

A WELDING TABLE

FIELD OF THE INVENTION

The present invention relates to a welding table and particularly although not solely to a welding table incorporating a heat sink for cooling metal components while welding to reduce heat distortion.

BACKGROUND OF THE INVENTION

In most welding processes such as fusion welding for hull construction in the shipbuilding industry, heat produced from the welding process often causes distortion of the welded components such as metals, steel panels or the like. Welding distortion tends to occur primarily due to localised heat input. Such distortions are undesirable and as a result, high man-hours are often exhausted to correct such distortions by further heat treatment or fairing.

Hence, to prevent or reduce distortion of the metals, cooling devices have been employed. Heat sinks, such as a metal plate which is water or air cooled is known in the art for the purposes of preventing distortion of steel plate during welding. See for example JP 07124782A2. Other types of cooling devices that are commonly employed are cooling tables onto which welding of metals take place.

In the shipbuilding industry, welding processes often take place in open space. In some instances, low ambient temperature may aid in cooling the components during welding. However, in tropical countries such as Singapore, the ambient temperature is generally higher than the ambient temperature in the non tropical countries such as some European countries especially during the seasons of winter, spring and autumn. Hence, the need to provide a cooling device for welding processes in the shipbuilding industry is more acute in tropical countries.

It is accordingly an object of the present invention to provide a welding table with cooling component or components for expelling heat produces from welding which addresses the abovementioned disadvantages or which will at least provide the public with a useful choice.

BRIEF DESCRIPTION OF THE INVENTION

Accordingly in a first aspect the present invention consists a welding table to provide support to a metal component during welding of said components said welding table comprising

a base structure

a working top onto which said metal components may be placed to be supported on said working top said working top positioned on said base structure

wherein said base structure includes or defines with said working top placed

thereon an enclosure which is capable, in use, to contain a fluid in thermal communication with said working top to thereby act as a heat sink to said working top.

Preferably said base structure has a box like perimeter structure defined by perimeter surfaces save for a top surface to provide an upper opening to said base structure which is covered by said working top.

Preferably said base structure has a box like perimeter structure defined by perimeter surfaces, said working top placed onto a top perimeter surface of said base structure.

Preferably said base structure has a shallow depth enclosure of a depth less than 30% of the width or length of the base structure.

Preferably said enclosure includes an inlet and an outlet via which the displacement of said fluid into and out of said base structure can, in use, occur to transfer heat gained by said fluid via said working top from said metal component away from said working surface.

Preferably base structure within said enclosure, includes a labyrinth like structure.

Preferably said labyrinth like structure is defined by a plurality of baffles.

Preferably said labyrinth like structure is defined by a plurality of baffles defining an elongated flow path between said inlet and outlet openings.

Preferably said enclosure of base structure is defined by a bottom panel upstanding from which is/are side panels defining a trough like enclosure of a constant depth (bottom panel to top of side panels).

Preferably said base structure within said enclosure, includes a labyrinth like structure defined by a plurality of baffles upstanding from said bottom panel and within the boundary defined by said side panel(s).

Preferably at least one said baffle extends across the direct path between said inlet and outlet openings.

Preferably said each said baffle extends across the direct path between said inlet and outlet openings.

Preferably said base structure is quadrilateral in plan (looking down on said working top) shape and wherein each said baffle extends between diametrically opposed side panels save for at least one opening in each said baffle to allow said fluid to pass through said baffle in a path towards said outlet opening.

Preferably said base structure is quadrilateral in plan (looking down on said working top) shape and wherein each said baffle extends between diametrically opposed side panels save for at least one opening in each said baffle to allow said fluid to pass through said baffle in a path towards said outlet opening wherein the openings of immediately adjacent said baffles are in a staggered formation.

Preferably said base structure is quadrilateral in plan (looking down on said working top) shape and wherein each said baffle extends between diametrically opposed side panels save for one opening in each said baffle to allow said fluid to pass through said baffle in a path towards said outlet opening wherein the opening of a first of said baffle is provided at one of said diametrically opposed side panels and the opening of the adjacent baffle is at the other of said diametrically opposed side panels.

Preferably said working top includes a planar surface onto which said metal component may be supported.

Preferably said working top includes a planar sheet of material.

Preferably said material is a metal material.

Preferably said metal material is selected from one of aluminium and copper and steel.

Preferably said working top includes a plurality of attractive elements to, in use attract said metal component to said working top to secure it to said working top.

Preferably said working top includes grid of a plurality of attractive elements to, in use attract said metal component to said working top to secure it to said working top.

Preferably each said attractive element is a magnetic or magnetisable member.

Preferably each attractive elements is an electromagnet.

Preferably said each attractive elements is a permanent magnet.

Preferably said attractive element is located within a respective recess provided in said working top.

Preferably said attractive element is located within a cavity extending through said base structure.

Preferably a means to circulate said fluid within said enclosure is provided.

Preferably said means to circulate includes a pump.

Preferably said fluid is passed through a heat exchanger external of said enclosure.

In a second aspect the present invention consists a welding table supporting a metal component during welding of said components said welding table comprising

a base structure

a working top onto which said metal components are placed to be supported on said working top said working top positioned on said base structure

wherein said base structure includes or defines with said working top placed

thereon an enclosure which is capable to contain a fluid in thermal communication with said working top to thereby act as a heat sink to said working top.

In a third aspect the present invention consists a welding table supporting a metal component during welding of said components, said welding table comprising

a base structure

a working top onto which said metal components are placed, said working top positioned on said base structure

wherein said base structure includes or defines with said working top placed thereon an enclosure which contains a fluid that flows through said base structure via at least two openings in said base structure, via at least one labyrinth structure confined flow path provided within said enclosure.

Preferably said openings are inlet and outlet via which the displacement of said fluid into and out of said base structure transfers heat gained by said fluid via said working top from said metal component away from working surface of said working top.

In a further aspect the present invention consist in a welding table supporting a metal component or components being subjected to welding, said welding table comprising

a base structure

a working top onto which said metal components are placed and supported

wherein said working top is positioned on said base structure, and

wherein said base structure includes or defines with said working top placed thereon an enclosure which contains a fluid in thermal communication with said working top to thereby act as a heat sink to said working top.

In still a further aspect the present invention consists in a welding table to support a metal component or components which during a welding thereof become subjected to localised heat, said welding table comprising

a base structure

a working top onto which said metal components can be placed, said working top positioned on said base structure

wherein said base structure includes or defines with said working top placed thereon an enclosure which contains a fluid,

means to displace said fluid through said enclosure and via at least two openings in said base structure, said enclosure including means to define a labyrinth structure confined flow path.

Preferably said openings are inlet and outlet via which the displacement of said fluid into and out of said base structure can occur to transfer heat gained by said fluid via said working top from said metal component away from working surface of said working top.

In even a further aspect the present invention consist in a method of cooling a work piece being subjected to heat, method comprising

placing a work piece on a working surface of a kind which is positioned on a base structure and supported by said base structure, wherein said base structure includes or defines with said working top placed thereon an enclosure which is capable, in use, to contain a fluid which in thermal communication with said working top acts as a heat sink to said working top, circulating fluid within said enclosure and underneath said working surface; wherein said fluid absorbs heat produces and draws said heat away from said work piece.

This invention may also be said broadly to consist in the parts, elements and features referred to or indicated in the specification of the application, individually or collectively, and any or all combinations of any two or more of said parts, elements or features, and where specific integers are mentioned herein which have known equivalents in the art to which this invention relates, such known equivalents are deemed to be incorporated herein as if individually set forth.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred form of the present invention will now be described with reference to the accompanying drawings in which:-

Figure 1 is a perspective view of the assembled welding table in accordance with the present invention,

Figure 2 is a side view of the welding table of Figure 1,

Figure 3 is a sectional view taken on line A-A of Figure 2,

Figure 4 is a sectional view of Figure 2 in an alternative form,

Figure 5 is an inside view of the base structure of the welding table,

Figure 6 is a top view of the base structure of Figure 5, showing the arrangement of the baffles,

Figure 6A is a top view of the base structure, showing an alternative form of the arrangement of the baffles,

Figure 7 is a sectional view taken on line B-B of Figure 6A,

Figure 8 is a sectional view taken on line C-C of Figure 1,

Figure 9 is a plan view of an alternative form of the welding table in tessellated form, and

Figure 10 is a plan view of an alternative form of the base structure.

DETAILED DESCRIPTION OF THE INVENTION

With reference to Figure 1, there is shown as assembled welding table 1 of the present invention for use to provide support to a metal component during welding of the component. The

welding table 1 comprises a working top 2 and a base structure 3. The working top 2 is positioned on the base structure 3 when assembled and when in use and is positioned with its working surface horizontal. In the preferred form, the base structure 3 and correspondingly the working top 2, is of a quadrilateral plan shape. However, it is envisaged that other shapes such as circular or triangular shapes can also be adopted.

In the case where the base structure and correspondingly the working top is of a triangular or square plan shape, a plurality of the assembled triangular base structure and working top may be put together to form a tessellated welding table as illustrated in Figure 9. Different sizes of welding table could hence be formed from such tessellation.

The working top 2 and the base structure 3 are of the same or similar plan shape. Alternatively the working top 2 could be slightly larger than the base structure 3.

The working top 2 includes a planar surface 4 onto which welding component 5 (as shown in Figure 2) such as steel panels, brackets, metallic components or the like can be placed when welding takes place. In an alternative form, the planar surface 4 is provided with a planar sheet of material that covers wholly or a substantial part of said planar surface 4. The planar sheet of material is preferably of a highly heat conductive material and preferably it is metal selected from one of aluminium, copper and steel.

The base structure 3 of the welding table 1 is of a box like structure. In the preferred form, the base structure is of a box with an upper opening. When in use, the upper opening of the base structure 3 is covered by the working top 2 as shown in Figure 3.

For cost effectiveness, the base structure 3 may be made from a cheaper material such as mild steel whilst the working top 2 is made from a highly heat conductive metal such as one selected from aluminium and copper.

In an alternative form, the base structure 3 may be of a closed box structure and when in use, the working top 2 sits on the top perimeter surface 50 of the base structure 3 as shown in Figure 4. In an alternative form of this configuration, the top perimeter surface of the base structure 3 is used as the working top to support the welding component. Since the working top and the base structure are preferably made of different materials, a planar sheet of material of the type as described above is to be provided on the perimeter surface of the base structure 3.

With reference to Figure 5, the base structure 3 includes a trough like enclosure defined by a bottom panel 6 upstanding from which are first pair of opposed side panels 8, 9 and second pair of opposed side panels 10, 11. The enclosure preferably has a constant depth and said depth may be less than 30% of the width or length of the base structure for achieving effective results. However, it is envisaged that other measurements and proportions may also be adopted.

In an alternative form, the base structure 3 may include an enclosure defined by a circular bottom panel or a triangular bottom panel, both with panel or panels upstanding from their perimeter sides. The depth of the base structure of these two configurations is preferably of the same measurements and proportions as the preferred form.

As can be seen in Figure 5, the base structure 3 further includes an inlet 12 disposed at one end of first side panel 8 of said first pair of side panels and an outlet 14 disposed at other end of second side panel 9 of the first pair of side panels such that the inlet 12 and the outlet 14 are positioned diagonally opposite each other. The arrangement of the inlet 12 and outlet 14 is not limited as such, other suitable arrangements may also be adopted. For example, the inlet and outlet may be positioned adjacent to one another or be positioned directly opposite one another with each disposed at respective end of opposing side panels or each be positioned at each end of the same side panel, etc.

Within the enclosure, a labyrinth like structure or flow path to direct flow to all of said enclosure as shown in Figure 5 is provided. The labyrinth like structure is defined by a plurality of baffles 16 upstanding from the bottom panel 6 of the base structure 3. The baffles 16 are arranged substantially parallel to each other and are preferably spaced at equidistant. The space between any two baffles defines an elongated flow path for a fluid. Each baffle extends between diametrically opposed second pair of side panels 10, 11 but has at least one opening to allow fluid to flow from one side of the baffle to the other. It is to be noted that in the case where the base structure 3 having a circular bottom panel, no such opening will be provided. The baffles provided within the circular bottom panel will be of a spiral configuration as shown in Figure 10.

An opening 18 of each baffle defined by a space between inner surface of first pair of either side panels 8, 9 and one end of the baffle is provided to allow the fluid to pass through in a path towards the outlet 14. The openings 18 of immediately adjacent the baffles 16 are in staggered formation in that the opening of a first of said baffle 9 is provided at one of the diametrically opposed side panel 9 and the opening of the adjacent baffle is at the other of the diametrically opposed side panel 8.

When the welding table 1 is in use, the enclosure constrains the fluid that is in thermal communication with the working top 2 to thereby act as a heat sink which allows heat to be drawn away from the working top 2. In the preferred form as shown in Figure 5, the fluid such as air or water flows in from said inlet 12, passes through first elongated flow path, through the opening 18 of first baffle adjacent second pair of side panel 10, through second elongated flow path, through the opening of baffle immediately adjacent the first baffle and so on until the fluid flows out through the outlet 14. The constant displacement of the fluid into and out of the enclosure transfer heat gained by the fluid via the working top 2 from the metal component 5 away from the planar

(working) surface 4. This creates a cooling effect that aids in delocalising of heat produces during welding and thereby reduces heat distortion of the welding components.

In order to achieve a constant circulating effect of the fluid within the enclosure or to maintain a constant input of the fluid to the enclosure, device such as a pump and preferably a heat exchanger external of the enclosure is used. It is envisaged that other suitable devices that serve the same purpose or purposes can also be adopted.

It is readily appreciated by a person skilled in the art that the term “fluid” refers to a gas/air or a liquid of any kind. In the preferred form, said fluid is a gas/air.

In an alternative form, the base structure 3 is further provided with a plurality of second set of baffles 20 that extends across the direct path between said inlet 12 and outlet 14 as shown in Figure 6A to form a lattice like structure. Each of the second set of baffles 20 have a plurality of holes spaced at equidistant along its longitudinal length through which the fluid passes (as shown in Figure 7). In the assembled form of the working table 1, the number of holes provided on each second set of baffles 20 corresponds with the number of the elongated flow path. The second set of baffles act to provide rigidity to the working surface.

As shown in Figure 1, the planar surface 5 of the working top 2 is provided with a plurality of recesses 22. In the preferred form, the recesses 22 are aligned in grid form. However, it will be appreciated by a person skilled in the art that other suitable arrangements of the recesses 22 may be adopted.

Within each recess 22 there is provided an attractive element 24 such as magnet (permanent or electromagnet) or magnetised member. When the working table 1 is in use, each attractive element 24 within each recess 22 attracts the welding component 5 to secure the welding component 5 to the working top 2. The magnetised working top holds the welding component 5 in place to prevent any movement of the welding component 5 during welding process.

Alternatively, the attractive element 24 is located within a cavity 26 extending through the base structure 3.

The above description is provided for the purposes of exemplification only and it will be understood by a person skilled in this field that modifications and variations may be made without departing from the invention

CLAIMS

1. A welding table to provide support to a metal component or components during their being subjected to welding, said welding table comprising

a base structure

a working top onto which said metal components may be placed to be supported on said working top said working top positioned on said base structure

wherein said base structure includes or defines with said working top placed

thereon an enclosure which is capable, in use, to contain a fluid which in thermal communication with said working top acts as a heat sink to said working top, wherein

said base structure is of a box like perimeter structure defined by perimeter surfaces save for a top surface to provide an upper opening to said base structure which is covered by said working top and

defined within its perimeter surfaces a shallow depth said enclosure of a depth less than 30% of the width or length of the base structure, wherein

said enclosure includes an inlet and an outlet via which the displacement of said fluid into and out of said base structure can, in use, occur to transfer heat gained by said fluid via said working top from said metal component away from said working surface, wherein

said base structure within said enclosure, includes a labyrinth like structure.

2. A welding table to provide support to a metal component or components during their being subjected to welding, said welding table comprising

a base structure

a working top onto which said metal components may be placed to be supported on said working top said working top positioned on said base structure

wherein said base structure includes or defines with said working top placed

thereon an enclosure which is capable, in use, to contain a fluid which in thermal communication with said working top acts as a heat sink to said working top, wherein

said base structure has a box like perimeter structure defined by perimeter surfaces, said working top placed onto a top perimeter surface of said base structure and

defined within its perimeter surfaces a shallow depth said enclosure of a depth less than 30% of the width or length of the base structure, wherein

said enclosure includes an inlet and an outlet via which the displacement of said fluid into and out of said base structure can, in use, occur to transfer heat gained by said fluid via said working top from said metal component away from said working surface, wherein

said base structure within said enclosure, includes a labyrinth like structure.

3. A welding table as claimed in claims 1 and 2 wherein said labyrinth like structure is defined by a plurality of baffles.
4. A welding table as claimed in claims 1 and 2 wherein said labyrinth like structure is defined by a plurality of baffles defining an elongated flow path between said inlet and outlet openings.
5. A welding table as claimed in any in one of claims 1 to 2 wherein said enclosure of base structure is defined by a bottom panel upstanding from which is/are side panels defining a trough like enclosure of a constant depth (bottom panel to top of side panels).
6. A welding table as claimed in claim 4 wherein said base structure within said enclosure, includes a labyrinth like structure defined by a plurality of baffles upstanding from said bottom panel and within the boundary defined by said side panel(s).
7. A welding table as claimed in claim 6 wherein at least one said baffle extends across the direct path between said inlet and outlet openings.
8. A welding table as claimed in claims 6 to 7 wherein each said baffle extends across the direct path between said inlet and outlet openings.
9. A welding table as claimed in any one of claim 6 to 8 wherein said base structure is quadrilateral in plan (looking down on said working top) shape and wherein each said baffle extends between diametrically opposed side panels save for at least one opening in each said baffle to allow said fluid to pass through said baffle in a path towards said outlet opening.
10. A welding table as claimed in any one of claims 6 to 9 wherein said base structure is quadrilateral in plan (looking down on said working top) shape and wherein each said baffle extends between diametrically opposed side panels save for at least one opening in each said baffle to allow said fluid to pass through said baffle in a path towards said outlet opening wherein the openings of immediately adjacent said baffles are in a staggered formation.
11. A welding table as claimed in any one of claims 6 to 10 wherein said base structure is quadrilateral in plan (looking down on said working top) shape and wherein each said baffle extends between diametrically opposed side panels save for one opening in each said baffle to allow said fluid to pass through said baffle in a path towards said outlet opening wherein the opening of a first of said baffle is provided at one of said diametrically opposed side panels and the opening of the adjacent baffle is at the other of said diametrically opposed side panels.

12. A welding table to support a metal component or components which during a welding thereof become subjected to localised heat, said welding table comprising a base structure

a working top onto which said metal components can be placed, said working top positioned on said base structure

wherein said base structure includes or defines with said working top placed thereon an enclosure which contains a fluid,

means to displace said fluid through said enclosure and via at least two openings in said base structure, said enclosure including means to define a labyrinth structure confined flow path.