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D E C I S I O N
of 11 March 1998

Case Number: T 0537/95 - 3.2.5

Application Number: 90311862.8

Publication Number: 0427438

IPC: B29C 45/66

Language of the proceedings: EN

Title of invention:
Drive arrangement for an injection molding machine

Applicant:
Vickers Incorporated

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0537/95 - 3.2.5

D E C I S I O N
of the Technical Board of Appeal 3.2.5
of 11 March 1998

Appellant: Vickers Incorporated
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Representative: Singleton, Jeffrey
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 27 February 1995 refusing European patent application No. 90 311 862.8 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: A. Burkhart
Members: W.-D. Weiß
C. Holtz

Summary of Facts and Submissions

I. The appellant (applicant) lodged an appeal against the decision of the Examining Division to refuse the application No. 90 311 862.8.

The Examining Division held that the application did not meet the requirements of Article 56 EPC (lack of inventive step), having regard to documents

D2: Patent Abstract of Japan, volume 11, No. 14 (M-553), referring to JP-A-61/189859, and

D3: EP-A-271 588.

II. The appellant requested that the decision under appeal be set aside and a patent be granted on the basis of amended claims 1 to 10 and an amended description according to the request of 27 October 1997.

III. Claim 1 reads as follows:

"1. An injection moulding machine (1) comprising a base frame (6), two mold plates (2,3) mounted on said base frame (6) for relative movement between a mold open position and a mold closed position, and drive means (5,10,11) mounted on said base frame (6) and operable to move and/or lock at least one of said mold plates (2,3), the drive means being in the form of linear drive means comprising at least one motor (10), at least one set of gears (11) driven by said motor (10), and a toothed rack (5) connected to said at least one mold plate (2,3) and in mesh with at least one gear (16,17) of said set of gears (11), whereby the rack (5) and said at least one mold plate are driven in operation of the motor, characterised in that the motor of the drive means is a servomotor, and in that the

rack (5) has a substantially circular cross-section with one or more series of teeth (12a,12b) provided only over a portion of the length of said rack (5), and the rack (5) is slidably mounted in bearings (13,14) on each side of the toothed portion, and in that the machine further comprises a casing (9) with the gears (16,17) and at least a portion of the rack (5) arranged inside said casing, with the rack being led through a wall of said casing, the rack (5) being supported in a bearing (13,14) in the wall of the casing (9), and the bearing being provided with a seal (15)."

IV. The appellant essentially argued that the drive means as defined in claim 1, i.e. the combination of rack and pinion and servo-motor, and the specific construction of the rack and its mounting in a casing, were not suggested by the disclosure of documents D2 and D3.

Reasons for the Decision

1. *Amendments*

The combination of the features of claim 1 now on file is disclosed in originally filed claims 1, 5, 6 and 7 in connection with originally filed figures 1, 2 and 4 and the corresponding parts of the description.

Claim 2 is based on originally filed claim 2 in connection with figures 1, 2 and 3.

Claims 3 to 5 are based on originally filed claims 2 to 4.

Claim 6 is based on originally filed claim 8 in connection with originally filed page 7, fifth paragraph.

Claims 7 and 8 are based on originally filed claims 9 and 10.

Claim 9 is based on originally filed claim 11 in connection with figure 5.

Claim 10 is based on the originally filed description, page 6, last four lines to page 7, first line, and page 7, third paragraph, in connection with originally filed figure 3.

The description has been adapted to the amended claims.

The amendments to the description and to the claims do not offend against Article 123(2) EPC.

2. *Novelty*

Document D2 (c.f. figure 4), which is considered to represent the closest prior art, discloses an injection moulding machine comprising a base frame, two mold plates mounted on said base frame for relative movement between a mold open position and a mold closed position, and drive means mounted on said base frame and operable to move and/or lock at least one of said mold plates, the drive means being in the form of linear drive means comprising at least one motor, at least one set of gears driven by said motor, and a toothed rack connected to said at least one mold plate and in mesh with at least one gear of said set of gears, whereby the rack and said at least one mold plate are driven in operation of the motor.

The moulding machine according to claim 1 differs from this prior art moulding machine in that the motor of the drive means is a servomotor, and in that the rack has a substantially circular cross-section with one or

more series of teeth provided only over a portion of the length of said rack, and the rack is slidably mounted in bearings on each side of the toothed portion, and in that the machine further comprises a casing with the gears and at least a portion of the rack arranged inside said casing, with the rack being led through a wall of said casing, the rack being supported in a bearing in the wall of the casing, and the bearing being provided with a seal.

Therefore, the subject-matter of claim 1 is novel.

3. *Inventive step*

The injection moulding machine according to document D2, which comprises the features of the preamble of claim 1, and wherein the pinion means are driven by a brake-equipped reversible electric motor, is considered to suffer from the disadvantages that precise final positioning of the mould plates is difficult to achieve, that the acceleration and deceleration control during the mould plate clamping operation is limited and that the drive means are not protected from environmental influences (see pages 1 and 2 of the description).

Therefore, the problem underlying the invention consists in improving the drive means of the injection moulding machine according to D2 in the sense that it provides precise control of the clamping operation and high closing and opening speeds, that it is economical to manufacture and maintain and that the principal components of the rack drive means are isolated from environmental contaminants (see pages 2 and 3 of the description).

This problem is solved by the features of the characterising portion of claim 1, i.e. by the use of a servomotor, which enables precise clamping control, and by a specific construction of the rack driving means and its mounting in a casing, which provides the advantages of low manufacturing and maintenance costs and easy sliding and good sealing of the rack by conventional, simple O-ring or lip-type sealing means.

The solution according to claim 1 of the present application is not rendered obvious by the documents D2 and D3, for the following reasons.

Document D2 does not disclose or suggest any of the features of the characterising portion of claim 1.

Document D3 discloses drive means for the mould clamping system in an injection moulding machine, wherein a servomotor is used to actuate the clamping plates via a ball-screw linear driving means (see claim 8 and figures 1 to 3).

However, there can be found no hint in D3 to replace the ball-screw driving means by a rack and pinion driving means, let alone to use a rack construction as specified in the characterising portion of claim 1.

Therefore, the subject-matter of claim 1 also involves an inventive step in the meaning of 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 grant a patent in the following version:

Description: page 1 filed on 15 March 1993 with letter of 12 March 1993,
page 2, filed on 22 April 1997, with letter of 21 April 1997,
pages 3, 4, filed on 29 October 1997, with the letter of 27 October 1997,
pages 5 to 9 as originally filed on 30 October 1990.

Claims: No. 1 to 10, partly, pages 10 and 11, filed on 29 October 1997, with letter of 27 October 1997,
No. 10, partly, page 12, filed on 22 April 1997 with letter of 21 April 1997.

Drawings: Figures 1 to 5, as originally filed.

The Registrar: The Chairman:

A. Townend A. Burkhart