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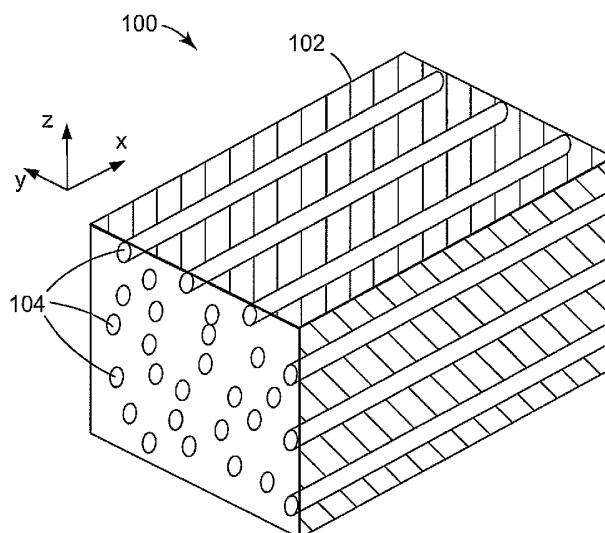
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(54) Title: COMPOSITE POLYMER FIBERS



(57) Abstract: A composite polymer fiber comprises a polymer filler material and a plurality of polymer scattering fibers disposed within the filler material. At least one of the filler material and the scattering fibers is formed of a birefringent material. The refractive indices of the filler material and the scattering fibers can be substantially matched for light incident in a first polarization state on the composite polymer fiber and unmatched for light incident in an orthogonal polarization state. The scattering fibers may be arranged to form a photonic crystal within the composite fiber. The composite fibers may be extruded and may be formed into a yarn, a weave or the like. If the filler material is soluble, it may be washed out of the yarn or weave, and the scattering fibers may then be infiltrated with a resin that is subsequently cured.

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Minimum documentation searched (classification system followed by classification symbols)
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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)

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 357 389 A (SATO ET AL) 2 November 1982 (1982-11-02)	1,2,4,7
Y	column 17, lines 57-64; claim 1; figure 13; table I	3,5
A	WO 02/101422 A (SAMSUNG ELECTRONICS CO., LTD; PARK, JOON, YONG) 19 December 2002 (2002-12-19) claims 1,6; figure 5	1,2,4,7-10,15
Y	US 2004/052484 A1 (BROENG JES ET AL) 18 March 2004 (2004-03-18) paragraph [0106]; figure 12 paragraph [0117]; figures 17-22 claims 17,23,24,41,42,49,50	3,5
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☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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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 2004/070464 A (KONINKLIJKE PHILIPS ELECTRONICS N.V; HUCK, HUBERTINA, P., M; HIKMET, R) 19 August 2004 (2004-08-19) page 8, lines 14-21; figure 5 -----	34

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2006/003741

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4357389	A	02-11-1982	JP 1445771 C	30-06-1988
			JP 56041234 A	17-04-1981
			JP 62052770 B	06-11-1987
WO 02101422	A	19-12-2002	JP 2004522200 T	22-07-2004
			KR 2003026336 A	31-03-2003
			US 2004031435 A1	19-02-2004
US 2004052484	A1	18-03-2004	AU 1494402 A	21-05-2002
			WO 0239159 A1	16-05-2002
			GB 2384323 A	23-07-2003
WO 2004070464	A	19-08-2004	CN 1748174 A	15-03-2006
			EP 1595181 A1	16-11-2005
			US 2006139948 A1	29-06-2006