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**Datasheet for the decision  
of 23 October 2007**

**Case Number:** T 0482/05 - 3.2.01

**Application Number:** 00106087.0

**Publication Number:** 1040993

**IPC:** B62M 11/16

**Language of the proceedings:** EN

**Title of invention:**

Rotatable seal assembly for a bicycle hub transmission

**Patentee:**

SHIMANO INC.

**Opponent:**

SRAM Deutschland GmbH

**Headword:**

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**Relevant legal provisions:**

EPC Art. 56, 100(b)

EPC R. 57a

**Keyword:**

"Disclosure - sufficiency - (yes)"

"Inventive step - general technical knowledge"

"Opposition procedure - amendment admissible (yes)"

**Decisions cited:**

G 0001/84, T 0194/89, T 0794/94, T 0323/03

**Catchword:**

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Case Number: T 0482/05 - 3.2.01

**D E C I S I O N**  
of the Technical Board of Appeal 3.2.01  
of 23 October 2007

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**Decision under appeal:** Interlocutory decision of the Opposition  
Division of the European Patent Office posted  
14 February 2005 concerning maintenance of  
European patent No. 1040993 in amended form.

**Composition of the Board:**

**Chairman:** S. Crane  
**Members:** J. Osborne  
T. Karamanli

## Summary of Facts and Submissions

I. The opponent's appeal is directed against the decision posted 14 February 2005 according to which, account being taken of the amendments made by the patent proprietor during the opposition proceedings, the patent and the invention to which it relates were found to meet the requirements of the EPC.

II. The following evidence played a role during the appeal proceedings:

E9: EP-A-0 021 734.

III. During oral proceedings held on 23 October 2007 the appellant requested that the decision under appeal be set aside and the patent revoked. The respondent requested that the patent be maintained in amended form on the basis of a main request or an auxiliary request, both submitted during the oral proceedings.

IV. Claim 1 according to the respondent's main request reads:

"A bicycle hub comprising:  
a hub shell (23) that rotates around a hub axis,  
wherein the hub shell (23) has at least one of a hub  
coupling projection (132,232) and a hub coupling groove  
(136,236);  
an inner member disposed coaxially with the hub shell  
(23);  
a transmission (10) for communicating a driving force  
to the hub shell (23) through a plurality of  
transmission paths; and

at least one seal (100,200) including:

- an annular housing (104,204) including at least one side wall (120,220) having an outer peripheral surface (124,224) and an inner peripheral surface (128,228), wherein the side wall has at least one of a side wall coupling projection (132) and a side wall coupling groove engaging the at least one of the hub coupling groove (136,236) or hub coupling projection (132,232), respectively and wherein the side wall (120,220) defines a plurality of circumferentially disposed slots (184);
- an annular seal member (108,208) retained to the housing, extending substantially radially inwardly and contacting the inner member,

wherein the inner member comprises a driving member (22) rotatably mounted around the hub shell (23) for supplying the driving force to the hub shell (23), or wherein the inner member comprises a bearing cone (35), and the hub shell (23) rotates relative to said bearing cone (35)."

Claim 1 according to the auxiliary request differs by the addition of the following wording:

"and the plurality of slots (184) extend through an end of the side wall (120,220) that is coupled to the shell, wherein a seal coupling projection (150) extends substantially radially inwardly from the side wall (120,220), and wherein the seal member (108,208) includes a seal coupling groove (154) substantially engaging the seal coupling projection."

Claim 1 according to the auxiliary request is followed by claims 2 to 10 which specify features additional to

those of claim 1. Claim 10 according to the auxiliary request reads:

"The bicycle hub of claim 1, wherein the seal member (108,208) is formed of a resilient material and the housing (104,204) is formed of a material that is more rigid than the seal member."

V. The appellant's submissions may be summarised as follows:

In respect of the feature in claim 1 of the slots the patent does not disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art (Article 100(b) EPC). According to the patent specification prior art labyrinth seals were insufficiently effective. Whilst contact seals were more effective they were subject to wear yet mounted in a way which rendered their replacement difficult. The problem was to provide an effective, easily replaceable seal. The solution is a contact seal mounted using a slotted housing to provide a snap fit. However, the slots potentially allow the ingress of contamination, thereby negating the improvement achieved by using the contact seal. It is implicit from the provision of grease retaining grooves that the fit of the seal housing on the hub has no sealing function. There is no teaching how to dimension the components to achieve the desired improvement in sealing performance and the skilled person would be unduly burdened by the resulting need to experiment.

Claim 1 does not involve an inventive step because it fails to solve a problem. As set out in respect of

sufficiency of disclosure, the problem of contaminant ingress merely moves from the location of the bearing cone to the location where the seal is mounted on the hub shell.

The subject-matter of claim 1 is also obvious in the light of E9 which acknowledged the earlier prior art of a contact seal and set out to solve the two problems of reducing wear of the seal and facilitating its replacement. In accordance with the embodiment of E9 figure 3 the first problem was solved by using a labyrinth seal and the second by a snap-on fitting with a "circumferentially interrupted" projection. The subject-matter of claim 1 according to the main request differs from that embodiment by the features of the contact seal and the slots. If the performance of the labyrinth seal were found to be inadequate it would be obvious for a skilled person to simply revert to a contact seal since the snap-on fitting now allows easy replacement. The skilled person would adopt slots in the light of the teaching of E9 that the projection be "interrupted". Claim 2 of the main request is evidence that the slots of claim 1 need not extend through the side wall. Nevertheless, that would be the most obvious solution, as set out in claim 1 according to the auxiliary request. The provision in that claim of the further additional feature of the radially extending coupling projection falls within the normal ability of the skilled person.

Claim 10 according to the auxiliary request is a dependent claim which has been added during the opposition procedure. This amendment was not necessitated by a ground for opposition and in

accordance with decision T 794/94 is not admissible. The feature is already present in a more limited form in claim 9.

VI. The respondent essentially countered that:

As regards the objection of insufficient disclosure the EPC has no requirement for a technical improvement. Figures 9, 10 of the patent specification are almost of detail drawing standard and provide the skilled person with sufficient information. As correctly determined by the opposition division, various standards of sealing are possible. The prior art labyrinth seal was of a relatively simple construction which provided a less effective seal than the contact between the housing and the hub according to the present invention.

As regards inventive step of claim 1 according to the main request E9 teaches away from the use of a contact seal. Moreover, the relevant disclosure is of only the projection being "interrupted". The additional features of claim 1 according to the auxiliary request relating to the slots in the end of the side wall provide the combined benefits of sealing to the hub and ease of removal. The further additional features permit improved sealing by allowing the seal member to be made of a softer material and are not known in the available state of the art.

Claim 10 according to the auxiliary request was introduced because it contains a feature which was only in claim 1 as granted which now has been deleted. It follows that the amendment was occasioned by a ground for opposition.

## **Reasons for the Decision**

1. The patent relates to a sealing arrangement between relatively rotating components in a bicycle hub. It is acknowledged in the patent specification that both contact and non-contact (labyrinth) seals were previously known in this technical field. According to the patent specification the labyrinth seal provided inadequate sealing. The contact seal provided adequate sealing but was subject to wear and its press-fit mounting rendered its replacement difficult. The patent aims to provide a bicycle hub having an easily replaceable contact seal. The seal adequately excludes contaminants and is retained by a projection in a groove. A series of slots in the housing render the projection easily removable from the groove to facilitate replacement of the seal.

### *Main request*

### *Sufficiency of disclosure - Article 100(b) EPC*

2. The patent specification discloses two embodiments of the seal which is included in the subject-matter of claim 1. The first, illustrated in figures 9 and 10, is on the drive side of the hub and the second, in figure 11, is on the opposite side. The seals themselves are similar and as far as the matter of sufficiency of disclosure is concerned there are two important differences between the respective disclosures. In the first embodiment the hub shell outer surface is provided with grease retaining grooves



which are not present in the second and whereas the cross-sectional view in figure 9 illustrates the cylindrical portion of the seal housing in contact with the hub shell the corresponding figure 11 shows them spaced apart.

- 2.1 It is implicit that in both embodiments the barrier to ingress of contaminants between the side wall and the hub shell must be appropriate to the desired degree of sealing. As correctly determined by the opposition division, various degrees of "sealing" may be provided in dependence on, for instance, the quality level and intended duty of the hub on which the seal is mounted. The skilled person accordingly would dimension the fit between these two plain portions as part of the detail design process which belongs to his normal activity. Similarly, it falls within his normal activity to dimension the slots in the light of the chosen thickness and material of the side wall.
- 2.2 The appellant argued that the provision of the grease retaining grooves on the drive side for capturing grease from the chain indicates that the plain portions do not, in fact, serve as an effective seal. As a result, it is further argued, the problem of improving on the effectiveness of a labyrinth seal cannot be solved. The problem as set out in the patent specification is not as stated by the appellant but is merely to provide a sealing system which can be removed and replaced easily (paragraph [0005]). Nevertheless, since the claims are directed towards subject-matter including a contact seal, it is implicit that the seal resulting from the fit between the housing and the hub would of a similar standard. However, the grease

retaining grooves are not an essential feature, they do not appear in any of the claims and, indeed, their purpose is not even discussed in the patent specification. Under these circumstances it is not possible to use their provision in the one embodiment to draw any conclusion which puts the overall disclosure into question.

2.3 The appellant further argued that the need to experiment with the various dimensions of the seal would place an undue burden on the skilled person. The board disagrees. The dimensioning of the slots in accordance with the properties of the material of the side wall and its thickness is routine work for the skilled person and would involve little experimentation, if any. The same applies as regards specification of the fit between the seal side wall and the hub shell in the light of normal considerations of costs and manufacturing tolerances.

2.4 On the basis of the foregoing the board concludes that the opposition ground according to Article 100(b) EPC is not prejudicial to maintenance of the patent.

*Inventive step*

3. E9 relates to a derailleur-equipped bicycle hub having a sealing arrangement between the hub shell and an inner member in the form of a stationary bearing cone. It acknowledges earlier prior art comprising contact seals, stating that they were "more or less in contact ... resulting in incomplete sealing and/or increased frictional resistance". It states that the earlier prior art both hindered "smooth and light

rotation" and suffered from wear, necessitating frequent replacement and resulting in incomplete sealing. The object was to minimise one or more of the recognised disadvantages. The solution is to provide a labyrinth seal mounted by *inter alia* a snap-on fitting. In a particular embodiment a divided rubber sealing member formed to create a labyrinth passage in conjunction with the bearing cone is mounted on a member having a projection to provide a "snap-fit" in a groove on the hub shell. In order to allow the projection to pass over the hub shell before entering the groove it is either elastically deformable to enable radial expansion or "circumferentially interrupted".

3.1 The subject-matter of present claim 1 differs from the seal according to E9 by the following features:

- (a) the seal member contacts the inner member; and
- (b) the side wall defines a plurality of circumferentially disposed slots.

These features have the respective effects of providing an alternative to the labyrinth seal of E9 and providing a practical implementation of the snap-fit mounting employing circumferential interruptions. Since the features have no functional relationship they are to be considered separately in judging inventive step.

3.2 Although E9 provides the labyrinth seal as an alternative to the contact seal the disclosure concentrates on the various mounting arrangements. It is apparent that although the possibility of easy

replacement is less important with the labyrinth seal this is nevertheless provided by the snap-fit mounting. If the skilled person having adopted the labyrinth seal with the snap-fit mounting were to find that the sealing performance were inadequate it would be obvious for him to simply revert to a contact seal by replacing the features defining the labyrinth and thereby arrive at feature (a). The teaching of E9 that the labyrinth seal in some respects is advantageous would not hinder him from rejecting it on the basis of inadequacy in its primary function.

3.3 The somewhat vague teaching of E9 that the "projection ... be ... interrupted" leaves the skilled person with the need to provide a practical solution. He learns from the use of the same expression elsewhere in E9 (page 4, lines 4 to 8) that it is intended to signify that the projection be split. He also is aware that E9 does not clearly distinguish between the projection and the adjacent endmost portion of the side wall. Indeed, when it states in the text that the projection is engaged in a groove figure 3 illustrates not just what is clearly the projection but also a great part of the local thickness of the side wall accommodated in the groove. In the board's view the skilled person when presented with this teaching in the light of his general technical knowledge would readily consider slots through the entire thickness of the side wall as a practical implementation of the embodiment.

3.3.1 The respondent takes the view that E9 contains two distinct and alternative teachings for achieving the snap-fit and that, as a result, the interrupted projection is not disclosed in combination with the

possibility of flexing to allow the projection to expand. However, in the board's view the skilled person would understand the circumferential interruptions as being an alternative to the elastic deformation of the projection whilst both would require the bending of the connecting portion.

3.3.2 The board therefore considers that it would be obvious also to arrive at feature (b).

3.4 On the basis of the foregoing the board finds that the subject-matter of claim 1 according to the main request does not involve an inventive step (Article 56 EPC) and the request therefore fails.

#### *Auxiliary request*

#### *Amendments*

4. The appellant raised no objection to either the amendment of claim 1, which is merely a combination of granted claims, or the consequential modification of the description. However, it argued that the introduction of dependent claim 10 is not admissible in the light of decision T 794/94 (not published in OJ EPO).

4.1 The patent specification as granted contained two independent claims. Claim 12, from which present claim 1 derives, was directed to a bicycle hub. Claim 1, on the other hand, was directed to a seal for a bicycle hub having *inter alia* the feature that "the housing is formed from a material that is more rigid than the seal member formed from a resilient material". No claim

directed to the hub contained a corresponding feature although claim 24, which has become present claim 9, specified that "the housing is substantially formed from metal and ... the seal member is substantially formed from rubber". During opposition proceedings granted claims 1 to 11 were deleted and the above-mentioned feature of granted claim 1 was introduced into what has become present claim 10.

4.2 In as far as the opposition procedure is not designed to be and not to be misused as an extension of the examination procedure, see decision G 1/84 (OJ EPO 1985, 299), the addition of features in a dependent claim which were not present in the granted claims is not admissible. Such an amendment would be inadmissible in accordance with Rule 57a EPC which states that the claims of a patent "may be amended, provided that the amendments are occasioned by grounds for opposition ...". However, in the present case the introduction of present claim 10 merely retains in the claims a feature which was present in a granted claim which as a result of the opposition has been deleted. It follows that the introduction of present claim 10 is an amendment occasioned by a ground for opposition and is not a result of the respondent taking an opportunity to reconsider which features it includes in the claims.

4.3 The appellant draws support for its view from decision T 794/94 (not published in OJ EPO). However, that decision in the relevant paragraph 2.2.4 of the reasons relates to "the addition of dependent claims which do not correspond to any claims as granted". As explained above, the subject-matter of present claim 10 was

contained in the claims as granted so the facts are different in the present case.

4.4 The existence of present claim 9 also does not prejudice the amendment. Whereas claim 10 depends directly from claim 1, claim 9 is dependent from claim 8 which specifies that the coupling groove is positioned on the outside circumference of the hub shell. As a result, whilst claim 9 *per se* may be more broadly formulated than claim 10 the respective subject-matters differ substantially.

4.5 On the basis of the foregoing the board finds that the addition of present claim 10 is an admissible amendment.

*Inventive step*

5. Claim 1 according to this request contains the additional features that:

- (c) the plurality of slots extend through an end of the side wall that is coupled to the shell;
- (d) a seal coupling projection extends substantially radially inwardly from the side wall; and
- (e) the seal member includes a seal coupling groove substantially engaging the seal coupling projection.

5.1 In the embodiment of E9 figure 3 the seal housing essentially consists of the side wall and an end flange. The divided seal member, which may be of resiliently deformable material, extends over essentially the entire radial distance from the sealing portion

adjacent the bearing cone to the side wall where it is trapped between the flange and side wall. The other embodiments are either similar (figures 4 to 6) or the seal member extends further to overlap the end face of the side wall (figure 7 to 9). The seal member may be of a resiliently deformable material but its radial extent would necessitate that it be sufficiently rigid to support the sealing portion in its desired location. The resulting limitations on the properties of the material would restrict its suitability for development into a contact seal.

- 5.2 Features (d), (e) in present claim 1 allow substantial separation of the functions of sealing and support of the seal member. As a result, the material of the sealing member may be selected in accordance with its primary duty, thereby allowing optimization of the performance of the seal. E9 contains neither any information relating to the construction of earlier prior art contact seals nor any suggestion which would lead the skilled person to provide features (d), (e). Moreover, the appellant has not relied on any other evidence but argues that features (d), (e) are merely the result of the normal activity of the skilled person. However, the normal activity of the skilled person is to apply his general knowledge of both his technical field and everyday life in a routine fashion and refine the results as necessary using conventional techniques such as trial-and-error testing. Given that there is no evidence before the board that features (d), (e) fall within such general knowledge the presently claimed arrangement cannot be regarded as obvious.



6. The appellant argues that the subject-matter of the claim fails to solve a problem and therefore cannot involve an inventive step. It contends that whilst the exclusion of contaminants by the seal member itself may be improved in comparison with a labyrinth seal the problem of fit between the side wall and the hub shell renders the overall performance no better. This contention relates not to a failure to solve a problem but to an alleged lack of technical advantage. However, the EPC does not require a technical advantage as the basis for recognising the presence of inventive step, cf. T 194/89, reasons 3.6 and T 323/03, reasons 2.7 (both not published in OJ EPO).
  
7. On the basis of the foregoing the board concludes that the subject-matter of claim 1 according to the auxiliary request is regarded as involving an inventive step (Article 56 EPC). Since claims 2 to 10 according to the auxiliary request contain all features of claim 1 this conclusion applies equally to those claims.

**Order**

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

1. The decision under appeal is set aside.
  
2. The case is remitted to the first instance with the order to maintain the patent in amended form on the basis of the following documents:
  - claims 1 to 10 as submitted during oral proceedings;
  
  - description pages 2 to 8 as submitted during oral proceedings;
  
  - drawings as granted.

The Registrar:

The Chairman:

A. Vottner

S. Crane