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Datasheet for the decision of 5 February 2009

Case Number: T 1887/06 - 3.4.02

Application Number: 95922098.9

Publication Number: 0760932

IPC: G01B 9/02

Language of the proceedings: EN

Title of invention:
Apparatus for detecting relative movement

Patentee:
GSI Group Corporation

Opponent:
DR. JOHANNES HEIDENHAIN GmbH

Headword:
-

Relevant legal provisions:
EPC Art. 52(1), 54(3), 123(2)

Relevant legal provisions (EPC 1973):
EPC Art. 56, 108
EPC R. 29(7), 65(1)

Keyword:
"Admissibility of appeal by patent proprietor (no)"
"Added subject-matter (no)"
"Novelty and inventive step (yes)"

Decisions cited:
T 1149/97

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 1887/06 **-** 3.4.02

D E C I S I O N
of the Technical Board of Appeal 3.4.02
of 5 February 2009

Appellant: (Opponent)
DR. JOHANNES HEIDENHAIN GmbH
Dr.-Johannes-Heidenhain-Str. 5
D-83301 Traunreut (DE)

Appellant: (Patent Proprietor)
GSI Group Corporation
22300 Haggerty Road
Northville
MI 48167 (US)

Representative:
Joly, Jean-Jacques
Cabinet Beau de Loménie
158, rue de l'Université
F-75340 Paris Cedex 07 (FR)

Decision under appeal:
Interlocutory decision of the Opposition Division of the European Patent Office posted 9 October 2006 concerning maintenance of European patent No. 0760932 in amended form.

Composition of the Board:

Chairman: A. G. Klein
Members: F. J. Narganes-Quijano
B. Müller

Summary of Facts and Submissions

I. Both the patent proprietor and the opponent lodged an appeal against the interlocutory decision of the opposition division finding European patent No. 0760932 (based on European patent application No. 95922098.9 published as International publication No. WO 95/033179) as amended according to the auxiliary request filed by the patent proprietor during the first-instance oral proceedings to meet the requirements of the EPC 1973.

The opposition filed by the opponent against the patent as a whole was based on the grounds of lack of novelty and lack of inventive step (Article 100(a) EPC 1973).

During the first-instance proceedings the opponent also raised an objection under Article 123(2) EPC 1973 with respect to, among others, dependent claims 6 to 14 as granted.

In its decision the opposition division referred to the following documents:

E1 : WO-A-9322615
E2 : EP-A-0577088
E3 : EP-A-0603905,

and held ***inter alia*** that the subject-matter of the claims amended according to the auxiliary request was novel and involved an inventive step with regard to the disclosure of documents E1, E2 and E3 (Articles 52(1), 54 and 56 EPC 1973). According to the minutes of the first-instance oral proceedings, the opposition division also found during the proceedings that

dependent claims 6 to 14 complied with the requirements of Article 123(2) EPC 1973.

II. With its statement setting out the grounds of appeal the opponent filed the following documents:

E4 : DE-C1-3810165
E5 : "Digital linear and angular metrology", A. Ernst, Verlag Moderne Industrie AG & Co., Landsberg/Lech (DE), 1990; pages 17 to 19.

III. As noted by the Registry in a communication, no statement of grounds of appeal was filed by the patent proprietor within the time limit prescribed by Article 108 EPC 1973.

IV. In an annex to summons to oral proceedings, the Board noted ***inter alia*** that the notice of appeal filed by the patent proprietor contained nothing that could be regarded as a statement of grounds within the meaning of Article 108 EPC 1973, that the extensive submissions filed by the patent proprietor months after the time limit prescribed by Article 108 EPC 1973 for filing the statement of grounds of appeal had expired constituted only a substantive reply to the appeal filed by the opponent, and that consequently the appeal filed by the patent proprietor would have to be rejected as inadmissible pursuant to Article 108 in conjunction with Rule 65(1) EPC 1973.

V. Oral proceedings were held on 5 February 2009.

During the oral proceedings the patent proprietor acknowledged that his appeal was inadmissible.

The opponent requested that the decision under appeal be set aside and the patent be revoked.

The patent proprietor requested that the patent be maintained as maintained by the opposition division in the decision under appeal or, on an auxiliary basis, maintained on the basis of the set of claims amended according to the auxiliary request filed with the letter dated 5 January 2009.

At the end of the oral proceedings the Board gave its decision as recorded in the order below.

VI. Claim 1 and dependent claim 6 of the patent as amended according to the auxiliary request relied upon by the opposition division in the interlocutory decision under appeal read as follows:

"1. An apparatus for detecting relative movement comprising

a diffraction grating (13, 13A) relatively movable with respect to a source (15) and having a period P and a characteristic which diffracts light at a preselected wavelength λ into positive and negative first orders (72, 70) which interfere with one another in a region of natural interference (73) adjacent the diffraction grating (13, 13A);

means (60, 74, 148, 214) for splitting the incident light beam into first and second beams (66, 68) of light of wavelength λ;

a polyphase periodic detector (25) including a plurality of periodically arranged detector elements and having a sensing plane positioned within the region

of natural interference (73) of the diffraction grating between positive and negative first orders (72, 70) diffracted by the diffraction grating from the first and second beams of light at opposed same angles;

wherein the periodic detector (25) has a period which is a function of the preselected wavelength λ and the period P of the diffraction grating (13), wherein the periodic detector (25) provides an output signal in response to light incident thereon, whereby the periodic detector (25) responds principally to interference at said sensing plane between the positive and negative first orders (72, 70) diffracted from said diffraction grating (13)."

"6. The apparatus of one of claims 1 to 5 comprising

a head structure (92);

a carrier structure (104) supported by the head structure (92) wherein the periodic detector (25) is positioned on the carrier structure (104);

a light source (15) which provides collimated, coherent light of the pre-selected wavelength λ and supported by the head structure (92);

electronic circuitry (106) positioned on the carrier structure (104), for conditioning the output signal from the periodic detector (25);

a mirror structure (19) supported by the head structure (92); wherein the mirror structure (19) has a position on the head structure (92) with respect to the light source (15) so as to be capable of directing onto the periodic detector (25) natural interference between positive and negative first orders (72, 70) which are diffracted by the diffraction grating (13) in response to light incident on the diffraction grating (13) from

the light source (15) when the head structure (92) is positioned adjacent the diffraction grating (13)."

The set of claims of the patent amended according to the interlocutory decision also includes dependent claims 2 to 5, 7 to 14 and 24 to 40 all referring back to claim 1, an independent claim 15 directed to a method for controlling the position of a component by means of an apparatus according to claim, and dependent claims 16 to 23 all referring back to claim 15.

The wording of the claims amended according to the auxiliary request of the patent proprietor is not relevant for the present decision.

VII. The arguments submitted by the opponent in support of its requests can be summarized as follows:

The amended feature of claim 1 relating to the polyphase periodic detector including a plurality of periodically arranged detector elements contravenes Article 123(2) EPC. In particular, paragraph [0020] of the patent specification has been amended at line 46 to specify that the disclosure in paragraphs [0022] to [0037] relating to Figures 1 to 4 does not constitute an example of the invention, so that, following decision T 1149/97 (point 6) and the Guidelines D-V-9, point 6.2, this disclosure cannot be used as a basis for the amended claimed feature. Although the decision T 1149/97 only refers to amendments before grant, the conclusion reached in the decision should also apply for amendments made to the patent after grant. Moreover, paragraph [0047] expressly indicates that in the embodiments of Figures 7 to 13 there is no means

for wave front correction; however, these means constitute, together with the aperture 60 of Figure 5 and the collimation lens 74 of Figure 6, the only implementations of the claimed splitting means specified in the patent specification, and since none of these alternative implementations is present in the embodiments of Figures 7 to 13, the disclosure of the patent relating to these figures cannot be used either as a basis for the amended claimed feature. In addition, the amended claimed feature is not derivable explicitly or implicitly from the disclosure of the remaining embodiments.

The amendment in claim 1 relating to the feature "at opposed same angles" can only be derived from specific optical arrangements disclosed in the application. Therefore, in the absence of a general teaching, its isolation constitutes an unallowable generalization. In particular, there is no express teaching in the application that the amended feature constitutes an essential feature of the invention. As regards the figures, in Figure 5 the incident light beams are parallel to each other and orthogonal to the grating scale, and in Figure 18 the incident light beams are not parallel but symmetric with respect to the grating scale, and only under these specific conditions the angles defined in the claim can be said to be the same.

Dependent claim 6 is based on original independent claim 6 and, in view of the terminology and the reference signs used in the claim, this independent claim was exclusively directed to the embodiments of Figures 7 to 13. As already indicated, however, these embodiments do not contain wave front correction means

or splitting means as claimed. In addition, the examples represented in Figures 9 and 10 do not contain means such as the head structure, the carrier structure and the electronic circuitry defined in independent claim 6 as published. Therefore, the reformulation of independent claim 6 and of dependent claims 7 to 14 of the application as claims dependent on claim 1 results in added subject-matter.

The disclosure of Figure 3 of document E1 includes the presence of splitting means. As shown by the light from the light source represented unambiguously in Figure 3 of document E1 as two separate incident light sub-beams, the provision of splitting means for splitting the two sub-beams is necessary and therefore implicitly disclosed in document E1. Alternatively, the elongated detector itself splits the light from the light source. In addition, the optical arrangement in Figure 3 of document E1 is such that the zeroth order diffraction light would be reflected back and not towards the detector, so that, contrary to the view expressed by the opposition division, in document E1 only the first order diffraction light reaches the detector. Therefore, the claimed subject-matter is anticipated by the disclosure of document E1.

The patent specification (paragraph [0033]) states that a detector arrangement constituted by large area photodetectors each having a mask constitutes an alternative to a polyphase detector array. Accordingly, this alternative falls within the scope of protection of claim 1. This alternative, however, is anticipated in document E3 by the detector constituted by the large area detector and the periodic grating. In addition, in

document E3 the grating G3 is close to the detector 3 and the detector plane is therefore in the region of natural interference within the meaning of the patent, especially in view of the comments on page 7, lines 2 to 6 of the patent specification. The claimed feature relating to the "opposed same angles" is also anticipated by the disclosure in document E3 with reference to Figure 10B. The claimed subject-matter is therefore not novel over document E3.

It was common general knowledge at the priority date to provide in an apparatus such as that disclosed in document E1 splitting means in the form of a grating in the path of the light beam between the light source and the grating scale. This common general knowledge is illustrated in the textbook E5 cited in the patent specification and in which the splitting means is constituted by a diffraction grating which splits the light beam into three sub-beams incident onto a reflective grating scale (Figure 10). Consequently, the provision of splitting means as those shown in document E5 in the apparatus of document E1 cannot be considered to involve an inventive step. The detector arrangements of documents E1 and E5 would not dissuade the skilled person from following this obvious approach, the patent specification itself already pointing at alternative equivalent detector arrangements (paragraphs [0033] and [0034]). Alternatively, document E1 already acknowledges the need for eliminating the zeroth order diffraction light and the skilled person would recognize in Figure 3 of the document that by isolating the two light beams represented in the figure from the incident light the zeroth order diffraction light would not reach the detector; the skilled person would

therefore provide a splitting means such as that shown in document E5 which uses a detector such as that mentioned in paragraph [0034] of the patent specification.

Document E4 also discloses an optical interference position measuring device in which the light directed towards a grating scale is split by a diffraction grating 2; the symmetrically emerging first order diffraction light beams are then used for the position measurement. Thus, the document provides a solution to the problem of eliminating the contribution of the zeroth order diffraction light beam to the interference pattern on the detector. Document E4 relies on two separate detectors, but the patent specification itself acknowledges that this detector arrangement constitutes an equivalent alternative (page 7, lines 2 to 6).

VIII. The arguments of the patent proprietor in support of its requests are essentially the following:

The disclosure of Figures 1 to 4 has not been deleted, but merely amended in paragraph [0020] to identify it as subject-matter useful for understanding the invention. The amendments were made post-grant and therefore decision T 1149/97 and the passage of the Guidelines cited by the opponent and pertaining to amendments before grant are irrelevant. The amendments -to claim 1 relating to the polyphase periodic detector are therefore supported by the corresponding disclosure of Figures 1 to 4, and in any case they are also supported by other passages of the application as published (corresponding to paragraphs [0007], [0076],

10[0092], [0104] and [0111] of the patent specification).

It is clearly und unambiguously derivable from at least the disclosure of each of Figures 5 and 18 that the first order diffraction light beams are at opposed same angles as claimed. In particular, the angles referred to in the disclosures of Figures 2 and 18 imply symmetry. In addition, the claimed feature has not been disclosed as being linked to any specific arrangement.

The use of splitting means according to the subject-matter of claims 6 to 14 as granted is derivable from page 20, lines 29 to 33 of the published application. The skilled person would understand that the presence of electronic circuitry in the exploded schematic view of Figure 9 is implied in view of the description of Figures 7 to 13, and page 22, lines 17 to 23 of the published application expressly mentions that a wave front correction structure can be used in Figure -+

10. The written description in no way excludes the use in claim 6 of splitting or wave front correction means. It is also well established that the use of reference numerals in the claims shall not be construed as limiting the claims (Rule 29(7) EPC 1973).

It is common practice in the field of optics to illustrate schematically arbitrarily isolated light rays, and document E1 does not describe Figure 3 in terms of two separate light beams incident on the scale 13. Instead, it makes reference to an illuminated region of width W, so that Figure 3 illustrates a single light beam incident on the scale. Also the

representation in Figure 1, linked to Figure 3, shows a single incident light beam. The detector of Figure 3 has a width narrower than what is necessary to separate the light beams as alleged by the opponent; in any case the detector does not lie in the incident light beam path and therefore cannot act as a beam splitter.

It has not been submitted that document E3 teaches a polyphase periodic detector as claimed, but only that the document allegedly discloses alternatives mentioned in the description of the patent; however, these alternatives have only been mentioned with reference to Figures 1 to 4 which are not encompassed by the claimed invention. Thus, claim 1 must be considered to be new with regard to document E3. In addition, the diffractive arrangement of Figure 10B of document E3 does not anticipate the remaining claimed features relating to the region of natural interference and to the opposed same angles.

Claim 1 differs from document E1 at least in the light splitting means. The objective problem is to provide a high accuracy apparatus for detecting relative movement with less or with relaxed constraints in using natural interference. The symmetric diffraction arrangement enlarges the region of natural interference, so that manufacturing limitations can be relaxed. In addition, the splitting configuration as claimed directly avoids zeroth order diffraction light incident on the detector, thus improving accuracy.

The claimed solution is not rendered obvious by the prior art. It would be ex-post-facto to isolate in

Figure 3 of document E1 the two light beams only representing the useful light in two split light beams.

Document E5 teaches splitting an incoming light beam at a scanning grating A into three directions; the first order diffraction beams are then diffracted by scale M into further first order diffraction beams which are diffracted again by grating A so that they interfere on a side of the grating A where they are detected and processed. Document E1, however, addresses the problem of avoiding the scanning gratings required in document E5, and the approaches of the two documents are different. Document E5 does not address the problem of the constraints and of the region of natural interference, and consequently the document is not in the context of the formulated problem.

Document E4 uses three gratings and requires splitting a light beam into first and zeroth order diffraction light beams which are then split again. The detectors 12 and 13 in document E4 are not positioned in a region of natural interference between the resulting split light beams. Instead, these beams are diffracted again into zeroth and first order diffraction light beams. Therefore, document E4 only teaches how to limit higher order, but not the zeroth order diffraction light. Thus, there is no reason for combining documents E1 and E4, and document E4 would in fact have led the skilled person away from the claimed invention because document E1 was intended to avoid the need for features such as those described in document E4.

Reasons for the Decision

1. *Admissibility of the appeals*

1.1 The appeal filed by the opponent is admissible. In particular, the opponent's appeal complies with the requirements of Articles 107 and 108 and Rule 64 EPC 1973.

1.2 As already noted during the proceedings by the Registry and by the Board (points III and IV above), no statement of grounds of appeal had been filed by the patent proprietor in support of its notice of appeal. Consequently, as acknowledged by the patent proprietor himself during the oral proceedings, his appeal has to be rejected as inadmissible pursuant to Article 108 in conjunction with Rule 65(1) EPC 1973.

1.3 In view of the conclusions reached above, the patent proprietor (in the following "the respondent") is considered as a non-appealing party in the proceedings initiated by the admissible appeal of the opponent (in the following "the appellant").

2. *Alleged added subject-matter*

The appellant has submitted that the claims amended according to the auxiliary request relied upon by the opposition division in the decision under appeal contravene the requirements of Article 123(2) EPC. However, the appellant's submissions are not considered convincing for the following reasons:

2.1 The disclosure of Figures 1 to 4 in the application as published and corresponding essentially to paragraphs [0022] to [0037] of the patent specification pertains to an apparatus for detecting relative movement and comprising, among other features, a detector as defined in claim 1, i.e. a polyphase periodic detector including a plurality of periodically arranged detector elements (Figure 4 and paragraph [0024]). The subsequent disclosure in both the application as published and the patent specification with reference to Figure 5 relates to the provision of an aperture structure operating as light splitting means as defined in claim 1 (paragraph [0039] ***et seq.***). The corresponding passages do not mention expressly that the detector is constituted by a polyphase periodic detector as disclosed with reference to Figures 1 to 4. However, the embodiment of Figure 5 is disclosed in both the application as published and the patent specification not as a separate embodiment unrelated to Figures 1 to 4 - as contended by the appellant -, but as a development of the apparatus previously disclosed with reference to Figures 1 to 4, and in this context the skilled person would understand that the detector of Figure 5, represented schematically in the figure as a periodic arrangement of detector elements as it is the case in Figure 4, is constituted by a detector as that previously disclosed with reference to Figures 1 to 4.

Claim 1 amended according to the interlocutory decision requires that the apparatus comprises a polyphase periodic detector and splitting means. The embodiments of Figures 1 to 4, however, do not include splitting means and consequently do not constitute embodiments of

the claimed invention, and the patent specification has been amended to specify that these figures are "an example which is useful for understanding the present invention" (amended paragraph [0020]). The effect of this amendment is that the disclosure of the embodiments of Figures 1 to 4 is retained in the patent specification as support for the features of the subsequent disclosure of Figure 5 and therefore as support of features of the claimed invention, and the mere fact that the embodiments of Figures 1 to 4 do not constitute embodiments of the invention does not imply at all - as it would appear to be suggested by the appellant's submissions - that the embodiment disclosed with reference to Figure 5 is then automatically deprived of those features common to the embodiments of Figures 1 to 4.

It follows from the above considerations that the whole disclosure in the application as published relating both directly and indirectly to Figure 5 supports the combination of a polyphase periodic detector and of light splitting means as specified in the amended claim under consideration within the meaning of Article 123(2) EPC, and that the fact that the embodiments disclosed with reference to Figures 1 to 4 do not fall within the scope of the claim has no effect on this finding.

As there is a clear basis in the application as published for the mentioned claimed combination of features, the further alternative submissions of the appellant and the respondent are not considered pertinent. In particular, it is not relevant for the issue under consideration whether the disclosure in the

application as published with reference to Figures 7 to 13 constitutes or not a further basis for the aforementioned claimed combination of features as disputed by the appellant. In addition, as regards the appellant's submissions with reference to decision T 1149/97 (OJ EPO 2001, 273) and the passage of the Guidelines D-V, point 6.2, the Board notes that the decision and the passage of the Guidelines mentioned by the appellant relate to the compliance with Article 123(3) EPC of the reinsertion in a granted patent of subject-matter deleted before grant or presented in the patent specification as not relating to the claimed invention (see in particular points 6.1.3 and 6.1.9 to 6.1.12 of the reasons of the mentioned decision), and not to the issues actually raised by the appellant, i.e. the compliance with Article 123(2) EPC of amendments made to the granted patent specification during opposition proceedings.

2.2 As regards the amendment in claim 1 requiring that the positive and negative first order diffraction light beams giving rise to the region of natural interference are diffracted by the diffraction grating "at opposed same angles", the appellant, without properly disputing that this feature is derivable from the embodiments disclosed in the application as filed, has submitted that the feature has been disclosed only in association with specific arrangements and particular parameters not specified in the amended claim.

However, as noted by the respondent, all the optical arrangements disclosed in the different embodiments are symmetric in such a way that the first order diffraction light beams diffracted by the diffraction

grating interfere in a symmetric region of natural interference, and the Board is satisfied that the fact that this symmetry is achieved in the different embodiments according to different arrangements and parameters would not deter the skilled person from identifying the symmetry of the different arrangements as a feature of the invention, independently of the specific arrangement or the particular parameters used in each embodiment. Therefore, this symmetry, expressed in the claim in terms of the symmetrical angular orientation of the first order diffraction light beams, although not formulated literally in the application as published as a feature of the invention, is clearly and unambiguously derivable from the disclosure of the invention.

Therefore, the Board does not see an unallowable generalization in the fact of specifying in claim 1 the symmetrical angular orientation of the first order diffraction light beams independently of the specific means or particular arrangement used to achieve it.

2.3 The reformulation of independent claim 6 as published as a dependent claim referring back to claim 1 has been objected to by the appellant under Article 123(2) EPC 1973. This amendment was already present in the patent as granted, so that the objection amounts in fact to an objection under Article 100(c) EPC 1973 which was not initially invoked by the appellant in its notice of opposition. However, since this same objection was already raised in the first-instance proceedings and rejected by the opposition division (see point I above), the Board considers that the corresponding ground for

opposition was *de facto* introduced by the opposition division into the proceedings.

The objection of the appellant relies on the allegations that, in view of the terminology and the reference signs used in the claim, independent claim 6 of the application as published was exclusively directed to the embodiments of Figures 7 to 13, that these embodiments do not include wave front correction and therefore do not include splitting means as claimed, and that consequently present dependent claim 6 contains, by virtue of its dependence on claim 1, splitting means not disclosed in the application as published.

The Board, however, is unable to follow these allegations. Firstly, as submitted by the respondent and expressly stated in Rule 29(7) EPC 1973, the reference numerals in a claim "shall not be construed as limiting the claim" and, in addition, the appellant has failed to identify specific features of independent claim 6 as published that would have restricted its subject-matter to only cover the embodiments disclosed with reference to Figures 7 to 13. Secondly, although the embodiments represented in Figures 7 to 13 are initially described in the description of the application as published explicitly as not employing wave front correction (paragraph [0047] of the patent specification and the corresponding passage of the application as published), subsequent passages of the description specify the use of wave front correction in these embodiments (paragraphs [0067] and [0075] of the patent specification and the corresponding passages of the application as published); as conceded by the

appellant, wave front correction constitutes one of the alternative means of implementation of the splitting means according to the disclosure of the invention, so that no added subject-matter can be seen in the amendment resulting in dependent claim 6 as granted and requiring splitting means as defined in claim 1. The further allegation of the appellant that the embodiments of Figures 9 and 10 do not contain all the means (the head structure, the carrier structure and the electronic circuitry) defined in independent claim 6 as published and that therefore the statement in the paragraph [0067] of the patent specification mentioned above and relating specifically to these figures cannot support the provision of the wave front correction cannot be followed either because, as pointed out by the respondent, the presence of these means in the schematic views of Figures 9 and 10 is implied in view of the disclosure of the related embodiments represented in Figures 7, 8 and 11 to 13.

In view of the above, the appellant's allegation that the subject-matter of dependent claim 6 contravenes the requirements of Article 123(2) EPC is not found convincing.

3. *Documents E4 and E5 filed on appeal*

The admissibility into the proceedings of documents E4 and E5 filed by the appellant with the statement of grounds of appeal was not contested by the respondent, and since the documents were filed in response to the amendments made to claim 1 during the first-instance oral proceedings, the Board has no objection to the admissibility of the documents into the proceedings.

4. *Novelty*

The appellant has submitted that the subject-matter of claim 1 is anticipated by the disclosure of each of documents E1 and E3. However, the submissions of the appellant are not found convincing for the following reasons:

4.1 Document E1 discloses an apparatus for detecting relative movement comprising a diffraction grating and a polyphase periodic detector. According to the disclosure of the document, light from a light source is diffracted by the grating, and the positive and negative first order diffraction light beams interfere with each other in a region of natural interference in which the polyphase periodic detector is located (Figures 1 to 4 and the corresponding disclosure). The document has been acknowledged in the introductory part of the patent specification, and the figures of the document are similar to Figures 1 to 4 of the patent specification. During the proceedings the issue of novelty has been confined to the question of whether document E1 also discloses means for splitting the incident light as required by claim 1.

In Figure 3 of document E1 the light incident on the grating is represented by two light beams at each side of the detector, and the resulting diffracted light is represented by two diffracted light beams directed towards the detector. The appellant has submitted that the skilled person would understand the two incident light beams represented in the figure as two separate light beams obtained by splitting the light from the

light source and that therefore the document discloses implicitly the provision of splitting means as claimed. However, the schematic representation depicted in Figure 3 alone is insufficient to support the appellant's contention in this respect. It is normal in this field to represent the light incident on an optical component by means of light beams not necessarily representing the real extension or the boundary of the whole incident light beam, but only a representative part or section of it. In addition, in Figure 3 the boundaries of the diffracted light beams represented in the figure reach the edges of the detector, so that it cannot be excluded that the incident light beams depicted in the figure merely represent the effective section of the incident light beam giving rise to that section of the first order diffraction light effectively covering the whole detector, without ruling out that other sections of the incident light give rise to diffraction light of an order different than one and also reaching the detector. In addition, the appellant has not identified any other disclosure of the document that would have supported his submissions, and the passages indicated by the respondent on page 4, lines 5 to 9 and 24 to 26 of document E3 and referring to the illuminated region of the grating scale as having a width W would rather point to a single incident light beam reaching the scale. Therefore, the Board considers the disclosure of document E1 insufficient to conclude that the document discloses implicitly splitting the light from the light source into two light beams as claimed.

The appellant has also submitted that in document E1 the detector is elongated and intercepts the incident light as shown in Figures 1 and 3, and that therefore the detector itself splits the incident light into two light beams. However, Figures 1 and 3 only represent a top view of the arrangement and, as indicated by the respondent, page 4, lines 18 to 23 of the document specifies that "while the detector is shown as though being in the path of the light beam [...], it can in fact be located above or below the beam"; in any case, there is no clear disclosure that the detector would then extend beyond the incident light beam so as to intercept the incident light and split it in two light beams as required by the claimed subject-matter.

The appellant has further submitted that in document E1 only the first order diffraction light would reach the detector, so that in document E1 the effect of the provision of light splitting means according to the invention, i.e. eliminating diffraction light other than the first order diffraction light and in particular the zeroth order diffraction light, is already achieved in document E1, thus pointing implicitly at the provision of light splitting means. However, document E1 refers to minimizing the zeroth order diffraction light by tailoring the grating (page 3, lines 28 to 33 and page 5, lines 17 to 20), so that the zeroth order diffraction light is not suppressed by the optical arrangement as it would be the case if splitting means as claimed were provided in the arrangement. In addition, even assuming that the zeroth order diffraction light is reflected back by the grating without reaching the detector as alternatively submitted by the appellant, there is no disclosure in

document E1 that would exclude diffraction light of an order of diffraction higher than one from also reaching the detector.

In view of the above considerations, the Board concludes that there is no direct and unambiguous disclosure in document E1 of light splitting means as claimed.

4.2 Document E3 discloses a displacement detection apparatus comprising, among other components, a light detection arrangement constituted by a diffraction grating G3 coupled to a light-receiving element (abstract and column 5, line 49 ***et seq***.). According to the appellant, this detection arrangement constitutes an arrangement of large area photodetectors each provided with a respective mask of the type disclosed in the patent specification as an alternative to the use of a polyphase detector (page 6, lines 53 to 58). Thus, the appellant himself acknowledges that document E3 does not disclose a polyphase periodic detector as required by the claimed subject-matter, but at the most an alternative detector arrangement, and for this reason alone the subject-matter of claim 1 is novel over the disclosure of document E3.

The Board notes in this respect that, contrary to the submissions of the appellant, the mere fact that the patent specification mentions possible alternatives to the use of a polyphase detector in the context of embodiments not falling within the claimed invention does not mean that the subject-matter of claim 1, which literally and expressly requires a polyphase periodic detector including a plurality of periodically arranged

detector elements, extends automatically to include such alternatives. Thus, in the present case the detector arrangement of document E3 may constitute at the most an equivalent technical alternative to the claimed polyphase detector, but not a polyphase detector as claimed. Technical equivalents, however, are not a matter of novelty, but of obviousness (see Case Law of the Boards of Appeal, EPO, 5th edition 2006, chapter I, sections C.2.5 and D.8.9), and accordingly document E3 does not constitute a valid novelty-destroying disclosure for the claimed subject-matter.

In view of the above considerations, there is no need to assess whether the remaining claimed features are disclosed in document E3 and, noting that document E3 constitutes prior art within the meaning of Article 54(3) EPC, the Board concludes that claim 1 defines novel subject-matter over the disclosure of document E3 within the meaning of Articles 52(1) and 54(3) EPC by virtue of the claimed polyphase detector.

5. *Inventive step*

5.1 It has been uncontested that document E1 represents the closest state of the art. As already concluded in point 4.1 above, the subject-matter of claim 1 differs from the apparatus disclosed in document E1 in the provision of light splitting means as claimed.

According to the disclosure of the invention, the provision of light splitting means prevents the zeroth order diffraction light from reaching the detector, thus increasing the measurement accuracy and the

reliability of the apparatus (paragraph [0006] together with paragraphs [0040] and [0043] of the patent specification). Other effects alleged by the respondent during the proceedings or mentioned by the opposition division in its decision (symmetrical arrangement causing an enlargement of the region of natural interference, improved detection by the polyphased configuration of the detector, etc.) are already achieved in document E1 or at least are not influenced by the distinguishing feature identified above and therefore cannot be taken into consideration in the formulation of the objective problem.

Accordingly, the objective technical problem solved by the claimed invention can be seen in improving the reliability and the accuracy of the movement detection apparatus of document E1.

5.2 Document E1 mentions that it is preferable that pure first order diffraction be achieved (page 8, lines 20 to 26), but this effect can be achieved by different alternative means and there is no indication in the document that the characteristics of the light from the light source incident on the grating would have an influence on this effect. In these circumstances, the skilled person confronted with the problem formulated above would have no obvious reason, without the hindsight knowledge of the claimed invention, to consider the provision of light splitting means in order to split the two light beams represented in Figure 3 from the remaining incident light as submitted by the appellant.

Document E5 is an excerpt from a textbook disclosing an interferential measuring system constituted by a grating scale and a scanning grating which diffracts the incoming light into three light beams; the diffracted light beams are then reflectively diffracted by the grating scale, diffracted again by the scanning grating and recombined and brought into interference with each other to form three interfering light beams which are detected by means of three solar cells (Figure 10 and page 17, penultimate paragraph). The Board accepts the argument of the appellant that the scanning grating of document E5 splits by diffraction the incident light into three diffraction light beams. However, document E5 discloses the provision of the scanning grating in a specific diffraction arrangement, and the document is insufficient to support in its generality the contention of the appellant that the provision in an interference detection apparatus of diffractive light splitting means between the light source and the grating scale constituted common general knowledge at the priority date of the patent. In addition, document E5 requires that the split diffraction light beams, after being diffracted by the grating scale, are then diffractively recombined by the same scanning grating so as to interfere with each other before being detected by the three solar cells. Therefore, assuming that the skilled person would have seen in the disclosure of document E3 a solution to the objective problem, he would then have replaced the polyphase detector of document E1 by the detection arrangement of document E3 constituted by the scanning grating and three solar cells. This approach, however, would have resulted in an apparatus differing from the claimed subject-matter and requiring expressly a

polyphase detector. Thus, even assuming that, as alleged by the appellant, the detector arrangement of document E5 constitutes one of the alternative detection arrangements mentioned in the patent specification, the combination of documents E1 and E5 would not result in the claimed subject-matter.

Document E4 discloses a position measuring apparatus (abstract and Figure 1) in which light incident obliquely on a first diffraction grating 2 is diffracted, the resulting zeroth and first order diffraction light is then diffracted by a grating scale 5 and diffracted again and recombined by a second diffraction grating 2' and brought into interference, and two resulting interference light beams are detected by means of two photodetectors 12 and 13 (abstract and Figure 1). Thus, even assuming that the skilled person would have identified in document E4 a possible solution to the objective problem formulated above, he would then have not only split the incident light beam by means of a first diffraction grating, but would also have replaced, consistently following the teaching of the document, the polyphase detector of document E1 by the detection arrangement constituted by the second diffraction grating coupled to the two photodetectors and disclosed in document E4 as essential in the determination of the position. The resulting detection arrangement, however, would only detect interference light at two discrete positions and would not constitute a polyphase detector including a plurality of periodically arranged detector elements as required by the claimed invention.

The parties have not disputed that document E3 constitutes prior art within the meaning of Article 54(3) EPC and consequently, in view of Article 56 EPC 1973, second sentence, the document is to be disregarded in the assessment of inventive step.

5.3 In view of the above, the Board concludes that the prior art referred to by the appellant does not render obvious the subject-matter of claim 1 within the meaning of Article 56 EPC 1973.

6. In view of the above considerations and conclusions, the Board concluded at the end of the oral proceedings that the case brought forward by the appellant during the appeal proceedings did not prejudice the maintenance of the patent as amended according to the auxiliary request relied upon by the opposition division in the decision under appeal and that, consequently, the appeal filed by the opponent was to be dismissed.

Order

For these reasons it is decided that:

1. The appeal filed by the patent proprietor is rejected as inadmissible.

2. The appeal filed by the opponent is dismissed.

The Registrar: The Chairman:

M. Kiehl A. G. Klein