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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, BN, 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, IR, IS, JP, KE, KG, 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, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, 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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— *with international search report (Art. 21(3))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

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15 January 2015

(54) Title: BIOSENSOR STRUCTURES FOR IMPROVED POINT OF CARE TESTING AND METHODS OF MANUFACTURE THEREOF

(57) Abstract: The present invention relates to analytical testing devices and methods for fabricating electrochemical creatinine biosensors, and in particular using point of care electrochemical biosensors for testing for creatinine in samples. For example, the present invention may be directed to a biosensor having an electrode, a first printed layer formed on the electrode and having a first matrix that includes creatinine amidohydrolase (CNH), creatine amidinohydrolase (CRH), and sarcosine oxidase (SOX), and second printed layer formed over the first printed layer and having a second matrix that includes CRH, SOX, and catalase.

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INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. C12Q1/00
ADD.

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)
C12Q

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 practicable, search terms used)
EPO-Internal, COMPENDEX, EMBASE, FSTA, INSPEC, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 200 051 A (COZZETTE STEPHEN N [CA] ET AL) 6 April 1993 (1993-04-06) abstract column 74, section 6.7	1-18
X	WO 99/38003 A1 (I STAT CORP [US]; DAVIS GRAHAM [US]; LIN CHAO [US]; LAUKS IMANTS R [CA) 29 July 1999 (1999-07-29) abstract figure 3 page 14, line 10 - page 15, line 8 page 8, line 17 - line 20	1-18
A	US 2007/158213 A1 (HSIUNG SHEN-KAN [TW] ET AL) 12 July 2007 (2007-07-12) the whole document	1-18

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

[X] See patent family 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 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	Date of mailing of the international search report
22 August 2014	01/12/2014

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Jacques, Patrice

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Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/024439

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 additional 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 an 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.:

1-18

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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-18

A biosensor comprising: an electrode; a first printed layer formed on the electrode comprising a first matrix that includes creatinine amidohydrolase (CNH), creatine amidinohydrolase (CRH), and sarcosine oxidase (SOX); and a second printed layer formed over the first printed layer comprising a second matrix that includes CRH, SOX, and catalase.
A method of manufacturing a biosensor comprising: forming an electrode on a wafer; microdispensing a first layer on the electrode comprising a first matrix that includes creatinine amidohydrolase (CNH), creatine amidinohydrolase (CRH), and sarcosine oxidase (SOX); and microdispensing a second layer over the first layer comprising a second matrix that includes CRH, SOX, and catalase.

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2. claims: 19, 20

A biosensor comprising:an electrode;a first spun layer formed on the electrode comprising a first aqueous polymeric matrix having at least one enzyme, wherein the first spun layer has a thickness in a range of about 2-5 ?m; anda second spun layer formed over the first spun layer comprising a second aqueous polymeric matrix having at least one enzyme, wherein the second spun layer has a thickness in a range of about 10-20 micrometer.

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KILLARD A J ET AL: "Creatinine biosensors: principles and designs", TRENDS IN BIOTECHNOLOGY, ELSEVIER PUBLICATIONS, CAMBRIDGE, GB, vol. 18, no. 10, 1 October 2000 (2000-10-01), pages 433-437, XP027301653, ISSN: 0167-7799 [retrieved on 2000-10-01] the whole document	1-18
A	ELHAM MOHABBATI-KALEJAHI ET AL: "A review on creatinine measurement techniques", TALANTA, ELSEVIER, AMSTERDAM, NL, vol. 97, 1 April 2012 (2012-04-01), pages 1-8, XP028450071, ISSN: 0039-9140, DOI: 10.1016/J.TALANTA.2012.04.005 [retrieved on 2012-04-25] the whole document	1-18

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2014/024439

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