

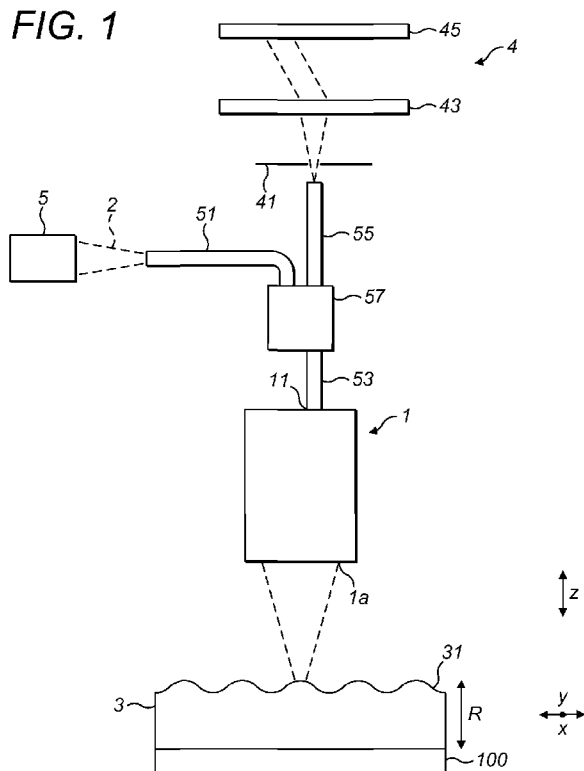


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[Continued on next page]

(54) Title: CHORMATIC CONFOCAL METROLOGICAL APPARATUS



(57) Abstract: Metrological apparatus and a confocal sensor for use in such apparatus are described. The confocal sensor (1) has an optical pinhole (11) adapted for letting through a light beam (2). An optical assembly of the sensor has a first lens (12) having a refractive profile (121) and a diffractive profile (122) and a second lens (13) having at least a refractive profile (131). The refractive profile (121) of the first lens (12) and the refractive profile (131) of the second lens (13) focus the light beam (2) into a focused beam (21). The diffractive profile (122) of the first lens (12) creates longitudinal chromatic aberration so that the focused beam (21) has a focal zone with a longitudinal depth (R).

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- *with international search report (Art. 21(3))*
- *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))*

INTERNATIONAL SEARCH REPORT

International application No PCT/GB2012/053187

A. CLASSIFICATION OF SUBJECT MATTER
 INV. G01B11/02 G02B21/00
 ADD.

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)
 G02B G01B

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)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	FR 2 848 664 A1 (MICRO MODULE [FR]) 18 June 2004 (2004-06-18) the whole document page 3, lines 3-12 page 8, line 23 - page 9, line 6 page 11, lines 19-30 page 16, lines 4-14 page 18, line 14 - page 19, line 7; figures 4-a page 21, lines 3-19; figure 6 -----	1,3-7, 11,14-21 8-10,22
A	US 2008/030743 A1 (LEHMANN PETER [DE]) 7 February 2008 (2008-02-07) paragraphs [0012], [0033]; figure 1 ----- -/--	1

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 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

9 September 2013

Date of mailing of the international search report

18/11/2013

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 Fazio, Valentina

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2012/053187

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2009/153067 A2 (MEL MIKROELEKTRONIK GMBH [DE]; JURCA MARIUS [FR]) 23 December 2009 (2009-12-23) claim 1; figure 1 -----	1
A	US 6 674 572 B1 (SCHERUEBL THOMAS [DE] ET AL) 6 January 2004 (2004-01-06) column 2, line 65 - column 3, line 21; figure 1 -----	1
A	DE 10 2005 006724 A1 (UNIV STUTTGART [DE]) 10 August 2006 (2006-08-10) paragraphs [0125] - [0129], [0134] - [0136]; figures 1,3 -----	1
Y	SHI K ET AL: "Chromatic confocal microscopy using supercontinuum light", OPTICS EXPRESS, OSA (OPTICAL SOCIETY OF AMERICA), WASHINGTON DC, (US), vol. 12, no. 10, 17 May 2004 (2004-05-17), pages 2096-2101, XP008133695, ISSN: 1094-4087 the whole document -----	8-10,22
X,P	EP 2 500 685 A1 (OMRON TATEISI ELECTRONICS CO [JP]) 19 September 2012 (2012-09-19) paragraphs [0016], [0017], [0025], [0029], [0030], [0042] - [0063]; claim 1; figures 1,2,4 -----	1,3-7, 14-21
E	EP 2 544 037 A1 (CONSEJO SUPERIOR INVESTIGACION [ES]) 9 January 2013 (2013-01-09) paragraphs [0005], [0009], [0011], [0012], [0017] - [0019], [0035]; figure 5 -----	2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2012/053187

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.: 12, 23-25
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:
see FURTHER INFORMATION sheet PCT/ISA/210

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 additional 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 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.:
1-10, 13-22

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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 12, 23-25

Claim 12 has not been searched because no search fee was paid for this claim.

Claims 23-25 contain references to the description and the drawings. According to Rule 6.2(a) PCT, claims should not contain such references except where absolutely necessary, which is not the case here.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guidelines C-IV, 7.2), should the problems which led to the Article 17(2) declaration be overcome.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-7, 11, 13-21

Chromatic confocal sensor comprising two lenses positioned in series along the optical axis of the sensor, one of which has a diffractive profile to introduce chromatic aberration. One of the two lenses is movable along the optical axis of the sensor to modify the longitudinal focal depth of the focused beam.

2. claims: 8-10, 22

Chromatic confocal sensor comprising two lenses positioned in series along the optical axis of the sensor, both of them having a refractive profile and a diffractive profile to induce an enhanced chromatic aberration.

3. claim: 12

Chromatic confocal sensor comprising two lenses positioned in series along the optical axis of the sensor, the two lenses being configured so that the sensor has a ratio r comprised between 1.5 and 3.0, where r is defined as $r = WD/R$, where WD is a distance between the second lens and a proximal focal point of the focal zone, and R is the longitudinal depth. This provides a dispersion which has a linear behaviour as a function of the wavelength.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/GB2012/053187

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2848664	A1	18-06-2004	NONE

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			WO 2011107642 A1 09-09-2011
