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- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
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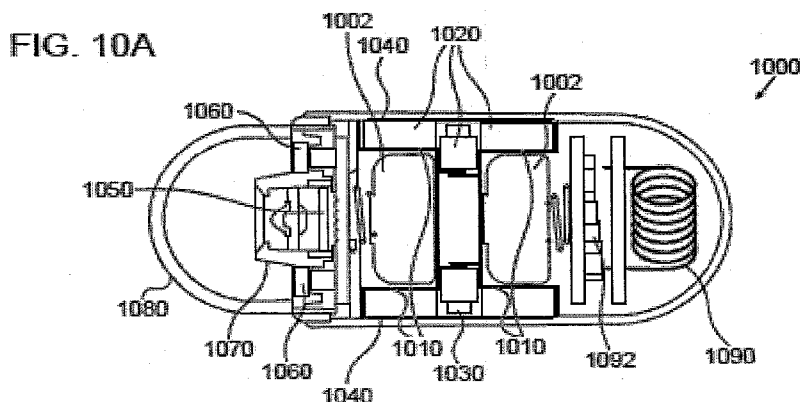
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13 September 2012

(54) Title: MAGNETICALLY MANEUVERABLE IN-VIVO DEVICE



(57) Abstract: An in-vivo device includes a magnetic steering unit (MSU) to maneuver it by an external electromagnetic field. The MSU may include a permanent magnets assembly to produce a magnetic force for navigating the device. The MSU may include a magnets carrying assembly (MCA) to accommodate the permanent magnet(s). The MCA may be designed to generate eddy currents, in response to AC magnetic field, to apply a repelling force. The in-vivo device may also include a multilayered imaging and sensing printed circuit board (MISP) to capture and transmit images. The MISP may include a sensing coil assembly (SCA) to sense electro-magnetic fields to determine a location/orientation/angular position of the in-vivo device. Data representing location/orientation/angular position of the device may be used by a maneuvering system to generate a steering magnetic field to steer the in-vivo device from one location or state to another location or state.



INTERNATIONAL SEARCH REPORT

International application No.

PCT/IL 11/00930

<p>A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - A61B 1/00 (2012.01) USPC - 600/101 According to International Patent Classification (IPC) or to both national classification and IPC</p>														
<p>B. FIELDS SEARCHED</p> <p>Minimum documentation searched (classification system followed by classification symbols) IPC(8) - A61B 1/00 (2012.01) USPC - 600/101</p> <p>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched A61B 5/00, 5/05, 5/06 600/407, 409, 9, 12, 13</p> <p>Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) PubWest (PGPB, USPT, EPAB, JPAB); Google Search Terms: Magnet\$, eddy current, use, utilize, steer, navigat\$, magnetically, electromagnetic, sense, determine, location, position, orientation, substrate, flexible, coil, sensing, x, y, z</p>														
<p>C. DOCUMENTS CONSIDERED TO BE RELEVANT</p> <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>Y</td> <td>US 2007/0244388 A1 (SATO et al.) 18 October 2007 (18.10.2007) Entire document, especially Abstract, para[0060]- para[0062], para[0251], para[0279], para[0676]- para[0678].</td> <td>1-15</td> </tr> <tr> <td>Y</td> <td>US 5,558,091 A (ACKER et al.) 24 September 1996 (24.09.1996) Entire document, especially Abstract, col 23, ln 15-32 and FIGS. 9-10.</td> <td>1-15</td> </tr> <tr> <td>Y</td> <td>US 2007/0055125 A1 (ANDERSON et al.) 08 March 2007 (08.03.2007) Abstract, para[0017], para[0055] and FIG. 3.</td> <td>6</td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	Y	US 2007/0244388 A1 (SATO et al.) 18 October 2007 (18.10.2007) Entire document, especially Abstract, para[0060]- para[0062], para[0251], para[0279], para[0676]- para[0678].	1-15	Y	US 5,558,091 A (ACKER et al.) 24 September 1996 (24.09.1996) Entire document, especially Abstract, col 23, ln 15-32 and FIGS. 9-10.	1-15	Y	US 2007/0055125 A1 (ANDERSON et al.) 08 March 2007 (08.03.2007) Abstract, para[0017], para[0055] and FIG. 3.	6
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<p><input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/></p>														
<p>* Special categories of cited documents:</p> <table border="0"> <tr> <td>“A” document defining the general state of the art which is not considered to be of particular relevance</td> <td>“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</td> </tr> <tr> <td>“E” earlier application or patent but published on or after the international filing date</td> <td>“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</td> </tr> <tr> <td>“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</td> <td>“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</td> </tr> <tr> <td>“O” document referring to an oral disclosure, use, exhibition or other means</td> <td>“&” document member of the same patent family</td> </tr> <tr> <td>“P” document published prior to the international filing date but later than the priority date claimed</td> <td></td> </tr> </table>			“A” document defining the general state of the art which is not considered to be of particular relevance	“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	“E” earlier application or patent but published on or after the international filing date	“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	“O” document referring to an oral disclosure, use, exhibition or other means	“&” document member of the same patent family	“P” document published prior to the international filing date but later than the priority date claimed			
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“P” document published prior to the international filing date but later than the priority date claimed														
<p>Date of the actual completion of the international search</p> <p>21 June 2012 (21.06.2012)</p>	<p>Date of mailing of the international search report</p> <p align="center">28 JUN 2012</p>													
<p>Name and mailing address of the ISA/US</p> <p>Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201</p>	<p>Authorized officer:</p> <p align="right">Lee W. Young</p> <p>PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774</p>													

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IL 11/00930

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.: 18-19
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Group I: claims 1-15, drawn to an electromagnetically maneuverable in-vivo device comprising permanent magnets, a carrying case to induce eddy currents and a sensing coil assembly.

Group II: claims 16-17, drawn to an in-vivo device comprising a tubular device with slits for inducing eddy currents and annular discs for augmenting the eddy currents and annular permanent magnets.

The inventions listed as Groups I - II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The first group teaches a specific type of device (in vivo magnetically maneuverable imaging device) with a sensing coil that operates with the generation of eddy currents, The second group teaches of tubular device with slits and annular magnets for augmenting the induced eddy currents. The commonality between the groups consists of in-vivo devices with permanent magnets that generate eddy currents. However, by the principles of magnetism all moving permanent magnets produce eddy currents, and such a device is described by US 2007/0244388 A1 (SATO et al.).

Thus, unity is lacking under PCT Rule 13 because the groups do not share a same or corresponding special technical feature.

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
Claims 1-15

- Remark on Protest**
- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
 - The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
 - No protest accompanied the payment of additional search fees.