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(54) **POLY-AMIC ACID, PHOTO-SENSITIVE RESIN COMPOSITION, DRY FILM, AND CIRCUIT BOARD**

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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2011/0054124 A1 3/2011 Chang et al.

FOREIGN PATENT DOCUMENTS

CN	1258187	A		6/2000
CN	101124270	A		2/2008
CN	101495915	A		7/2009
CN	102361913	A		2/2012
JP	2000186143	A		7/2000
JP	2000212280	A		8/2000
JP	2000338668	A		12/2000
JP	2004-25610	A		1/2004
JP	2005326579	A		11/2005
JP	2007233319	A		9/2007
JP	2012527009	A		11/2012
KR	10-2001-0062506	A		7/2001
KR	10-2001-0077251	A		8/2001
KR	10-2010-0040269	A		4/2010
KR	10-1010036	B1		1/2011
KR	10-2011-0023814	A		3/2011
KR	10-2011-0045779	A		5/2011
WO	2004/018545	A1		3/2004
WO	2010/036873	A1		4/2010
WO	2010-050523		*	5/2010
WO	2011/025307	A2		3/2011

OTHER PUBLICATIONS

Sakumoto, WO 2010-050523 Machine Translation, May 6, 2010.*

* cited by examiner

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(57) **ABSTRACT**

The present invention relates to a novel polyamic acid introduced with an imidazolyl group in the polymer chain, a photosensitive resin composition including the polyamic acid and that is capable of providing a photosensitive material that satisfies the characteristics of an excellent bending property and low stiffness and also exhibits excellent heat resistance and coating resistance, a dry film obtained from the photosensitive resin composition, and a circuit board including the dry film.

17 Claims, No Drawings