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(72) Inventor; and

(71) Applicant : **WHITFIELD, Ronald, Peter** [CA/CA];  
783 Old Tecumseh Rd. Rr#1, Belle River, ON N0R 1A0  
(CA).

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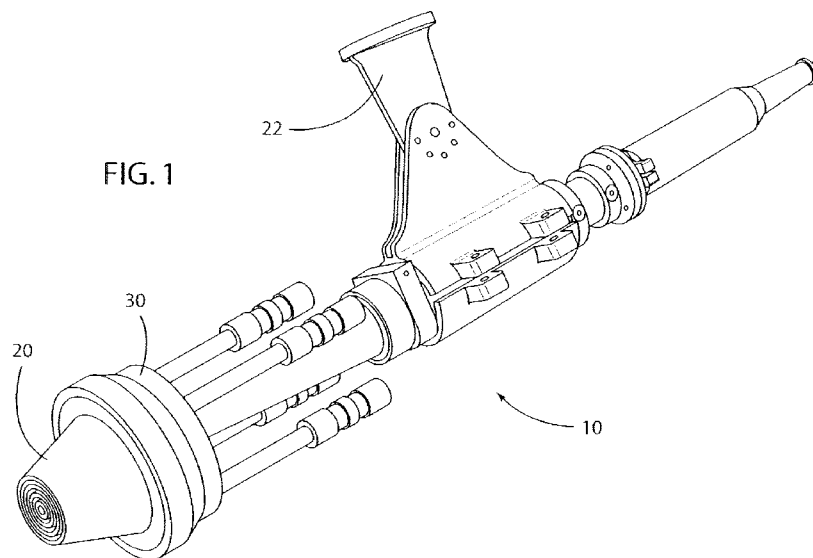
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(54) Title: LASER CLADDING DEVICE WITH AN IMPROVED NOZZLE



(57) Abstract: A laser cladding device for applying a coating to a part comprising a laser which can generate laser light, which is adapted to heat the coating and the part, a main body defining a laser light channel adapted to transmit the laser light to the part, a coating channel adapted to transmit the coating to the part, and a vacuum channel and a nozzle having an exit. The nozzle comprises a delivery port at one end of the laser light channel, a coating port at one end of the coating channel, and a vacuum port at one end of the vacuum channel, wherein the vacuum port is positioned generally adjacent the delivery port. In operation the vacuum port draws a vacuum, pulling the coating towards the part.



# INTERNATIONAL SEARCH REPORT

International application No.  
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| <b>A. CLASSIFICATION OF SUBJECT MATTER</b><br>IPC: <b>B23K 26/34</b> (2006.01), <b>B05B 1/4</b> (2006.01), <b>B05D 1/12</b> (2006.01), <b>B23K 26/00</b> (2006.01),<br><b>B23K 26/14</b> (2006.01), <b>C23C 24/10</b> (2006.01), <b>B22F 3/105</b> (2006.01)<br>According to International Patent Classification (IPC) or to both national classification and IPC                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| <b>B. FIELDS SEARCHED</b><br>Minimum documentation searched (classification system followed by classification symbols)<br>IPC: B23K 26/00, 14, 34; B05B 1/4; B05D 1/12; C23C 24/10; B22F 3/105<br>US Cl. 118/50.1; 118/723; 219/121*; 427/554, 555, 556, 596<br>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched<br>None<br>Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)<br>Google Scholar DELPHION (entire collection) Canadian Patent Database ESPACENET<br>Japanese Patent Database Korean Patent Database EPOQUE<br>search terms used: laser, coat*, clad*, nozzle, concentric, coaxial, vacuum, evacuate*, low pressure, inert, gas, annular, annulus, port, |                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Category*                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Citation of document, with indication, where appropriate, of the relevant passages                                                                    | Relevant to claim No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | US 20070193981 A1 (GENERAL ELECTRIC CO.)<br>23 August 2007 (23-08-2007)                                                                               | 1, 3 to 8 and 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | (entire document)                                                                                                                                     | 2, 9 and 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | US 6534745 B1 (LOWNEY)<br>18 March 2003 (18-03-2003)                                                                                                  | 1, 3 to 8 and 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | (entire document)                                                                                                                                     | 2, 9 and 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | US 6696664 B2 (MTS SYSTEMS CORP.)<br>24 February 2004 (24-02-2004)                                                                                    | 1, 3 to 8 and 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | (entire document)                                                                                                                                     | 2, 9 and 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | US 2002008090 A1 MUKASA ET AL.<br>24 January 2002 (24-01-2002)<br>(see figs. 1 and 4 and paragraphs [0033] to [0036], [0039], [0041], [0043], [0045]) | 1, 3 to 8 and 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| * Special categories of cited documents :<br>"A" document defining the general state of the art which is not considered to be of particular relevance<br>"E" earlier application or patent but published on or after the international filing date<br>"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)<br>"O" document referring to an oral disclosure, use, exhibition or other means<br>"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<br>"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<br>"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<br>"&" document member of the same patent family |
| Date of the actual completion of the international search<br>15 July 2009 (15-07-2009)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                       | Date of mailing of the international search report<br>3 August 2009 (03-08-2009)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Name and mailing address of the ISA/CA<br>Canadian Intellectual Property Office<br>Place du Portage I, C114 - 1st Floor, Box PCT<br>50 Victoria Street<br>Gatineau, Quebec K1A 0C9<br>Facsimile No.: 001-819-953-2476                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                       | Authorized officer<br>Daniel Weslake 819- 997-2999                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

**INTERNATIONAL SEARCH REPORT**International application No.  
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                   | Relevant to claim No. |
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| A         | US 7259353 B2 (HONEYWELL INTERNATIONAL INC.)<br>21 August 2007 (21-08-2007)<br>(entire document)     | 1 to 11               |
| A         | KR1020010081867 A (KOREA ATOMIC ENERGY RES.)<br>29 August 2001 (29 August 2001)<br>(entire document) | 1 to 11               |

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.  
**PCT/IB2008/003856**

| Patent Document<br>Cited in Search Report | Publication<br>Date | Patent Family<br>Member(s)                                                                                                                                   | Publication<br>Date                                                                                                                      |
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