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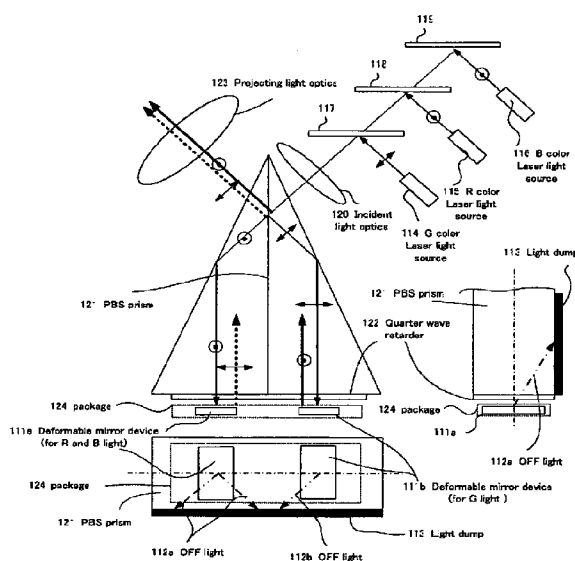
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[Continued on next page]

- (54) Title:** A MIRROR DEVICE MODULATING PERPENDICULAR INCIDENT LIGHT



- (S7) Abstract:** A display system includes a light source for projecting a linearly polarized illumination light. The display system further includes a deflectable mirror device having a plurality of mirror pixels. The display system further includes a polarized light separation plane that separates reflected light from the illumination light, a wave plate disposed near the deflectable mirror device, and a projection lens that projects the reflected light from the deflectable mirror device. In this system, the optical axes of the illumination light and an ON reflected light reflected from the deflectable mirror device are substantially perpendicular to the deflectable mirror device, and the optical axis of an OFF reflected light is inclined to the optical axis of the image display projection light path.



FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL,
PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM,
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A. CLASSIFICATION OF SUBJECT MATTER IPC: G02B 5/30 (2006.01) USPC: 359/494 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) U.S. : 359/494 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EAST		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6,604,828 B2 (Lu) 12 August 2003, column 3, lines 3-68, column 4, lines 1-18	1-28
Y	US 2003/0184843 A1 (Moon et al.) 2 October 2003, paragraphs 55-58, 0121	1-28
Y	US 2005/0190429 A1 (Ishii) 1 September 2005, paragraphs 0027-0028, 0034	2,8,9,10-11,14,17,20,23,26,28
Y	US 6,707,595 B2 (Kutz et al.) 16 March 2004, column 5, lines 47-50.	5-7, 28
☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
* Special categories of cited documents:		
"A"	document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E"	earlier application or patent published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P"	document published prior to the international filing date but later than the priority date claimed	
Date of the actual completion of the international search 09 August 2008 (09.08.2008)		Date of mailing of the international search report 22 AUG 2008
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201		Authorized officer Stephone B. Allen <i>Stephone B. Allen</i> Telephone No. 571-272-2800

INTERNATIONAL SEARCH REPORT

International application No.

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Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
Please See Continuation Sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☒ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of any additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

- Remark on Protest**
- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
 - ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
 - ☐ No protest accompanied the payment of additional search fees.

BOX III. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I(a), claim(s) 5, 7, drawn to a display system further comprising a laser or an LED light source for projecting the linearly polarized illumination light.

Group I(b), claim(s) 13, 15, drawn to a display system wherein an angle of incidence for an optical axis of the reflected light incident onto the polarized light separation plane in the OFF or intermediate state of the deflectable mirror device is smaller than an angle of incidence for the optical axis of the illumination light incident on the polarized light separation plane.

Group I(c), claim(s) 16, 18, drawn to a display system wherein an angle of incidence for an optical axis of the reflected light incident on the polarized light separation plane in the OFF or intermediate state is larger than the angle of incidence for an optical axis of the illumination light incident on the polarized light separation plane.

Group I(d), claim(s) 19, 21, drawn to a display system wherein the optical axis of an OFF light reflected from the deflectable mirror device is not intersected with the polarized light separation plane.

Group I(e), claim(s) 22, 24, drawn to a display system wherein an OFF light reflected from the deflectable mirror device is absorbed in a plane intersected the polarized light separation or passes through a plane intersecting the polarized light separation plane.

Group I(f), claim(s) 25, 27, drawn to a display system wherein the deflectable mirror pixel is controlled to move to an angular position between an ON and OFF states with at least part of the reflected light reflecting toward the polarized light separation plane.

Group I(g), claim(s) 4, drawn to a display system further comprising at least two wave plates each disposed near a respective deflectable mirror device that have the same optical functional characteristics and have directions of optical axes substantially aligned with incident illumination lights of different colors incident to the two deflecting mirrors.

Group I(h), claim(s) 12, drawn to a display system wherein the wave plate is disposed on a prism disposed near the deflectable mirror.

Group II(a), claim(s) 6, drawn to a display system further comprising a laser or an LED light source for projecting the linearly polarized illumination light.

Group II(b), claim(s) 8, drawn to a display system wherein the deflectable mirror device has a transparent window, and the wave plate is integrated with the transparent window.

Group II(c), claim(s) 9, drawn to a display system wherein the wave plate further comprises a sub-wavelength periodic structure.

Group II(d), claim(s) 10, drawn to a display system wherein the wave plate is disposed on a reflective surface of the deflectable mirror device.

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Group II(e), claim(s) 11, drawn to a display system wherein the wave plate is disposed on a prism disposed near the deflectable mirror.

Group II(f), claim(s) 14, drawn to a display system wherein an angle of incidence for an optical axis of the reflected light incident onto the polarized light separation plane in the OFF or intermediate state of the deflectable mirror device is smaller than an angle of incidence for the optical axis of the illumination light incident on the polarized light separation plane.

Group II(g), claim(s) 17, drawn to a display system wherein an angle of incidence for an optical axis of the reflected light incident on the polarized light separation plane in the OFF or intermediate state is larger than the angle of incidence for an optical axis of the illumination light incident on the polarized light separation plane.

Group II(h), claim(s) 20, drawn to a display system wherein the optical axis of an OFF light reflected from the deflectable mirror device is not intersected with the polarized light separation plane.

Group II(i), claim(s) 23, drawn to a display system wherein an OFF light reflected from the deflectable mirror device is absorbed in a plane intersected the polarized light separation or passes through a plane intersecting the polarized light separation plane.

Group II(j), claim(s) 26, drawn to a display system wherein the deflectable mirror pixel is controlled to move to an angular position between an ON and OFF states with at least part of the reflected light reflecting toward the polarized light separation plane.

Claims 1 and 3, link Groups I(a)-I(f).

The inventions listed as Groups I(a)-I(f) do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding technical features for the following reasons: the common technical feature in all groups is a display system comprising a deflectable mirror device including a plurality of mirrors wherein optical axes of the illumination light and an ON reflected light of the deflectable mirror device are substantially perpendicular to the deflectable mirror device, and an optical axis of an OFF reflected light is inclined relative to an optical axis of an image display projection light path. This element cannot be a special technical feature under PCT Rule 13.2 because the system is shown in the prior art. US Patent Application 2005/0190429 teaches a display system substantially as claimed in claims 1 and 3.

Claims 2 and 28, link groups II(a)-II(j).

The inventions listed as Groups II(a)-II(j) do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding technical features for the following reasons: the common technical feature in all groups is a display system wherein an angle between optical axes of the illumination light and an image projection light path when the mirror pixel is in an ON or intermediate state is half an angle u for determining an NA of the projection lens or smaller. This element cannot be a special technical feature under PCT Rule 13.2 because the system is shown in the prior art. US Patent Application 2005/0190429 teaches a display system substantially as claimed in claims 2 and 28.

The inventions listed as Groups I(a)-I(h) and II(a)-II(j) do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

For each of Groups I(a)-I(h) and II(a)-II(j) above, each of the listed groups has special technical features not required for the other listed groups. The special technical features exclusive to each group are listed above in the listing of the groups.

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