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D E C I S I O N
of 29 July 1998

Case Number: T 0992/95 - 3.2.4

Application Number: 89116370.1

Publication Number: 0361140

IPC: B25J 9/04

Language of the proceedings: EN

Title of invention:
Industrial robot

Applicant:
KAWASAKI JUKOGYO KABUSHIKI KAISHA, et al

Opponent:
-

Headword:
Robot/KAWASAKI

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (yes, after amendments)"

Decisions cited:
-

Catchword:

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Case Number: T 0992/95 - 3.2.4

D E C I S I O N
of the Technical Board of Appeal 3.2.4
of 29 July 1998

Appellant: KAWASAKI JUKOGYO KABUSHIKI KAISHA
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 30 June 1995 refusing European patent application No. 89 116 370.1 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: C. A. J. Andries
Members: P. Petti
M. Lewenton

Summary of facts and submissions

I. The European patent application No. 89 116 370.1 was refused by a decision of the examining division dispatched on 30 June 1995.

The reason the examining division gave for the refusal was that the subject-matter of the independent Claims 1 and 6 did not involve an inventive step within the meaning of Article 56 EPC.

II. The appellant lodged an appeal against this decision on 28 August 1995 and simultaneously paid the appeal fee. The statement setting out the grounds of appeal was filed on 9 November 1995.

III. In response to a communication of the board, the appellant filed with the letter dated 22 October 1997 an amended independent Claim 1 which was further amended as agreed by telephone on 15 July 1998 and confirmed by the appellant with the letter dated 20 July 1998. This Claim 1 reads as follows:

"1. An industrial robot including an arm assembly having at least a first arm (22) and a second arm (24), each arm having a longitudinal axis, said first arm (22) being a lower arm mounted at a lower end portion thereof on a stationary base (20) for swinging movements fore and aft from a generally vertical position about a substantially horzontal first axis (21), said second arm (24) being an upper arm mounted adjacent to an upper end portion of said lower arm (22) to extend in a direction crossing the longitudinal axis of said lower arm (22), a swingable member (42) on which the upper arm (24) is rotatably mounted at its one end portion so that the upper arm projects in one direction from the swingable member, said swingable

member (42) being mounted on the upper end portion of the lower arm (22) allowing swinging movements up and down about a second axis (23) from a position in which the longitudinal axis of the upper arm (24) is generally perpendicular to the longitudinal axis of the lower arm (22), the first axis (21) being stationary relative to the base (20) and the second axis (23) being stationary relative to the lower arm (22), the second axis (23) being substantially parallel to the first axis (21); said swingable member (42) having a pivot means (54a, 54b) for allowing pivotal movements of said upper arm (24) about a third axis (26) which is in a plane containing the longitudinal axis of said lower arm (22) and perpendicular to said second axis (23), and driving means (25, 27, 81) for selectively effecting said swinging movements of said lower and upper arms (22, 24) and said pivotal movements of said upper arm (24); said swingable member (42) having a portion extending in a direction opposite to said one direction of the upper arm (24) beyond said one end portion of the upper arm (24)."

IV. The appellant requested that the impugned decision be set aside and a patent be granted on the basis of the following documents:

- Claim 1, as filed with the letter dated 22 October 1997 and as further amended as agreed by telephone on 15 July 1998; Claim 2, as filed with the letter dated 22 October 1997;

- Description: pages 1 to 11, as filed with the letter dated 30 June 1997;

- Drawings: Sheets 1/11 to 11/11 (Figures 1 to 11), as filed with the letter dated 30 June 1997.

Reasons for the decision

1. The appeal is admissible.

2. *Amendments*

2.1 The subject-matter of Claim 1 differs from that of Claim 4 (i.e. from the combination of features specified in Claims 1 and 4) of the application as originally filed in that (see particularly the parts in bold print):

(a) first and second arms are defined as being **lower** and **upper** arms, respectively;

(b) the base is defined as being **stationary**;

(c) the feature that "[the first arm is mounted on a base] for swingable movement in a substantially vertical plane about a ... first axis" has been replaced by the feature that "[the lower arm is mounted on the base] for swinging movements **fore and aft from a generally vertical position** about a ... first axis";

(d) the upper arm is defined as being **rotatably** mounted on the swingable member **at its one end portion so that it projects in one direction from the swingable member**;

(e) the swingable member is defined as allowing swinging movements **up and down** about the second axis **from a position in which the longitudinal axis of the upper arm is generally perpendicular to the longitudinal axis of the lower arm**;

(f) the swingable member is defined as **having a pivot means;**

(g) the swingable member is defined as **having a portion extending in a direction opposite to said one direction of the upper arm beyond said one end portion of the upper arm;**

(h) the first axis is defined as being **stationary relative to the base;**

(i) the second axis is defined as being **substantially parallel to the first axis;**

(l) the third axis is defined as being **perpendicular to said second axis.**

These amendments can be unequivocally derived from the application as filed, namely from:

- page 6, line 23 to page 7, line 1 and Figures 1 and 2 for the amendments (a), (b) and (c);

- Claim 6, Figures 1, 2, 5 and 6 for the amendments (d) and (g);

- page 7, lines 20 to 25 for the amendments (f) and (l);

- Figure 1 for the amendments (e), (h) and (i).

2.2 The features of dependent claim 2 have a basis in the description of the application as filed (page 8, line 3 to page 9, line 2).

2.3 The amendments of the description consist essentially in its adaptation to the amended claims.

2.4 The board is satisfied that these amendments do not contravene Article 123(2) EPC.

3. The prior art

3.1 The application as originally filed describes a prior art robot referring to Figures 10 and 11.

This conventional industrial robot is described as including an arm assembly having at least a first arm 5 and a second arm 8, each arm having a longitudinal axis, the first arm 5 being a lower arm mounted at its lower end portion on a base 1, for swinging movements fore and aft from a generally vertical position about a substantial horizontal first axis 6, the second arm 8 being an upper arm mounted adjacent to an upper end portion of the lower arm 5 to extend in a direction crossing the longitudinal axis of the lower arm 5, the upper arm 8 being (directly) mounted on the upper end portion of the lower arm 5 so as to allow swinging movements up and down about a second axis 7 from a position in which the longitudinal axis of the upper arm 8 is generally perpendicular to the longitudinal axis of the lower arm 5, the second axis 7 being substantially stationary relative to the lower arm 5 and parallel to the first axis 6, a swivel body 2 being supported by the base 1 so as to allow swivel movements of the combination of both the lower and upper arms about a third axis 3 which is in a plane containing the longitudinal axis of the lower arm 5, and driving means for selectively effecting the swinging and swivel movements of the lower and upper arms.

3.2 Document DE-A-3 301 022 (D1), upon which the decision under appeal is based, discloses an industrial robot including an arm assembly having a (first) lower arm 8a and a (second) upper arm 11a, each having a

longitudinal axis, the lower arm 8a being mounted at its lower end portion on a base 7 for swingable movement in a substantially vertical plane about a substantially horizontal first axis 9 (which is stationary relative to the base 7), the (second) upper arm 11a being mounted adjacent to an upper end portion of the (first) lower arm 8a to extend in a direction crossing the longitudinal axis of the lower arm, mounting means 8b being provided between the lower and upper arms, the mounting means comprising a pivoting member (or mounting bracket) 8b, the (second) upper arm being mounted on the pivoting member 8b in a manner for allowing swingable movements of the (second) upper arm 11a with respect to the lower arm 8a about a second axis 12 which is perpendicular to the longitudinal axis of the (first) lower arm, the pivoting member being mounted on the upper end portion of the (first) lower arm in a manner allowing pivoting movement of the pivoting member itself and, thus, of the (second) upper arm about a third axis 10 which is in a plane containing the longitudinal axis of the lower arm 8a and perpendicular to the second axis 12. It can be assumed that the robot also comprises driving means for selectively performing the movements of said arms.

According to document D1 it is essential that the second axis 12 is not parallel to the first axis 9 in order to permit the second upper arm to move in a plane inclined with respect to the vertical plane.

3.3 The prior art disclosed by the remaining documents cited in the search report is less relevant than that mentioned above.

4. *Novelty*

The subject-matter of independent Claim 1 is novel with respect to the available prior art.

5. *Inventive step*

5.1 The conventional robot referred to in the description of the application (see the above section 3.1) is considered as being the closest prior art.

5.1.1 The description of the application as filed also describes a technical problem to be solved referring to this conventional industrial robot. This problem essentially consists in providing a robot requiring a smaller space than the conventional robot and particularly in decreasing the possibility of interference between adjacent conventional robots (see description of the application as filed: page 3, lines 6 to 17; page 10, line 3 to page 11, line 5). It can be understood from the description of the application as filed that this problem arises because the upper arm 8 of the conventional robot can only rotate around the vertical axis 3 together with the rest of the robot so that the whole robot has to rotate around the vertical axis which remains fixed with respect to the base of the robot (see particularly Figure 10) and because the upper arm has a rearward end portion projecting a certain distance from the longitudinal axis of the lower arm 5.

5.1.2 The problem mentioned above does not arise when the robot according to document D1 is used, inter alia because the upper arm of this robot assembly has no rearward portion projecting from the longitudinal axis of the lower arm. Therefore, this document is not considered as being the closest prior art.

5.2 The subject-matter of Claim 1 differs from the closest prior art essentially in that

(i) the arm assembly includes **a swingable member on which the upper arm is mounted at its one end portion** so that the upper arm projects in one direction **from the swingable member, said swingable member being mounted on the upper end portion of the lower arm** allowing swinging movements up and down of the upper arm;

(ii) **the first axis is stationary relative to the base**;

(iii) **the swingable member has** (i.e. is provided with) the pivot means for allowing the pivotal movements of the upper arm about the third axis.

5.2.1 These distinguishing features permit the rearward end portion of the swingable member 42 to be moved under the pivotal movement about the third axis along a circular path of a radius which does not increase even when the lower arm is inclined rearwardly (see Figure 2).

Thus, the board is satisfied that the combination of features defined in Claim 1 solves the problem referred to in the above section 5.1.1.

5.3 Claim 1 defines a linkage which is formed by the lower arm (swinging about the first horizontal axis), the swingable member (swinging about the second horizontal axis) and the upper arm (pivoting about the third axis perpendicular to the second axis). This linkage not only is structurally different from the linkage according to the closest prior art, which is formed by the lower arm (swinging about the first horizontal

axis), the upper arm (swinging about the second horizontal axis) and by the swivel body (swivelling about the third vertical axis) carrying both the lower and upper arms, but also operates in a different way so as to reduce the risk of interference between adjacent robots..

5.4 The available prior art neither indicates the technical problem to be solved nor suggests the distinguishing features (i) to (iii), so that a skilled person would not be led towards the subject-matter of Claim 1 by the available prior art.

5.5 The subject-matter of Claim 1 meets, therefore, the requirements of Article 56 EPC.

6. Therefore, a patent can be granted on the basis of the independent Claim 1 and of dependent Claim 2, which concerns a particular embodiment of the invention defined in Claim 1.

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 with the order to grant a patent on the basis of the following documents:

- Claim 1, as filed with the letter dated 22 October 1997 and as further amended as agreed by telephone on 15 July 1998; Claim 2, as filed with the letter dated 22 October 1997;

- Description: pages 1 to 11, as filed with the letter dated 30 June 1997;

- Drawings: Sheets 1/11 to 11/11 (Figures 1 to 11), as filed with the letter dated 30 June 1997.

The Registrar: The Chairman:

N. Maslin C. Andries