May 7, 1940. H. L. COYNE 2,200,059

ELECTRICAL TERMINAL

Filed June 11, 1938

FIG. 1

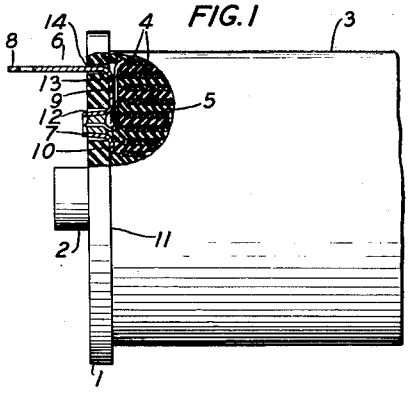


FIG. 2

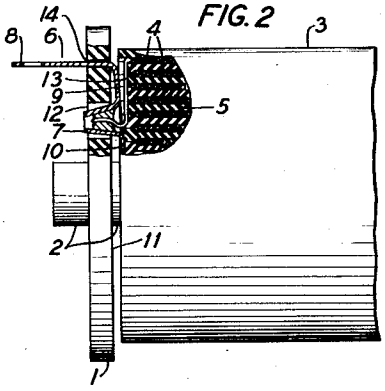


FIG. 3

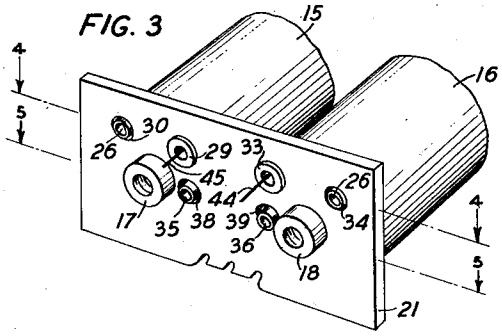


FIG. 4

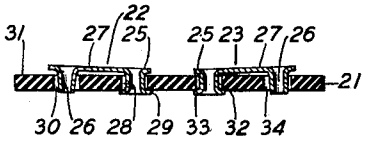


FIG. 5

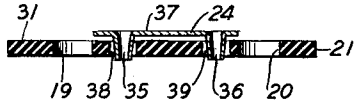
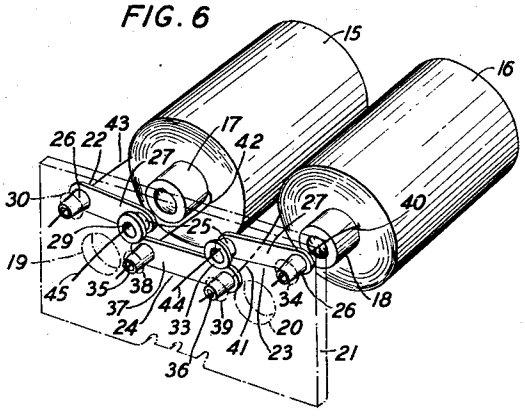


FIG. 6



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ELECTRICAL TERMINAL

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4 Claims. (Cl. 175—21)

This invention relates to electrical terminals and more particularly to terminals adapted for use on wire wound electrical devices.

The object of the invention is to provide a terminal structure and an arrangement suitable for use on wire wound electric devices subject to shrinkage and which will prevent breaking of the wire.

A feature of the invention resides in the terminal structure and its manner of support in a spoolhead.

In the drawing, Fig. 1 is a side elevational view, partly in section, of a portion of a wire wound electrical device embodying this invention;

Fig. 2 is a view of the same portion of the device shown in Fig. 1 but taken after shrinkage has occurred in a portion of the structure;

Fig. 3 is a view in perspective of a portion of a double-coil wire wound device embodying this invention;

Figs. 4 and 5 are views, in section, of portions of the device shown in Fig. 3, and taken on the line 4—4 and 5—5, respectively; and

Fig. 6 is a view in perspective and in exploded form of portions of a double-coil wire wound device of the type shown in Fig. 3.

In wire wound electrical devices where the winding is disposed on the core of a spool type support and terminals for the ends of the wire winding are supported on the spoolhead, shrinkage of the wound portion of the structure will sometimes cause severance of the portions of wire leading to the terminals. This frequently occurs in structures where strips of insulating material are alternated with various layers of wire wound on the spool structure. The strips of insulating material in some cases, for instance, are made of sheet cellulose acetate. In other cases they may comprise paper or other sheet insulating material impregnated and coated with wax, cellulose acetate or other suitable insulating material or compound. The insulating material may shrink with age or under the influence of a change in temperature and thus cause a decrease in the over-all length of the coil comprising the winding of wire and the interposed layers of insulating material. The shrinkage of the coil structure causes tension on the ends of the wire winding leading to terminals supported on the spoolhead. Since the coil structure moves inwardly away from the spoolhead, the tension developed in the portions of the wire winding leading to the terminals is in some cases sufficient to cause severance of the wires and consequent disconnection of the coil from a circuit.

In this invention, terminal structures and arrangements are provided wherein portions of the terminals are free to move relative to the spoolhead to compensate for shrinkage of the coil structure and thus relieve the tension on the end portions of the coil leading to the terminals.

As shown in Figs. 1 and 2, an apertured spoolhead 1 is supported on a core 2. In a complete structure another spoolhead, not shown, but corresponding to the spoolhead 1 is supported on the core 2 and spaced from the spoolhead 1. Supported on the core 2 and disposed between the spoolheads is a coil 3 comprising various layers 4 of the wire winding and interposed layers 5 of sheet insulating material. A terminal 6 is supported in the spoolhead 1. The terminal 6 comprises an eyelet portion 7 and a tab portion 8 connected by a bar portion 9. The eyelet portion 7 is flanged at 10 to bear against the inner face 11 of the spoolhead 1 and the tubular part of the eyelet portion 7 is loosely set in an aperture 12 provided in the spoolhead 1. An end portion 13 of the winding 4 is extended into the eyelet portion 7 of the terminal and is suitably connected thereto, for instance, by means of solder. The bar portion 9 of the terminal 6 lies between an end of the coil 3 and the inner face of the spoolhead 1. The tab portion 8 of the terminal 6 extends at an angle from the bar portion 9 and through an aperture 14 in the spoolhead 1 and provides a conveniently arranged terminal portion for connecting to an electrical system. The tab portion 8 may be anchored in the aperture 14 by cement or other suitable means or may be simply held therein by friction between the parts. The eyelet portion 7 and the bar portion 9, however, are quite free to move in the event of shrinkage occurring in the coil 3. Since the eyelet portion 7 is only loosely positioned in the aperture 12, the bar portion 9 and flange 10 are simply held, under normal conditions, against the inner surface 11 of the spoolhead by the adjacent end of the coil 3.

When the coil 3 shrinks away from the spoolhead 1, as shown in Fig. 2, the eyelet portion 7 of the terminal 6 follows the movement of the coil 3, the bar portion 9 and the flange 10 also follow the movement of the coil 3 and move away from the inner face 11 of the spoolhead 1, the bar portion 9 being slightly flexed. The relatively large aperture 12 in the spoolhead permits tilting of the eyelet portion 7 and free movement of the eyelet portion when the coil 3 shrinks. Since a portion of the terminal 6 follows the movement of the coil 3 when the coil shrinks away

from the inner face of the spoolhead, the end portion 13 of the wire winding is relieved of considerable strain that it would otherwise be subjected to were the eyelet portion secured to the spoolhead. The terminal structure and arrangement shown in Figs. 1 and 2, therefore, prevents breaking of the end portion 13 of the wire winding. I have found that this structure and arrangement also prevents breaking of the end portion 13 of the wire winding when the apparatus is being shipped or otherwise handled where the apparatus is subjected to jars or shocks such as would ordinarily cause breaking of a relatively small gauge wire.

In Figs. 3, 4, 5 and 6, the invention is shown as applied to a double-coil structure of the type found in telephone ringers. As shown in Figs. 3 and 6, the operating coils 15 and 16 are supported on the respective cores 17 and 18. End portions of the cores 17 and 18 project through respective spaced apertures 19 and 20 in a plate 21 of insulating material. The plate 21 serves as a spoolhead common to the coils 15 and 16. Another spoolhead (not shown since it forms no part of the invention) may be applied to the other end of the structure.

Supported in spaced relation in the plate 21 are double eyelet terminals 22, 23 and 24, the terminals 22 and 23 serving respectively as terminals for the coils 15 and 16 and the terminal 24 serving as a strap connection between the coils 15 and 16. The terminals 22 and 23 are alike in structure and each comprises, as shown in Fig. 4, eyelet portions 25 and 26 connected by a bar portion 27. Four spaced apertures are provided in the upper portion of the plate 21 for receiving the eyelet portions of the terminals 22 and 23, the apertures being arranged in pairs and each pair being spanned by a terminal. The eyelet portion 25 of the terminal 22 is positioned in an aperture 28 in the plate 21 and one end of the eyelet portion 25 is spun over lightly against the outer surface of plate 21 to form a flange 29 to hold the eyelet portion 25 loosely in place. The eyelet portion 26 is loosely positioned in an aperture 30 and is left free to move therein. The bar portion 27 of the terminal 22 is normally disposed against the inner face 31 of the plate 21. The eyelet portion 25 of the terminal 23 is positioned in an aperture 32 in the plate 21 and one end is spun over lightly against the outer face of the plate to form a flange 33 to hold the eyelet portion loosely in position. The eyelet portion 26 in the terminal 23 is loosely positioned in an aperture 34 in the plate 21 and is left free to move therein. The bar portion 27 of the terminal 23 normally bears against the inner face 31 of the plate 21.

The terminal 24, as shown in Fig. 5, comprises eyelet portions 35 and 36 connected by a bar portion 37. The eyelet portions 35 and 36 are loosely positioned in the respective apertures 38 and 39 provided in a central portion of the plate 21 and are free to move therein. The bar portion 37 normally rests against the inner face 31 of the plate 21. It is to be noted that the terminal 24 is left free to move relatively to the inner face of the plate 21 since the eyelet portions 35 and 36 are not spun over against the outer face of the plate 21.

The terminals 22, 23 and 24 are applied to the plate 21 before the coils 15 and 16 and their respective cores 17 and 18 are applied to the plate 21. When the coils 15 and 16 are applied to the plate 21 by inserting ends of the cores 17 and 18 in the respective apertures 19 and 20, ends of the coils 15 and 16 adjacent the inner face of the plate 21 bear against the terminals 22, 23 and 24 and press the bar portion 37 of the terminal 24 and the bar portions 27 of the terminals 22 and 23 against the inner face 31 of the plate 21. Before the coils 15 and 16 are placed in this position, the ends of the windings of the coils 15 and 16 are thrust through the free eyelet portions of the terminals and are drawn forwardly of the front face of the plate 21 as shown in Fig. 6. After the ends of the windings have been brought forwardly through the free eyelet portions of the terminals, the wires are attached to the free eyelet portions of the terminals, for instance, by means of solder. One end portion 40 of the winding of the coil 16, for instance, is brought through the eyelet portion 26 of the terminal 23 and is connected thereto. The other end portion 41 of the winding of the coil 16 is brought through the eyelet portion 36 of the terminal 24 and is secured thereto. An end portion 42 of the winding of the coil 15 is brought through the eyelet portion 35 of the terminal 24 and is secured thereto. The other end portion 43 of the winding of the coil 15 is brought through the eyelet portion 26 of the terminal 22 and is secured thereto. The spun-over end portions 29 and 33 of the respective terminals 22 and 23 serve as points of connection for wires 45 and 44 of a circuit in which the coils 15 and 16 may be connected when in use. For the purpose of illustration and not in the sense of being a limitation to the invention, the coils 15 and 16 have been shown as being connected in series. Assuming that the connections have been made in accordance with the arrangement shown in Figs. 3 and 6, the circuit of the structure would be as follows: Incoming wire 44 to the eyelet portion 25 of terminal 23, bar portion 27 of terminal 23, eyelet portion 26 of terminal 23, end portion 40 of the winding of coil 16, the winding of coil 16, end portion 41 of the winding of coil 16, eyelet portion 36 of terminal 24, bar portion 37 and eyelet portion 35 of terminal 24, end portion 42 and coils of the winding of coil 15, end portion 43 of the winding of coil 15, eyelet portion 26 of terminal 22, bar portion 27 and eyelet portion 25 of terminal 22, to outgoing wire 45.

The coils 15 and 16 in the structures shown in Figs. 3 and 6 may have layers of sheet insulating material alternated with various layers of wire wound on the cores and be constructed along the lines of the coil 3 shown in Figs. 1 and 2. When the double-coil structure shown in Figs. 3 and 6 is first made, the ends of the coils adjacent the inner face 31 of the plate 21 are tightly pressed against the inner face of the plate. When the coils 15 and 16 shrink with age or under the influence of a change of temperature so that the ends of the coils adjacent the plate 21 move away from the inner face of the plate, the terminal 24 and portions of the terminals 22 and 23 will follow the movement of the coils enough to prevent breaking of the portions of the coils where they are led to the terminals. Under the shrinking movement above mentioned, the terminal 24 will move bodily in the direction of movement of the coils 15 and 16 and will take, for instance, the position shown in Fig. 5 with the bar portion 37 spaced from the inner face 31 of the plate 21 and the eyelet portions 35 and 36 extending a lesser distance through the respective apertures 38 and 39 than they did before the shrinkage occurred. The eyelet portions 26 of the terminals 22 and 23 under the same condition will move in the direction of the coils 15 and 16, and the bar por-

tions 27 will move away from the inner face 31 of the plate 21 to the position shown in Fig. 4, the bar portions 27 being more or less flexed according to the extent of shrinkage of the coils 15 and 16.

From the foregoing description and as illustrated in the drawing it will be seen that in this invention a departure has been made from the usual practice of having end portions of the wire forming a coil attached directly to terminal posts immovably supported in a spoolhead or in a plate of insulating material, and that the terminal or a portion thereof is made movable to compensate for changes in the length of the coil structure under changes in temperature and for relative movement of parts of the structure such as would occur under the influence of jars or shocks to which the apparatus might be subjected in transportation. The result of the invention is that with less breaking of parts in service and in transportation of the apparatus considerable savings in expense are effected.

What is claimed is:

1. In a wire wound electrical device comprising a core, a wire winding on said core and an apertured plate of insulating material supported on said core adjacent an end of said winding, a terminal comprising two tubular eyelet portions and a bar portion connecting said eyelet portions, one of said eyelet portions being loosely positioned in an aperture in said plate and connected to an end of the wire winding and the other eyelet portion being supported in an aperture in said plate and having end portions flanged over into engagement with opposite faces of said plate.

2. In a wire wound electrical device comprising a coil built up of a plurality of layers of windings of wire and interposed layers of insulating material, a core supporting said winding and an apertured plate of insulating material supported on said core adjacent an end of said coil, a terminal comprising two tubular eyelet portions and a bar portion connecting said eyelet portions, said bar portion being between an end of said coil and an adjacent face of said plate, said eyelet portions projecting forwardly of said bar portion through apertures in said plate and at least one of said eyelet portions being loosely disposed in an aperture in said plate and connected to an end of the wire winding in said coil.

3. In a wire wound electrical device comprising an operating coil, a core supporting said coil and an apertured spoolhead supported on said core adjacent an end of said coil, a terminal comprising two spaced tubular eyelet portions and a bar portion extending from one eyelet portion to the other, said bar portion being disposed between said spoolhead and an adjacent end of said coil, said eyelet portions extending forwardly of said bar portion and within apertures in said spoolhead, one of said eyelet portions being fastened to said spoolhead and the other eyelet portion being loosely positioned in the spoolhead and electrically connected to an end of said coil.

4. In an electromagnetic device comprising a pair of operating coils, means for supporting said coils in parallel spaced relation and an apertured plate disposed adjacent ends of said coils and serving as a spoolhead common to said coils, a set of terminals for said coils, each of said terminals comprising a bar portion and spaced projections extending normal to the plane of said bar portion, said bar portions lying against an inner face of said plate and between said plate and said operating coils and said projections extending into apertures in said plate, one of said terminals being common to said coils and having its projections loosely positioned in apertures in said plate and connected to end portions of said coils and each of the other terminals having one projection extending through an aperture in said plate and spun over against an outer face of said plate and another projection loosely positioned in an aperture in said plate and connected to an end of a coil.

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