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Declarations under Rule 4.17:

— of inventorship (Rule 4.17(iv))

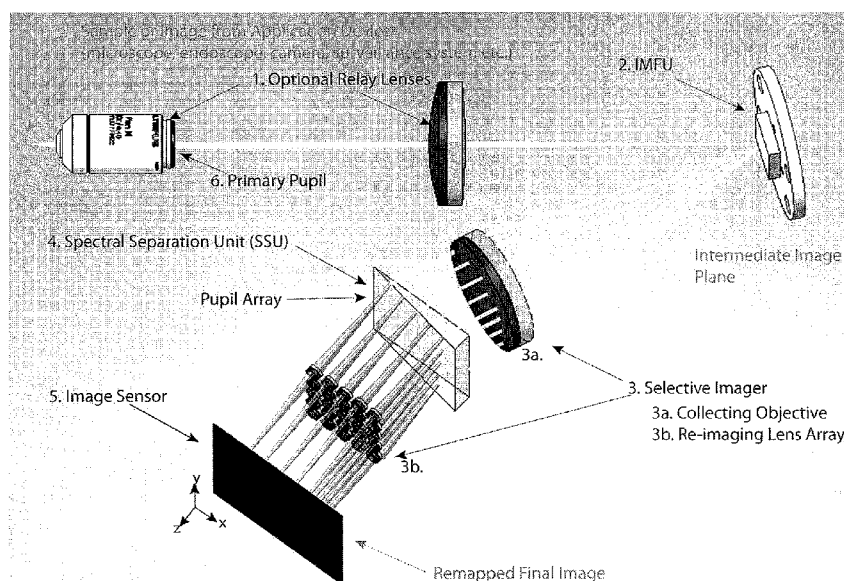
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[Continued on next page]

(54) Title: IMAGE MAPPING SPECTROMETERS

Fig. 2



(57) Abstract: Devices and methods for hyperspectral and multispectral imaging are discussed. In particular, Image Mapping Spectrometer systems, methods of use, and methods of manufacture are presented. Generally, an image mapping spectrometer comprises an image mapping field unit, a spectral separation unit, and a selective imager. Image mapping spectrometers may be used in spectral imaging of optical samples. In some embodiments, the image mapping field unit of an image mapping spectrometer may be manufactured with surface shaped diamond tools.



— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(88) **Date of publication of the international search report:**
8 July 2010

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2009/063259

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - G01J 3/28 (2010.01)

USPC - 359/237

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)

IPC(8) -G01J 3/28; G02B 26/00; G02F 1/00 (2010.01)

USPC - 359/237; 356/326, 328

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)

USPTO EAST System (US, USPG-PUB, EPO, DERWENT), MicroPatent

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4,678,332 A (ROCK et al) 07 July 1987 (07.07.1987) entire document	1-3, 5, 6, 12, 14-17, 21, 26, 29, 31-35, 40
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Y		18-20, 25, 36, 37, 44, 52
X	US 2008/0043314 A1 (HAGLER) 21 February 2008 (21.02.2008) entire document	1, 2, 4, 6, 8-11, 13, 30-32, 38, 43, 46, 50
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Y		18-20, 23, 24, 41, 42
X	US 2006/0033026 A1 (TREADO et al) 16 February 2006 (16.02.2006) entire document	1, 28, 31, 47, 51
X	US 2003/0232445 A1 (FULGHUM, JR) 18 December 2003 (18.12.2003) entire document	1, 31, 45, 48, 49
Y	US 2005/0270528 A1 (GESHWIND et al) 08 December 2005 (08.12.2005) entire document	23, 24, 36, 37, 41, 42
Y	US 2003/0025917 A1 (SUHAMI) 06 February 2003 (06.02.2003) entire document	25, 44, 52

☐ Further documents are listed in the continuation of Box C.

* 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 but 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

"&" document member of the same patent family

Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2009/063259

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:

See extra 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 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.:
1-52

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.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2009/063259

Continued from Box III.

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, claims 1-52, drawn to an image mapping spectrometer and method comprising a spectral separation unit; and a selective imager.

Group II, claims 53-57, drawn to a method of fabricating image field units, comprising providing a substrate; providing an optical component cross sectional profile; providing a surface shaped diamond tool specific to the optical component cross sectional profile; and utilizing the surface shaped diamond tool to create the optical component cross sectional profile in the substrate to form a mapping element.

The inventions listed as Groups I-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 feature of the Group I invention: a spectral separation unit; and a selective imager as claimed therein is not present in the invention of Group II. The special technical feature of the Group II invention: providing a surface shaped diamond tool specific to the optical component cross sectional profile; and utilizing the surface shaped diamond tool to create the optical component cross sectional profile in the substrate as claimed therein is not present in the invention of Groups I.

Groups I and II lack unity of invention because even though the inventions of these groups require the technical feature an image mapping spectrometer having an image mapping field unit, this technical feature is not a special technical feature as it does not make a contribution over the prior art in view of US 4,678,332 A (ROCK et al) 07 July 1987 (07.07.1987) column 4, lines 61-65; column 5, lines 35-66; figures 5a, 5b.

Since none of the special technical features of the Group I or II inventions are found in more than one of the inventions, unity of invention is lacking.