

Internal distribution code:

- (A) Publication in OJ
(B) To Chairmen and Members
(C) To Chairmen
(D) No distribution

D E C I S I O N
of 7 June 2006

Case Number: T 1195/04 - 3.2.01

Application Number: 97103771.8

Publication Number: 0795460

IPC: B62M 11/16

Language of the proceedings: EN

Title of invention:
Hub bicycle transmission

Patentee:
SHIMANO INC.

Opponent:
SRAM Deutschland GmbH

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
"Novelty (yes)"
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-



Case Number: T 1195/04 - 3.2.01

D E C I S I O N
of the Technical Board of Appeal 3.2.01
of 7 June 2006

Appellant: SRAM Deutschland GmbH
(Opponent) Romstr. 1
D-97424 Schweinfurt (DE)

Representative: Thum, Bernhard
Wuesthoff & Wuesthoff
Patent- und Rechtsanwälte
Schweigerstrasse 2
D-81541 München (DE)

Respondent: SHIMANO INC.
(Patent Proprietor) 77, Oimatsucho 3-cho
Sakai-shi
Osaka (JP)

Representative: Wallinger, Michael
Wallinger & Partner
Patentanwälte
Zweibrückenstrasse 2
D-80331 München (DE)

Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office posted
6 August 2004 concerning maintenance of
European patent No. 0795460 in amended form.

Composition of the Board:

Chairman: J. Osborne
Members: P. L. P. Weber
C. Heath

Summary of Facts and Submissions

- I. The appeal is directed against the interlocutory decision of the opposition division posted on 6 August 2004 that, account being taken of the amendments made by the proprietor during the opposition procedure in its auxiliary request, the patent and the invention to which it relates meet the requirements of the EPC.
- II. The appellant (Opponent) filed an appeal against the decision. The notice of appeal was filed on the 6 October 2004 and the appeal fee paid on the same day. The grounds were filed on the 6 December 2004.
- III. Claim 1 as approved by the opposition division reads as follows:

An internally mounted bicycle transmission comprising:

a hub axle (3);

a drive member (10) rotatably mounted around the hub axle (3);

a hub body (2) rotatably mounted around the hub axle (3);

a gear mechanism

(21,22,23,24,26,28,29,30,31,32,33,34) coupled between the drive member (10) and the hub body (2) for communicating rotational force from the drive member (10) to the hub body (2) through multiple transmission paths, wherein the gear mechanism includes:

a sun gear (31) rotatably supported around the axle (3);

a planet gear (21) supported by a planet gear carrier (26) for rotation around the hub axle (3), wherein the planet gear (21) engages the sun gear (31);

a ring gear (29) engaging the planet gear (21), wherein the ring gear (29) is integrally formed with the drive member (10);

a power transmission clutch (35) disposed between the drive member (10) and the planet gear carrier (26)

characterised in that

the ring gear (29) is formed as one piece with the drive member (10),

the drive member (10) comprises an annular member (10) having a first end (12) structured for attaching a sprocket (1) thereto and a second end (14) having a plurality of teeth disposed along a peripheral surface thereof for forming the ring gear (29), and

wherein the ring gear (29) defines a first hole having a first diameter (D1), wherein the second end (14) of the annular member (10) defines a second hole (15) having a second diameter (D2), and wherein the first end (12) of the annular member (10) defines a third hole (11) having a third diameter (D3) for receiving a hub axle (13) therethrough, and wherein the power transmission clutch (35) is disposed within the second hole (15).

Claims 2 to 8 approved by the opposition division define features additional to those of Claim 1.

IV. Oral proceedings were held on 7 June 2006. The appellant requested the setting aside of the decision and the revocation of the patent.

The respondent requested the appeal to be dismissed (main request) or in the alternative maintenance of the patent in amended form on the basis of respective first, second and third auxiliary requests filed with a letter of 8 May 2006.

V. The following documents played a role in the appeal proceedings:

D1: Sonderdruck aus Antriebstechnik, Oktober 1965,
Nr. 10, Krauskopf-Verlag, Mainz

D6: US-A-4973297

D7: EP-A-0531608

D8: EP-A-0693419

D13: GB-A-14315

VI. The arguments of the appellant in respect of the main request can be summarized as follows:

First of all it should be noted that the last feature of Claim 1 does neither define any relationship between the diameters D1, D2, D3 nor does it define the spacial arrangement of the three holes. The wording of the claim also only requires the presence of multiple transmission paths so that already two paths fulfil this requirement.

The subject-matter of Claim 1 is not new over D13.

The internally mounted bicycle transmission according to D13 comprises:

- a hub axle (spindle E);
- a drive member (driving member A) rotatably mounted around the hub axle;
- a hub body (hub shell C) rotatably mounted around the hub axle.

It also comprises a gear mechanism coupled between the drive member and the hub body for communicating rotational force from the drive member to the hub body through multiple transmission paths (two paths).

This gear mechanism includes:

- a sun gear (sun pinion D) rotatably supported around the axle;
- a planet gear supported by a planet gear carrier (planet pinion carrier B) for rotation around the hub axle, wherein the planet gear engages the sun gear;
- a ring gear engaging the planet gear, wherein the ring gear is integrally formed with the drive member.

A power transmission clutch disposed between the drive member and the planet gear carrier is also disclosed in D13. The clutch is shown in the drawings and comprises pegs J which are displaceable between a disengaged position and an engaged position in which they enter recesses A2. Alternatively another option is addressed in the description in which the pegs engage projections instead of the recesses.

From the drawings it is clear that the ring gear is formed as one piece with the drive member and that the

drive member comprises an annular member having a first end structured for attaching a sprocket thereto and a second end having a plurality of teeth disposed along a peripheral surface thereof for forming the ring gear. The drawings clearly show a first hole having a first diameter (D1) and a third hole having a third diameter for receiving the hub axle. The skilled person when following the teaching of D13 regarding the alternative clutch construction will aim to make the minimum of changes and achieve the lowest production cost. This would inevitably result in an arrangement comprising a second hole having a second diameter defined by the projections. Since the pegs would then engage these projections the power transmission clutch would be disposed within the second hole.

Accordingly the subject-matter of Claim 1 is not new.

However, even if this arrangement of projections were not the only one which the skilled person would contemplate, it would at least be considered by him and therefore be obvious.

Moreover, the subject-matter of Claim 1 is not inventive over D7 and the general knowledge of the skilled person.

The only feature which is not known from D7 is to form the ring gear as one piece with the drive member. This, however, is self-evident once it is decided not to have a back pedal brake in the arrangement of D7. The clutch 20 which connects the drive member 2 and the ring gear 16 is not actively actuated in any of the seven gearpaths and the ring gear rotates always at the same rotational speed as drive member 2. When the brake

is activated it is necessary to transmit the braking force from the drive member through the gear train to the brake and in order to avoid any blocking in the gears the clutch 20 is freed.

In other words the clutch 20 serves no purpose if no back pedal brake is needed.

Hence when no back pedal brake is desired it is an obvious simplification of the construction to form a one piece element out of the drive member 2 and the ring gear 16. By doing so the other features of Claim 1 are automatically generated, so that the subject-matter of Claim 1 is obvious over D7 and the general knowledge of the skilled person.

The subject-matter of Claim 1 also is not inventive over a combination of D7 with each of D1, D6, D8 and D13.

D8 suggests the claimed solution to the skilled person because the drive member 4 and the ring gear 45 form a one piece element working together with a back-pedal brake which is located on the driver.

Hence, if the skilled man is looking for a simplification of the construction of the arrangement according to D7, D8 shows him to make the drive member and the ring gear as a one piece element without renouncing the back pedal brake.

D6 also shows a one piece drive member and ring gear in its figure 11 and the corresponding part of the description which leads to a lower cost construction of the transmission.

Also D1 shows on page 6 table 6 item 3 a one piece drive member and ring gear element, thereby rendering this feature an obvious modification of D7.

Similarly, the skilled person would recognise from D13 that the drive member and ring gear may be a single element.

VII. The arguments of the respondent in respect of the main request can be summarised as follows:

None of the cited prior art takes away the novelty of the subject-matter of Claim 1.

In particular, the drive member A of the planetary gear as shown in the drawings of D13 does not have a second hole having a second diameter as required by the wording of present Claim 1. It only shows a first hole comprising the ring gear and a third hole for supporting the hub axle via a ball bearing.

The appellant's assumption that when considering the alternatively suggested construction in which the pegs may engage projections instead of recesses automatically entails the presence of a second diameter in which the clutch is positioned cannot be accepted. According to jurisprudence of the boards, to be considered as being disclosed a feature must be clearly and unambiguously present in a prior art document. This is not the case here, there being no specific embodiment showing how the projections according to the alternative option should be provided. Additionally, there are several other possible constructions apart from the one suggested by the appellant. Moreover, even in that construction the power transmission clutch is

not disposed within the second hole, it only engages the second hole.

The transmission according to D13 offers only two transmission paths of which only one passes through the gear mechanism. D13 therefore does not disclose "a gear mechanism ... for communicating rotational force ... through multiple transmission paths" as required by present Claim 1.

Considering inventive step the skilled person would not combine the teaching of documents disclosing specific embodiments of different planetary gear mechanisms, since this always means a complete rethinking and reconstruction of the particular embodiments.

There must be a concrete hint to combine two documents which is not the case here. In addition it seems unlikely that the person skilled in the art would turn back to such an old document as D13.

D7 does not disclose the feature that the drive member and the ring gear are formed as one piece. It does not render obvious such a feature since it clearly points out the independent rotation of the ring gear and the drive member and therefore teaches away from their combination into one piece.

D1 (page 6, left column, last sentence) highlights the advantage of providing no bearing for the ring gear so that the skilled person will refrain from combining it with the drive member.

A one piece drive member and ring gear has the disadvantage that it has to be precisely manufactured

as concentricity between the drive member and the planetary gears must be guaranteed.

D13 does not disclose the provision of the clutch in the second hole having a second diameter and the provision of these features is not obvious from D13 alone, since it would be more complicated than the existing solution and with no additional effect.

The transmission according to D6 operates quite differently from that according to D7. Even if the skilled person would wish to adopt the one-piece drive member and ring gear of D6 in the transmission of D7, he would also need to adopt the different braking mechanism, requiring a complete re-design.

Similarly, the brake mechanism according to D8 is quite different from that of D7 in as far as it is mounted adjacent the drive member so that braking torque does not pass through the gear mechanism.

No combination of any other prior art renders the invention obvious.

Reasons for the Decision

1. The appeal complies with the requirements of Articles 106 to 108 and Rule 64 EPC it is therefore admissible.

Main request

Novelty

2. Novelty of the subject-matter of Claim 1 was disputed only with regard to D13.

In the opinion of the Board of Appeal several features of the claim are not disclosed in D13.

Present Claim 1 requires the presence of a gear mechanism coupled between the drive member and the hub body for communicating rotational force from the drive member to the hub body through multiple transmission paths (emphasis added).

In the opinion of the Board this feature means that there must be a gear mechanism between the drive member and the hub body which embodies multiple transmission paths to communicate the rotational force from the drive member to the hub body.

D13 shows a two speed transmission in which the rotation of the drive member A is directly transmitted through the pegs J to the hub C in the first position of the pegs when they are engaged in the holes A2 of the drive member and is transmitted to the hub through a planetary gear mechanism when the pegs are in their second position disengaged from the holes A2.

Thus, in the bicycle transmission shown in D13 the gear mechanism only communicates the rotational force from the drive member to the hub body through a single transmission path.

The requirement of Claim 1 cited above that the gear mechanism exhibits multiple transmission paths is thus not fulfilled. For this reason the subject-matter of Claim 1 is new.

3. For the sake of completeness the Board would like to add the following.

It is mentioned in D13 that as an alternative construction the pegs J may engage projections on the drive member instead of recesses therein. A specific alternative construction embodying this option is however not disclosed and contrary to the opinion of the appellant such an alternative construction does not necessarily include a second hole with a second diameter in which the clutch is positioned as required by present Claim 1.

While the alternative construction possibly could be embodied with the projections formed as explained by the appellant, this is clearly not the only technical possibility. In particular, even if the alternative construction suggested by the appellant would involve the least modification and lowest unit costs, for which there is no evidence, the skilled person would not limit himself to these considerations when determining the form of the alternative construction. It follows that the feature of present Claim 1 concerning the location of the clutch within a second hole cannot be said to be implicitly disclosed in D13.

In addition it is to be noted that even if one considered the construction proposed by the appellant to be the only one possible, the clutch still would not be disposed in the second hole, since only the pegs (in

one of their positions) would engage the projections in the second hole but the remainder of the clutch still would be outside of the second hole.

Hence, D13 does not take away the novelty of the subject-matter of Claim 1.

Inventive step

4. The parties agree that the closest prior art bicycle transmission is disclosed in the embodiments of figures 1 to 23 and the corresponding parts of the description of D7.

The bicycle transmission according to D7 comprises a hub axle 1;

 a drive member 2 rotatably mounted around the hub axle 1;

 a hub body 3 rotatably mounted around the hub axle 1;

 a gear mechanism coupled between the drive member 2 and the hub body 3 for communicating rotational force from the drive member 2 to the hub body 3 through seven transmission paths.

The gear mechanism includes a sun gear 14a rotatably supported around the axle 1, a planet gear 14b supported by a planet gear carrier 5a for rotation around the hub axle 1, the planet gear 14b engaging the sun gear 14a.

The gear mechanism further comprises a ring gear 16 engaging the planet gear 14b and a power transmission clutch 19 disposed between the drive member 2 and the planet gear carrier 5a. The drive member comprises an annular member having a first end structured for attaching a sprocket thereto and defining a (third)

hole having a (third) diameter for receiving a hub axle therethrough. The ring gear defines a (first) hole having a (first) diameter.

- 4.1 However in this bicycle transmission the ring gear 16 is formed neither integrally nor as one piece with the drive member 2.

The following features of present Claim 1 are also not disclosed in D7: the annular member of the drive member comprising a second end having a plurality of teeth disposed along a peripheral surface thereof for forming the ring gear, the second end of the annular member defining a second hole having a second diameter and the power transmission clutch being disposed within the second hole.

- 4.2 In the relevant embodiment of D7, the drive member and the ring gear are two separate elements linked with each other through a slide spring 16a and a clutch 20.

Making the ring gear and drive member as a one piece element would make the manufacturing of the transmission easier and cheaper so that the objective problem to be solved can be considered to be a simplification of the device according to D7 (see also column 1, lines 25 to 35 of the patent specification).

- 4.3 Thus the question to be answered is whether the skilled person wanting to simplify the transmission of D7 would have made a one piece element out of the drive member and ring gear used in that transmission.

4.4 The bicycle transmission shown in D7 is a seven speed transmission including a back pedal brake located at the end of the transmission opposed to that having the driving member and operated by applying reverse torque through the transmission.

In addition to the gear carrier 5a the gear mechanism includes a second planet gear carrier more remote from the drive member. The two gear carriers are linked to each other and rotate together at the same angular speed also during braking when torque is fed to the second planet gear carrier to move the rollers of the back pedal brake.

The drive member is linked through a first clutch 47 with the first planet gear carrier and through a second clutch 20 with the ring gear 16.

When the cyclist is pedalling forwardly clutch 20 communicates the rotation of the drive member to the ring gear 16; ring gear 16 will thus rotate in unison with drive member 20 at the same rotational speed. However, when the cyclist rotates the drive member backwardly to actuate the brake, clutch 20 prevents transmission of the backward rotational movement to ring gear 16. Simultaneously, clutch 47 communicates the backward rotational movement to the first planet gear carrier and therefore also to the second planet gear carrier which in turn actuates the brake. In other words, in the transmission according to D7 the braking force is always transmitted through the planet carriers rotating at the same speed as the drive member, whatever the speed ratio set by the cyclist. However, in, for instance, the speed ratio "m" the planet gear carriers rotate at a speed different from that of the ring gear and drive member.

From this way of functioning it follows that in the bicycle transmission according to D7 the ring gear 16 and the drive member 2 being in two parts is an essential feature in order to allow the communication of a backwards rotation of the drive member to the brake while not disturbing the rest of the transmission, in particular avoiding any blocking of it.

- 4.5 As a general rule the skilled person desiring to simplify the construction of a device does not renounce one of its fundamental functions.

In the present case this means that if attempting to make a one piece element out of the drive member and ring gear of D7 the skilled person would not renounce the back pedal brake and thus would have to find another constructional solution for operating it. In the opinion of the Board the skilled person's general knowledge offers no obvious solution for that since it would mean a substantial redesign of the transmission.

5. Also, neither D6 nor D8 provides the skilled person with a solution to his problem.

D6 and D8 disclose six and ten speed internally mounted transmissions respectively, both having a drive member formed as a one piece element with a ring gear. It is to be noted that although both D6 and D8 disclose a transmission with a drive member and ring gear formed as a one piece element they do not mention any advantage of such constructions.

Present Claim 1 requires that there is a power transmission clutch disposed between the drive member and the planet gear carrier and that this clutch is disposed in the second hole of the one piece drive member and ring gear.

In the transmissions according to both D6 and D8 not only is there no clutch between the drive member and the planet gear carrier but such a clutch would have no purpose since the sun gear of the planetary gear concerned is fixed on the axle, this planetary gear only being used for diminishing the entrance rotational speed. This has the result that the planet gear carrier never rotates at the same speed as the drive member, irrespective of selected speed ratio and direction of pedalling.

It follows that even if the skilled person were to recognize that a one piece element as disclosed in D6 or D8 could be advantageous in the transmission of D7 he would still have to adapt it to accommodate the clutch necessary to provide the seven speeds in the transmission of D7.

6. D1 is a general document summarising different possible layouts of planetary gear systems mainly for 3 speed transmissions and includes a reference to D13.

While one piece driver and ring gear elements are present in some of the layouts shown, they are shown in a very diagrammatical way and no particular advantages or drawbacks are mentioned in relation thereto and the disclosure is no more relevant than D13.

This document is a document showing the state of the art in 1965 and cannot give any hint for changing the

construction of the transmission according to D7 to that presently claimed.

7. The appellant argued that the seven speed hub transmission according to D7 has exactly the same transmission paths as the one according to the main embodiment of the invention the skilled person wishing to simplify the transmission according to D7 would simply delete the back pedal brake and thereby immediately come to the invention without any inventive step.

The Board cannot share this opinion. As already mentioned above in the opinion of the Board the skilled person would not wish to lose such an important function as the brake when simplifying the device according to D7. Such an attitude is not a normal attitude to follow for the skilled person. If the skilled person wishes a transmission without a back pedal brake, he will use an existing transmission without a back pedal brake but not a transmission with a back pedal brake and come to the conclusion that the brake is a problem.

For the sake of completeness the Board would like to add that even if the skilled person were to delete the back pedal brake in the transmission according to D7 he would not necessarily come to the one piece element as required by present Claim 1. Two elements rotating at the same rotational speed do not necessarily have to be manufactured as a one piece element. For instance, as shown in the transmission according to D7, another planetary gear carrier 4a is unrotatably engaged with a relay member 9. Both elements thus rotate at the same rotational speed and are not subject to relative axial

movement. The designer of the transmission according to D7 nevertheless chose to make them as two separate pieces.

The appellant also argued that the skilled person wishing to embody the second constructional option mentioned in D13 would come to the invention without inventive step.

As already mentioned in relation with novelty, the Board is of the opinion that when the pegs are engaged with the recesses or the projections according to the optional construction the whole of the clutch would still not be in the second hole since only the part of the pegs engaging the recesses or projections would be in this second hole.

In addition, even when embodying the option of having the pegs engaging projections the transmission according to D13 would still only have one transmission path going through a gear mechanism.

Because the transmission of D13, even in the alternative construction proposed by the appellant, does not comprise the feature of the clutch being disposed within the second hole, a combination of the teachings of D7 and D13 would not lead to the subject-matter of present Claim 1.

The Board therefore concludes that the subject-matter of present Claim 1 involves an inventive step. The same conclusion applies equally for claims 2 to 8.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

A. Vottner

J. Osborne