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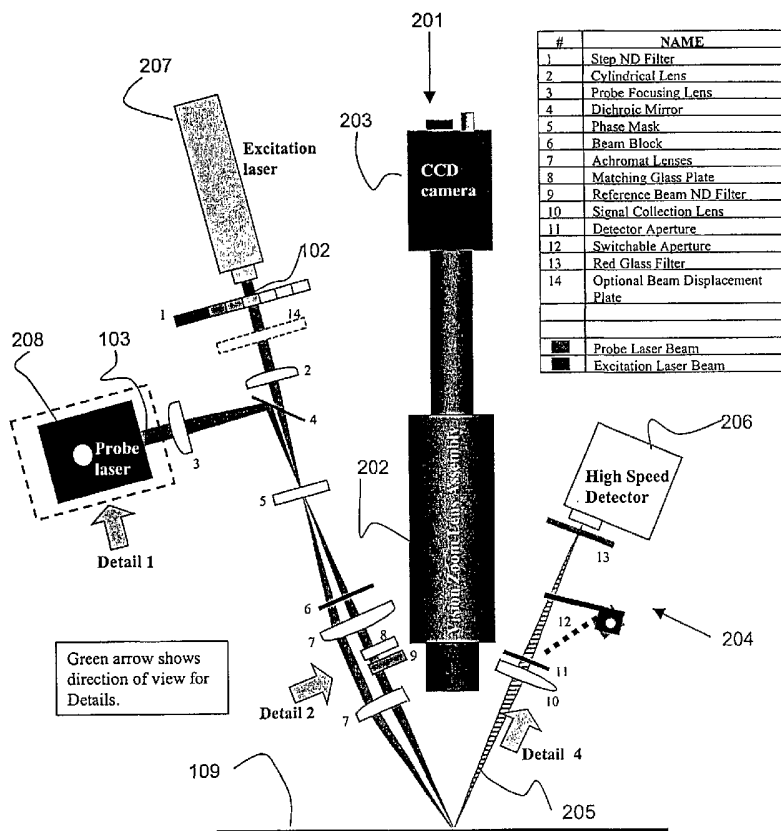
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(54) Title: OPTO-ACOUSTIC APPARATUS WITH OPTICAL HETERODYNING FOR MEASURING SOLID SURFACES AND THIN FILMS



(57) Abstract: In an opto-acoustic measuring device for thin films and solid surfaces, the probe beam (103) is split into a first probe beam portion and a second reference beam portion. The splitting of the probe beam is achieved using a phase mask (5) that also splits the excitation beam (102). The probe beam is aligned using a retro-reflector on a motorized stage to control the beam angle. Excitation and probe/reference beams are overlapped at the sample surface (109). The first probe beam portion gets diffracted by material disturbances generated by excitation beams. The diffracted part of the first probe beam portion is collinear with the second reference beam portion, resulting in heterodyning. The heterodyne signal measured by the detector (206) is analyzed in order to determine thickness and/or other properties of a thin film or solid surface. The invention improves magnitude and reproducibility of the opto-acoustic signal which results in enhanced precision of measurements.

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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)

EPO-Internal, WPI Data, PAJ, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 01 09586 A (KONINKL PHILIPS ELECTRONICS NV) 8 February 2001 (2001-02-08) page 4, line 27 -page 5, line 5 page 6, line 15 -page 7, line 28 figure 1	1-31
Y	US 6 069 703 A (MAZNEV ALEXEI ET AL) 30 May 2000 (2000-05-30) cited in the application column 10, line 33 - line 42	1-31
X	US 5 734 470 A (ROGERS JOHN A ET AL) 31 March 1998 (1998-03-31) cited in the application column 8, line 59 -column 9, line 17 figure 3	1-31
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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.
Y	US 6 256 100 B1 (ROGERS JOHN A ET AL) 3 July 2001 (2001-07-03) figures 1A,9 -----	1-31
A	MAZNEV A A ET AL: "Impulsive stimulated thermal scattering for sub-micron-thickness film characterization" THIN SOLID FILMS, ELSEVIER-SEQUOIA S.A. LAUSANNE, CH, vol. 290-291, 15 December 1996 (1996-12-15), pages 294-298, XP004173335 ISSN: 0040-6090 the whole document -----	1-31

INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 0109586	A	08-02-2001	WO 0109586 A2	08-02-2001
			EP 1144981 A2	17-10-2001
			JP 2003506675 T	18-02-2003
US 6069703	A	30-05-2000	EP 1000317 A1	17-05-2000
			WO 9961867 A1	02-12-1999
			JP 2002516985 T	11-06-2002
US 5734470	A	31-03-1998	EP 0805947 A1	12-11-1997
			IL 116789 A	11-04-1999
			JP 10512958 T	08-12-1998
			WO 9623197 A1	01-08-1996
US 6256100	B1	03-07-2001	EP 0991915 A1	12-04-2000
			WO 9956077 A1	04-11-1999
			JP 2002508081 T	12-03-2002
			US 2003058449 A1	27-03-2003