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**Datasheet for the decision
of 5 July 2016**

Case Number: T 1429/13 - 3.2.04

Application Number: 04015253.0

Publication Number: 1496218

IPC: F02B75/04

Language of the proceedings: EN

Title of invention:

Lower link of piston crank mechanism for internal combustion engine

Applicant:

NISSAN MOTOR CO., LTD.

Headword:

Relevant legal provisions:

EPC Art. 83, 84, 54(1), 56

Keyword:

Sufficiency of disclosure - (yes)
Claims - clarity (yes)
Novelty - (yes)
Inventive step - (yes)

Decisions cited:

Catchword:



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Case Number: T 1429/13 - 3.2.04

D E C I S I O N
of Technical Board of Appeal 3.2.04
of 5 July 2016

Appellant:
(Applicant)

NISSAN MOTOR CO., LTD.
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Representative:

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Decision under appeal:

**Decision of the Examining Division of the
European Patent Office posted on 16 January 2013
refusing European patent application No.
04015253.0 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman A. de Vries
Members: S. Oechsner de Coninck
C. Schmidt

Summary of Facts and Submissions

I. The appellant (applicant) lodged an appeal, received on 26 March 2013, against the decision of the examining division, dispatched on 16 January 2013, refusing the application No. 04 015 253.0. The appeal fee was also paid on 26 March 2013. The statement setting out the grounds of appeal was received on 24 May 2013.

II. The examining division came to the conclusion that the application did not meet the requirements of Articles 83 and 84 EPC, and that the subject-matter of claim 1 lacks novelty and thus did not meet the requirements of Articles 52 and 54 EPC having regard to the state of the art as disclosed in document:

D1: EP 1 180 588 A2

The following documents are also cited in the European search report of 21 August 2009:

D2: WO 02/12694 A1

D3: JP 2002 061501 A

D4: EP 1 247 960 A2

III. In response to a telephone conversation with the board the appellant has filed with a letter of 21 June 2016 a new main request and amended pages 1 to 4 of the description, and with a letter of 6 July 2016 an amended page 11 of the description.

IV. Request

- The appellant requests that the decision under appeal be set aside and that the application be granted on the basis of the new main request dated 21 June 2016.

V. Claim 1 of the main request as now on file reads as follows:

"A lower link (1) of a piston crank mechanism of an internal combustion engine, wherein the lower link (1) is of a split type including upper and lower half-parts (2, 3) adapted to be coupled by a bolt (4, 5), and wherein the lower link (1) is adapted to be pivotally connected to one end of an upper link through an upper pin, is adapted to be pivotally disposed through a crank pin bore (10) on a crank pin of a crankshaft and is adapted to be pivotally connected to one end of a control link through a control pin, and wherein a contacting surface of the two half-parts passes through a center (10C) of the crank pin bore (10), the lower link (1) comprising:

a crank pin bearing housing portion (11) adapted to receive the crank pin, the crank pin bearing housing portion (11) being an annular portion which defines a first contour in a side view of the lower link (1), an upper pin receiving bore portion (7) adapted to receive the upper pin, the upper pin receiving bore portion (7) being an annular boss portion which defines a second annular contour in the side view of the lower link (1), and

a control pin receiving bore portion (9) adapted to receive the control pin, the control pin receiving bore portion (9) being an annular boss portion which defines a third annular contour in the side view of the lower link (1),

characterized by

a given portion (16, 18; 17, 19) that has therein an internally threaded bore (12, 13) formed in one of the upper and lower half-parts (2, 3) of the lower link (1) and a bored portion (14, 15) formed in the other of the upper and lower half-parts (2, 3) of the lower link (1), the given portion (16, 18; 17, 19) being a bulged portion thicker than a general portion of the lower link (1) and defining a fourth rectangular contour in

the side view of the lower link (1), the upper and lower half-parts (2, 3) being coupled by the bolt (4, 5) that passes through the bored portion (14, 15) and is engaged with the internally threaded bore (12, 13); and

radially projected portions (23, 33) that extend radially outward beyond an imaginary minimum reference contour (MRC) that is provided by connecting outer edge portions of the first, second, third and fourth contours with a continuous line, wherein an apex (24) of one of the radially projected portions (23) is positioned at the side of the upper pin receiving bore portion (7) with respect to a normal bisector (L28) of a straight line segment (L27) that connects a center (6C) of the upper pin receiving bore portion (7) and the center (10) of the crank pin bearing housing portion (11), and wherein, an apex (34) of the other one of the radially projected portions (33) is positioned at the side of the control pin receiving bore portion (9) with respect to a normal bisector (L37) of a straight line segment (L36) that connects a center (8G) of the control pin receiving bore portion (9) and the center (IOC) of the crank pin bearing housing portion (11), and wherein the upper half-part (2) includes the upper pin receiving bore portion (7) and the lower half-part (3) includes the control pin receiving bore portion (9)".

VI. The Appellant argues as follows:

- With regard to the first instance's reasons relating to sufficiency, figure 3 should not be taken as the sole source for the disclosure of the invention. The skilled person will derive from page 7, lines 19 to 26 of the application as filed a teaching on how to determine the minimum reference contour of MRC of the lower link. This teaching is also consistent with the

claimed subject-matter and figure 1 and therefore does not show discrepancies contrary to Art. 84 EPC.

- The subject-matter of claim 1 is also novel over D1. In particular figures 13 and 14 of D1 do not show apexes but slightly curved outer surfaces. The apexes of the claimed invention provide the advantage of reinforcing the resistance to shearing forces applied on the lower link. The problem is therefore to provide a lower link design which can resist the forces applied to the lower link. Although the resistance problem is mentioned in D1, no hint is present to solve it by projecting portions, the subject-matter of claim 1 involves also an inventive step.

Reasons for the Decision

1. The appeal is admissible.
2. *Subject-matter of the invention*

The application concerns a lower link of a piston crank mechanism of an internal combustion engine. In a piston crank mechanism of double link type with upper and lower links connecting the crankpin to the piston, the lower link connects pivotally to the upper link, the crank pin and a control link via an upper pin and bore, the crank pin in a bearing housing pins, and the control pin and bore. The lower link is of a split type including upper and lower half-parts.

The object of the application is to improve the lower link configuration so that it combines improved mechanical strength with lightweight and compact design (see [0004]).

The solution is provided according to the characterising portion of claim 1 by the following key concepts: portions accommodating bolts that couple the two halves are bulged and define a rectangular contour. That contour and contours of the upper pin, crank pin and control pin bores or housings define a minimum reference contour beyond which extend radially projected portions. These in turn have apexes that lie at the upper pin side respectively the lower pin side of the normal bisector of the straight line segment connecting the centre of crank pin bearing housing with the upper pin bore respectively the control pin bore.

3. *Amendments*

The amended claim 1 according to the main request combines claims 1 and 8 as originally filed but refines the definition of the first to fourth contours taken from page 5, line 27 to page 6, line 12 (paragraph [0025] of the published application) and page 7, lines 5 to 10 (paragraph [0028] of the published application) of the original description, so that it now claims in clearer terms the central features of the invention, namely the bulging portions and apexes located in relation to the contours as shown in figure 1. These amendments concern in particular the first to third contours being annular and the fourth being rectangular as in the sole embodiment of the lower link disclosed in the description and depicted in Figs 1 to 6. Their inclusion allow the radially projecting portions (23, 33) and placement of the apexes (24, 34) to be defined as claimed, these features in turn resulting in the desired strength and compact, lightweight design as explained on page 7, line 31, to page 9, line 21 (paragraphs [0030] to [0038] as published).

The Board therefore concludes that these amendments comply with the provisions of Art. 123(2) EPC.

4. *Sufficiency/Clarity*

4.1 The independent claim 1 defines four contours in relation to specific parts of the link (annular (boss) portion of the pin housing or bores; bulged portion). In this regard the term "contour" is not considered unclear per se and will be understood by the skilled person with a mind willing to understand who reads the claim contextually, trying to make technical sense of it and by building up rather than tearing down. If necessary he will refer to the description for a deeper understanding of effects and advantages and to find further information of specific limitations for achieving them. There he will find useful information in the paragraphs [0025] and [0028]. These paragraphs considered in conjunction with the figures present in great detail the structure of the lower link around the pin bores 7,9 10 and around the bolt receiving portions 16 to 19. Here the skilled person will understand that the different contours as defined in the claim relate to the structural reinforcements around the bores or in the bolting areas in the given portions.

4.2 Since the figures 1 and 3 are patent drawings they do not have the level of detail of engineering drawings meant for manufacturing an article. They only serve to illustrate the technical content of a description and claims and support the essential features thereof (see case law of the boards of appeal I.C.3.6, 7th edition and T451/88). They therefor allow for some level of imprecision or imperfection such as the minor discrepancies noted by the examining division between figures 1 and 3 which would not show three different

heights for the contours. In the Board's view such minor discrepancies do not constitute a hindrance to the skilled person carrying out the invention. The level of detail of description and figures is such as to provide a complete, consistent and coherent picture of the invention, in particular of its key features, the minimum reference contour (MRC) imaginary envelope around the three bores portions and bolting areas (given portion), and the location of the apexes outside this imaginary envelope. They are consistently described and depicted in all the figures, in particular figure 1 where all the necessary parameters are identified.

- 4.3 Therefore the application discloses the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art. The application therefore satisfies Article 83 EPC.
- 4.4 With the present wording of claim 1 of the main request the first to third contours are further defined as being annular and the fourth contour as being rectangular. These features are by way of clarification such that the key features of the location of the apex in relation to the contour acquire its full meaning. Indeed the particular advantages of improved mechanical strength and lightweight design are connected with this specific feature of the link design, see paragraphs [0030] to [0038] mentioned earlier. The Board concludes that present claim 1 is both clear and supported by the description, in accordance with the provisions of Article 84 EPC.

5. *Novelty/inventive step*

5.1 In figures 13 and 14 of D1 an alternative embodiment of a lower link (6) divided in two half-parts (6C,6D) is disclosed that also includes a crank pin bearing housing (23), an "upper" pin (21) receiving bore and a control pin (22) receiving bore. Two bolts located in two given portions of the lower link are present. Furthermore, the contours of annular bores and crank pin bearing housing can be imagined as forming an imaginary minimum reference contour.

However, bulged portions accommodating bore and thread for the bolts and with a rectangular contour are not readily visible. Even if radial projecting portions extending beyond the contour are identifiable in the smooth outer surface near the two bores 21 and 22, these do not have apexes in the position claimed, as can be easily verified by drawing the connecting lines between crank pin bearing housing and the upper and control pin bores, as well as their normal bisectors. , Thus the subject-matter of claim 1 differs from D1's disclosure by in particular the given portion being a bulged portion thicker than a general portion of the lower link and defining a fourth rectangular contour in the side view of the lower link; and by the radially projected portions each having an apex positioned as further defined in the characterising portion of claim 1.

5.2 The apexes in the radially projecting portion provide additional bending stiffness to the lower link while providing a slim design outwardly of the inner contour of the lower link, paragraphs [0030] to [0038]. Thus the problem can indeed be formulated according to paragraph 4 of the application as to improve a lower link configuration providing both enhanced mechanical strength and lightweight design.

- 5.3 A solution to the above stated problem is nowhere addressed in D1. D1 in particular already provides in its figures 12 to 13 a lightweight design having recessed portion for the bolt access instead of outwardly bulging portions, and there is no hint to further improve this design.
- 5.4 Turning to the other documents D2 to D4 cited in the search report, none discloses all the features of the amended claim 1, in particular neither a minimum reference contour as defined in the claim nor apexes of radial portions located as required in claim 1, as is again apparent when the relevant connecting lines and bisectors are drawn. In particular the lower link ("Querhebel") 7 in D2 does not disclose bulging portions or apexes positioned as claimed (see figure 6a and 6b). Similarly, in the vertically split lower link of D3, see figure 4, there are again no bulging portions or apexes as claimed. Whereas several embodiments in D4, see e.g. figure 1 or 4, may have bulging portions at the bolts connecting the halves, any apexes are not in the position as claimed. All these designs furthermore feature a flat outer surface of the lower link, i.e. without annular boss portions that form the claimed contour. Therefore no combination of these document prompts the skilled person to provide projected areas around bulging portions each having an apex as claimed.
- 5.5 The Board concludes, therefore, that the subject-matter of claim 1 of the main request fulfils the requirements of novelty and inventive step, Article 52(1) with Articles 54(1) and 56 EPC.

6. The dependent claims 2 to 5 define further features of the lower link of claim 1 and therefore also comply with the requirements of novelty and inventive step, Article 52(1) with Articles 54(1) and 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 department of first instance with the order to grant a patent based on the following application documents:

Claims:

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1 to 5 filed with letter of 21 June 2016.

Description:

Pages 1 to 4 filed with letter of 21 June 2016.

Pages 5 to 10 as originally filed.

Page 11 filed with letter of 6 July 2016.

Drawings:

Figures 1 to 6 as originally filed.

The Registrar:

The Chairman:



G. Magouliotis

A. de Vries

Decision electronically authenticated