Internal distribution code:

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

Datasheet for the decision of 23 October 2020

Case Number: T 0187/18 - 3.2.08

Application Number: 12196480.3

Publication Number: 2604873

IPC: F16C9/02, F16C33/10, F16C17/02

Language of the proceedings: EN

Title of invention:
Main bearing for crankshaft for internal combustion engine

Patent Proprietor:
Daido Metal Company Ltd.

Opponent:
MAHLE International GmbH

Headword:

Relevant legal provisions:
RPBA 2020 Art. 13(2)
EPC Art. 56

Keyword:
Amendment to appellant's case - admitted (no)
Inventive step - (yes)

Decisions cited:

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

Boards of Appeal

Chambres de recours

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0
Fax +49 (0)89 2399-4465

Case Number: T 0187/18 - 3.2.08

D E C I S I O N
of Technical Board of Appeal 3.2.08
of 23 October 2020

Appellant: (Opponent)	MAHLE International GmbH Pragstrasse 26-46 70376 Stuttgart (DE)
Representative:	BRP Renaud & Partner mbB Rechtsanwälte Patentanwälte Steuerberater Königstraße 28 70173 Stuttgart (DE)
Respondent: (Patent Proprietor)	Daido Metal Company Ltd. 13F Nagoya Hirokoji Bldg. 3-1 Sakae 2-chome Naka-ku Nagoya (JP)
Representative:	Beckmann, Claus Kraus & Weisert Patentanwälte PartGmbB Thomas-Wimmer-Ring 15 80539 München (DE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 20 November 2017 concerning maintenance of the European Patent No. 2604873 in amended form.**

Composition of the Board:

Chairman	C. Herberhold
Members:	M. Foulger
	C. Schmidt

Summary of Facts and Submissions

I. With the decision dated 20 November 2017, the opposition division decided that the patent and the invention to which it related according to the then valid first auxiliary request met the requirements of the EPC.

II. The opponent filed an appeal against this decision.

III. Oral proceedings took place before the Board on 23 October 2020.

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

V. The respondent (patent proprietor) requested that the appeal be dismissed or, in the alternative, that the patent be maintained in amended form according to one of the auxiliary requests 1 – 3 filed with the reply to the appeal (letter dated 9 August 2018).

VI. Claim 1 of the main request reads:

"**1.1** A bearing apparatus, comprising:

1.2 a crankshaft main bearing (19; 19'; 19") for a crankshaft for an internal combustion engine; and

1.3 a journal section (10) of the crankshaft which is rotatably supported by the main bearing,

1.4 wherein the journal section includes a lubricating oil path (10a) extending therein, and an inlet opening

(26) of the lubricating oil path that is formed on an outer circumferential surface thereof, and

1.5 wherein the main bearing is composed of a pair of semi-cylindrical bearings (17; 17'; 17", 18; 18'; 18"), and any one of the semi-cylindrical bearings (17; 17'; 17") has an oil groove (17a; 17a'; 17a") formed on an inner circumferential surface (17S) thereof,
1.6 the oil groove extends in a circumferential direction at least through a central portion of the one semi-cylindrical bearing in the circumferential direction

1.7 and is arranged so that the center of the width of the oil groove in an axial direction aligns with the center of the inlet opening of the journal section, and

1.8 an end portion (17E; 17F) of the oil groove in the circumferential direction does not extend to an end surface (17A; 17B) of the one semi-cylindrical bearing in the circumferential direction and therefore the inner circumferential surface extends between the end portion of the oil groove in the circumferential direction and the end surface of the one semi-cylindrical bearing in the circumferential direction to form a separation inner circumferential surface (17S') therebetween, and

1.9 the end surface of the one semi-cylindrical bearing in the circumferential direction to which the oil groove does not extend, and an end surface (18A; 18B) of the other semi-cylindrical bearing in the circumferential direction which is joined to the end surface of the one semi-cylindrical bearing each comprise inclined surfaces (17C; 17D; 18C; 18D) on an inner circumferential surface side that extend

throughout an entire length in the axial direction, so that an axial direction groove (24A; 24B) is formed at a joint portion of the pair of semi-cylindrical bearings, and

1.10 the separation inner circumferential surface extends between the axial direction groove and the oil groove, **characterized in that**

1.11 a length L1 of the separation inner circumferential surface in the circumferential direction is smaller than a length L2 of the inlet opening of the journal section in the circumferential direction, so that the oil groove is communicable with the axial direction groove via the inlet opening of the lubricating oil path,

1.12 the depth of the axial groove (24A; 24B) from the inner circumferential surface (17S´) of the main bearing is 0.1 mm to 1 mm, and

1.13 the width of the axial direction oil groove (24A; 24B) in the circumferential direction on the inner circumferential surface (17S´) of the main bearing is 0.2 mm to 2 mm."

(Feature numbering in bold as used in the impugned decision)

VII. The following documents are referred to in this decision:

D1: DE 10 2005 009 470 A1
D2: EP 2 078 875 A1
D4: EP 1 557 544 A1
D7: EP 2 253 859 A1

VIII. The appellant argued essentially the following:

i) Amendment to the appellant's appeal case

The arguments submitted with the letter of 18 August 2020 were merely a precision of already submitted arguments. D1 and D7 were already in the proceedings. Moreover, the combination of the teachings of D1 and D7 was *prima facie* relevant.

Thus, these arguments should be admitted into the proceedings.

ii) Inventive step

a) D1 as closest prior art

The features 1.1 through to 1.8 were clearly disclosed in D1. Moreover, the relief area 3 could be regarded as a groove because it formed a depressed strip of material compared to the rest of the bearing surface. Thus, feature 1.9 was also known from D1.

Moreover, there was a separation inner circumferential surface 4 between the end of the circumferential groove 5 and the relief area 3 (feature 1.10). Taking the angle of 1° mentioned in paragraph [0025] and typical dimensions of a main bearing and its oil inlet opening led to feature 1.11 also being derivable from D1.

The width and depth of the axial groove was merely a matter of normal design practice for the skilled person. The skilled person would therefore have arrived at the subject-matter of claim 1, when dimensioning the

axial groove to enable foreign matter to be removed as known from document D2, without the exercise of inventive skill.

b) D7 as closest prior art

D7 disclosed a main bearing 3 and a connecting rod bearing 5. The main bearing showed features 1.1 - 1.5 of claim 1. The chamfers at the circumferential ends of the half-bearing formed an axial oil groove (feature 1.9). The size of the chamfers was disclosed in paragraph [0015], hence features 1.12 and 1.13 were also known from D7. In paragraph [0025] it was stated that aspects relating to the connecting rod bearing could also be applied to the main bearing.

In order to control the outflow of oil from the main bearing, D4 (see Fig. 4) proposed a separation inner circumferential surface between the circumferential and axial oil grooves.

The skilled person would have applied this concept to the main bearing known from D7 and would thereby have arrived at the subject-matter of claim 1 without the exercise of inventive activity.

IX. The respondent argued essentially the following:

i) Amendment to the appellant's appeal case

The inventive step attack based on the combination of the teachings of D1 and D7 raised in the letter dated 18 August 2020 was indeed an amendment to the appellant's case.

ii) Inventive step

a) D1 as closest prior art

D1 did not disclose an axial groove because the stress relief did not have inclined surfaces. Hence, features 1.8 - 1.13 were not known from D1. Even taking the teachings of D2 or the common general knowledge of the skilled person into account would not have enabled the skilled person to arrive at the subject-matter of claim 1.

b) D7 as closest prior art

D7 related primarily to the connecting rod bearing. The main bearing disclosed did not have a separation inner circumferential surface. Paragraph [0025] may well disclose that the invention could be applied to the main bearing, but no details were given as to which aspects could be so applied. It was emphasized that none of the cited documents disclosed directly and unambiguously feature 1.11. The skilled person would therefore have had to combine elements from the main bearing, the connecting rod bearing, D2 and common general knowledge in order to arrive at the subject-matter of claim 1.

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

Reasons for the Decision

1. Amendment to the appellant's appeal case

The appellant initially - with the statement setting out the grounds of appeal - only argued that the

subject-matter of claim 1 did not involve an inventive step based on the teachings of the following combinations of documents: D1 and D2, D7 and D4. With the letter dated 18 August 2020, the appellant introduced a new line of attack based on the combination of documents D1 and D7.

The argument that this was admissible was not convincing. The Board could not view a new combination of documents as being a precision ("präzisiert") of a previously pleaded line of argumentation. According to Article 13(2) RPBA, a change in a party's case after notification of a summons to oral proceedings shall not be taken into account unless there are exceptional circumstances which have been justified with cogent reasons by the party concerned. Hence, an alleged *prima facie* relevance is not *per se* a consideration. The appellant did not identify any special reasons for the amendment to their case and consequently the Board did not admit this into the proceedings.

2. Inventive step

2.1 Considering D1 as closest prior art

2.1.1 Disclosure of D1

It is common ground that D1 discloses features 1.1 - 1.8 of claim 1.

The respondent disputed that the feature 1.9, relating to the axial oil groove, was known from D1, i.e. whether the crush relief (Figure 1, item 3) could be regarded as a groove in the sense of the claim.

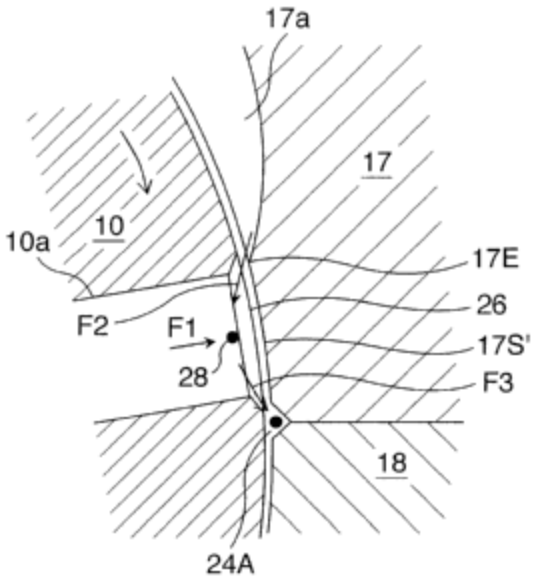
As argued by the appellant, it is correct that the crush relief 3 in D1 presents a depression in the surface of the bearing. However, the crush relief does not have inclined walls as claimed but rather a curved form (see paragraph [0020]: "konkav ... ausgeschnitten"). Also, the depth of the crush relief disclosed in D1, paragraph [0020], is much smaller (0.01 - 0.05 mm) than the depth of the groove defined in claim 1 (feature 1.12: 0.1 - 1 mm).

Thus, the crush relief of D1 cannot be seen as fulfilling the definition of the axial oil groove given jointly in features 1.9, 1.12 and 1.13 of the claim and consequently these features are not known from D1.

Furthermore, features 1.10 and 1.11 are not known from D1.

These features have the effect that foreign particles can pass the separation inner circumferential surface as illustrated in Fig. 10 of the patent, reproduced below:

FIG.10



This illustrates the path which the foreign particle 28 takes in order to be evacuated from the bearing. This path is made possible by the relation of the length L1 of the separation inner circumferential surface to the length L2 of the inlet opening of the journal section in the circumferential direction.

This relationship is neither disclosed by any of the cited documents nor does it appear to be part of the common general knowledge of the skilled person. In this respect the calculation of the separation inner circumferential surface length based on an allegedly typical crank shaft diameter derived from a first set of prior art documents (see statement of grounds of appeal, page 8, 9) and an allegedly typical inlet opening size derived from another prior art document D7 cannot be considered a clear and unambiguous disclosure of features 1.10 and 1.11.

2.1.2 Problem to be solved

The problem to be solved is to better evacuate foreign particles from the bearing.

2.1.3 Combination with the teaching of D2

D2 discloses a sliding bearing which seeks to reduce the amount of lubricant that flows out of an oil clearance while inhibiting damage caused by foreign matter. The skilled person would therefore consider the teaching of D2 when attempting to solve the above problem. Hence, the skilled person could well arrive at a bearing with the feature 1.9.

The features 1.10 - 1.13 are however not disclosed directly and unambiguously in D2. Moreover, only once

lengths L1 and L2 are adapted to enable the foreign matter transport path illustrated in Figure 10 of the patent (reproduced above) is there a reason to adapt the axial groove to the transport of such transported foreign matter particles.

Hence, the subject-matter of claim 1 involves an inventive step with regard to D1 as closest prior art.

2.2 Considering D7 as closest prior art

2.2.1 D7 relates principally to a connecting rod bearing 5. A main bearing 3 is also discussed in paragraph [0008]. In paragraph [0025], it is noted that "[f]urthermore, although in the above-described embodiment, the description was given of the case where the present invention is applied to the sliding bearing 5 as the con-rod bearing, it is needless to say that the present invention of the above-described configuration and dimensional setting can be applied also to the sliding bearing 3 as the main bearing."

The main bearing of D7 has the features 1.1 - 1.4. The connecting rod bearing of D7 has the features 1.12 and 1.13 (see paragraph [0015]).

2.2.2 According to the appellant, the skilled person would either adapt the chamfer sizes disclosed for use in a main bearing or would retain the same bearing for use in a different engine.

There is, however, no clear and unambiguous disclosure of how to dimension or possibly scale up the width and depth of the oil groove known from D7, paragraph [0015] for the con rod bearing 5 in the event that its

teaching were "applied also to the sliding bearing 3 as the main bearing" as suggested in D7, paragraph [0025]. There is also no disclosure as to using a bearing sized and dimensioned as disclosed for the con rod bearing 5 as a crank shaft bearing.

2.2.3 D4, Fig. 4 - the disclosure of which would allegedly be considered by the person skilled in the art in addition to the teaching of D7 - discloses a bearing with a separation inner circumferential surface, i.e. features 1.9 and 1.10. These features have the technical effect of controlling the flow of oil from the circumferential groove.

Thus, even assuming in the appellant's favour that the teaching of D7 and D4 would be combined, in order to arrive at the subject-matter of claim 1, the skilled person would have to combine features of the main and connecting rod bearings of D7 with the further teachings of D4 and then make additional modifications to arrive at the feature 1.11 to 1.13. To do this would require the skilled person to exercise inventive activity.

2.3 Consequently, the subject-matter of claim 1 involves an inventive step.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

D. Magliano C. Herberhold

Decision electronically authenticated