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Baecher

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(54) **METHOD FOR DETERMINING AN ANGLE OF ROTATION**

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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,880,586 A 3/1999 Dukart et al.
2009/0278531 A1 11/2009 Franke et al.
2011/0187351 A1 8/2011 Hunger
2012/0095712 A1 4/2012 Komasaki et al.
2014/0278224 A1* 9/2014 Trontelj G01D 5/145
702/151

FOREIGN PATENT DOCUMENTS

DE 10 2008 010 374 A1 9/2009
DE 10 2011 083 249 A1 4/2012
EP 2 117 103 A1 11/2009
EP 2 354 769 A1 8/2011
WO WO 96/16316 5/1996

* cited by examiner

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(57) **ABSTRACT**

A method for determining an angle of rotation between a sensor array and a magnetic field of a magnet, whereby the magnetic field is formed substantially parallel and perpendicular to the rotation axis, and the magnet is arranged rotationally symmetric relative to the rotation axis. A first measurement signal and a second measurement signal are generated by the two subsensors of the first magnetic field sensor unit, and the first measurement signal is assigned a first relation and the second measurement signal is assigned a second relation. A third measurement signal and a fourth measurement signal are generated by the two subsensors of the second magnetic field sensor unit, whereby the third measurement signal is assigned a third relation and the fourth measurement signal is assigned a fourth relation. The angle of rotation is then determined.

5 Claims, 2 Drawing Sheets

