



US005329269A

United States Patent [19]

(11) Patent Number: 5,329,269

Watson

(45) Date of Patent: Jul. 12, 1994

[54] SINGLE CORE TRIAXIAL FLUX-GATE MAGNETOMETER

671627 5/1952 United Kingdom 336/234
830094 3/1960 United Kingdom 336/213

[76] Inventor: William S. Watson, 3026 Aspen Ct., Eau Claire, Wis. 54703

OTHER PUBLICATIONS

[21] Appl. No.: 782,488

[22] Filed: Oct. 25, 1991

Article by William A. Geyger, *Flux-Gate Magnetometer*; Jun. 1, 1962, labelled Reference 1.

Article by Doug Garner, *A Magnetic Heading Reference for the Electro Fluidic Autopilot*; Sport Aviation, Labelled as Reference 2.

Article by Stanley V. Marshall, *An Analytic Model for the Fluxgate Magnetometer*; Labelled as Reference 3.

A Brochure for Domain Magnetics, Pubs No. DTM 0010, Labelled as Reference 4 *Dual and Three Axis Magnetometers*.

A Brochure for Develco, Inc., *Fluxgate Magnetometer, Model 9200C*; Aug., 1982, Labelled as Reference 5.

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 565,794, Aug. 10, 1990.

[51] Int. Cl.⁵ H01F 27/24

[52] U.S. Cl. 336/213; 29/609; 324/247; 336/188; 336/229; 336/234

[58] Field of Search 29/609; 324/247; 336/213, 234, 233, 229, 118

[56] References Cited

U.S. PATENT DOCUMENTS

510,640	12/1893	Hornberger .	
553,847	2/1896	Freeman .	
1,406,245	2/1922	Thordarson .	
1,933,140	10/1933	Gakle .	
2,199,116	4/1940	Sanders .	
2,220,732	11/1940	Sanders .	
2,220,733	11/1940	Sanders .	
2,246,239	6/1941	Brand .	
2,246,240	6/1941	Brand .	
2,269,726	1/1942	Martin .	
2,282,854	5/1942	Driftmeyer .	
2,314,912	3/1943	Troy .	
2,333,015	10/1943	Kramer et al. .	
2,367,927	1/1945	Chubb .	
3,153,215	10/1964	Burkhardt et al. .	
3,303,449	2/1967	Stimler .	
3,621,382	11/1971	Valet .	
3,800,213	3/1974	Rorden .	324/43 R
4,366,520	12/1982	Finke et al. .	
4,462,165	7/1981	Lewis .	
4,521,957	6/1985	McLeod .	
4,557,039	12/1985	Manderson .	336/234
4,588,971	5/1986	Basser .	336/213
4,825,166	4/1989	MacGugan .	
4,851,775	7/1989	Kim et al. .	

FOREIGN PATENT DOCUMENTS

521125	5/1940	Fed. Rep. of Germany .	
52-58818	5/1977	Japan .	336/213

Primary Examiner—Thomas J. Kozma
Attorney, Agent, or Firm—Moore & Hansen

[57] ABSTRACT

A single core triaxial flux-gate magnetometer including a tall-toroidal core having a radial excitation winding, two orthogonal sets of axial or circumferential output windings, and an equatorial output winding oriented orthogonal to both axial output windings. The core is fabricated from a strip of magnetic tape material wrapped to form a toroid having a height ranging from approximately equal to its diameter to one and one half times its diameter. Each end of the strip is uniformly tapered along the top and bottom edges such that the tapered segments extend around an integer multiple of complete revolutions of the wrapping, the length of each tapered segment thereby being equal to the inner or outer circumference of the toroid or an integer multiple thereof. Leakage of the induced magnetic field at any point along the edge of the tapered segment will be generally proportional to the height of the tapered segment between its edges at that point, and will extend with equal magnitude in opposite directions from the strip parallel to the planar surface of the toroid and perpendicular to the edges. The tapered segments are oriented and aligned relative to one another in the wrapped toroid such that the induced magnetic field leakage is generally symmetrical and balanced across any diameter of the core.

17 Claims, 2 Drawing Sheets

