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D E C I S I O N
of 18 May 2000

Case Number: T 0206/98 - 3.5.2

Application Number: 89202734.3

Publication Number: 0369510

IPC: G11B 7/135

Language of the proceedings: EN

Title of invention:
Apparatus for optically scanning a radiation-reflecting information plane

Applicant:
Koninklijke Philips Electronics N.V.

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 83

Keyword:
"Apparently incompatible requirements recited in claim. Insufficient disclosure as to how these requirements may be met simultaneously"

Decisions cited:
-

Catchword:
-

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Case Number: T 0206/98 - 3.5.2

D E C I S I O N
of the Technical Board of Appeal 3.5.2
of 18 May 2000

Appellant: Koninklijke Philips Electronics N.V.
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 2 October 1997 refusing European patent application No. 89 202 734.3 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: W. J. L. Wheeler
Members: M. R. J. Villemin
P. H. Mühlens

Summary of Facts and Submissions

I. The appellant contests the decision of the examining division to refuse European patent application No. 89 202 734.3. The reason given for the refusal was that the subject-matter of the claims of the main and auxiliary request then on file was not novel with regard to either of the following documents representing prior art under Article 54(3) EPC:

D1: EP-A-0 300 570

D4: EP-A 0 308 022.

A further document:

D3: EP-A-0 219 908,

corresponding to the document US-A-4 665 310 cited in the present application as originally filed, was also cited in the examination procedure.

II. In reply to a communication of the Board annexed to the summons to attend oral proceedings, the appellant filed a single request comprising new claims 1 to 5 with the letter faxed on 18 April 2000.

III. In the oral proceedings held on 18 May 2000 the appellant filed amended pages 1, 3, 4, 8, 9 and 13 of the description and submitted a sketch of "the apparatus of D3".

IV. Claim 1 is worded as follows:

"An apparatus for scanning a radiation-reflective

information plane, which apparatus comprises a diode laser (4) for supplying a scanning beam (b), an objective system (6) for focussing the scanning beam to a scanning spot (V) in the information plane (2) and for re-imaging the scanning spot on a composite radiation-sensitive detection system (10), and a composite diffraction element (9), comprising two sub-gratings (12, 13) and arranged in the radiation path between the diode laser and the objective system for deflecting a part of the radiation beam reflected by the information plane towards the radiation-sensitive detection system and for splitting the deflected beam into a plurality of sub-beams (b_1, b_2) forming a corresponding plurality re-imaged radiation spots (V_1, V_2) on a corresponding plurality of detector pairs (18, 19; 20, 21) of the composite detection system (10), the separating strips (22, 23) between two detectors associated with one detector pair having such an orientation that displacements of the re-imaged radiation spots (V_1, V_2) resulting from wavelength variations of the scanning beam (b) have a negligible influence on the detector signals, characterized in that the separating strips (22, 23) of the detector pairs are substantially parallel to a line (CL) which connects the centre of the radiation-emitting surface of the diode laser (4) to the centre (M) of the composite radiation-sensitive detection system (10) and in that the sub-gratings (12, 13) have an varying grating period (p_1, p_2) and curved grating strips (14, 15)."

Claims 2 to 5 are dependent on claim 1.

V. The appellant's arguments may be summarised as follows:

Documents D3 and D4 and the present invention all addressed the same general problem, namely overcoming focussing errors of the sub-beams on the detector pairs caused by temperature induced variations in the wavelength of the scanning beam. A first order problem was solved in the apparatus according to D3 by arranging the detector pairs such that the direction of their separating strips coincided with the direction in which the re-imaged radiation spots moved upon a wavelength variation. A second order problem was solved in D4 by arranging the separating strips to extend at equal and opposite small angles to the line connecting the centre of the detection system and the centre of the diode laser emitting surface to compensate for asymmetrical enlargement of the spots when they are not correctly focussed. The present invention concerned a further development aimed at relaxing the otherwise strict tolerances for the distance between the centre of the composite detector and the centre of the diode laser emitting surface.

The feature in claim 1 that the separating strips 22, 23 of the detector pairs were substantially parallel to the line CL was not paradoxical, because the grating geometry of the apparatus disclosed in D3, in which the two sub-gratings had straight grating strips and the same constant grating period, was different from that of the claimed apparatus in which the sub-gratings had curved grating strips and a varying grating period. Comparing the sketch of the apparatus of D3 submitted in the oral proceedings with the embodiment shown in Figure 2 of the present application, it was apparent that:

- the line 26 separating the sub-gratings of the

apparatus known from D3 lay in the XZ plane whereas the corresponding separating line 11 in the claimed apparatus was in the YZ plane;

- the detector pairs 16, 17 and 18, 19 of the apparatus disclosed in D3 were on opposite sides of the radiation-emitting surface of the diode laser, and the separating strips 22, 23 of the detector pairs formed an acute angle to a line passing through the centre O of the radiation-emitting surface and the separating line 26. The line CL specified in claim 1 did not exist in this apparatus. This arrangement was different from that shown in Figure 2 of the present application which showed that the detector pairs were disposed on opposite sides of the line CL.

The arrangement shown in Figure 2 of document D4, in which the separating lines 22, 23 of the two detector pairs were situated on the OY axis, was not comparable with that shown in Figure 2 of the present application. The arrangement shown in Figure 2 of document D4 suffered from errors in the detector output signals due to wavelength variations caused by temperature fluctuations. To correct this error, D4 taught that the separating lines 22, 23 should be disposed at angles $á_1$ and $á_2$ to the line CL as illustrated in Figure 6 of this document.

The discrepancy alleged by the Board between the requirements in claim 1 that the separating strips 22, 23 had such an orientation that displacements of the re-imaged radiation spots V_1, V_2 resulting from wavelength variations had a negligible influence on the detector signals and that these separating strips were

substantially parallel to the line CL only arose if the disclosure of D3 was taken into account.

The claimed apparatus used a detector geometry designed according to a new concept departing from the design concept of the apparatus known from D3. According to this new concept the detector was designed first to be optimized for reducing the influence of wavelength variations thereby creating more degrees of freedom for the design of the other optical and mechanical components (see description originally filed, page 4, lines 8 to 20 and page 10, line 31 to page 12, line 1).

VI. The Appellant requested that the decision under appeal be set aside and a patent granted on the basis of the application in its present form, namely:

Claims: No. 1 to 5 filed with the letter of 18 April 2000.

Description: Pages 2, 5 to 7, 10 to 12, 14 as originally filed,
Pages 1, 3, 4, 8, 9, 13 filed in the oral proceedings before the Board.

Drawings: Sheets 1 to 6 as originally filed.

Reasons for the Decision

1. The appeal is admissible.

2. The object of the present invention as mentioned in the

description (page 3, line 29 to page 4, line 2) is "to provide an apparatus of the type described in the opening paragraph which is corrected for wavelength variations and which provides wider tolerances for the positions and parameters of the optical elements, as compared with other apparatuses". However, as will be explained below, it is not clear how the claimed invention solves the stated problem, so the application cannot be considered as disclosing the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art, as is required by Article 83 EPC.

3. In the apparatus defined in claim 1, the separating strips 22, 23 between the detectors of a respective detector pair have to satisfy both of the following two requirements:

First requirement (recited in the prior art portion): the separating strips 22, 23 have such an orientation that displacements of the re-imaged radiation spots V_1, V_2 resulting from wavelength variations of the scanning beam b have a negligible influence on the detector signals;

Second requirement (recited in the characterizing portion): the separating strips 22, 23 are substantially parallel to a line CL which connects the centre of the radiation-emitting surface of the diode laser 4 to the centre M of the composite radiation-sensitive detection system 10.

4. While there is no doubt that the skilled person would be able to arrange the separating strips 22, 23 to meet the second requirement, in the judgement of the Board

he would not be able to arrange them to meet the first requirement as well, unless taught how to do so by the present application. As pointed out in the communication annexed to the summons to attend oral proceedings, these two requirements appear to be mutually incompatible, because the prior art attempts to meet the first requirement have required the separating strips of the detector pairs to be at an angle to a straight line which connects the centre of the radiation-emitting surface of the diode laser to the centre of the composite radiation-sensitive detection system.

5. Prior art document D3 (which corresponds to US-A-4 665 310 cited in the introductory part of the description of the present application) discloses that, in order to avoid an offset in the focus-servo signal produced by wavelength variations, the bounding lines 22, 23 between respective detector pairs 16, 17; 18, 19 of the composite radiation-sensitive detection system 25 (see Figure 1 of D3) have to be perpendicular to the grating strips 13, 14 of the sub-gratings of the composite diffraction element 9 (see Figure 2 and page 2, line 26 to page 3, line 3; page 6, lines 18 to 34). In this arrangement, the bounding lines 22, 23 (which correspond to the separating strips recited in the present claim 1) cannot be substantially parallel to each other, or to a line which connects the centre of the radiation-emitting surface of the diode laser to the centre of the composite radiation-sensitive detection system. The appellant has argued that this impossibility does not apply to the present invention because the grating geometry is different and the orientation of the grating is different.

6. Regarding the orientation of the grating, the arrangement shown in the sketch of the apparatus of D3 produced in the oral proceedings differs from the arrangement shown in Figure 2 of the present application in that in the sketch the x-axis has been defined parallel to the line 26 separating the sub-gratings, whereas in Figure 2 of the present application the y-axis has been defined parallel to the line separating the sub-gratings. When due allowance is made for this, the arrangement shown in Figure 2 of the present application differs from the arrangement according to D3 only in that the separating strips of the detector pairs are substantially parallel to a line

(CL) which connects the centre of the radiation-emitting surface of the diode laser to the centre of the composite radiation-sensitive detection system and in that the sub-gratings have a varying grating period and curved grating strips. The grating as specified in claim 1 of the present application differs from the grating shown in D3 only in that the sub-gratings have a varying grating period and curved grating strips.

7. It is noted that the description of the present application as originally filed (page 4, lines 24 to 36) discloses that the sub-gratings may have straight grating strips and a constant grating period, or, preferably, are curved and have a varying grating period. The description explains that "when using a diffraction grating having a varying grating period, less stringent requirements need to be imposed on the accuracy of positioning the diode laser relative to the detectors in the form of photodiodes, which is particularly important if the height of the apparatus, measured along the optical axis of the objective system must be reduced" and that "when using gratings with curved grating strips, it is possible to correct for imaging errors such as coma and astigmatism by adapting the curvatures of the composite grating" (see also the published patent specification, column 4, lines 7 to 23). The Board is unable to find any teaching, not even the remotest hint, in the original description of the present application or in the prior art acknowledged in the present patent application (US-A-4 665 310) or its EP counterpart D3, of how to design a grating with curved grating lines of varying grating pitch such that errors in the positions of the re-imaged spots resulting from wavelength variations could be so compensated that the detector pairs may be arranged

with their separating strips substantially parallel to a line which connects the centre of the radiation-emitting surface of the diode laser to the centre of the composite radiation-sensitive detection system. Furthermore, the appellant has provided no convincing explanation of how this could be done, neither in the written submissions nor when questioned on this point in the oral proceedings before the Board. In answer to the appellant's explanation that the invention stems from a novel design concept as explained in the original description at page 4, lines 8 to 20, and page 10, line 31 to page 12, line 1, it is noted that the only information given there concerning the grating, namely "by displacing the grating 9 along the X and Y axes and rotating it about the Z axis it can be ensured that the radiation spots V_1 and V_2 occupy the desired positions on the composite detector 10" does not disclose the technical features of the grating necessary to ensure that displacements of the re-imaged radiation spots V_1, V_2 resulting from wavelength variations of the scanning beam have a negligible influence on the detector signals. This feature of claim 1 (requirement 1 identified in paragraph 3 above) amounts to a desideratum, which is part of the problem rather than of the solution.

8. In conclusion, the application cannot be considered as disclosing the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art, as is required by Article 83 EPC. Consequently, the appeal has to be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

M. Hörnell W. J. L. Wheeler