

REVISED VERSION

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
2 October 2014 (02.10.2014)



(10) International Publication Number
WO 2014/155180 A9

- (51) International Patent Classification:
B23K 26/14 (2014.01) *B23K 26/34* (2014.01)
B23K 26/20 (2014.01)
- (21) International Application Number:
PCT/IB2014/000421
- (22) International Filing Date:
25 March 2014 (25.03.2014)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
13/849,860 25 March 2013 (25.03.2013) US
- (71) Applicant: LINCOLN GLOBAL, INC. [US/US]; 17721 Railroad St., City of Industry, CA 91748 (US).
- (72) Inventors: PETERS, Steven, R.; 15565 Windmill Point Road, Huntsburg, OH 44046 (US). DENNEY, Paul, Edward; 28107 West Oakland Road, Bay Village, OH 44140 (US). BLANKENSHIP, George, D.; 12221 Bradford Road, Chardon, OH 44024 (US).
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,

HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

- (88) Date of publication of the international search report:
11 December 2014

[Continued on next page]

(54) Title: METHODS OF AND SYSTEM FOR LASER CLADDING WITH MULTIPLE HEATED CONSUMABLES

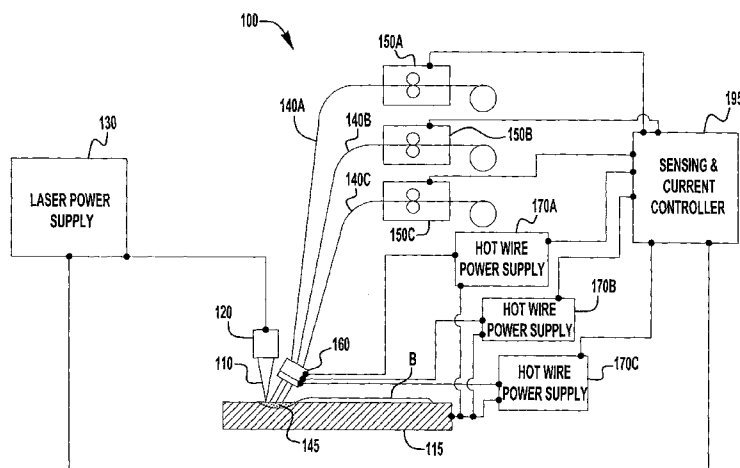


FIG. 1

(57) Abstract: A system (100) and a method to provide a welding or cladding operation are provided which using multiple consumables (140A, 140B, 140C) in a single operation, where the overall heat input is reduced. Each of the consumables (140A, 140B, 140C) can be deposited into a single molten puddle (145), where the total energy input to the puddle (145) from trailing consumables (140B, 140C) is less than that of a leading consumable (140A). Further embodiments can use more than one molten puddle (145), but the energy input by the leading consumable (140A) is still higher than that of trailing consumables (140B, 140C).



**Date of publication of the revised international search
report:**

(15) Information about Correction:
see Notice of 5 March 2015

5 March 2015

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2014/000421

A. CLASSIFICATION OF SUBJECT MATTER

INV. B23K26/14 B23K26/20 B23K26/34
ADD.

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)
B23K

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)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2011 050998 A (MAZDA MOTOR CORP) 17 March 2011 (2011-03-17)	15
Y	abstract; figures paragraphs [0026] - [0027] -----	1-14
Y	US 5 932 121 A (Y. MANABE ET AL) 3 August 1999 (1999-08-03)	1-14
A	figures 2,5; examples 2,4 -----	15
Y	JP S62 207583 A (CHIYODA CHEM ENG & CONSTR CO LTD) 11 September 1987 (1987-09-11) abstract; figures -----	5,6,8-14
A	JP 2004 237326 A (AIKO ENGINEERING KK) 26 August 2004 (2004-08-26) abstract; figures -----	1,2,15



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"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)

"O" document referring to an oral disclosure, use, exhibition or other means

"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

"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

"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

"&" document member of the same patent family

Date of the actual completion of the international search

12 December 2014

Date of mailing of the international search report

22/12/2014

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Jeggy, Thierry

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2014/000421

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2011050998 A	17-03-2011	JP 5499577 B2	21-05-2014
		JP 2011050998 A	17-03-2011
US 5932121 A	03-08-1999	DE 69721421 D1	05-06-2003
		DE 69721421 T2	11-03-2004
		DE 69735906 T2	21-12-2006
		EP 0832710 A1	01-04-1998
		EP 1231009 A2	14-08-2002
		JP 3530322 B2	24-05-2004
		JP H1099966 A	21-04-1998
		US 5932121 A	03-08-1999
JP S62207583 A	11-09-1987	NONE	
JP 2004237326 A	26-08-2004	NONE	