March 16, 1948. N. R. SMITH 2,438,075

CONTACT PIN AND METHOD OF MAKING THE SAME

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Fig. 1.

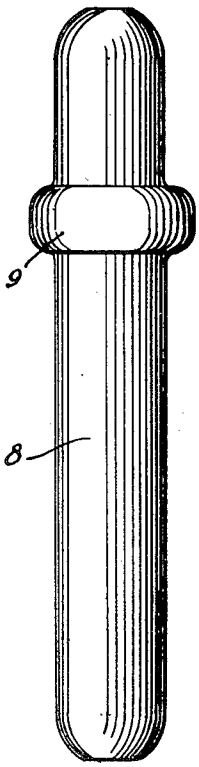


Fig. 2.

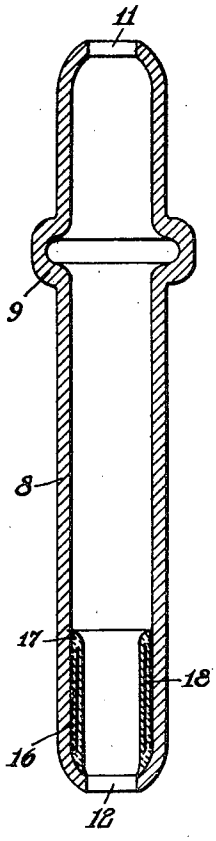
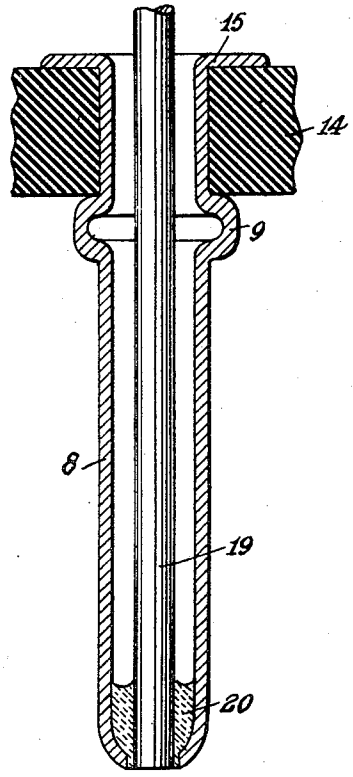


Fig. 3.



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Fig. 4.

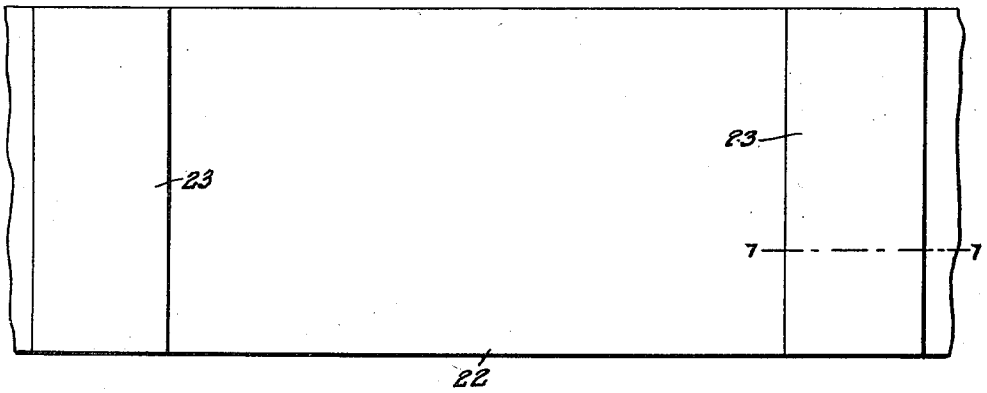


Fig. 5.

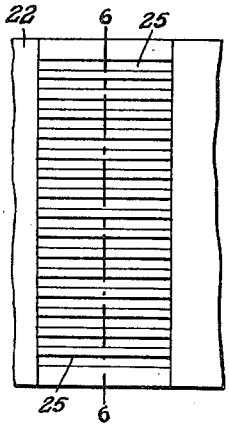


Fig. 6.

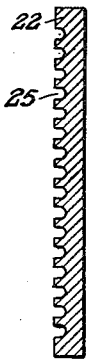


Fig. 7.

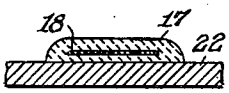


Fig. 8.

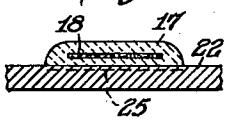


Fig. 9.

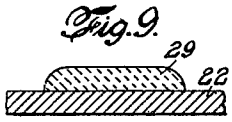


Fig. 10.

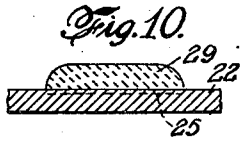


Fig. 11.

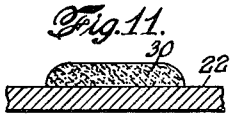
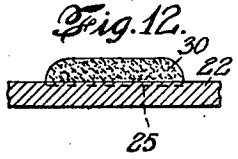


Fig. 12.



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CONTACT PIN AND METHOD OF MAKING THE SAME

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Application February 9, 1945, Serial No. 576,979

4 Claims. (Cl. 173—361)

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This invention relates to contact pins such, for example, as those used in connection with radio tubes, attachment plugs, etc., and to methods of making the same.

Such contact pins are tubular and generally made of sheet metal and are adapted to receive within them a lead wire which must be soldered to the contact pin; but it is to be understood that the invention is not to be regarded as so limited since it may be embodied in contacts of many types.

The general object of the invention is to provide a contact pin which may be secured to a lead wire with economy in the labor and materials involved, and with assurance of obtaining a satisfactory electrical bond.

A method which has been generally used for securing contact pins to lead wires is characterized by passing the end of the lead wire through the contact pin until the end of the wire extends through the opening in the end of the pin, cutting off the wire flush with the outside of the end of the pin, pressing the end of the pin into a pad wet with flux which causes flux to enter the pin, dipping the end of the pin for an instant in hot solder which enters the pin through the annular space between the end of the pin and the wire and solidifies within the pin around the wire, in the annular space and to an uncontrolled extent on the outside surface of the end of the pin. While these operations have generally given satisfactory results, the labor involved has been very considerable, the quantity of solder used has sometimes been more than is really necessary to make a good connection between the lead wire and the contact pin, and the amount of solder adhering to the outside of the pin has been objectionable.

Contacts of the pin type made according to the present invention offer the advantages, among others, of economy in the labor and the amount of solder employed in uniting the lead wire and contact pin, and of leaving the outside of the end of the contact pin substantially free of solder and in a smooth condition.

Generally speaking, the novelty in the contact pin hereinafter described resides in including within the pin, during its manufacture, the amount of solder or flux and solder necessary to provide for the satisfactory union of the lead wire with the contact pin. The solder or flux and solder in an annular-shaped mass are attached to the inside of that portion of the inside surface of the contact pin adjacent the place where the union with the lead wire is to take

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place, for example, adjacent the end of the pin remote from the end of the pin through which the lead wire is inserted. It is preferable to apply both flux and solder to the inside of the pin, but if desired only solder may be applied and the necessary flux may be introduced in the customary manner hereinbefore mentioned.

In the preferred way of using this contact pin, it is merely necessary to pass the lead wire through the contact pin and cut it off flush with the outside end of the pin in the usual way, after which sufficient heat is applied to the end of the contact pin to melt the annular-shaped mass of solder and mix it with the flux and cause the solder to unite with the lead wire and with the inside of the end of the contact pin. At the same time, the solder fills any annular space that may exist around the lead wire at the opening in the end of the contact pin, and the outside of the end of the contact pin is left substantially free of solder and in a smooth condition. As it is necessary during the soldering operation to heat only a short length of the free end of the contact pin, the danger of affecting the union of the pin at its other end with a part in which it may have been embedded is minimized.

Contact pins of the kind to which the present invention particularly relates are usually made in a suitable machine out of a sheet-metal ribbon which is drawn into tubular shape and then swaged down to final shape and dimensions, so as to form tubular contact pins having an opening at each end thereof through which the lead wire may be inserted. In the making of contact pins according to the present invention, the mass of solder or flux and solder is applied to the sheet-metal ribbon at separated intervals corresponding to those portions of each pin to the inside of which the lead wire is to be attached. Various methods may be used for applying and securing to the sheet-metal ribbon the solder or flux and solder needed in contact pins embodying the present invention. A satisfactory method of applying the mass of solder or flux and solder to the ribbon is hereinafter described.

The contact pin embodying the present invention and a method of making the same will be understood from the following description taken in connection with the accompanying drawing in which Fig. 1 shows, on an enlarged scale, the outside of a contact pin embodying the invention; Fig. 2 is a longitudinal cross-section of the contact pin showing an annular-shaped mass of solder and flux therein; Fig. 3 is a longitudinal cross-section of said contact pin after it has been

mounted in a supporting member, a lead wire has been inserted and cut off, and the solder has been melted so as to secure the pin to the lead wire; Fig. 4 is a plan view showing the masses of solder or solder and flux attached to the sheet-metal ribbon from which the contact pins embodying the invention are made; Fig. 5 is a plan view showing how the portions of the sheet-metal ribbon may be roughened prior to the application of the solder or solder and flux; Fig. 6 is a section on the line 6—6 of Fig. 5; Figs. 7 to 12 are cross-sectional elevations, as on the line 7—7 of Fig. 4, showing various masses of solder or solder and flux attached to the sheet-metal ribbon. Like parts are referred to by the same reference characters throughout the several views.

Figs. 1 and 2 show a contact pin which in external appearance is of conventional form and consists of a tubular body portion 8 having a bulge 9 and provided at its opposite ends with apertures 11 and 12. As shown in Fig. 3, the end of the pin having the opening 11 is adapted to be embedded in a supporting member 14 which at its bottom engages the bulge 9 and at its top is engaged by the lips 15 formed by bending over the edges of the hollow pin around the opening 11 by means of a staking punch, all in a manner customary in the art.

Fig. 2 shows the flux 16 and the annular-shaped mass of solder 17 having flux 18 embedded therein secured to the inside of the tubular contact member adjacent the end thereof having the opening 12. Methods by which the flux and solder may be attached securely to the sheet-metal ribbon from which the contact pin is formed will be hereinafter described. When a lead wire 19 is to be secured to the contact pin, it is inserted through the opening 11 in the contact pin and on through the opening 12. It will be obvious that after being so inserted the lead wire is surrounded by the annular-shaped mass of flux and solder. When heat is applied to the free end of the contact pin, in any suitable manner, the solder is melted and the flux is activated, and the solder assumes the position, shown at 20 in Fig. 3, in which it is bonded to the lead wire 19 and to the inside of the contact pin 8. The melted solder also fills any annular space between the lead wire 19 and the walls of the opening 12 in the free end of the contact pin. The lead wire 19 may be cut off flush with the free end of the contact pin, as shown in Fig. 3, either before or after the soldering operation has taken place. Since the solder 20 is held within the pin by surface tension and solidifies quickly in the annular space around the lead wire 19 in the opening 12, no solder becomes attached to the outside of the free end of the contact pin. Thus the lead wire 19 is secured by the solder 20 to the contact pin 8 and good electrical conductivity is assured.

As hereinbefore mentioned, it is customary to make contact pins in a machine out of a sheet-metal ribbon which is drawn into tubular shape and then swaged down to final shape and dimensions. In Fig. 4 the sheet-metal ribbon is indicated at 22, and the masses of solder or flux and solder are shown at 23 attached to the ribbon 22 at separated intervals corresponding to those portions of the ribbon which are to form the portions of each pin to the inside of which the lead wire is to be attached.

Various methods may be used for attaching the masses of solder or flux and solder to the sheet-metal ribbon so securely that they will not come off during the drawing and swaging operations to which the ribbon is subjected in the machine in which the contact pins are formed from the ribbon. It is possible to secure the masses of solder or flux and solder directly to the smooth surface of the ribbon 22; but security of attachment may be increased by roughening the portions of the metal ribbon to which said masses are to be attached. Figs. 5 and 6 show how the portions of the metal ribbon 22 may be roughened by knurling the surface as shown at 25. This type of knurling causes a clamping action on the solder when the ribbon is formed into contact pins.

Figs. 7 to 12, which are cross-sectional elevations as on the line 7—7 of Fig. 4, show various masses of solder or solder and flux attached to the sheet-metal ribbon 22. In Figs. 7, 9 and 11 the said masses are shown attached to the smooth surface of a ribbon; and in Figs. 8, 10 and 12 the said masses are shown attached to the roughened surface 25 of a ribbon. Figs. 7 and 8 show a mass of solder 17 containing a core of flux 18 (see also Fig. 2) attached to the ribbon 22. Figs. 9 and 10 show a mass of solder 29 attached to the ribbon 22. Figs. 10 and 11 show a mass, composed of a mixture 30 of powdered solder and flux, attached to the ribbon 22. In attaching the masses of solder or flux and solder to the metal ribbon 22, the portion of the ribbon to be covered, whether smooth or roughened, may be treated with flux and then the mass of solder or flux and solder may be bonded to the ribbon by the application of sufficient heat and pressure. Or, instead of applying heat and pressure to bond the masses of solder or solder and flux to the metal ribbon, a mechanical bond which will hold the masses in place during the subsequent forming of the contact pins may be obtained by swaging the masses into the roughened portions of the ribbon. These methods insure that the masses of solder or solder and flux are firmly attached to the sheet-metal ribbon; but of course variations in the method of attaching the said masses to the sheet-metal ribbon may be adopted without departing from the essence of the invention as defined in the claims.

What is claimed is:

1. An article of manufacture comprising a tubular contact pin having an end opening through which a lead wire may be passed, and an annular-shaped mass of solder through which the lead wire may also be passed located within said contact pin in axial alinement with said contact pin and said opening and intimately bonded in a high thermal conductivity relation to the inside surface of said contact pin.

2. An article of manufacture comprising a tubular contact pin having an end opening through which a lead wire may be passed, and an annular-shaped mass of solder and flux through which the lead wire may also be passed located within said contact pin in axial alinement with said contact pin and said opening and intimately bonded in a high thermal conductivity relation to the inside surface of said contact pin.

3. An article of manufacture comprising a tubular contact pin having at each end an opening through which a lead wire may be passed through said contact pin, and an annular-shaped mass of solder, through which the lead wire may also be passed, located within said contact pin in axial alinement with and adjacent one of said openings and intimately bonded in a high thermal conductivity relation to the inside surface of said contact pin near said last mentioned opening.

4. An article of manufacture comprising a tu-

bular contact pin having at each end an opening through which a lead wire may be passed through said contact pin, and an annular-shaped mass of solder and flux, through which the lead wire may also be passed, located within said contact pin in axial alinement with and adjacent one of said openings and intimately bonded in a high thermal conductivity relation to the inside surface of said contact pin near said last mentioned opening.

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