BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

Internal distribution code:
(A) [ ] Publication in OJ
(B) [ ] To Chairmen and Members
(C) [ ] To Chairmen
(D) [X] No distribution

Datasheet for the decision of 11 June 2007

Case Number: T 0932/03 - 3.5.04

Application Number: 98105425.7

Publication Number: 0899969

IPC: H04N 13/02

Language of the proceedings: EN

Title of invention:
3D image reconstructing apparatus and 3D image capturing apparatus

Applicant:
CANON KABUSHIKI KAISHA

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 56, 123(2)

Keyword:
"Added subject-matter (no, after amendment)"
"Inventive step - yes"

Decisions cited:
-

Catchword:
-

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0932/03 - 3.5.04

D E C I S I O N
of the Technical Board of Appeal 3.5.04
of 11 June 2007

Appellant: CANON KABUSHIKI KAISHA
30-2, Shimomaruko 3-chome
Ohta-ku
Tokyo (JP)

Representative: TBK-Patent
Bavariaring 4-6
D-80336 München (DE)

Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 25 March 2003 refusing European application No. 98105425.7 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: F. Edlinger
Members: A. Dumont
T. Karamanli

Summary of Facts and Submissions

I. The appeal is directed against the decision of the examining division to refuse European patent application 98 105 425.7, published as EP 0 899 969 A2.

II. The examining division refused the application for the reasons that the amended claims according to the main request and the first auxiliary request infringed Article 123(2) EPC and that the subject-matter of claim 1 of these requests and of the second auxiliary request did not involve an inventive step, required by Article 56 EPC, in view of:

D1: US 4 367 486 A.

III. In the oral proceedings before the board on 11 June 2007 the appellant replaced all previous requests by a sole new request.

IV. The appellant requested that the decision under appeal be set aside and that a patent be granted in the following version:

Description: pages 1 to 33 filed with the letter of 11 May 2007;
Claims: No. 1 to 14 filed in the oral proceedings on 11 June 2007;
Drawings: sheets 1/17 to 17/17 filed with the letter of 11 May 2007.

V. Claim 1 reads as follows.

"A three-dimensional image reconstructing apparatus for reconstructing a three-dimensional image and permitting said three-dimensional image to be observed at an observation position by an observer, said apparatus comprising:
image display means (1) for displaying image information at light-emitting points (1a', 1b', 1c') on a display surface of the image display means (1);
spatial light modulating means (3) for forming a fine aperture (4), wherein said fine aperture (4) is moved throughout an entire area of the spatial light modulating means (3) successively from one position to an adjacent one;
an optical system (2; 20) disposed near said spatial light modulating means (3); and
control means (5, 6) for controlling said image display means (1) and said spatial light modulating means (3) such that rays which emanate from the light-emitting points (1a', 1b', 1c') on said image display means (1) and become beams by being passed through the fine aperture (4) formed on said spatial light modulating means (3) pass through a predetermined image point (P) of the image to be reconstructed in a three-dimensional space to reach the observation position within a fixed period of time,
wherein the positions of said light-emitting points (1a', 1b', 1c') on said image display means (1) and the position of said fine aperture (4) are controlled by said control means (5, 6) such that a distance (p) on the observation position between two beams which emerge from adjacent positions of said fine aperture (4) and are closest among said beams passing

the predetermined image point (P) and reaching the observation position is not more than the diameter of the pupil of the observer, and
wherein a configuration of the spatial light modulating means (3) is such that, at the observation position, a maximum diameter of the beams emerging from the fine aperture (4) of said spatial light modulating means (3) is not more than the diameter of the pupil of the observer."

Claims 2 to 14 are dependent claims.

VI. The arguments of the examining division as regards inventive step, in so far as they are applicable to the subject-matter of the amended present claim 1, may be summarised as follows.

The apparatus disclosed in the embodiments of figures 11 and 12 of D1 comprises a display, spatial light modulating means forming a moving fine aperture, an optical system and control means. It substantially comprises the same physical structure as the one according to claim 1 of the second auxiliary request, for the purpose of reconstructing a three-dimensional image. The display and the spatial light modulating means must therefore be assumed to be controlled in the same way as the present invention, so as to generate rays intersecting at determined points such as point "P" in figure 9 of the present application. Otherwise the observer would not see a three-dimensional image made up of such points. The present invention, as described in figures 6 to 9, merely constitutes an alternative manner to illustrate the functioning of substantially the same device as disclosed in D1. The

passage in D1, column 5, lines 22 to 32, further relates the size of the fine aperture to the diameter of an average human pupil in daylight and determines that an aperture of one millimetre diameter must be utilised in order to obtain an appropriate angular resolution. The only differing feature of claim 1 under consideration, namely dimensioning the spatial light modulating means in dependence on the diameter of the pupil of the observer according to the criteria set out in the claim, was therefore obvious.

VII. The argumentation by the appellant in support of inventive step may be summarised as follows.

The display and the fine aperture in the apparatus according to D1 are controlled such that, at a given point in time, rays emerging from different image points on the display enter the right and left eyes of the observer, so that the two eyes observe different image points on the display surface. As the entire surface of the spatial light modulating is scanned by movement of the fine aperture each eye focuses on the display surface and observes a different two-dimensional image. The apparatus therefore relies on binocular parallax to cause three-dimensional perception by the observer (see for instance D1, column 2, lines 26 and 27). In contrast thereto, the display and the fine aperture in the apparatus of the present invention are controlled such that light beams converge at points "P" to reconstruct a three-dimensional image in the space in front of the spatial light modulating means and reach the eyes of the observer so that the eyes focus on this three-dimensional image, not on the display. The dimensioning

and the control of the apparatus as well as the perception by the observer are different in D1 and in the present invention. Neither D1 nor any other prior art document gave any hint to arrive at the invention, which therefore involves an inventive step.

Reasons for the Decision

1. The appeal is admissible.

2. Article 123(2) EPC

2.1 Claim 1 sets out the combination of a display means with spatial light modulating means and an optical system in the terms used in claim 1 as originally filed. The grounds under Article 123(2) EPC in the appealed decision do not apply to present claim 1, which substantially comprises the features of claim 1 of the then second auxiliary request, which had not been objected to under Article 123(2) EPC.

2.2 The last paragraph of present claim 1 ("wherein a configuration …") sets out an additional feature corresponding in substance to the wording of claim 4 as originally filed.

2.3 The wording of present claim 1 has been further amended in the appeal proceedings by making clear that light rays representing image information originate at light-emitting points and become beams by being passed through the fine aperture, as originally described on page 22, line 27, to page 23, line 24,

(paragraphs [0073] and [0074] of the patent application as published; see also figures 6 and 7).

2.4 The board is therefore satisfied that the amended claim 1 complies with Article 123(2) EPC. The same is true for the other amendments, mainly adaptations made to the dependent claims, the description and drawings.

3. Article 56 EPC

3.1 It is common ground that the apparatus known from D1 (figures 11 and 12), which is regarded as the closest prior art, comprises image display means (cathode ray tube having a surface 90), spatial light modulating means (for instance a liquid crystal display) for forming a fine aperture (transparent slit 88), an optical system (lens 92) and control means for controlling the image display means and the spatial light modulating means such that light beams emerging from the spatial light modulating means and entering the eyes of an observer permit the observation of three-dimensional images.

3.2 The apparatus according to the invention controls the image display and the spatial light modulating means such that at least two light beams emerge from (successive) adjacent positions of the moving fine aperture, geometrically intersect in ("pass through") a predetermined image point (P) and reach the observer's position. The distance (p) on the observation position between these adjacent beams is not more than the diameter of the pupil of the observer. Satisfying this condition ensures that the eyes focus on a three-dimensional image reconstructed in front of the spatial

light modulating means (see page 17, lines 2 to 16, of the current description and figure 9; paragraph [0076] of the patent application as published).

3.3 Relying on the same physical structure and the correspondence of the parts constituting the apparatus according to D1 and the present invention, the examining division assumed that the apparatus of D1 also had to reconstruct images as shown in figure 9 of the present application for them to be perceived as three-dimensional in the space before the screen (see point 3.2 b) of the appealed decision). The board does not share this assumption for the following reason.

3.4 The apparatus of D1 produces images capable of being observed with parallax (see column 1, lines 40 to 44; column 2, lines 22 to 27; column 3, lines 33 to 40, and column 5, lines 48 to 50). A multiplicity of images of an object are successively picked up by a camera with angles of incidence depending on the position of a moving fine aperture of the camera. They are then reproduced on the display in synchronism with the corresponding position of the fine aperture. Three-dimensionality results from the fact that the image display and the spatial light modulating means are controlled such that the two eyes of an observer see a multiplicity of ("geometrically and positionally congruent") successive image points, each eye at a different angle, through the spatial light modulating means which appears as a window to the observer (see column 4, line 57, to column 5, line 1). D1 does not envisage any measure being taken to reconstruct an image in front of the apparatus, let alone a requirement relating to the distance between two beams

emerging from adjacent positions and entering one eye at the observation position.

3.5 In the board's opinion the passage in column 5, lines 22 to 32, does not hint at a reconstruction of image points by intersecting light beams as in the present application. It only addresses the size of the fine aperture and relates it to the diameter of the observer's pupil for achieving a resolution equal to that of the human eye. These considerations relate to the diameter of pinholes and light beams and are substantially different from the condition relating to the distance (p) between intersecting light beams on the observation position set out in present claim 1, which sets a condition for the observation position to ensure that the observer's eyes can focus on a reconstructed image point (see point 3.2 above).

3.6 In conclusion, although the apparatus disclosed in D1 comprises parts corresponding to those according to the present invention, the dimensional configuration and control of the image display means and the spatial light modulating means is based on a totally different concept of reconstructing a three-dimensional image. As a result, the disclosure of D1, which does not reconstruct such image points but produces, for the right and left eye of the observer, separate image points on the screen which are perceived at different angles, does not render obvious the apparatus with the control means as set out in claim 1.

3.7 The further prior art cited in the European search report and the present application does not hint at a system reconstructing a three-dimensional image in

front of a spatial light modulating means. As a result, they also do not render obvious the apparatus set out in claim 1.

3.8 For the above reasons the invention set out in claim 1 and its dependent claims involves an inventive step. The application and the invention to which it relates therefore comply with the requirements of the EPC.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to grant a patent in the following version:

Description:
Pages 1 to 33 filed with the letter of 11 May 2007
Claims:
No. 1 to 14 filed in the oral proceedings on 11 June 2007
Drawings:
Sheets 1/17 to 17/17 filed with the letter of 11 May 2007.

The Registrar The Chairman

D. Sauter F. Edlinger