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(54) **SENSOR FOR MEASURING MAGNETIC FIELD STRENGTH AND TEMPERATURE FOR AN ELECTRIC MOTOR**

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(52) **U.S. Cl.** **324/244.1**; 324/96; 250/227.19
(58) **Field of Search** 324/244.1, 96, 324/252; 250/227.19, 227.11, 227.14, 227.17, 227.18; 359/280, 282; 385/12, 13; 702/134, 135

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,433,291 * 2/1984 Yariv et al. 324/244.1
4,591,786 * 5/1986 Koo et al. 324/244.1
4,600,885 * 7/1986 Koo et al. 324/244.1
4,622,460 * 11/1986 Failes et al. 250/227.19
4,868,495 * 9/1989 Einzig et al. 324/97
4,899,042 * 2/1990 Falk et al. 250/227.19
4,974,182 * 11/1990 Tank 702/135
5,239,488 * 8/1993 Markham et al. 702/135

* cited by examiner

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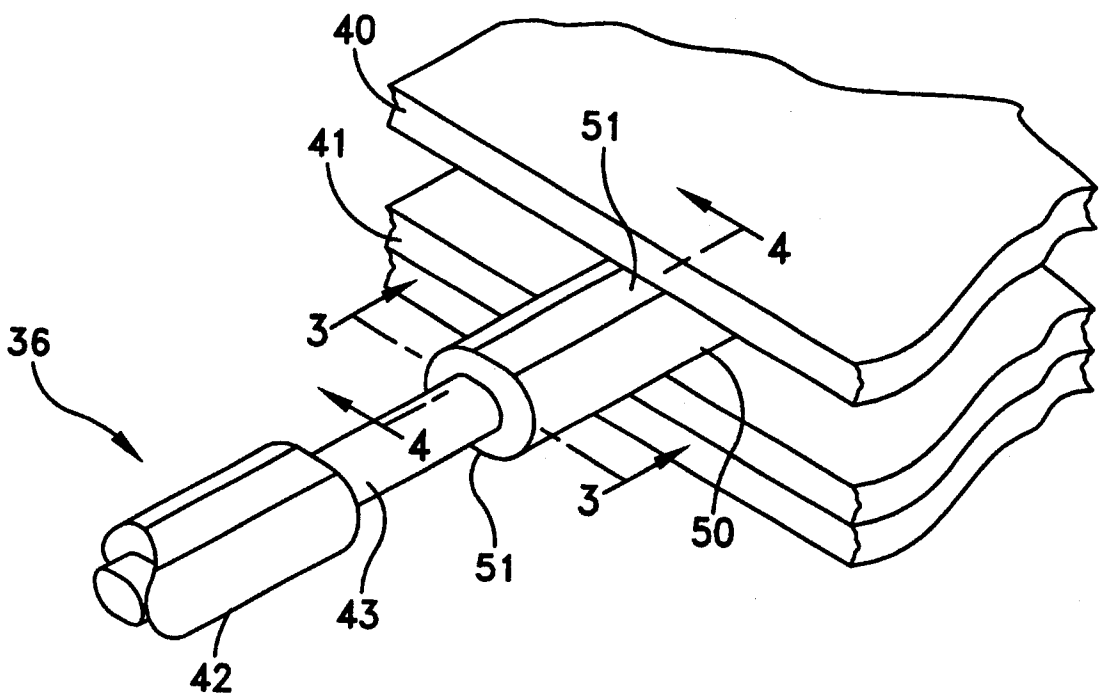
(57) **ABSTRACT**

A sensor for facilitating the measurement of temperature and magnetic field is described. The sensor comprises an optical cable having a distal end encompassed in a sheath of giant magnetoresistive material. Temperature changes alter the spectrum emissivity of the giant magnetoresistive material. Magnetic field changes alter the spectrum changes that occur from distorting the optical fiber that occur when the giant magnetoresistive material distorts the optical fiber.

14 Claims, 5 Drawing Sheets