Title: NOZZLE FOR JET DRILLING AND ASSOCIATED METHOD

Abstract: A jet nozzle (60) is provided for drilling holes through the earth. The nozzle (60) may include orifices (68) for discharging fluid to drive the nozzle forward and includes a disk (70) or other device having orifices (80) to produce a swirling motion to fluid in the body of the nozzle. Swirling fluid is discharged from a front orifice (74) and an extension (76) is placed forward of the front orifice to confine the swirling fluid in a radial direction.
as to the applicant’s entitlement to claim the priority of the
earlier application (Rule 4.17(iii)) for the following designa-

Published:

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(88) Date of publication of the international search report:

15 July 2004

For two-letter codes and other abbreviations, refer to the “Guidance Notes on Codes and Abbreviations” appearing at the beginning of each regular issue of the PCT Gazette.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
IPC(7)    : E21B 07/18, 07/08
US CL     : 175/67, 424, 393; 239/463, 494; 299/17
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)
U.S. : 175/67, 424, 393, 45, 61, 340; 239/463, 494, 498, 483, 490, 492, 497; 299/17

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)
EAST: nozzle, jet drill, outlet, inlet, swirling, whirling, chamber

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<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 4,787,465 A (DICKINSON, III et al) 29 November 1988 (29.11.1988), column 3, lines 11-13 and 64-68; column 4, lines 1-39; column 5, lines 22-34; column 6, lines 49-68; column 9, lines 67 through column 10, line 9.</td>
<td>1,3,7,8,12-14,19,22</td>
</tr>
<tr>
<td>Y</td>
<td>US 5,853,056 A (LANDERS) 29 December 1998 (29.12.1998), column 1, lines 8-15; column 2, lines 1-30.</td>
<td>2,4-6,15-18,20</td>
</tr>
<tr>
<td>Y</td>
<td>US 5,862,871 A (CURLETT) 26 January 1999 (26.01.1999), claim 12.</td>
<td>4</td>
</tr>
</tbody>
</table>

Further documents are listed in the continuation of Box C. See patent family annex.

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Date of the actual completion of the international search: 30 May 2003 (30.05.2003)

Date of mailing of the international search report: 21 MAY 2004

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