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COMPLETE SPECIFICATION

Improvements in or relating to Soldered Joints

We, CALTEX (INDIA) LIMITED, a Company organised under the laws of the Bahama Islands, of "Caltex House," No. 8 Ballard Road, Ballard Estate, Bombay, India, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention is for improvements in and relating to the soldering of metal parts, such as the soldering of seams and joints in the manufacture of metal containers or like articles.

It is well known to unite two or more sections of metal by an application of solder and also to apply solder to the seams and/or joints of manufactured metal containers or other metal articles. The usual practice is to bring one piece of metal into contact with the other and then to solder the exposed surface around the area to be jointed. It has been found, however, that this external or after-application of solder to formed seamed areas, or for the uniting of two or more sections of metal which have been lap-jointed for soldering, does not offer sufficient strength to the concealed surfaces to be soldered because it does not permit the entry of the solder to the fullest extent between the contacting surfaces. The strength of the soldered union, joint or seam is therefore poor and also the general appearance of the soldered piece or article suffers from the soldered edges giving visible evidence of the soldering operation.

The present invention has for its object to provide a method of soldering two metal surfaces, especially the seams and/or joints of manufactured metal containers and other articles, whereby the strength of the soldered union formed between the two metal surfaces is considerably increased as compared to past soldering methods, the finished union shows substantially no external evidence of the soldering operation, the application of the solder is confined to a specific location or locations, and the amount of solder used may be controlled.

The invention has further for an object to provide an improved method of manufacturing metal containers and like articles having soldered seams and/or joints and the provision of improved metal containers having greater stability than the soldered metal containers hitherto manufactured.

According to the invention, a method of forming a soldered union between two metal surfaces, comprises pre-applying solder metal in liquid form to an area of one of said surfaces by passing said one surface between solder coating rollers whereof one rotates in a bath of liquid solder metal and applies the same to said one surface as it passes between said rollers, then bringing over and against said pre-applied solder an area of the other of said surfaces whereby entirely to confine and conceal the solder metal between the two overlapping surface areas and then applying heat to fuse the solder metal and form an entirely concealed soldered union which extends throughout said overlapping areas.

The invention further relates to a method of forming a soldered joint or seam in a manufactured metal container or like article, which comprises pre-applying solder in the manner set forth above to either one of the areas which are to be overlapped or to both areas, allowing said pre-applied solder to solidify, and then forming the joint or seam with the solidified solder metal locked within the internal surfaces of the joint or seam and thereafter heating the jointed or seamed areas to form the soldered union entirely concealed within the joint or seam.

The invention particularly comprises a method for use in the manufacture of metal containers or other hollow metal articles according to which there is first deposited in the manner set forth above on a blank or plate of metal to be formed into a part of the container or other hollow article to be made a layer of solder metal in liquid form, which is then allowed to solidify thereon, the blank or plate is then formed into the desired

[Price 3s. 0d.]

shape of container or other article part, a complementary part of the container or other article being made is brought into jointing or seaming position relatively to said first part and a joint or seam is made between said two parts and the soldered union completed by heating to fuse the solder metal.

In its preferred form of application to the manufacture of metal containers of the type intended to have a top and a bottom part soldered to a main body part, the method comprises taking a blank or plate of metal adapted to be formed into one half of the container body and pre-applying in the manner set forth above, a layer of liquid solder along one edge of said blank or plate, and along the opposite edge of said blank or plate, allowing the liquid solder layers to solidify, deforming the blank or plate to provide one half of the body part of the container with the pre-solder-coated opposite edges thereof forming upper and lower flanges with the solder facing outermost, repeating the operation on a second blank or plate of metal to form the other half of the container body part, bringing the two body halves together and joining or seaming them as by side-seam clinching, whereby to form a completed container body having upper and lower flanges each carrying on the outer surface of the same a layer of solidified solder metal, applying against said respective flanges the top and bottom parts of the container and double-seaming the same in position so that the pre-solder coated flanges of the container body are each folded into a double seam with the marginal flanges of the top and bottom container parts respectively with the layers of solder entirely concealed and locked within the internal surfaces of the respective seams, and thereafter applying heat to fuse the solder between the internal surfaces of the seams.

In order that the invention may be more fully understood, a preferred embodiment of the same as applied to the manufacture of a metal container will now be described in the following, by way of example, with reference to the accompanying drawings, in which:

Figs. I (a), (b) and (c) illustrate diagrammatically the arrangement of solder coating rollers for depositing a layer of liquid solder on one of the metal surfaces to be soldered, and

Figs. II (a) to (f) illustrate diagrammatically various stages in the manufacture of the container.

In the Example described, the container to be manufactured is of the type suitable for storing and transporting oils and like commodities and is designed to have a lid or top part and a bottom part soldered to a main body part and the invention is applied to the soldering operation required between those complementary container parts as are formed by the said top and bottom parts and the body part respectively, but not to the seaming of the body part itself. There will thus first be described the manufacture of the body part of the container with pre-deposited layers of solder metal thereon at areas with which the container top and bottom parts are to be united and then the operations necessary to complete the soldering of the said top and bottom parts in position.

With reference to the drawings, a trimmed blank or plate 1 (Fig. II(a)) of sheet metal or tinplate is fed into a solder coating machine illustrated diagrammatically in Figs. I (a), (b) and (c). In Fig. I (a), the machine is shown as comprising input and output feed-rollers 2 which operate to regulate the movement of the plate or blank 1. The said plate or blank passes between solder coating rollers consisting of upper pressure rollers 3 which press the plate or blank 1 against solder coating rollers proper 4 which rotate in a bath or pot 5 of molten solder metal 6. Fig. I (c) is a front elevation of the pressure and solder coating rollers 3, 4 and the solder bath 5 and it will be seen that there are two upper pressure rollers 3 and two lower solder coating rollers 4. When the blank or plate 1 travels through the machine the rollers 4 deposit a controlled amount of liquid solder metal along the opposite underedges of the plate or blank to form layers or ribbons of deposited solder metal confined to, and spread over, pre-determined areas at opposite edges of the blank or plate. This is clearly shown in Fig. II(a). In its movement through the machine, the blank or plate 1 is regulated both when entering and leaving the rollers 3, 4 by the feed-rollers 2 which are shown in elevation in Fig. I(b).

The layers or ribbons of solder metal deposited on opposite edges of the plate or blank 1 are allowed to solidify and the plate or blank is then deformed in any suitable or known manner into the shape of a half container body. This is shown in Fig. II(b) and it will be seen that the edges of the plate or blank carrying the pre-deposited ribbons or layers of solder metal form on the half container body upper and lower flanges 7 and 7*a* respectively having their layers of pre-deposited solder facing outermost.

The operation is repeated on a second blank 1*a* and the two halves of the container body so formed are then joined together by a well known side-seam clinching process along the lines 8 to form a completed container body having upper and lower flanges 7, 7*a* each carrying on the outer surface of the same a pre-deposited layer of solder metal as shown in Fig. II(c).

In Fig. II(d) are illustrated the container top 9 and bottom 10 about to be attached to the container body. This operation is effected by applying against the top flange 7 of the

container body the marginal flange of the container top 9 so that the layer of solidified solder metal on the flange 7 is entirely confined within and concealed between the surface areas of the contacting flanges. The joining of the container top to the upper part of the container body is then made by a known double-seaming process whereby the pre-solder coated flange 7 is folded or curled into a double seam with the flange of the container top and the layer of solidified solder metal is locked within the internal surfaces of the seam so made. Exactly the same operation takes place with the container bottom 10 and the lower pre-solder coated flange 7*a*. Hereagain the container bottom is double-seamed to the pre-solder coated flange 7*a* with the solidified layer of solder metal locked within the internal surfaces of the seam. This is shown in Fig. (II (e)). The container is then ready for sweating, i.e. to have the soldering operation of the container top 9 and bottom 10 to the container body completed. This is a heating and fusing operation which is illustrated diagrammatically in Fig. II (f) where the container is shown passing between four burners 11 which may be kerosene burners or any other suitable or convenient sources of heat and which are located in such a position that heat is supplied and isolated to the seamed areas. These areas are thereby raised to a suitable temperature whereby to fuse the solder metal and complete the soldered union of the container top and bottom to the container body.

Although the operation has been shown, by way of example, as involving the pre-solder coating of the container body flanges 7 and 7*a* only with the cooperating flange areas of the container top and bottom 9 and 10 respectively left without any solder layer, this is not absolutely necessary, although it makes for economy in solder. It would be quite possible, however, to pre-solder coat also the flange areas of the container top 9 and/or bottom 10.

It will be seen that by means of the invention there is obtained a soldered joint or seam which has a number of important advantages over soldered joints or seams hitherto proposed. These advantages are that the method of the invention permits the soldering of the internal contact areas of the joints or seams, thereby making for a considerably stronger joint or seam with the fused solder metal extending throughout the internal contact areas and being entirely confined and concealed therein. This has the important advantage that the greater strength at the joint or seam improves considerably the stability of the containers. Also, the general external appearance of the containers is improved because they bear no evidence of external solder around the top and bottom seamed areas. The method also permits of control of the amount of solder deposited in the soldering operation and the confining of the solder to a specific location or locations.

The above are indications of some of the advantages obtained by means of the invention and also of one particularly important application of the invention. It will be understood, however, that the invention is not limited thereto but may be applied to the forming of a soldered union between any two metal surfaces and that the scope of the invention is limited only by that of the appended claims.

What we claim is:—

1. A method of forming a soldered union between two metal surfaces, which comprises pre-applying solder metal in liquid form to an area of one of said surfaces by passing said one surface between solder coating rollers whereof one rotates in a bath of liquid solder metal and applies the same to said one surface as it passes between said rollers, then bringing over and against said pre-applied solder an area of the other of said surfaces whereby entirely to confine and conceal the solder metal between the two overlapping surface areas and then applying heat to fuse the solder metal and form an entirely concealed soldered union which extends throughout said overlapping areas.

2. A method according to claim 1, wherein a layer of solder metal in liquid form is pre-applied in the manner stated on each of the areas which are to be brought together, the pre-applied solder metal being allowed to solidify before the areas are brought together for the fusing by heat.

3. A method of forming a soldered joint or seam in a manufactured metal container or like article, which comprises pre-applying solder in the manner stated in claim 1 to either one of the areas which are to be overlapped or to both areas in the manner stated in claim 2, allowing said pre-applied solder to solidify, and then forming the joint or seam with the solidified solder metal locked within the internal surfaces of the joint or seam and thereafter heating the jointed or seamed areas to form the soldered union entirely concealed within the joint or seam.

4. In the manufacture of a metal container or other hollow metal article, the method wherein a layer of solder metal in liquid form is deposited in the manner stated in claim 1, on a blank or plate of metal to be formed into a part of the container or other hollow article to be made and is allowed to solidify thereon, the bank or plate is then formed into the desired shape of container or other article part, a complementary part of the container or other article being made is brought into jointing or seaming position relatively to said first part and a joint or seam is made between the said two parts, and the soldered union

container body the marginal flange of the container top 9 so that the layer of solidified solder metal on the flange 7 is entirely confined within and concealed between the surface areas of the contacting flanges. The joining of the container top to the upper part of the container body is then made by a known double-seaming process whereby the pre-solder coated flange 7 is folded or curled into a double seam with the flange of the container top and the layer of solidified solder metal is locked within the internal surfaces of the seam so made. Exactly the same operation takes place with the container bottom 10 and the lower pre-solder coated flange 7*a*. Hereagain the container bottom is double-seamed to the pre-solder coated flange 7*a* with the solidified layer of solder metal locked within the internal surfaces of the seam. This is shown in Fig. (II (e)). The container is then ready for sweating, i.e. to have the soldering operation of the container top 9 and bottom 10 to the container body completed. This is a heating and fusing operation which is illustrated diagrammatically in Fig. II (f) where the container is shown passing between four burners 11 which may be kerosene burners or any other suitable or convenient sources of heat and which are located in such a position that heat is supplied and isolated to the seamed areas. These areas are thereby raised to a suitable temperature whereby to fuse the solder metal and complete the soldered union of the container top and bottom to the container body.

Although the operation has been shown, by way of example, as involving the pre-solder coating of the container body flanges 7 and 7*a* only with the cooperating flange areas of the container top and bottom 9 and 10 respectively left without any solder layer, this is not absolutely necessary, although it makes for economy in solder. It would be quite possible, however, to pre-solder coat also the flange areas of the container top 9 and/or bottom 10.

It will be seen that by means of the invention there is obtained a soldered joint or seam which has a number of important advantages over soldered joints or seams hitherto proposed. These advantages are that the method of the invention permits the soldering of the internal contact areas of the joints or seams, thereby making for a considerably stronger joint or seam with the fused solder metal extending throughout the internal contact areas and being entirely confined and concealed therein. This has the important advantage that the greater strength at the joint or seam improves considerably the stability of the containers. Also, the general external appearance of the containers is improved because they bear no evidence of external solder around the top and bottom seamed areas. The method also permits of control of the amount of solder deposited in the soldering operation and the confining of the solder to a specific location or locations.

The above are indications of some of the advantages obtained by means of the invention and also of one particularly important application of the invention. It will be understood, however, that the invention is not limited thereto but may be applied to the forming of a soldered union between any two metal surfaces and that the scope of the invention is limited only by that of the appended claims.

What we claim is:—

1. A method of forming a soldered union between two metal surfaces, which comprises pre-applying solder metal in liquid form to an area of one of said surfaces by passing said one surface between solder coating rollers whereof one rotates in a bath of liquid solder metal and applies the same to said one surface as it passes between said rollers, then bringing over and against said pre-applied solder an area of the other of said surfaces whereby entirely to confine and conceal the solder metal between the two overlapping surface areas and then applying heat to fuse the solder metal and form an entirely concealed soldered union which extends throughout said overlapping areas.

2. A method according to claim 1, wherein a layer of solder metal in liquid form is pre-applied in the manner stated on each of the areas which are to be brought together, the pre-applied solder metal being allowed to solidify before the areas are brought together for the fusing by heat.

3. A method of forming a soldered joint or seam in a manufactured metal container or like article, which comprises pre-applying solder in the manner stated in claim 1 to either one of the areas which are to be overlapped or to both areas in the manner stated in claim 2, allowing said pre-applied solder to solidify, and then forming the joint or seam with the solidified solder metal locked within the internal surfaces of the joint or seam and thereafter heating the jointed or seamed areas to form the soldered union entirely concealed within the joint or seam.

4. In the manufacture of a metal container or other hollow metal article, the method wherein a layer of solder metal in liquid form is deposited in the manner stated in claim 1, on a blank or plate of metal to be formed into a part of the container or other hollow article to be made and is allowed to solidify thereon, the bank or plate is then formed into the desired shape of container or other article part, a complementary part of the container or other article being made is brought into jointing or seaming position relatively to said first part and a joint or seam is made between the said two parts, and the soldered union

completed by heating to fuse the solder metal.

5. In the manufacture of metal containers of the type intended to have a top part and a bottom part soldered to a main body part, the method which comprises taking a blank or plate of metal adapted to be formed into one half of the container body and pre-applying according to claim 1 a layer of liquid solder along one edge of said blank or plate, and along the opposite edge of said blank or plate, allowing the liquid solder layers to solidify, deforming the blank or plate to provide one half of the body part of the container with the pre-solder-coated opposite edges thereof forming upper and lower flanges with the solder facing outermost, repeating the operation on a second blank or plate of metal to form the other half of the container body part, bringing the two body halves together and joining or seaming them, as by side-seam clinching, whereby to form a completed container body having upper and lower flanges each carrying on the outer surface of the same a layer of the solidified solder metal, applying against said respective flanges the top and bottom parts of said container and double-seaming the same in position so that the pre-solder-coated flanges of the container body are each folded into a double seam with the marginal flanges of the top and bottom container parts respectively with the layers of solder entirely concealed and locked within the internal surfaces of the respective seams, and thereafter applying heat to fuse the solder between the internal surface of the seams.

6. A method of forming a soldered union between two metal surfaces, substantially as hereinbefore described.

7. A method of forming a soldered joint or seam in a manufactured metal container or like article, substantially as hereinbefore described.

8. The manufacture of metal containers, substantially as described with reference to and as illustrated in the accompanying drawings.

9. A soldered union between two metal surfaces, which has been made by a method according to claim 1, 2 or 6.

10. A soldered joint or seam in a manufactured metal container or like article which has been made by a method according to claim 3 or 7.

11. A metal container or other hollow metal article which has been made by a method according to claim 4.

12. A metal container such as for the storage and transport of oil and like commodities which has been made by a method according to claim 5 or 8.

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