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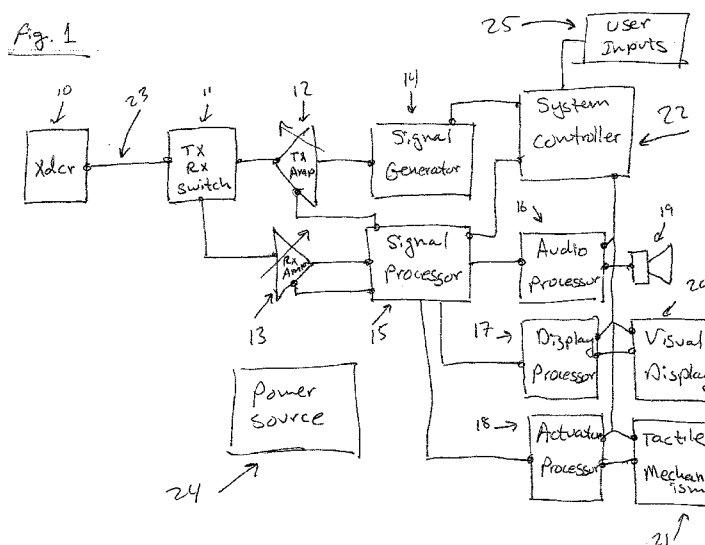
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- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the
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amendments (Rule 48.2(h))

(88) Date of publication of the international search report:
26 February 2015

(54) Title: METHOD AND APPARATUS FOR POSITIONING MEDICAL DEVICE



(57) **Abstract:** Placement of a medical device in proximity to a fluid filled compartment within a human body is aided by ultrasound and a time-stretching technique. An ultrasound transducer is placed near the tip of a catheter within a ventricle of the brain to drain cerebrospinal fluid. The transducer emits sound waves, the echoes contain information about structures in front of the transducer. These echoes are amplified and processed so that the information is spread out over a longer period than the acquisition time. This information may be presented visually, audio or tactile feedback. The information is displayed visually through variations in the color or brightness of a light; through audio that is modulated in amplitude, frequency; through tactile feedback that is modulated in intensity or duration. Further embodiments are disclosed which combine audio, visual, or tactile feedback. Further embodiments incorporate a digital or graphical display to provide quantitative information.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 14/40143

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A61B 8/12 (2014.01)

CPC - A61B 8/0816

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols):

IPC(8) : A61B 8/12 (2014.01)

CPC : A61B 8/0816

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

IPC(8) : A61B 8/00, 8/08, 8/13, 8/14 (2014.01)

USPC : 600/300, 407, 437, 449, 459 CPC: A61B 8/00, 8/08, 8/0808, 8/12, 8/14, 8/42

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Patbase, Google Patent, Google Scholar: ventriculostomy, stylet, ultrasound, sense, measure, detect, transducer, pulse, emit, transmit, receive, distance, range, fluid, liquid, fill, structure, space, ventricle, audio, visual, tactile, haptic, feedback, proportional, stretch, beep, ping, flash, vibrate, rapid, increase, catheter, probe, needle, rat

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,690,117 A (GILBERT) 25 November 1997 (25.11.1997) see especially col 3, ln 63 to col 4, ln 51, col 5, ln 50-41, col 5, ln 49 to col 6, ln 2, col 6, ln 12-36, col 7, ln 5-63, fig 1, 3, 4, 5, 7	1-22, 23a, 23b, 23c, 23d, 23e, 24-32
Y	US 2012/0010506 A1 (ULLRICH) 12 January 2012 (12.01.2012) see especially para [0017], [0018], [0020], [0021], [0022], [0024], [0028], [0029], fig 1	1-22, 23a, 23b, 23c, 23d, 23e, 24-32
Y	US 5,156,157 A (VALENTA Jr et al) 20 October 1992 (20.10.1992) see especially col 5, ln 23 to col 6, ln 31, col 10, ln 43-59, fig 1, 2	9-10
Y	US 2010/0256483 A1 (WALL et al) 07 October 2010 (07.10.2010) see especially para [0071]	20
A, P	WO 2013/086521 A1 (MOURAD et al) 13 June 2013 (13.06.2013) see whole document	1-22, 23a, 23b, 23c, 23d, 23e, 24-32
A	US 2008/0287916 A1 (AGMON) 20 November 2008 (20.11.2008) see whole document	1-22, 23a, 23b, 23c, 23d, 23e, 24-32
A	US 2007/0083100 A1 (SCHULZ-STUBNER) 12 April 2007 (12.04.2007) see whole document	1-22, 23a, 23b, 23c, 23d, 23e, 24-32
A	US 2005/0049510 A1 (HALDEMAN et al) 03 March 2005 (03.03.2005) see whole document	1-22, 23a, 23b, 23c, 23d, 23e, 24-32
A	US 2004/0267121 A1 (SARVAZYAN et al) 30 December 2004 (30.12.2004) see whole document	1-22, 23a, 23b, 23c, 23d, 23e, 24-32

☐ Further documents are listed in the continuation of Box C.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"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)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"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

"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

"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

"&" document member of the same patent family

Date of the actual completion of the international search

19 November 2014 (19.11.2014)

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

international application No.

PCT/US 14/40143

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.:
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:
--- see continuation sheet ---

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.:
1-22, 23a, 23b, 23c, 23d, 23e, 24-32

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.

Box III - Observations where unity of invention is lacking (Continuation of item 3 of first sheet):

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1.

Group I: claims 1-32 directed to a surgical apparatus

Group II: claims 33-51 directed to a method of identifying or tracking the position of a fluid filled space in front of an ultrasound transducer

The groups of inventions above 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:

Special Technical Features:

The special technical feature of the Group I claims is the apparatus comprising a stylet with a bore in which the ultrasound transducer is disposed, and electronic circuitry configured for implementation of a time stretch technique that formats information from ultrasound echoes, which is not present in the claims of Group II.

The special technical feature of the Group II claims is identifying the end of initial noise or ring down and further identifying two independent signal features that exceed thresholds of amplitude and duration, which is not present in the claims of Group I.

Common Technical Features

Groups I-II share the technical feature of an ultrasound transducer that produces echoes of a fluid filled space and presenting an indication to the user. This generic feature does not avoid the prior art, as evinced by US 5,690,117 A to Gilbert which notably teaches a stylet transducer for detecting fluid filled ventricles having an ultrasound transducer and display monitor means (col 3, ln 63 to col 4, ln 51, col 6, ln 12-25).

Therefore, the listed inventions lack unity of invention under PCT Rule 13 because they do not share a same or corresponding special technical feature.