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H. WOLFSON ET AL

2,421,047

METHOD OF ATTACHING WIRES TO METAL SURFACES

Filed Feb. 5, 1944

FIG. 1.

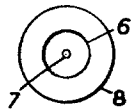


FIG. 2.

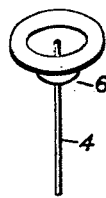


FIG. 4.

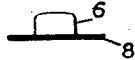
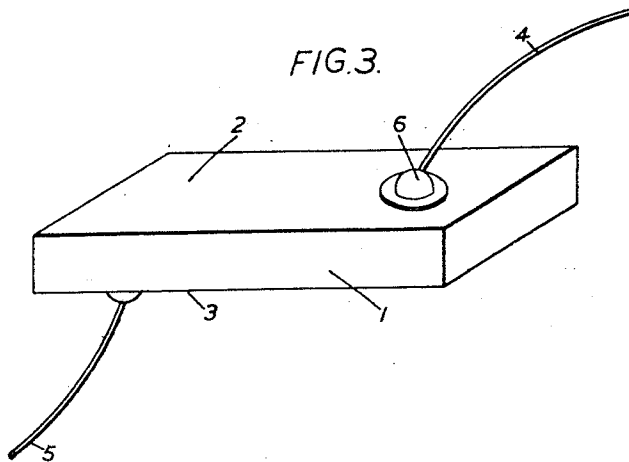


FIG. 3.



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METHOD OF ATTACHING WIRES TO METAL SURFACES

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4 Claims. (Cl. 113—112)

1

The present invention relates to improved methods for soldering or otherwise fixing wires to metal surfaces, more particularly in relation to making connections in electrical apparatus.

In electrical circuits and apparatus there are a number of cases where an element may have a metal coating or layer, or the like, of extended area, serving possibly as an electrode, to which a wire must be attached by soldering, or by a similar process, to make electrical connection therewith. Examples of such elements are piezoelectric crystals having metallic layers acting as electrodes; condensers consisting of dielectric sheets coated on both sides with metal to form the condenser plates; resistance elements in block form having metallized areas or the like for the attachment of wires. Furthermore, electrical apparatus is frequently enclosed in sheet metal boxes acting as electrostatic screens, and wires often have to be soldered to the sides of such boxes. The method described in this specification is applicable to all such cases and has the advantage that all joints are identical in appearance and are very easily and quickly made. No special jigs are required and it is not necessary to heat separately the crystal, block, or other element before a sound joint can be made, and such separate heating is often impracticable.

According to the invention, there is provided a method of attaching a wire to a metal surface which comprises sealing the wire through a metal cup with fusible metal contained therein, and attaching the cup to the surface by melting the fusible metal so that it alloys with the surface.

The invention also consists in an attachment of a wire to a metal surface comprising a metal cup, fusible metal therein, a wire sealed through the cup by the fusible metal, and an alloy of the fusible metal and the metal of the surface securing the fusible metal and the cup to the surface.

The invention will be described with reference to the accompanying drawing in which:

Fig. 1 shows the plan view of a metal cup used to make the connection between the wire and the metal surface.

Fig. 2 shows how the wire is secured to the cup; and

Fig. 3 shows a resistance element with wires attached according to the invention.

Fig. 4 shows a side elevation of a metal cup used to make the connection between the wire and the metal surface.

Fig. 3 shows as an example a block of resistance material 1 having its upper and lower surfaces 2 and 3 coated with metal layers in any

2

suitable way. The wires which are attached to these layers are designated 4 and 5 respectively. The block 1 could, for example, be a temperature sensitive resistance element having a very high temperature coefficient of resistance, with silver coatings for electrodes.

To make the joint according to the invention, a small circular cup 6 made from thin metal sheet as shown in Figs. 1 and 4 is used. This cup has a relatively wide flange 8, and the bottom of the cup has a small central hole 7 just large enough to clear the wire 4. The cup should be capable of containing just enough solder or other fusible metal to make the joint.

According to the preferred method of making the joint, the wire 4 is threaded through the hole 7 as shown in Fig. 2 so that it projects into the cup 6 nearly to the level of the flange 8. Solder is then melted into the cup up to the level of the flange so that it runs around the wire and alloys properly with it, and with the inside surface of the cup. When cool, the wire will be firmly attached to the cup.

The cup with the wire attached is now placed with the flange in contact with the coating on the surface 2 of the block, as shown in Fig. 3. A soldering iron or other suitable heating means is now applied to the outside of the cup, which is heated until molten solder alloys with the surface and appears round the edge of the flange. On allowing the cup to cool, the wire will be found to be firmly attached to the coating on the surface of the block 1; and it is not necessary to heat the block itself.

To give a specific example, the cup 6 may be made from sheet copper 0.012" thick, the diameter of the flange being $\frac{1}{4}$ inch. The internal diameter of the depression may be $\frac{1}{8}$ inch and its depth $\frac{3}{8}$ inch. It is obvious that the dimensions and material can be varied in any way to suit any particular case. It is evident also that the joint might be made in substantially the same way with any fusible metal or alloy other than solder. Furthermore the flange 8 could be shaped to fit a convex or concave surface and need not be flat as shown; the cup is not necessarily circular, and the hole 7 could be placed anywhere in the bottom or sides of the cup.

It will be noted that the cup forms a neat shield for the solder and increases the strength of the joint by increasing the soldering area. By its use a series of joints of uniform appearance can be made with the minimum of time and skill.

Although the principal application of the in-

3

vention is for making electrical connections between wires and metal surfaces, it may also be used when a purely mechanical connection is desired, for example to attach any metal object to a suspending wire. The invention is particularly adapted for this sort of application since the joint obtained in the manner described is mechanically very strong, and by crimping, knurling or otherwise deforming the end of the wire where it joins the solder, the strength may be further increased.

What is claimed is:

1. The method of attaching a wire to a metal surface which includes the steps of inserting the end of said wire into a flanged metal cup, sealing it therein with fusible metal, placing the cup and wire on the metal surface with the outer surface of the flange against said surface, and attaching said cup to said metal surface by melting said fusible metal, whereby it alloys with a portion of said surface.

2. The method of attaching a wire to a metal surface including the steps of inserting said wire into a flanged metal cup, melting and pouring fusible metal to substantially fill said cup and cooling it so as to secure said wire end there-within, placing said cup upon said surface with the flange against said surface and affixing said cup thereto by applying heat to said cup so as to melt said fusible metal, whereby it alloys with a portion of said surface.

3. The method of attaching a wire to a metal

4

surface by the use of a metal cup provided with a hole therethrough and a flange, including the steps of threading the end of said wire through said hole in said metal cup, adapting said flange to fit said surface, melting fusible metal into said cup around the end of said wire to substantially fill the cup, and allowing said metal to cool and solidify, placing said cup and wire on said surface with the outer surface of the flange against said surface, and heating said cup so as to re-melt said fusible metal, whereby it runs over and alloys with a portion of said surface.

4. A method according to claim 3, also including the additional step of deforming the end of said wire, after threading it through said hole, in order to strengthen the joining thereof with the fusible metal.

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