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**Datasheet for the decision  
of 6 June 2019**

**Case Number:** T 1238/15 - 3.2.06

**Application Number:** 08159715.5

**Publication Number:** 2075186

**IPC:** B62M11/16

**Language of the proceedings:** EN

**Title of invention:**

Bicycle internal hub transmission with helical gear

**Patent Proprietor:**

SHIMANO INC.

**Opponent:**

SRAM Deutschland GmbH

**Headword:**

**Relevant legal provisions:**

EPC Art. 100(c), 123(2), 56  
RPBA Art. 13(1)

**Keyword:**

Grounds for opposition - extension of subject-matter (yes)

Amendments - added subject-matter (yes) (first auxiliary request)

Inventive step - (no) (second auxiliary request)

Late-filed auxiliary requests - requests clearly allowable (no)

**Decisions cited:**

G 0010/91

**Catchword:**



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Case Number: T 1238/15 - 3.2.06

**D E C I S I O N**  
**of Technical Board of Appeal 3.2.06**  
**of 6 June 2019**

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**Decision under appeal:** **Interlocutory decision of the Opposition  
Division of the European Patent Office posted on  
5 June 2015 concerning maintenance of the  
European Patent No. 2075186 in amended form.**

**Composition of the Board:**

**Chairman** M. Harrison  
**Members:** T. Rosenblatt  
E. Kossonakou

## **Summary of Facts and Submissions**

I. The appellants (patent-proprietor and opponent) filed respective appeals against the interlocutory decision of the opposition division in which the opposition division found that European patent No. 2 075 186 in an amended form met the requirements of the EPC.

As both parties are appellants (and thus also respectively respondents), they will be referred to in the following as (patent) proprietor and opponent.

II. The Board issued a summons to oral proceedings with a subsequent communication containing its provisional opinion. The Board opined *inter alia* that maintenance of the patent as granted appeared to be prejudiced by the grounds of opposition under Article 100(a) in combination with Article 56 EPC and under Article 100(c) EPC. In regard to the 1<sup>st</sup> to 7<sup>th</sup> auxiliary requests submitted by the proprietor with its grounds of appeal, the Board opined *inter alia* that the subject-matter of claim 2 of the first auxiliary request did not appear to meet the requirements of Article 123(2) EPC.

III. In reply to the Board's preliminary opinion and in preparation for the oral proceedings, the proprietor submitted an 8<sup>th</sup> auxiliary request.

IV. Oral proceedings before the Board were held on 6 June 2019. During the oral proceedings the proprietor withdrew its 2<sup>nd</sup> to 6<sup>th</sup> auxiliary requests filed with its statement of grounds of appeal, as well as its previously submitted 8<sup>th</sup> auxiliary request and submitted new 2<sup>nd</sup>, 7<sup>th</sup> and 9<sup>th</sup> auxiliary requests.

V. The patent proprietor requested that the decision under appeal be set aside and the patent maintained as granted (main request) or, subsidiarily, that the patent be maintained on the basis of the first auxiliary request filed with the statement setting out the grounds of appeal or of one of the second, seventh or ninth auxiliary requests submitted during the oral proceedings.

VI. The opponent requested that the decision under appeal be set aside and the European patent No. 2 075 186 be revoked.

VII. The evidence relied upon by the parties and relevant for the present decision is the following:

E13 : EP-A-0 876 953,

E6 : Dubbel, "*Taschenbuch für den Maschinenbau, 21. Auflage*", G124-G127, G138, G139,

E14 : EP-A-0 727 276,

E15 : DE-A-24 58 762,

E16 : "*Schräg oder gerade, das ist hier die Frage*",  
10 March 2006, [www.industrie.de](http://www.industrie.de).

VIII. Claims 1 to 6 as granted (proprietor's main request) read:

"1. An internal hub transmission (12) comprising:

a hub axle (20);

a driver (22) rotatably supported by the hub axle (20);

a hub shell (24) rotatably supported by the hub axle (20);

a power transmission mechanism (28) disposed between the driver (22) and the hub shell (24) for transmitting rotational power from the driver (22) to the hub shell (24) through a plurality of power transmission paths,

the power transmission mechanism (28) having at least one planetary gear mechanism (113) that includes a sun gear (38), a planetary gear (114) and a gear ring (118), the planetary gear (114) being supported by a gear rack (116), the planetary gear (114) having gear teeth (120), and the sun gear (38) and the gear ring (118) are provided with gear teeth (146) that mesh to gear teeth (120) of the planetary gear (114); and a shift mechanism (26) for selecting one of the plurality of power transmission paths, characterized in that the gear teeth (120) of the planetary gear (114) are helical gear teeth, and the gear teeth of the sun gear (38) and the gear ring (118) are helical gear teeth that mesh to the helical gear teeth (120) of the planetary gear (114), and the internal hub transmission (12) further comprises a first ball bearing assembly (160) operatively disposed between the gear rack (116) and the gear ring (118) to support smooth rotation therebetween.

2. The internal hub transmission (12) according to claim 1, further comprising a second ball bearing assembly (162) operatively disposed between the driver (22) and the gear ring (118) to support smooth rotation therebetween.

3. The internal hub transmission (12) according to claim 1 or 2, further comprising a third ball bearing assembly (132) operatively disposed between the gear rack (116) and the planetary gear (114) to support smooth rotation therebetween.

4. The internal hub transmission (12) according to any of the preceding claims, further comprising a fourth ball bearing assembly (170) operatively disposed

between the gear rack (116) and the hub axle (20) to support smooth rotation therebetween.

5. The internal hub transmission (12) according to claim 1, wherein the hub shell (24) rotates about a rotation axis (A) that extends through the hub axle (20), and the helical gear teeth (120) on the planetary gear (114) are angled by a helix angle that is approximately 20 degrees measured relative to the rotation axis.

6. The internal hub transmission (12) according to claim 1, wherein the sun gear (38) is formed on an exterior surface of the hub axle (20)."

IX. The claims of the 1<sup>st</sup> auxiliary request have been amended by combining granted dependent claims 2 to 4 into a single dependent claim 2, reading

"2. The internal hub transmission (12) according to claim 1, further comprising a second ball bearing assembly (162) operatively disposed between the driver (22) and the gear ring (118) to support smooth rotation therebetween, a third ball bearing assembly (132) operatively disposed between the gear rack (116) and the planetary gear (114) to support smooth rotation therebetween, and a fourth ball bearing assembly (170) operatively disposed between the gear rack (116) and the hub axle (20) to support smooth rotation therebetween."

Independent claim 1 remains unchanged and the remaining dependent claims have been renumbered.

X. In the 2<sup>nd</sup> auxiliary request submitted during the oral proceedings, claim 1 is again unchanged, whereas all

dependent claims have been deleted.

XI. Compared to claim 1 as granted, claim 1 of the 7<sup>th</sup> auxiliary request submitted during the oral proceedings reads (emphasis of amendments added by the Board in bold type):

"An internal hub transmission (12) comprising:  
a hub axle (20);  
a driver (22) rotatably supported by the hub axle (20);  
a hub shell (24) rotatably supported by the hub axle (20);  
a power transmission mechanism (28) disposed between the driver (22) and the hub shell (24) for transmitting rotational power from the driver (22) to the hub shell (24) through a plurality of power transmission paths, the power transmission mechanism (28) having at least one planetary gear mechanism (113) that includes a sun gear (38), planetary gears (114) and a gear ring (118), the planetary gears (114) being supported by a gear rack (116), the planetary gears (114) having gear teeth (120), and the sun gear (38) and the gear ring (118) are provided with gear teeth (146) that mesh to gear teeth (120) of the planetary gear (114); and  
a shift mechanism (26) for selecting one of the plurality of power transmission paths,  
characterized in that the gear teeth (120) of the planetary gears (114) are helical gear teeth, and the gear teeth of the sun gear (38) and the gear ring (118) are helical gear teeth that mesh to the helical gear teeth (120) of the planetary gears (114), and the internal hub transmission (12) further comprises a first ball bearing assembly (160) operatively disposed between the gear rack (116) and the gear ring (118) to support smooth rotation therebetween **and a second ball bearing assembly (162) operatively disposed between the**



**driver (22) and the gear ring (118) to support smooth rotation therebetween and a third ball bearing assembly (132) that supports the planetary gears (114) on shafts (124) of the gear rack (116) operatively disposed between the gear rack (116) and the planetary gears (114) to support smooth rotation therebetween and a fourth ball bearing assembly (170) operatively disposed between the gear rack (116) and the hub axle (20) to support smooth rotation therebetween."**

XII. Compared to claim 1 as granted, the characterising portion of claim 1 of the 9<sup>th</sup> auxiliary request has been amended as follows (emphasis added by the Board in bold type):

"[...characterized in that] the gear teeth (120) of the planetary gear (114) are helical gear teeth, and the gear teeth of the sun gear (38) and the gear ring (118) are helical gear teeth that mesh to the helical gear teeth (120) of the planetary gear (114), **and the helical gear teeth (120) on the planetary gear (114) are angled by a helix angle that is approximately 20 degrees measured relative to the rotation axis**, and the internal hub transmission (12) further comprises a first ball bearing assembly (160) operatively disposed between the gear rack (116) and the gear ring (118) to support smooth rotation therebetween."

XIII. The arguments of the proprietor may be summarised as follows.

*Main request of the proprietor - patent as granted*

The objection under Article 100(c) EPC was not raised in the notice of opposition but only after the parties had been summoned to oral proceedings before the

opposition division, thus at a very late stage. The Board should not admit the objection into the proceedings.

In the application as filed, first to fourth ball bearings were embraced by the subject-matter of claims 2 to 5, all referring back to claim 1. They were therefore disclosed as individual features which could be cumulatively combined, as is corroborated by their numbering. This understanding was furthermore supported by paragraph 37 of the description.

*1<sup>st</sup> auxiliary request*

The subject-matter of claim 2, resulting in the combination of all four ball bearing assemblies, was disclosed in paragraph 37 and therefore met the requirement of Article 123(2) EPC.

*2<sup>nd</sup> auxiliary request*

The distinguishing features in the characterising portion of claim 1, when starting from D13 as the closest prior art, solved the objective problem reducing noise in an internal hub transmission. The skilled person would not have used helical gears in the hub transmission known from E13. Helical gears were known to increase the friction between the intermeshing teeth, which was however contrary to the objectives sought in E13 according to paragraphs 5 and 6. If the skilled person wanted to reduce noise in this hub transmission, paragraph 63 of E13 taught that a planetary roller mechanism should be used. Such planetary roller mechanisms were known to the skilled person for their decreased noise levels as documented by E14 and E15. Moreover, E16 also confirmed that

helical gears were not necessarily quieter or more efficient than spur gears. This all clearly prevented the skilled person from using expensive helical gears in an internal hub transmission for a bicycle. E6 was a general textbook and could not provide any incentive for the skilled person to introduce helical gears in a bicycle hub. The skilled person would also not have considered mounting an additional ball bearing between the gear frame and the gear ring in E13. A gap existed between these two components, so that no friction occurred, meaning that a ball bearing assembly would actually increase the friction. Moreover, there was neither enough space for mounting a ball bearing assembly nor could the two components then be assembled without further substantial constructional modifications.

*7<sup>th</sup> auxiliary request*

Claim 1 defined, in addition to all four ball bearing assemblies, also the plurality of planetary gears. The bearing support portions mentioned in paragraph 37 would not require explicit definition since they were implicitly defined by the respective features. The terms "inner" and "outer" used in that context in paragraph 37 served only to properly distinguish the two support portions without attributing any importance to a radial arrangement. Errors in the reference signs indicated that the figures did not belong to the disclosure.

*9<sup>th</sup> auxiliary request*

Amended claim 1 was based on granted claims 1 and 5.

XIV. The arguments of the opponent may be summarised as follows.

*Main request of the proprietor - patent as granted*

A disclosure for an internal hub transmission with either only two or three ball bearing assemblies according to the dependent granted claims could not be found in the application as filed.

*1<sup>st</sup> auxiliary request*

Paragraph 37 disclosed a combination of all four bearing assemblies. However this disclosure related to a specific embodiment comprising *inter alia* a plurality of planetary gears, whereas the subject-matter of claim 2 related to a single planetary gear, thereby contravening Article 123(2) EPC.

*2<sup>nd</sup> auxiliary request*

The objective technical problem was to reduce noise in the known internal hub transmission of E13 and to make it more efficient. The advantages of helical gears were well known to the skilled person, as could be seen from E6. Helical gears were also known to be used in planetary gear transmissions. The problems reported in paragraphs 5 and 6 of E13 related to different structural components of the hub transmission and would not have provided a prejudice against the consideration of helical gears. The reference in paragraph 63 of E13 to a "planet roller mechanism" was far too general, without any indication of how to implement such mechanism in E13. E16 constituted an isolated, negatively tainted opinion, which moreover confirmed the commonly accepted opinion on the advantages of

helical gears. The gear rack and the gear ring in E13 were in contact in the axial direction so that friction occurred between these two components. The size of the required ball bearing assembly was not limited by the claim. Mounting an additional ball bearing assembly between these components under the given (space) constraints would not involve anything more than the customary practice of the skilled person.

*7<sup>th</sup> auxiliary request*

The subject-matter of amended claim 1 *prima facie* did not meet the requirement of Article 123(2) EPC. Paragraph 37 had to be read together with the figures. Disclosed was a radial load bearing arrangement, which was not defined in claim 1.

## **Reasons for the Decision**

*Main request of the proprietor - patent as granted*

1. Article 100(c) EPC

1.1 In its preliminary opinion the Board noted the following:

"This ground of opposition was introduced by the opposition division of its own motion according to Article 114(1) EPC, as can be seen from point 3.2 of the grounds for the impugned decision, in particular the last paragraph of this point.

As explained by the Enlarged Board of Appeal in opinion G 10/91, an opposition division may, in

application of Article 114(1) EPC, introduce a ground for opposition not covered by the notice for opposition of its own motion, if such a ground is considered sufficiently relevant.

If an opposition division does introduce such a ground into the proceedings before it, it will of course decide whether such ground prejudices the maintenance of the patent, in the decision that it issues. Since, in the case at hand, the opposition division did decide to introduce said ground for opposition, it became part of the contested decision and, as a result, part of the appeal's legal and factual framework. The Board is therefore both entitled and obliged to consider such ground further, as it is clearly not "a fresh ground for opposition" to be "admitted" in the appeal proceedings (or not), as requested by the patent proprietor.

Moreover, there are no EPC provisions under which a ground for opposition admitted to and examined during the opposition proceedings could be eliminated at the appeal stage nor does the proprietor indeed explicitly rely upon any."

The proprietor did not submit any further comments in reply to this part of the preliminary opinion of the Board. The Board therefore does not see any reason to deviate from its opinion and confirms it hereby.

- 1.2 As concerns the substance of the corresponding objection, the Board had also noted in its written opinion that it considered the findings under point 3.2 of the impugned decision correct.

Also in regard to this part of the Board's preliminary opinion, the proprietor did not submit further comments. The Board therefore does not see any reason to deviate from its opinion and confirms it hereby, concluding that the subject-matter of at least granted claim 2 extends beyond the content of the application as filed at least for the reasons set out below.

- 1.3 Indeed and as it was also found by the opposition division and argued by the opponent, the original application (reference is made here and in the following to the published application) only discloses an internal hub transmission with either a first, a second, a third or a fourth ball bearing assembly according to the originally filed claim 1 in combination with either claim 2 or claim 3 or claim 4 or claim 5, all dependent claims being dependent only on claim 1. In the alternative it discloses (according to the description of the preferred embodiment in paragraph 37) a hub transmission with all four ball bearing assemblies in combination, albeit with additional features. In contrast, a hub transmission combining only the first and, for example according to claim 2, the second ball bearing assembly cannot be derived directly and unambiguously from the application as filed.
- 1.4 The Board thus concludes that the opposition ground under Article 100(c) EPC prejudices maintenance of the patent.

*1<sup>st</sup> auxiliary request*

2. Article 123(2) EPC

2.1 Amended claim 2 combines the second, third and fourth ball bearing assemblies of granted claims 2, 3 and 4. Since it depends on claim 1, its resulting subject-matter defines an internal hub transmission comprising *inter alia* four ball bearing assemblies arranged between the different components of the hub transmission.

2.2 As noted above, such a hub transmission is at least not directly and unambiguously derivable from the originally filed claims 1 to 5, due to the missing back-references in the dependent claims. Contrary to the view of the proprietor, the resulting subject-matter is also not derivable, at least not unambiguously, from paragraph 37 of the application as filed, even when read together with the claims. As pointed out by the opponent, paragraph 37 belongs to the description of the single preferred embodiment disclosed in the application as filed, starting in paragraph 32 and drafted with specific reference to Figures 2, 3 and 6 to 10. This embodiment comprises a number of further features which have not been defined in the claim, for example a plurality of planetary gears as disclosed also in paragraph 33. The claim in contrast only requires a single planetary gear. The resulting subject-matter of claim 2 thus constitutes an intermediate generalisation for which there is no disclosure in the application as filed. The simple fact that the ball bearing assemblies are numbered, according to the claims and the description, cannot be considered to constitute an unambiguous disclosure for the resulting subject-matter.



The Board concludes that the subject-matter of claim 2 extends beyond the content of the application as filed and therefore contravenes Article 123(2) EPC.

- 2.3 Consequently, maintenance of the patent according to the 1<sup>st</sup> auxiliary request cannot be allowed.

*2<sup>nd</sup> auxiliary request*

3. Article 56 EPC

- 3.1 The Board applies the problem-solution approach to examine whether the subject-matter of claim 1 involves an inventive step.

- 3.2 It is undisputed that the internal hub transmission shown in Figure 2 of E13 constitutes the closest prior art to the subject-matter of claim 1 of the 2<sup>nd</sup> auxiliary request and that the claimed subject-matter is distinguished from this known hub transmission by the features defined in the characterising portion of the claim.

- 3.3 The technical effects achieved by these features are noise reduction (by the use of helical teeth in the respective components of the power transmission mechanism) and friction reduction (by the use of the first ball bearing assembly between the gear ring and the gear rack).

- 3.4 The next issue to be considered in the problem-solution approach is whether the two distinguishing features, though providing for two separate technical effects, do nevertheless contribute to solve a single technical problem. Since a well-known side effect of helical

gears is that part of the torque transmitted between the gears is converted to an axial force, which needs to be supported by appropriately arranged axial bearings, a first ball bearing arranged between gear ring and gear rack could thus be seen as a technical consequence arising from the use of helical gears. It might thus be argued that both features contribute to solving a single technical problem of noise reduction.

However, the Board notes that the orientation of the helical teeth of the respective gears is not defined in the claim. Axial forces arising from their use could thus be directed in either direction along the axis of the relative rotating gears components, depending on the orientation of the helical teeth. The resulting forces on the gear rack and gear ring could therefore also act in opposite directions, tending to push those two components further apart. Consequently the first ball bearing assembly defined in claim 1 does not necessarily have to support such axial forces between respective axially abutting portions of the gear rack and the gear ring. Therefore the two distinguishing features do not necessarily contribute to solve a single technical problem; rather they relate to partial technical problems.

The Board thus concludes that the partial objective technical problems to be solved in regard to the closest prior art internal hub transmission of E13 can be seen as a) reducing noise and b) reducing potentially occurring frictional forces between the gear ring and gear rack.

- 3.5 The distinguishing features defined in claim 1 which provide the solutions to the respective partial problems belong to the common general knowledge of the

skilled person. This as such was also not disputed by the proprietor. The proprietor disputed however that the skilled person would indeed have applied the respective features in the bicycle hub transmission of the closest prior art for several reasons. The Board is nevertheless not convinced by the proprietor's arguments and considers that the skilled person would have employed these well known features for their well known purposes in an internal hub transmission known from E13 and would thus have arrived without involving an inventive step at the combination of features according to claim 1. The reasons are the following.

- 3.5.1 As noted previously, compared to spur gears the reduction of noise by the use of helical gears belongs to common general knowledge, as well as the generally perceived disadvantages (*inter alia*, higher cost due to more complex manufacturing and a reduction of efficiency depending on the angle of the helical teeth with respect to the rotation axis). This is documented for example in E6, G124, right column under section 8, "*Geräuschverhalten*", G126, left column, "*Schrägverzahnung*". Being a general textbook on mechanical engineering, the teaching of E6 belongs also to the general knowledge of the skilled person designing internal hub transmissions of bicycles. Planetary gear transmissions are mentioned there in the left column on page G124 as one field of application for the different gear pairings, including helical gears. Balancing the well known advantages against the equally well known disadvantages of a particular technical feature is obvious for the skilled person.

Contrary to the proprietor's view, the Board cannot accept that the problems referred to in paragraphs 5 and 6 of E13 would have prevented the skilled person

from considering helical gears. The cited paragraphs discuss drawbacks of prior art internal hub transmissions related to increased frictional forces which occur between a clutch member and parts of the planetary gear mechanism under high driving forces during a shift operation and which therefore require a higher force to be applied by the user on the shift lever for shifting of a corresponding control cable. These specific problems are solved in E13 by a particular clutch control mechanism (see paragraph 6). Although the use of helical gears is indeed generally known to be accompanied by an increase of frictional forces between the gears, compared to spur gears, the Board cannot see that the resulting frictional forces due to helical gears would necessarily amount to an instruction that would undermine the effects sought in E13. At least the proprietor did not provide any evidence for its assertion in this regard.

The mention in paragraph 63 of E13 of a planet roller mechanism instead of a planet gear mechanism also does not alter the Board's conclusion. The reference in paragraph 63 is far too general. An intended purpose for such alternative mechanism, let alone to the specific purpose of reducing noise, is in no way indicated. The knowledge of the skilled person that such roller mechanisms are quieter than gear mechanisms, as may arise for example from E14 and E16, cannot change the obviousness of the use of helical gears for their well known advantages.

Also the content of E16 does not support the proprietor's case. Rather than representing the general knowledge of the skilled person, the content of E16 represents merely an isolated opinion of a certain manufacturer of planetary gear transmissions. The Board

cannot find any substantiated indication in E16 according to which the advantages attributed as a result of common general knowledge to the use of helical gears would be generally wrong. Despite mentioning at the end of the paragraph preceding the heading "*Contra Schrägverzahnung*" that noise reduction is less a question of using helical or spur gears than of machining precision when forming the teeth, this passage again simply confirms that helical gears are generally known for the previously mentioned advantages.

The Board concludes that the use of helical teeth for the different meshing components of the planetary gear mechanism is thus obvious for the skilled person.

- 3.5.2 The same conclusion is reached for the use of a ball bearing assembly between the gear rack 41 and the gear ring 43 of the hub transmission of E13, since ball bearings are well known for the purpose of reducing frictional forces between components which contact each other during their relative movement.

An indication that a gap existed between the respective facing portions of the gear rack 41 and the gear ring 43 which would exclude any contact between these components and therefore render a ball bearing at best useless and more importantly increasing friction, as argued by the proprietor, cannot be found in E13. Quite the contrary, the drawings suggest that during their relative rotational movement the relevant components indeed may come, or are continuously, in contact at their axially abutting faces and at their radially opposing respective inner and outer faces. For example, and as pointed out by the opponent, the different hatchings in the relevant portions in Figures 2, 3 and

7 to 8, terminate on a common line drawn to illustrate the limits of each of the two components 41 and 43, excluding the presence of a gap. Moreover, the entire structure of the hub transmission shown in these drawings suggests that the axially abutting faces of the gear ring 43 and the gear rack 41 block potential axial displacement which could otherwise occur during normal operation. The Board could at least not find any evidence of other axial stops in the drawings or in the description. The proprietor also did not indicate any support in E13 for other features preventing the normally occurring relative axial displacements towards each other of the components 41 and 43. In the absence of any clear disclosure of a gap, the skilled person would consider the mentioned opposing surfaces to constitute a source of friction which would be reduced by an appropriate ball bearing assembly.

Furthermore, the Board considers that the respective portions of the gear rack 41 and gear ring 43 offer sufficient material volume to accommodate bearing assemblies without requiring a major overhaul and without impeding the function of the relevant components. Since the claim is not limited by a particular angle of the helical teeth with respect to the rotation, even very small helix angles (e.g. 5 degrees) are covered by the claim. Axial forces resulting from such small helix angles will be relatively small (the resulting axial force depends on the tangent of the helix angle which becomes very small for such small angles). Small induced forces may therefore be supported by comparatively small bearing assemblies. The provision of such small ball bearing assemblies does not require a substantial overhaul of the internal hub transmission, contrary to the proprietor's argument.

Finally the Board cannot accept that assembling the internal hub transmission with such additional ball bearing assembly would confront the skilled person with particular difficulties. The gear rack 41 and the gear ring 43 of the hub transmission of E13 are two essentially tubular elements (cf. col. 5, lines 38/39, 46/48) fitted in a telescope-like manner with respect to each other (e.g. Fig. 2). Mounting a ball bearing assembly, which does not have to be large in size (see above) between the interior opposing faces of the two components does not go beyond the customary practice of the skilled person.

- 3.6 The Board therefore concludes that the subject-matter of claim 1 of the 2<sup>nd</sup> auxiliary request does not involve an inventive step, contrary to Article 56 EPC. It follows that the patent cannot be maintained on the basis of the 2<sup>nd</sup> auxiliary request.

*7<sup>th</sup> auxiliary request*

4. Article 13(1) RPBA

- 4.1 The 7<sup>th</sup> auxiliary request was filed during the oral proceedings before the Board, hence after the time limit for filing the appeal grounds or a reply to other party's appeal and therefore constitutes an amendment to the proprietor's case (Article 13(1) RPBA).

Any amendment to a party's case may be admitted and considered at the Board's discretion. The discretion shall 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.

In order to be in line with the requirement of procedural economy, amendments should be *prima facie* allowable in the sense that they at least overcome the objections raised against previous requests without giving rise to any new ones.

- 4.2 In reply to the objections against the amendments to claim 2 of the 1<sup>st</sup> auxiliary request (see point 2), claim 1 of the present request has been amended by defining all four ball bearing assemblies and by indicating a plurality of planetary gears through the use of the plural form "gears".

However, and as has been argued by the opponent, the resulting subject-matter would still contravene Article 123(2) EPC. Paragraph 37 in combination with Figures 2, 3 and 6 to 10 (see paragraph 32) together disclose a particular arrangement of (merely as one example) the first ball bearing assembly 160 supported between radially opposing portions, 142 and 128, of the gear ring 118 and the gear rack 116. Amended claim 1 in contrast leaves it open in which way the first ball bearing assembly is arranged in relation to these components. It encompasses for example also embodiments in which the ball bearing assembly could be arranged only between axially facing portions of the two components, for which there appears to be no basis in the application as filed.

The Board cannot accept the proprietor's argument that the terms "inner" and "outer" used in the description are of no significance in regard to a radial arrangement of the relevant features. For example, Figure 2 and paragraph 37 consistently disclose the outer bearing support portion 128 of the gear rack 116 as providing a radial inner support of the first ball



bearing assembly 160, whereas the corresponding bearing support portion 142 of the gear ring 118 provides a radial outer support. The Board cannot find any inconsistencies in the reference signs of the relevant components. Finally, and as indicated before, paragraph 32 makes explicit reference to *inter alia* Figure 2 for the detailed description of the power transmission mechanism in the following paragraphs 33 to 43. The Board has therefore no doubts that the figures have to be considered for assessing whether the subject-matter of amended claim 1 extends (or not) beyond the content of the application as filed.

- 4.3 The Board concludes that amended claim 1 would not fulfill the requirement of Article 123(2) EPC. The 7<sup>th</sup> auxiliary request is thus not *prima facie* allowable in the above sense. The Board therefore exercised its discretion under Article 13(1) RPBA not to admit the 7<sup>th</sup> auxiliary request into the proceedings.

*9<sup>th</sup> auxiliary request*

5. Article 13(1) RPBA

Also the 9<sup>th</sup> auxiliary request was submitted during the oral proceedings. Taking into account the criteria referred to above under point 4.1, the Board exercised its discretion under Article 13(1) RPBA not to admit the 9<sup>th</sup> auxiliary request into the proceedings for the following reasons.

The subject-matter of amended claim 1 is based on a combination of granted claims 1 and 5. Granted claim 1 corresponds to the combination of originally filed claims 1 and 2 while granted claim 5 corresponds to original claim 6 which was dependent only on claim 1.

For similar reasons as already set out in regard to the main request (see point 1.3 above) the subject-matter resulting from the combination of granted claims 1 and 5, i.e. a combination of an internal hub transmission according to originally filed claim 1 with only a first ball bearing assembly and with the specific helix angle, cannot be derived directly and unambiguously from the application as filed.

The proprietor did not indicate any support for the amendments other than the claims, which is however, as explained, insufficient.

Amended claim 1 of the 9<sup>th</sup> auxiliary request therefore at least *prima facie* does not fulfil the requirement of Article 123(2) EPC.

6. Absent any request which meets the requirements of the EPC, the patent has to be revoked according to Article 101(3)(b) EPC.

## **Order**

### **For these reasons it is decided that:**

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chairman:



M. H. A. Patin

M. Harrison

Decision electronically authenticated