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**Datasheet for the decision
of 17 July 2008**

Case Number: T 0807/07 - 3.2.01

Application Number: 02758597.5

Publication Number: 1401695

IPC: B61F 5/16

Language of the proceedings: EN

Title of invention:

A thrust bearing

Patentee:

Minebea Co., Ltd.

Opponent:

Schaeffler KG

Headword:

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Relevant legal provisions:

-

Relevant legal provisions (EPC 1973):

EPC Art. 56

Keyword:

"Inventive step - yes (after amendment)"

Decisions cited:

-

Catchword:

-



Case Number: T 0807/07 - 3.2.01

D E C I S I O N
of the Technical Board of Appeal 3.2.01
of 17 July 2008

Appellant: Schaeffler KG
(Opponent) Industriestrasse 1-3
D-91074 Herzogenaurach (DE)

Representative: -

Respondent: Minebea Co. Ltd.
(Patent Proprietor) 4106-73 Oaza Miyota
Miyota-machi
Kitasaku-gun
Nagano 389-0293 (JP)

Representative: Hoarton, Lloyd Douglas Charles
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Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office posted
6 March 2007 concerning maintenance of European
patent No. 1401695 in amended form.

Composition of the Board:

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

Summary of Facts and Submissions

- I. The appeal by the opponent is directed against the interlocutory decision posted 6 March 2007 according to which it was found that, account being taken of the amendments made by the patent proprietor according to the first auxiliary request during the opposition proceedings, European patent No. 1 401 695 and the invention to which it relates was found to meet the requirements of the EPC 1973.
- II. The following evidence played a role during the appeal:
- D1: DD-A-5399
- D3: GB-A-2 165 808
- D4: EP-B-0 559 635
- A1: acknowledgement in the patent specification of a known thrust bearing.
- III. At oral proceedings held 17 July 2008 the appellant (opponent) requested that the decision under appeal be set aside and the patent revoked. The respondent requested that the decision be set aside and that the patent be maintained on the basis of the claims 1 to 14 of the sole request presented at the oral proceedings.
- IV. The independent claims 1, 14 according to the respondent's request read:

"1. A thrust bearing comprising:

an outer housing having a substantially circular base and a spherical bearing surface, wherein a cylindrical side wall and a central post are upstanding from the base, the central post being integrally formed with the outer housing and having a main body which is frusto-conical, the outer housing not being provided with a central hole;

an outer ball having an outer spherical bearing surface and an inner spherical bearing surface, the outer ball being an annulus and having a central aperture having a chamfered surface seated on and at least partially within the outer housing; and

an inner ball having an outer spherical bearing surface, the inner ball being mounted on the central post, the outer ball being sandwiched between the inner ball and the outer housing, the outer bearing surface of the inner ball and the inner bearing surface of the outer ball abutting one another and the outer bearing surface of the outer ball abutting the bearing surface of the outer housing, wherein an outer surface of the central post and the chamfered surface of the outer ball together form an end stop limiting angular displacement of the outer ball with respect to the outer housing."

"14. A method of assembling a thrust bearing comprising the steps of:

providing an outer housing having a substantially circular base and a spherical bearing surface, the outer housing having a cylindrical side wall and an integrally formed central post having a main body which is frusto-conical upstanding therefrom, the outer housing not being provided with a central hole;

seating an outer ball having an outer spherical bearing surface and an inner spherical bearing surface, the inner ball being an annulus and having a central aperture having a chamfered surface on and at least partially within the outer housing;
mounting an inner ball having an outer spherical bearing surface on the central post to sandwich the outer ball between the inner ball and the outer housing; the outer bearing surface of the inner ball and the inner bearing surface of the outer ball abutting one another and the outer bearing surface of the outer ball abutting the bearing surface of the outer housing; and fixing the inner ball to the central post, wherein an outer surface of the central post and the chamfered surface of the outer ball together form an end stop limiting angular displacement of the outer ball with respect to the outer housing."

Claims 2 to 13 specify features additional to those of claim 1.

V. The appellant's submissions may be summarised as follows:

The closest state of the art is known from D4 which discloses all features of claim 1 except those that the main post is integrally formed and has a frusto-conical main body, the outer housing is not provided with a central hole and the central aperture of the outer ball has a chamfered surface which together with the outer surface of the central post limits angular displacement with respect to the housing. The feature of the integrally formed main post is known from D1 and would be obvious to solve the problem of increasing the

strength of the assembly in D4. The adoption of that feature in D4 would render the central hole redundant. The frusto-conical form is already known from D3. The chamfered surface acting together with the outer surface of the central post to limit the angular displacement of the outer ball is also known from D1.

Alternatively, if D1 is considered as the closest state of the art the problem is to permit assembly of the bearing with access from only one side. The solution is already known from D4.

VI. The respondent countered essentially as follows:

The features of claim 1 which are new with respect to D4 solve the problem of providing a more robust construction and limiting angular displacement of the bearing within restricted dimensions. D4 concentrates on providing a low-profile bearing and provides end stops externally of the bearing itself. The skilled person when applying his general technical knowledge to increase the strength of the D4 bearing would merely increase dimensions. In D1 the bolt forms the central post and the sleeve is merely a spacer so there is no integral central post.

Reasons for the Decision

1. The patent relates to a bearing for coupling two carriages of, for instance, a tram or light rail vehicle and accommodating universal articulation between the carriages. Spherical bearing surfaces are provided between an annular, outer bearing member

connectable to one carriage and an assembly of an inner bearing member and outer housing connectable to the other carriage. The inner bearing member is mounted on a central post which is integral with the outer housing, has a frusto-conical form and forms an end stop with the outer bearing member. The only matter at issue is inventive step.

2. In the board's view the closest state of the art for considering inventive step is that known from D4. D4 relates to a low-floor rail vehicle having two carriages joined at a walk-through passageway. It acknowledges earlier state of the art in which a tram vehicle is provided with carriages connected by a spherical joint which results in an undesirably high floor. D4 provides a low-profile joint which avoids the need to locally raise the floor. The bearing according to D4, see particularly figure 3, comprises two disc-shaped cylindrical housings, the first having a central post welded into a hole and a peripheral wall comprising a groove. A spherical bearing surface is located radially inwards of the peripheral wall. The second housing has a peripheral lip which enters into the groove and carries an annular outer ball assembly which seats in the spherical bearing surface of the first housing. An inner ball is attached to the end of the central post and seats in the inner bearing surface of the outer ball assembly. The low-profile construction is achieved by providing the annular outer ball in the general form of a spherical segment comprising a cylindrical wall of the second housing carrying bearing portions on its inner and outer surfaces. There is provision for 5° vertical articulation but no explicit disclosure of an end stop

to limit that articulation. However, it is implicit that an end stop would be provided by engagement between the lip and the groove.

2.1 The subject-matter of present claim 1 differs from the disclosure of D4 by the following features:

- the central post is integrally formed with the outer housing, the outer housing not being provided with a central hole;
- the central post is frusto-conical and the outer ball is provided with a chamfered surface at its central aperture, wherein an outer surface of the central post and the chamfered surface of the outer ball together form an end stop limiting angular displacement of the outer ball with respect to the outer housing.

The integral, frusto-conical formation of the central post provides a more robust structure for incorporating the end stop.

2.2 D1 relates to the accommodation of higher loads in spherical joints between heavy rail vehicles by providing an intermediate, replaceable layer between the spherical surfaces in the outer housing and the outer ball. In the embodiment the intermediate layer is provided in an assembly which is generally not described and is disclosed essentially only in the drawing figure 1. From figure 1 an assembly is apparent in which the spherical surface of the outer housing comprises a central inward axial projection, the inner ball sits against the end surface of the projection and

is retained by the head of a bolt passing through a hole in the projection and secured by a nut on the outside of the outer housing. The projection is apparently essentially cylindrical and the central aperture of the outer bearing comprises a chamfered surface.

2.2.1 The parties disagree as to whether the projection or the bolt constitutes the central post within the meaning of the present patent and therefore whether or not D1 provides a disclosure of an integral post. However, present claim 1 does not merely specify an integral post but the combination of this feature with the absence of a central hole in the outer housing. This is clearly different from the D1 assembly in which the hole is necessary to accommodate the bolt. Moreover, in the absence of a detailed description it cannot be determined whether the chamfered surface on the outer ball is intended to provide an end stop by abutting against the projection or merely to provide clearance whilst an end stop is provided elsewhere. The presently claimed frusto-conical form of the central post also is not present. It follows that a combination of D4 with features taken from D1 would not arrive at the subject-matter of present claim 1.

2.2.2 The appellant is of the opinion that the feature of a frusto-conical central post may be taken from D3. D3 relates to the provision of a spherical bearing in order to allow a railway carriage to be tilted relative to the running gear when passing through curves at high speed. In each of the described embodiments the construction is similar to that of D1, having a projection at the centre of the spherical surface of

the outer housing and being provided with a through hole. A bolt passes through the projection to be secured by a nut and retain the inner ball against the end of the projection. The main part of the projection is essentially cylindrical in all embodiments. It may be that a small length of the projection in figure 3 is shown as tapered but this is without any description or apparent relevance to the function of the bearing. It is therefore doubtful that a frusto-conical form can be considered as being disclosed but even if it were it would be of no relevance as regards improvement of the bearing according to D4 and would not be considered by the skilled person.

- 2.3 According to A1 a spherical bearing assembly was already known in which a nut and bolt hold the inner ball against the end face of a cylindrical sleeve which surrounds the bolt and abuts at its opposite end against the outer housing. This arrangement is not dissimilar to the clamping of the inner ball against the projection in D1 but the bolt is inserted in the opposite direction and its head is retained to the outer housing by a series of screws. An end stop is provided by abutment between a chamfered surface on the aperture of the annular, generally hemispherical outer ball and the cylindrical surface of the sleeve. This end stop arrangement is not applicable to the low-profile construction of D4 in which the structural part of the outer ball, namely the cylindrical wall of the second housing, is spaced from the central post. As a result, the skilled person would not attempt to introduce the end stop arrangement of A1 into the assembly according to D4. Moreover, the feature of a frusto-conical, integrally formed central post does not

- result from any combination of features according to D4 and A1.
3. The appellant alternatively argued that D1 may form the closest state of the art for consideration of inventive step, whereby the problem would be to permit assembly of the coupling with access from only one side. However, as has already been set out above, a combination of D1 and D4 would not result in all features of present claim 1 so that a detailed analysis of this line of argumentation is not necessary.
 4. On the basis of the foregoing the board concludes that the subject-matter of claim 1 involves an inventive step.
 5. Claim 14 relates to a method of assembling a thrust bearing which has all of the features contained in claim 1. The parties are in agreement that as a result of the correspondence between the features in claims 1 and 14 inventive step considerations are the same for both claims. No separate examination of that claim therefore is necessary. Since claims 2 to 13 contain all features of claim 1 the subject-matter of those claims also involves an inventive step.

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 with the order to maintain the patent on the basis of the following documents:
 - claims 1 to 14 and amended description presented as sole request at the oral proceedings;
 - drawings as granted.

The Registrar:

The Chairman:

A. Vottner

S. Crane