

Internal distribution code:

- (A) Publication in OJ
(B) To Chairmen and Members
(C) To Chairmen
(D) No distribution

D E C I S I O N
of 2 May 2006

Case Number: T 0602/04 - 3.4.02

Application Number: 00306291.6

Publication Number: 1072924

IPC: G02B 27/22

Language of the proceedings: EN

Title of invention:

Parallax barrier, autostereoscopic 3D picture and
autostereoscopic 3D display

Applicant:

SHARP KABUSHIKI KAISHA

Opponent:

-

Headword:

-

Relevant legal provisions:

EPC Art. 54, 56

Keyword:

-

Decisions cited:

-

Catchword:

-



Case Number: T 0602/04 - 3.4.02

D E C I S I O N
of the Technical Board of Appeal 3.4.02
of 2 May 2006

Appellant: SHARP KABUSHIKI KAISHA
22-22 Nagaike-cho
Abeno-ku
Osaka 545-8522 (JP)

Representative: Robinson, John Stuart
Marks & Clerk
Nash Court
Oxford Business Park South
Oxford OX4 2RU (GB)

Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 2 December 2003
refusing European application No. 00306291.6
pursuant to Article 97(1) EPC.

Composition of the Board:

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

Summary of Facts and Submissions

I. The appellant lodged an appeal, received on 3 February 2004, against the decision of the examining division, dispatched on 2 December 2003, refusing the European patent application 00306291.6. The fee for the appeal was paid on 2 February 2004 and the statement setting out the grounds of appeal was received on 31 March 2004.

The examining division objected that claim 1 of the main and auxiliary requests then on file was not allowable under Article 123(2) EPC since there was no basis in the application as originally filed for the expression that the points of inflection were stationary.

II. With the statement containing the grounds of appeal the appellant filed eighteen sets of claims to be considered as its main and first to seventeenth auxiliary requests.

III. In a Communication pursuant to Article 11(1) RPBA and accompanying a summons to oral proceedings, the board raised objections to the claims according to the main and first to sixth auxiliary requests and indicated that claim 1 of the seventh auxiliary request could form the basis for an allowable request.

IV. In a facsimile letter received on 7 February 2006 the appellant submitted an amended set of claims based on the former seventh auxiliary request. In a telephone consultation with the appellant on 8 February 2006, the rapporteur pointed to certain remaining deficiencies in the dependent claims and the description.

V. With a facsimile letter received on 28 March 2006 and a further letter received on 4 April 2006 the appellant filed revised claims and description pages to be considered as its single request. The documents comprising the request include:

Claims: 1 to 13, as received with the letter of 28 March 2006;

Description: pages 2, 3, 10 to 17, 19 to 21, 27 as originally filed
pages 1, 7, 8, 18, 22, 24 to 26 as received with the letter of 7 February 2006;
pages 4, 5, 6, 9, 23 as received with the letter of 28 March 2006;

Drawings: sheets 1/30 to 7/30 and 24/30 to 30/30 as originally filed;
sheets 8/30 to 13/30 and 15/30 to 23/30 as received with the letter of 28 March 2006;
sheet 14/30 received with the letter of 4 April 2006.

VI. By an order issued on 5 April 2006 the appellant was informed that the oral proceedings were cancelled.

VII. The wording of independent claim 1 reads as follows:

"Use, as a parallax barrier with a spatial light modulator in an autostereoscopic 3D display, of a structure to reduce diffraction in the parallax barrier, the structure comprising a plurality of parallel elongate apertures extending in a first direction, each

of the apertures having an optical transmission function which varies in a second direction perpendicular to the first direction such that the sum of the number of maxima and the number of points of inflection is greater than three".

Claims 2 to 13 are dependent claims.

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

Claim 1 has been amended to avoid the wording objected to in the decision of the examining division. The term "subaperture" has been replaced with a definition based on maxima and points of inflection. The basis for this definition is in the fourth paragraph on page 6 of the original application. The feature that optical transmission function varies such that the sum of the number of maxima and the number of points of inflection is greater than three is not explicitly found in the specification, but the skilled person directly arrives at such a concept based on the common mathematical meaning of "point of inflection" used throughout the description. In particular item 22 in Figure 4, as well as the curves in Figures 9 to 14, clearly possess one maximum and two points of inflection in the common mathematical meaning. These curves are clearly designated as the prior art. On the other hand, the sum of the maxima plus points of inflection according to the common mathematical definition in the Examples of the invention are as follows: Figure 4, item 23: six; Figure 15: fifteen; Figures 16 to 18: nine; Figures 19 to 24: seven. Therefore, since the specification teaches at page 9, second paragraph, that the number of sub-apertures is determined by the number of maxima

plus the number of points of inflection, those skilled in the art would realize that this sum must be greater than three to exclude a single aperture.

The structures used as parallax barriers as defined in claim 1 have a performance which is characterised by reduced undesirable diffraction artefacts. Such barriers have improved uniformity of illumination and reduced cross-talk. With respect to the prior art, document D1 (EP-A-0 822 441) represents the conventional art in terms of parallax barriers wherein the optical transmission function corresponds to the single-aperture curves in Figure 4 (item 22) and Figures 9 to 14 of the present patent application. Therefore this document is not relevant to a parallax barrier having the type of optical transmission functions as in the present invention. Document D2 (EP-A-0 847 208) discloses a mask for use in correcting the transmission function of a pixel into a more constant shape (as shown in Figures 16 and 17 of D2). The mask itself has a transmission function shown in Figure 19, which arguably could be considered to show a plurality of maxima within the meaning of the present patent application. However, document D2 does not describe the mask as a parallax barrier and in fact teaches away from the possibility that a mask with an optical transmission function having a number of maxima and a number of points of inflection greater than three could function as a parallax barrier, since in D2 an entirely and separate conventional type of parallax barrier is provided in addition to the mask component and it is in no way suggested that the mask component could be used as a parallax barrier. Specifically, the teaching of D2 is to provide a mask which compensates

for irregularities in the transmission function of a pixel, so as to make the combined window from the pixel, mask and parallax barrier more similar to the conventional art as shown in document D1. Therefore from the teaching of D2 as a whole, those skilled in the art could not even identify the technical problem of providing a parallax barrier whose transmission function is as defined in claim 1. This is equally true of the further documents cited in the European Search Report. Hence, the subject-matter of claim 1 is not disclosed or rendered obvious by any of the available documents.

Reasons for the Decision

1. The appeal is admissible.
2. *Amendments*

The present patent application relates to the use of a parallax barrier with a spatial light modulator in an autostereoscopic 3D display. In particular it is disclosed that by setting constraints to the optical transmission function of the apertures of the parallax barrier an improved uniformity of illumination at a reduced level of crosstalk may be provided. In the original claims this had been defined in terms of "sub-apertures" of the optical transmission function, which claim language had been objected to as lacking clarity under Article 84 EPC by the examining division. The board is satisfied that the definition in terms of the number of maxima and points of inflection of the transmission function in present claim 1 does not

suffer from such a lack of clarity and that the passages and Figures in the description referred to by the appellant have a fair basis of support in the original application. The description has been adapted in a manner which was found to be admissible under Article 123(2) EPC.

3. *Patentability*

3.1 *Novelty*

Document D1

Document D1 discloses an optical device for use in an autostereoscopic display comprising a plurality of picture elements the phase and/or amplitude transmission of which vary in the lateral direction of the optical device for reducing the level of diffraction caused by the device (see, for instance, Figure 13). In a further embodiment, shown in Figure 20, the display device includes a front parallax barrier 1g. In column 13, lines 34 to 47 it is disclosed that an autostereoscopic device including a parallax barrier suffers from disadvantages due to diffraction caused by the parallax barrier which may be reduced by adjusting the parallax barrier so as to include regions of varying transmission, such as illustrated in Figure 21. In this passage it is also disclosed that suitable transmission functions are as those shown for individual pixels (Figures 11a, 11c, 11e, 11g and 11i). These transmission functions correspond to those shown in Figures 9 to 14 of the present patent application as "known types of barrier". A transmission function for the apertures of the parallax barrier as defined in claim 1 (i.e. a function varying in a second direction

perpendicular to the first direction such that the sum of the number of maxima and the number of points of inflection is greater than three) is not disclosed in this document.

Document D2

The directional display system with applications in autostereoscopic displays disclosed in this document comprises a rear parallax barrier (Fig. 18a). According to D2, this type of display suffers from Fresnel diffraction losses by the arrangement of barrier and pixels apertures. In order to reduce these effects D2 proposes to include a mask 21 (Figure 18a) with a transmission function as shown in Figure 19. According to D2, see column 2, lines 48 to 52, the parallax barrier is a flat opaque screen with a series of thin transmitting slits having a regular pitch. Therefore its transmission has a rectangular top-hat profile and does not vary according the function defined in claim 1.

The other documents from the European Search Report disclose more remote prior art.

The subject-matter of claim 1 is therefore novel.

3.2 *Inventive step*

- 3.2.1 In both documents D1 and D2 the problem of Fresnel diffraction losses in a structure comprising picture elements and a parallax barrier for use in autostereoscopic displays is addressed, which is also the technical problem underlying the present patent application. Therefore either of these documents could be seen as the closest prior art.

3.2.2 As set out before, in document D1 it is disclosed that the diffraction may be reduced by varying the transmission across the width of a pixel or the transmission of the parallax barrier. The appropriate transmission functions disclosed in this document correspond to the "prior art" functions shown in Figures 9 to 14 of the patent application. There is no suggestion in document D1 to apply optical transmission profiles for the parallax barriers with the functionality defined in claim 1.

3.2.3 Document D2 proposes a different solution by introducing an additional compensating element to the prior art display system for an autostereoscopic display: between the parallax barrier consisting of an opaque screen with a series of transparent slits and the backlight a mask is arranged to compensate for the effects of diffraction (column 13, lines 40 to 45). As is indicated in Figures 16 and 17, the aim of this combined structure is to provide a substantially more uniform illumination profile (see also column 15, line 1). Since the Fresnel diffraction pattern of an arrangement comprising a rear parallax barrier and a subsequent pixel plane (as schematically shown in Figure 11 of D2) is already quite complex and the addition of an angularly correcting element with non-uniform transmission profile (see Figures 16 to 19 of D2) adds even more complexity, it is not obvious that a skilled person would consider replacing this combined mask / parallax barrier by a parallax barrier having an optical transmission function which varies according to claim 1.

3.3 Therefore, in the opinion of the board, the subject-matter of claim 1 is novel and involves an inventive step. This similarly applies to claims 2 to 13, which are dependent claims.

4. For the above reasons, the board finds that the appellant's request meets the requirements of the EPC and that a patent can be granted on the basis thereof.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance with the order to grant a patent on the basis of the following documents:

Claims: 1 to 13, as received with the letter of 28 March 2006;

Description: pages 2, 3, 10 to 17, 19 to 21, 27 as originally filed

pages 1, 7, 8, 18, 22, 24 to 26 as received with the letter of 7 February 2006;

pages 4, 5, 6, 9, 23 as received with the letter of 28 March 2006;

Drawings: sheets 1/30 to 7/30 and 24/30 to 30/30 as originally filed;

sheets 8/30 to 13/30 and 15/30 to 23/30 as received with the letter of 28 March 2006;

sheet 14/30 received with the letter of 4 April 2006.

The Registrar:

The Chairman:

M. Kiehl

A. Klein