(54) Title: DEVICES AND METHODS FOR TISSUE REMOVAL

(57) Abstract: Methods and apparatus are provided for selective surgical removal of tissue, e.g., for enlargement of diseased spinal structures, such as impinging lateral recesses and pathologically narrowed neural foramen. In one variation, tissue may be ablated, resected, removed, or otherwise remodeled by standard small endoscopic tools delivered into the epidural space through an epidural needle. Once the sharp tip of the needle is in the epidural space, it is converted to a blunt tipped instrument for further safe advancement. A nerve stimulator optionally may be provided to reduce a risk of inadvertent neural abrasion. Additionally, safe epidural placement of the working barrier and epidural tissue modification tools may be further improved with the use of electrical nerve-stimulation capabilities within the invention that, when combined with neural stimulation monitors, provide neural localization capabilities to the surgeon.

[Continued on next page]
Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BI, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published: with international search report 2 November 2006

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A61B 17/22 (2006.01); A61D 1/02 (2006.01)
USPC - 604/150, 170, 180; 604/022

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)

USPC: 604/150, 170, 180; 604/022

(IPC): A61B10/00, A61B17/22 (2006.01)

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

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

MicroPat, MEDLINE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
</table>

Further documents are listed in the continuation of Box C.

Searched patent family annex.

* Special categories of cited documents:

"A" documents defining the general state of the art which are not considered to be of particular relevance.

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

"C" 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).

"D" documents referring to an oral disclaimer, use, exhibition or other means.

"E" documents published prior to the international filing date but later than the priority date claimed.

"X" letter document published after the international filing date or priority claimed and not in conflict with the application but cited to understand the principle or theory underlying the invention.

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is taken alone.

"Z" 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.

"W" document member of the same patent family.

Date of the actual completion of the international search
25 May 2006

Date of mailing of the international search report
07 JUL 2006

Name and mailing address of the ISA/US
Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450
Facsimile No. 571-273-3001

Form PCT/ISA/210 (second sheet) (April 2005)
INTERNATIONAL SEARCH REPORT

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:
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. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claims 1-25, 29-46, drawn to a flexible elongate body with a width greater than a height.
Group II, claims 26-27, drawn to a tissue removal system with a plurality of needles.
Group III, claim 28, drawn to a tissue removal system having a driveshaft to cause a tissue removal system to move.
Group IV, claims 47-58 and 80-83, drawn to a connector for electrically coupling an electrode to a nerve stimulation apparatus.
Group V, claims 59-79 and 84-86, drawn to a medical device having a cannula and an atraumatic protective cover.

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.: 1-25 and 29-46

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.

Form PCT/ISA/210 (continuation of first sheet (2)) (April 2005)