



US009073111B2

(12) **United States Patent**
Araki

(10) **Patent No.:** **US 9,073,111 B2**

(45) **Date of Patent:** **Jul. 7, 2015**

(54) **MOLDING DEVICE FOR PULLING OPEN ELONGATED HOLES IN PIPES OR SHEETS**

72/370.24, 370.27, 55, 70, 71, 324, 329,
72/330, 333, 336, 337, 20.4, 54.71, 112,
72/125, 370.08, 466.8, 393; 29/90.01,
29/428, 446

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See application file for complete search history.

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(56) **References Cited**

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

U.S. PATENT DOCUMENTS

2,895,356 A * 7/1959 Cogsdill 408/200
3,592,038 A * 7/1971 Larikka 72/325

(Continued)

(21) Appl. No.: **13/982,115**

(22) PCT Filed: **Jan. 24, 2012**

FOREIGN PATENT DOCUMENTS

(86) PCT No.: **PCT/JP2012/051449**

JP 03-090221 4/1991
JP 09-103827 4/1997
JP 2003-001331 1/2003

§ 371 (c)(1),
(2), (4) Date: **Oct. 8, 2013**

OTHER PUBLICATIONS

(87) PCT Pub. No.: **WO2012/102271**

Japanese Office Action dated Apr. 16, 2013 filed in the corresponding Japanese Patent application No. 2011-015320.

PCT Pub. Date: **Aug. 2, 2012**

(Continued)

(65) **Prior Publication Data**

US 2014/0020443 A1 Jan. 23, 2014

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(30) **Foreign Application Priority Data**

Jan. 27, 2011 (JP) 2011-015320

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(51) **Int. Cl.**

B21D 31/02 (2006.01)

B21D 19/08 (2006.01)

(Continued)

(57) **ABSTRACT**

A high-tolerance molding device that uses a pulling technique to quickly form a desired elongated hole in a workpiece such as a pipe or a sheet with little material loss, due to the use of single-piece molding, while preventing material degradation. The workpiece is provided with a pilot hole that is smaller than but roughly concentric with the desired elongated hole. This molding device includes a power-coupling arm that can be inserted into the pilot hole; a control unit that controls the movement of the power-coupling arm; and a molding plug that is prepositioned on the opposite side, with respect to the power-coupling arm, of the surface of the workpiece in which the pilot hole is provided.

(52) **U.S. Cl.**

CPC **B21D 19/08** (2013.01); **B21D 28/285** (2013.01)

1 Claim, 7 Drawing Sheets

(58) **Field of Classification Search**

CPC B21B 19/04; B21B 23/00; B21C 37/104;
B21C 37/292; B21C 37/205; B21C 37/15;
B21C 37/06; B21D 28/28; B21D 28/285
USPC 72/367.1, 368, 370.01, 370.16, 370.23,

