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**D E C I S I O N**  
**of 25 March 1994**

**Case Number:** T 0900/91 - 3.2.5

**Application Number:** 87114054.7

**Publication Number:** 0265674

**IPC:** B23Q 11/00

**Language of the proceedings:** EN

**Title of invention:**

Counterbalance mechanism for a vertically movable member and a machine tool comprising such counterbalance mechanism

**Applicant:**

Cincinnati Milacron Inc.

**Opponent:**

-

**Headword:**

-

**Relevant legal norms:**

EPC Art. 56

**Keyword:**

"Inventive step (yes)"

**Decisions cited:**

-

**Catchword:**

-



Case Number: T 0900/91 - 3.2.5

**D E C I S I O N**  
of the Technical Board of Appeal 3.2.5  
of 25 March 1994

**Appellant:** Cincinnati Milacron Inc.  
(a corporation existing  
under the laws of Ohio)  
4701 Marburg Avenue  
Cincinnati  
Ohio 45209 (US)

**Representative:** Lally, William  
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**Decision under appeal:** Decision of the Examining Division of the European  
Patent Office dated 28 June 1991 refusing European  
patent application No. 87 114 054.7 pursuant to  
Article 97(1) EPC.

**Composition of the Board:**

**Chairman:** C.V. Payraudeau  
**Members:** A. Burkhart  
H.P. Ostertag

**Summary of Facts and Submissions**

I. The Appellant (Applicant) lodged an appeal against the decision of the Examining Division to refuse the application No. 87 114 054.7.

The Examining Division had expressed the view that the application did not meet the requirements of Articles 52(1) and 56 EPC, having regard to the following documents:

D1: DE-A-3 422 586

D2: GB-A-1 066 383

D3: DE-A-1 930 125.

II. The Appellant requested that the decision under appeal be set aside and a patent be granted on the basis of the following documents:

Description: pages 1 and 5 to 8, as originally filed;  
pages 2 and 3 filed on 8 October 1993  
with letter of 5 October 1993;  
pages 4 and 4a, filed on 6 August 1993  
with letter of 4 August 1993;

Claims: Claim 1 filed on 8 October 1993 with  
letter of 5 October 1993;  
Claims 2 to 9 filed on 6 August 1993 with  
letter of 4 August 1993;

Drawings: Sheets 1/2, 2/2, as originally filed.

The Appellant requested further a reimbursement of the appeal fee.

III. The wording of Claim 1 reads as follows:

"A counterbalancing mechanism for a vertically movable member (10), said mechanism comprising motive means (14) connected to said vertically movable member to move said member vertically; and hydraulic counterbalance means (18, 25) connected to said vertically movable member for exerting a counterbalance force on said vertically movable member (10) as said vertically movable member is moved in either vertical direction by said motive means (14); characterised in that control means (27, 34, 41, 45-50) is provided to vary the hydraulic pressure exerted by the hydraulic means (23) in response to a sensor means (17) which senses the force on the vertically movable member (10), whereby the counterbalance means (18, 25) exerts a substantially constant counterbalance force on said vertically movable member (10)."

IV. The Appellant essentially argued as follows:

Document D1 directs the person skilled in the art away from the use of a hydraulic counterbalance system as disclosed in documents D2 and D3, since document D1 teaches that hydraulic systems are not suitable to produce a constant counterbalance force on the vertically movable member, and that hydraulic systems are complicated and are of low reliability.

## Reasons for the Decision

### 1. *Amendments*

The subject-matter of the new claims is disclosed on the following locations of the originally filed application documents:

Claim 1: see original Claims 1, 2 and 4.

Claim 2: see original Claim 3.

Claim 3: see original Claim 4.

Claim 4: see original Claim 5.

Claim 5: see original Claim 6.

Claim 6: see original Claim 7.

Claim 7: see original Claim 8.

Claim 8: see original Claim 9.

Claim 9: see original Claim 10.

The originally filed description has been adapted to the new claims and a new prior art discussion has been introduced into the description.

There is no objection under Article 123(2) EPC.

### 2. *Novelty*

- 2.1 Document D1 discloses a counterbalancing mechanism for a vertically movable member which comprises motive means connected to the vertically movable member to move it vertically and an electrically driven device provided for exerting a counterbalance force on the vertically movable member as said member is moved in either direction by said motive means. A control means is provided for controlling in response to the signals of a sensor means the counterbalancing means to cause said counterbalancing means to exert a substantially constant

counterbalancing force on the vertically movable member. The counterbalancing mechanism according to Claim 1 differs from this known mechanism in that the counterbalance force is exerted by hydraulic means.

2.2 Document D2 discloses a vertically movable supporting table for work-pieces comprising a hydraulic pedestal and a hydraulic counterbalancing means wherein the varying weight of the supporting table is balanced by adjusting the hydraulic pressure in the counterbalance means in response to the pressure sensed in the hydraulic pedestal. Document D2 does not disclose a sensor means which senses the counterbalance force exerted on the vertically movable member and the counterbalance force exerted by the counterbalance means is not constant as claimed in present Claim 1 of the patent application in suit but is varying with the varying weight of the work-piece.

2.3 Document D3 discloses a hydraulic counterbalancing mechanism for a vertically movable member wherein the hydraulic pressure exerted by the hydraulic means on the vertically movable member is varied by a system consisting of pressure limiting valves and multi-way valves. However, this document does not disclose the use of a sensor means which senses the force applied on the vertically movable member and controls the hydraulic pressure exerted by the hydraulic means as claimed in Claim 1.

2.4 Document GB-A-1 372 487 (D4), which has been introduced in the proceedings by the Board of appeal, discloses a counterbalancing means for a vertically movable member, comprising motive means connected to the vertically movable member to move it vertically, and hydraulic counterbalance means connected to the vertically movable member for exerting a counterbalance force on the latter

as it is moved in either vertical direction by the motive means. The counterbalancing mechanism according to Claim 1 differs from this known counterbalancing mechanism in that a control means is provided for varying the hydraulic pressure exerted by the hydraulic means in response to a sensor which senses the force acting on the vertically movable member.

2.5 Therefore, the subject-matter of Claim 1 is new with respect to the prior art known from the documents D1, D2, D3 and D4.

3. *Inventive step*

3.1 In the counterbalancing mechanism according to document D4, which the Board considers as representing the closest prior art, the hydraulic control means for producing the counterbalance force is operated by a hydraulic pressure system (hydraulic reducing and releasing valves) which provides certain predetermined pressure values depending on the direction of movement of the vertically movable member (see Figure 3 and the corresponding parts of the description of the document D4). With this system which uses predetermined pressure values, it is not possible to keep the counterbalancing force substantially constant within very narrow tolerances, and therefore, a precise and reliable positioning of the vertically movable member, as is required in numerically controlled machine-tools, cannot be achieved.

3.2 The problem underlying the present invention lies therefore in providing a hydraulic counterbalancing system which achieves an accurate positioning of the vertically movable member within very narrow tolerances at any desired position as is required in the

numerically controlled machine-tools (see pages 1 and 2 of the description).

- 3.3 This problem is solved according to the invention in that the counterbalancing mechanism known from document D4 is modified by providing a control means to vary the hydraulic pressure exerted by the hydraulic means in response to a sensor means which senses the force acting on the vertically movable member. Since, according to this solution, the sensor means continually senses the actual force acting on the vertically movable member and the control means continually counteracts the actual changes in this sensed force in a closed control loop, the counterbalance force can be kept substantially constant within very narrow tolerances.
- 3.4 The person skilled in the art does not find in the other documents constituting the pertinent prior art any suggestion to modify the system disclosed in document D4 in such a manner.
- 3.5 Document D1 which was relied upon in the decision under appeal as the nearest state of the art cannot be considered as pertinent prior art in this context. Although this document relates to the same problem as the present invention, it teaches away from the use of a hydraulic system for a counterbalancing mechanism. In particular, it is stated in this document (from page 4, third paragraph to page 5, first paragraph) that hydraulic systems are not suitable to produce a constant counterbalance force on the vertically movable member or that they are complicated and are of low reliability and economy. For this reason, document D1 proposes the use of an electro-mechanical counterbalancing mechanism. There would be therefore no reason for the person skilled in the art to isolate the concept of the control system of the mechanism disclosed in this document from

its use with an electro-mechanical counterbalancing means and try adapting it to a hydraulic mechanism contrary to the clear teaching of document D1.

- 3.6 Neither of the other documents D2, D3 discloses nor suggests the use of a closed loop control means wherein a sensor means is provided which senses the force acting on the vertically movable member and in response to which the hydraulic pressure of the hydraulic means is varied.
- 3.7 Therefore, the subject-matter of Claim 1 involves an inventive step in the meaning of Article 56 EPC.
4. For the foregoing reasons, Claim 1 is allowable under Article 52(1) EPC.

Claims 2 to 8, which are dependent on Claim 1 and relate to specific embodiments of the subject-matter of Claim 1, are also allowable.

The same applies to Claim 9 which relates to a machine tool comprising a vertically movable spindle carrier and a counterbalance mechanism according to any of Claims 1 to 8.

5. A patent can thus be granted according to the request of the Appellant.
6. The request for reimbursement of the appeal fees is rejected since the Appellant has not given any ground, why he considers such a reimbursement as being justified, and since the Board cannot recognise any substantial procedural violation on behalf of the Examining Division which would justify a reimbursement of the appeal fees.

Order

For these reasons, it is decided that:

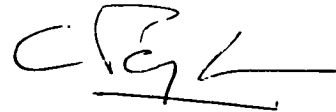
1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to grant a patent on the basis of the documents mentioned under point II of this decision.
3. The request for reimbursement of the appeal fees is refused.

The Registrar:



A. Townend

The Chairman:



C. Payraudeau