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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: OPTICAL APPARATUS FOR VIRTUAL INTERFACE PROJECTION AND SENSING

(57) Abstract: Optical and mechanical apparatus and methods for improved virtual interface projection and detection, by combining this function with still or video imaging functions. The apparatus comprises optics for imaging multiple imaged fields onto a single electronic imaging sensor. One of these imaged fields can be an infra red data entry sensing functionality, and the other can be any one or more of still picture imaging, video imaging or close-up photography. The apparatus is sufficiently compact to be installable within a cellular telephone or personal digital assistant. Opto-mechanical arrangements are provided for capturing these different fields of view from different directions. Methods and apparatus are provided for efficient projection of image templates using diffractive optical elements. Methods and apparatus are provided for using diffractive optical elements to provide efficient scanning methods, in one or two dimensions.



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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/IL04/00995

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC: H04N 5/225,9/04,7/18;G02B 13/16;G09G 5/00

USPC: 348/207.99,77,335;345/168

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. : 348/207.99,77,335;345/168

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)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X — Y	US 5,680,205 A (BORZA) 21 October 1997 (21.10.97), column 1, lines 45-67; column 2, line 49 to column 3, line 23.	1,3,6-9,13,14,17-20,23,32,33 ----- 2,11,21,37-39
Y	US 6,911,972 B2 (BRINJES) 28 June 2005 (28.6.05), column 1 line 48 to column 2, line 32; column 3, lines 1-59; column 7, line 47 to column 9, line 49; column 11, lines 57-65.	1,2,3,6-9,11,13,14,17-21,23,32,33,37-39
A	US 6,710,770 B2 (TOMASI ET AL.) 23 March 2004 (23.3.2004), see entire document.	1-39
A	US 6,650,318 B1 (ARNON) 18 November 2003 (18.11.2003), see entire document.	1-39
A	US 6,798,401 B2 (DUFAUX) 28 September 2004 (28.9.2004), see entire document.	1-39
A	US 6,750,849 B2 (POTKONEN) 15 June 2004 (15.6.2004), see entire document.	1-39



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

"E" earlier application or patent published on or after the international filing date

"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)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"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

"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

"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

"&amp;"

document member of the same patent family

Date of the actual completion of the international search

03 March 2006 (03.03.2006)

Date of mailing of the international search report

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Name and mailing address of the ISA/US

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# INTERNATIONAL SEARCH REPORT

International application No.

PCT/IL04/00995

## Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

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

1. ☐ Claim Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claim 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. ☐ Claim Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of Item 2 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 an additional fee, this Authority did not invite payment of any additional fee.
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.: 1-39

Remark on Protest

☐  
☐

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

## INTERNATIONAL SEARCH REPORT

PCT/IL04/00995

### **BOX II. 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, claim(s) 1-39, drawn to an electronic camera with a first and second imaging functionality.

Group II, claim(s) 40-75, drawn to an optical apparatus for producing an image including portions located at a large diffraction angle.

The inventions listed as Groups I and II 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: the special technical features of Group I claims are the claimed first and second imaging functionality and these features are not claimed in Group II. The special technical feature of Group II is the claimed diffractive optical element and this feature is not claimed in Group I. Therefore unity is lacking.