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**Datasheet for the decision
of 5 September 2018**

Case Number: T 0253/18 - 3.4.02

Application Number: 06114414.3

Publication Number: 1726919

IPC: G01D5/245, G01D5/36

Language of the proceedings: EN

Title of invention:

Method and apparatus for generating an origin signal of an encoder

Applicant:

Mitutoyo Corporation

Relevant legal provisions:

EPC 1973 Art. 54(1), 56, 83

Keyword:

Sufficiency of disclosure (yes)
Novelty and inventive step (yes)



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Case Number: T 0253/18 - 3.4.02

D E C I S I O N
of Technical Board of Appeal 3.4.02
of 5 September 2018

Appellant: Mitutoyo Corporation
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Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted on 17 July 2017
refusing European patent application No.
06114414.3 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman R. Bekkering
Members: F. J. Narganes-Quijano
G. Decker

Summary of Facts and Submissions

- I. The appellant (applicant) lodged an appeal against the decision of the examining division refusing European patent application 06114414.3.
- II. In its decision the examining division held that the invention defined in the independent claims of the main and the auxiliary requests then on file was not sufficiently disclosed within the meaning of Article 83 EPC 1973.
- III. During the first-instance proceedings reference was made, among other documents, to the following document:
- D2: EP 0 453 971 A2.
- IV. With the statement setting out the grounds of appeal the appellant requested that the decision under appeal be set aside and a patent be granted on the basis of the claims of the main request or of the auxiliary request underlying the decision under appeal.
- V. In reply to a communication of the board, the appellant submitted with the letter dated 23 July 2018 an amended set of claims 1 to 3 and amended pages 1 to 3 and 8 of the description. The appellant requested as a main request that the decision under appeal be set aside and a patent be granted on the basis of the following application documents:
- claims: Nos. 1 to 3 filed with the letter dated 23 July 2018;
 - description: pages 1 to 3 and 8 filed with the letter dated 23 July 2018, page 3a filed with the

letter dated 16 September 2016, and pages 4 to 7 of the application as originally filed; and

- drawings: sheets 1/7 to 7/7 of the application as originally filed.

The appellant maintained the auxiliary request formulated in the statement of grounds of appeal.

VI. Independent claims 1 and 2 of the main request read as follows:

"1. A method of generating origin signals of an encoder having a scale (10) on which an incremental pattern (12) and an origin pattern (14) are formed,

the method comprising initially detecting the origin pattern and initially generating a first origin signal with preset width (P) at an origin position actually detected by an initial operation after power-on;

characterised in that the method further comprises then generating following origin signals with the preset width (P) using software, the following origin signals being generated at positions of a predetermined count value of an internal counter (48) based upon a main signal waveform obtained from the incremental pattern and, in accordance with the obtained main signal waveform, DOWN pulses generated by movement in one direction relative to the incremental pattern causing the internal counter to count down and UP pulses generated by movement in an opposing direction causing the internal counter to count up, wherein the first origin pattern is actually detected in the first operation alone, and the following origin signals are subsequently generated virtually by software according to the count value of the internal counter (48)."

"2. An apparatus for generating origin signals of an encoder having a scale (10) on which an incremental pattern (12) and an origin pattern (14) are formed, the apparatus comprising:

means for obtaining an origin waveform from the origin pattern (14);

means for obtaining a main signal waveform from [sic] the incremental pattern (12);

means for generating a first origin signal with preset width (P) at an origin position actually detected by an initial operation after power-on;

an internal counter (48) for counting the main signal waveform and outputting a count based upon a main signal waveform obtained from the incremental pattern and, in accordance with the obtained main signal waveform, DOWN pulses generated by movement in one direction relative to the incremental pattern causing the internal counter to count down and UP pulses generated by movement in an opposing direction causing the internal counter to count up;

characterised in that the apparatus further comprises means for generating following origin signals with preset width (P) using software, wherein the origin pattern is actually detected in the first operation alone, and the following origin signals are subsequently generated virtually by software according to the count value of the internal counter (48)."

The claims of the main request also include a dependent claim 3 referring back to independent claim 2.

Reasons for the Decision

1. The appeal is admissible.
2. *Main request - Amendments*

Claim 1 is based on claim 1 and dependent claim 2 as originally filed together with the passages on page 3, lines 29 to 31, and page 6, line 24 to page 7, line 30 of the description of the application as originally filed. Independent claim 2 is based on independent claim 4 and dependent claim 2 as originally filed together with the passages of the description mentioned in the previous sentence. Dependent claim 3 is based on dependent claim 5 as originally filed.

The board is therefore satisfied that the amended application documents of the main request comply with the requirements of Article 123(2) EPC.

3. *Main request - Sufficiency of disclosure*
 - 3.1 Claim 1 is directed to a method of generating origin signals of an encoder having a scale on which an incremental pattern and an origin pattern are formed. According to the claimed method, a first origin signal is generated after power-on upon detection of the origin pattern, and thereafter the subsequent origin signals are virtually generated using software at positions of a predetermined count value of an internal counter based upon a main signal waveform obtained from the incremental pattern of the encoder. The internal counter counts down the DOWN pulses generated by movement in one direction relative to the incremental pattern and counts up the UP pulses generated by movement in the opposite direction.

In its decision the examining division held that the internal counter counts depending on the main signal waveform, but that with the main signal waveform disclosed in the description with reference to Fig. 4 to 7 as the only input it would not be possible for the internal counter to determine the direction of movement relative to the incremental pattern of the scale. The examining division concluded that it would not be possible for the counter to discriminate between UP and DOWN pulses, and that for this reason the claimed invention was not sufficiently disclosed (Article 83 EPC 1973).

- 3.1.1 The appellant has contested the examining division's view in this respect and has referred to the passage on page 7, line 32 to page 8, line 1 of the description as originally filed as a technical disclosure that would teach the skilled person how the internal counter would count pulses, while discriminating between UP and DOWN pulses depending on the direction of movement relative to the incremental pattern.

The passage of the description referred to by the appellant pertains to the disclosure of the invention as claimed and specifies that "the counting direction of the detection head 20 is determined by the relationship between A and B phases of the analog waveforms obtained from the output of the main signal light-receiving device 42". Although this passage refers to "the main signal light-receiving device 42" in the singular, the passage requires "A and B phases of the analog waveforms" in the plural, and in the board's opinion the skilled person would understand that the counting operation is not only based on one single waveform of the main or incremental displacement signal, but on more than one signal waveform, i.e. on

the analog waveforms referred to in the passage and on the basis of which the counting direction and therefore the up and down counting of the main or incremental displacement signal waveform are being determined.

This interpretation is, in addition, consistent with the disclosure of Fig. 1 and 2 of the application relating to an encoder having a scale comprising an incremental pattern and an origin pattern (page 1, lines 16 to 21), and a detection head comprising "an index scale 30, four main signal light-receiving devices 42, and an origin light-receiving device 44", and wherein the "main signal light-receiving devices 42 acquire respective four phases of output for the sake of direction discrimination and phase division" (page 1, lines 26 to 34). The skilled person would see in this disclosure a confirmation of the fact that, while a main signal waveform is obtained from the incremental pattern as this pattern moves, further signal waveforms are being obtained and analysed for determining on the basis of the phases of the waveforms whether the movement is in a direction or in the opposite direction.

The board notes that Fig. 1 and 2 are disclosed on page 1, lines 16 to 34 as representing prior art (see the mention "PRIOR ART" in Fig. 1 and 2), and in particular as "a conventional encoder" (page 5, lines 8 to 11). However, as submitted by the appellant, the skilled person reading the application would understand that the invention is directed to a development of the conventional encoder shown in Fig. 1 and 2 in which the origin signals, instead of being generated every time the origin pattern is detected (page 1, lines 21 to 24 of the description), are generated upon detection of the origin pattern only once after power-on and then

subsequently generated virtually by software embodying the claimed internal counter (page 3, lines 29 to 31, page 4, lines 7 and 8, and page 6, lines 30 to 35). The skilled person would therefore understand that the invention essentially resides in a modification of the means responsible for generation of the origin signals, and in particular in a modification of the software, while the remaining structural features, and in particular the "main signal light-receiving devices 42" of the system of Fig. 1, may remain essentially the same. This is confirmed by the fact that according to the description "like elements have been denoted throughout the figures with like reference numerals" (page 5, lines 3 to 21) and the structural means schematically shown in Fig. 5 representing the invention and corresponding in Fig. 1 to the "main signal light-receiving devices 42" are also denoted as "42", and also confirmed by the further statement in the description on page 4, lines 11 to 14 specifying that "if the origin signal is generated and output accordingly by software, it is possible to maintain compatibility with conventional encoders [...]". The skilled person would therefore see in the disclosure of the conventional system of Fig. 1 the technical means required for discriminating whether the movement relative to the incremental pattern is in one direction or in the opposite direction, and therefore the technical means required for determining in the claimed invention whether a pulse of the main signal waveform is to be counted as a DOWN or as an UP pulse.

- 3.1.2 In its decision the examining division also held that, even if it were accepted that the detection head produced multiple signals having different phases, it would be clear from Fig. 5 that what would be provided by the phase division circuit to the internal counter

would still be a single sinusoidal waveform, regardless of how many signals were provided by the detection head.

The board concurs with the examining division that Fig. 5 shows one single main signal waveform being processed, and that the corresponding disclosure on page 5, line 33 to page 6, line 20 is also confined to the processing of one single signal waveform. However, neither Fig. 5, which only constitutes a schematic representation of the processing of a specific signal waveform, namely of the main or incremental displacement signal waveform, nor the corresponding passages of the description exclude that additional signal waveforms - in particular, the waveforms of the "A and B phases of the analog waveforms" referred to on page 7, line 32 to page 8, line 1, of the description - are also being used by the counter.

In the decision under appeal the examining division also noted that the skilled person might potentially consider the provision of additional signals to carry out the UP and DOWN counting, but that this approach would go "beyond the scope of the application as filed".

The board, however, does not find this line of argument persuasive. As already noted in point 3.1.1 above, second paragraph, the invention is disclosed in the description of the application as originally filed with reference to the relationship between phases of analog waveforms. In addition, as noted in the third paragraph of point 3.1.1 above, this disclosure is directly connected to the disclosure in the introductory part of the description of Fig. 1 and 2, which, although pertaining to the prior art, also constitutes in the

present circumstances (see point 3.1.1 above, fourth paragraph) technical information included in the application and which, as such, is also to be taken into account in the assessment of sufficiency of disclosure under Article 83 EPC 1973.

- 3.1.3 With the statement of grounds of appeal the appellant also submitted that the determination of the direction of movement of an encoder on the basis of the relative phase between two signal waveforms constituted common general knowledge in this art, and the appellant filed five patent documents in support of this allegation.

There is, however, no need to address the common general knowledge alleged by the appellant because, as concluded in points 3.1.1 and 3.1.2 above, the content of the application itself is sufficient to conclude that the invention is sufficiently disclosed within the meaning of Article 83 EPC 1973.

- 3.2 In view of the above considerations, the board concludes that the invention defined in claim 1 is sufficiently disclosed within the meaning of Article 83 EPC 1973.

- 3.3 In the decision under appeal the same objection raised under Article 83 EPC 1973 in respect of claim 1 was also raised in respect of independent claim 2.

Independent claim 2 is directed to an apparatus for generating origin signals of an encoder having a scale on which an incremental pattern and an origin pattern are formed, the apparatus comprising means the functional features of which are in direct correspondence with the steps of the method defined in claim 1. In view of the functional relationship between

the steps of the method of claim 1 and the structural means of the apparatus defined in independent claim 2, the board concludes that the invention defined in independent claim 2 is also sufficiently disclosed within the meaning of Article 83 EPC 1973 for the same reasons given in point 3.1 above in respect of claim 1.

4. *Main request - Novelty and inventive step*

The subject-matter of independent claims 1 and 2 of the present main request is essentially the same as that of independent claims 1 and 2 of the main request underlying the decision under appeal, and during the first-instance proceedings the examining division did not object to novelty and inventive step of the corresponding subject-matter. The board is satisfied that the subject-matter of the claims of the present main request is novel and involves an inventive step, the reasons being as follows:

- 4.1 Document D2 discloses an encoder having a scale comprising an incremental pattern and an origin pattern, a detector for obtaining a main signal waveform from the incremental pattern and an origin waveform from the origin pattern, and a counter for counting the pulses of the main signal waveform as DOWN or UP pulses, depending on the direction of movement relative to the incremental pattern, for the purpose of determining the position of the encoder (see Fig. 1 and 3 together with the corresponding disclosure, and page 2, lines 18 to 26).

However, while in document D2 the generation of origin signals consists in generating an origin signal every time the origin pattern is detected (page 2, lines 27 to 30), according to the subject-matter of independent

claims 1 and 2 an origin signal is generated upon detection of the origin pattern after power-on and the subsequent origin signals are then virtually generated by software according to the count value of the counter counting the DOWN and UP pulses of the main signal waveform.

The remaining documents on file are less relevant.

Therefore, the subject-matter of independent claims 1 and 2, and therefore also of dependent claim 3, is novel over the available prior art (Article 54(1) EPC 1973).

- 4.2 Document D2 represents the closest state of the art, and the claimed distinguishing feature identified in point 4.1 above improves the performance (precision, repeatability, flexibility in the origin signal width and in the origin setting, etc.) in the generation of the origin signals (see description of the application, page 2, lines 2 to 25, and page 3, line 23 to page 4, line 25).

None of the documents on file discloses or suggests going beyond the conventional approach of generating an origin signal every time the origin pattern of the scale is detected, and generating an origin signal the first time the origin pattern is detected after power-on and subsequently generating the origin signals virtually by software according to the counting of the DOWN and UP pulses of the main signal waveform as claimed.

Therefore, the subject-matter of independent claims 1 and 2, and therefore also of dependent claim 3,

involves an inventive step over the available prior art (Article 56 EPC 1973).

5. The description has been brought into conformity with the invention as defined in the present claims (Article 84 and Rule 27(1)(c) EPC 1973), and the pertinent state of the art (in particular, document D2) has been appropriately acknowledged in the introductory part of the description (Rule 27(1)(b) EPC 1973).
6. In view of the above considerations, the board concludes that the application documents of the main request satisfy the requirements of the EPC within the meaning of Article 97(1) EPC.

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:
 - claims: Nos. 1 to 3 filed with the letter dated 23 July 2018;
 - description: pages 1 to 3 and 8 filed with the letter dated 23 July 2018, page 3a filed with the letter dated 16 September 2016, and pages 4 to 7 of the application as originally filed; and
 - drawings: sheets 1/7 to 7/7 of the application as originally filed.

The Registrar:

The Chairman:



C. Spira

R. Bekkering

Decision electronically authenticated