99052441

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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :
A61B 5/06

A1

(11) International Publication Number: WO 98/49938

(43) International Publication Date: 12 November 1998 (12.11.98)

(21) International Application Number: PCT/US98/09454

(22) International Filing Date: 8 May 1998 (08.05.98)

(30) Priority Data:
08/852,940 8 May 1997 (08.05.97) US

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(81) Designated States: AL, AM, AT, AU, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, 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, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ARIPO patent (GH, GM, KE, LS, MW, SD, 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, ML, MR, NE, SN, TD, TG).

Published
With international search report.



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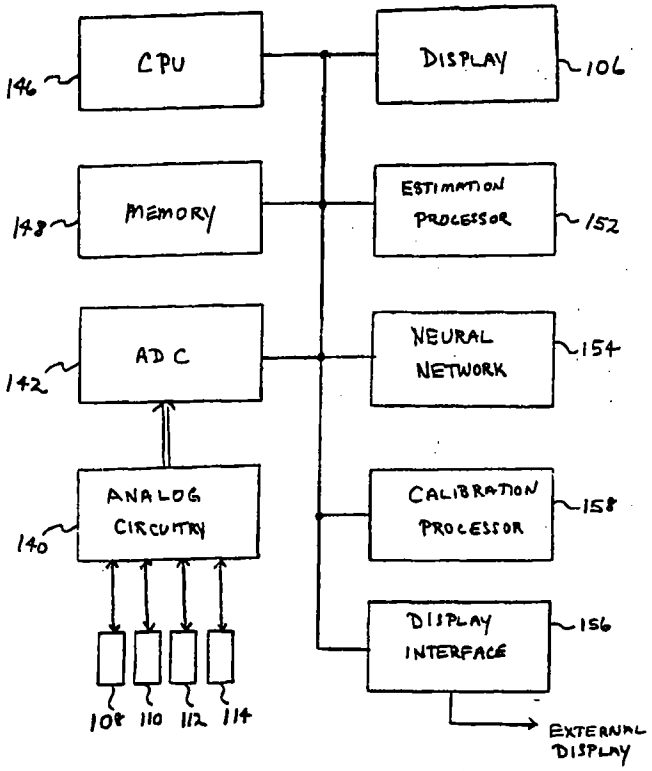


G00001

(54) Title: SYSTEM AND METHOD TO DETERMINE THE LOCATION AND ORIENTATION OF AN INDWELLING MEDICAL DEVICE

(57) Abstract

A device to detect the location of a magnet coupled to an indwelling medical device within a patient uses three or more sets of magnetic sensors each having sensor elements arranged in a known fashion. Each sensor element senses the magnetic field strength generated by the magnet and provides data indicative of the direction of the magnet in a three-dimensional space. The device uses fundamental equations for electricity and magnetism that relate measured magnetic field strength and magnetic field gradient to the location and strength of a magnetic dipole. The device uses an iterative process to determine the actual location and orientation of the magnet. An initial estimate of the location and orientation of the magnet results in the generation of predicted magnetic field values. The predicted magnetic field values are compared with the actual measured values provided by the magnetic sensors. Based on the difference between the predicted values and the measured values, the device estimates a new location of the magnet and calculates new predicted magnetic field strength values. This iteration process continues until the predicted values match the measured values within a desired degree of tolerance. At that point, the estimated location matches the actual location within a predetermined degree of tolerance. A two-dimentional display provides an indication of the location of the magnet with respect to the housing of the detector. A depth indicator portion of the display can be used to provide a relative or absolute indication of the depth of the magnet within the patient.



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