Sept. 10, 1940. H. N. WAGAR 2,214,151

TERMINAL AND WIRE CONNECTION

Filed June 28, 1938

FIG. 1

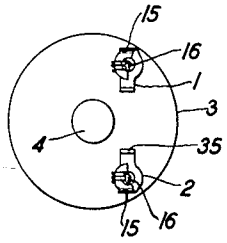


FIG. 2

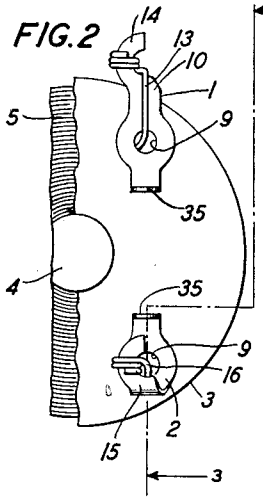


FIG. 3

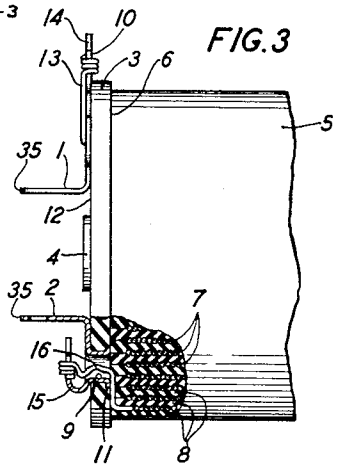


FIG. 4

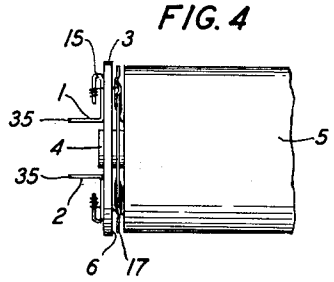


FIG. 5

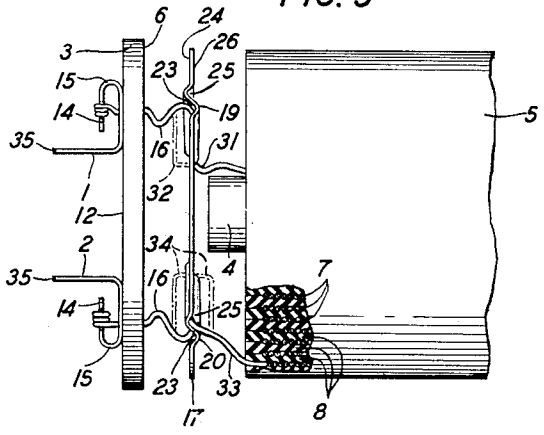
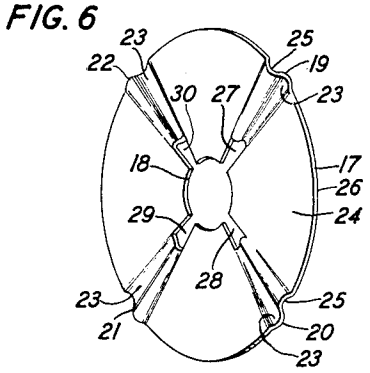


FIG. 6



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TERMINAL AND WIRE CONNECTION

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Application June 28, 1938, Serial No. 216,209

4 Claims. (Cl. 175—21)

This invention relates to electrical terminals and a manner of running and connecting wires thereto, and more particularly to electrical terminals and wire connections suitable for use on wire wound electrical devices.

The object of the invention is to provide a terminal structure and arrangement suitable for use on wire wound electrical devices subject to shrinkage or relative movement of parts and which will prevent breaking of a wire leading to the terminal.

A feature of the invention resides in the terminal structure.

Another feature resides in the manner of connection between the terminal and an end portion of a wire winding.

Another feature resides in a washer of particular form disposed between a coil structure and a spoolhead.

In the drawing:

Fig. 1 is a front-face view of a wire wound electrical device comprising a spoolhead and terminals supported on the spoolhead and embodying the invention;

Fig. 2 is an enlarged view of a portion of the device shown in Fig. 1 with portions broken away, with one terminal completely formed and another partially formed;

Fig. 3 is a side elevational view, partly in section, of the structure shown in Fig. 2, taken on the line 3—3, and showing a portion of a wire wound electrical device;

Fig. 4 is a side elevational view of a portion of a wire wound electrical device drawn to the same scale as Fig. 1 and showing the washer interposed between a coil and a spoolhead and the relative positions of parts after shrinkage of the coil has occurred;

Fig. 5 is an enlarged view, partly in section, of the structure shown in Fig. 4 and with parts relatively displaced to more clearly show the manner in which ends of the coil are brought to the terminals; and,

Fig. 6 is a view in perspective of the washer present in the structure shown in Figs. 4 and 5 and drawn to the same scale as Fig. 5.

In some of the common and well-known wire wound electrical devices, an electrical coil is supported on a spool type support comprising a core and spoolheads supported on the core. The coil comprises layers of wire wound on the spool and strips of sheet insulating material alternated with the layers of wire. End portions of the wire are attached to terminals supported on at least one of the spoolheads. Under normal conditions the inner face of the spoolhead bearing the terminals is in contact with an end of the built-up coil. It has been found that the electrical coil structure at times moves away from the spoolhead and that end portions of the wire in the coil are broken as a result of such movement of the coil. The movement of the coil may be due to jars or shocks to which the device is subjected in transportation, or may be due to shrinkage of the coil structure such as occurs in natural aging of the material of the coil or under a change in temperature.

In this invention a terminal structure and a wire arrangement are provided to prevent breaking of the end portions of the wire windings when the coil moves away from the spoolhead.

As shown in Fig. 1 terminals 1 and 2 are terminal plates supported on a spoolhead 3. The spoolhead 3 is supported on one end of a core 4. A spoolhead (not shown but corresponding in general structure to the spoolhead 3) may be supported on the opposite end of the core 4. As shown in Figs. 2 and 3 an electrical coil 5 is supported on the core 4, one end portion of the coil 5 lying adjacent an inner face 6 of the spoolhead 3. The coil 5 may be of any desired construction, but has been shown merely for the purpose of illustration and not in a limiting sense to this invention as comprising layers of wire 7 and strips 8 of insulating material, the strips 8 being alternated with the layers of wire 7. The strips 8 are wider than the wire layers and normally extend into engagement with the inner face 6 of the spoolhead 3.

The terminals 1 and 2 are alike in structure as shown in Fig. 1 which shows the terminals in the final form. The terminals, however, are not initially applied to the spoolhead 3 in this form but are first applied in the form shown for 1 in Figs. 2 and 3. The terminal as shown at 2 in Fig. 3 comprises an eyelet portion 9 and a tab portion 10 shown in the terminal 1 in Figs. 2 and 3. The eyelet portion 9 extends through an aperture in the spoolhead 3 and is spun over on its inner end 11 against the inner face 6 of the spoolhead 3. The inner face of the spoolhead may be recessed to accommodate the spun over inner end of the eyelet portion 9. The tab portion 10 is on the outer end of the eyelet and a portion of it bears against the outer face 12 of the spoolhead. When the terminal is first applied to the spoolhead, the tab portion 10 extends normal to the axis of the eyelet portion 9 and parallel with the outer face 12 of the spoolhead. An end portion 13 of the wire of the coil 5 is led through the eye-

let portion 9 of the terminal and over the outer face of the tab portion 10 to a hook portion 14 provided on the outer end of the tab portion and is secured thereto. The connection of the end portion 13 of the wire may be made as shown in the drawing by winding a portion of the wire around the hook portion 14 of the terminal or connection of the parts may be made in any other manner found suitable.

After the wire has been connected to the tab portion of the terminal as shown in 1 in Figs. 2 and 3, the tab portion 10 is bent back on itself over one end of the eyelet portion 9 of the terminal so that the terminal takes the form of the terminals 1 and 2 of Fig. 1, and the terminal 2 shown in Figs. 2 and 3. The tab portion 10, therefore, becomes a curved portion 15. The bending back of the tab portion 10 across the eyelet portion 9, as shown at 2 in Fig. 3, creates a slack portion 16 in the portion 13 of the wire. The slack portion 16 extends from the hook portion 14 and into the eyelet portion 9 and with a portion of the wire lying within the eyelet portion of the terminal being disposed therein in looped formation. It will be seen that the slack portion 16 provides sufficient slack between the end portion of the coil 5 and the point of connection to the terminal to permit considerable movement of the coil 5 inwardly away from the inner face 6 of the spoolhead 3 without causing a strain to be applied to the end portion of the wire, such as might cause severance of the wire and hence disconnection of the coil from the terminal. The terminal structure and wire connection arrangement, therefore, permit movement of the coil 5 relative to the spoolhead 3 without causing breaking of the wire from the terminal.

To insure the maintenance of a good electrical connection of the portion 13 of the wire and the hook portion 14 of the terminal, the parts may be secured together by means of solder. In making such connection of the parts I have found it preferable to solder connect the parts after the portion 13 of the wire has been connected to the hook portion 14 and after the tab portion 10 of the terminal has been bent back on itself across the eyelet portion 9. That is to say, I first bring the portion 13 of the wire across the tab portion 10 of the terminal and wind the wire around the hook portion 14. Then I bend the tab portion 10 back on itself across the eyelet portion 9 to create the slack portion 16. After this is done I apply solder to the point at which the wire is wound around the hook portion 14 of the terminal. This avoids working or bending of the wire at or adjacent the solder connection point.

In Figs. 4, 5 and 6 a washer 17 is shown which may be added to the structure of the device shown in Figs. 1, 2 and 3. The washer 17 is disposed between an end portion of the coil 5 and the inner face of the spoolhead 3. The aperture 18 in the center of the washer 17 fits over an end portion of the core 4 of the coil. The washer 17 is corrugated at spaced points to provide a plurality of pairs of radially extending channels 19, 20, 21 and 22. Each pair of channels comprises a channel 23 on the front face 24 and a channel 25 on the rear face 26 of the washer. The channels 23 and 25 in each pair of channels lie adjacent each other and are wider at their outer ends than at their inner ends, the difference in width being due to the difference in diameter of the portions of the washer traversed by the channels. The inner ends of the channels terminate in elongated apertures 27, 28, 29 and 30 which extend radially outward at spaced points from the central aperture 18.

The channels in the washer 17 serve as receptacles for end portions of the wire of the coil 5. The end portions of the wire are laid in the channels and are guided by the channels to the required terminals 1 and 2 supported on the spoolhead 3. The courses of the wires are indicated in Fig. 5 in which the actual positions of the wires are shown in full lines and the directions of run are shown more clearly by the dotted lines. The inner end portion 31 of the wire of the coil 5 is passed through the aperture 27 in the washer 17 and is laid in the channel 23 of the pair 19 and is extended therein to a point in line with the axis of the eyelet portion 9 of the terminal 1. The wire is then bent forwardly and is passed through the eyelet portion of the terminal to the hook portion 14 to which it is suitably attached as previously explained in connection with the description of Figs. 2 and 3. The course of the wire 31 is indicated by the dotted line 32. The outer end portion 33 of the wire of the coil 5 is laid in the channel 25 of the pair 20 and is extended inwardly therein to the aperture 28. The wire 33 is then passed through the aperture 28 and is laid in the channel 23 and extended therein to a point in line with the axis of the eyelet portion 9 of the terminal 2. The course taken by the wire 33 is indicated by the dotted line 34. The wire is then bent forwardly and is passed through the eyelet portion 9 of the terminal 2 and is led to the hook portion 14 to which it is suitably attached, as previously described. When the washer 17 and the spoolhead 3 are assembled on the core 4, with the washer 17 interposed between the end of the coil 5 and the inner face 6 of the spoolhead 3, the end portions 31 and 33 of the wires of coil 5 are retained in the channels of the washer in which they have been laid.

It will be seen that the washer 17 with its channels formed therein serves to guide the end portions of the wire of the coil from their points of emergence from the coil to positions in line with the longitudinal center line of the eyelet portions of the respective terminals and that there is no snubbing of the end portions of the wire against the inner ends of the eyelet portions of the terminals. The slack portion 16 of the wire is created within the space defined by the eyelet portion of the terminal when the tab portion is bent back on itself over the eyelet portion. Movement of coil 5 and washer 17 relative to the spoolhead, therefore, will not result in sufficient strain on the end portions of the wire to cause severance of the coil from the terminal. In Fig. 4 the coil 5 is shown as having shrunk away from the inner face of the spoolhead 3 and the washer 17.

The washer 17 has been shown as having four pairs of channels and four elongated apertures since this provides a balanced construction and a washer not limited to use in the two-terminal device described. In the two-terminal device shown and described only the channel pairs 19 and 20 and the elongated apertures 27 and 28 are used for the running of the wire ends to the terminals. In a four terminal device the channel pairs 21 and 22 and elongated apertures 29 and 30 would be used for running wire ends to the additional terminals.

The terminals 1 and 2 may be provided with

extending portions to serve as suitable points for connecting to the wires of a circuit. The extending portions mentioned may be pin portions **35** extending normal to the plane of the outer face **12** of the spoolhead **3**.

What is claimed is:

1. In an electrical device comprising a wire element, a support for said element and an apertured plate secured to said support, a terminal plate supported on said apertured plate and connected to said element, said terminal plate having a short upset eyelet portion secured in said apertured plate and a relatively long tab portion extending from said eyelet portion in engagement with said apertured plate and bent back in return-bend form so that the free end lies over an open end of said eyelet portion and said wire element having an end portion extending through said eyelet portion and attached to said tab portion and having a slack portion located within said eyelet portion.

2. In an electrical device comprising a core, a wire winding on said core and an apertured plate supported on said core, a terminal plate supported on said apertured plate, said terminal plate comprising a short upset eyelet portion secured in said apertured plate and a relatively long tab portion extending radially from said eyelet portion in engagement with said plate and bent back in return-bend form so that the free end lies across the opening in said eyelet portion and said wire winding having an end portion extending in looped formation through said eyelet portion of said terminal and attached to said tab portion.

3. In an electrical device comprising a spool type support, a wire winding on said support and an apertured spool-head, a terminal plate supported on said spoolhead, said terminal plate comprising a short upset eyelet portion secured in the aperture in said spoolhead, a relatively long tab portion extending from said eyelet portion in engagement with said spoolhead and bent back in return-bend form so that the free end lies in spaced relation over an end of said eyelet portion and an end portion of said wire winding extending in curved formation within the eyelet portion of said terminal and attached to the free end of said tab portion.

4. In an electrical device comprising a spool type support, a wire winding on said support, a spoolhead and terminals supported in spaced relation on said spoolhead, a washer supported on said support between an end of said winding and said spoolhead, spaced corrugations in said washer forming pairs of radially extending tapered channels and said washer being apertured adjacent the inner ends of said corrugations, and end portions of said winding laid in said channels and guided thereby in indirect routes to said terminals and attached to said terminals.

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