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**D E C I S I O N**  
**of 3 March 1999**

**Case Number:** T 0747/96 - 3.4.2

**Application Number:** 88117622.6

**Publication Number:** 0311144

**IPC:** G01B 9/02

**Language of the proceedings:** EN

**Title of invention:**

Optical instrument for measuring displacement

**Patentee:**

Sony Magnescale, Inc.

**Opponent:**

Dr. Johannes Heidenhain GmbH  
Canon Kabushiki Kaisha

**Headword:**

-

**Relevant legal provisions:**

EPC Art. 54, 56, 123

**Keyword:**

"Amendments - added subject-matter (no)"  
"Novelty (yes) - prior disclosure - sufficiency (no)"  
"Inventive step - main and first to third auxiliary requests  
(no)"

**Decisions cited:**

-

**Catchword:**

-



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Boards of Appeal

Chambres de recours

Case Number: T 0747/96 - 3.4.2

**D E C I S I O N**  
**of the Technical Board of Appeal 3.4.2**  
**of 3 March 1999**

**Appellant:** Sony Magnescale, Inc.  
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**Representative:** Ayers, Martyn Lewis Stanley et al.  
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**Respondent:** Dr. Johannes Heidenhain GmbH  
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**Respondent:** Canon Kabushiki Kaisha  
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**Representative:** Beresford, Keith Denis Lewis  
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**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 10 June 1996  
revoking European patent No. 0 311 144 pursuant  
to Article 102(1) EPC.

**Composition of the Board:**

**Chairman:** E. Turrini  
**Members:** S. V. Steinbrener  
M. Lewenton

## Summary of Facts and Submissions

I. The appellant (proprietor of the patent) lodged an appeal against the decision of the Opposition Division revoking European patent No. 0 311 144 (Application No. 88 1117 622.6).

Two oppositions had been filed against the patent as a whole and based on Articles 100(a) and (c) EPC since the subject-matter of the patent in suit allegedly lacked novelty and inventive step respectively, and extended beyond the content of the parent application No. 84 307 484.0 from which the application leading to the opposed patent was divided.

The Opposition Division held that the grounds for opposition mentioned in Article 100(a) EPC prejudiced the maintenance of the patent in that the subject-matter of claim 1 as granted in accordance with the main request or as amended in accordance with the auxiliary request did not involve an inventive step when taking account of the following documents (using the numbering of the Opposition Division):

DI: J. Willhelm: "Dreigitterschrittgeber, photoelektrische Aufnehmer zur Messung von Lageänderungen", Dissertation, Technische Universität Hannover, 1978; and

D6: O plus E, 1981-4, No. 17, pages 84 to 87 & English translation thereof, pages 1 to 16.

II. During the appeal proceedings, the respondents and the Board referred *inter alia* to the following further

documents:

D1: GB-A-1 474 049

D4: R. Hioki (ed.): "Encyclopaedia of Optical Terms",  
OHM Company, 1981, page 214, keyword "beam  
splitter" & English translation thereof

D12: Optics and Spectroscopy, vol. XIV, pages 215 to  
219, 1963,

D13: Optics and Spectroscopy, vol. XIV, pages 295 to  
297, 1963

D19: US-A-3 822 942, and

D20: US-A-3 881 823.

Of these documents, documents D1 and D4 had already  
been cited before the first instance, and the remaining  
documents were submitted by respondents 01 and 02  
(opponents 01 and 02) during the appeal proceedings.

III. In its communication of 12 November 1998 pursuant to  
Article 11(2) of the Rules of Procedure of the Boards  
of Appeal, the Board expressed its doubts as to whether  
the subject-matter of claim 1 as granted was novel and  
involved an inventive step respectively, over the prior  
art identified. Furthermore, in the Board's provisional  
view, the additional features of dependent claims 2 to  
4 as granted could not render the claimed subject-  
matter patentable.

IV. Oral proceedings took place on 3 March 1999, at the end

of which the Board's decision was pronounced.

- V. The appellant requested that the decision under appeal be set aside and that the patent be maintained as granted (main request) or on the basis of the three auxiliary requests submitted with its letter of 3 February 1999.
- VI. The respondents requested that the appeal be dismissed.
- VII. The wording of claim 1 according to the **main request** reads as follows:

"1. An optical instrument for measuring displacement, comprising a light source (1) composed of a semiconductor laser device, a beam splitter (2) for dividing a beam emerging from said light source into two split beams, a diffraction grating (3) on which the two split beams are projected, and reflectors (4, 5, 6, 7) which reflect the two first order beams diffracted by said diffraction grating and redirect them to said diffraction grating, the reflected first order diffraction beams being diffracted again by said diffraction grating (3), and the two first order diffraction beams thus rediffracted being caused to interfere with each other by said beam splitter (2)."

Claims 2 to 4 as granted are dependent on claim 1.

The wording of claim 1 in accordance with the auxiliary requests is as follows:

First auxiliary request

"1. An optical instrument for measuring displacement, comprising a light source (1) composed of a semiconductor laser device, a beam splitter (2) for dividing a beam emerging from said light source into two split beams, one split beam transmitting through the beam splitter (2) and the other split beam reflecting from the beam splitter (2), a diffraction grating (3) on which the two split beams are projected, and reflectors (4, 5, 6, 7) which reflect the two first order beams diffracted by said diffraction grating and redirect them to said diffraction grating, the reflected first order diffraction beams being diffracted again by said diffraction grating (3), and the two first order diffraction beams thus rediffracted being caused to interfere with each other by said beam splitter (2)."

Second auxiliary request

"1. An optical instrument for measuring displacement, comprising a light source (1) composed of a semiconductor laser device, a polarization beam splitter (2) for dividing a beam emerging from said light source into two split beams, a diffraction grating (3) on which the two split beams are projected, and reflectors (4, 5, 6, 7) which reflect the two first order beams diffracted by said diffraction grating and redirect them to said diffraction grating, the reflected first order diffraction beams being diffracted again by said diffraction grating (3), and the two first order diffraction beams thus rediffracted being caused to interfere with each other by said polarization beam splitter (2), the instrument further comprising two quarter wavelength plates (4, 7), each



quarter wavelength plate (4, 7) being disposed in a respective one of the optical paths between the polarization beam splitter (2) and the reflectors (5, 6)."

Third auxiliary request

"1. An optical instrument for measuring displacement, comprising a light source (1) composed of a semiconductor laser device, a polarization beam splitter (2) for dividing a beam emerging from said light source into two split beams, one split beam transmitting through the polarization beam splitter (2) and the other split beam reflecting from the polarization beam splitter (2), a diffraction grating (3) on which the two split beams are projected, and reflectors (4, 5, 6, 7) which reflect the two first order beams diffracted by said diffraction grating and redirect them to said diffraction grating, the reflected first order diffraction beams being diffracted again by said diffraction grating (3), and the two first order diffraction beams thus rediffracted being caused to interfere with each other by said polarization beam splitter (2), the instrument further comprising two quarter wavelength plates (4, 7), each quarter wavelength plate (4, 7) being disposed in a respective one of the optical paths between the polarization beam splitter (2) and the reflectors (5, 6)."

An amended set of claims 2 to 4 is appended to claim 1 of the respective auxiliary requests.

VIII. The appellant's arguments in support of its requests

may be summarised as follows:

Having regard to the main request, the subject-matter of claim 1 as granted is not anticipated by document DI, since the wording of the claim does not cover a diffraction grating as a beam splitter for the following reasons:

- The claimed beam splitter produces precisely two split beams, this fact being consistent with the overall disclosure of the original application documents as has been detailed in the statement of grounds of appeal. A skilled person would consider this finding to hold even in the presence of stray light because stray light would be understood to be an inevitable optical side effect which does not interfere with the unambiguous intention of dividing the incoming beam into two. Moreover, by its general terminology claim 1 clearly distinguishes between a "beam splitter" and a "diffraction grating" generating first (and lower/higher) order beams. A similar distinction is made in document DI at page 48.
  
- Although it is accepted that a diffraction grating may in general be used as a beam splitter, such a grating is incapable of producing only two split beams in that it at least diffracts into the zero and first order light beams (sinusoidal gratings), i.e. three beams, of which the zero order beam comprises a considerable amount of light and is not useful for measurement, or it at least diffracts into the first and third order light beams (laminar gratings), the third orders

accounting for almost 10% of the light intensity compared to the first order light beams. Thus, even if only two beams are used in the optical instrument according to DI, it is clear that, in contrast to the claimed device, the prior art diffraction grating does not produce only two split beams.

As regards the existence of an inventive step, the optical instrument of document DI (see page 52), which makes double use of a diffraction grating for beam splitting and subsequent diffraction, is considered to be the closest prior art. However, as is already indicated in DI, by providing a diffraction grating as a beam splitter the prior art device suffers from severe problems, so that a person skilled in the art could not get it to work satisfactorily. In particular, the known instrument is sensitive to wavelength fluctuations of the light source and difficult to miniaturise. Troublesome zero order light cannot be fully suppressed in practice because of small imperfections which inevitably exist in laminar gratings. The overall system design is restricted by the fixed angle of diffraction. Light losses are considerable since the first order beams contain only 80% of the light intensity, which reduces to 64% due to the double passage through the grating. Moreover, these are theoretical values only which are not even approximately achieved in practice.

All of the above problems have been solved in an advantageous way by the use of a beam splitter according to the present invention. Although the author of DI knew about beam splitters and was aware of the

unsatisfactory performance of the prior art design, he did not suggest any modification for improvement.

If, despite the negative opinion given in DI about the four grating devices, a skilled person were nevertheless assumed to intend a modification of the known instrument, it has first to be emphasised that DI does not clearly define which of the known gratings is used as a scale. In the appellant's view, this function must be exercised by the left-hand grating of the prior art, i.e. the so-called "reference grating", which finding is supported by the passage at the bottom of page 52 of DI. Otherwise, the prismatic right-hand element would have to be as long as the length of measurement, i.e. up to 1 m, which would be impractical. However, because of its function as a scale, the substitution of a beam splitter for the reference grating would not be envisaged by a skilled person, nor could such a substitution be considered as the mere use of a well-known equivalent, as has been shown above.

Document D13 referred to in document DI does disclose the replacement of an entrance grating by a beam splitter, but for a triple grating device only, which has a lower resolution. The arrangement of Figure 1 of D13 has been tested by the inventors and found not very useful in practice, whereas the claimed instrument has the best resolution over a length of measurement of 1 m.

Having regard to the auxiliary requests, the amendment to claim 1 in accordance with the first auxiliary request is based on every single example of the

application documents as filed and intended to further distinguish the claimed beam splitter from a diffraction grating. The arguments with respect to inventive step are maintained since they already presuppose such a distinction.

The subject-matter of claim 1 according to the second auxiliary request relates to a specific beam splitting system having an excellent performance. This system makes use of a polarisation beam splitter and is disclosed in Figures 1 (at least implicitly) and 15, and at page 18, line 8 of the application documents as filed. It is true that the claimed subject-matter is a generalisation of the embodiment shown in Figure 15. However, the other optical elements of Figure 15, which are not in the claim, are not considered necessary for the purpose of an inventive distinction from the prior art disclosed in DI. In the top embodiment at page 52 of DI, incident and output light beams are not separated. The necessary separation could in principle be achieved by adding a polarisation beam splitter in accordance with the teaching of documents D19 or D20. In this context, a skilled person would, however, not change the structure and function of the elements present in said embodiment of DI since a polarisation beam splitter cannot act as a scale. Moreover, the fact that an entirely different solution to the separation problem is proposed in the embodiment at the bottom of page 52 of DI must be considered to constitute a strong proof of inventive step.

In claim 1 of the third auxiliary request, the above amendments according to the preceding auxiliary requests have been introduced in combination so that no

additional arguments are required.

IX. The respondents put forward the following counter-arguments:

Respondent 01 considered the subject-matter of claim 1 of the main request to be anticipated by document DI for two reasons:

Firstly, since claim 1 merely defines the function of the beam splitter as generating two split beams, there is no explicit limitation to exactly two split beams. Rather, all beam splitters dividing the incoming light into more than two split beams fall under the wording of the claim. This is the case in document DI, where an incident light beam is divided into more than two split beams.

Secondly, if the existence of only two split beams is considered relevant, then the Figures at page 52 of DI unambiguously disclose the generation of two split beams, and only these split beams are considered further in this prior art.

Moreover, although in document DI it is considered "expedient" to use the reference grating as a scale, equivalent alternatives for a reference grating, such as Wollaston prisms or dividing plates, are suggested at page 47 of DI. In consequence, an optical engineer would select the most suitable beam splitting element for his purposes and adapt the functions of the remaining elements without exercising inventive skill.

The additional feature of claim 1 according to the

first auxiliary request is obvious from document DI, since a dividing plate already has the claimed function. Moreover, in this context document DI refers to document D13, which also discloses the use of beam splitters of the claimed type in closely related optical instruments.

Respondent 02 referred to the meaning of functional and structural definitions in general. When it comes to issues of patentability, the former, which gives a broader scope of protection, may not be interpreted in a restrictive way to exclude specific structural definitions falling under the broad functional definition without actually restricting the functional definition to different structural definitions. A difference in structure should hence be clearly defined both in argument **and** claims. "Beam splitter" is a purely functional definition covering a number of possible equivalent structures, as can be seen from documents D4 or D13. The meaning of this functional definition is not in doubt, and no alternative meaning has been proposed in the contested patent. Apart from Figure 15, which shows the only concrete construction comprising a polarising beam splitter and quarter wavelength plates, the beam splitter is presented either as a schematic cube (see e.g. Figure 1) or as a mere line without any description of the structure of the element (see e.g. Figure 8). Thus, no particular structure is indicated in claim 1 as granted. In particular, claim 1 does not explicitly state that only two beams are meant.

Furthermore, claim 1 has to be interpreted in the light of inevitably existing stray beams. As is acknowledged

in the patent specification, in the prior art using highly coherent light sources, stray beams had to be suppressed by expensive non-reflection coatings. The patent in suit however explicitly admits stray beams, in that cheap, uncoated optical parts and multimode semiconductor laser devices having a short coherence length are provided. Thus, more than two beams are also produced in an instrument according to claim 1 of the main request.

The appellant's remaining arguments are not reflected in the claim. In particular, claim 1 is completely silent on which element moves, and there is nothing in the claim about accuracy and length of measurement. Nor is the inventors' alleged test of prior art arrangements relevant, since no adequate description of any experiments performed or results achieved has been furnished.

Having regard to the auxiliary requests, the beam splitting cube in Figure 1 is not described as a polarising beam splitter; only Figure 15 discloses the beam splitting configuration as claimed in accordance with the second auxiliary request. However, Figure 15 relates to a very particular arrangement which has been generalised in claim 1 of the second auxiliary request without there being a basis for such a general teaching in the original application documents. Thus, claim 1 according to the second auxiliary request is not admissible under Article 123(2) EPC. The same argument applies to claim 1 of the third auxiliary request.

The inventive idea was initially directed to an increase in resolution with respect to the three



grating case by using double diffraction. This basic idea is anticipated by document DI, which clearly describes the possibility of double diffraction if fine scale gratings are not available. The remaining details merely constitute obvious workshop variants, since the additional features of the second and third auxiliary requests and their associated effects as such are well-known to optical practitioners (see e.g. documents D19 and D20), and the use of alternative beam splitters has already been suggested in DI.

## **Reasons for the Decision**

### *1. Admissibility of Appeal*

The appeal is admissible.

### *2. Articles 123 and 84 EPC*

The Board considers the amended versions of claim 1 according to the auxiliary requests to be admissible and clear.

2.1 Having regard to claim 1 of the first auxiliary request, the additional features can directly and unambiguously be derived from all of the embodiments of the patent in suit. No objection under Article 123 EPC has, indeed, been raised against claim 1 of the first auxiliary request.

2.2 In the Board's view the above finding of admissibility also holds for claim 1 according to the second and

third auxiliary requests, despite the respondents' counter-arguments.

It is true that a polarisation beam splitter in combination with two quarter wavelength plates has explicitly been disclosed only in the embodiment according to Figure 15 (polarising cube 74;  $\lambda/4$  plates 77 and 78; see also page 8, lines 22 to 36 of the application documents as published). From the cited passage, it is clear that the specific beam splitting arrangement serves the purpose of separating incident light and signal light.

Polarising beam splitters are further mentioned in the patent in suit as forming part of the signal detection system (see Figures 3 to 7: polarising cubes 28 and 29) and thus having a different function, whereas in the embodiments according to Figures 8 to 14 the type of beam splitter is not specified (beam splitter 54 symbolised as a simple line). Figure 1 is a special case in that it shows the claimed quarter wavelength plates together with a beam splitting cube, the polarising nature of which is not indicated. The Board is, however, convinced that the consistent use of the same graphic symbol for polarising beam splitters (cube with diagonal line) in combination with the existence of two  $\lambda/4$  plates, the purpose of which has been originally disclosed, would automatically lead a skilled person to the conclusion that the beam splitter in Figure 1 of the patent in suit must also be of the polarising type. Therefore, the appellant's argument of an implicit disclosure of the claimed features in Figure 1 can be accepted.

Moreover, in accordance with established case law, the Board does not consider the introduction of further optical elements of the said embodiments according to Figures 1 and 15 into the claims to be necessary, since such elements (lenses, detectors, additional dividing plates and gratings etc.) are not essential for the function of the claimed invention in the light of the technical problem solved.

3. *Article 54 EPC*

3.1 Main request

The Board agrees with the parties that document DI constitutes the closest prior art.

From this document (see section 4.2.1.3 at page 52 of DI, in particular both top and bottom embodiments shown in the figures), there is already known an optical instrument for measuring displacement, comprising a beam splitter for dividing a beam into split beams, a diffraction grating on which the split beams are projected, and reflectors which reflect the beams diffracted by said diffraction grating and redirect them to said diffraction grating, the reflected beams being diffracted again by said diffraction grating, and the rediffracted beams being caused to interfere with each other by said beam splitter.

Apparently, these facts are not at issue among the parties.

Contrary to the appellant's opinion, the Board holds the view that the so-called reference grating of

document DI (left-hand grating of the embodiments at page 52) is covered by the definition of "a beam splitter for dividing a beam ... into two split beams" used in claim 1, since the wording only implies that the beam splitter must be suitable to serve the purpose of generating two split beams. This is clearly the case for the reference grating in DI, which on the one hand falls under the widely-recognised meaning of "beam splitter" (see e.g. document D4, a standard encyclopaedia of optical terms, page 214, keyword "beam splitter") and on the other hand divides the incoming beam into two split beams (see DI, page 52). Whether further split beams not used for measuring displacement are necessarily generated by the known beam splitter is irrelevant, since such further split beams are also not excluded in the claimed subject-matter, as the respondents have rightly pointed out.

Therefore, the subject-matter of claim 1 as granted may only differ from the closest prior art by the features not explicitly described in the context of the above-cited passage of DI, i.e.

- (i) a light source composed of a **semiconductor laser device**;
- (ii) said beam **emerges from said light source**;
- (iii) said reflected beams are the two **first order** beams; and
- (iv) said rediffracted beams are the two **first order** diffraction beams.

Although the presence of features (i) to (iv) in the prior art instruments may be regarded as highly plausible (see DI, in particular page 56, section 4.3, first paragraph, with respect to features (i) and (ii); page 23 to page 25, second paragraph and page 50, last paragraph, with respect to features (iii) and (iv)), the Board nevertheless does not consider these features to be directly and unambiguously derivable from the rather concise and self-contained description of the four grating embodiments in DI.

Therefore, in accordance with the established practice of the Boards of Appeal, novelty of the claimed subject-matter with respect to document DI has to be accepted. As the remaining documents of the prior art identified are less relevant, the subject-matter of claim 1 of the main request meets the requirements of Article 54 EPC.

### 3.2 Auxiliary requests

In the auxiliary requests, the beam splitting arrangement has been specified to further distinguish it from the grating employed as a beam splitter in DI. Hence, the claimed subject-matter in accordance with the respective auxiliary requests also meets the requirement of novelty pursuant to Article 54 EPC. In fact, the novelty of these claims has not been contested in the present proceedings.

## 4. *Article 56 EPC*

### 4.1 Main Request

The above differences (i) to (iv) (see point 3.1 of the present decision) relate to a number of choices a skilled person would have to make when attempting to put the teaching of document DI into practice. The technical problem solved may therefore be seen in completing the disclosure of DI for the practical implementation of the prior art instruments.

The Board is convinced that features (i) to (iv) constitute natural selections which would readily occur to a skilled person in view of the overall disclosure of document DI (see the passages cited above). In particular, using the beam of a semiconductor laser device, i.e. typically a laser diode well-known in the technical field concerned (see DI, page 56, Section 4.3, first paragraph), for the incoming light would be an obvious compromise having regard to coherency of light, cost reduction and miniaturisation. Moreover, as the two first order beams are generally preferred for signal generation in grating arrangements under the aspect of light efficiency (see DI, page 23, last paragraph; page 25, second paragraph; and page 50, last paragraph), the use of reflected and rediffracted first order beams would be a skilled person's first idea of how to realise the path of light rays shown in the four grating embodiments of DI (see page 52).

The appellant's counter-argument is mainly based on the opinion that the prior art reference grating does not fall under the meaning of "beam splitter" as used in the patent in suit, in that the reference grating does not produce only two split beams, which opinion is not shared by the Board, as has been pointed out above (see point 3.1 above). However, even if the appellant's

allegation were accepted, then replacement of the reference grating of DI by conventional beam splitters dividing a light beam into exactly two split beams (if stray phenomena are ignored) would appear only to imply the application of a well-known measure in a closely analogous situation, and thus to be obvious as well (see e.g. document DI, page 47, penultimate paragraph; document D1, page 3, lines 106 to 121; document D12, page 219, left-hand column, last paragraph - right-hand column, first paragraph; and document D13, Figures 1 to 3 and associated text, and page 296, left-hand column, second paragraph). In particular, the replacement of the reference grating by e.g. a dividing plate is explicitly mentioned in document DI in the context of a three grating configuration. Such configurations mainly differ from the four grating instrument by a lower resolution or - if a similar resolution is to be achieved - by the need for a very fine grating constant of the scale, whereas such fine grating constants can be avoided by double diffraction in the four grating case. However, insofar as the splitting-up of the incoming beam is concerned, there is a close analogy between the three and four grating configurations. Therefore, the Board cannot see any major barrier preventing a skilled person from considering beam splitter alternatives in the four grating case.

The appellant's further arguments are beside the point, since the disadvantages attributed to the known four grating embodiments are not specifically excluded in claim 1 as granted.

A major part of these alleged disadvantages relates to the mere use of a grating as a beam splitter, which use

is however in the Board's opinion covered by the wording of the claim. The remaining arguments, which mainly focus on the specification of the moving scale and the length and accuracy of measurement, are also not relevant, since such specifications are not included in claim 1 of the main request.

In consequence, claim 1 of the main request cannot be considered allowable (Article 56 EPC).

#### 4.2 First auxiliary request

In claim 1 of the first auxiliary request, the beam splitter of claim 1 of the main request has been specified to produce "one split beam transmitting through the beam splitter and the other split beam reflecting from the beam splitter" (additional feature (v)), whereas in both embodiments of DI the reference grating transmits (and diffracts) both split beams (see DI, page 52). The objective technical problem solved by features (i) to (v) with respect to the closest prior art may therefore be seen in realising an alternative practical design of the known instrument.

As has already been pointed out in point 4.1 above, such an alternative design utilising e.g. a dividing plate as a beam splitter has already been considered in document DI in the context of three grating instruments. In the Board's view, an application of this alternative design to the four grating case would be obvious to a skilled person because of the close analogy between both types of instruments with respect to the beam splitting requirements (see point 4.1



above), and because of the fact that the respective advantages and disadvantages of beam splitting elements as such should be familiar to an optical engineer. Moreover, an evaluation of the respective properties of different beam splitter types in the field of instruments for measuring displacement is also available from document DI (see page 47, penultimate paragraph, to page 48, first paragraph, and page 52, second paragraph; see also document D13 cited in DI in this context, page 296, second paragraph, to page 297).

The appellant argued in substance that the reference grating of the four grating embodiments of DI cannot be replaced by an alternative beam splitter type since it must simultaneously serve as the moving scale. The Board does not consider this argument to be convincing, in that use of the right-hand grating as the moving scale is not excluded in DI, according to which said additional function of the reference grating is only preferred for the bottom embodiment at page 52. Moreover, the appellant's argument is based on the assumption of a considerable length of measurement, which length is, however, not specified in claim 1 of the first auxiliary request.

Therefore, claim 1 of the first auxiliary request is also not allowable (Article 56 EPC).

#### 4.3 Second and third auxiliary requests

Claim 1 of the second auxiliary request includes an alternative specification of the beam splitter of claim 1 of the main request, whereas claim 1 of the third auxiliary request is obtainable by adding this

alternative specification to claim 1 of the first auxiliary request as a further limitation. The alternative specification consists of providing a "polarisation" beam splitter in combination with "two quarter wavelength plates, each quarter wavelength plate being disposed in a respective one of the optical paths between the polarisation beam splitter and the reflectors" (additional feature (vi)).

The effect achieved by this specific type of beam splitter consists of a separation of incident and reflected light so that in particular no light returns to the laser device (see page 8, lines 22 to 36 of the application documents as published). Hence, the different features (i) to (iv) and (vi) of claim 1 of the second auxiliary request and (i) to (vi) of claim 1 of the third auxiliary request aim at a practical design alternative, in particular the top embodiment at page 52 of DI, the alternative having the advantage of preventing signal light from returning to the laser device.

In the preceding discussion (see point 4.2 above), the Board came to the conclusion that a modification of the known four grating instruments by substituting a different conventional beam splitter type, e.g. a dividing plate, for the reference grating is obvious from the closest prior art DI. Although document DI does not explicitly refer to polarisation beam splitters in this context, such beam splitting arrangements in combination with  $\lambda/4$  plates and their specific advantages with respect to light separation are well-known in the general field of interferometric devices for length measurement (see e.g. document D19,

Figure 1 and column 5, lines 15 to 51, or document D20, column 1, lines 56 to 62; Figure 1 and column 2, line 53 to column 3, line 7). Moreover, these conventional polarisation beam splitters divide the incident light beam such that one split beam is transmitted through the polarisation beam splitter and the other split beam is reflected from the polarisation beam splitter, and thus also anticipate feature (v).

In the Board's view an optical practitioner would therefore arrive at the claimed solutions according to the second and third auxiliary requests without exercising inventive skill.

The appellant has advanced the counter-argument that a polarisation beam splitter might be added to the top embodiment of DI as an obvious solution to the light separation problem. Substitution of a beam splitter for the reference grating would not be taken into consideration, since the reference grating serves as a moving scale. However, as has already been emphasised above (see point 4.2), the Board is not convinced that the reference grating must necessarily have this additional function, in particular if the top embodiment at page 52 of DI is referred to. Therefore, a skilled person may well consider the use of a polarisation beam splitter in combination with two  $\lambda/4$  plates for the top embodiment of DI in order to simultaneously achieve the effect of beam splitting and light separation.

In the Board's view, a skilled person would also not be prevented from such considerations by the fact that light separation has been achieved in a different way

according to the bottom embodiment of DI, as the appellant believes. Since there is a clear indication in DI that the reference grating may be replaced by an alternative beam splitter type, a skilled person intending to try such an alternative for the top embodiment of DI would make his choice among conventional beam splitting elements in accordance with any additional requirements, including the necessity of light separation. Moreover, the mere existence of a different solution in the prior art would normally not bar a skilled person from attempts to circumvent such a known solution.

In consequence, the subject-matter claimed in accordance with the second and third auxiliary requests also lacks the inventive step required by Article 56 EPC, and the respective claims are not allowable for this reason.

## **Order**

**For these reasons it is decided that:**

The appeal is dismissed.

The Registrar:

The Chairman:

P. Martorana

E. Turrini