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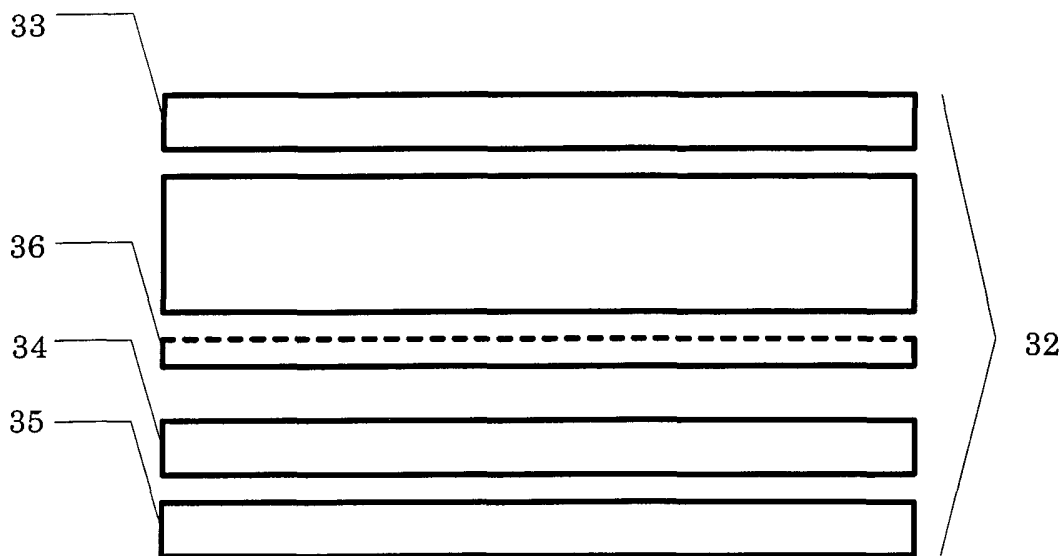
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- (74) Common Representative: **MACFARLANE, Rodney**; Deep Video Imaging Limited, Airport Road, RD 2, Hamilton 2002 (NZ).
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[Continued on next page]

(54) Title: OPTIMISING POINT SPREAD FUNCTION OF SPATIAL FILTER



(57) Abstract: Design of an optical system (32) incorporating an optical spatial filter (36) uses a software model to optimise the point spread function of an image, by varying both (i) the distance between the image and spatial filter (36) and (ii) the bidirectional scattering transmission function of the spatial filter (36). The spatial filter (36) can be a holographic diffuser for abating colour moire interference arising from multi-layered LCD screens (33,34). The optimisation can take into account the contrast sensitivity function of the human visual system.



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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.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ03/00046

A. CLASSIFICATION OF SUBJECT MATTERInt. Cl. ⁷: G02B 27/46, 5/32, G02F 1/1335, G06F 17/50

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)

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)

DWPI, JAPIO Keywords: spatial, hologra, cut off, low pass, transform, function; filter, diffus; G02B 27/46; point spread function, psf; btdf, btsf, bidirectional, scattering, transmission, distribution; moire; distance, displac, spacing; blur; spatial; filter, frequenc; csf; contrast; sensitivit, threshold, function

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5046827 A (FROST et al.) 10 September 1991 Columns 1-3, 6, 8-10	1-13, 17-19
X	US 5706139 A (KELLY) 6 January 1998 Columns 3-6	1-13, 17-19
X	JP 09-211392 A (OMRON CORP) 15 August 1997 (Figures and translation from http://www.ipdl.jpo.go.jp/homepg_e.ipdl) Paragraphs 4-15, 32-46, 53	1-13, 17-19



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 but 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
15 August 2003

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ03/00046

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3940788 A (ABE et al.) 24 February 1976 Columns 3-6	1, 3, 17, 19
P, X	JP 2002-156608 A (KUREHA CHEM IND CO LTD) 31 May 2002 (Figures and translation from http://www.ipdl.jpo.go.jp/homepg_e.ipdl) Paragraphs 7-16, 29-41, 47-51, Figure 2	1-13, 17-19
A	Patent Abstracts of Japan, JP 07-198921 A (SONY CORP) 1 August 1995 Abstract	1-13, 17-19
A	US 5337181 A (KELLY) 9 August 1994 Whole document	1-13, 17-19
X	US 4613896 A (TAKITA et al.) 23 September 1986 Columns 3-4, claim 1	1-4, 10-13, 17-19
A	Patent Abstracts of Japan, JP 63-318856 A (27 December 1988) Abstract	1-13, 17-19
X	WO 00/17708 A (HONEYWELL INC.) 30 March 2000 Pages 13-16, Figure 16	14-15
X	US 4447141 A (EISENKRAFT) 8 May 1984 Columns 2, 5-6, 8	14-15
A	Patent Abstracts of Japan, JP 11-066306 A (RICOH CO LTD) 9 March 1999 Abstract	14-15

INTERNATIONAL SEARCH REPORT

International application No.

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Box I 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 No : 16
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:
Claim 16 is so unclear in scope that no meaningful international search is possible.

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 II 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:

1. Claims 1-13, 17-19
 2. Claims 14-15
- as reasoned on a separate 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.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.

Supplemental Box

(To be used when the space in any of Boxes I to VIII is not sufficient)

Continuation of Box No: II

The international application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept. In coming to this conclusion the International Searching Authority has found that there are different inventions as follows:

1. Claims 1-13, 17-19 are directed to a method of controlling the point spread function of an optical system by altering the placement and the bidirectional scattering transmission function of a spatial filter. It is considered that control of the point spread function by altering the placement and bidirectional scattering transmission function of a spatial filter comprises a first "special technical feature".
2. Claims 14-15 are directed to a method of optimising the spatial filtration of an image by use of a function incorporating the contrast sensitivity function of the human visual system. It is considered that spatial filtration via a function which incorporates the contrast sensitivity function of the human visual system comprises a second "special technical feature".

Since the abovementioned groups of claims do not share any of the technical features identified, a "technical relationship" between the inventions, as defined in PCT rule 13.2 does not exist. Moreover, while a feature common to all of the claims is control/optimisation associated with spatial filtering, this common feature is generic in the art (see also, for example, US 5337181 A (KELLY) 9 August 1994, and JP 04-219061 A (VICTOR CO OF JAPAN LTD) 10 August 1992). Consequently the common feature does not constitute "a special technical feature" within the meaning of PCT Rule 13.2, second sentence, since it makes no contribution over the prior art. Since there exists no other common feature which can be considered as a special technical feature within the meaning of PCT Rule 13.2, second sentence, no technical relationship within the meaning of PCT Rule 13 between the different inventions can be seen. Consequently it appears that a posteriori, the claims do not satisfy the requirement of unity of invention.

It is considered that these groups of claims require independent and separate searches of the literature, and could not be both be searched without involving significant extra effort.

Note 1: Claims 18 and 19 do not have any antecedent for "the optical system" when appended to claims 14 or 15, and hence are construed as appended only to any one of claims 1-13 and 17.

Note 2: Due to unclear appendancies in general (eg, claim 4 is appended to claims 5-13 which are in turn appended to claim 4, and claim 15 is appended to claim "n"), it is assumed for the purposes of this Report that

- (i) no claim is appended to a later claim; and
- (ii) claim 15 is appended only to claim 14.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/NZ03/00046

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
US	5046827	CA	2020372	EP	409188	JP	3148622
US	5706139	WO	9714987				
JP	9211392	NONE					
US	3940788	JP	49096628				
JP	2002156608	NONE					
JP	7198921	NONE					
US	5337181	NONE					
US	4613896	JP	60211830				
JP	63318856	NONE					
WO	200017708	CA	2345128	EP	1116070	EP	1271944
		US	6377306				
US	4447141	NONE					
JP	11066306	NONE					
END OF ANNEX							