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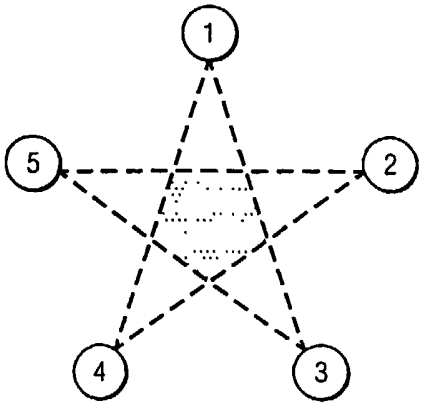
(54) Title: ELECTRODE ASSEMBLY FOR CONSTANT-CURRENT ELECTROPORATION AND USE




(57) Abstract: The present invention relates to a modular electrode system, and its use, for facilitating the introduction of a macromolecule into cells of a selected tissue in a body or plant. The modular electrode system comprises a plurality of needle electrodes; a hypodermic needle; an electrical connector that provides a conductive link from a programmable constant-current pulse controller to the plurality of needle electrodes; and a power source. In a preferred embodiment of the present invention, an operator can grasp the plurality of needle electrodes that are mounted on a support structure and firmly insert the them into the selected tissue in a body or plant. The macromolecules are then delivered via the hypodermic needle into the selected tissue. The programmable constant-current pulse controller is activated and constant-current electrical pulse is applied to the plurality of needle electrodes. The applied constant-current electrical pulse facilitates the introduction of the macromolecule into the cell between the plurality of electrodes. Cell death due to overheating of cells is minimized by limiting the power dissipation in the tissue by virtue of constant current pulses.

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# INTERNATIONAL SEARCH REPORT

International Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61N1/30 A61N1/32

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 7 A61N

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 and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | WO 01/89455 A (MERCK & COMPANY INC ;SIMON ADAM J (US)) 29 November 2001 (2001-11-29) | 1-5,12, 13,19, 21-27, 33, 36-47, 50,54, 55,61, 64-68 |
| Y | page 8 -page 44; figure 5 | 6-11, 14-18, 28-32, 34,35, 48,49, 51-53, 56-60 |
| A | --- -/-- | 20,62, 63,69-72 |

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° 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 document 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

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"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 27 July 2004 | 28.07.04 |

| Name and mailing address of the ISA | Authorized officer |
|---|---|
| European Patent Office, P.B. 5818 Patentlaan 2<br>NL - 2280 HV Rijswijk<br>Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,<br>Fax: (+31-70) 340-3016 | Kurze, V |

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# INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 03/06833

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | WO 00/45823 A (CHIRON CORP ;EMED CORP (US)) 10 August 2000 (2000-08-10) | 1-5,12, 13,19, 21-27, 33, 36-47, 50,54, 55,61, 64-68 |
| Y | page 4 -page 27 | 6-11, 14-18, 28-32, 34,35, 48,49, 51-53, 56-60 |
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| Y | US 6 233 482 B1 (NANDA GURVINDER S ET AL) 15 May 2001 (2001-05-15) cited in the application | 6-11, 14-18, 28-32, 34,35, 48,49, 51-53, 56-60 |
| | column 2, line 7 -column 14, line 65; figures 1,2A-G,6,7A-D, | |
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| Y | US 5 702 359 A (HAYAKAWA YASUHIKO ET AL) 30 December 1997 (1997-12-30) cited in the application | 6-11, 14-18, 28-32, 34,35, 48,49, 51-53, 56-60 |
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# INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 03/06833

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 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. [X] Claims Nos.: 73-85
because they relate to subject matter not required to be searched by this Authority, namely:

Rule 39.1(iv) PCT - Method for treatment of the human or animal body by surgery: The method includes the step of "penetrating tissue with needles". This is a surgical step which renders the entire method surgical.

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 II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

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

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 an additional fee, this Authority did not invite payment of any additional fee.

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.:

**Remark on Protest**

[ ] The additional search fees were accompanied by the applicant's protest.

[ ] No protest accompanied the payment of additional search fees.

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