



- (51) **International Patent Classification:**
B23K 9/095 (2006.01) *B23K 9/32* (2006.01)
- (21) **International Application Number:**
PCT/US2013/035197
- (22) **International Filing Date:**
4 April 2013 (04.04.2013)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
61/621,430 6 April 2012 (06.04.2012) US
13/759,917 5 February 2013 (05.02.2013) US
- (71) **Applicant: ILLINOIS TOOL WORKS INC.** [US/US];
3600 West Lake Avenue, Glenview, Illinois 60026 (US).
- (72) **Inventors: BORNEMANN, Brian, J.;** c/o Illinois Tool
Works Inc., 3600 West Lake Avenue, Glenview, Illinois
60026 (US). **PFEIFER, Kyle, A.;** c/o Illinois Tool Works
Inc., 3600 West Lake Avenue, Glenview, Illinois 60026
(US). **ACHTNER, Richard, M.;** c/o Illinois Tool Works
Inc., 3600 West Lake Avenue, Glenview, Illinois 60026
(US).
- (74) **Agent: HAUPTMAN, Benjamin, J.;** Lowe Hauptman
Ham & Berner, LLP, 2318 Mill Road, Suite 1400, Alexan-
dria, VA 22314 (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, IS, JP, KE, KG, KM, 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, 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, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— as to the identity of the inventor (Rule 4.17(i))

Published:

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

[Continued on next page]

(54) **Title:** WELDING SYSTEMS HAVING NON-CONTACT TEMPERATURE MEASUREMENT SYSTEMS

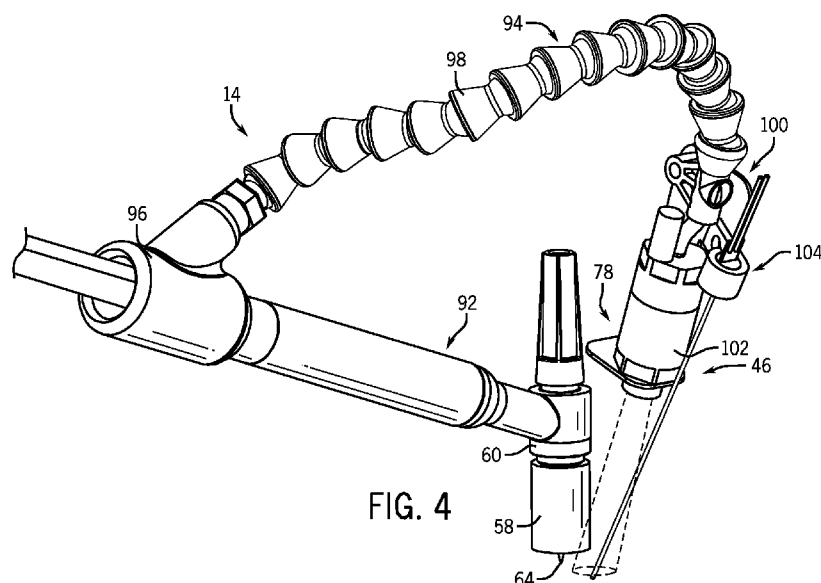


FIG. 4

(57) **Abstract:** [0042] Welding systems including welding torch assemblies (14) are provided. The welding torch assembly (14) may include a welding torch (54) adapted to be utilized in a welding operation to establish a welding arc between the welding torch and a workpiece. Shielding gas may be supplied to the welding torch for establishment of a gas shielding area around a weld pool. The welding torch assembly may also include a temperature sensing system (46) having a non-contact temperature sensor coupled to the welding torch and adapted to sense a temperature of the workpiece at a location outside of the molten weld pool.



— *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:**
19 December 2013

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2013/035197

A. CLASSIFICATION OF SUBJECT MATTER
INV. B23K9/095 B23K9/32
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 G01J

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	EP 2 189 786 A2 (BENTELER AUTOMOBILTECHNIK GMBH [DE]) 26 May 2010 (2010-05-26)	1-4,9
Y	paragraph [0018] - paragraph [0020]; figures	5,16-20
X	----- KOZONO Y ET AL: "CONTROL OF BACK BEAD WIDTH IN GIRTH TIG WELDING OF SMALL TUBES USING SURFACE TEMPERATURE MONITORING", WELDING INTERNATIONAL, TAYLOR & FRANCIS, ABINGDON, GB, vol. 3, no. 2, 1989, pages 137-141, XP0000000613, ISSN: 0950-7116 the whole document ----- -/-	1-4,9



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

10 July 2013

Date of mailing of the international search report

04/11/2013

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

Caubet, J

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2013/035197

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 20 2007 011584 U1 (INTERFORGE KLEE GMBH [DE]) 2 January 2009 (2009-01-02) paragraph [0079] - paragraph [0081]; figures -----	1-4,9
X	US 4 532 404 A (BOILLOT JEAN-PAUL [CA] ET AL) 30 July 1985 (1985-07-30) figures -----	1-4,9
Y	US 5 211 478 A (HORSLEY JOHN [GB]) 18 May 1993 (1993-05-18) abstract; figures -----	5,16-20

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/035197

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.:
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:
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:

see additional sheet

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 an additional fees, this Authority did not invite payment of 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.:

1-5, 9, 16-20

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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-5, 9, 16-20

Welding system with a cooled pyrometer

2. claims: 6-8, 10-15

Welding system with adjustable pyrometer

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2013/035197

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 2189786	A2	26-05-2010	DE 102008058187 A1	10-06-2010
			EP 2189786 A2	26-05-2010
			US 2010123080 A1	20-05-2010

DE 202007011584	U1	02-01-2009	DE 202007011584 U1	02-01-2009
			EP 2027962 A1	25-02-2009

US 4532404	A	30-07-1985	CA 1205872 A1	10-06-1986
			DE 3403253 A1	23-08-1984
			FR 2540019 A1	03-08-1984
			GB 2134670 A	15-08-1984
			JP S59144579 A	18-08-1984
			US 4532404 A	30-07-1985

US 5211478	A	18-05-1993	GB 2250812 A	17-06-1992
			JP H05126646 A	21-05-1993
			US 5211478 A	18-05-1993
