).

In the wording of claim 1, D1 discloses:
A constant-velocity universal joint comprising:
an outer joint member (2) having a plurality of outer ball grooves (2b);
an inner joint member (3) having a plurality of inner

ball grooves (3b) respectively corresponding to the plurality of the outer ball grooves;
a plurality of torque transmitting balls (4) which are respectively guided by a pair of the outer ball groove and the inner ball groove; and
a ball cage (5) containing the plurality of the torque transmitting balls,
wherein the outer ball groove and the inner ball groove respectively have a double shape which is formed by a connection of different shapes (curved then straight - see Fig. 2).

The appellant argued that D1 did not disclose that the groove had a point of inflexion as required by claim 1 of the main request.

It is correct that D1 does not mention a point of inflexion if one takes the strict mathematical sense of the term, i.e. a point on a smooth plane curve at which the curvature changes sign. But in general English an "inflection" can also simply be a bend. Also there is no justification in the patent for the more restrictive strictly mathematical meaning. The patent drawings seem to show a curve followed by a straight line as is shown in D1. The patent, paragraph [0024] states "the inflection point C means a point where the two portions S1 and S2 having different shapes meet." This requirement is equally met by the joint shown in D1.

1.2 The appellant argued that D1 did not disclose that the outer joint groove of the constant velocity joint was parallel to the groove centre-line. This groove could equally be tapered outwards as was known in the art. Therefore, no conclusion could be drawn about the ratio O/H from the value of the angle Φ.

It is correct that constant-velocity joints with tapered outer grooves are known in the art. The question is however how the skilled person would read the disclosure of D1 and what they would understand therefrom. In the current case nothing in D1 indicates that a tapered groove is intended. The skilled person would therefore read the drawing with the conventional joint in mind as nothing else is indicated and, hence, understand that the straight portion of the groove was parallel with the joint centre-line. Therefore, there is a unequivocal link/relation between the angle Φ and the ratio O/H.

1.3 Moreover, the appellant argued that the drawing of D1 appeared to disclose an angle Φ of 7° which would lead to the ratio O/H being outside the claimed range.

It might be correct that the angle Φ measured from Figure 2 of D1 has a value of 7° and that for this value the ratio O/H would lie outside the claimed value. However, D1 discloses in paragraph [0018] that the value of the angle Φ can be 5°. This corresponds to a ratio O/H of 0.0875 which falls in the claimed range.

The appellant argued that D1 did not disclose whether all the geometrical relationships in Fig. 2 would be retained for all disclosed values of Φ. The Board did not find this argument persuasive because there is no reason and no hint in D1 as to why the skilled person would change the geometrical relationships between the elements in the drawing when working within all of the disclosed values of Φ.

1.4 Thus, the subject-matter of claim 1 is known from D1.

2. Inventive step - auxiliary request

Feature 1.10 is not known from D1.

The appellant argued that paragraph [0028] of the patent described that this feature had the technical effect of improving the possible operating angle of the joint.

The Board did not find this argument persuasive because the paragraph also refers first of all to the claimed dimensions, i.e. that the contact point of the axial contacting surface contacting the torque transmitting ball may be positioned at a point between 1/8 and 1/12 from an inner end to an outer end of a contacting surface (patent, col. 5, l. 18 - 22). This paragraph then goes on to say that "according to an embodiment of the present invention, a circumferential space for the ball cage 40 may be 1.2 to 1.4 times of the total rotational direction of the torque transmitting ball 30", col. 5, l. 26 - 30. Subsequent to this it is mentioned that "due to these values a high articulation value can be achieved" (col. 5, l. 35 - 36). From the patent it is not explicit whether the effect of improving the possible operating angle is due exclusively to the selection of the position of the contact point in feature 1.9 or to the circumferential space of the cage or a combination of both.

Since the joint of claim 1 is not restricted to a specific value of the circumferential space for the cage as required in paragraph [0028], the effect argued by the appellant to show evidence of inventive activity is not unambiguously disclosed in the patent. Hence, the problem solved by Feature M1.9 is to determine the contact point of the axial contacting surface with the

torque transmitting ball.

The feature merely amounts to a selection of dimensions which the skilled person would arrive at simply by using a process of trial and error as part of their usual activities.

The subject-matter of claim 1 of the auxiliary request does not therefore involve an inventive step.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairwoman:

C. Moser P. Acton

Decision electronically authenticated