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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,

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Declarations under Rule 4.17:

- of inventorship (Rule 4.17(iv))

Published:

- 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))

[Continued on next page]

(54) Title: UNIVERSAL REPORTER-BASED GENOTYPING METHODS AND MATERIALS

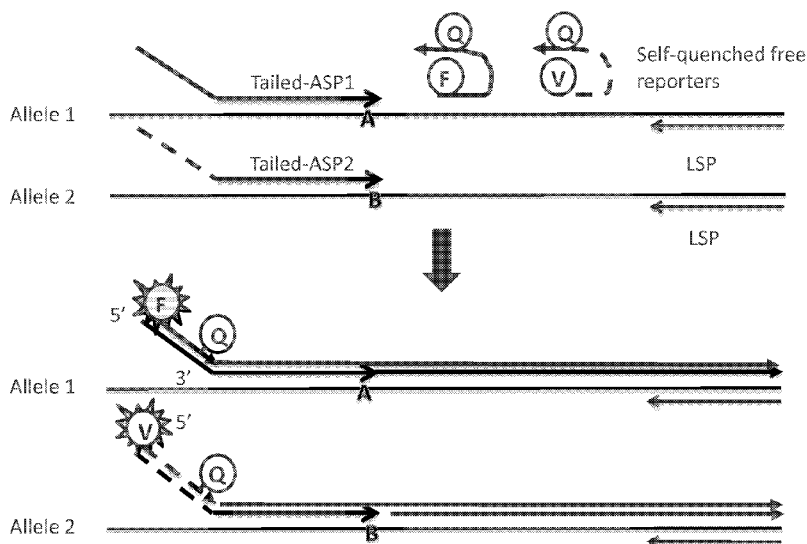


Fig. 1

(57) Abstract: The present disclosure is drawn to methods for detection, quantitation and analysis of nucleotides of interest, for example SNPs, in nucleic acid sequences of interest using universal FRET-based reporter primers.



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

INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2014/024803

A. CLASSIFICATION OF SUBJECT MATTER  
INV. C12Q1/68  
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, 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	MASARU ASARI ET AL: "A New Method for Human ABO Genotyping Using a Universal Reporter Primer System", JOURNAL OF FORENSIC SCIENCES, vol. 55, no. 6, 1 November 2010 (2010-11-01), pages 1576-1581, XP055126604, ISSN: 0022-1198, DOI: 10.1111/j.1556-4029.2010.01503.x	28-30
Y	abstract figures 1,2 page 87 - page 88 figure 1 ----- -/--	31,32

Further documents are listed in the continuation of Box C.

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  8 July 2014	Date of mailing of the international search report  23/12/2014
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer  Schmitt-Humbert, C
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# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2014/024803

## 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.:

1-8, 15-27, 33-39(completely); 28-32(partially)

### 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.

## INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2014/024803

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	ASARI M ET AL: "Single nucleotide polymorphism genotyping by mini-primer allele-specific amplification with universal reporter primers for identification of degraded DNA", ANALYTICAL BIOCHEMISTRY, ACADEMIC PRESS INC, NEW YORK, vol. 386, no. 1, 1 March 2009 (2009-03-01), pages 85-90, XP025884784, ISSN: 0003-2697, DOI: 10.1016/J.AB.2008.11.023 [retrieved on 2008-11-27]	28-30
Y	abstract figure 1 page 1577, column 2, last paragraph - page 1578, column 1, paragraph 1 table 1	31,32
X	----- US 2003/165859 A1 (NAZARENKO IRINA [US] ET AL) 4 September 2003 (2003-09-04)	1,2,7,8, 15-21, 28-30, 33-39
Y	paragraphs [0003], [0079], [0214], [0244], [0346], [0354] - [0356] example 20 figure 33 paragraphs [0082], [0172] - [0175], [0431] - [0439]	3-6,31, 32
X	----- MYAKISHEV M V ET AL: "High-throughput SNP genotyping by allele-specific PCR with universal energy-transfer-labeled primers", GENOME RESEARCH, COLD SPRING HARBOR LABORATORY PRESS, WOODBURY, NY, US, vol. 11, no. 1, 1 January 2001 (2001-01-01), pages 163-169, XP002242292, ISSN: 1088-9051, DOI: 10.1101/GR.157901	1,2,7,8, 15-25, 33-39
Y	abstract figure 1 table 1 page 163, column 2, last paragraph - page 165, column 1, paragraph 1 page 166, column 1, last paragraph - column 2, paragraph 1 page 168, column 1, paragraph 1	3-6,26, 27
X	----- US 2010/112565 A1 (TOBLER ANDREAS R [US]) 6 May 2010 (2010-05-06) paragraphs [0003], [0020], [0030], [0054], [0058]	28-32
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## INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2014/024803

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2004/009515 A1 (LIU QIANG [US] ET AL) 15 January 2004 (2004-01-15) paragraphs [0002], [0059], [0129], [0206] - [0208] figure 11 -----	3-6,26, 27,31,32
Y	WO 2012/082753 A2 (LIFE TECHNOLOGIES CORP [US]; XI LEI A K A LARRY [US]; KENNEY PAUL [US]) 21 June 2012 (2012-06-21) page 5, line 32 - page 13, line 5 -----	3-6,26, 27,31,32

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/US2014/024803
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2003165859 A1	04-09-2003	US 2003165859 A1	04-09-2003
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		US 2010129871 A1	27-05-2010
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		US 2012196329 A1	02-08-2012
		WO 2012082753 A2	21-06-2012
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**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

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

1. claims: 1-8, 15-27, 33-39(completely); 28-32(partially)

Method for determining the genotype of a target nucleic acid molecule, the method using a first allele-specific primer, which is specific for a first allele, comprising a first 5'-universal tail which comprises a binding site for a first universal FRET-based reporter primer (UFP), a first UFP comprising a first fluorophore and at least a first quencher moiety, a second allele-specific primer which is specific for a second allele, comprising a second 5'-universal tail which comprises a binding site for a second UFP, and a second UFP comprising a second fluorophore and at least a second quencher moiety; a reaction mixture suitable for analyzing, quantitating or detecting one or more alleles or polymorphisms in a target nucleic acid, wherein the reaction mixture comprises a first allele-specific primer, which is specific for a first allele, comprising a first 5'-universal tail which comprises a binding site for a first universal FRET-based reporter primer (UFP) and a second allele-specific primer which is specific for a second allele, comprising a second 5'-universal tail which comprises a binding site for a second UFP; a universal FRET-based reporter primer (UFP) comprising at least one quencher moiety attached to an internal nucleotide of the UFP and a fluorophore attached to the 5'-end of the UFP; an oligonucleotide comprising an allele-specific portion and a 5'-universal tail, wherein the 5'-universal tail comprises a binding site for a universal FRET-based reporter primer and the universal tail is not complementary to the target nucleic acid sequence; and a kit comprising a first allele-specific primer, which is specific for a first allele, comprising a first 5'-universal tail which comprises a binding site for a first universal FRET-based reporter primer (UFP), and a second allele-specific primer which is specific for a second allele, comprising a second 5'-universal tail which comprises a binding site for a second UFP.

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2. claims: 9-14(completely); 28-32(partially)

a method for determining the genotype of a target nucleic acid molecule, the method using a first allele-specific primer, which is specific for a first allele, comprising a first 5'-universal tail which comprises a binding site for a first UFP, a the first UFP comprises a first fluorophore; a second allele-specific primer which is specific for a second allele, comprising a second 5'-universal tail which comprises a binding site for a second UFP, and a second UFP comprises a second fluorophore; wherein the first and second fluorophore are different and are not directly excited by excitation light and an oligonucleotide comprising an



**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

allele-specific portion and a 5'-universal tail, wherein the 5'-universal tail comprises a binding site for a universal FRET-based reporter primer and the universal tail is not complementary to the target nucleic acid sequence.

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