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D E C I S I O N
of 22 March 2001

Case Number: T 0232/00 - 3.2.1

Application Number: 90312247.1

Publication Number: 0427553

IPC: F16J 15/32, F16J 15/40

Language of the proceedings: EN

Title of invention:
Shaft sealing arrangements

Patentee:
The BOC Group plc

Opponent:
CR Elastomere GmbH

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 123(2)(3)

Keyword:
"Novelty (yes)"
"Inventive step (yes, after amendments)"
"Change of category"

Decisions cited:
G 0002/88

Catchword:
-



Case Number: T 0232/00 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 22 March 2001

Appellant: The BOC Group plc
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Surrey GU20 6HJ (GB)

Representative: Bousfield, Roger James
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Respondent: CR Elastomere GmbH
(Opponent) Düsseldorf Strasse 121
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Representative: -

Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 22 December 1999
revoking European patent No. 0 427 553 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: F. A. Gumbel
Members: J. Osborne
G. Weiss

Summary of Facts and Submissions

I. The patent proprietor's appeal is directed against the decision of the Opposition Division to revoke European patent No. 0 427 553.

II. The patent had been opposed on the grounds of lack of novelty and inventive step and the following evidence was cited:

D1: DE-U-1 981 048

D2: US-A-2 132 249

D3: GB-A-706 876.

The Opposition Division was of the opinion that the subject-matter of Claim 1 amended according to the patent proprietor's main request lacked novelty with respect to D1. An auxiliary request filed during oral proceedings to further amend the subject-matter of the claim was not admitted in accordance with Rule 71a EPC.

III. The written decision of the Opposition Division was posted on 22 December 1999. Notice of appeal together with payment of the appeal fee was received on 21 February 2000 and the reasons for appeal were received on 26 April 2000.

IV. During oral proceedings held on 22 March 2001 the appellant requested that the decision of the Opposition Division be set aside and that the patent be maintained based on Claims 1 to 8 and description filed during the oral proceedings.

The respondent requested that the appeal be dismissed. In addition to arguing that the subject-matter of Claim 1 according to the appellant's request lacked an inventive step, the respondent raised an objection of addition of subject-matter (Article 123(2) EPC) as a result of the amendments made to the claim.

- V. The patent as amended according to the appellant's request contains, in addition to Claim 1, dependent Claims 2 to 8 which relate to preferred embodiments of the subject-matter of Claim 1. The description has been amended essentially only for consistency with Claim 1.

Claim 1 reads as follows, whereby amendments made in comparison with the claim as granted are indicated in bold text:

"**The use of** a sealing arrangement for effecting a seal with a rotatable shaft (1) having with respect to its longitudinal axis a generally cylindrical shape, which comprises a shaft seal (6,40) positioned in a housing (5,42) so that its sealing lip (7,8,30) engages the shaft (1) and defines a first liquid side and a second air side, the shaft (1) having a conical portion (4,21) on the second side whose cross sectional diameter decreases in a direction away from the sealing lip and an annular cavity (9) defined in part by the conical portion (4,21) and also in part by a radially extending apertured plate member (10,41) positioned about the shaft (1) characterised in that **the use is in conjunction with perfluoropolyethers and such that any of the liquid lubricant** escaping from the first liquid side of the seal to the second air side of the seal enters in to and is constrained in the cavity (9) **to**

form a well of the liquid lubricant at the base thereof until sufficient liquid lubricant is present in the cavity (9) to impinge on the conical portion (4,21) of the shaft (1) and thereby be urged by centrifugal force towards the sealing lip (7,8,30)."

VI. The appellant's arguments can be summarised as follows:

As regards the disclosure in the application as originally filed of the use of the seal arrangement in conjunction with perfluoropolyethers, it was disclosed in column 1, lines 34 to 44 of the application as published, relating to the prior art, that difficulties occur in attempting to contain perfluoropolyether lubricants by means of a seal in conjunction with a rotating shaft. By disclosing in column 1, lines 45 to 48 that the invention aims to mitigate or minimise such difficulties by providing a novel seal arrangement there is an implicit disclosure of the use of such a seal arrangement in conjunction with perfluoropolyethers.

As regards novelty and inventive step, no cited document relates to the use of a sealing arrangement in conjunction with perfluoropolyethers. D1 is unclear in its teaching in respect of whether the inner or outer part of the bearing rotates and so should be disregarded as not relevant. According to D2 a conical portion on the rotating shaft is not disclosed as moving oil towards a seal and there would be no reason for it to do so.

VII. The respondent essentially reasoned that:
The original application disclosed the lubricants termed as perfluoropolyethers only in respect of the

prior art. The original claims related only to the sealing arrangement itself and there was no suggestion for the skilled person that the sealing arrangement would be used with these lubricants. Moreover, there was no indication that protection would be claimed in respect of the use of the sealing arrangement. Amended Claim 1 therefore offends the provisions of Article 123(2) EPC.

The shaft of D1 is stationary and the constructional features of Claim 1 in suit are merely a kinematic inversion of the arrangement known from D1. D2 discloses all of the constructional features of Claim 1 in suit and it is implicit for the skilled person that the rotating conical portion on the shaft will exhibit the same functional feature as is defined in the claim. The only novel feature in comparison with the prior art therefore is the use of the sealing arrangement with perfluoropolyethers. However, both of the prior art sealing arrangements are suitable for such a use.

Reasons for the Decision

1. The appeal is admissible.
2. *Amendments*
 - 2.1 Claim 1 as granted defined a sealing arrangement and so the amendment to define a use concerns a change of category after the patent has been granted. The question whether such a change is in compliance with the provisions of Article 123(3) EPC in such a case was answered positively in decision G2/88 (Point 5 of the reasons) and, since the respondent has not challenged

this point, need not be considered further. However,

the respondent does challenge in accordance with the

provisions of Article 123(2) EPC the disclosure of the application as originally filed in respect of both the use of the sealing arrangement with perfluoropolyethers and the possibility of claiming protection for its use.

2.2 The application as originally filed begins by discussing prior art arrangements for sealing against a rotating shaft in general and in column 1, lines 34 to 44 explains that particular problems existed in respect of perfluoropolyether lubricants which exhibit low surface tension and so are difficult to contain with a conventional shaft seal. In the subsequent text (column 1, lines 45 to 48) it is stated that the invention is concerned with a sealing arrangement which in general overcomes, or at least mitigates or minimizes, such difficulties. Those difficulties will be overcome only if the sealing arrangement is actually used with perfluoropolyethers and the use of the sealing arrangement in conjunction with perfluoropolyethers is therefore implicitly disclosed. Moreover, the claimed effect of the use of the sealing arrangement "such that any of the liquid lubricant escaping ... enters in to and is constrained in the cavity to form a well of the liquid lubricant at the base thereof until sufficient liquid lubricant is present in the cavity to impinge on the conical portion of the shaft and thereby be urged by centrifugal force towards the sealing lip" is implicit from the disclosure of the application as originally filed in column 2, lines 14 to 20 relating to the sealing arrangement having the radially extending apertured plate member which now forms part of the subject-matter of Claim 1.

2.3 The respondent's objection under Article 123(2) EPC in

respect of the change of category of Claim 1 relates to the question of disclosure in the application as originally filed of the protection which is to be sought. As set out by the Enlarged Board of Appeal in Decision G 2/88 in Point 5 of the reasons, 3rd paragraph, it is generally accepted as a principle underlying the EPC that a patent which claims a physical entity *per se* confers absolute protection upon that physical entity, including for all uses thereof. It follows that a claim in an application as originally filed to a product is a disclosure of seeking protection which would cover also the use of that product. The claims as originally filed in the present case relate to a sealing arrangement and the amendment of the category of the claims to the use of the sealing arrangement serves merely to exclude some of the protection which effectively would have been afforded by the product claims. Since this use was implicitly addressed in the original application (see paragraph 2.2) the amendment of the category of Claim 1 does not lead to the subject-matter of the application extending beyond the content of the application as originally filed.

2.4 The description and the dependent claims have been amended essentially only for consistency with Claim 1.

2.5 The Board therefore finds that the requirements of Article 123(2) EPC are fulfilled.

3. *Novelty*

None of the cited prior art documents relates to the use of a sealing arrangement in conjunction with perfluoropolyethers and following amendment of Claim 1

to define such a use the Board is satisfied that the subject-matter of the claim is novel. Indeed, the respondent no longer objected in accordance with Article 54 EPC.

4. *Inventive step*

4.1 The problem to which the subject-matter of the patent relates is that of providing a seal to a rotatable shaft to satisfactorily constrain perfluoropolyether lubricants, which exhibit a low surface tension (column 1, lines 36 to 50). The wording of Claim 1 requires that the sealing arrangement is used "such that ... lubricant ... is constrained ... to form a well ... until sufficient liquid lubricant is present ... to impinge on the conical portion of the shaft and thereby be urged by centrifugal force towards the sealing lip ... ". Since this effect of centrifugal force requires that the shaft rotates, it follows that the subject-matter of the claims necessarily involves the rotation of the shaft in providing the improved sealing properties.

4.2 D1 concerns a sealing arrangement for a vehicle wheel bearing (page 1, 1st paragraph). In the detailed embodiment the sealing arrangement is between the wheel hub 1 and the axle 2 on which the wheel is mounted by means of a taper-roller bearing 3, 4, 5, the inner race 5 of which is shown in the sole figure as being mounted on and, implicitly, stationary relative to the axle 2. The inner race 5 is shown but not described in the text, as having a conical portion which, together with the sealing lip 12 engaging the inner race 5 and a dust protection lip 10 in the form of a radially extending apertured plate member engaging the axle 2, defines a

cavity 14. In the opinion of the Board it is implicit for the skilled person that in the disclosed embodiment the wheel rotates around the stationary axle. Moreover, taper-roller bearings in vehicle wheel assemblies are lubricated by grease which according to D1 fills the cavity 14 (description, final sentence). It follows that there is no disclosure regarding a function of the conical portion to urge liquid towards the sealing lip 12 by means of centrifugal force. The Board is of the opinion that the skilled person wishing to achieve satisfactory sealing to a rotating shaft to constrain perfluoropolyethers would not choose as the starting point a sealing arrangement such as is disclosed in D1 in which the shaft is stationary and the seal is effective against a lubricant having quite different physical properties. D1 therefore does not form the closest prior art for Claim 1.

- 4.3 D2 concerns an improvement in oil lubricated bearings in traction motors subjected to movement or vibration which causes splashing of the oil (page 1, left hand column, lines 1 to 22). The prior art arrangement from which D2 starts employed a felt member 18 partially immersed in a reservoir of oil and which served to provide oil to a rotating shaft member 11 carried in the bearing (page 1, right hand column, lines 11 to 35). Oil was present on both sides of the felt member by virtue of its passage through peripheral openings 16a, 17a in washers 16, 17 which housed the felt member. Since the oil was on both sides of the felt member, D2 starts from an arrangement which does not have a shaft seal with a sealing lip defining an air side and a liquid side. The improvement which D2 aims to achieve is to prevent the oil from splashing from the reservoir level 20 up to the level of the shaft and

for this purpose a seal member 25 is introduced adjacent one of the washers 17. A conical portion located within a cavity defined between the seal member 25, the washer 17 and a radially extending apertured member 22 is shown on the rotating shaft member 11 but is not mentioned in the text. However, even with this additional seal member 25, there is no disclosure for the skilled person that a sealing arrangement defining an air side and a liquid side is achieved. Therefore also D2 does not form the closest prior art for Claim 1.

4.4 D3, which was not used by the respondent during the appeal procedure, relates to a seal between the inner and outer races of a ball bearing and also in the opinion of the Board is not of relevance to the present case.

4.5 In the opinion of the Board the closest prior art is that which the appellant acknowledges in the description of the patent specification (column 2, lines 9 to 12) as corresponding to the preamble of Claim 1 as granted, whereby the novel constructional features are those relating to the annular cavity. In the use defined in Claim 1 in suit, perfluoropolyethers which escape past the sealing lip may be thrown from the shaft and build up in the annular cavity until sufficient liquid is present to contact the conical surface and thereby be propelled back towards the seal. In the absence of the annular cavity, liquid passing the lip seal would be thrown from the shaft and would be lost. The novel features of Claim 1 therefore solve the problem of reducing the loss of perfluoropolyether lubricant which leaks past the seal of a rotating shaft.

4.6 Neither D1 nor D2 relates to the problem solved by the novel constructional features. Since the shaft 2 of D1 does not rotate, any liquid which might pass the lip seal 12 would not be thrown to the base of the cavity 14 but would simply remain on the surface of the inner race 5 and centrifugal force could not serve to return the liquid to the area of the lip seal. As regards a kinematic inversion of the sealing arrangement of D1 resulting in rotation of the shaft 2, as suggested by the respondent, there is no reason for the skilled person to expect that the arrangement would be suitable for use with perfluoropolyethers since they exhibit such different physical properties to the grease with which D1 is intended to be used and the skilled person therefore would receive no encouragement in this direction. The seal member 25 which is added to the arrangement according to D2 and which forms an annular cavity is specifically provided for controlling movement of fluid from the oil reservoir towards the shaft, in a direction opposite to that of any liquid which might pass between the seal 18 and the shaft. The idea of an implicit teaching in D2 of a well of oil collecting in the cavity, which potentially could be splashed against the shaft, is contrary to the teaching of D2 in adding the seal member 25 in order to avoid oil from being splashed against the shaft. It follows that neither D1 nor D2 gives the skilled person any encouragement to add to the closest prior art sealing arrangement features relating to the annular cavity in order to solve the problem set.

4.7 The Board therefore finds that the subject-matter of Claim 1 does not derive in an obvious way from the prior art and concludes that the subject-matter of Claim 1, and therefore also of Claims 2 to 8, involves

an inventive step (Article 56 EPC).

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 with the following documents:

Claims: 1 to 8 submitted during the oral proceedings on 22 March 2001;

Description: columns 1 to 5 submitted during the oral proceedings on 22 March 2001;

Drawings: as granted.

The Registrar

The Chairman

S. Fabiani

F. Gumbel