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Datasheet for the decision of 27 June 2023

Case Number: T 2679/19 - 3.2.06

Application Number: 11170099.3

Publication Number: 2452865

IPC: B62M9/10, B62M9/125

Language of the proceedings: EN

Title of invention:
Sprocket support structure

Patent Proprietor:
Shimano Inc.

Opponent:
SRAM Deutschland GmbH

Headword:

Relevant legal provisions:
EPC Art. 123(2), 56, 111(1)

Keyword:
Amendments - auxiliary requests 1 and 2 - added subject-matter (yes)
Inventive step - auxiliary request 3 (yes)

Decisions cited:

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

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Case Number: T 2679/19 - 3.2.06

D E C I S I O N
of Technical Board of Appeal 3.2.06
of 27 June 2023

Appellant: (Patent Proprietor)	Shimano Inc. 3-77 Oimatsu-cho Sakai-ku Sakai City, Osaka 590-8577 (JP)
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Appellant: (Opponent)	SRAM Deutschland GmbH Romstr. 1 97424 Schweinfurt (DE)
Representative:	Ruttensperger Lachnit Trossin Gomoll Patent- und Rechtsanwälte PartG mbB Postfach 20 16 55 80016 München (DE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 25 July 2019 concerning maintenance of the European Patent No. 2452865 in amended form.**

Composition of the Board:

Chairman	M. Harrison
Members:	P. Cipriano
	J. Hoppe

Summary of Facts and Submissions

I. In its interlocutory decision the opposition division found that, account being taken of the amendments made by the patent proprietor during the opposition proceedings, European patent No. 2 452 865 met the requirements of the EPC.

II. Appeals were filed by both the patent proprietor and the opponent.

III. The appellant/proprietor requested that the decision under appeal be set aside and (as its main request) that the patent be maintained according to the main request as filed on 6 September 2018, or as an auxiliary measure that the patent be maintained on the basis of the auxiliary requests 1 to 4 dated 27 March 2020.

IV. The appellant/opponent requested that the decision under appeal be set aside and the patent be revoked.

V. The following documents are of relevance for this decision:

E1 DE 102 18 664 A1
E2 EP 1 439 118 B1
E3 EP 1 616 781 A1
E4 EP 1 186 446 A2
E5 EP 1 566 287 B1

VI. The Board issued a summons to oral proceedings and a subsequent communication in which it gave its provisional opinion *inter alia* mentioning that it might require discussion whether paragraph [0020] or dependent claim 3 of the published application provided

a basis for the amendment of features 1.3.2, 1.3.3 and 1.3.4 (see claim feature-by-feature analysis below in item VIII).

VII. Oral proceedings were held before the Board on 27 June 2023, during which the proprietor withdrew its main request of 6 September 2018 and the opponent confirmed that its objections regarding auxiliary request 3 were solely based on lack of inventive step.

At the close of proceedings, the requests of the parties were as follows:

The proprietor requested that the decision under appeal be set aside and the patent be maintained based on one of auxiliary requests 1 to 4 dated 27 March 2020.

The opponent requested that the decision under appeal be set aside and the European patent be revoked.

VIII. Claim 1 of auxiliary request 1 (with the feature-by-feature analysis as set out in the decision under appeal) reads as follows:
"**1.1** A sprocket support structure comprising:

1.2 a main body (74) including an outer surface (76) with a plurality of parallel extending sprocket attachment splines (80) defining a plurality of sprocket engaging grooves (82) between the sprocket attachment splines;

1.3 a plurality of projections (88)

1.3.1 extending radially outward farther than the sprocket attachment splines with respect to a rotation axis (A) of the main body,

1.3.2 each of the projections including a first surface (90) and a second surface (92) that extend radially outwardly in directions perpendicular to the rotational axis (A) and
- an outermost surface (93);

1.3.3 wherein the first surfaces (90) are **facing in** a first axial direction (A_1) of the main body, which is parallel to the rotational axis (A), and

1.3.4 wherein the second surfaces (92) are **facing a** second axial direction (A_2) which is parallel to the rotational axis (A) and extends in a direction opposite the first axial direction (A_1); and

1.4 an abutment ring (78)

1.4.1 being disposed on the main body as a separate member from the main body and

1.4.2 adjacent to the second surface(92) of the projections (88),

1.4.3 the abutment ring including a third surface (100) facing in the first axial direction and

1.4.4 axially spaced from the first surfaces of the projections with respect to the rotation axis (A), and

1.4.5 the abutment ring including the third surface (100)

1.4.6 including surface portions (100') that are exposed within the sprocket engaging grooves between the sprocket attachment splines;

1.5 characterized in that the third surface of the abutment ring is exposed between the projections as viewed along the sprocket engaging grooves;

1.6 the third surface (100) is configured to abut a first sprocket support member (110) of a sprocket cassette (40); and

1.7 the first surface (90) is configured to abut another first sprocket support member (110', 110") of another sprocket cassette (40', 40") which is different from the sprocket cassette (40)."

IX. Claim 1 of auxiliary request 2 differs from claim 1 of auxiliary request 1 in that feature 1.3 reads as follows:
"wherein each of the sprocket attachment splines (80), including a keyway (84), includes a radially outwardly extending projection (88), defining a plurality of projections (88)".

X. The wording of claim 1 of auxiliary request 3 reads as follows:
"A sprocket support structure comprising:
a main body (74) including an outer surface (76) with a plurality of parallel extending sprocket attachment splines (80) defining a plurality of sprocket engaging grooves (82) between the sprocket attachment splines;
wherein each of the sprocket attachment splines (80), including a keyway (84), includes a radially outwardly extending projection (88), defining a plurality of projections (88) extending radially outward farther than the sprocket attachment splines with respect to a rotation axis (A) of the main body, each of the projections including

- a first surface (90) and a second surface (92) that extend radially outwardly in directions perpendicular to the rotational axis (A) and
- an outermost surface (93);
wherein the first surfaces (90) are facing in a first axial direction (A_1) of the main body, which is parallel to the rotational axis (A), and
wherein the second surfaces (92) are facing a second axial direction (A_2),
which is parallel to the rotational axis (A) and extends in a direction opposite the first axial direction (A_1); and
wherein the first surfaces (90) extend radially outward along the projections (88) between the sprocket attachment splines (80) and the outermost surfaces (93) defining a first distance D1, and
wherein the second surfaces (92) extend from the outer surface (76) to the outermost surfaces (93) defining a second Distance D2, where D2 is larger than D1;
and
an abutment ring (78) being disposed on the main body as a separate member from the main body and adjacent to the second surface (92) of the projections (88),
the abutment ring including a third surface (100) facing in the first axial direction and axially spaced from the first surfaces of the projections with respect to the rotation axis (A), and the abutment ring including the third surface (100) including surface portions (100') that are exposed within the sprocket engaging grooves between the sprocket attachment splines;
characterized in that the third surface of the abutment ring is exposed between the projections as viewed along the sprocket engaging grooves;

the third surface (100) is configured to abut a first sprocket support member (110) of a sprocket cassette (40); and
the first surface (90) is configured to abut another first sprocket support member (110', 110'') of another sprocket cassette (40', 40'') which is different from the sprocket cassette (40)."

XI. The proprietor's arguments relevant to the decision may be summarised as follows:

Auxiliary requests 1 and 2 - Article 123(2) EPC

Dependent claim 3 and paragraph [0020] provided a basis for the addition of features 1.3.2, 1.3.3 and 1.3.4 to claim 1.

Auxiliary request 3 - Article 56 EPC

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

E2 did not disclose a keyway.

The objective problem to be solved was to allow an easy assembly of a sprocket with length compensation which would allow the interchangeability of sprockets.

Figures 5 and 6 of E2 did not disclose an abutment ring and therefore could not provide a hint to the skilled person. The skilled person would not use the teaching of E3, which was about saving weight. Even if the skilled person were to adopt a separate abutment ring as suggested in paragraph [0026] of E3, it would not result in exposed surfaces between the projections and the grooves as defined in features 1.4.6 and 1.5.

E4 and E5 do not disclose an abutment ring as defined in claim 1 such that the skilled person adopting their teaching would not arrive at the subject-matter of claim 1 in an obvious manner.

XII. The opponent's arguments relevant to the decision may be summarised as follows:

Auxiliary requests 1 and 2 - Article 123(2) EPC

Dependent claim 3 did not provide a basis for the addition of features 1.3.2, 1.3.3 and 1.3.4 of claim 1. The only other possible basis was paragraph [0020] of the published application as filed, which however disclosed more specific protrusions.

Auxiliary request 3 - Article 56 EPC

The subject-matter of claim 1 lacked an inventive step when starting from E2 and combining it with common general knowledge or the technical teaching of E3, E4 or E5.

Figures 2A and 2B of E2 disclosed a keyway as defined in claim 1 of auxiliary request 3.

If the Board concluded that Figures 2A and 2B of E2 did not disclose an abutment ring as defined in features 1.4 to 1.6, the objective problem was to allow easier manufacturing which would allow the separately formed ring to be made of a different material and thus e.g. to have a higher wear resistance and/or be lighter.

The skilled person looking for an alternative arrangement would derive from E4 and E5 that the flange

portions 96 would be replaced by an abutment ring as disclosed in E4 and E5.

Alternatively, Figures 5 and 6 of E2 provided a hint for the skilled person faced with the objective problem of finding an alternative arrangement to replace the projections by an abutment ring, such a replacement being common general knowledge to the skilled person anyway.

In addition, paragraph [0026] of E3 taught the skilled person to replace the integral projections at the end portions of each rib with projections made on a separate ring nut. The skilled person faced with this teaching would perform this replacement and arrive at the subject-matter of claim 1 in an obvious manner.

Reasons for the Decision

1. Auxiliary requests 1 and 2 - Article 123(2) EPC

1.1 Claim 1 of auxiliary requests 1 and 2 defines *inter alia* the following features which were added to claim 1 during the opposition proceedings:

1.3.2 each of the projections including a first surface (90) and a second surface (92) that extend radially outwardly in directions perpendicular to the rotational axis (A) and
- an outermost surface (93);

1.3.3 wherein the first surfaces (90) are **facing in** a first axial direction (A_1) of the main body, which is parallel to the rotational axis (A), and

1.3.4 wherein the second surfaces (92) are **facing a** second axial direction (A_2) which is parallel to the rotational axis (A) and extends in a direction opposite the first axial direction (A_1).

1.2 The proprietor argued that originally filed claim 3 and paragraph [0020] of the published patent application provided a basis for the combination of features of claim 1, including features 1.3.2, 1.3.3 and 1.3.4.

This argument is not persuasive. Even if it could be argued that features 1.3.2 and 1.3.3 are derived from the feature of originally filed claim 3, feature 1.3.4 ("each of the projections (88) including a second surface (92), wherein the first (90) and second surfaces (92) are perpendicular with respect to the rotation axis (A)") cannot be.

The first and second surfaces being perpendicular to the axis of rotation as defined in originally filed claim 3 does not imply that the second surfaces (92) are facing a second axial direction (A2) opposite the first axial direction as defined in feature 1.3.4. The only other possible basis for feature 1.3.4 is therefore paragraph [0020], where the feature is disclosed *verbatim*. The proprietor also did not argue that feature 1.3.4 itself had any basis other than paragraph [0020].

Whilst the Board agrees that paragraph [0020] discloses features 1.3.2, 1.3.3 and 1.3.4, that paragraph is part

of a disclosure of a more specific arrangement of sprocket attachment splines and projections.

In this regard, paragraph [0020] further discloses that the first surface 90 (of each projection of the arrangement) extends radially outward along the projection 88 between the sprocket attachment splines 80 and the outermost surfaces 93 a first distance D_1 and the second surface 92 (of each projection of the arrangement) extends from the outer surface 76 to the outermost surfaces 93 a second distance D_2, where D_2 is larger than D_1. Also, paragraph [0018], which is part of the same embodiment of splines being described, discloses that one of the sprocket attachment splines is a keyway in the arrangement.

None of these distances or the keyway are defined in claim 1 of auxiliary request 1, although they are both structurally and functionally related to the arrangement of splines and projections described in paragraphs [0018] to [0020]. Absent these features, the combination of features included in claim 1 are an unallowable intermediate generalisation of the content of the application as filed.

1.3 The combination of originally filed claims 1, 3 and paragraph [0020] therefore does not provide a basis for the subject-matter of claim 1 of auxiliary request 1. The subject-matter of claim 1 of auxiliary request 1 therefore contravenes Article 123(2) EPC.

1.4 Claim 1 of auxiliary request 2 differs from claim 1 of auxiliary request 1 in that it further defines that each of the sprocket attachment splines (80), including a keyway (84), includes a radially outwardly extending

projection (88), defining a plurality of projections (88).

1.5 Paragraph [0018] describes this feature but, as explained above, paragraph [0018] belongs to a more specific arrangement of sprocket attachment splines and projections (see paragraph [0020]) which also includes a description of the distances D_1 and D_2 of the first and second surfaces where, in addition, D_2 is larger than D_1. These are features which are not defined in claim 1 of auxiliary request 2.

1.6 Thus, the subject-matter of claim 1 of auxiliary request 2 also does not fulfil the requirement of Article 123(2) EPC.

1.7 Auxiliary requests 1 and 2 are hence not allowable.

2. Auxiliary request 3 - inventive step

2.1 As regards the disclosure of the various features of claim 1 in E2, the opponent had initially argued that the rectangle at the left hand side of Figure 5 (just beyond the tip of the lead arrow from numeral 74) would be understood to be an abutment ring when comparing this to the abutments 96 in Fig. 2A which performed the same function. After this had been discussed and the Board had given its preliminary view that this could not be derived directly and unambiguously, not least given the schematic nature of the drawings and no mention of any abutment ring being made in the description, the opponent conceded that this was not unambiguously derivable, albeit arguing that it would provide a hint to the skilled person that a ring could be used (see below). Since it was common ground that features 1.4 to 1.6 were not disclosed, it was then

only in dispute whether E2 disclosed feature 1.7 or not. Both the parties concurred that the remaining features of claim 1 were disclosed. The Board also sees no reason to doubt this.

2.2 Regarding feature 1.7, the Board finds that the transition surface 142, as seen in Figures 2A and 2B of E2, is aligned with the flange portion 96 such that different sprocket members can abut against this (see also Fig. 5). None of the alternative sprocket members disclosed in E2 abutting the transition surface 142 is a first sprocket member of a cassette, as further sprockets and sprocket holders are mounted on the second radially outer peripheral surface portion 94.

However, although not shown in E2, it is technically feasible and not unreasonable that the freewheel hub of E2 can have a shorter cassette with less gears fitted on it, the first sprocket support member of which abuts the transition surface 142. The wording of feature 1.7, and more generally the definition of the first surface in claim 1, is such that it imposes no restrictions on the suitable type and size of the sprocket cassette. E2 therefore discloses feature 1.7.

2.3 The opponent argued that the differing features 1.4 to 1.6, which provide an abutment ring separate from the main body, allowed for easier manufacturing and for the skilled person to select different materials for the ring and for the main body such that the ring could be made to have a higher resistance to wear and/or be lighter.

The Board is, however, not persuaded by these arguments. Although the patent does not associate any specific effect with the provision of an abutment ring

and it is possible to choose different materials if the ring and the main body are provided as separate parts, the patent does not discuss the materials of the different components nor any issues related to wear. In addition, the greatest load in a freewheel body is borne by the splines that transmit the power between the chain and the wheel hub. The abutment ring is mainly there to axially adjust the sprocket cassette, thus ensuring reliable gear shifting. There is no relative movement between the cassette and the ring and the axial force applied to the ring need only be sufficient to hold it in position and considerably less than the pedal force transmitted through the splines. A ring also implies a greater volume than the corresponding projections, such that the choice of a lighter material would have to compensate for the extra mass.

It is also not evident that a separate abutment ring would necessarily be easier to manufacture, not least since it requires the manufacturing of a separate part and an additional assembly step.

The Board is therefore not convinced that the provision of an abutment ring instead of the fixed projections brings any of the effects alleged by the opponent and finds instead that the objective problem is to find an alternative way to set the axial position of the sprocket cassette when compared to the fixed abutment projections used for positioning of E2.

2.4 The opponent argued that the arrangements in Figure 10 of E4 and Figure 3 of E5 would teach the skilled person faced with the objective problem to replace the projections with an abutment ring in an obvious manner.

The Board does not find this argument persuasive. Whilst Figure 10 of E4 and Figure 3 of E5 both disclose arrangements in which an abutment ring is used for setting the axial position of the sprocket cassette, they do not replace the projections but rather serve as spacers in addition to the projections already present in the freewheel bodies of E4 and E5. Likewise, although they are used to set the axial position of the cassette, they are inserted from the spline side of the freewheel body such that, if adopted into the structure of E2, they would not be adjacent to the second surface of the projections as defined in feature 1.4.2.

In addition, such a ring used as in E4 or E5 would need to have an inner radius larger than the radius of the splines 130 in E2 in order for the ring to be inserted all the way until contact with the projections. Such a ring would therefore also not have surface portions that are exposed within the sprocket engaging grooves between the sprocket attachment splines as defined in feature 1.4.6.

2.4.1 Therefore, the skilled person applying the teaching of E4 and E5 to find an alternative way of setting the sprocket cassette axial position of the freewheel body of E2 would not arrive at the subject-matter of claim 1 unless an inventive step were involved.

2.5 The opponent also argued that, although not unambiguously disclosed, Figures 5 and 6 of E2 already provided the skilled person with a hint to replace the projections at the end of the splines with an abutment ring and that this replacement was common general knowledge of the skilled person and had been done previously, as evidenced by the arrangements in Figure 10 of E4 and Figure 3 of E5.

The Board does not accept this argument. Figures 5 and 6 of E2 purport to be partial cross-sectional views, but they do not show any details regarding either the surface or the interior of the main body, e.g. they do not show either the splines or grooves on the surface in the lower half of the main body or the hollow interior on the upper half. Given the lack of detail in both Figures as to the shape of the main body, the skilled person would not be able to derive a ring shaped body on the left side of the main body, let alone a ring which is separate (as required by claim 1). Indeed, it is nothing more than pure speculation that the rectangle shown at the left side of Figs. 5 and 6 might be a ring. Therefore, neither Figure 5 nor Figure 6 provides a hint for the projections to be replaced by a separate ring. Nor, as a consequence, can the separate rings in E4 or E5, be helped by the alleged "hint" in Figs. 5 and 6 of E2 towards providing a teaching to replace or supplement the projections (as required by claim 1) by a ring in E2 as a matter of common general knowledge.

2.5.1 Thus, the skilled person, starting from the disclosure in E2 and faced with the objective problem of finding an alternative way to set the axial position of the sprocket cassette, would not arrive at the subject-matter of claim 1 supported by their common general knowledge without exercising an inventive step.

2.6 The opponent also argued that paragraph [0026] of E3 taught the skilled person to replace the integral projections at the end portions of each rib by projections made on a separate ring nut. Thus, it would allegedly have been obvious to the skilled person, starting from Figures 5 and 6 of E2, to make the ring

separate from the body in order to e.g. change its material properties and arrive at the subject-matter of claim 1.

However, as explained above, Figures 5 and 6 of E2 do not unambiguously disclose a ring and the objective problem starting from the embodiment of the hollow body of Figures 2(A) and 2(B), which is the same as that of Figures 5 and 6, is not related to the possibility to change any of the material properties. For these reasons alone, the Board does not accept this argument.

2.7 As a further attack on a similar theme, the opponent argued that starting from the hollow body with integral projections 96 disclosed in E2, the skilled person looking for an alternative way of setting the axial position of the sprocket cassette would derive from the teaching of paragraph [0026] of E3 that these projections 96 can be replaced by a separate ring. According to the opponent, the skilled person would also realize that the bending torque to which the projections are subjected is not negligible and they would make the protrusions on the ring with the same height as before, i.e. the skilled person would provide a ring with an outer radius extending to the height of the splines from which small projections with the height D_1 would project. This would then necessarily result in a ring having a flat surface that would be adjacent to the second surface of the projections as defined in feature 1.4.2 and exposed within the sprocket engaging grooves between the sprocket attachment splines and the projections as defined in features 1.4.6 and 1.5.

The Board, however, does not find these arguments persuasive. As the opponent itself acknowledged, the

skilled person applying the teaching of paragraph [0026] of E3 would make as few changes as possible to the freewheel body of E2, limiting themselves to the bare necessary in accordance with the teaching of E3 to solve the problem posed. As explained above in item 2.3, the greatest load in a freewheel body is borne by the splines (i.e. resisting the rotational torque) and not by the projections in an axial direction such that the skilled person would not inherently seek to reduce the bending torque on the projections. Since the "inwardly extending splines" (see e.g. E2, column 4, lines 14 to 23 and Fig. 2(B)) do not have any axial limiters/protrusions at their axial end, the skilled person adapting the ring nut of paragraph [0020] of E3 to the freewheel body of E2 would not, without hindsight, set an outer radius above the surface of the freewheel body, and would simply arrange the ring with its abutment projections defined on the ring nut to align with the splines (which correspond to the "ribs" in E3). A further modification to radially extend the ring at locations between the axial projections to arrive at feature 1.4.6 is simply not taught in either E2 or E3.

2.7.1 The opponent also argued that the problem-solution approach was not the exclusive method for dealing with the consideration of inventive step and that, regardless of the differing features and of the objective problem, the skilled person was always looking for improvements and would immediately recognize that a ring allowed for an easy assembly.

This argument is also not persuasive. The problem-solution approach was primarily used to ensure an objective assessment of inventive step and to avoid *ex post facto* analysis of the prior art or subjective

considerations. Although the opponent has not provided any reason for the Board to depart from the problem-solution approach, and the Board also does not see any reason to do so in this case, and if it were assumed that the skilled person is always simply looking for "improvements" and recognized that an easy assembly was desirable (in fact this is then also a problem to be solved), the skilled person applying the teaching of E3 would not arrive at the subject-matter of claim 1 for the same reasons as set out above in item 2.7. The further adaptations which would be required to arrive at the structure in claim 1 are thus based on purely subjective or hindsight considerations.

2.7.2 In summary, therefore, starting from E2 and wishing to solve the objective technical problem, even if the skilled person were to consider E3, they would not be led to the claimed subject-matter without exercising an inventive step.

2.8 The subject-matter of claim 1 thus meets the requirement of Article 56 EPC.

3. Regarding adaptation of the description to the new claims, the Board considers that the required amendments to the description are not of inconsiderable scope, e.g. a description of the disclosure in E2 should be added to the description with an indication of the features of claim 1 disclosed therein (as explained above).

4. Under these circumstances, the Board exercises its discretion to remit the case to the opposition division under Article 111(1) EPC, for the description to be adapted to the claims found allowable.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the opposition division with the order to maintain the patent in amended form on the basis of the following documents:
claims 1 to 11 of auxiliary request 3, filed on 27 March 2020 and
a description to be adapted.

The Registrar: The Chairman:

D. Grundner M. Harrison

Decision electronically authenticated