

**Internal distribution code:**

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

**D E C I S I O N**  
of 9 April 2003

**Case Number:** T 0843/01 - 3.2.1

**Application Number:** 95307124.8

**Publication Number:** 0711931

**IPC:** F16D 41/28, F16D 41/06

**Language of the proceedings:** EN

**Title of invention:**  
A bicycle roller clutch

**Patentee:**  
SHIMANO INC.

**Opponent:**  
SRAM Deutschland GmbH

**Headword:**  
-

**Relevant legal provisions:**  
EPC Art. 54, 56, 114(2)

**Keyword:**  
"Novelty (yes)"  
"Inventive step (yes)"  
"Late submitted material - admitted (no)"

**Decisions cited:**  
-

**Catchword:**  
-



Case Number: T 0843/01 - 3.2.1

**D E C I S I O N**  
of the Technical Board of Appeal 3.2.1  
of 9 April 2003

**Appellant:** SRAM Deutschland GmbH  
(Opponent) Romstrasse 1  
D-97424 Schweinfurt (DE)

**Representative:** -

**Respondent:** SHIMANO INC.  
(Proprietor of the patent) 77, Oimatsucho 3 cho  
Sakai-shi  
Osaka (JP)

**Representative:** Pacitti, Paolo  
Murgitroyd and Company  
165-169 Scotland Street  
Glasgow G5 8PL (GB)

**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 31 May 2001  
rejecting the opposition filed against European  
patent No. 0 711 931 pursuant to Article 102(2)  
EPC.

**Composition of the Board:**

**Chairman:** S. Crane  
**Members:** J. Osborne  
S. U. Hoffmann

## Summary of Facts and Submissions

I. The appeal is directed against the decision of the Opposition Division to reject the opposition against European patent No. 0 711 931. The patent had been opposed in its entirety on the grounds of lack of novelty and lack of inventive step.

II. The following evidence which was considered during the opposition procedure played a role also during appeal:

E1: DE-C-800 531

E3: US-A-5 101 946.

The following evidence had been disregarded by the Opposition Division in accordance with Article 114(2) EPC but was admitted by the Board because of its potential relevance:

E4: GB-A-20 888.

The appellant introduced the following evidence during the appeal procedure in support of arguments against the claims of the patent in the form as granted:

E7: GB-A-628 282

E8: DE-C-288 726

E9: GB-A-5 240/1911

E10: EP-A-0 531 608

E11: US-A-3 135 368

E12: DE-C-1 140 481

E13: *G. Niemann et al.*, "Maschinenelemente", vol. III, 2nd edn., Springer Verlag, 1983, 274 to 278

E14: *H. Messinger*, "Langenscheidts Großes Schulwörterbuch Englisch-Deutsch", 1996, 886, 887, 936, 937

E15: "Langenscheidts Großes Schulwörterbuch Deutsch-Englisch", 1996, 614, 615, 868, 869

E16: "Langenscheidts Fachwörterbuch Technik", CD-ROM version, English-German, entry for "roller clutch"

E17: GB-A-315 422

E18: GB-A-338 096.

III. During oral proceedings held 9 April 2003 the appellant requested that the decision under appeal be set aside and that the patent be revoked. The respondent requested that the appeal be dismissed and that the patent be maintained as granted (main request) or in the alternative on the basis of the claims according to the auxiliary request submitted with letter dated 5 March 2003.

IV. Claim 1 as granted (main request) reads:

"A one-way clutch (1) comprising:  
an internal rotary member (5);  
an external rotary member (7);  
wherein a surface of the internal rotary member (5) and  
a surface of the external rotary member (7) define a

clutch member space (6) so that a width of the clutch member space (6) varies from a wider portion to a narrower portion,

a clutch member (4a,4b) disposed in the clutch member space (6) so that:

(i) relative rotation between the internal rotary member (5) and the external rotary member (7) is inhibited when the clutch member (4a,4b) is disposed in the narrower portion of the clutch member space (6); and

(ii) relative rotation between the internal rotary member (5) and the external rotary member (7) is allowed when the clutch member (4a,4b) is disposed in the wider portion of the clutch member space (6);

a clutch member support (8) for supporting the clutch member (4a,4b) within the clutch member space (6); and  
a resilient coupling member (9) for increasing the friction force between the clutch member support (8) and one of the internal rotary member (5) or external rotary member (7),

characterised in that the coupling member (9) is attached to the clutch member support (8), and in that the coupling member (9) is adapted to increase said friction force when the clutch (1) rotates in a drive direction and to decrease said friction force when the external rotary member (7) rotates in a direction opposite to the drive direction relative to the internal rotary member (5)."

The claims according to the main request additionally contain dependent claims 2 to 16 which define features additional to the subject-matter of claim 1.

Claim 17 as granted (main request) reads as follows:

"A bicycle roller clutch (1) comprising:  
a plurality of rollers (4a,4b);  
a cone (5) fixed to a hub barrel (C);  
a cup (7) rotatably supported on the cone (5);  
wherein an outer surface of the cone (5) and an inner surface of the cup (7) define a plurality of clutch member spaces (6) so that a width of each clutch member space (6) varies from a wider portion to a narrower portion;  
wherein at least one of the plurality of rollers (4a,4b) is disposed in each clutch member space (6) so that:  
    (i) relative rotation between the cup (7) and the cone (5) is inhibited when the roller (4a,4b) is disposed in the narrower portion of its corresponding clutch member space (6); and  
    (ii) relative rotation between the cup (7) and the cone (5) is allowed when the roller (4a,4b) is disposed in the wider portion of its corresponding clutch member space (6);  
roller supports (8) for supporting the plurality of rollers (4a,4b) at equidistant spacing; and  
a resilient coupling member (9) for increasing the friction force between the roller supports (8) and one of the cup (7) or cone (5),  
characterised in that the coupling member (9) is attached to the roller supports (8), and in that the coupling member (9) is adapted to increase said friction force when the clutch (1) rotates in a drive direction and to decrease said friction force when the cup (7) rotates in a direction opposite to the drive direction relative to the cone (5)."

V. The appellant's submissions in respect of the respondent's main request can be summarised as follows:

The subject-matter of claim 1 of the contested patent is a machine element which is defined as having a rotary external member and the action of the coupling member is defined with reference to a drive direction. However, the possibility of rotation of the external member is determined by external constraints and the drive direction of a clutch is merely the direction of torque transmission. E4 relates to a bicycle hub having both a freewheel and a back-pedal brake mechanism, the latter including a one-way clutch which comprises all constructional features of claim 1 of the contested patent and destroys novelty of its subject-matter. The brake sleeve which forms the external member of the clutch of E4 is a rotary member when the hub is not built into a bicycle and the direction of torque transmission through the clutch defines a drive direction.

The closest prior art for consideration of inventive step of claim 1 of the contested patent is known from E3. The subject-matter of claim 1 differs from this prior art one-way clutch only by the feature that the coupling member is adapted to provide a differing level of friction force according to whether the clutch rotates in or opposite to the drive direction. The problem was to provide for differential levels of friction during lock-up and overrun. Drag-springs having such a property are well known in the bicycle industry and E4 discloses such a spring in a one-way clutch and it would be obvious for the skilled person to use this spring in the clutch of E3. Although E4 was published in 1908, E1 is evidence that an improved form of the mechanism was still being developed much more recently. It is not relevant that E4 provides for axial movement of the clutch since contested claim 1 is

silent on this matter.

VI. The counter arguments of the respondent are essentially:

E4 does not disclose a one-way clutch within the meaning of contested claim 1. In particular, the clutch which forms part of the back-pedal brake has no external rotary member and if the brake sleeve were to be allowed to rotate not only would there be insufficient friction to initiate operation of the clutch but the mechanism would not function according to the disclosure of E4. E4 explicitly states that the clutch can be light because it does not transmit a braking force and, because the purpose of the clutch is merely to lock the inner member to a stationary outer member, there is no driving direction.

The subject-matter of contested claim 1 differs from that of E3 by the features in the characterising portion of the claim. The device according to E3 is a modern cage-phased roller clutch with no hint of any problem caused by providing the same frictional force in both directions. If the skilled person were seeking to improve the clutch he would not consider a document which is as old as E4 and which relates not to a driving clutch but to a brake mechanism which relies on axial movement for its operation.

## **Reasons for the Decision**

### *Main request*

1. *Late filed evidence*



1.1 All of the evidence listed under II above with the exception of E1 and E3 was filed after expiry of the 9 month period for filing an opposition according to Article 99 EPC but in respect of the claims in their form as granted. This evidence therefore is not submitted within due time within the meaning of Article 114(2) EPC. According to established case law of the Boards of Appeal the relevance of late filed evidence is an important consideration in respect of whether it should be disregarded.

1.2 E4 discloses a drag-spring operating a one-way clutch and which, implicitly, provides a differential force depending on the direction of relative rotation. E4 therefore is potentially relevant to the decision and, although E4 was disregarded by the Opposition Division, the Board decided to take it into account.

1.3 The documents E7 to E18, on the other hand, contain no disclosure which could be relevant to the decision. These are therefore disregarded by the Board in accordance with Article 114(2) EPC.

2. *Interpretation of claim 1*

The features in claim 1 according to which the resilient coupling member is for "increasing" (final feature of the preamble) and adapted to "increase" and "decrease" (second section of the characterising portion) the friction force find no clear technical support in the embodiments in the specification when read by the skilled person. The Board therefore raised the question with the parties. The appellant expressed no view on the matter. In agreement with the respondent the Board interprets the claim as requiring that the

coupling member produces a differential in the friction force between the clutch member support and one of the internal and external rotary members, whereby the friction force is higher during relative rotation in the drive direction than in the opposite direction. This interpretation is fully consistent with the description of the preferred embodiments.

3. *Novelty of claim 1*

3.1 E4 discloses a bicycle hub incorporating both a freewheel and a back-pedal brake. Forward drive is transmitted from the sprocket "b" mounted rigidly on a driving shell "c" through a first one-way roller clutch "e", "f" engaging the interior of a hub shell "a" and acting as a freewheel. The element "f" forms the cage of the roller clutch and drives a coupling ring "i" by means of ratchet teeth "g", "h". During braking the coupling ring "i" is held stationary by a second one-way roller clutch whilst the cage "f" is rotated backwards by the sprocket "b". The resulting relative rotation between the cage "f" and the coupling ring "i" causes the ratchet teeth to move the coupling ring "i" axially into contact with a braking sleeve "q", "s". The coupling ring "i" forms an inner rotary member of the second one-way roller clutch and it is this clutch which in the opinion of the appellant destroys the novelty of the subject-matter of present claim 1.

3.2 In the second one-way roller clutch a roller "k" (clutch member) is supported in a tapering clutch member space "y" by a cage "n" (clutch member support) having a drag spring "o" (resilient coupling member) mounted thereon for engagement with the interior of the brake sleeve "q", "s" which forms the external member

of the clutch. However, it is clearly derivable from E4 that a projection (without reference) on a cone "p" (see Figure 3) which is prevented from rotating by an arm "u" engages the brake sleeve "q", "s". It follows that the external member of the clutch (the brake sleeve) is not "rotary" as required by present claim 1. The appellant argues that the brake sleeve would be a rotary member if the hub were not mounted on a cycle. The Board cannot accept this argument because, firstly, this does not correspond to the teaching of E4 which relates not to the clutch in isolation but to a mechanism whose function requires that the brake sleeve should not rotate and, secondly, there is no disclosure in E4, even implicit, that the second one-way clutch would operate as intended in the event that the brake sleeve could rotate.

3.3 The Board therefore concludes that the subject-matter of present claim 1 is novel (Article 54 EPC).

4. *Inventive step of claim 1*

4.1 It is not disputed that E3 represents the closest prior art. In the clutch according to E3 rollers 30 (clutch members) are supported in a cage 32 (clutch member support) between internal and external rotary members 22 and 24 respectively, the latter having recesses therein which form tapered clutch member spaces. A series of drag springs 36 (resilient coupling members), which are attached to the cage and located between it and the internal rotary member are symmetrical in side elevation and there is no disclosure as regards any difference in friction force in the two directions of relative rotation of the internal and external rotary members. It was not

disputed by the parties that the skilled person would understand that the friction force produced by the drag springs would be essentially equal in both directions. The rollers are located in pockets in the cage by means of resilient pocket liners which provide a force on the rollers which is directed radially outwards and holds the rollers out of contact with the internal rotary member when the clutch is in the overrun condition, thereby reducing drag and wear (column 2, lines 20 to 22). The tangential component of the resultant reaction force between the rollers and the tapered recesses moves the rollers in the overrun condition to the trailing end of the recesses (column 2, lines 16 to 20), this acting in addition to the friction force created by the drag springs. When the relative rotation of the internal and external rotary members is reversed the friction force of the drag springs is opposed to the tangential component of the reaction force and moves the rollers into their locking position. It follows that in the clutch according to E3 the force serving to move the rollers into the locking position is lower than that serving to move them out of it. According to E3 the particular form of drag spring shown in the figures is the most economical but any drag means which translates some portion of the relative rotation of the internal member to the cage could provide the necessary cage shifting force (column 5, lines 5 to 9).

- 4.2 E3 thus discloses all features of the preamble of present claim 1 and also the first characterising feature, that the coupling member is attached to the clutch member support. The subject-matter of present claim 1 differs from that of E3 in the final feature of the claim, namely that the coupling member produces a

differential friction force in dependence on the direction of relative rotation of the internal and external members and being higher in the drive direction (cf. 2 above). This has the effect that the imbalance in tangential forces acting on the cage during locking and during overrun may be reduced or reversed. The problem to be solved was to reduce the losses in the clutch during overrun whilst maintaining the efficiency of locking in the drive direction.

4.3 E3 does suggest that alternative drag means may be used but the emphasis is on "providing the necessary cage shifting force" and the skilled person understands that this refers to the force to shift the rollers in the direction towards the locking condition since that is the drag spring's primary function (see E1 page 2, lines 16 to 20). Indeed, in the clutch according to E3 this is the only force which drives the rollers into the locking position, in opposition to the tangential component of the reaction force which always attempts to shift the cage in the other direction. Whilst E3 does address the problem of reducing frictional losses during overrun, this is achieved using the resilient pocket liners and there is no suggestion to modify the drag spring to this end. For these reasons the Board considers that the skilled person wishing to improve the clutch according to E3 would not be encouraged by that teaching to seek a drag spring providing a directionally dependent differential in the friction force.

4.4 As regards the teaching of E4, the component of the hub in that disclosure which in its function most closely corresponds to the clutch of E3 is the freewheel roller clutch arrangement "e" about which E4 is silent in

respect of any drag spring. Moreover, although the disclosure of E4 is essentially concerned with the clutch which forms part of the back-pedal brake and which comprises the drag spring "o", it is silent as regards that spring's properties. It is therefore the Board's view that, even if the skilled person were to consider E4 when seeking a solution to the problem existing in respect of E3, he would receive no teaching which would lead him to arrive at the subject-matter of present claim 1.

- 4.5 The Board concludes from the above that the subject-matter of present claim 1 involves an inventive step (Article 56 EPC).

5. *Claims 2 to 17*

The subject-matter of claim 17 is more restricted than that of claim 1 in as far as the clutch is designated as a bicycle clutch and some component parts are defined in a more detailed way (the external and internal members are designated as a cup and a cone respectively and the clutch members are designated as rollers). Since claim 17 and also claims 2 to 16 contain all of the features of claim 1 the above conclusions regarding novelty and inventive step apply equally to these claims.

Since the respondent's main request is allowable consideration of the respondent's auxiliary request would be superfluous.

**Order**

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

The appeal is dismissed.

The Registrar:

The Chairman:

S. Fabiani

S. Crane