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US 10/882,092 (CON)  
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- (74) Agents: STOBBS, Gregory, A. et al.; HARNESS, DICKEY & PIERCE, P.L.C., P.O. Box 828, Bloomfield Hills, Michigan 48303 (US).
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**Declarations under Rule 4.17:**

- 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))

**Published:**

- with international search report (Art. 21(3))

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11 September 2009



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(54) Title: SYSTEM FOR AND METHOD OF ZOOM PROCESSING

(57) Abstract: A laser processing system for precision manufacturing is operated by adjusting a scan lens within the system to create a wide variety of features on a workpiece. The zoom scan lens is adjusted continuously within the system to alter radius of an annulus of the processing beam(s), resulting in change of feature size on the final workpiece. The zooming of the scan lens may be performed in combination with adjustments to the laser power and dwell time in order to maintain optimum power-per-unit area for high-quality laser processing. The invention is well-suited for drilling tapered, conical holes, such as those found in inkjet nozzles, but may be applicable for processing tapered or non-tapered features of almost any geometrical shape.

**INTERNATIONAL SEARCH REPORT**

International application No.

PCT/US05/20812

<p><b>A. CLASSIFICATION OF SUBJECT MATTER</b>                  IPC: <b>B23K 26/06( 2006.01)</b></p> <p>USPC: 219/121.75,121.76,121.78,121.7,121.71,121.85,121.68,121.69                  According to International Patent Classification (IPC) or to both national classification and IPC</p>																						
<p><b>B. FIELDS SEARCHED</b></p> <p>Minimum documentation searched (classification system followed by classification symbols)                  U.S. : 219/121.75, 121.76, 121.78, 121.7, 121.71, 121.85, 121.68, 121.69</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)                  US OCR, US PAT, US PG, Derwent, JPO, EPO</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 --- Y</td> <td>US 6,433,301 B1 (DUNSKY et al. ) 13 August 2002 (13.08.2002) full text</td> <td>1, 4, 7-8, 18, 20-23, 26-28, 45 ----- 2-3, 5-6, 9-17, 19, 24-25, 29-30, 42, 46-47</td> </tr> <tr> <td>Y</td> <td>US 6,720,519 B2 (LIU et al.) 13 April 2004 (13.04.2004) full text</td> <td>2-3, 5-6, 9-17, 19, 24-25, 29-30, 42, 46-47</td> </tr> <tr> <td>A</td> <td>US 6,563,567 B1 (KOMATSUDA et al.) 13 May 2003 (13.05.2003)</td> <td>1-47</td> </tr> <tr> <td>A,P</td> <td>US 2005/0056626 A1 (GROSS et al.) 17 March 2005 (17.03.2005)</td> <td>1-47</td> </tr> </tbody> </table>			Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X --- Y	US 6,433,301 B1 (DUNSKY et al. ) 13 August 2002 (13.08.2002) full text	1, 4, 7-8, 18, 20-23, 26-28, 45 ----- 2-3, 5-6, 9-17, 19, 24-25, 29-30, 42, 46-47	Y	US 6,720,519 B2 (LIU et al.) 13 April 2004 (13.04.2004) full text	2-3, 5-6, 9-17, 19, 24-25, 29-30, 42, 46-47	A	US 6,563,567 B1 (KOMATSUDA et al.) 13 May 2003 (13.05.2003)	1-47	A,P	US 2005/0056626 A1 (GROSS et al.) 17 March 2005 (17.03.2005)	1-47					
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<p><input 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"</td> <td>document defining the general state of the art which is not considered to be of particular relevance</td> <td>"T"</td> <td>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"</td> <td>earlier application or patent published on or after the international filing date</td> <td>"X"</td> <td>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"</td> <td>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"</td> <td>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"</td> <td>document referring to an oral disclosure, use, exhibition or other means</td> <td>"&amp;"</td> <td>document member of the same patent family</td> </tr> <tr> <td>"P"</td> <td>document published prior to the international filing date but later than the priority date claimed</td> <td></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>Date of the actual completion of the international search                  21 July 2006 (21.07.2006)</p>		<p>Date of mailing of the international search report  <b>08 NOV 2006</b></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                  M. Alexandra Elve      <b>DEBORAH A. THOMAS</b>                  Telephone No. 703-308-0661      <b>PARALEGAL SPECIALIST</b>  </p>																				

**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.: 31-41,43 and 44  
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:  
Claims were indefinite.
  
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:

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 any 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.