

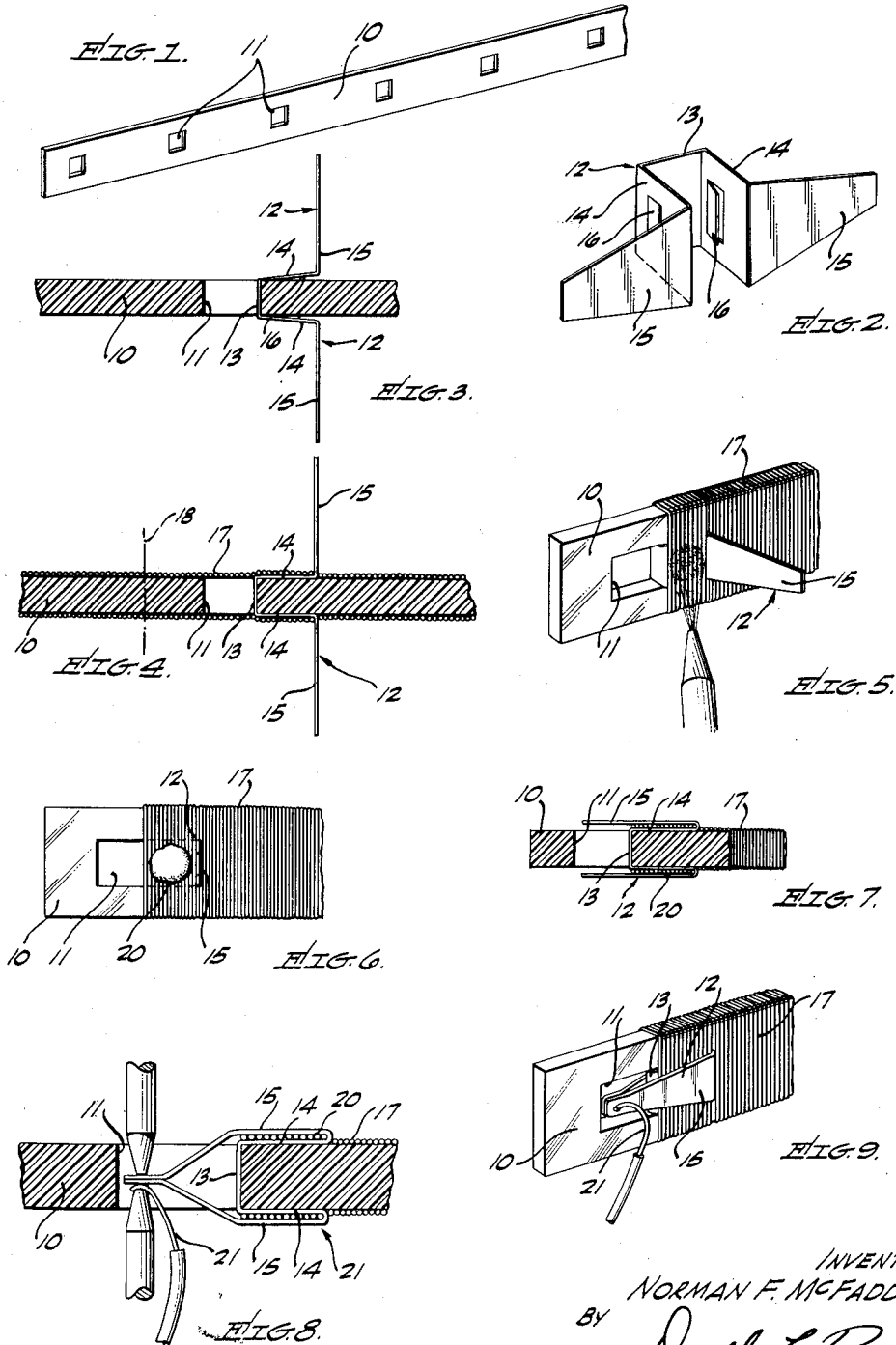
March 21, 1961

N. F. McFADDAN

2,976,509

RESISTOR TERMINATION AND METHOD OF MANUFACTURE

Filed Aug. 31, 1959



INVENTOR.
NORMAN F. McFADDAN,
BY
Donald L. Ryan
AGENT

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2,976,509

RESISTOR TERMINATION AND METHOD OF MANUFACTURE

Norman F. McFadden, Los Angeles, Calif., assignor to Hughes Aircraft Company, Culver City, Calif., a corporation of Delaware

Filed Aug. 31, 1959, Ser. No. 837,097

7 Claims. (Cl. 338—329)

The present invention relates generally to resistors or the like, and relates more particularly to a means for providing a terminal end for wire material wound upon a card, or the like.

In various electrical apparatus, such as resistance elements used in potentiometers and the like, it is common practice to wind the wire material thereof about a card of non-conductive material. Various means are provided for enabling electrical connection with ends of the wire material. Prior terminal constructions have taken the form of simply removing insulation from the wire material and securing it to a lead as by soldering. The wire material has also been secured to clips, screws, clamp-on terminals and the like, and has been retained against unwinding from the card as by gluing, potting, or otherwise securing the material to the card. All of these prior forms of construction have certain advantages and are completely satisfactory for most uses; however, when the resistance element is used in applications requiring the passage of high current, or in a high-temperature atmosphere, many problems exist. With the current advent of many developments concerning miniaturization of electrical components and marginal usage thereof only over limited periods of time, many additional problems have been experienced. Furthermore, in certain installational situations, apparatus of this type is subjected to changes in temperature and vibrational conditions which render prior terminal structures inadequate for the purposes intended.

In such miniaturization of electrical components, it is necessary that the various portions of the components be as simple as possible and easily assembled, whereby to permit their use and their manufacture using mass producing techniques and through use of relatively inexperienced personnel.

It is therefore one important object of the present invention to provide an apparatus for terminating wire material wound upon a base card.

It is another object of the invention to provide a means for wire termination that is particularly adapted for use in miniaturized components intended for use in high temperature situations.

A further object in the present invention is to provide a wire terminal structure for use with a card-supported resistance element.

Still another important object of the invention is to provide a resistance element terminating structure that is simple in construction, reliable and effective in use, and possessing an ease of manufacture.

A further object of the invention is to provide a resistance element terminating arrangement for use in connection with a nonconductive base material, and which may withstand high temperatures without deterioration thereof.

Other and further important objects of the invention will become apparent from the disclosures in the follow-

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ing detailed specification, appended claims and accompanying drawing, wherein:

Figure 1 is a perspective view of a resistance element card;

Fig. 2 is a perspective view of a terminal clip that is used with the card of Fig. 1 to provide the present termination;

Fig. 3 is an enlarged elongated sectional view showing the clip of Fig. 2 in conjunction with the base card;

Fig. 4 is an enlarged, elongated sectional view showing wire material wound about the card and the terminal clip;

Fig. 5 is a perspective view showing a manner of removing an insulatory coating from the wire material;

Fig. 6 is an elevational view showing the manner and position of application of a metallic cement to a portion of the wire material;

Fig. 7 is an elongated sectional view showing a further step in the establishment of the terminal end for the wire wound about the base material;

Fig. 8 is an elongated sectional view showing the manner of securing portions of the terminal clip together and in conjunction with a lead; and

Fig. 9 is a perspective view showing the completed terminal end structure for the wire material.

With reference to the drawing, and with reference primarily to Fig. 1, an elongated strip of base material 10 is shown. Material of the base 10 may be any suitable non-conductive substance such as plastic or the like. The base 10 is in the form of a strip that is generally rectangular in cross-section, and in practice is approximately $\frac{5}{16}$ of an inch wide and approximately .010 inch thick. The base 10 is provided with a plurality of longitudinally spaced generally square openings 11 which extend therethrough.

As shown in Fig. 2, a clip indicated generally at 12 is employed in forming the present wire termination. The clip 12 may be made from any suitable material, such as, for example, stainless nickel of approximately .002 inch in thickness. The clip 12 is formed, as shown in Fig. 2, and has a transverse portion 13, a pair of side portions 14 and a pair of outwardly extending tabs 15. The tabs 15 are suitably tapered. The side portions 14 are formed with inwardly directed portions 16 that have been cut along three sides from the side portions 14.

As shown in Fig. 3, a clip 12 is disposed through each of the openings 11 in the base 10 with the transverse portions 13 positioned in contact with one edge of each opening 11. The inwardly directed portions 16 engages the sides of the base 10 and serve to retain the clips 12 in the position shown in Fig. 3.

As shown in Fig. 4, a plurality of windings of small diameter wire material 17 are wound about the entire length of the base 10 and over the side portions 14 of the clip 12. Winding of the wire material 17 over the side portions 14 of the clip 12 serves to deform the portions 16 and to dispose the sides of the clip in contact with the base 10. In practice, the wire material used for this purpose has an insulating coating of varnish or the like, and a total diameter of approximately .001 inch. The adjacent windings are positioned in contact with each other. It may thus be seen that, with wire material of such a size, ordinary types of terminals or leads would be impractical for providing the necessary termination therefor.

As shown in Fig. 4, the base 10, together with the wire material wound thereon, is next cut as indicated by the dotted line 18 thus to establish a plurality of lengths of wirewound resistance elements from the common strip of base material. As shown in Fig. 5, the portion of the wire material 17 overlying the opening 11 and the

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adjacent end of the base 10, is removed and the wire is exposed by removal of insulation from the area of the windings overlying the side portions 14 of the clip 12. This insulating material may be removed as by sandblasting or other similar techniques.

As shown in Fig. 6, the area of the wire material from which the insulation is removed is thereafter coated with a metallic paste 20 that is electrically conductive and may be in the form of a gold, silver, platinum or the like, type of material. While the paste is still moist, the tabs 15 are bent back over the portion of the wire material 17 overlying the side portions 14 of the clip 12, thus producing the configuration as shown in Fig. 7.

With the partially formed wire termination being in the stage illustrated in Fig. 7, the entire unit is then placed in an oven, or the like for a period of approximately one hour and at a temperature of approximately 100° F., whereby to bake the paste 20 and provide a firm bond thereof to both the wire material 17 and the portion of the tabs 15 overlying this material.

Following removal from the baking operation, the ends of the tabs 15 and the clip 12 are bent for end surface contact with each other within the opening 11 and secured together as by spot welding or the like, and together with a terminal lead 21, thus to produce the final form of the wire termination as illustrated in Fig. 9. The lead 21 may also be of nickel to improve the conductivity and enable easy welding.

It may thus be seen that means are provided for enabling a positive termination of the resistance windings about a card that is particularly adapted for use in connection with extremely fine wire material and miniaturized components. The termination thus formed may be subjected to substantially higher amplitudes of vibration than could be expected to be withstood by the wire material alone, and operated in and under temperature conditions that would otherwise destroy the wire material. The present terminal is also comparatively easy to manufacture and is applicable to mass production techniques.

Having thus described the invention and the present embodiment thereof, it is desired to emphasize the fact that many modifications may be resorted to in a manner limited only by a just interpretation of the following claims.

I claim:

1. In a terminating structure for insulated wire wound about a base having an opening therethrough, said structure comprising: a metallic clip disposed through said opening; side portions on said clip disposed in contact with said base; a tab disposed from each of said side portions, said wire being wound on said base and continuously through a plurality of revolutions over said side portions of said clip, an area of said wire overlying said side portions, said wire area having insulation removed therefrom and secured to a surface of said tabs folded thereover, ends of said tabs being secured together within said opening; and a lead secured to said tabs.

2. In a terminating structure for insulated wire wound about a base having an opening therethrough, said structure comprising: a metallic clip disposed through said opening; side portions on said clip disposed in contact with said base; struck out portions in said side portions for retaining said clip in position; a tab disposed from each of said side portions, said wire being wound on said base and continuously through a plurality of revolutions over said side portions of said clip, an area of said wire overlying said side portions, said wire area having insulation removed therefrom and secured to a surface of said tabs folded thereover, ends of said tabs being secured together within said opening; and a lead secured to said tabs.

3. In a terminating structure for insulated wire wound

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about a base having an opening therethrough, said structure comprising: a metallic clip disposed through said opening; side portions on said clip disposed in contact with said base; a tab disposed from each of said side portions, said wire being wound on said base and continuously through a plurality of revolutions over said side portions of said clip, an area of said wire overlying said side portions, said wire area having insulation removed therefrom and secured to a surface of said tabs folded thereover, ends of said tabs being welded together within said opening; and a lead secured to said tabs at said welded together ends thereof.

4. In a terminating structure for insulated wire wound about a base having an opening therethrough, said structure comprising: a metallic clip disposed through said opening; integral side portions on said clip disposed in contact with said base; struck out portions in said side portions for retaining said clip in position; a tapered tab disposed integrally from each of said side portions, said wire being wound on said base and continuously through a plurality of revolutions over said side portions of said clip, an area of said wire overlying said side portions, said wire area having insulation removed therefrom and secured to a surface of said tabs folded thereover, ends of said tabs being welded together within said opening; and a lead secured to said tabs at said welded together ends thereof.

5. In a terminating structure for insulated wire wound about a base having an opening therethrough, said structure comprising: a metallic clip disposed through said opening; integral side portions on said clip disposed in contact with said base; struck out portions in said side portions for retaining said clip in position; a tapered tab disposed integrally from each of said side portions, said wire being wound on said base and continuously through a plurality of revolutions over said side portions of said clip, an area of said wire overlying said side portions, said wire area having insulation removed therefrom and secured to a surface of said tabs folded thereover by means of a heat cured conductive paste, ends of said tabs being welded together within said opening; and a lead secured to said tabs at said welded together ends thereof.

6. The method of terminating insulated wire on a wire wound resistance card element comprising, the steps of: disposing a metallic clip through an opening in said card; winding wire about said card, said opening and portions of said clip; removing said wire from a portion of said card including those portions overlying said opening; removing insulation from areas of said wire overlying said portions of said clip; applying a conductive paste to said area of said wire; disposing other portions of said clip over said area of said wire and in contact with said paste; heat curing said paste; and securing ends of said other portions of said clip together within said opening.

7. The method of terminating insulated wire on a wire wound resistance card element comprising, the steps of: disposing a metallic clip through an opening in said card; winding wire about said card, said opening and portions of said clip; removing said wire from a portion of said card including those portions overlying said opening; removing insulation from areas of said wire overlying said portions of said clip; applying a conductive paste to said area of said wire; disposing other portions of said clip over said area of said wire and in contact with said paste; baking and heat curing said paste; and welding ends of said other portions of said clip together within said opening and in conjunction with a lead conductor.

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Oct. 3, 1950