July 13, 1937. L. E. MITCHELL 2,086,985

WELD SPLASH SHIELD

Filed Nov. 21, 1935

Fig. 1

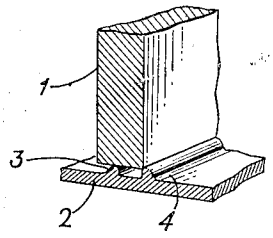


Fig. 2

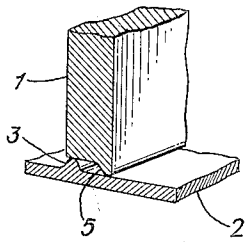


Fig. 3

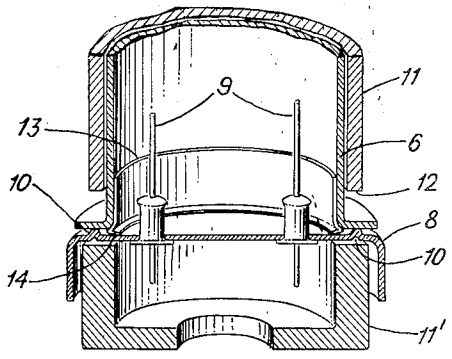
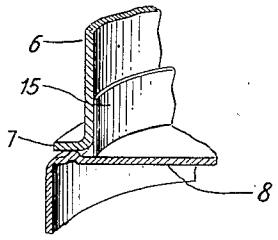


Fig. 4



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WELD-SPLASH SHIELD

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Application November 21, 1935, Serial No. 50,832

3 Claims. (Cl. 250—27.5)

My invention relates to electric welding, particularly to resistance welding of metal and to the prevention of splashing of molten metal during heating.

To join two metal pieces by resistance welding, the faces of the two pieces are placed together and sufficient current passed between the two pieces to heat and fuse them together. To increase the resistance of the contacting surfaces, a raised bead or boss may be formed upon one member to provide a line contact between the two members. The relatively small mass of the raised portion or boss quickly melts away however, and open circuits the two members unless sufficient mechanical pressure is applied between the two members to force them together as the boss softens and melts. Unfortunately, the relatively high mechanical pressures necessary between the members tend to extrude molten metal from between the two faces of the members and to splash nearby objects, leaving the welded seam rough in appearance and non-uniform in depth. In welding the parts of a metal envelope of electron discharge devices, molten metal is often splashed or sprayed upon the electrodes within the envelope causing short circuits, leakage paths, etc.

It is an object of this invention to prevent the splashing of molten metal from a welded seam, and to produce a stronger and more uniform seam.

It is a further object of my invention to improve the manufacture of welded metal envelopes of electron discharge devices.

The desired results, according to this invention, are accomplished by providing the surfaces to be welded with two or more line contacting paths, the first of which may be a raised bead or boss formed centrally along the surface to be welded. A second contacting path is provided parallel to the first and on the side of the first from which splashing is to be shielded. The passage of sufficient current through the second mentioned path to soften the metal of the raised portion is prevented by so constructing the second mentioned contacting path that its resistance will shunt the greater portion of the welding current through the first mentioned contacting path.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claims, but the invention itself will best be understood by reference to the following description taken in connection with the accompanying drawing in which Figure 1 shows one form of my invention embodying the basic characteristics thereof; Figure 2 shows a second basic embodiment of my invention; Figure 3 shows the essential characteristics of my invention employed in the fabrication of a metal envelope, and Figure 4 shows my invention in modification applied to the metal envelope of a discharge device.

The essential characteristics of my invention may be advantageously employed in welding together two metal plate members. In Figure 1, for example, where the edge of member 1 is to be joined to the surface of member 2, two bosses or raised portions 3 and 4 are formed along the surface of member 2. Bosses 3 and 4 which may be pressed, machined, cast or rolled on member 2 thus provide two parallel contacting paths between the members 1 and 2. If, for example, it is desired that molten metal be prevented from splashing to the right, boss 4 must be prevented from becoming molten during the welding operation by increasing its contact resistance with member 1 so that a substantial portion of the welding current will be shunted through boss 3, to localize the molten metal to the region of boss 3. The resistance between member 1 and boss 4 may be made greater than the resistance between member 1 and boss 3, for example, by bringing the lower corner of member 1 into sliding engagement with the side of boss 4 and by bringing the face of member 1 into direct pressure contact with boss 3. Or, boss 4 may be coated with an insulating material, such as a ferrous oxide, to increase its contact resistance with member 1. With member 1 forced under mechanical pressure toward member 2 and upon the application of a welding voltage between the two members, boss 3 first softens and then fuses with the face of member 1, boss 4 effectively sealing the right hand edge of the seam against splashing of extruded metal.

The parallel contacting paths between members 1 and 2 may, if desired, be formed as shown in Figure 2, where conjugate bosses 3 and 5 upon the members 1 and 2 may be formed to provide the two contacting paths. As suggested in connection with Figure 1, the contact resistance of one boss may be greater than the other, to confine the molten metal of the seam.

The essential characteristics of my invention may advantageously be employed in the fabrication of metal envelopes for electron discharge devices. To this end it has been found that one of the two contacting paths may be formed by means of a third metallic member held in firm

contact with the two members to be welded, this third member or shield being positioned over the seam to be welded to shield the molten metal against extrusion.

The usual metal envelope, Figure 3, of receiving tubes may comprise a cup-like shell, 6, with a flanged rim, 7, at its open end. Closure means for the shell is a circular disc or header 8 in which have been sealed gas-tight lead-in wires 9 and upon which may be mounted any desired electrode arrangement. The rim of the shell is positioned concentrically upon the header and in registry with a raised bead or boss 10 formed in the face of the header. A cylindrical shaped welding electrode 11 with an inside diameter slightly greater than the outside diameter of the shell 6 may be fitted over the shell with the annular face 12 of the electrode adapted to bear against the radially extending rim 7. A cooperating welding electrode 11 engaging the lower face of the header serves with the upper electrode to tightly compress the rim 7 of the shell into engagement with the boss 10.

In the application of my invention to the welding of metal shells to discs, a thin metal ring 13 is fitted into the end of the shell, with its outer edge extending slightly beyond the plane of the rim to engage the face of the disc in a circular line of contact. The outer edge of the ring may be crimped or rolled into a V-shaped section 14 so that the ring will fold at the apex of the V as the disc is forced against the shell to maintain a uniform and snug engagement between the edge of the ring and the disc along the annular line of contact. When the shell and header are pressed together under the driving force of the welding electrodes, the ring folds along the V section and effectively seals the inner edge of the weld seam against inward splashing or extrusion of molten metal from within the seam as the boss is melted by the heating current passed therethrough.

The characteristic features of my invention may also be employed as suggested in Figure 4. Here the ring 15 is of uniform diameter throughout its length and fits snugly in the end of the shell. Upon the compression of the header 8 against the rim 7 of the shell, the ring 15 telescopes inwardly maintaining a uniform and firm contact along its outer edge against the face of the header. This construction as in Figure 1, effectively shields the interior of the envelope from splashing molten metal from within the seam.

It will be noted that the essential characteristics of my invention may be employed in the manufacture of metal envelopes of the type above disclosed merely by providing the header or disc to shell seam with two concentric contacting paths, so that the inner contacting path provides a contact between the header and shell of sufficiently greater resistance than the outer path that the welding current will be shunted through the outer contacting path. The molten metal of the seam is thus confined to the exterior of the inner contacting path.

With envelopes of .03 inch steel stock having a shell diameter of about one inch, good welds between the heater and shell have been obtained by passing a current of the order of 50,000 amperes laterally through the seam for about $\frac{1}{20}$ of a second.

To those skilled in the art many modifications may become apparent in my invention without departing from the scope thereof. It is accordingly desired that my invention be limited only by the prior art and by the appended claims.

I claim:

1. An envelope for an electron discharge device comprising a tubular shell with a radial flange at the rim of one end, a closure disc for said end, and a metal ring in annular engagement with the inner wall of said shell and extending axially beyond said flange of the rim and into contact with said disc.

2. An envelope for an electron discharge device comprising a tubular shell with a radial flange at the rim of one end, a closure disc for said end, and a cylindrical metal ring of a diameter equal to the internal diameter of the tubular shell fitted in said shell with the edge of said ring extending axially outward from the rim of said shell and arranged to telescope slidably inward upon the compression of said closure disc over said flange.

3. An envelope for an electron discharge device comprising a tubular shell with a radial flange at the rim of one end, a closure disc for said end, and a metal ring in annular engagement with the inner wall of said shell and extending axially beyond said rim and into contact with said disc, the axially extending portion of said ring being V-shaped in cross-section.

LORIS E. MITCHELL.