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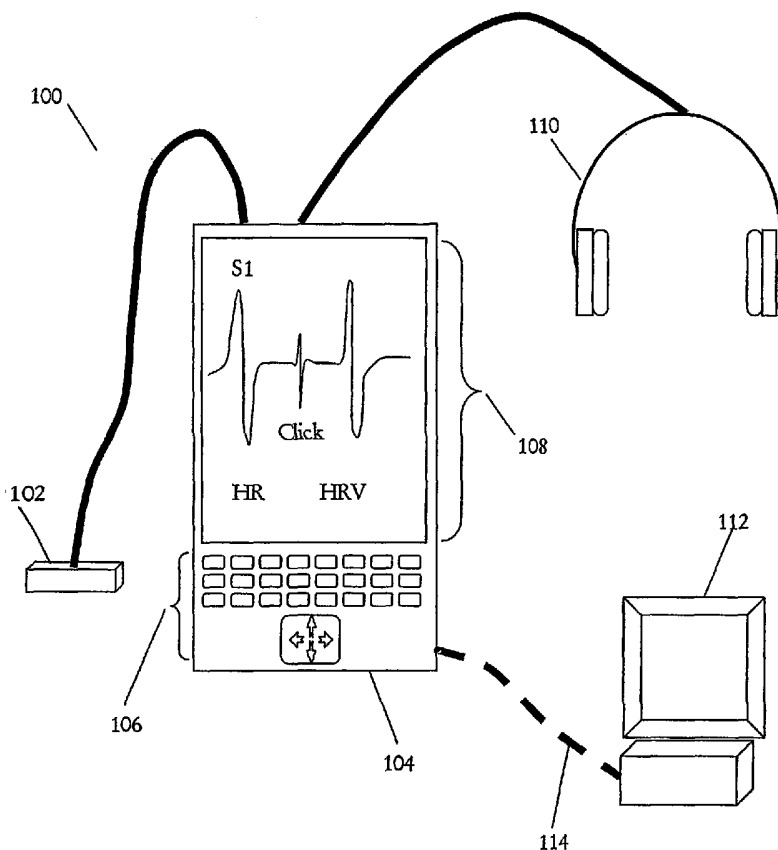
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[Continued on next page]

(54) Title: A HANDHELD AUSCULTATORY SCANNER WITH SYNCHRONIZED DISPLAY OF HEART SOUNDS



(57) Abstract: A handheld auscultatory scanner (100) continuously obtains a heart sound signal from a patient, using a noninvasive passive acoustic sensor (102), allowing free-form protocol, analysis and display of the heart sound signal on a handheld processing unit (104) in a graphical manner such that a single heart cycle (200) is displayed in a synchronized manner, along with summary results (202, 204, 206) of the processing of the acoustic signal. The results are presented in terms of standard auscultatory findings. The combination of summary findings, heart sound display and audible signal (110) provides a method for assisting in patient screening for heart conditions and for teaching auscultation techniques.

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**INTERNATIONAL SEARCH REPORT**

International application No.

PCT/US04/37495

<p><b>A. CLASSIFICATION OF SUBJECT MATTER</b>                  IPC(7) : A61B 7/04, 5/02                  US CL : 600/528; 381/67; 181/131                  According to International Patent Classification (IPC) or to both national classification and IPC</p>																																						
<p><b>B. FIELDS SEARCHED</b>                  Minimum documentation searched (classification system followed by classification symbols)                  U.S. : 600/528; 381/67; 181/131</p> <p>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched</p> <p>Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)</p>																																						
<p><b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b></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</td> <td>US 5,010,889 A (BREDESON et al) 30 April 1991, fig. 1, columns 3-6, 9, 11, 20, 24-34, 43, &amp; 44.</td> <td>1-6, 9-12, 14, 17, 19-26, 38, and 39</td> </tr> <tr> <td>X</td> <td>US 5,025,809 A (JOHNSON et al) 25 June 1991, figures 1-3, columns 3, 4, and 6-9, claims 3 and 5.</td> <td>1, 7, 21, 26, 28, 32-37, and 40</td> </tr> <tr> <td>---</td> <td></td> <td>-----</td> </tr> <tr> <td>Y</td> <td></td> <td>8 and 29</td> </tr> <tr> <td>Y</td> <td>US 4,424,815 A (KUNTZ) 10 January 1984, column 2, lines 60-68, column 3, lines 1-30.</td> <td>8 and 29</td> </tr> <tr> <td>X</td> <td>US 2002/0052559 A1 (WATROUS) 2 May 2002, figure 3, paragraphs 0012, 0028, 0029, 0031, 0033, 0034, 0036, 0037, 0039-0041, 0044-0049, 0055, 0069, 0070-0073, and 0080.</td> <td>10, 13, 15, 16, 21, and 30</td> </tr> <tr> <td>---</td> <td></td> <td>-----</td> </tr> <tr> <td>Y</td> <td></td> <td>17, 18, 26, 27, and 31</td> </tr> <tr> <td>Y</td> <td>US 4,991,581 A (ANDRIES) 12 February 1991, figure 1, columns 2, lines 4-12 &amp; 47-62, column 4, lines 2-9, column 7, lines 22-26 &amp; 65-68, column 8.</td> <td>17, 18, 26, 27, and 31</td> </tr> <tr> <td>Y</td> <td>US 2003/0176802 A1 (GALEN et al) 18 September 2003, paragraphs 0002-0005.</td> <td>18</td> </tr> <tr> <td>A</td> <td>US 5,957,866 A (SHAPIRO et al) 28 September 1999, columns 4, 5, and 7.</td> <td></td> </tr> </tbody> </table>			Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	US 5,010,889 A (BREDESON et al) 30 April 1991, fig. 1, columns 3-6, 9, 11, 20, 24-34, 43, & 44.	1-6, 9-12, 14, 17, 19-26, 38, and 39	X	US 5,025,809 A (JOHNSON et al) 25 June 1991, figures 1-3, columns 3, 4, and 6-9, claims 3 and 5.	1, 7, 21, 26, 28, 32-37, and 40	---		-----	Y		8 and 29	Y	US 4,424,815 A (KUNTZ) 10 January 1984, column 2, lines 60-68, column 3, lines 1-30.	8 and 29	X	US 2002/0052559 A1 (WATROUS) 2 May 2002, figure 3, paragraphs 0012, 0028, 0029, 0031, 0033, 0034, 0036, 0037, 0039-0041, 0044-0049, 0055, 0069, 0070-0073, and 0080.	10, 13, 15, 16, 21, and 30	---		-----	Y		17, 18, 26, 27, and 31	Y	US 4,991,581 A (ANDRIES) 12 February 1991, figure 1, columns 2, lines 4-12 & 47-62, column 4, lines 2-9, column 7, lines 22-26 & 65-68, column 8.	17, 18, 26, 27, and 31	Y	US 2003/0176802 A1 (GALEN et al) 18 September 2003, paragraphs 0002-0005.	18	A	US 5,957,866 A (SHAPIRO et al) 28 September 1999, columns 4, 5, and 7.	
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<p><input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C.      <input type="checkbox"/> See patent family annex.</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 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>"&amp;" 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 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>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                  John D. Alexander <i>[Signature]</i>                  Telephone No. (571) 272-8756 <i>[Signature]</i></p>																																				

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## C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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A	GB 2 188 732 A (MICRO MEDICAL LIMITED) 7 October 1987, pages 1 and 2.	