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United States Patent Application Publication

20250262694

Kind Code

A1

Publication Date

August 21, 2025

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ADJUSTABLE PIPE CLAMP

Abstract

An adjustable clamp for welding together pipes, the adjustable clamp having a first axis perpendicular to the pipes and a second axis parallel to the pipes. The adjustable clamp includes four clamp corners, four transverse bolts, two parallel bolts, two threaded inserts, and four spacers. Each clamp corner includes a first transverse aperture, a second transverse aperture, and a third parallel aperture. The first and second apertures are transverse relative to the first axis and the third aperture is parallel relative to the first axis. Each transverse bolt is securable within the first and second transverse apertures of the four clamp corners. Each parallel bolt is securable within the third apertures of the four clamp corners. Each threaded insert is placeable within the third apertures of the four clamp corners and each threaded insert is mated with a respective parallel bolt. Each spacer surrounds a portion of each transverse bolt.

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Family ID: 1000008589268

Appl. No.: 19/203653

Filed: May 09, 2025

Related U.S. Application Data

parent US division 17577855 20220118 parent-grant-document US 12337422 child US 19203653

Publication Classification

Int. Cl.: B23K37/0533 (20250101); B25B5/14 (20060101); B25B27/10 (20060101); F16L1/09 (20060101)

U.S. Cl.:

Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION [0001] This is a divisional of co-pending patent application Ser. No. 17/577,855, by the same title herein, filed on Jan. 18, 2022, now U.S. Pat. No. _____, issued _____.

FIELD OF THE INVENTION

[0002] The present invention relates to a clamp used to assist in welding pipes together. It more particularly relates to an adjustable clamp used to assist in welding pipes together. It specifically relates to an adjustable clamp consisting of four clamp corners securable together such that the overall clamp can be adjusted to fit around pipe ends of varying dimensions.

BACKGROUND OF THE INVENTION

[0003] Tools for clamping and aligning boiler tubes when connecting the ends of the boiler tubes by welding are known as disclosed in U.S. Pat. Nos. 4,493,139, 4,579,272 and 4,722,468. The devices disclosed in these patents include structures for securing boiler tube ends in aligned and adjacent relation and function effectively when the boiler tubes are in a spaced relation. However, in boiler wall tubes, the boiler tubes are positioned in closely spaced relation and are interconnected by webs to form a continuous boiler tube sheet or wall. The tools disclosed in the above-mentioned patents are not especially adapted for use with boiler tubes forming a boiler wall.

[0004] In addition, and considered relevant to the present invention, are U.S. Pat. Nos. 4,846,391 and 4,936,500, both issued to Gary McClure and disclosing various clamping tools that engage the respective tubes to facilitate welding in the repair of a wall tube or tubes. The '391 patent teaches a clamp having a pair of opposed clamp members that each include a pair of recesses to engage adjacent ends of a pair of boiler wall tubes on opposite sides of a juncture between adjacent ends. The tool includes means for moving the clamps toward one another, thereby generating a secure clamp engagement between the clamps onto the respective tube or tubes. The '500 patent discloses a clamp that is bolted directly onto a boiler tube wall as opposed to utilizing the handle and mounting bar combination disclosed in the '391 patent. However, neither of these patents demonstrates an ability to provide versatility to the user in accommodating varying sizes beyond the dimensions of the recesses provided in the '391 and '500 disclosures. The present invention overcomes this deficiency by providing the user with the ability to use the present invention on variously sized/dimensioned tubes.

SUMMARY OF THE INVENTION

[0005] An embodiment of the present invention provides an adjustable clamp for welding together ends of two pipes, wherein the adjustable clamp has a first axis perpendicular to the pipes and a second axis parallel to the pipes, the adjustable clamp comprising: four clamp corners, wherein each clamp corner includes a first transverse aperture, a second transverse aperture, and a third parallel aperture, wherein the first and second transverse apertures are transverse relative to the first axis and the third parallel aperture is parallel relative to the first axis; four transverse bolts securable within the first and second transverse apertures of the four clamp corners; two parallel bolts securable within the third apertures of the four clamp corners; two threaded inserts placeable within the third apertures of the four clamp corners, wherein each threaded insert is mated with a respective parallel bolt; and four spacers, each said spacer surrounding a portion of each transverse bolt.

[0006] Another embodiment of the present invention provides an adjustable clamp as in any embodiment above, further comprising four transverse lock nuts, wherein each transverse lock nut

is mated with a respective transverse bolt to secure said transverse bolt within a pair of first or second transverse apertures of a pair of clamp corners.

[0007] Another embodiment of the present invention provides an adjustable clamp as in any embodiment above, further comprising four transverse washers, wherein each transverse washer is placed adjacent a head of a respective transverse bolt.

[0008] Another embodiment of the present invention provides an adjustable clamp as in any embodiment above, further comprising two parallel washers, wherein each parallel washer is placed adjacent a head of a respective parallel bolt.

[0009] Another embodiment of the present invention provides an adjustable clamp as in any embodiment above, wherein a first clamp corner is securable to a second clamp corner through the use of a first and second transverse bolt to form a first clamp half and wherein a third clamp corner is securable to a fourth clamp corner through the use of a third and fourth transverse bolt to form a second clamp half.

[0010] Another embodiment of the present invention provides an adjustable clamp as in any embodiment above, wherein a first clamp half is securable to a second clamp half through the use of a first parallel bolt and a second parallel bolt.

[0011] Another embodiment of the present invention provides an adjustable clamp as in any embodiment above, wherein each spacer of the four spacers has the same spacer length.

[0012] Another embodiment of the present invention provides an adjustable clamp as in any embodiment above, wherein the spacer length is selected from 0.16 inches, 0.40 inches, 0.875 inches, or 1.375 inches.

[0013] An embodiment of the present invention provides a method of welding together the ends of two pipes comprising the steps of: securing a first clamp corner to a second clamp corner to create a first clamp half; securing a third clamp corner to a fourth clamp corner to create a second clamp half; placing a first end of a first pipe adjacent a first end of a second pipe to create a weldable pipe; placing said first clamp half adjacent a first side of said weldable pipe and said second clamp half adjacent a second side of said weldable pipe; securing said first clamp half to said second clamp half to create an adjustable clamp having a first and second weld window; and welding together said weldable pipe within said first and second weld windows.

[0014] Another embodiment of the present invention provides a method of welding together the ends of two pipes as in any embodiment above, wherein each said clamp corner includes a first transverse aperture, a second transverse aperture, and a third parallel aperture, wherein the first and second transverse apertures are transverse relative to a first axis perpendicular to the pipes and the third parallel aperture is parallel relative to the first axis.

[0015] Another embodiment of the present invention provides a method of welding together the ends of two pipes as in any embodiment above, wherein said step of securing said first clamp corner to said second clamp corner includes placing a first transverse bolt within the first transverse aperture of said first clamp corner and a second transverse bolt within the second transverse aperture of said first clamp corner, placing a first spacer around the first transverse bolt and a second spacer around the second transverse bolt, placing said first transverse bolt within the first transverse aperture of said second clamp corner and said second transverse bolt within the second transverse aperture of said second clamp; and securing a first transverse lock nut to an end of said first transverse bolt and a second transverse lock nut to an end of said second transverse bolt.

[0016] Another embodiment of the present invention provides a method of welding together the ends of two pipes as in any embodiment above, wherein said step of securing said third clamp corner to said fourth clamp corner includes placing a third transverse bolt within the first transverse aperture of said third clamp corner and a fourth transverse bolt within the second transverse aperture of said third clamp corner, placing a third spacer around the third transverse bolt and a fourth spacer around the fourth transverse bolt, placing said third transverse bolt within the first transverse aperture of said fourth clamp corner and said fourth transverse bolt within the second

transverse aperture of said fourth clamp; and securing a third transverse lock nut to an end of said third transverse bolt and a fourth transverse lock nut to an end of said second transverse bolt.

[0017] Another embodiment of the present invention provides a method of welding together the ends of two pipes as in any embodiment above, wherein said step of securing said first clamp half to said second clamp half includes placing a first parallel bolt within the third parallel aperture of the first clamp corner of the first clamp half and a second parallel bolt within the third parallel aperture of the second clamp corner of the first clamp half, placing a first threaded insert within the third parallel aperture of the third clamp corner of the second clamp half and a second threaded insert within the third parallel aperture of the fourth clamp corner of the second clamp half, and securing the first threaded insert with the first parallel bolt and the second threaded insert with the second parallel bolt to create the adjustable clamp.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] Additional utility and features of the invention will become more fully apparent to those skilled in the art by reference to the following drawings, which illustrate the primary features of the preferred embodiment and numerous alternative embodiments.

[0019] FIG. 1 shows a partially exploded view of the adjustable pipe clamp of the present invention;

[0020] FIG. 2 shows an exploded view of two of the four corners of the adjustable pipe clamp of the present invention prior to the two corners being secured together to form one half of the adjustable clamp of the present invention and prior to the one half being secured around two ends of a pipe to be welded together;

[0021] FIG. 3 shows the two halves of the adjustable pipe clamp of the present invention prior to being secured together around two ends of a pipe to be welded together; and

[0022] FIG. 4 shows the two halves of the adjustable pipe clamp of the present invention secured together around two ends of a pipe to be welded together.

DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

[0023] The present invention relates to an adjustable pipe clamp **10** as generally shown in FIGS. 1-4. The adjustable pipe clamp **10** of the present invention is utilized to clamp the ends of two pipes **P1** and **P2** together, such that the ends of the two pipes **P1** and **P2** are aligned such that they can be welded together. The pipe clamp **10** consists of four clamp corners **12**, **14**, **16**, and **18**. The clamp corners **12** and **14** can be secured together to form a first clamp half **20** and the clamp corners **16** and **18** can be secured together to form a second clamp half **22**. Each of the clamp corners **12**, **14**, **16**, and **18** include a pipe-facing face **F** that forms a 45° angle θ . When the clamp corners **12**, **14**, **16**, and **18** are secured together to form the clamp **10**, each pipe-facing face **F** will be against a surface of one of the two pipes **P1** or **P2**.

[0024] As shown in FIG. 1, each clamp corner **12**, **14**, **16**, and **18** contains a first transverse aperture **24a-d**, a parallel aperture **26a-d**, and a second transverse aperture **28a-d**. The first and second transverse apertures **24a-d** and **28a-d** are transverse to axis **X** and the parallel apertures **26a-d** are parallel to axis **X**. To secure together clamp corners **12** and **14** to form first clamp half **20**, a first transverse bolt **29a** is threaded through the first transverse aperture **24b** on clamp corner **14**. Then, said first transverse bolt **29a** is threaded through the first transverse aperture **24a** on clamp corner **12** and the first transverse bolt **29a** is finally secured with a first transverse lock nut **30a**. Next, a second transverse bolt **29b** is threaded through the second transverse aperture **28b** on clamp corner **14**. Then, said second transverse bolt **29b** is threaded through the second transverse aperture **28a** on clamp corner **12**. Next, the second transverse bolt **29b** is then finally secured with a second transverse lock nut **30b**. Similarly, to secure together clamp corners **16** and **18** to form second

clamp half **22**, a third transverse bolt **29c** is threaded through the first transverse aperture **24d** on clamp corner **18**. Then, said third transverse bolt **29c** is threaded through the first transverse aperture **24c** on clamp corner **16**. Next, the third transverse bolt **29c** is secured with a third transverse lock nut **30c**. Next a fourth transverse bolt **29d** is threaded through the second transverse aperture **28d** on clamp corner **18**. Then, said fourth transverse bolt **29d** is threaded through the second transverse aperture **28c** on clamp corner **16**. Finally, the fourth transverse bolt **29d** is then secured with a fourth transverse lock nut **30d**.

[0025] As shown in FIG. **1**, also present between the clamp corners **12** and **14** is a first spacer **32a** and a second spacer **32b**. Similarly, there is also present a third spacer **32c** and a fourth spacer **32d** between the clamp corners **16** and **18** as best shown in FIG. **2**. A washer **34a-d** is placed between the head of respective transverse bolts **29a-d** and the clamp corner to which it is secured as best shown in FIG. **1**.

[0026] For any given adaptation of the adjustable pipe clamp **10**, the spacers **32a-d** will be the same size. The size of the particular spacers **32a-d** selected to be placed within clamp **10** will depend upon the size of the pipes **P1** and **P2** to be welded together. The clamp **10** of the present invention can accommodate pipes with a diameter between 1.5 and 6 inches, with the spacers **32a-d** being sized to fit pipes between that range of diameters, with a new set of spacers being used for each half-inch diameter between said range of 1.5 to 6 inches. In one embodiment, to accommodate welding together pipes with a diameter of 1.25 inches, the spacers **32a-d** will be about 0.16 inches in length. In another embodiment, to accommodate welding together pipes with a diameter of 1.5 inches, the spacers **32a-d** will be about 0.40 inches in length. In an additional embodiment, to accommodate welding together pipes with a diameter of 2 inches, the spacers **32a-d** will be about 0.875 inches in length. In yet another embodiment, to accommodate welding together pipes with a diameter of 2.5 inches, the spacers **32a-d** will be about 1.375 inches in length.

[0027] Once the clamp corners **12** and **14** have been secured together to form the first clamp half **20** and the clamp corners **16** and **18** have been secured together to form the second clamp half **22**, the first and second clamp halves **20** and **22** can be secured together to form the clamp **10** as shown in FIG. **4**. To do this, a pair of parallel bolts **36a** and **36b**, with accompanying washers **38a** and **38b**, are placed through the parallel apertures **26a** and **26b** of the first clamp half **20**; then a pair of threaded inserts **40a** and **40b** are placed within the parallel apertures **26b** and **26c** of the second clamp half **22**, and finally the parallel bolts **36a** and **36b** are secured within the threaded inserts **40a** and **40b** to form the clamp **10**. Although the embodiment above was discussed with the parallel bolts **36a** and **36b** being first placed within the first clamp half **20**, it is also envisioned by the present invention that the parallel bolts **36a** and **36b** could be first placed within the second clamp half **22**.

[0028] In one or more embodiments, the transverse bolts **29a-d** are a first length and the parallel bolts **36a-b** are a second length, wherein the first length is shorter than the second length.

[0029] Once the clamp **10** is secured in place around the pipes **P1** and **P2**, the clamp forms a weld window **W** that allows for a user to then proceed to tack weld together the pipes **P1** and **P2**.

Although not shown in the drawings, there is also a second weld window formed by the clamp **10** on the opposite side clamp **10** which also allows for a tack weld to take place. Once the tack welding has taken place within the weld windows **W**, the clamp **10** is removed and then the weld can be finished around the entire connection between the two pipes **P1** and **P2**.

[0030] In one or more embodiments, the clamp corners **12**, **14**, **16**, and **18** are made from preheated 4140 steel, and prior to use, the clamp corners **12**, **14**, **16**, and **18** are then electroless nickel plated.

In one or more embodiments, the spacers **32a-d** are cut to length from a tube made from 4130 steel.

[0031] In light of the foregoing, it should be appreciated that the present invention significantly advances the art by providing an adjustable pipe clamp and method of using the same that is structurally and functionally improved in a number of ways. While particular embodiments of the invention have been disclosed in detail herein, it should be appreciated that the invention is not

limited thereto or thereby inasmuch as variations on the invention herein will be readily appreciated by those of ordinary skill in the art. The scope of the invention shall be appreciated from the claims that follow.

Claims

1. A method of welding together the ends of two pipes comprising the steps of: a. securing a first clamp corner to a second clamp corner to create a first clamp half; b. securing a third clamp corner to a fourth clamp corner to create a second clamp half; c. placing a first end of a first pipe adjacent a first end of a second pipe to create a weldable pipe; d. placing said first clamp half adjacent a first side of said weldable pipe and said second clamp half adjacent a second side of said weldable pipe; e. securing said first clamp half to said second clamp half to create an adjustable clamp having a first and second weld window; and f. welding together said weldable pipe within said first and second weld windows.
 2. The method of claim 1, wherein each said clamp corner includes a first transverse aperture, a second transverse aperture, and a third parallel aperture, wherein the first and second transverse apertures are transverse relative to a first axis perpendicular to the pipes and the third parallel aperture is parallel relative to the first axis.
 3. The method of claim 2, wherein said step of securing said first clamp corner to said second clamp corner includes placing a first transverse bolt within the first transverse aperture of said first clamp corner and a second transverse bolt within the second transverse aperture of said first clamp corner, placing a first spacer around the first transverse bolt and a second spacer around the second transverse bolt, placing said first transverse bolt within the first transverse aperture of said second clamp corner and said second transverse bolt within the second transverse aperture of said second clamp; and securing a first transverse lock nut to an end of said first transverse bolt and a second transverse lock nut to an end of said second transverse bolt.
 4. The method of claim 3, wherein said step of securing said third clamp corner to said fourth clamp corner includes placing a third transverse bolt within the first transverse aperture of said third clamp corner and a fourth transverse bolt within the second transverse aperture of said third clamp corner, placing a third spacer around the third transverse bolt and a fourth spacer around the fourth transverse bolt, placing said third transverse bolt within the first transverse aperture of said fourth clamp corner and said fourth transverse bolt within the second transverse aperture of said fourth clamp; and securing a third transverse lock nut to an end of said third transverse bolt and a fourth transverse lock nut to an end of said second transverse bolt.
 5. The method of claim 4, wherein said step of securing said first clamp half to said second clamp half includes placing a first parallel bolt within the third parallel aperture of the first clamp corner of the first clamp half and a second parallel bolt within the third parallel aperture of the second clamp corner of the first clamp half, placing a first threaded insert within the third parallel aperture of the third clamp corner of the second clamp half and a second threaded insert within the third parallel aperture of the fourth clamp corner of the second clamp half, and securing the first threaded insert with the first parallel bolt and the second threaded insert with the second parallel bolt to create the adjustable clamp.
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