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D E C I S I O N
of 15 September 2005

Case Number: T 0749/03 - 3.4.02

Application Number: 95308004.1

Publication Number: 0714015

IPC: G01D 5/36

Language of the proceedings: EN

Title of invention:

Optical encoder

Patentee:

Mitutoyo Corporation

Opponent:

Dr. Johannes Heidenhain GmbH

Headword:

-

Relevant legal provisions:

EPC Art. 123(3), 84, 56, 69

EPC R. 29(4)

Keyword:

"Extent of protection by replacing features in independent claim by those from an improperly appended dependent claim (here: no)"

"Inventive step (no)"

Decisions cited:

T 0190/90, T 0371/88

Catchword:

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Case Number: T 0749/03 - 3.4.02

D E C I S I O N
of the Technical Board of Appeal 3.4.02
of 15 September 2005

Appellant:
(Opponent)

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Representative:

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Respondent:
(Proprietor of the patent)

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Decision under appeal:

Decision of the Opposition Division of the
European Patent Office posted on 7 May 2003
rejecting the opposition filed against European
patent No. 0714015 pursuant to Article 102(2)
EPC.

Composition of the Board:

Chairman: A. G. Klein
Members: A. G. M. Maaswinkel
C. Rennie-Smith

Summary of Facts and Submissions

I. The appellant (opponent) lodged an appeal, received on 8 July 2003, against the interlocutory decision of the opposition division, dispatched on 7 May 2003, that European patent No. 0 714 015 (based on application No. 95 308 004.1) be maintained in an amended form. The fee for the appeal was paid on 8 July 2003. The statement setting out the grounds of appeal was received on 27 August 2003.

II. Opposition had been filed against the patent as a whole on the basis of Article 100(a) EPC in combination with Articles 52(1), 54 and 56 EPC and on the basis of Article 100(c) EPC. To support its objections the opponent referred inter alia to the following documents:

(E1) JP-A-3-252 525 with German translation

(E3) DD-A-233 649

(E4) US-A-4 782 229.

III. In its decision the opposition division found that the claims of the main request met the requirements of Article 123(2) and (3) EPC. In particular, the subject-matter of amended claim 1 did not extend the protection conferred by the European patent since it was based on claims 1 and 5 as granted, wherein the second grating defined in claim 1 had not been deleted but had been replaced by the light detecting array defined in claim 5, furthermore making reference to page 5, paragraph [0047] of the patent. The subject-matter of claim 1 was novel and involved an inventive step since

none of the documents E1 to E4 disclosed or suggested a light detecting device array having a non-uniform grating with rectangular light detecting portions and non-detecting wiring portions, where the rectangular light detecting portions had different widths from each other based on a one cycle sine waveform.

- IV. On 15 September 2005 oral proceedings were held as requested by both parties.
- V. At the oral proceedings the appellant requested that the decision under appeal be set aside and that the patent be revoked.
- VI. The respondent requested that the patent be maintained on the basis of the main request filed during the oral proceedings.
- VII. Claim 1 of the main request reads as follows:

"An optical encoder having a main scale (31) and a light detecting device array (32) arranged in parallel with each other to be relatively movable, and a light source (10) for irradiating collimated light to the main scale (31), the light transmitted from the main scale (31) and received by the light detecting device array (32) being modulated by the overlapping state between the main scale (31) and the light detecting device array (32), wherein

the main scale (31) has a uniform grating (11) which is formed of a plurality of rectangular transmitting portions (14) and a plurality of rectangular non-transmitting portions (15) alternately arranged at a predetermined pitch, each of the

rectangular transmitting portions having a uniform width, and wherein

the light detecting device array (32) has a non-uniform grating consisting of at least one set of M (where M is an integer of 2 or more) pairs of rectangular light detecting portions (33) and non-detecting wiring portions (34), the pairs being arranged at the same pitch as the uniform grating (11), the rectangular light detecting portions (33) having different widths from each other within said one set of M pairs based on a one cycle sine waveform whose wavelength is equal to one pitch of said uniform grating (11), the width of each said rectangular light detecting portion (33) being set equal to each width of sliced portions of said one cycle sine waveform sliced at M different slice levels".

Claims 2 to 5 are dependent claims.

VIII. The arguments of the appellant may be summarised as follows:

Claim 1 is objectionable under Article 123(3) EPC, since the optical encoder of claim 1 of the granted patent included, in addition to a first or "main" scale, a second or "index" scale comprising light transmitting and light non-transmitting portions which therefore was explicitly defined as a transmission grating. In this claim, the light transmitted through this transmission grating falls onto the subsequent light detector. Claim 1 as allowed by the interlocutory decision no longer includes this second scale in the shape of a transmission grating: rather, the optical encoder according to this amended claim now defines, in

addition to the first scale and instead of the transmission grating, a detector array comprising rectangular portions which may be light-detecting or non-detecting. Substituting the second scale (transmission grating) by such a detector is a clear violation of the provisions of Article 123(3) EPC, because this substitution does not include a restriction of the claimed subject-matter but rather a shift towards a different subject-matter ("aliud"). This is immediately apparent from a comparison of the optical encoder defined in present claim 1 with the subject-matter of claim 1 as granted: the encoder without transmission grating and including the detector array with transmitting and non-transmitting portions does not fall within the extent of protection of claim 1 as granted, but would now fall within the extent of protection of the present claim 1, which is in breach of Article 123(3) EPC.

It is the responsibility of every applicant to ensure that the claims of its European patent application are drafted clearly and without ambiguity. If a patent application discloses subject-matter which, because of poorly or too narrowly drafted claims, is not unambiguously covered by the claims, the patent proprietor has no right to extend the scope of protection to include such subject-matter after grant. The patent proprietor had full control over the proceedings at the application stage; if the proprietor omitted to exercise that control appropriately, the general interest of the public in legal certainty must outweigh the proprietor's interest in defending the patent in amended form, if such amendments result de facto in widening the scope of the claims.

With respect to claim 5 of the patent as granted, this was dependent on claim 1: it cannot therefore define a separate area of protection, but only a narrower form of the protection afforded by claim 1 as granted.

As regards novelty and inventive step, document E3 discloses an optical encoder device which addresses the same technical problem as in the patent, i.e. the reduction and filtering of higher harmonics in the periodic signals of an incremental encoder. In the abstract of this document it is disclosed that this may be accomplished by dimensioning different portions of the detector with predetermined widths. For instance, the abstract explicitly discloses "different rectangular detector surfaces with predetermined widths". These widths are, analogous to the solution in the patent in suit, determined by a sinusoidal wave form, as illustrated in Figures 2 and 3 of E3 showing the widths of segments I to IX. This is supported by the description, where it is stated that transmission curve has a \cos^2 -dependence, which is equivalent to a sinusoidal dependence. With respect to Figure 1 of E3, in which a second grating 4 is shown, reference is made to the embodiment ("Ausführungsbeispiel") on page 2, line 8, which discloses that the detector 5 is located immediately behind this grating ("unmittelbar dahinter angeordnet"). There is no contradiction between this embodiment and the prior disclosure in E3, since reducing the distance between the second scale 4 and the surface detector 5 in Figure 1 to zero automatically results in the arrangement disclosed in the abstract and in claim 1 of E3. Therefore the subject-matter of claim 1 differs from the optical

encoder device disclosed in E3 only in the accommodation of the wiring portions of the detector array in the non-detecting portions between the light sensitive portions of the array. However, this layout of the wiring portions is not related at all to the technical problem of the reduction of the harmonic distortion in the output signal of the incremental detector addressed in both the patent and document E3 but is merely an approach the skilled person would take depending on the exact design of the apparatus, in particular if connecting the light-sensitive areas by wiring through the non-sensitive areas were to be the only sensible wiring layout. Therefore this feature does not involve an inventive step.

IX. The arguments of the respondent may be summarised as follows:

With respect to the objection that the amended claims would infringe Article 123(3) EPC, reference is made to the published (A2) patent application, from which it clearly follows that claim 1 as originally filed had a scope which includes subject-matter fully described with reference to the example discussed in Figures 9 and 10 of the A2 publication. Specifically, on page 3 at lines 12 to 15, it is stated that "this aspect of the invention is advantageous... in case that the photo detector array is formed to serve as an index scale". At line 26 of this page it is disclosed "Fig. 9 shows a transmitting type linear encoder of another embodiment of the invention". On page 5, from lines 34 to 46, Figure 9 is described in which the light detecting device array 32 "serves as an index scale"; and at line 4 of this page it is suggested that the example of

Figure 9 is "able to use the grating arrange [*sic*] of Fig. 6 for the light receiving portion arrangement". From this it is clear that there was an unmistakable teaching in the application as filed that Figures 9 and 10 described an example falling within the scope of the invention as claimed in original claim 1. Since during the examination procedure claim 1 had only been amended in a minor aspect with regard to clarity, claim 1 of the granted patent also had this scope of original claim 1, including the embodiments with respect to Figures 9 and 10.

Claim 5 of the original application is a dependent claim, and has by definition a narrower scope than the independent claim to which it is appended. Dependent claim 5 specifically suggests that the first scale is a main scale and the second scale is a light detecting device array which serves as an index scale. Claim 1 upheld by the opposition division differs from claim 1 as granted in that the subject-matter of claim 5 was incorporated into claim 1. Since this claim 5 was a dependent claim, its incorporation into the independent claim cannot extend the scope of the independent claim. Furthermore the argument of the appellant that the upheld claim 1 extends the protection conferred by claim 1 of the patent as granted is erroneous, since Article 69 EPC specifies that the extent of protection conferred by the patent is determined by all claims, to which end the description and drawings shall be used to interpret the claims. This is explained in more detail in the annexed Protocol on the Interpretation of this Article. In any case, should there be any doubt concerning the scope of an independent claim, then it is well established that such a claim should be

interpreted to encompass within its scope each and every embodiment specifically described within the patent specification, as for instance ruled in Decision T 190/90 [of 16.01.1992].

Concerning the issue of patentability the opposition division had correctly set out in Section 6.2 of its decision that the optical encoder disclosed in document E3 contains a three-component arrangement, as shown in Figure 1 of that document: the arrangement comprises a measuring grid 3, a second or scanning grid 4 and a radiation detector 5 placed behind the scanning grid 4. Document E3 does not disclose the two-component arrangement as set out in claim 1, namely with the main scale and the light detecting device array. The references by the appellant to the abstract and to claim 1 of E3 are not persuasive, since these passages are not very clear. Rather, in interpreting the disclosure of E3 in this way it appears that this document is being read with hindsight. It is stressed that E3 does not describe the use of a detector array as claimed, but always employs a separate index scale. This is clearly disclosed in its sole embodiment ("Ausführungsbeispiel") and if the remainder of the description does not clearly describe the subject-matter of its abstract and claim 1 in detail it should be ignored because it would not be enabling in this broad sense. In any case, even if E3 did describe a two-component system, such a device would not have the rectangular light detecting portions and non-detecting wiring portions arrangement as claimed. Furthermore claim 1 requires the dimensioning to be "based on a one cycle sine wave whose wavelength is equal to one pitch of said uniform grating" and also that the portion

widths are "equal to each width of sliced portions of said one cycle sine waveform sliced at M different slice levels". This is also not disclosed in E3.

Therefore the subject-matter of Claim 1 is novel and involves an inventive step.

Reasons for the Decision

1. The appeal is admissible.
2. *Amendments*
 - 2.1 Objection under Article 123(2) EPC

During the appeal proceedings the appellant did not raise objections under Article 123(2) EPC against the set of claims on file. The board does not see any reason for a different assessment.
 - 2.2 Objection under Article 123(3) EPC
 - 2.2.1 The appellant based its objection under Article 123(3) EPC on the fact that the optical encoder defined in claim 1 of the patent as granted included a first and a second scale, wherein the second scale was a transmission grating and a subsequently arranged detector. These features were missing in claim 1 upheld by the opposition division, which claim defined a light detecting device with photosensitive portions and non-detecting wiring portions instead. These features had been defined in claim 5 of the patent as granted, which, however, was a dependent claim, therefore the extent of

the protection afforded by this claim should be narrower than that of the independent claim and could not be used to broaden the scope of protection of the independent claim.

2.2.2 By reference to claims 1, 5 and corresponding sections in the description, the respondent argued that the application as originally filed had consistently disclosed the example in Figures 9 and 10 as one of the embodiments of the invention, whence the subject-matter of present claim 1 was fully within the extent of protection conferred by the claims of the patent as granted, in particular if using the description and the figures to interpret the claims.

2.2.3 The board concurs with the appellant that, in a case where the claims are properly drafted and all the dependent claims meet the provisions of Rule 29(4) EPC (i.e. such claims include all features of the independent claim), it may be expected that the broadest extent of protection will be that of the independent claim and that the dependent claims will, by virtue of their additional features, be more restricted in scope.

2.2.4 In the present case, however, the set of claims in the application as originally filed did not conform to Rule 29(4) EPC: in particular, according to its wording, original claim 5 was directly appended to claim 1 (which, to the casual reader, might have given the impression that this claim was a "dependent" claim within the meaning of the EPC). In this claim it was specified that the "*second scale is a light detecting device array which serves as an index scale*". This

claim wording as such is already obscure, since an "index scale" is not defined in appending claim 1 (only in claim 4, to which claim 5 did not refer), and it is therefore not clear how the detecting device should serve as an index scale, and whether these features should be "additional" to all the features in claim 1. On the assumption that this "index scale" should apply to the second scale defined in claim 1 and since that claim defined that its second scale had transmission and non-transmission portions (i.e. was a transmission type grating), the further features in claim 5 were not additional features but implied a replacement of some of the features of the device in claim 1, which replacement, moreover, is not just a simple exchange but has further constructional consequences (for instance, the "light detecting means" defined in original claim 1 as a further item is now included in the light detecting device). It is highly regrettable that the applicant filed the application with the set of claims drafted in this way, because these were not only defective under Rule 29(4) EPC but clearly also under Article 84 EPC. It is even more regrettable that this had not been noticed during the examination procedure. As a result it is not a straightforward matter to determine the "extent of protection" by referring to claim 1 as the "broadest" claim.

2.2.5 Rather, the board considers claim 5 in the originally filed application as an improper dependent claim, which should in fact be regarded (in combination with some of the features of claim 1) as a second independent claim.

2.2.6 It therefore appears that, whereas claim 1 of the originally filed patent application was in itself clear

in addressing the embodiments in Figures 1 to 8, claim 5, addressing the embodiment in Figures 9 and 10, was poorly drafted and grossly unclear. In spite of the deficiencies in that claim the extent of the protection conferred is determined by the terms of the claims (i.e. all claims), where, in the present case, it is mandatory to use the description and drawings to interpret the claims. According to Article 69(1) EPC, this is permissible.

2.2.7 In its arguments the respondent made reference to Decision T 190/99, which in points 2.3 and 2.4 of the Reasons discusses the possibility of amending a granted claim to replace an inaccurate technical statement, which is evidently inconsistent with the totality of the disclosure of the patent by an accurate statement of the technical features. According to that Decision, the skilled person, when considering a claim, should rule out interpretations which are illogical or do not make technical sense. It appears that in the present case a similar situation arises: claim 5 as originally filed would, if taken alone, not make technical sense, and even the simple addition of its features to the features of claim 1 would result in an inadequately defined apparatus. However, by taking into account the whole disclosure of the patent the skilled person may arrive at a technically sensible interpretation of the claim.

2.2.8 In this context reference is also made to Decision T 371/88 [OJ 1992, 157], which was concerned with the question of the admissibility of amendment of a granted claim to replace a restrictive term by a less restrictive term. The board ruled that such replacement

was permissible under Article 123(3) EPC, if the examination of the extent of protection conferred by the granted claim results in the following conclusions:

- (a) The restrictive term in the granted claim is not so clear in its technical meaning in the given context that it could be used to determine the extent of protection without interpretation by reference to the description and the drawings of the patent;
- (b) It is quite clear from the description and the drawings of the patent and also from the examination procedure up to grant that the further embodiment belongs to the invention and that it was never intended to exclude it from protection conferred by the patent.

2.2.9 In the present case, having regard to claim 1 alone (covering the embodiments of Figures 1 to 8) the features relating to the second (transmission) grating were perfectly clear in their technical meaning. However, in combination with claim 5 these features would only make sense by making reference to the description and drawings. Therefore requirement (a) is met.

2.2.10 As to requirement (b), it is beyond doubt from the embodiment of Figures 9 and 10 and from the examination procedure that the applicant did not waive this embodiment. Hence, requirement (b) is also met.

2.2.11 The skilled person, by consulting the set of claims in its entirety together with the description and drawings of the patent application, would have been aware that the scope of protection sought included all embodiments, even if the claim language might have been poor. Therefore the board does not share the view of the

appellant that the legitimate interest of the public would be harmed by allowing the amendment in claim 1 as carried out after grant of the patent.

2.2.12 It is concluded that claim 1 meets the provisions of Article 123(3) EPC.

3. *Patentability*

3.1 Novelty - Document E3

3.1.1 This document discloses an optical encoder device and addresses the same problem as in the patent, namely reducing or removing the harmonic distortion of the displacement signal, see E3, Section "Anwendungsgebiet der Erfindung" compared with paragraph [0008] of the patent specification. According to E3, see Section "Charakteristik der bekannten technischen Lösungen", the prior art incremental encoder devices comprising a light source and a transmitting main scale suffered from the problem that the signal in the scanning or object plane contained higher harmonics which was detrimental to the measurement resolution.

3.1.2 In the Section "Darlegung des Wesens der Erfindung" ("essence of the invention"), second paragraph, E3 discloses that an intensity distribution with spatial periodicity in the measurement (displacement) direction consisting of a dominant fundamental wave and an appreciable higher harmonics component is sampled in the sampling or image plane by a "number of spatially separated radiation detector elements with the same locally constant detection sensitivity or different rectangular detection surfaces of predetermined widths

in the direction of displacement with a detection sensitivity which has a \cos^2 -functional local detection sensitivity compared to that of a single grating element".

3.1.3 In the subsequent paragraph it is disclosed that "in a preferable arrangement a finite number of detector elements with locally constant detection sensitivity but having different widths are arranged in arbitrary sequence with the distance of their centre lines of the size of the image of one grating element in such way that the centre lines of the individual detector elements overlap" ("Vorteilhaft ist die Anwendung einer Anordnung, die so aufgebaut ist, dass eine endliche Anzahl von Strahlungsempfängerelementen mit örtlich konstanter Strahlungsempfindlichkeit aber unterschiedlicher Breite in beliebiger Reihenfolge mit dem Abstand ihrer Mittellinien von der Größe des Bildes eines Rasterelementes des Maßstabes nebeneinander so übereinander angeordnet werden, dass die Mittellinie der einzelnen Strahlungsempfängerelemente zusammenfallen"). Therefore in the assessment of the board, this passage in E3 discloses the use of a detector array ("endliche Anzahl von Strahlungsempfängerelemente") with array elements of different widths ("unterschiedlicher Breite"), which widths are determined by a \cos^2 -functional dependence and wherein the periodicity or pitch of this array is as the one in the first scale (overlapping centre lines).

3.1.4 It is acknowledged that in the Example ("Ausführungsbeispiel") E3 discloses a different solution, as is also illustrated in its Figure 1.

However, the board does not concur with the respondent that the earlier cited passages of this document would be vague and that the interpretation of the appellant was based on hindsight. Rather the board finds no inconsistency within document E3: as disclosed in the last sentence of the Section "Darlegung des Wesens der Erfindung", a simple practical realisation of the inventive concept is by approximation of the \cos^2 -transmission profile by a finite number of grating elements with rectangular transmission profiles. This is the solution subsequently presented in the Example. Therefore the Example as illustrated in Figure 1 of E3 is not in contradiction with the idea of employing a detector array with rectangular light detecting portions with a sinusoidal width (of the shape illustrated in Figure 2), it is merely a practical realisation of this idea.

- 3.1.5 The respondent furthermore objected that E3 did not disclose the requirements of claim 1 that the dimensioning be based on a one cycle sine wave whose wavelength is equal to one pitch of said uniform grating and that the portion widths be equal to each width of sliced portions of said one cycle sine waveform sliced at M different slice levels. The board does not concur with this assessment: as pointed out before, the array elements of the detector in E3 are spaced at the same pitch as the image of the first grating (in any case this appears to be a fundamental constraint of this type of encoders, because otherwise a filtering of harmonics is impossible). Furthermore Figure 2 of E3 and the expression of the widths of the individual elements in the Example (b_i) disclose the widths of the portions. Also the equivalence of a \cos^2

and sine function is elementary. Finally the board notes that Figure 3 in E3 and Figure 7 of the patent show the same sequence of elements (apart from the fact that in E3 only nine slices are selected -as shown in its Figure 2- whereas in the patent ten slices are used, see its Figure 3).

3.1.6 It is concluded that the subject-matter of claim 1 differs from the encoder known from document E3 in that claim 1 specifies that the detector comprises pairs of light detecting portions and non-detecting portions, wherein the latter are wiring portions.

3.1.7 The other documents disclose more remote prior art and are not relevant for the purpose of this Decision.

3.1.8 The subject-matter of this claim is therefore novel (Art. 52(1) and 54 EPC).

3.2 Inventive step

3.2.1 With respect to the feature that the non-detecting portions of the array are wiring portions the patent specification does not provide any further information. The technical problem addressed by this feature could be seen in the provision of the wiring layout for the detector array. Since all detector arrays must be wired in order to transfer the electrical signals to a signal processing unit this problem as such is regarded as obvious. The appellant expressed its opinion that this problem was not related to the problem of reducing harmonics signals in the measurement signal.

3.2.2 The solution to use the non-detecting portions for wiring cannot be considered as involving an inventive activity for the following reason. In this encoder, the contributions (electrical output signals) of the array elements of the detector are summed, as in the case of a single detector with pre-positioned transmission grating (see Figure 1 of the patent and the Example in Figure 1 of E3). Therefore, the positioning of the individual elements can be freely selected (which is the case for the arrangement in E3, which discloses that the sequence is "arbitrary", see point 3.1.3 *supra*; as well as in the patent, see Figures 6 and 7) and those individual detector elements must be connected. It would therefore appear to involve a simple constructional measure to make electrical connections between the individual detector elements via wiring located between the photosensitive surfaces.

3.2.3 Therefore claim 1 of the main request is not allowable because its subject-matter lacks an inventive step (Articles 52(1) and 56 EPC).

4. Since claim 1 of this request is not allowable, the patent cannot be maintained.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chairman:

P. Martorana

A. Klein