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# Datasheet for the decision of 26 November 2013

**Case Number:** T 2256/11 - 3.2.04

**Application Number:** 03010503.5

**Publication Number:** 1361350

**IPC:** F02B75/04

**Language of the proceedings:** EN

**Title of invention:**
Link mechanism of reciprocating internal combustion engine

**Applicant:**
NISSAN MOTOR COMPANY LIMITED

**Headword:**

**Relevant legal provisions:**
EPC Art. 84, 123(2)
EPC R. 137(5)

**Keyword:**
clarity of claims (yes)
Added subject-matter (no)
Remittal to the department of first instance

**Decisions cited:**

**Catchword:**

Europäisches Patentamt
European Patent Office
Office européen des brevets

**Beschwerdekammern**
**Boards of Appeal**
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**Case Number: T 2256/11 - 3.2.04**

# D E C I S I O N
# of Technical Board of Appeal 3.2.04
# of 26 November 2013

| | |
|---|---|
| **Appellant:** (Applicant) | NISSAN MOTOR COMPANY LIMITED<br>2 Takara-cho<br>Kanagawa-ku<br>Yokohama-shi Kanagawa 221-0023 (JP) |
| **Representative:** | Grünecker, Kinkeldey,<br>Stockmair & Schwanhäusser<br>Leopoldstrasse 4<br>80802 München (DE) |
| **Decision under appeal:** | **Decision of the Examining Division of the European Patent Office posted on 17 May 2011 refusing European patent application No. 03010503.5 pursuant to Article 97(2) EPC.** |

**Composition of the Board:**

**Chairman:** A. de Vries
**Members:** E. Frank
C. Heath

## Summary of Facts and Submissions

I. The appeal lies from the decision of the examining division dated 13 April 2011 and posted on 17 May 2011 to refuse European application No. 03 010 503.5 pursuant to Article 97(2) EPC. The examining division held that the subject-matter of method claim 1 and engine claim 6 according to the main and auxiliary requests as filed on 14 July 2010 and 31 March 2011, respectively, did not meet the requirements of Article 84 EPC.

The appellant (applicant) filed a notice of appeal on 19 July 2011, paying the appeal fee on the same day. The statement of grounds of appeal was filed on 6 September 2011.

II. A communication dated 3 July 2013 pursuant to Article 15(1) RPBA was issued after a summons to attend oral proceedings. In response, the appellant on 19 July 2013 filed amended claims together with an adapted description page 4 as a new main request. Subsequently, oral proceedings were cancelled.

III. The appellant requested that the decision under appeal be set aside and the case be remitted to the department of first instance for further examination or, alternatively, to convene oral proceedings as summoned.

IV. The wording of claims 1 and 6 of the new main request reads as follows (feature numbering a to h between square brackets and preceding features of claim 1 has been added by the Board for further reference but does not form part of the claim's wording):

"1. A method of controlling a link mechanism (1) of a reciprocating internal combustion engine by means of a control shaft (8), the link mechanism (1) comprising:
[a] an upper link (4) having a first end connected to a piston pin (3) of a piston (2), the piston pin (3) having a center (F);

[b] a lower link (7) connected to the upper link (4) via an upper pin (10) having a center (H), the lower link (7) being connected to a crank pin (6) of a crank shaft (5);

[c] the control shaft (8) extending substantially in parallel with the crank shaft (5), the control shaft (8) having a rotational center (B); and

[d] a control link (9) comprising a first end swingably connected to the control shaft (8) and a second end connected to the lower link (7), the control link (9) having a swingable center (A) for allowing the control link (9) to swing with respect to the control shaft (8), the swingable center (A) being offset from the rotational center (B) of the control shaft (8), the control link (9) being connected to the lower link (7) via a control pin (11) having a center (J),

[$e_{new}$] wherein the control shaft (8) is controlled such that a motion of the center (H) of the upper pin (10) in an upward direction substantially along a reciprocating motion of the piston (2) moves the center (F) of the piston pin (3) in the upward direction, while the motion of the center (H) of the upper pin (10) in a downward direction substantially along the reciprocating motion of the piston (2) moves the center (F) of the piston (3) in the downward direction,

[$f_{new}$] the reciprocating motion of the piston (2) makes an axial line (G) which is a first track (G) of the center (F) of the piston pin (3), and the center (H) of the upper pin (10) moving nearer to the axial line (G) tends to move the center (F) of the piston pin (3) in the upward direction while the center (H) of the upper pin (10) moving away from the axial line (G) tends to move the center (F) of the piston pin (3) in the downward direction,

[$g_{new}$] in a process of the center (H) of the upper pin (10) moving nearer to the axial line (G) of the piston pin (3), the center (J) of the control pin (11) moves in the upward direction, thus inclining the lower link (7) so as to counteract the upward movement of the center (H) of the upper pin (10) and the center (F) of the piston pin (3) to move them in a downward direction, and
[h] a maximum value of a piston's acceleration before a bottom-dead-center (BDC) is produced at a timing when an inclination angle (Φ) of the upper link (4) relative to the reciprocating moving direction of the piston (2) is approximately zero."

"6. A reciprocating internal combustion engine having a link mechanism (1) comprising:
an upper link (4) having a first end connected to a piston pin (3) of a piston (2), the piston pin (3) having a center (F);
a lower link (7) connected to the upper link (4) via an upper pin (10) having a center (H), the lower link (7) being connected to a crank pin (6) of a crank shaft (5);
a control shaft (8) extending substantially in parallel with the crank shaft (5), the control shaft (8) having a rotational center (B); and

a control link (9) comprising a first end swingably connected to the control shaft (8) and a second end connected to the lower link (7), the control link (9) having a swingable center (A) for allowing the control link (9) to swing with respect to the control shaft (8), the swingable center (A) being offset from the rotational center (B) of the control shaft (8), the control link (9) being connected to the lower link (7) via a control pin (11) having a center (J), wherein the link mechanism (1) is controlled according to one of claims 1 to 5."

V. The appellant submitted the following arguments:

As to features f and g of claim 1 of the impugned decision, the objection raised by the examining division under point 1.2 of its decision was unfounded, since these features did not state that the piston moved up and down at the same time. Rather, feature f specified that the top most position of the second circular track I was displaced in relation to the first track G towards the opposite side of the control shaft. Thus, a loop-shaped track was defined by feature g, cf. figure 2 of the application. However, the amendments of claim 1 of the new main request now on file were meant to resolve the assumed inconsistency between features f and g. These amendments were also directly and unambiguously disclosed in paragraphs [0057],[0058] and figure 3 of the original application. Finally, having regard to feature h of claim 1, the skilled person was instructed to adjust the second track I in relation to the first track G, cf. figure 3A. Thus, feature h did not claim a result to be achieved as had been objected to by the examining division. It moreover evidently formed a single inventive concept with the originally claimed invention and was therefore not affected by

Rule 137(5) EPC as objected to in the decision under appeal. These considerations likewise applied to claim 6 of the new main request. Therefore, claims 1,6 and the suitably adapted page 4 of the description fulfilled the requirements of Articles 84 and 123(2) EPC.

## Reasons for the Decision

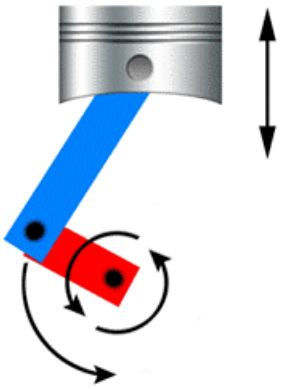
1. The appeal is admissible.

2. *Clarity, Article 84 EPC*

2.1 Firstly, contrary to the finding of the examining division under point 1.2 of its decision, means to control the shaft 8 of feature c of claim 1 are clearly constituted by appropriately arranged links and pins of the link mechanism described in features a to d, the motion of which is defined by feature e (as numbered by the examining division) of claim 1. The newly amended feature $e_{new}$ contains a minor correction only, and thus corresponds to feature e of claim 1 of the refused application, see point 3.1 below.

2.2 Secondly, in the Board's view, the skilled person would readily understand that feature f referred to in the same paragraph 1.2 of the impugned decision relates to the typical circular path that a combustion engine's crank pin would follow during motion of a conventional piston (without the additional link mechanism at the lower end of the piston rod), viz. the respective movements of centres H (lower end of piston rod) and F (upper end of piston rod) of the upper link (piston

rod) with respect to the axial line G (piston stroke travel).



Conventional piston motion

That is, according to feature (f), the centre H moving nearer to the axial line G moves the centre F in the upward direction while the centre H moving away from the axial line moves the centre F in the downward direction.

2.3 Furthermore, the method step according to feature (g) of claim 1 as refused states that in a process of the centre H moving nearer to the axial line G, the centre J (ie, the other end of the lower link 7, which is not attached to the lower end H of the piston rod) moves in the upward direction, thus inclining the lower link 7 (n.b.: necessarily around crank pin 6, cf. feature (b) of claim 1), and allowing the centre H and the centre F to move in the downward direction. Thus, due to the action of the additional link mechanism of claim 1, the piston rod now moves differently in accordance with a further method step.

This distinctive piston motion deviates from the conventional circular path of the lower end H of a piston rod as described by feature (f) of claim 1 as

refused. That is, the piston rod does not move upwardly anymore, whilst the piston rod is moving nearer to the axial line defined by the piston stroke travel. See point 2.2 above.

2.4 However, the Board shares the examining division's concerns that for the skilled person with a mind willing to understand, method steps f and g in the version of claim 1 refused, on first reading might appear contradictory. The distinctive counteraction of the link mechanism as required by feature (g) of claim 1 as refused, therefore, should have been more clearly described, Article 84 EPC: see point 1 of the Board's communication dated 3 July 2013.

Reformulated features $f_{new}$ and $g_{new}$ of the new main request now specify that because of its inclination, the lower link counteracts the upward movement of the piston rod and moves the latter downwardly. Therefore, as argued by the appellant, they define a circular path of the piston rod's lower end as being offset to the right (or left) with respect to the piston stroke travel, i.e. the axial line G: see figure 2, the loop-shaped second track I, and its corresponding description. The Board is thus satisfied that features $f_{new}$ and $g_{new}$ of claim 1 now clearly define the matter for which protection is sought.

2.5 Thirdly, the Board holds that the last paragraph of claim 1, i.e. feature h, does not describe a result to be achieved as advanced by the examining division under point 1.3 of its decision. Rather, as argued by the appellant, the skilled person is instructed to suitably adjust the second circular track I of the lower end of the piston rod with respect to the first track G of the piston stroke travel. This is also in accordance with

figure 3A of the application and the corresponding description as filed, cf. paragraphs [0047] and [0048].

3. *Allowability of amendments, Article 123(2) EPC*

3.1 Claim 1 is in the first place based on the link mechanism of claim 1 as originally filed, and has now been directed to a method of controlling a link mechanism. Feature $e_{new}$ adds to the corresponding feature of original claim 1 the wording "wherein the control shaft is controlled such that a motion of the center of the upper pin...". This is taken directly from paragraph [0037] on page 8 as filed, since by means of the control shaft, the entire link mechanism is controlled. Moreover, in feature $e_{new}$ the expression "piston ring (3)" has been merely replaced by the correct original term "piston pin (3)".

2.7 Features $f_{new}$ and $g_{new}$ of claim 1 now clearly describe (see above) that the centre of the upper pin moving nearer the axial line G tends to move the centre F of the piston pin in the upward direction, whilst inclining the lower link due to the upward movement of the centre of the control pin counteracts the upward movement of the centre of the upper pin and the centre of the piston, to move them in a downward direction. This is directly derivable from paragraphs [0057] and [0058] of the application as filed. The added last paragraph of claim 1, i.e. feature h, is based on paragraphs [0022], [0047], and [0048] on pages 6, 9, and 10 as filed, cf. in particular the application's figure 4, where the link mechanism 1 with piston 2 (not shown) is in a state in which piston 2 is in the vicinity of (just before) its bottom dead centre (BDC).

4. In light of the above, the Board concludes that the subject-matter of claim 1 complies with the requirements of Articles 84 and 123(2) EPC. Since the combustion engine of claim 6 comprises a link mechanism which is controlled according to claim 1, this conclusion applies for claim 6 *mutatis mutandis.* The newly filed description page 4 of the present main request has been adapted to the amended claims and, therefore, is also in conformity with Articles 84 and 123(2) EPC.

5. For the sake of completeness, the Board notes that the examining division's *obiter dictum* in point 1.3 of its decision that the final feature h of claim 1 relates to unsearched, non-unitary subject-matter, is incorrect. This feature does in fact form a single general inventive concept with the originally claimed invention, Rule 137(5) EPC, as it merely specifies in clearer detail (shown in the application's figure 2) the relationship between the first and second tracks G and I that already figured centrally in original claim 1.

6. *Remittal to the examining division*

The application was refused solely on the basis of lack of clarity, Article 84 EPC. Since the requirements of novelty and inventive step were not yet considered by the examining division, the Board exercises its discretion under Article 111(1) EPC and remit the case to the first instance in accordance with the the appellants main request. Since the new main request complies with Articles 84 and 123(2) EPC, there was no need for the Board to hold oral proceedings, as requested by the appellant in the auxiliary.

**Order**

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

1. The decision under appeal is set aside.

2. The case is remitted to the examining division for further prosecution on the basis of the new main request dated 19 July 2013.

The Registrar: The Chairman:

G. Magouliotis A. de Vries

Decision electronically authenticated