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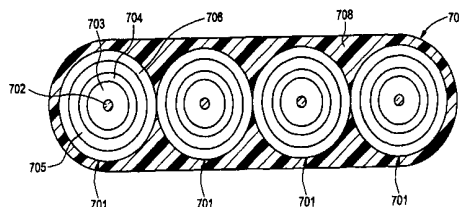
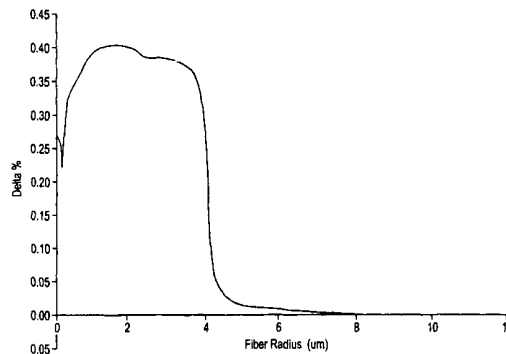
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[Continued on next page]

(54) Title: HIGHER WAVELENGTH OPTIMIZED OPTICAL FIBER WAVEGUIDE



(57) Abstract: Single mode optical fiber waveguides with reduced bending losses for wavelength range of 1300 nm to 1700 nm are disclosed. The extended ranges are achieved by altering the optical characteristics of the fiber, namely, the MAC number, the mode field diameter ("MFD"), and the cut-off wavelength. The single mode fibers disclosed exhibit a lower MFD and higher cut-off wavelength. In addition, optical fiber transmission systems, wave division multiplexing ("WDM") systems, and optical fiber ribbon cables are disclosed that incorporate the single mode optical fiber. Figure 2 shows the refractive index profile as a function of the fiber radius. Figure 6 illustrates a ribbon cable (700) with 4 fibers in a matrix material (708). Each fiber consists of a central core (702), a cladding layer (703), a primary (704) and a secondary polymer layer (705) and a colored ink coating layer (706).



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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/US 00/25362

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 G02B6/16

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 7 G02B

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 practical, search terms used)

EPO-Internal, PAJ, INSPEC, 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	UNGER C ET AL: "Characterization of the bending sensitivity of fibers by the MAC-value" OPTICS COMMUNICATIONS, 1 MAY 1994, NETHERLANDS, vol. 107, no. 5-6, pages 361-364, XP000955364 ISSN: 0030-4018	1,12
Y	the whole document ---	26,30
Y	EP 0 883 002 A (LUCENT TECHNOLOGIES INC) 9 December 1998 (1998-12-09) page 4, line 23 - line 37 page 6, line 34 -page 7, line 3; figure 6 figures 3B,6,7 --- -/--	26,30

Further documents are listed in the continuation of box C.

Patent family members are listed in 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 document 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

24 January 2001

Date of mailing of the international search report

09.03.01

Name and mailing address of the ISA

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 00/25362

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>COCCHINI F ET AL: "MICROBENDING SENSITIVITY OF OPTICAL FIBRES" OFMC. OPTICAL FIBRE MEASUREMENT CONFERENCE,XX,XX, vol. 1, September 1995 (1995-09), pages 135-138, XP000669868 the whole document</p>	1,12
X	<p>UNGER C ET AL: "INVESTIGATION OF THE MICROBENDING SENSITIVITY OF FIBERS" JOURNAL OF LIGHTWAVE TECHNOLOGY,US,IEEE. NEW YORK, vol. 12, no. 4, 1 April 1994 (1994-04-01), pages 591-596, XP000470355 ISSN: 0733-8724 the whole document</p>	1,12
P,X	<p>PATENT ABSTRACTS OF JAPAN vol. 2000, no. 02, 29 February 2000 (2000-02-29) -& JP 11 305086 A (FUJIKURA LTD), 5 November 1999 (1999-11-05) the whole document</p>	1
A	<p>US 5 278 931 A (SMITH DAVID K ET AL) 11 January 1994 (1994-01-11) abstract; figures; table 1 column 1, line 16 - line 25</p>	1,12
A	<p>US 5 673 342 A (NELSON KATHERINE THERESA ET AL) 30 September 1997 (1997-09-30) abstract; figure 1</p>	26,30

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 00/25362

Box I Observations where certain claims were found unsearchable (Continuation of item 1 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.: **2-11, 13-25, 27-29, 31, 32**
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 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:

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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box I.2

Claims Nos.: 2-11,13-25,27-29,31,32

Present independent claims 1, 12, 26 and 30 relate to a product and a system using this product defined by reference to the following parameter(s):

P1: a single mode optical fiber comprising a MAC number measured at 1625nm equal to or less than about 7.8

The use of these parameters in the present context is considered to lead to a lack of clarity within the meaning of Article 6 PCT. It is impossible to compare the parameters the applicant has chosen to employ with what is set out in the prior art. The lack of clarity is such as to render a meaningful complete search impossible. Consequently, the search has been restricted to an optical fiber with the refractive index profile shown in figure 2, having a MAC number close to 7.8 in the third infrared transmission window.

The applicant's attention is drawn to the fact that claims, or parts of 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.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 00/25362

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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