(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
18 June 2009 (18.06.2009)

PCT

(10) International Publication Number
WO 2009/075596 A2

(51) International Patent Classification:
B23K 26/30 (2006.01) *B21D 53/06* (2006.01)
B21C 37/26 (2006.01) *F28F 1/36* (2006.01)

(21) International Application Number:
PCT/PL2008/000091

(22) International Filing Date:
28 November 2008 (28.11.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

P-384018	11 December 2007 (11.12.2007)	PL
P-384019	11 December 2007 (11.12.2007)	PL
P-384020	11 December 2007 (11.12.2007)	PL
P-384341	28 January 2008 (28.01.2008)	PL

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(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, BR, BW, BY, BZ, CA, CH, 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, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, 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, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

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(54) Title: METHOD OF MANUFACTURE OF FINNED TUBES

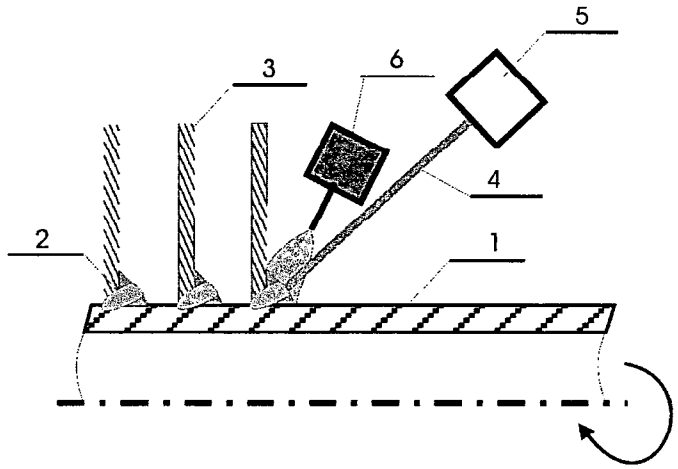

Fig. 4

(57) Abstract: The method of the Invention consists in that for the manufacture of finned tubes a fibre laser is used. A flat bar is taken and is bent by mechanical means to form a U section, an L-section or an I section, which is then wound onto a rotating tube by means of expedient feed rolls. Upon contact of the flat bar the laser beam or a MAG welding arc is guided on the lower surface of the U section, L section or I section and the formed fillet weld is fused by the laser beam. Laser beam welding is carried out at high speed of more than 1 m/min, whereas prior to welding the tube is pre-heated to 0 - 100^{0}C. It is possible to carry out welding using a filler in the form of a wire dispensed into the area of the focused beam.

WO 2009/075596 A2

— *of inventorship (Rule 4.17(iv))*

Published:

— *without international search report and to be republished upon receipt of that report*

Method of manufacture of finned tubes

The object of the invention is a method of manufacture of finned tubes, particularly tubes designed for the power industry.

At present finned tubes are manufactured by automatic welding using the MAG (metal active gas welding) method. The joint is made using a fillet weld or a weld made under the fin.

The present invention consists in that a fibre laser is used in the manufacture of finned tubes. A flat bar is taken and bent by mechanical means to form a U section, an L section or an I section, which is then wound by means of expedient feed rolls onto a rotating tube. Upon contact of the flat bar the laser beam or a MAG welding arc is guided on the lower surface of the U section, L section or I section and the formed fillet weld is fused by the laser beam. The width of the laser beam is such that the width of the weld made is equal to 1 to 1.25 of the fin width. Laser beam welding is carried out at high speed of more than 1 m/min, whereas prior to welding the tube is not pre-heated or is pre-heated to ca. 100°C. It is possible to carry out welding using a filler in the form of a wire dispensed into the area of the focused beam.

The method according to the invention enables high efficiency of finned tube manufacture without welding flaws, with or without the use of a filler.

A continuous penetration weld is obtained with very low welding deformations and a narrow heat-affected zone. The application of the method increases the speed of welding, enables avoiding the use of a filler, provides a continuous penetration weld and improves the economics of manufacture.

One embodiment of the invention is presented in drawings, where Figures 1 to 4 illustrate the manner of manufacture of finned tubes with a U section using laser fusion welding (Fig. 1), with an L section using laser fusion welding (Fig. 2), with an I section using laser fusion welding (Fig. 3) and using a hybrid welding method (MAG + laser) (Fig. 4).

A transfer tube **1** with a diameter of 57.5 mm made of P235GH steel was combined with a 1.0 mm thick U-shaped, L-shaped or I-shaped fin **3** made of S235GH steel by means of a laser beam **4** at a speed of 10 m/min. The U-shaped, L-shaped or I-shaped fin was pressed against the tube by mechanical means **6**. A 10 kW fibre laser **5** was used along with an inert gas shroud. Prior to welding the tube was heated to 50°C. The bond created **2** was a continuous penetration weld the hardness of which was less than 320 HV.

Claims

1. A method of manufacture of finned tubes characterised in that for securing the fin to the tube a laser beam and a U-shaped fin section are used, wherein welding is done in downward position between section flanges along the lower part of the fin without any additional operations at speeds of more than 1 m/min, whereas the panels are pre-heated prior to welding to 0 – 100°C.

2. A method of manufacture of finned tubes characterised in that for securing the fin to the tube a laser beam and an L-shaped fin section are used, wherein welding is done in downward position between section flanges along the lower part of the fin without any additional operations at speeds of more than 1 m/min, whereas the panels are pre-heated prior to welding to 0 – 100°C.

3. A method of manufacture of finned tubes characterised in that for securing the fin to the tube a hybrid system is used: metal active gas (MAG) welding + laser beam, wherein the welding is carried out with the use of a flat bar prepared beforehand, which by means of expedient rolls is wound onto a rotating tube, and wherein the fillet weld is made using the MAG welding method and fused afterwards by means of a laser beam to provide a finned tube with a continuous complete penetration weld, the thickness of the weld being larger than the thickness of the fin.

4. A method of manufacture of finned tubes characterised in that for securing the fin to the tube a laser beam and an I-shaped fin section are used, wherein welding is done on the side of the fin without any additional operations at speeds of more than 1 m/min, whereas the panels are pre-heated prior to welding to 0 – 100°C.

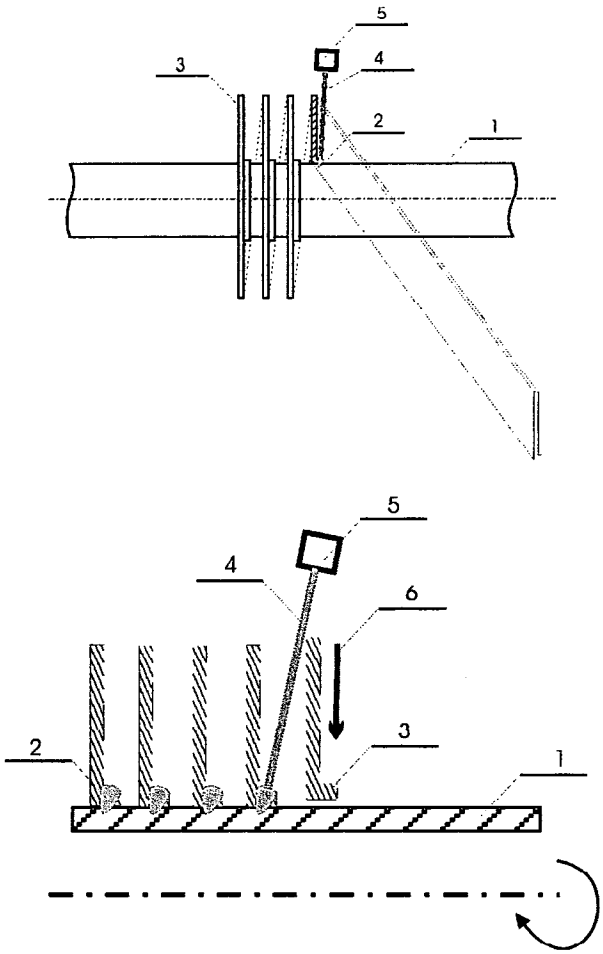

Fig. 1

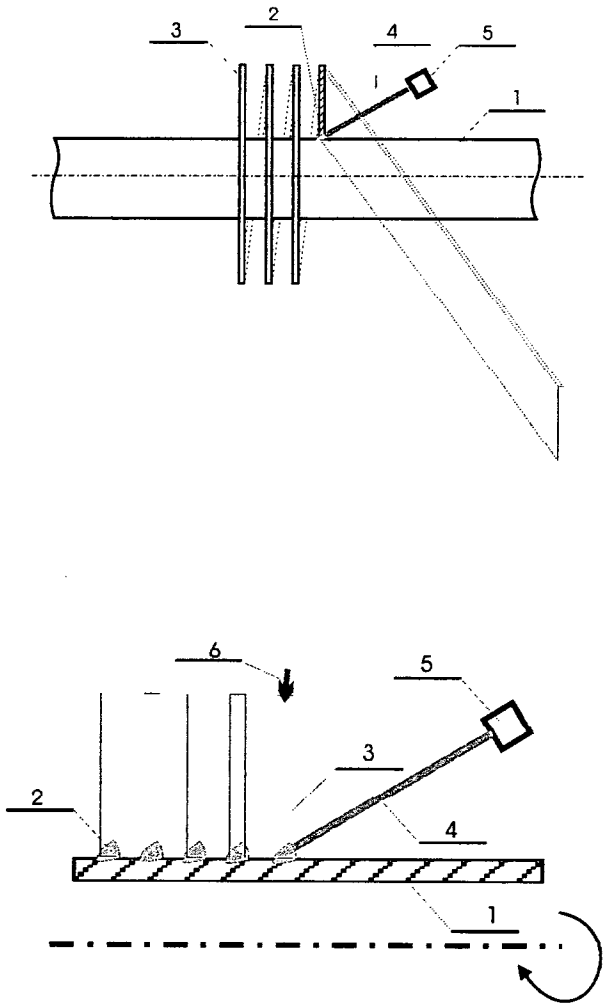

Fig. 2

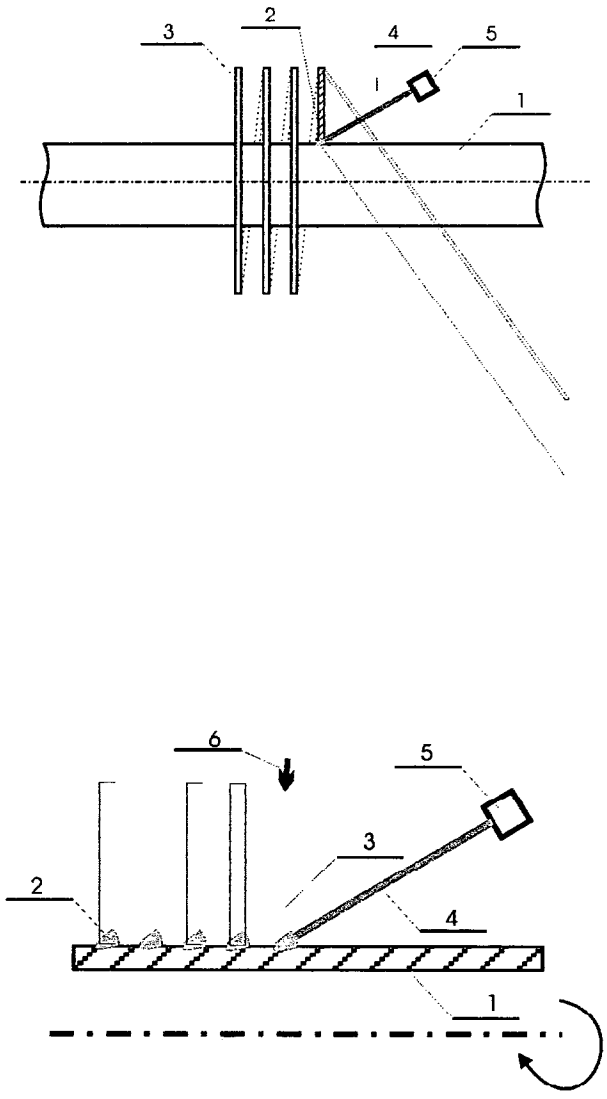

Fig. 3

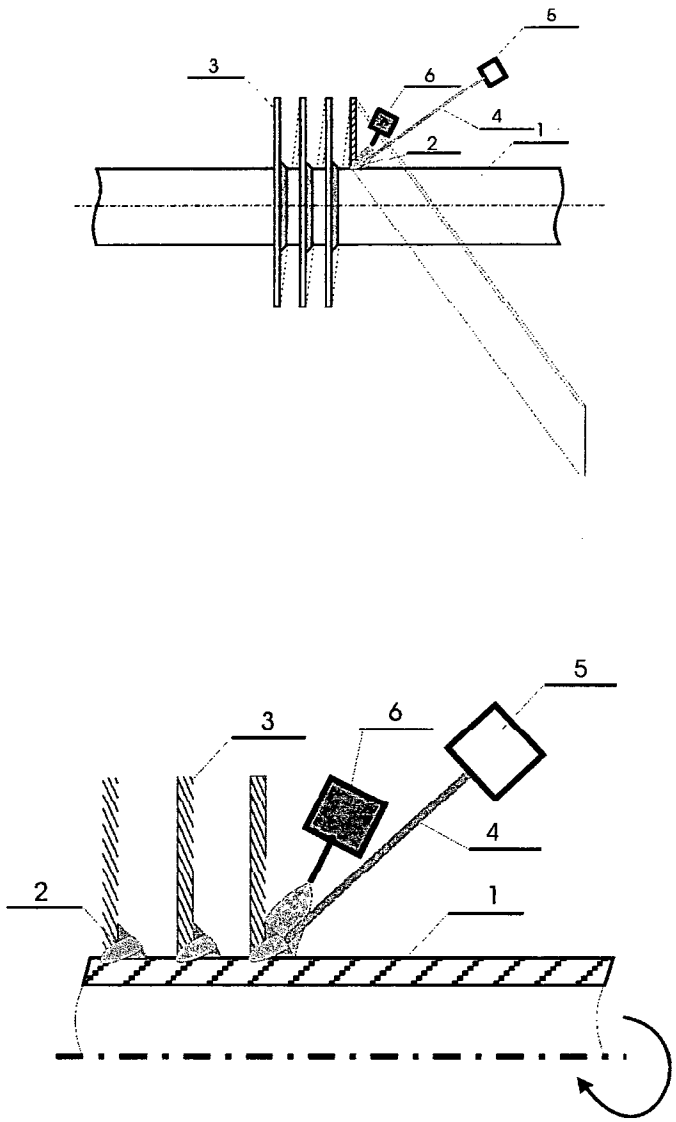

Fig. 4