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- (71) Applicants: **QUVIUM UK LTD** [GB/GB]; 1st Floor, Woodberry Grove, Finchley, London, N12 0DR., Finchley Greater London N12 0DR (GB). **PARILOGIX, LLC** [US/US]; 600 West Cummings Park, Suite 4000, Woburn, Massachusetts 01801 (US).
- (72) Inventor: **SCHMIDT, Steven P.**; 7 North Policy Street, Salem, New Hampshire 03079 (US).
- (74) Agent: **ELIEZER, Yuri L.**; 2870 Peachtree Rd #484, Atlanta, Georgia 30305 (US).

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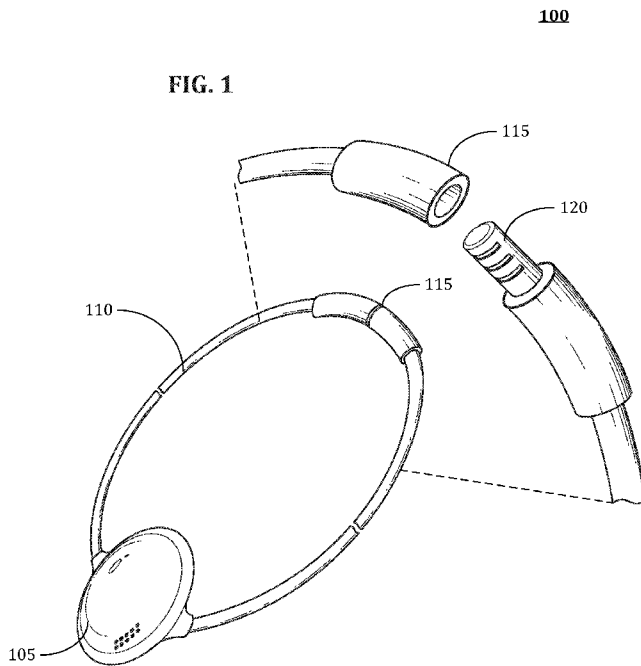
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Declarations under Rule 4.17:

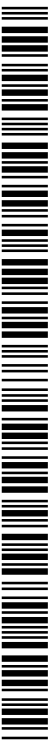
— as to the identity of the inventor (Rule 4.17(i))

[Continued on next page]

(54) Title: COUGH DETECTION, ANALYSIS, AND COMMUNICATION PLATFORM



(57) Abstract: A cough detection, analysis, and communication platform may be provided. The platform may comprise methods, systems, and a devices for detecting, analyzing, and communicating cough detection data. A cough detection device may comprise at least one microphone and analytic firmware used to employ methods of detecting, analyzing, and communicating the cough detection data. The analytic software may be updated to use the appropriate algorithms for an individual or corresponding demographic based on, for example, age and disease, with abnormal cough frequency components, abnormal cough frequency profiles, and alert thresholds. The cough detection device may be configured to communicate cough detection data to a server. The server, in turn, may be operative to process and communicate the data to a third party, such as, for example, a physician. Systems may further be operative to provide a user interface (e.g., mobile or web applications) for interfacing with the platform.





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- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
 - *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*
 - *of inventorship (Rule 4.17(iv))*
- Published:**
— *with international search report (Art. 21(3))*
- (88) Date of publication of the international search report:**
9 April 2015

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 14/47405

<p>A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - A61B 8/00, A61B 5/08 (2014.01) CPC - A61B 5/0823, A61B 2562/0204, A61B 5/087, A61B 8/08, A61B 7/003, A61B 5/113 According to International Patent Classification (IPC) or to both national classification and IPC</p>																									
<p>B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) CPC - A61B 5/0823, A61B 2562/0204, A61B 5/087, A61B 8/08, A61B 7/003, A61B 5/113 IPC(8) - A61B 8/00, A61B 5/08 (2014.01)</p> <p>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched CPC - A61B 5/0823, A61B 2562/0204, A61B 5/087, A61B 8/08, A61B 7/003, A61B 5/113, A61B 8/488 IPC(8) - A61B 8/00, A61B 5/08 (2014.01); USPC - 600/453, 600/529</p> <p>Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) Patbase; Google, Google Patent Search terms used: cough detection sound acoustic microphone initialize counter number threshold sense increment reset interval time transmit communicate processor memory server passive active wake receive configuration setting</p>																									
<p>C. DOCUMENTS CONSIDERED TO BE RELEVANT</p> <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X --- Y --- A</td> <td>WO 2012/117393 A1 (SITBON et al.) 07 September 2012 (07.09.2012), pg 5-6, 12-13</td> <td>11-14 ----- 15, 16, 20 ----- 17-19</td> </tr> <tr> <td>Y --- A</td> <td>US 2006/0277037 A1 (WOODCOCK et al.) 07 December 2006 (07.12.2006), para [0010] [0012] -[0018], [0072]</td> <td>1-6, 9, 10 ----- 7, 8</td> </tr> <tr> <td>Y --- A</td> <td>US 2012/0302898 A1 (ZHANG et al.) 29 November 2012 (29.11.2012), para [0006], [0085], [0086]</td> <td>1-6, 9, 10 ----- 7, 8</td> </tr> <tr> <td>Y --- A</td> <td>US 2011/0015702 A1 (TERNES et al.) 20 January 2011 (20.01.2011), para [0124], [0127], [0128]</td> <td>10, 15</td> </tr> <tr> <td>Y --- A</td> <td>US 2011/0257935 A1 (DE GRAAF et al.) 20 October 2011 (20.10.2011), para [0034], [0046]</td> <td>5, 6, 16 ----- 7, 8, 17-19</td> </tr> <tr> <td>Y --- A</td> <td>WO 2008/152433 A1 (GUARINO et al.) 18 December 2008 (18.12.2008), pg 3, ln 28-33; pg 9, ln 19-pg 10, ln 29</td> <td>20</td> </tr> <tr> <td>Y --- A</td> <td>US 2009/0216127 A1 (GAVRIELY) 27 August 2009 (27.08.2009), para [0021]</td> <td>1-6, 9, 10</td> </tr> </tbody> </table>		Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X --- Y --- A	WO 2012/117393 A1 (SITBON et al.) 07 September 2012 (07.09.2012), pg 5-6, 12-13	11-14 ----- 15, 16, 20 ----- 17-19	Y --- A	US 2006/0277037 A1 (WOODCOCK et al.) 07 December 2006 (07.12.2006), para [0010] [0012] -[0018], [0072]	1-6, 9, 10 ----- 7, 8	Y --- A	US 2012/0302898 A1 (ZHANG et al.) 29 November 2012 (29.11.2012), para [0006], [0085], [0086]	1-6, 9, 10 ----- 7, 8	Y --- A	US 2011/0015702 A1 (TERNES et al.) 20 January 2011 (20.01.2011), para [0124], [0127], [0128]	10, 15	Y --- A	US 2011/0257935 A1 (DE GRAAF et al.) 20 October 2011 (20.10.2011), para [0034], [0046]	5, 6, 16 ----- 7, 8, 17-19	Y --- A	WO 2008/152433 A1 (GUARINO et al.) 18 December 2008 (18.12.2008), pg 3, ln 28-33; pg 9, ln 19-pg 10, ln 29	20	Y --- A	US 2009/0216127 A1 (GAVRIELY) 27 August 2009 (27.08.2009), para [0021]	1-6, 9, 10
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<p><input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/></p>																									
<p>* Special categories of cited documents:</p> <table border="0"> <tr> <td>“A” document defining the general state of the art which is not considered to be of particular relevance</td> <td>“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</td> </tr> <tr> <td>“E” earlier application or patent but published on or after the international filing date</td> <td>“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</td> </tr> <tr> <td>“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)</td> <td>“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</td> </tr> <tr> <td>“O” document referring to an oral disclosure, use, exhibition or other means</td> <td>“&” document member of the same patent family</td> </tr> <tr> <td>“P” document published prior to the international filing date but later than the priority date claimed</td> <td></td> </tr> </table>		“A” document defining the general state of the art which is not considered to be of particular relevance	“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	“E” earlier application or patent but published on or after the international filing date	“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	“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)	“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	“O” document referring to an oral disclosure, use, exhibition or other means	“&” document member of the same patent family	“P” document published prior to the international filing date but later than the priority date claimed															
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<p>Date of the actual completion of the international search 26 December 2014 (26.12.2014)</p>	<p>Date of mailing of the international search report 13 JAN 2015</p>																								
<p>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. 571-273-3201</p>	<p>Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774</p>																								

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 14/47405

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.

-- see extra 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.:

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/US 14/47405

Continuation of Box No. III -- Observations where unity of invention is lacking

Group I: Claims 1-10 drawn to a method comprising: detecting a sound exceeding a first threshold; determining whether the detected sound comprises a cough; incrementing, in response to a determination that the detected sound comprises the cough, a counter; determining whether the counter has been incremented past a second threshold within a predetermined period of time; and transmitting, in response to a determination that the counter has been incremented past the second threshold within the predetermine period time, data associated with detected coughing.

Group II: Claims 11-20, drawn to an apparatus comprising: at least one microphone; and a communications module; a memory storage; and a processing unit associated with the microphone, the communications module, and the memory storage, wherein the processing unit is operative to: establish a baseline dataset, receive a signal from the at least one microphone, determine whether the received signal comprises a cough, wherein the processing unit is operative to determine whether the received signal comprises the cough by comparing a signal waveform associated with the received signal to the baseline waveform, and transmit, via the communications module, data associated with the received signal.

The inventions listed as Groups I through II 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

Group I includes the special technical feature of determining whether the counter has been incremented past a second threshold within a predetermined period of time, not included in the other groups.

Group II includes the special technical feature of a processing unit associated with the microphone, the communications module, and the memory storage and determine whether the received signal comprises the cough by comparing a signal waveform associated with the received signal to the baseline waveform, not included in the other groups.

Common Technical Features:

The only technical features shared by Groups I and II that would otherwise unify the groups, are determining whether the detected sound comprises a cough and transmitting data associated with detected coughing. However, these shared technical features do not represent a contribution over prior art, because these shared technical features are disclosed by US 2009/0216127 A1 (Gavriely).

Gavriely discloses determining whether the detected sound comprises a cough (para [0021] and transmitting data associated with detected coughing (para [0021], data is then transmitted to a data register that keeps log of the coughing activity detected by sensor).

As the technical features were known in the art at the time of the invention, these cannot be considered special technical features that would otherwise unify the groups.

Therefore, Groups I-II lack unity under PCT Rule 13.