



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : H01F 1/00, 3/00, 7/00, 7/02, 7/20, 13/00		A1	(11) International Publication Number: WO 00/63927
			(43) International Publication Date: 26 October 2000 (26.10.00)
(21) International Application Number: PCT/US99/12694 (22) International Filing Date: 8 June 1999 (08.06.99) (30) Priority Data: 09/292,002 15 April 1999 (15.04.99) US (71)(72) Applicants and Inventors: CLOUTIER, Paul, A. [US/US]; 2011 Port Royal, Nassau Bay, TX 77058 (US). MARZOLF, Timothy, I. [US/US]; 22918 Holly Hollow, Tomball, TX 77375 (US). OEHME, Delbert, R. [US/US]; 1301 Broadmoor, Bryan, TX 77802 (US). STEBBINGS, Ronald, F. [US/US]; 2171 University Boulevard, Houston, TX 77030 (US). (74) Agents: SHAPIRO, Nelson, H. et al.; Vorys, Sater, Seymour and Pease LLP, 11th floor, 1828 L. Street N.W., Washington, D C 20036 (US).			(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published With international search report.

(54) Title: METHOD AND APPARATUS FOR PROVIDING PERMANENT MAGNETIC SIGNATURES IN BURIED CABLES AND PIPES

(57) Abstract

Ferromagnetic material of an elongated object, such as a fiber optic cable (12), is permanently magnetized in a manner that results in a substantially cylindrically symmetric radial external magnetic field around the object. The radial external magnetic field varies periodically along the length of the object. If the wavelength of the periodic variations is long compared to the width (diameter) of the object, the strength of the radial external magnetic field decreases approximately inversely with distance from the object for distances that are small compared to the wavelength. Magnetization of the ferromagnetic material is achieved by a magnetizer having pairs (10) of counter-rotating mirror-image magnets adjacent to an object that is moved longitudinally relative to the magnets. By virtue of the magnetization, buried objects, such as pipes and cables can be detected magnetically at substantial distances from the objects.

