July 16, 1935. W. F. MALONE 2,008,288

WIRE WOUND ELECTRICAL DEVICE

Filed Jan. 31, 1934

FIG. 1

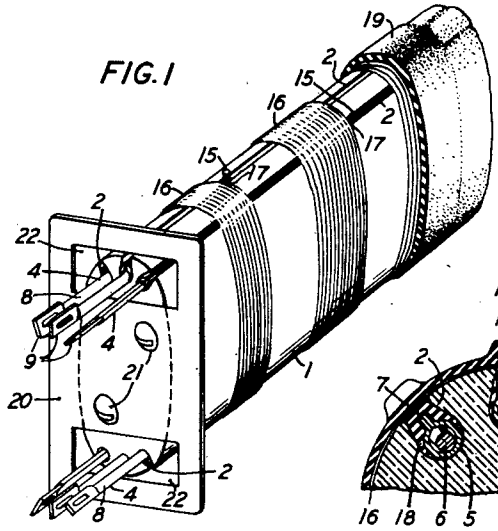


FIG. 2

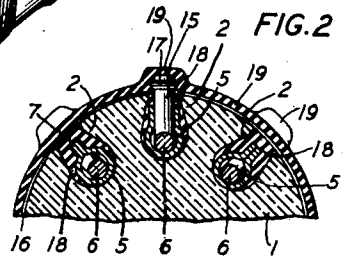


FIG. 3

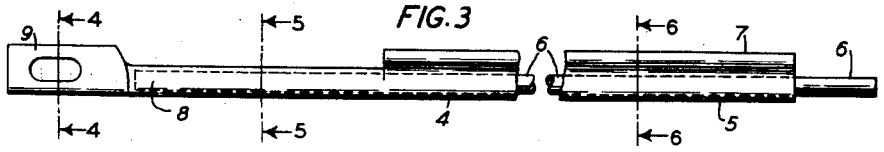


FIG. 4

FIG. 5

FIG. 6

FIG. 7

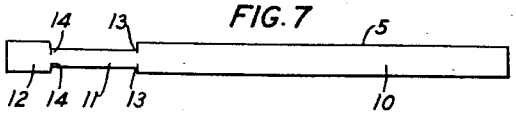


FIG. 8

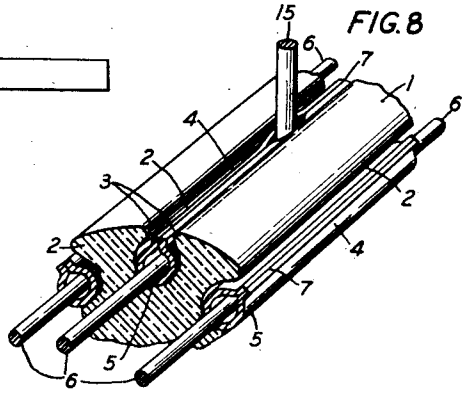
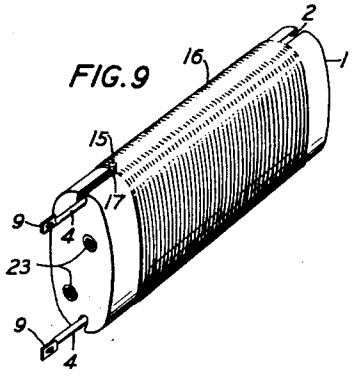


FIG. 9



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Patented July 16, 1935

2,008,288

UNITED STATES PATENT OFFICE

2,008,288

WIRE WOUND ELECTRICAL DEVICE

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Application January 31, 1934, Serial No. 709,061

9 Claims. (Cl. 201—63)

This invention relates to electrical devices and more particularly electrical resistance elements.

The object of this invention is to provide means for terminating one or more windings of a wire wound electrical device at desired points.

A feature of this invention resides in a deformable rod member a portion of which may be moved along a support to meet a predetermined point of a wire winding.

Another feature of this invention resides in a seamed sleeve member which encloses the rod member and clamps a portion of the rod member in adjusted position.

In the drawing Fig. 1 is a view in perspective and partly in section of a wire wound electrical device including this invention;

Fig. 2 is a sectional view of a fragmentary portion of the device shown in Fig. 1;

Fig. 3 is a side elevational view of a terminal before being placed in the device shown in Fig. 1;

Figs. 4, 5 and 6 are views in section of the terminal shown in Fig. 3 taken on the lines 4—4, 5—5, 6—6, respectively;

Fig. 7 is a plan view of a sheet metal stamping from which is formed a part of the terminal shown in Fig. 3;

Fig. 8 is a view in perspective and partly in section of a fragmentary portion of the structure shown in Fig. 1 and before a wire winding is applied; and

Fig. 9 is a view in perspective of a wire wound electrical device in which only two terminals are provided for the wire winding.

In the manufacture of resistances, when a predetermined length of wire is wound on a support, it is frequently desirable to have a terminal with an attachment point located near or at the point of termination of the winding. It is also desirable to have the terminals for the ends of the winding so secured to the insulating support that in service there will be no relative movement between the insulating support and the terminal or between the terminal and its point of connection to the wire winding. In some cases resistances are required having more than one winding on a support and hence more than two terminals for the respective ends of the wire windings. To meet some requirements several wire windings connected in series are wound on a support and conducting taps or leads are connected to the windings at various points.

In the drawing in which like parts bear like numerals and in which the invention is shown as applied to a wire wound electrical resistance device, 1 is a support preferably made of insulating material and shown as being elliptical in cross-section and having spaced longitudinal grooves 2 at and near the vertices. The side walls forming the grooves 2 are made to converge in the vicinity of the periphery of the support 1 as shown at 3 in Fig. 8 for a purpose to be later explained. The grooves 2 are receptacles for terminals 4 which are laid into the grooves as shown in Figs. 1, 2 and 3.

Each terminal 4 as shown in Fig. 3 consists of a sleeve 5 and a rod 6. The sleeve 5 is made of conducting material having a fair amount of resiliency, such, for instance, as German silver, and has a seamed conduit 7 running longitudinally of and along the major portion of its length. The seamed conduit 7 of the sleeve 5 is substantially the same length as the support 1 and terminates at one end in a tubular portion 8. The tubular portion 8 forms a connection between the seamed conduit 7 of the sleeve 5 and an apertured flat end portion 9 which serves as a tab to which a wire of a circuit may be connected. The rod 6 is made of easily deformable conducting material such for instance as copper wire and run longitudinally of and within the sleeve 5 and is of such diameter that it will fit snugly into the tubular portion 8 of the sleeve 5. The rod 6 is of sufficient length that when one end is thrust into the tubular portion 8 of the sleeve 5 the other end of the rod will project from the free end portion of the seamed conduit 7. The sleeve 5 may be made from a flat stamping of sheet metal such as shown in Fig. 7. This stamping has a relatively long enlarged portion 10, a short reduced portion 11 and a still shorter enlarged end portion 12. Spaced lateral cuts are made in the sheet metal stamping at 13—13 and 14—14 so that the tubular portion 8 may be made of a form different from the remainder of the sleeve 5. In making the sleeve 5 from this sheet metal stamping the short reduced portion 11 is rolled on a form having the same diameter as the rod 6 and is made into a tube to fit the rod 6. In forming the tubular portion 8 the edges of the sheet metal are brought into abutting relationship to each other so that the inside and outside surfaces of the tubular portion 8 are substantially smooth and free from projections as shown in Fig. 5. In making the seamed conduit 7 of the sleeve 5 the relatively long enlarged portion 10 of the sheet metal stamping is rolled on a form to produce a seamed conduit of larger diameter than the rod 6. In forming the seamed conduit 7 the edge portions of the sheet metal are not brought into abutting relationship but are turned upward

from the rounded portion of the conduit and are brought together with their inside face portions in parallel relationship as shown in Figs. 6 and 8. The apertured flat end portion 9 is made by making a single longitudinal fold and pressing the leaves of the fold together and perforating them as shown in Fig. 4. After the sleeve 5 has been formed the rod 6 is inserted endwise into the sleeve 5 and the inner end of the rod 6 is forced into the tubular portion 8.

Terminals 4 made as above described are placed in the spaced grooves 2 of the support 1 by sliding the terminals 4 lengthwise into the grooves 2 from one end of the support 1. The terminal 4 is pushed into a groove 2 of the support 1 sufficient to bring all of the seamed conduit 7 of the sleeve 5 within the groove 2 and so that the tubular portion 8 of the terminal 4 projects from one end of the support 1 as shown in Figs. 1 and 9. When the terminals 4 have been placed in the spaced grooves 2 of the support 1 removal of the terminals 4 radially from the support 1 is prevented by the converging side walls of the grooves 2 which overhang the seamed conduit portion 7 of the terminal 4 at 3 as shown in Fig. 8.

In applying a wire winding 16 to the support 1 the wire is wound on the support 1 and the wire winding is connected at predetermined points to the terminals 4. In making a connection of a predetermined point in the winding 16 to a terminal 4 the free end of the rod 6 is grasped by means of a suitable tool, such for instance, as a pair of pliers and is turned upward so that it registers with the seam in the seamed conduit 7 of the sleeve 5. By pulling upward on the upturned free end of the rod 6 sufficient to bring it into engagement with the seam in the seamed conduit 7 of the sleeve 5 the seam is opened and the walls forming the seam are displaced sufficient to permit passage of the upturned free end of the wire 6 through the seam as shown in Fig. 8. In this figure the upturned free end 15 of the wire 6 is shown as projecting through the seam of the seamed conduit 7 of the sleeve 5 and has progressed a short distance forward from the end of the sleeve 5 and along the support 1. By reason of the resiliency of the material used in the sleeve 5 the walls forming the seam have a tendency to spring back in place after being displaced by the upturned end portion 15 of the wire 6 and proceed to progressively close up after the upturned end portion 15 of the wire 6, as the upturned end portion progresses forward along the support 1. It follows therefore that when the upturned end portion 15 of the rod 6 is released the upturned end portion 15 will be held in its last adjusted position by the surrounding walls of the seam of the seamed conduit 7.

To bring the rod 6 of the terminal 4 into connection with a predetermined point of the wire winding 16 on the support 1 the upturned end portion 15 is pulled until the free end of the rod 6 has progressed along the support 1 to the predetermined point in the wire winding. Several turns of the wire winding 16 are then made around the upturned end 15 of the rod 6 as shown at 17 in Figs. 1, 2 and 9. The connection thus established between the wire winding 16 and the upturned end 15 of the rod 6 may be secured by means of solder. After connection has been made between the upturned end 15 of the wire 6 and the predetermined point in the winding 16 the free end of the upturned end 15 above the point of connection 17 to the winding 16 may be cut off. A terminal 4 is brought into connection with the other end of the winding 16 or to some other predetermined point in the winding in the manner above described.

It is obvious that a plurality of windings either separate or in series may be wound on a support 1 as shown in Fig. 1 and that connections may be made to ends of a winding or to any predetermined point in a winding by moving a free end of a rod 6 up to the required point of connection and by making a few turns of the winding around the upturned free end 15 of the terminal.

If a wire wound unit is required having only a single winding and a terminal for each end of the winding the device could be made as shown in Fig. 9. In this instance only two grooves are provided in the support 1 and only two terminals are employed. The structure otherwise is the same as shown and described with reference to Fig. 1.

When the required number of windings has been applied to a support and when connections have been made to the terminals in the manner above described the spaced grooves 2 in the support 1 may be filled with a suitable cement to hold the terminals 4 firmly in the grooves 2 of the support 1. In Fig. 2 the grooves 2 are shown as having a filling 18 of cement over the sleeves 5 of the terminals 4. The resistance device shown in Fig. 1 is provided with a coating of insulating material 19 which may be vitreous enamel. I have found that a suitable coating 16 of vitreous enamel may be applied to the wire wound unit by dipping the wire wound unit into a solution containing vitreous enamel and then hardening the enamel by a suitable baking process. In Fig. 2 the coating 19 of insulating material is shown as covering the winding 16 and the upwardly turned ends 15 of the rods 6 which project beyond the periphery of the support 1.

The resistance device in Fig. 1 is shown as being mounted on a panel 20 by means of the screws 21—21. The screws 21—21 pass through apertures in the panel 20 and enter internally threaded inserts 23 in the end of the support 1 which are not visible in this figure but which are shown in Fig. 9. The panel 20 in Fig. 1 is provided with spaced elongated apertures 22—22 to permit extension of the tubular portions 8 of the terminals 4 through the panel 20.

From the foregoing it will be seen that I have provided a wire wound electrical device having terminals which are sufficiently flexible or adjustable to meet conditions where it is necessary to bring a connection point of a terminal along a support to meet a predetermined point of a winding on the support. This invention while shown as being applied to an electrical resistance device is not limited to such use but is applicable to other wire wound electrical devices in which the same terminal connecting conditions have to be met.

What is claimed is:

1. An electrical device comprising a support, a wire winding on said support, terminals for said winding and a deformable rod member in each terminal, said rod member having a free end portion adapted for bending outward of said support and for movement along said support to meet a predetermined point in the wire winding.

2. In an electrical device comprising a winding and a support for said winding, a terminal for said winding, said terminal having a seamed sleeve member embedded in said support a de-

formable rod member enclosed in said sleeve member and a portion of said rod member brought upward through the seam in said sleeve member and into contact with said winding at a predetermined point.

3. An electrical device comprising an insulating support, a winding on said support, longitudinal grooves formed in said support and terminals supported in said grooves, each of said terminals comprising a seamed sleeve and a deformable rod member attached to and enclosed in said sleeve, the rod member having a free end which is drawn upward through the seam of the sleeve and to which the winding is secured at a predetermined point.

4. An electrical device comprising an insulating core member elliptical in cross-section, a winding on said core member, longitudinal grooves formed in the vertices of the core member and terminals supported in said grooves, each of said terminals comprising a seamed sleeve and a rod of conducting material enclosed in said sleeve, the rod having a bent-up free end portion which is brought upward through the seam of said sleeve and along said sleeve to meet a predetermined point on the winding.

5. A terminal comprising a seamed sleeve and a rod of conducting material enclosed in said sleeve, said rod having a bent-up free end portion brought upward through the seam of said sleeve and moved along said sleeve through the seam in said sleeve to shorten the effective length of said terminal.

6. An electrical unit comprising a support and a winding on the support, a seamed sleeve embedded in said support, a tube extending longitudinally of said sleeve and integral therewith, a rod of conducting material enclosed in said sleeve and attached to said tube and a bent free end portion of said rod extending upward through the seam of said sleeve, said seamed sleeve and said rod forming a terminal for said winding.

7. In an electrical unit comprising a grooved insulating support and a wire winding on said support, a seamed sleeve of conducting material supported in the groove in said insulating support, a conducting rod attached to and enclosed in said sleeve and a bent free end portion on said rod, said bent free end portion being brought upward through the seam in said sleeve and along said sleeve to meet the wire winding, said wire winding being attached to said rod at the meeting point, and said sleeve clamping the rod in position adjacent the point at which said winding is attached to said rod.

8. A terminal comprising a sleeve of conducting material and a rod of conducting material enclosed in the sleeve, said sleeve having a seamed conduit and a tubular portion extending longitudinally of the seamed conduit and said rod extending longitudinally through said seamed conduit and into said tubular portion of said sleeve.

9. An electrical device comprising an insulating core member having spaced grooves running the length of the core member, seamed terminals embedded in said grooves, a wire winding wound around the core member and over the terminals, deformable rods of conducting material in said terminals, said rods having bent-up ends passing through the seams in said terminals and connected to predetermined points of the wire winding and said grooves having converging side walls overhanging the terminals to prevent radial separation of said terminals from said support.

WILLIAM F. MALONE.