

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
24 November 2005 (24.11.2005)

PCT

(10) International Publication Number  
**WO 2005/110666 A1**

(51) International Patent Classification<sup>7</sup>: **B23K 26/38**,  
26/40

(21) International Application Number:  
PCT/US2004/012191

(22) International Filing Date: 19 April 2004 (19.04.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
10/825,039 14 April 2004 (14.04.2004) US

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(81) Designated States (unless otherwise indicated, for every  
kind of national protection available): AE, AG, AL, AM,  
AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,  
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,  
GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,  
KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD,  
MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG,  
PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM,  
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM,  
ZW.

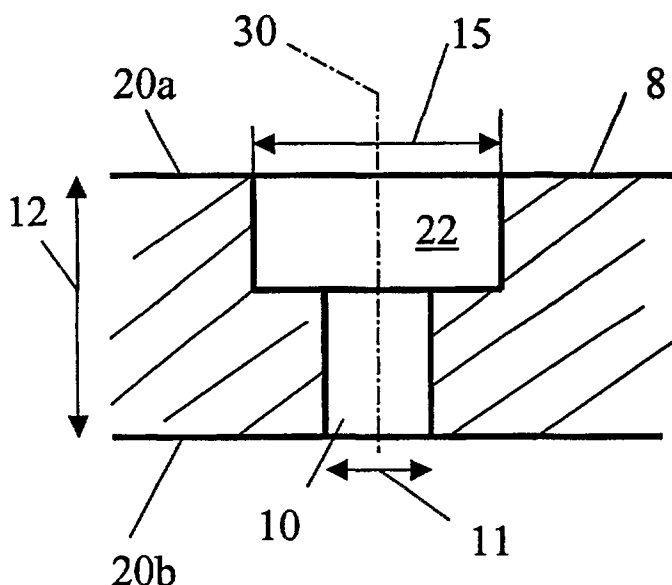
(84) Designated States (unless otherwise indicated, for every  
kind of regional protection available): ARIPO (BW, GH,  
GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),  
Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), Euro-  
pean (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR,  
GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK,  
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,  
ML, MR, NE, SN, TD, TG).

**Published:**

— with international search report

For two-letter codes and other abbreviations, refer to the "Guid-  
ance Notes on Codes and Abbreviations" appearing at the begin-  
ning of each regular issue of the PCT Gazette.

(54) Title: METHODS OF DRILLING THROUGH-HOLES IN HOMOGENEOUS AND NON-HOMOGENEOUS SUB-  
STRATES



(57) Abstract: A differential diameter hole drilling method by which through-holes (14) having improved major surface quality are formed in a target material (8) involves drilling a pilot hole (10) having a diameter that is less than the desired diameter of the through-hole and then drilling a through-hole having the desired diameter. The pilot hole forms a channel from which thermal energy produced during laser drilling can diffuse into the environment, thereby reducing the amount of thermal energy diffusing into the surrounding target material matrix and the degree of thermal damage to the heat affected zone of the target material matrix. The pilot hole also forms a channel through which ablated target material may be removed, thereby increasing overall through-hole throughput. Pilot hole formation reduces the thermal energy required to form the remaining portion of the through-hole and thereby results in less thermal damage to the surrounding target material matrix.

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