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**Datasheet for the decision  
of 4 October 2023**

**Case Number:** T 0770/21 - 3.2.01

**Application Number:** 15200984.1

**Publication Number:** 3037337

**IPC:** B62M9/122, B62M9/132

**Language of the proceedings:** EN

**Title of invention:**  
ELECTRIC DERAILLEUR MOTOR GEAR UNIT

**Patent Proprietor:**  
SHIMANO INC.

**Opponent:**  
SRAM Deutschland GmbH

**Headword:**

**Relevant legal provisions:**  
EPC Art. 123(2), 83, 54, 56  
RPBA 2020 Art. 12(4), 12(6), 13(2)

**Keyword:**

Amendments - extension beyond the content of the application as filed (yes)  
Sufficiency of disclosure - main request (no) - enabling disclosure (no)  
Novelty - (yes)  
Inventive step - (yes) - non-obvious alternative - ex post facto analysis  
Late-filed objection - should have been submitted in first-instance proceedings (yes) - admitted (no)  
Amendment after summons: new evidence, new auxiliary request  
1A bis - exceptional circumstances (no) - taken into account (no) ; new auxiliary request 6B - exceptional circumstances (yes) - admitted (yes)

**Decisions cited:**

T 0523/89, T 1216/12, T 0731/16, T 0187/18, T 0623/97

**Catchword:**



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Case Number: T 0770/21 - 3.2.01

**D E C I S I O N**  
**of Technical Board of Appeal 3.2.01**  
**of 4 October 2023**

**Appellant:** SRAM Deutschland GmbH  
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**Decision under appeal:** **Decision of the Opposition Division of the  
European Patent Office posted on 6 April 2021  
rejecting the opposition filed against European  
patent No. 3037337 pursuant to Article 101(2)  
EPC.**

**Composition of the Board:**

**Chairman** G. Pricolo  
**Members:** A. Wagner  
M. Millet

## **Summary of Facts and Submissions**

I. The appeal of the opponent lies against the decision of the Opposition Division to reject the opposition filed against European patent No. 3037337 pursuant to Article 101(2) EPC.

II. In its decision, the Opposition Division held that the claimed invention is sufficiently disclosed (Article 100(b) EPC), that the subject-matter of independent claims 1, 2 and 3 as granted (main request) is novel and inventive over the cited prior art (Article 100(a) EPC) and that the dependent claims 5, 6 and 8 do not include added subject-matter with regard to the application as originally filed (Article 100(c) EPC).

III. In order to come to these conclusions the opposition division considered, among others, the following documents:

**D2:** "Conditions for Self-Locking in Planetary Gear Trains"; by David R. Salgado, J.M.del Castillo; in Trans. of the ASME, Vol. 129, p. 960-968; Sept. 2007

**D4:** "Grenzbereiche für selbsthemmende Planetengetriebe"; by B. Klein; in VDI Zeitschrift, Bd. 126 (1984) Nr. 7 - April (I), p. 221-231

**D6:** "Selbsthemmende und selbstbremsende Getriebe", VDI-Richtlinien Vol. 2158, p. 1-48, Dezember 1991

**D7:** "Some Considerations on the Application of Wolfrom Planetary Gear Trains"; by Zeljko Vrcan, Neven Lovrin and Vedran Mrzljak; in XII International Conference On

Mechanical Engineering, L. Sarek, B. Hucko (Eds.)  
Bratislava, Slovakia, November 13 to 14, p. 1-9, 2008

**D8:** "Planetenradlager für selbsthemmende Zahnräder-  
Umlaufgetriebe"; by J. Theissen et al., in Gleit- und  
Wälzlager als Maschinenelemente, VDI-Berichte Nr. 374,  
p.1-11, 1980

**P1:** EP 1 690 784 A2

**P3:** DE 43 40 471 C1

**P5:** DE 19 501 283 A1

**P6:** DE 60 018 528 T2

IV. Together with its statement of grounds of appeal dated  
13 August 2021 the opponent submitted the following  
document:

**P17:** "Lueger - Lexikon der Technik", Band 13  
"Feinwerktechnik A-K", 1968

V. With letter dated 2 October 2023 the appellant  
(opponent) submitted the following document:

**D9:** DE 195 48 849 B4

VI. Oral proceedings by videoconference were held before  
the Board on 4 October 2023.

VII. The appellant (opponent) requested to set aside the  
decision under appeal and to revoke the patent.

The respondent (patent proprietor) requested to  
dismiss the appeal (main request) or, in the  
alternative, to maintain the patent in amended form on  
the basis of one of the auxiliary requests 1A, 1B, 2,  
2A, 2B, 3, 3A, 3B, 4 filed with the reply, and 1Abis,

5, 5A, 5Abis, 5B, 6, 6A, 6Abis, 6B, 7 and 7B filed on 4 August 2023 with the auxiliary requests in the order 1Abis, 1B, 6B with the other auxiliary requests in the order 1A, 2, 2A, 2B, 3, 3A, 3B, 4, 5, 5A, 5Abis, 5B, 6, 6A, 6Abis, 7 und 7B.

VIII. The independent claims 1 to 3 as granted (main request) read as follows (feature numbering adopted from the impugned decision).

**Claim 1:**

**1.0** A bicycle derailleur motor gear unit configured to reduce motor speed of a motor (31) and transmit motor torque of the motor to a derailleur, the bicycle derailleur motor gear unit comprising:

**1.1** an output shaft (21);  
characterized by the unit further comprising:

**1.2** a fixed sun gear (12);

**1.3** an output sun gear (15) rotatable relative to the fixed sun gear (12), the output sun gear being fixedly coupled to the output shaft;

**1.4** a plurality of planet gears (13); and

**1.5** a carrier (11) rotatably and revolvably supporting the planet gears;

**1.6** each of the planet gears (13) having a first gear (13b) that engages with the fixed sun gear

**1.7** and a second gear (13d) that engages with the output sun gear,

**1.8** the first gear and the second gear being coaxially coupled to each other,

**1.9** wherein the fixed sun gear (12), the output sun gear (15), the first gear (13b), and the second gear (13d) having tooth counts, respectively, such that the fixed sun gear, the output sun gear, the first gear, and the second gear lock while an external force is exerted to the output sun gear.

**Claim 2** differs from claim 1

- by specifying in features 2.2 and 2.3 that the fixed sun gear and the output sun gear are external gears and that the output sun gear has external gear teeth, and  
- by the formulas given in feature 2.9. Claim 2 reads as follows:

**2.0** A bicycle derailleur motor gear unit configured to reduce motor speed of a motor (31) and transmit motor torque of the motor to a derailleur, the bicycle derailleur motor gear unit comprising:

**2.1** an output shaft (21);  
characterized by the unit further comprising:

**2.2** a fixed external sun gear (12);

**2.3** an output external sun gear (15) rotatable relative to the fixed external sun gear (12), the output external sun gear being fixedly coupled to the output shaft; the output external sun gear having external gear teeth

**2.4** a plurality of planet gears (13); and

**2.5** a carrier (11) rotatably and revolvably supporting the planet gears;

**2.6** each of the planet gears (13) having a first gear (13b) that engages with the fixed external sun gear

**2.7** and a second gear (13d) that engages with the output external sun gear,

**2.8** the first gear and the second gear being coaxially coupled to each other,

**2.9** wherein the fixed external sun gear (12), the output external sun gear (15), the first gear, and the second gear having tooth counts, respectively, such that the tooth counts satisfy the following formulas:

$(\eta_{ab} * Z_a / Z_b + 1) / (Z_e / (\eta_{de} * Z_d) + 1) \leq 1$  when  $Z_b * Z_e < Z_a * Z_d$ ;  
and

$(\eta_{de} * Z_e / Z_d + 1) / (Z_a / (\eta_{ab} * Z_b) + 1) \leq 1$  when  $Z_b * Z_e > Z_a * Z_d$ ,

where

$Z_a$  represents the tooth count of the fixed external sun gear,  $Z_e$  represents the tooth count of the output external sun gear,  $Z_b$  represents the tooth count of the first gear,

$Z_d$  represents the tooth count of the second gear,

$\eta_{ab}$  represents a transmission coefficient between the fixed external sun gear and the first gear, and

$\eta_{de}$  represents a transmission coefficient between the output external sun gear and the second gear.

**Claim 3** differs from claim 1

- by specifying in features 3.2 and 3.3 that the fixed gear and the output gear are internal gears and that the output gear has internal gear teeth, and



- by the formulas given in feature 3.9. Claim 3 reads as follows:

**3.0** A bicycle derailleur motor gear unit configured to reduce motor speed of a motor (31) and transmit motor torque of the motor to a derailleur, the bicycle derailleur motor gear unit comprising:

**3.1** an output shaft (57); characterized by the unit furthermore comprising:

**3.2** a fixed internal gear (52);

**3.3** an output internal gear (54) rotatable relative to the fixed internal gear, the output internal gear being fixedly coupled to the output shaft, the output internal gear having internal gear teeth;

**3.4** a plurality of planet gears (53); and

**3.5** a carrier (55) rotatably and revolvably supporting the planet gears;

**3.6** each of the planet gears (53) having a first gear (53b) that engages with the fixed internal gear and

**3.7** a second gear (53d) that engages with the output internal gear,

**3.8** the first gear and the second gear being coaxially coupled to each other,

**3.9** the fixed internal gear, the output internal gear, the first gear, and the second gear having tooth counts, respectively, such that the tooth counts satisfy the following formulas:

$(\eta_{bc} \cdot Z_c / Z_b - 1) / \{Z_f / (\eta_{df} \cdot Z_d) - 1\} \leq 1$  when  $Z_c \cdot Z_d > Z_b \cdot Z_f$ ;

and

$(\eta_{df} \cdot Z_f / Z_d - 1) / (\eta_{bc} \cdot Z_c / Z_b - 1) \leq 1$  when  $Z_c \cdot Z_d < Z_b \cdot Z_f$ ,

where

$Z_c$  represents the tooth count of the fixed internal sun gear,  $Z_f$  represents the tooth count of the output internal gear,

$Z_b$  represents the tooth count of the first gear,

$Z_d$  represents the tooth count of the second gear,

$\eta_{bc}$  represents a transmission coefficient between the fixed internal gear and the first gear, and

$\eta_{df}$  represents a transmission coefficient between the output internal sun gear and the second gear.

**Auxiliary request 1A<sub>bis</sub>** is based on the main request wherein dependent claims 5, 6 and 8 as granted are amended.

In granted claims 5 and 6 the expression

"fixed sun / external sun / internal gear, the output sun/ external sun / internal gear"

is replaced by the wording

"fixed sun gear, the fixed external sun gear or the fixed internal gear, respectively, the output sun gear, the output external sun gear or the output internal gear, respectively,".

In granted claim 8, the expression

"the output sun/ external sun / internal gear"

is replaced by

"the output sun gear or the output external sun gear or the output internal gear (12; 52), respectively,".

**Auxiliary request 1B** is based on the main request wherein granted claims 5, 6 and 8 are deleted. No

further amendments are made.

**Auxiliary request 6B** is based on auxiliary request 1B wherein additionally granted claim 3 is deleted. Granted claim 4 is adapted accordingly by deleting the second option ("or") which refers back to the internal gears defined in granted claim 3.

IX. The appellant's (opponent's) arguments relevant to the present decision may be summarized as follows:

*Substantiation*

In chapters IV and V of the statement of grounds, which concerned novelty and inventive step, repeated reference was made to the contested decision. Therefore the appeal was sufficiently substantiated with regard to novelty and inventive step - contrary to the patent proprietor's opinion.

*Added subject-matter in granted claims 5, 6, 8*

The opposition division's reasoning given under point 8.2 of the impugned decision, that the original wording (with brackets) covered all embodiments that fell under the granted wording (with slashes), was wrong. Instead the granted wording allowed a wider interpretation than the original one such that it covered embodiments which were not originally disclosed.

*Sufficiency of disclosure - main request and auxiliary request 1B*

Reason 1:

There was an error in the derivation of granted claim 3 for the condition that  $Zc * Zd < Zb * Zf$ . As explained

in Annex 4 of the statement of grounds of appeal,  
instead of

$$(\eta_{df} \cdot Z_f / Z_d - 1) / (\eta_{bc} \cdot Z_c / Z_b - 1) \leq 1 \quad \text{when } Z_c \cdot Z_d < Z_b \cdot Z_f$$

the correct formula was

$$(\eta_{df} \cdot Z_f / Z_d - 1) / (Z_c / (\eta_{bc} \cdot Z_b) - 1) \leq 1 \quad \text{when } Z_c \cdot Z_d < Z_b \cdot Z_f$$

Due to this error, the formula did not result in a self-locking condition over its full range.

Alternatively it was argued that self-locking conditions were known from the prior art, e.g. D2. In as much as the claimed range deviated from the known range, the patent did not comprise enough information on how to perform the invention in this range.

Reason 2:

The claims were directed to certain kinds of self-locking planetary gears (planetary gear transmissions). However, the entire patent document did not describe a single example of a particular set of gears with specific tooth counts fulfilling one of the given conditions or being self-locking. Also from the figures 4A-C, 12, 14A-B, 21A-B, 22 and 23A-D - referred to by the opposition division (impugned decision, point 9.2) - not all of the tooth counts of all the different elements were discernible.

#### *Admission of auxiliary request 1Abis*

The issue of added subject-matter in granted claims 5, 6 and 8 had already been discussed in detail in the first instance. Auxiliary request 1Abis was just another try to overcome an objection that was raised from the beginning of the opposition proceedings. This request was clearly filed too late.

*Admission of auxiliary request 6B*

Auxiliary request 6B was filed at the same time as auxiliary request 1A bis and thus too late. The objection concerning claim 3 was discussed in the first instance. There was no reason why this request was not filed at the latest with the statement of grounds of appeal.

*Novelty of claim 1 and claim 2 over D2, D4, D6, D7 and D8*

All these documents disclosed a planetary gear with the features 1.1 to 1.9, 2.1 to 2.9 respectively. Contrary to the opposition division's opinion all these planetary gears were also suitable for a bicycle derailleur, i.e. features 1.0 and 2.0 were fulfilled. As pointed out in T 0523/89, the disclosure of an equivalent article without indication of the particular use claimed but which was nevertheless suitable therefor would destroy the novelty of a claim to the article for that particular use.

D2 qualified the disclosed planetary gear for a bicycle derailleur by mentioning the characteristics "small size, low weight, high speed ratio and high efficiency".

D4 mentioned "Maschinen- und Feinwerktechnik". As was derivable from P17, the technical field "Feinwerktechnik" included planetary gears having a size suitable for the claimed use.

D6 explicitly referred to "Schaltwerke" (chapter 1, last paragraph) and showed a planetary gear (Figures 27, 28 with table 11) that might have a size which was unusual but however suitable for bicycle derailleurs. D8 disclosed a similar planetary gear as D6 which

likewise would be suitable.

D7 (point 2.3) mentioned the use of a self-locking planetary gear to operate a butterfly valve. Due to its size, such a planetary gear was suitable for a bicycle derailleur.

*Admission of D9*

The high prima facie relevance of the document constituted exceptional circumstances. D9 disclosed a planetary gear with a diameter of 30 mm and was therefore clearly novelty destroying for the patent as granted. In e.g. T1216/12 and T0731/16, it was pointed out that late filed documents should be admitted when they were prima facie so highly relevant that they could reasonably be expected to change the outcome of the proceedings. D9 was such a document.

*Inventive step - Admission of the attacks D2, D4, D6, D7, D8 with general knowledge - Article 12(4), (6) RPBA 2020*

Should these documents not been considered as novelty destroying, the only implicit restriction in feature 1.0 could be a size restriction. The attack was admissible as it specifically addressed the respective points in the impugned decision.

Unfortunately, the opposition division agreed with the patent proprietor that feature 1.0 (2.0 respectively) comprised additional restrictions without ever having clearly defined what these additional restrictions actually were. Therefore, it would not have made sense to submit these attacks in the first instance.

However the alleged delimitations (decision, e.g. point 10.1.1.2) were meaningless without claiming and

specifying the motor or derailleur in detail. Furthermore it had been made clear that the size restriction alone could not justify inventive step as it was part of the skilled persons general knowledge to scale the known planetary gears to any desired size.

*Inventive step*

- P1 with one of the documents D2, D4, D6, D7 or D8:

The conclusion of the opposition division that the subject-matter of claim 1 as granted involved an inventive step starting from P1 was wrong (decision, point 10.3.1.2.), in particular because of the incorrect application of the problem-solution approach.

Contrary to the opposition division's reasoning, P1 (paragraph [0005]) itself included a hint that prompted a skilled person to seek an alternative to the disclosed worm gear. The solution proposed in P1 did not fix the problem at its core but only somewhat alleviated the symptoms by providing an adjusting screw 226 or bolt 328 (P1, paragraph [0023]).

Furthermore the skilled person knew from their general knowledge that planetary gears were widely used in bicycles in different applications, e.g. in derailleurs as shown in P5 or P6 (figures 2 and 3, planetary gear 29).

In order to replace the self-locking worm gear mechanism 207, 208 of P1 (figure 5) with a self-locking planetary gear, the motor 206 was repositioned so that the motor output shaft 206 was parallel to the axes of the gears of mechanism 210 and shaft unit 234. The motor output shaft 206 was then coupled to the input shaft of the self-locking planetary gear. The output shaft of the planetary gear could either be directly

coupled to gear 234a of the output shaft unit 234 or to the input gear 214 of the speed reduction mechanism 210. Both alternative solutions were well within the standard repertoire of the skilled person.

The necessary modification to P1 for replacing a worm gear unit by a planetary gear were all obvious and within the customary practice of the skilled person - contrary to the opposition division's opinion (point 10.3.2.2). Reference was made to T 0612/97 according to which such obvious modifications could not involve an inventive step.

D2 taught to use planetary gears with the features 1.1 to 1.9 as an *"alternative to worm gears when one requires the input and output axes to be coaxial"* (last lines of the conclusions, point 7). The skilled person was thus explicitly prompted by D2 to replace the worm gear drive of P1 by a self locking planetary gear as shown e.g. in figure 3 of D2.

Also D7 disclosed (last sentence of the conclusion, point 3) that *"a self-locking Wolfrom unit can be used instead of a worm drive unit"*.

D4 mentioned a preference for planetary gears (point "1 Einleitung", second paragraph: *"bevorzugt Planetengetriebe"*).

D6 explicitly mentioned *"Schaltwerke"* (point "1 Einleitung", last paragraph) which was a correct translation of the term *"derrailleur"*.

- P3 with one of the documents D2, D4, D6, D7 or D8:

Contrary to the opposition division's opinion (impugned decision, point 10.3.7.2) the subject-matter of claim 1 was obvious over P3 combined with one of the documents D2, D4, D6, D7 or D8.



The gear unit of a bicycle derailleur disclosed in P3 (figure 1) was accommodated in a sealed housing 8 and comprised a worm shaft 26 that cooperated with a worm gear 27. The problem was to find an alternative gear unit that allowed to reduce the size and to simplify the construction of the sealed housing.

The skilled person knew that planetary gears were also self-locking, had a closed housing and were small in size. D2, D4, D6, D7 and D8 all disclosed planetary gears as claimed. The combination of P3 with one of these documents was therefore obvious, in particular as each of D2, D4, D6 and D7 comprised information - as explained above with P1 as closest prior art - motivating the skilled person to replace the worm gear mechanism of P3 with a self-locking planetary gear, thus arriving at the subject-matter of claim 1 and claim 2.

- X. The respondent's (patent proprietor's) arguments relevant to the present decision may be summarised as follows:

*Substantiation*

Concerning the novelty attacks based on D2, D4, D6 to D8, the appellant did not explain why the opposition division erred but only repeated already known arguments. Therefore the grounds of appeal were not properly substantiated. Furthermore the statement of grounds of appeal comprised a main section and seven annexes. These annexes were only repetitions of the first instance arguments and could not be relied on for the appeal.

*Added subject-matter*

The skilled person was reading the patent with a mind willing to understand and was not artificially trying to find some possible misreading. The objection raised by the opponent was only a clarity issue. Non-logical alternatives in the claims would be ruled out by the person skilled in the art.

*Sufficiency of disclosure - main request and auxiliary request 1B*

The decision of the opposition division had to be confirmed.

ad Reason 1:

Neither figure 18 nor the formula in claim 3 for the condition that  $Z_c \cdot Z_d < Z_b \cdot Z_f$  was incorrect. The formula was based on specific geometric relationships. The appellant did not give any non-working example of gear units falling within claim 3 but not being self-locking. Actually, the entire range was self-locking. The appellant did not prove that the equation of granted claim 3 was false.

ad Reason 2:

No undue burden was needed to find respective tooth counts to put the invention into practice. The figures provided sufficient support.

*Admission of auxiliary request 1Abis*

The amended wording in claims 5, 6 and 8 was just a clarification of how the skilled person would have understood the granted claim wording. The filing of auxiliary request 1Abis was a direct reaction to the

preliminary opinion of the Board wherein it was indicated that the finding of the opposition division with regard to Article 100(c) EPC was not followed.

*Admission of auxiliary request 6B*

Auxiliary request 6B was based on auxiliary request 1B filed with the statement of grounds of appeal with claim 3 deleted. The amendment did not introduce new aspects that had to be discussed and did not delay the proceedings.

*Novelty of claim 1 and claim 2 over D2, D4, D6, D7 and D8*

The claimed subject-matter not only differed in feature 1.0 or 2.0 but also in feature 1.9 or 2.9.

The opposition division was correct in holding none of the planetary gears disclosed in D2, D4, D6, D7 or D8 suitable for being mounted between an electric motor and a derailleur of a bicycle as feature 1.0 or 2.0 included limitation concerning the intended use - not only in size. A gear unit which required modifications with regard to size, transfer ratio or self-locking force to enable it to be used in a bicycle derailleur was not considered as being suitable for a bicycle derailleur and thus could not anticipate the claims.

*Inventive step - Admission of the attacks D2, D4, D6, D7, D8 with general knowledge - Article 12(4), (6) RPBA 2020*

These attacks were late filed and should not be admitted. Furthermore none of the attacks was substantiated, in particular no arguments were provided

why the skilled person would choose an unsuitable planetary gear for the claimed application.

*Inventive step*

- *P1 with one of the documents D2, D4, D6, D7 or D8:*

P1, paragraph [0005], dealt with a similar problem as the patent in suit (paragraph [0005]) and could serve as closest prior art. However P1 already proposed a solution to the problem by providing a movement control unit 209, i.e. a screw 226 (see figures 5, 6). Thus P1 did not hint at all at departing from the worm gear. Even if the skilled person would consider the need for further improvement, many other solution would be available - as stated by the opposition division (see e.g. impugned decision, point 10.3.2.2). The argumentation of the appellant was based on hindsight. The skilled person would not even consider any of the documents D2, D4, D6 to D8 because of the lack of suitability of the planetary gears disclosed therein.

- *P3 with one of the documents D2, D4, D6, D7 or D8:*

P3 was not an appropriate starting point as it did not include any hint to replace the worm gear by a planetary gear. The problem described in P3 was directed to lubrication matters which could not be solved by a planetary gear.

The argumentation of the appellant was based on knowledge of the patent which was not allowable.

## **Reasons for the Decision**

### **1. Substantiation**

- 1.1 The appeal of the opponent with regard to novelty and inventive step is sufficiently substantiated. These attacks thus form part of the appellant's appeal case (Article 12(3) RPBA 2020).
- 1.2 The Board does not follow the respondent's (patent proprietor's) argument that the appellant was only repeating the arguments of the first instance proceedings without indicating why the opposition division was wrong in its decision.
- 1.3 The statement of grounds of appeal comprises a main section and seven annexes. The annexes fall under the provision of Article 12(1)(b) and (2) RPBA 2020 as parts of the basis for appeal proceedings.
- 1.4 When considering Annex 3, a detailed analysis of D2, D4, D6, D7 and D8 is provided for the undisputed features. In the main section of the statement of grounds of appeal, only the disputed features are discussed, explaining where these features in the respective prior art are seen by the appellant. Obviously in these points, the appellant does not agree with the opposition division and is of the opinion that the opposition division erred.
- 1.5 The main section of the statement of grounds of appeal is not merely a repetition of the arguments as set out in the notice of opposition. Instead, reference is made to certain points in the impugned decision with which the appellant disagrees, see statement of grounds of

appeal, e.g. points III.3, IV.3, V.2.5.1 or V.2.5.5.

2. **Added subject-matter - dependent claims 5, 6 and 8 as granted**

2.1 Dependent claims 5, 6 and 8 as granted contravene Article 100(c) EPC. Hence, the main request is not allowable.

2.2 Dependent claims 5, 6 and 8 as originally filed comprise the expressions

"fixed (external/internal) sun gear" and  
"output (external/internal) sun gear".

In claims 5, 6 and 8 as granted, these expressions have been replaced by

"fixed sun/ external sun/ internal gear" and  
"output sun/ external sun/ internal gear".

2.3 While the respondent (patent proprietor) is of the opinion that the objection is merely a clarity issue, the Board agrees with the appellant (opponent) that - due to the clarity issue - the wording of the granted claims is broader than the original one.

2.4 The wording "fixed (external/internal) sun gear" clearly refers to a fixed sun gear, that can be either a fixed external sun gear or a fixed internal sun gear. However the wording "fixed sun/ external sun/ internal gear" does not link  
- the term "fixed" to the terms "external" and "internal" and  
- the term "sun" to the internal gear.

- 2.5 Thus the planetary gear mechanism may include the fixed sun gear as e.g. claimed in claim 1 and an internal gear not functioning as a fixed sun gear. Such a gear unit was originally not disclosed. Furthermore, an "internal gear" which is not specified to be either a fixed internal gear or an output internal gear (claim 3) is not originally disclosed.
- 2.6 The same is valid for the wording "the output sun/ external sun/ internal gear".
- 2.7 The wording of claims 5, 6 and 8 thus contains subject-matter which extends beyond the content of the application as filed and the main request falls for this reason

3. **Auxiliary request 1B - Sufficiency of disclosure**

- 3.1 In auxiliary request 1B, claims 1 to 3 are identical to claims 1 to 3 as granted. Claim 3 does not meet the requirements of Article 83 EPC.

*Reason 1*

- 3.2 The formulas in claim 2 and claim 3 are intended to reflect the condition under which the claimed gear unit is self-locking. Objected is the second case in claim 3, when  $Z_c \cdot Z_d < Z_b \cdot Z_f$ .
- 3.3 As argued by the appellant, the patent specification itself raises doubts about the correctness of the formula in claim 3. These doubts could not be dispelled by the respondent.
- 3.3.1 As convincingly argued by the appellant (statement of grounds of appeal, point VII.3, see page 32f), the

error is caused by incorrect figure 18 relating to the condition that  $Z_c \cdot Z_d < Z_b \cdot Z_f$ . Therein, on the left hand side, the fixed gear c is shown as being driven and the planet gear b is shown as being driving. However the situation should be the opposite.

3.3.2 Comparing figures 9 and 10 (referring to claim 2) it is evident that when changing from one condition ( $Z_b \cdot Z_e < Z_a \cdot Z_d$ ) to the other condition ( $Z_b \cdot Z_e > Z_a \cdot Z_d$ ) the four gears a, b, c and d are in a regression drive relationship, thus the rotational direction is the reverse (see paragraphs [0067, 0068]).

As stated by the respondent this is also the case for the gear of claim 3, see reply, page 27, foot note.

3.3.3 On the above-mentioned page 27 of the respondent's reply, the case of claim 3 with  $Z_c \cdot Z_d > Z_b \cdot Z_f$  is explained. This explanation is not disputed by the appellant. In the foot note of page 27, it is stated that "*when  $Z_c \cdot Z_d < Z_b \cdot Z_f$  the direction of rotation is reversed*". Thus the driving gears become driven and vice versa - similar to the figures 9, 10 for the gear of claim 2.

3.3.4 Figures 16 to 19 show the situation for the gear of claim 3. Figure 16 shows the first condition  $Z_c \cdot Z_d > Z_b \cdot Z_f$  (paragraphs [0105] to [0115]) while in figure 18 the second condition  $Z_c \cdot Z_d < Z_b \cdot Z_f$  is shown (paragraphs [0116] to [0124]). However the fixed internal gear c is driven in figure 16 as well as in figure 18. Due to the incorrect figure 18, when setting up the respective equations, the coefficient  $\eta_{bc}$  is assigned to the wrong gear, which leads to the above mentioned error in the formula of claim 3.



3.3.5 The respective equation (37) of the patent in suit which refers to the situation at the left-hand side of figures 18 and 19, should thus be corrected from:

$$\begin{aligned} r_{bc} \cdot \eta_{bc} / \cos(\alpha_{wbc}) &= L + r_{bb} / \cos(\alpha_{wbc}) \\ \text{(driven fixed gear c)} &= \text{(driving planet gear b)} \end{aligned}$$

to

$$\begin{aligned} r_{bc} \cdot \eta_{bc} / \cos(\alpha_{wbc}) &= L + r_{bb} \cdot \eta_{bc} / \cos(\alpha_{wbc}) \\ \text{(driving fixed gear c)} &= \text{(driven planet gear b)}. \end{aligned}$$

3.3.6 Applying this correction of equation (37) to the following paragraphs [0118] to [0124] of the patent in suit, the Board comes to the conclusion that indeed in claim 3 the inequality condition should be corrected from

$$(\eta_{df} \cdot Z_f / Z_d - 1) / (\eta_{bc} \cdot Z_c / Z_b - 1) \leq 1 \quad \text{when } Z_c \cdot Z_d < Z_b \cdot Z_f$$

to

$$(\eta_{df} \cdot Z_f / Z_d - 1) / (Z_c / (\eta_{bc} \cdot Z_b) - 1) \leq 1 \quad \text{when } Z_c \cdot Z_d < Z_b \cdot Z_f$$

3.4 As a consequence of the error in claim 3, the formula under dispute does not describe a self-locking condition over the entire claimed range. Thus the invention according to claim 3 is not sufficiently disclosed in the sense of an enabling disclosure.

3.5 This finding is further supported by the prior art, in which self-locking conditions for planetary gears are disclosed. While equivalent formulas for claim 2 and the first formula of claim 3 ( $Z_c \cdot Z_d > Z_b \cdot Z_f$ ) can be found in the prior art (e.g. D2), this is not the case for the second formula in claim 3 ( $Z_c \cdot Z_d < Z_b \cdot Z_f$ ). Thus, even if the objected formula in claim 3 were correct as argued by the respondent, then the patent in suit does not provide sufficient information on how the

self-locking is achieved in the range in which no equivalent condition can be found in the prior art.

*Reason 2*

3.6 The Board however does not follow the appellant's argument that as no example of a particular set of gears with specific tooth counts fulfilling one of the given conditions or being self-locking was provided, the person skilled in the art could not put the claimed invention into practice.

3.7 The skilled person is able without undue burden, at least by trial and error, to find tooth counts that fulfill the conditions as defined in feature 1.9. According to paragraph [0084] of the patent, the claimed planetary gear unit is then self-locking.

**4. Auxiliary request 1Abis**

4.1 Auxiliary request 1Abis was filed after the notification of the summons to oral proceedings and thus falls under the provision of Article 13(2) RBPA 2020.

4.2 Notwithstanding that auxiliary request 1Abis (comprising claim 3 as granted) would anyway not be allowable under Article 83 EPC (see point 3 above), the Board did not admit auxiliary request 1Abis as there are no exceptional circumstances apparent which would justify the admission of this request. Auxiliary request 1Abis only addresses the issue of added subject-matter in dependent claims 5, 6 and 8. This objection was raised by the opponent with their notice of opposition filed on 6 March 2019 (see point IV.4.1

therein).

4.3 The respondent was aware of this objection and filed auxiliary requests 1A and 1B addressing the same issue with their reply to the statement of grounds of appeal. Auxiliary request 1Abis should have been filed at the latest with this reply together with auxiliary requests 1A and 1B.

4.4 The argument that auxiliary request 1Abis was a direct reaction to the Board's preliminary opinion that the findings of the opposition division are not followed, does not constitute an exceptional circumstance. The preliminary opinion did not raise any new issue. In fact, it is the objections of the opponent that were to be addressed, not the preliminary opinion of the Board on this point.

5. **Admission of auxiliary request 6B**

5.1 Auxiliary request 6B was filed after the notification of the summons to oral proceedings and thus also falls under the provision of Article 13(2) RBPA 2020.

5.2 The Board admitted auxiliary request 6B as, in the present case, the nature of the amendments, consisting in merely deleting independent claim 3, as compared to auxiliary request 1B filed with the statement of grounds of appeal, can be considered to fall within the exceptional circumstances under Article 13(2) RPBA 2020.

5.3 Indeed the amendment made renders moot the objection under Article 83 EPC for claim 3 of auxiliary request 1B and does not introduce any new aspects to the discussion, which remains the same for all other

claims.

6. **Auxiliary request 6B - Novelty over D2, D4, D6, D7 and D8**

6.1 Claim 1 and claim 2 of auxiliary request 6B are identical to claim 1 and claim 2 as granted. The Board confirms the decision of the opposition division that the subject-matter of claim 1 and claim 2 is novel over the cited prior art. None of the cited documents directly and unambiguously discloses a motor gear unit suitable for a bicycle derailleur configured to transmit motor torque of the motor to the derailleur.

6.2 Claim 1 differs from any of these documents at least by feature 1.0. Feature 2.0 is identical to feature 1.0. Therefore the following reasoning applies for claim 1 as well as for claim 2.

6.3 The appellant is of the opinion that - as neither the motor nor the derailleur was claimed - each planetary gear having the features 1.1 to 1.9 fell under the wording of claim 1. As D2, D4, D6, D7 and D8 all disclosed such a planetary gear, claim 1 was not allowable under Article 54 EPC.

6.4 The Board does not agree. Feature 1.0 requires that the claimed motor gear unit has to be suitable for a bicycle derailleur. As argued by the respondent (patent proprietor) and also found by the opposition division (decision, point 10.1.1.2), feature 1.0 implies certain limitations to the motor gear unit, e.g. in size, weight or transfer ratio. Thus, the planetary gear units disclosed in document D2, D4, D6, D7 or D8 have to be suitable for the claimed application. Such a suitability is not directly and unambiguously derivable

for the following reasons:

- 6.4.1 D2 mentions "small size, low weight" but without any reference for these relative terms. No exemplary dimensions are mentioned. As acknowledged by the appellant D2 is a theoretically oriented paper. Whether the planetary gear units disclosed therein are suitable for the specific field of bicycle derailleurs remains open.
- 6.4.2 D6 is the only document mentioning "Schaltwerke und Verstellgetriebe" in a list of applications of self-locking gears (chapter 1, last paragraph). In a further list (chapter 1, fifth paragraph) different gear types are listed ("Umlaufrädergetriebe, Schnecken-, Schraub- und einfache Gelenkgetriebe"). However, the understanding of the skilled person of the term "Schaltwerk" in a VDI-Standard, which is directed to self-locking gears in general, is not limited to bicycle derailleurs. The term "Schaltwerk" is to be understood in the broader sense of switch gears.

In D6, an exemplary planetary motor gear unit as shown in figure 27 or 28 figure has a diameter of about 11 cm (page 36, table 11). A similar diameter is disclosed in D8 (page 5, table 1), however D8 does not disclose any application.

As acknowledged by the appellant this diameter is not usual for bicycle derailleurs. A skilled person would not consider such a gear as suitable for use for bicycle derailleurs.

Therefore this embodiment is not suitable for the claimed application and feature 1.0 is not directly disclosed in D6 or D8.

6.4.3 D4 refers generally to "Maschinen- und Feinwerktechnik" as well as to "Handhabungsgeräte und Roboter". P17 (page 300, left column, last paragraph) mentions "Büromaschinen, Mess- und Regelgeräte und -Anlagen, optische Geräte und elektrische Nachrichtengeräte" as examples for "Feinwerktechnik", i.e. "precision engineering". However, the requirement for precision engineering, being highest precision or measuring accuracy within smallest space (e.g. watches), can not be compared to the requirements for a bicycle derailleur.

Whether the planetary gear units disclosed in D4, in particular in figure 7, are suitable for a bicycle derailleur is not unambiguously derivable, in particular as no size for the planetary gears or no technical field at least neighbored to the claimed application is disclosed.

6.4.4 Finally, D7 explicitly mentions three applications: airplane propellers, hoists and butterfly valves in industrial application. All applications relate to technical fields that are very different to the technical field of bicycle derailleurs. Therefore feature 1.0 is not directly derivable.

The appellant pointed in particular to the application in butterfly valves. However the size of butterfly valves and thus the size or weight and the transfer ratio of planetary gears used therein are in a wide range such that this industrial application cannot directly imply the suitability for bicycle derailleurs.

6.4.5 The appellant (opponent) further referred to T0523/89 according to which without an indication of a particular use an article could nevertheless be suitable for that particular use. The Board agrees

therewith, however, conversely, it cannot be argued that if a suitability is not mentioned, therefore the suitability is given. The appellant (opponent) could not convincingly show that one of the above discussed documents disclose a motor gear unit suitable for the claimed application.

**7. Admission of D9 - Article 13(2) RPBA 2020**

7.1 D9 was filed by the appellant (opponent) with letter dated 2 October 2023, i.e. one day before oral proceedings were held. In the appellant's view, the alleged high prima facie relevance of D9 constituted an exceptional circumstance according to Article 13(2) RPBA, which justified its admission.

7.2 According to Article 13(2) RPBA, a change in a party's case after notification of a summons to oral proceedings shall not be taken into account unless there are exceptional circumstances which have been justified with cogent reasons by the party concerned. However - as held in T0187/18 (reasons, point 1) - an alleged prima facie relevance is not per se such an exceptional circumstance. The appellant did not identify any special reasons for the amendment to their case and consequently the Board did not admit D9 into the appeal proceedings.

7.3 The appellant (opponent) referred to T 1216/12 and T 0731/16 according to which a high prima facie relevance would justify the admission of late filed documents. However the decision T1216/12 was taken under the provision of the RPBA 2007 and the decision T0731/16 fell under the transitional regulation of Article 25(3) RPBA 2020 such that Article 13(2) RPBA did not apply.

**8. Inventive step - Admission of attacks starting from one of the documents D2, D4, D6, D7 or D8 - Article 12(4), (6) RPBA 2020**

8.1 The Board exercised its discretion under Article 12(4), (6) RPBA 2020 to not admit the inventive step attacks starting from one of the documents D2, D4, D6, D7 or D8 as they could and should have been presented in the first instance proceedings.

8.2 During opposition proceedings, submissions based on each of D2, D4, D6, D7 and D8 were presented under Article 54 EPC. The argument of the appellant that it would not have made sense to present inventive step attacks starting from one of these documents before the opposition division because they considered that the term bicycle derailleur implied further limitations in addition to the size of the planetary gear is not convincing.

8.3 It is true that the opposition division indicated already in the summons to oral proceedings that in their opinion it was not only the size that qualified a planetary gear to be suitable for a bicycle derailleur. However, in their letter dated 10 December 2020 (points 2.1 and 6), the opponent countered this view and argued - under the auxiliary assumption that feature 1.0 was not disclosed in any of the documents D2, D4, D6, D7 or D8 - that then the closest prior art could be seen in P1 or P3.

8.4 Already at this stage, the opponent could and should have put forward the attacks on inventive step starting from one of the documents D2, D4, D6, D7 or D8. The impugned decision does not comprise any new issues with regard to the findings to feature 1.0 (point 10.1.1.2)



which would justify the admittance of the attacks submitted for the first time with the opponent's statement of grounds of appeal.

## **9. Inventive step starting from P1 or P3**

9.1 The Board confirms the decision of the opposition division that the subject-matter of claim 1 and of claim 2 as granted - corresponding to claims 1 and 2 of auxiliary request 6B - involves an inventive step in view of document P1 or P3 taken in combination with one of the document D2, D4, D6, D7 or D8.

### **9.2 P1 as closest prior art**

#### *Distinguishing features*

9.2.1 The parties agreed that claim 1 differs from P1 by a planetary gear with the features 1.2 to 1.9.

9.2.2 P1 discloses a gear unit with a worm 207 mounted on a motor output shaft, a worm wheel 208 and a subsequent speed reduction mechanism 210 (see figure 5). Furthermore P1 describes in paragraph [0005], that because the axes of the worm and of the worm wheel are oriented perpendicularly to each other, "*there is a risk that the motor output shaft deflects in a direction that may cause the worm gear to contact the input gear at an undesirable angle, thereby causing locking or excessive wear of the gear teeth, or even separation of the worm gear from the input gear.*" To solve this problem, D1 proposes to provide an adjusting screw 226 (see figure 6).

#### *Objective technical problem*

- 9.2.3 According to the appellant, the skilled person was motivated by paragraph [0005] to find a self-locking alternative gear unit without power transfer in a perpendicular direction to replace the worm gear.
- 9.2.4 However, as argued by the respondent, the problem as formulated by the appellant comprises already a part of the solution, i.e. proposing an alternative gear with non-perpendicular, e.g. coaxial power transfer. The technical problem formulated by the appellant is thus based on hindsight.
- 9.2.5 Starting from P1, the objective technical problem is to be seen in a broader sense as reducing malfunction of gears in a worm gear such as wear. This corresponds to the problem as formulated in P1, paragraph [0005] and in the patent in suit, paragraph [0005].

*Non-obvious solution*

- 9.2.6 For the problem posed (point 9.2.5), indeed P1 already provides a solution as argued by the respondent. There is no reason for the skilled person to look for alternatives which may also overcome the problem but would involve much more constructional effort.
- 9.2.7 In particular, the skilled person would not obviously consider to replace the worm gear 207, 208 and therewith forego the advantageous self-locking characteristics which are necessary for bicycle derailleurs. As known by the skilled person, planetary gears are only self-locking under certain conditions and are more complex in their construction.
- 9.2.8 Even if - as argued by the appellant - the skilled person knows from P5 or P6 that also planetary gears

can be used in bicycle derailleurs, from P1, P5 and P6 it is only derivable that specific solutions with worm gears and specific solutions with planetary gears exist in parallel. However, these documents do not include any teaching that worm gears and planetary gears may be easily interchanged within these specific solutions, or that any type of self-locking planetary gears is suitable for bicycle derailleurs. The skilled person rather has to decide from the scratch which of the two gear types to choose.

9.2.9 Indeed, considering the replacement of the worm gear of P1 - be it only of the components 207, 208 in figure 5 or also of further gear elements shown therein - by a planetary gear as disclosed in D2, D4, D6, D7 or D8 would subsequently require a complete reconstruction of the motor gear unit to provide the same output as provided by the motor gear unit of P1. The individual gear elements have to be synchronised with each other. Additionally the skilled person has to consider not only the size of the planetary gear, but also the transfer ratio while guaranteeing the self-locking ability, the re-positioning of the motor, modifications at the housing considering the available space, etc. It is therefore not apparent what would motivate the skilled person to consider modifying, in a complex and yet to be determined manner, the apparatus of P1.

9.2.10 The appellant referred to T0623/97 according to which further additional modifications resulting from the fact that the skilled person was prompted to combine two documents could not involve an inventive step as long as each individual step was obvious to the skilled person and the solution, even if it requires two or more such steps, results for the skilled person in an obvious manner from the prior art.

The Board does not agree that this applies to the present case, in particular for the reasons given under points 9.2.7 to 9.2.9 above.

9.2.11 Furthermore, the Board is not convinced that the combination with any of the documents D2, D4, D6, D7 or D8 is per se obvious or obviously results in the claimed subject-matter.

(a) D2 is a theoretically oriented paper having the aim to define calculation models for determining the self-locking conditions of planetary gears. The fact that planetary gears can be self-locking under certain conditions is already known to the skilled person. The skilled person does not expect to find a solution in D2 on how to avoid malfunction in a worm gear for a bicycle derailleur.

Even if the skilled person would consider D2 and would find the hint that a self-locking planetary gear "*may represent an alternative to worm gear drives when one requires the input and output axes to be coaxial*" (page 968, chapter 7, second paragraph), the skilled person would not simply replace the worm gear in P1 and arrive at the claimed subject-matter for the reasons already given under points 9.2.7 to 9.2.9 above.

(b) As D2, also D4 is a theoretically oriented paper describing conditions for the self-locking of planetary gears. Accordingly, the skilled person does not expect to find a solution for the problem posed (point 9.2.5 above) in D4 either.

Even if D4 mentions a preference for planetary gears in the second paragraph of chapter 1

("Einleitung"), this preference is over multi-stage worm gears, whereas only a single-stage worm gear is disclosed in P1.

Additionally, the reasons provided under points 9.2.7 to 9.2.9 above apply.

- (c) D6 and D8 teach in general how to dimension planetary gears such that they become self-locking. Both documents provide an example with a diameter of ca. 11 cm (see D6, page 36, table 11 with figure 28; D8, page 5, table 1 with figure 9). From this, however, it is only possible to deduce what the skilled person already knows from their common technical knowledge, i.e. that planetary gears are self-locking under certain conditions.

This is not changed by the term "Schaltwerk" mentioned in chapter 1 "Einleitung", last paragraph, as this term is to be understood generally as "switch gear" and is furthermore not related to the previously mentioned planetary gear ("Einleitung", fifth paragraph). On the contrary, the planetary gear is mentioned in the same list as the worm gear without any valuation.

Consequently, the skilled person would not expect to find a solution to the problem of how to reduce wear in the worm gear of P1 in neither D6 nor D8 without already knowing the solution proposed in the patent in suit.

- (d) D7 refers to industrial applications which lie in very different technical fields compared to bicycle derailleurs. Consequently, it is not obvious to consider D7 at all, even if a planetary gear is mentioned as an alternative for a worm gear (last sentence of the chapter "Conclusion").

Even if the skilled person would consider D7, the

reasoning as provided under point 9.2.7 to 9.2.9 applies.

### **9.3 P3 as closest prior art**

#### *Distinguishing features*

9.3.1 It is undisputed that claim 1 differs from the motor gear unit disclosed in P3 by features 1.2 to 1.9.

9.3.2 P3 discloses (figure 1) a motor shaft with a gear 24 that meshes with a gear 25 which carries a worm shaft 26 that cooperates with a worm gear 27. The gear unit is placed in a sealed housing, and the object of P3 is to provide a sufficient sealing for the lubricating means within the housing in order to ensure a sufficient service life (column 1, lines 59-64).

#### *Objective technical problem*

9.3.3 According to the appellant, the worm gear construction was big and complicated. The problem was to find an alternative gear unit that allowed to reduce the size and to simplify the construction of the sealed housing.

#### *Non-obvious solution*

9.3.4 The skilled person would not expect to find a solution to the problem posed in any of the documents as D2, D4, D6 and D8 are generally directed to conditions in which planetary gears are self-locking and D7 is concerned with industrial applications in very different technical fields compared to bicycle derailleurs. Even if the skilled person would consider any of the documents D2, D4, D6, D7 or D8, these documents are not concerned with a sealed housing in conjunction with a

planetary gear and thus can not provide a solution for the problem posed.

9.3.5 Even if the skilled person knows that motor gear units with planetary gears for bicycle derailleurs exist (P5, P6) and that planetary gears can be compact, small in construction, self-locking and may replace worm gears (D2, D7), the claimed subject-matter is not obvious as the reasoning given above under points 9.2.7 to 9.2.11 in conjunction with P1 also apply to P3 as closest prior art.

9.3.6 In fact, it is not apparent what would motivate the skilled person to simply replace the worm gear 26, 27 of P3 with a planetary gear. Such a measure would imply a reconstruction from the scratch (in particular where and how to position the planetary gear between motor 20 and lever 9) that goes beyond the skilled person's customary practice and would result in a fundamentally different motor gear unit. In addition, P3 is specifically directed to the improvement of devices with a worm gear (see column 1, lines 17 ff.), in the sense of improving the lubrication thereof, and it is not apparent what would motivate the skilled person to abandon the teaching of P3 and consider a completely different mechanical construction.

#### 9.4 **Claim 2**

The same arguments and conclusions apply "mutatis mutandis" to the subject-matter of the independent claim 2.

### 10. **Adaptation of the description**

It is undisputed that the description needs to be adapted to the set of claims according to auxiliary request 6B. In this regard, the parties agreed to a remittal to the opposition division.

## Order

### For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the department of first instance with the order to maintain the patent in amended form on the basis of the claims of Auxiliary Request 6B, filed on 4 August 2023, and a description to be adapted.

The Registrar:

The Chairman:



A. Voyé

G. Pricolo

Decision electronically authenticated