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(54) **TIRE STATE JUDGING DEVICE**

(56) **References Cited**

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U.S. PATENT DOCUMENTS

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5,497,657	A *	3/1996	Taguchi et al.	73/146.2
6,092,028	A *	7/2000	Naito et al.	702/47
6,668,637	B2 *	12/2003	Ono et al.	73/146.5
2002/0059826	A1 *	5/2002	Ono et al.	73/146.5
2009/0105921	A1	4/2009	Hanatsuka et al.	

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FOREIGN PATENT DOCUMENTS

(21) Appl. No.: **13/578,069**

JP	61 56546	4/1986	
JP	5 133831	5/1993	
JP	6 297923	10/1994	
JP	2002 172920	6/2002	
JP	2003-154828	A	5/2003
JP	2003154828	A *	5/2003 B60C 23/06
JP	2005 164337	6/2005	
JP	2009-513945	A	4/2009
WO	2006 135090	12/2006	

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OTHER PUBLICATIONS

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* cited by examiner

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(57) **ABSTRACT**

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A tire state judging device includes wheel speed sensors configured to detect rotational speeds of tires, and a control unit configured to perform frequency-analysis of detection results of the wheel speed sensors to detect a frequency of a valley part of an output, and calculate an air pressure of the tire from the detected frequency of the valley part. According to this, the tire state judging device has an effect that this can detect a state of the tire irrespective of a state of a road surface.

(58) **Field of Classification Search**
None
See application file for complete search history.

12 Claims, 8 Drawing Sheets

