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**Datasheet for the decision
of 16 January 2012**

Case Number: T 1131/08 - 3.5.02

Application Number: 01302896.4

Publication Number: 1139561

IPC: H02P 7/63

Language of the proceedings: EN

Title of invention:
Electric motor control device

Applicant:
FANUC CORPORATION

Headword:
-

Relevant legal provisions:
EPC Art. 84, 56

Keyword:
"Claims - clarity (yes)"
"Inventive step - (yes) after amendment"

Decisions cited:
-

Catchword:
-



Case Number: T 1131/08 - 3.5.02

DECISION
of the Technical Board of Appeal 3.5.02
of 16 January 2012

Appellant:
(Applicant)

FANUC CORPORATION
3580 Shibokusa Aza-Komanba
Oshino-mura
Minamitsuru-gun
Yamanashi 401-0597 (JP)

Representative:

Haseltine Lake LLP
Redcliff Quay
120 Redcliff Street
Bristol BS1 6HU (GB)

Decision under appeal:

Decision of the Examining Division of the
European Patent Office posted 20 February 2008
refusing European patent application
No. 01302896.4 pursuant to Article 97(1) EPC
1973.

Composition of the Board:

Chairman: M. Ruggiu
Members: G. Flyng
R. Moufang

Summary of Facts and Submissions

- I. The applicant appealed against the decision of the examining division refusing the European patent application no. 01 302 896.4. The examining division refused the application on the grounds that claims 1 and 7 of the then valid main request, as well as claim 1 of the then valid auxiliary request, lacked clarity (Article 84 EPC) and did not involve an inventive step (Article 56 EPC).
- II. The following prior art document references are used in this decision:

D1: US-A-5 744 927
D2: US-A-5 068 777
D5: US-A-4 691 269.

III. Requests

With a letter dated 25 October 2011, the appellant submitted a main request and an auxiliary request. The main request was for grant on the basis of a sole, independent method claim.

In a telephone conversation on 16 November 2011, the Rapporteur invited the appellant to file amendments to the description to render it consistent with the claim of the main request, as filed with the letter of 25 October 2011. In response, with a letter dated 22 November 2011, the appellant filed amended description pages 1, 3, 3a, 4, 5, 6 and 7.

Thus, the appellant's main request is that the decision under appeal be set aside and the patent be granted in the following version:

Description:

- Pages 1, 3, 3a, 4, 5, 6 and 7 filed with the letter dated 22 November 2011;
- Pages 2 and 8 to 13 as originally filed;

Claims:

- No. 1 of the main request filed with the letter dated 25 October 2011;

Drawings:

- Sheets 1/4 to 4/4 as originally filed.

IV. The sole claim (claim 1) according to the main request is directed to a method of operating an AC servomotor driving a cutting tool in a machine tool. It reads as follows:

"1. A method of operating an AC servomotor (5) driving a cutting tool in a machine tool, comprising issuing a move command from a numerical controller (1), and driving and controlling the AC servomotor (5) by a servo controller (3) through a servoamplifier (4) in accordance with a PWM method in dependence upon the move command issued by the numerical controller (1), the servoamplifier (4) comprising switching elements (T1, T2) applying voltage to each phase of the AC servomotor (5) under PWM control, the numerical controller (1) instructing change of the PWM period, and the servo controller (3) changing the PWM period corresponding to a PWM period changing command;

characterised in that said numerical controller (1) instructs a mode A PWM operation or a mode B PWM operation in dependence upon whether the AC servomotor (5) drives the cutting tool in a fast feed operation or in a cutting feed operation respectively such that, in said fast feed mode A operation, the period of the PWM control extends as compared with its period in cutting feed mode B operation, thereby reducing the ratio of the time of a dead zone (δ) to the time of an ON zone in the PWM control of said switching elements (T1, T2) in the fast feed mode A operation."

- V. The appellant argues in essence that claim 1 of the main request is clear and is novel and inventive over the cited prior art.

Reasons for the Decision

1. The appeal is admissible.
2. Amendments, Article 123(2) EPC

Present claim 1 is identical to claim 1 of the auxiliary request that was considered in the contested decision. The examining division did not raise any objection to that claim under Article 123(2) EPC and the Board sees no reason to do so now.

3. Clarity, Article 84 EPC
 - 3.1 In the contested decision, the examining division held that claim 1 of the then valid auxiliary request lacked clarity in so far as "the wording [...] has been chosen

so that the claimed method is solely *suitable* for driving the cutting tool in cutting/fast feed operation modes" (see Reasons, sections 2 and 2.1 to 2.3).

- 3.2 Present claim 1 specifies "A method of operating an AC servomotor (5) driving a cutting tool in a machine tool". It further specifies that a "numerical controller (1) instructs a mode A PWM operation or a mode B PWM operation in dependence upon whether the AC servomotor (5) drives the cutting tool in a fast feed operation or in a cutting feed operation respectively".

With these features, the Board considers that the claim does not merely define that the method is suitable for driving the cutting tool in cutting/fast feed operation modes, rather it defines that the method actually comprises operating the AC servomotor such that it drives the cutting tool in these modes. Hence, the Board does not see any lack of clarity.

4. **Novelty and inventive step**

- 4.1 Document D1 discloses a PWM control method which may be used to operate a motor driven cutting tool (see column 9, lines 9 to 17. According to one embodiment of D1 (see figure 3 and column 5, lines 35 to 60), the *fpwm* [PWM frequency] *is the same as in the conventional art in the low speed range, where heavy cutting is performed relatively many times, to prevent the switching device-generated heat from increasing. However, the fpwm is raised in the high speed range where primarily light cutting is conducted, in order to maintain the control performance. As a result, the*

inverter control apparatus ... can be used to ensure very fast revolutions.

According to present claim 1, in the fast feed "mode A" operation, the period of the PWM control extends as compared with its period in cutting feed "mode B" operation. An extended PWM period corresponds to a lower PWM frequency in fast feed operation than in cutting operation. This is the opposite relationship to that disclosed in D1, where the PWM frequency is higher at high speed than at low speed.

4.2 Documents D2 and D5 disclose ways of operating motors using PWM control, in which the PWM carrier frequency, and hence PWM period is varied. Indeed, it can be seen from figure 4 of D2 and figure 9 of D5 that at relatively higher output frequencies (i.e. higher motor speeds) relatively lower PWM carrier frequencies (i.e. extended PWM periods) are used. At least with the benefit of hindsight, it might be observed that this is a similar relationship between motor speed and PWM frequency to that presently claimed. However neither D2 nor D5 suggest using the PWM control methods to operate a motor driven cutting tool, such that the subject-matter of claim 1 may be considered to be novel over D2 and D5, Article 54 EPC.

Furthermore, according to D2 and D5, the reason for using the above-mentioned relationship between PWM carrier frequency and motor speed, is that it is possible to use a lower PWM frequency at high speed, because any increased noise caused by switching at the lower PWM frequency will be masked by the higher noise to be expected at higher speed (D2: column 4, lines 14

to 22; D5: column 4, lines 45 to 53). In the context of a cutting tool, however, this situation would not necessarily apply, because during cutting at lower speed, the noise is likely to be higher than it would be during fast feeding. Hence, the skilled person considering a solution for a machine tool application would have no reason to take the teachings of D2 and D5 into account, either alone, or in combination with D1.

4.3 None of the other prior art cited in the search report is more relevant than D1, D2 and D5.

4.4 In conclusion, the Board finds that the subject-matter of claim 1 according to the main request is not rendered obvious by the cited prior art and, hence meets the requirements for inventive step, Article 56 EPC.

5. In view of the above the board accedes to the appellant's request for grant.

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 in the following version:

Description:

- Pages 1, 3, 3a, 4, 5, 6 and 7 filed with the letter dated 22 November 2011;
- Pages 2 and 8 to 13 as originally filed;

Claims:

- No. 1 of the main request filed with the letter dated 25 October 2011;

Drawings:

- Sheets 1/4 to 4/4 as originally filed.

The Registrar:

The Chairman:

C. Moser

M. Ruggiu