

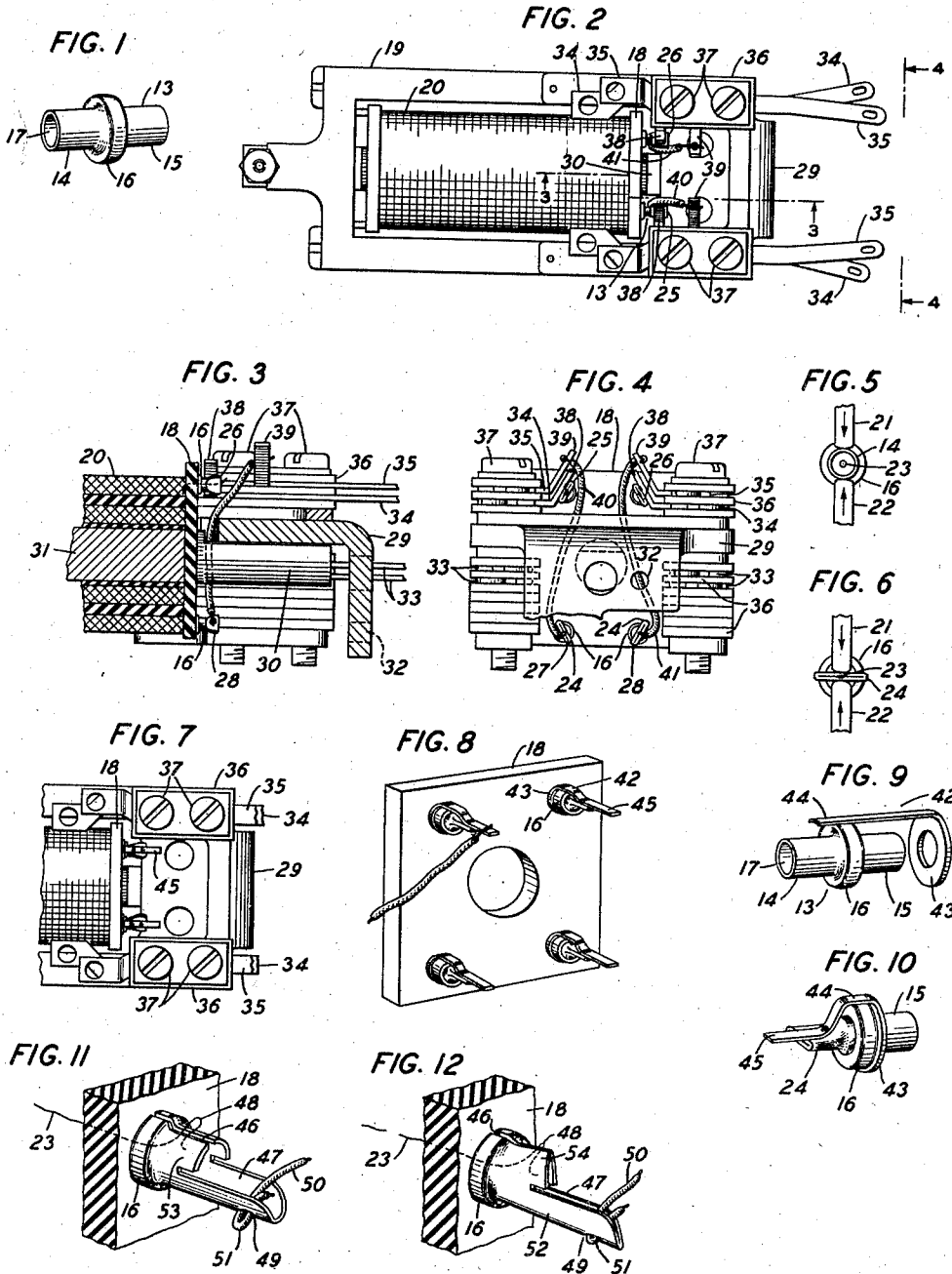
Sept. 22, 1942.

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2,296,346

ELECTRICAL TERMINAL

Filed July 3, 1941



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UNITED STATES PATENT OFFICE

2,296,346

ELECTRICAL TERMINAL

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Application July 3, 1941, Serial No. 400,906

7 Claims. (Cl. 173—324)

This invention relates to terminals, and more particularly to terminals adapted for use in wire wound electrical devices such, for instance, as relays.

The object of the invention is to provide a relatively small and inexpensive terminal suitable for use on electrical devices in which the space available for location of the terminal is quite limited.

A feature of the invention resides in the structure of an eyelet terminal and the manner in which a wire is electrically connected to the terminal.

Another feature resides in the manner in which the wire and another terminal are simultaneously connected to the eyelet terminal.

Another feature resides in a modification in which a conducting tab is used in combination with the eyelet.

Another feature resides in a modification providing for the simultaneous connecting of two wires to the terminal at separated points on the terminal.

In the drawing:

Fig. 1 is an enlarged view in perspective of the eyelet from which the terminal is formed;

Fig. 2 shows a relay equipped with the terminal of this invention;

Fig. 3 is a side view, partly in section, of a portion of the relay shown in Fig. 2 and taken on the line 3—3;

Fig. 4 is an end view of the relay shown in Fig. 2 and taken on the line 4—4;

Fig. 5 shows one step in the formation of the terminal, a pair of electrodes in engagement with the eyelet, and a wire placed in the eyelet;

Fig. 6 shows the position of the parts in Fig. 5 after an advanced step has been made in forming the terminal;

Fig. 7 shows a portion of a relay equipped with the terminal having the conducting tab thereon;

Fig. 8 is an enlarged view of a spoolhead of the relay with the terminal shown in Fig. 7 mounted thereon and a wire connected to one of the tabs;

Fig. 9 is an enlarged view of the terminal embodying the tab and with the parts shown in exploded arrangement;

Fig. 10 shows the parts of Fig. 9 connected together to form the terminal shown in Figs. 7 and 8;

Fig. 11 is an enlarged view, in perspective and partly in section, of a modification of the invention and with wires arranged for connection to an eyelet type terminal; and

Fig. 12 shows the parts illustrated in Fig. 11 and with the wires electrically connected to the terminal.

In the manufacturing of wire wound electrical devices in which a spoolhead is provided on the end of a core supporting the winding, and more particularly in the making of relays of the type shown in Fig. 2, it is often found that the space available on the spoolhead for supporting terminals for the wire is very limited. Also, that after the relay has been assembled, some difficulty is had in connecting outside wires to the terminal means mounted on the spoolhead.

The terminal provided by this invention is relatively small and only a small space is required for mounting it on the spoolhead and for making electrical connections of wires or other conducting means to the terminal.

In its simplest form the terminal is made from an eyelet 13 of conducting material shown in Fig. 1, the eyelet comprising tubular portions 14 and 15 and an integral bead portion 16. The bore 17 of the eyelet 13 extends longitudinally all the way through the eyelet 13 so that a wire may be thrust longitudinally through the eyelet. The bead 16 is in the nature of a peripheral flange formed on the eyelet 13.

The eyelet 13 as shown in Fig. 2 is mounted on a spoolhead 18 which may be part of a wire wound electrical device such, for instance, as the relay 19. The spoolhead 18 is apertured to accommodate one of the tubular portions 14 or 15 of the eyelet 13. The bead portion 16 bears against the outer face of the spoolhead 18 and the tubular portion of the eyelet thrust through the spoolhead 18 is spun over against the inner face of the spoolhead 18 to hold the eyelet 13 in place. An end of the wire of the winding 20 is thrust longitudinally through the eyelet 13. The outer end of the eyelet is then placed between relatively movable jaw members and sufficient pressure is applied by means of the jaw members to flatten the outer end of the eyelet against the end of the wire. The manner in which the outer end of the eyelet is flattened and pressed against the wire is illustrated in Figs. 5 and 6 in which 21 and 22 are the jaw members and 23 is the wire. In Fig. 5 the jaw members 21 and 22 are in engagement with the tubular portion 14 of the eyelet 13 preparatory to the flattening of the end portion 14. In Fig. 6 the jaw members 21 and 22 have been brought closer together and the portion 14 of the eyelet has been distorted so that it now forms the flat-

tened portion 24, the wire 23 being clamped in place and held in the flattened end portion 24. In the event that it is desired to electrically weld the wire 23 to the flattened portion 24 of the eyelet the weld may be made by having the jaws 21 and 22 constitute parts of an electrical welding system and by supplying a suitable electrical current to the parts through the jaws, the jaws in this case being electrodes of an electrical welding apparatus. The same arrangement may be used also to remove enamel or other insulating material from the portion of the wire 23 engaged by the flattened end portion 24 of the eyelet, the insulating material being burned or melted from the wire 23 by the application of a suitable electrical current to the parts by way of the jaws 21 and 22.

It will be seen by looking at Figs. 2, 3 and 4 that terminals 25, 26, 27 and 28 have been formed from eyelets of the type 13 shown in Fig. 1. Each terminal has the bead portion 16 bearing against the outer face of the spoolhead 18, the inner end of each terminal having been spun over against the inner face of the spoolhead 18. The relay 19 is equipped with an L-shaped bracket 29 supported on an outwardly extending end portion 30 of the core 31. The bracket 29 is drilled and tapped at suitable points 32 to receive mounting screws, not shown, and provides a means for mounting the relay 19 on a relay rack or other suitable support. A pile-up of leaf spring contacts 33 and conducting bars 34 and 35 with insulating strips 36 interposed therewith is supported on the bracket 29 by means of the screws 37. The conducting bars 34 and 35 serve as outside terminals for the relay 19 and are provided with angularly extending lugs 38 and 39, respectively. In Figs. 2, 3 and 4 the lugs 38 are electrically connected to the flattened portions 24 of the terminals 25 and 26, the lug 38 of one of the conductor bars 34 being connected to the flattened portion 24 of the terminal 25 and the lug 38 of the other conducting bar 34 being connected to the flattened portion 24 of the terminal 26. The lug 38 may be solder-connected or electrowelded to the flattened portion 24 of the terminal. If electrowelding of these parts is required the lugs 38 may be placed between one of the electrodes of the welding apparatus and the terminal preparatory to the flattening of the end portion of the terminal against the wire 23, the parts disposed between the electrodes being then subjected to sufficient heat and pressure to form a suitable weld connection.

Jumper wires 40 and 41 are provided to electrically connect the terminals 27 and 28 to the conducting bars 35. One end of the jumper wire 40 is electrically connected to the flattened portion 24 of the terminal 27 and the other end is electrically connected to the lug 39 of a conducting bar 35. The jumper wire 41 is electrically connected to the flattened portion 24 of the terminal 28 and to the lug 39 of the other conducting bar 35. The connecting of the jumper wires to the terminals and to the lugs 39 may be readily accomplished by placing the parts to be connected in engagement with each other and between the electrodes of a welding machine such, for instance, as the jaws 21 and 22 and then applying sufficient heat and pressure to the parts to electroweld them together. It will be seen that the flattened portion 24 of the terminals 27 and 28 and the lugs 39 of the conducting bars 35 permit the ready making of the electro-

welds between the jumper wires and the parts to be electrically connected thereto. A particular advantage in the construction and arrangement of the terminals is that the jumper wires 40 or 41 or the lugs 38 or 39 may be electrowelded to the terminal when the flattened portion 24 is being formed and connected to an end of the winding of the relay.

In doing this the end of the wire 23 is inserted in the eyelet 13, an end of the jumper wire or lug 38 is placed in contact with the end 14 of the eyelet, the parts are then placed between the electrodes 21 and 22 and sufficient heat and pressure is applied to the parts to flatten the end 14 of the eyelet against the wire 23 and electroweld together all of the parts to be connected. This considerably reduces the labor cost in making the electrical connections.

In Figs. 7, 8, 9 and 10 a tab 42 shown in its original form in Fig. 9 is applied to the eyelet 13. The tab 42 comprising a ring portion 43 and an angularly disposed integral tailpiece 44 is slipped over the end portion 15 of the eyelet and so that the ring portion 43 bears against the bead 16. The eyelet 13 is set into an aperture in the spoolhead 18 as shown in Fig. 8 and so that the ring portion 43 is clamped between the front face of the spoolhead and the bead 16, the inner end portion 15 of the eyelet being then spun over against the inner face of the spoolhead 18. When an end of the wire 23 is thrust through the bore 17 of the eyelet and the end portion 14 is flattened against the wire 23 and the flattened portion 24 is formed, the tailpiece 44 is also pressed against the flattened portion 24 as shown in Figs. 8 and 10. The tailpiece 44 projects beyond the flattened portion 24 and serves as a terminal tab 45 which may be suitably connected to the lugs 38 or 39 or to the jumper wires 40 or 41 shown in Fig. 2. The tailpiece 44 may be welded to the flattened portion 24 while the portion 24 is being formed. In this case the tab 42 is electrically connected at two points to the eyelet member since the ring portion 43 is pressed against the bead 16 and the tailpiece 44 is connected to the flattened portion 24. The tailpiece 44 is rather long and flexible and will absorb stresses resulting from relative movement of the connected parts. Such movements may be due, for instance, to heating of the parts by the winding 20 or may be due to changes in humidity of the atmosphere in which the relay is located. If due to a change in atmosphere the spoolhead 18 should shrink or move and fail to hold the ring portion 43 tightly against the bead 16 there would still be good electrical connection between the terminal tab 45 and the flattened portion 24 of the terminal.

Figs. 11 and 12 show a modification of the invention. In this case the end portion 14 of the eyelet 13 and the bead 16 are cut to provide a longitudinal open seam 46. The end portion 14 is also cut back to provide a trough portion 47. The eyelet is mounted on the apertured spoolhead 18 in the same manner as the structure shown in Figs. 2, 3 and 4, the inner end of the eyelet being spun over against the inner face of the spoolhead 18. The end of the wire 23 is thrust through the bore of the eyelet and then brought out through the open seam 46 in the form of a loop 48. The trough portion 47 is apertured at 49 to receive a conductor 50 which may be a wire of a circuit to be connected to the terminal on the spoolhead 18. The conductor 50 is thrust in the form of a loop 51 through the

aperture 49. The outer end portion of the terminal is then flattened as shown in Fig. 12 to provide the flattened end portion 52, the trough portion 47 being flattened to entrap the loop 51 in the aperture 49 and the tubular portion 53 of Fig. 11 being flattened as shown at 54 in Fig. 12 to entrap the loop 48 in place. The loops 48 and 51 may be electrowelded to the terminal by applying sufficient heat and pressure to the parts through the electrodes 21 and 22 during the flattening of the outer end portion of the terminal. It will be understood that if the wire 23 and the conductor 50 are provided with coatings of insulating material, the insulating material may be simultaneously removed at the points of connection during the flattening of the outer end portion of the terminal, the insulation being melted or consumed by reason of the heat applied. Also, that by flattening the outer end portion of the terminal against the looped portions of the wire 23 and the conductor 50 the wire 23 and the conductor 50 may be electrically connected to the terminal without welding of the parts if no insulating covering is provided on the wire 23 or the conductor 50 and only frictional connection of the parts is required.

What is claimed is:

1. In an electrical terminal connection for a wire and an electrical conductor, and in which the terminal connection is mounted on an apertured support, in combination, a tubular body member having an annular bead portion located intermediate the end portions of said body member, a tubular end portion extending through the aperture in said support and spun over against the inner face of said support, said bead portion being located on the outer side of said support, a flattened end portion on said body member extending from said bead portion and outwardly of said support, a wire extending longitudinally through said tubular portion and through said bead portion and into said flattened end portion, and electrically connected to said flattened end portion, a tab extending from said flattened end portion and said conductor being electrically connected to said tab.

2. In a terminal connection for a wire and an electrical conductor, in combination, an apertured support, a tubular member of conducting material having a peripheral enlargement intermediate the end portions thereof, a tab having an apertured portion mounted on said member and in engagement with said enlargement and a tailpiece extending in parallel relation with said tubular member and beyond one end of said tubular member, said tailpiece being electrically connected to said conductor, said tubular member being mounted on said support and having a portion of said wire extending through its bore and said tubular member having one of its end portions flattened against said wire and secured to said wire.

3. In a terminal connection for a wire and an electrical conductor, in combination, an apertured support, a metal eyelet secured at one of its end portions in said support, a peripheral bead formed on said eyelet intermediate end portions thereof, a tab having a ring portion encircling the secured end portion of said eyelet and bearing against said bead and said support, a tailpiece on said tab extending at an angle from said ring portion and beyond the unsecured end portion of said

eyelet, an end of said wire extending through said eyelet and into the unsecured end portion of said eyelet, the unsecured end portion of said eyelet being flattened into electrical contact with said wire and said tailpiece being pressed against the flattened end portion of said eyelet and being electrically connected to said conductor.

4. A terminal connection for wires comprising a metal eyelet having a tubular end portion mounted in a support, a peripheral enlargement engaging one face of said support, an open-seamed tubular portion extending from said enlargement and outwardly of said support, a trough portion extending from said open-seamed tubular portion, said trough portion being apertured at one end, one of said wires extending through the secured end portion of said eyelet and into said open-seamed portion and being disposed in the form of a loop extending through the open seam, another of said wires being extended in the form of a loop through the aperture in said trough portion and said trough portion and said open-seamed portion being laterally pressed into engagement with the looped portions of said wires to make electrical connection of said wires to said eyelet.

5. A terminal connection comprising a tube of conducting material mounted at one end in an apertured support, an open-seamed tubular end portion extending outwardly of said support, a wire extending in loop formation through the open seam and the open-seamed end portion of said tube being flattened to entrap the loop portion of said wire into electrical connection with said tube.

6. A terminal connection comprising a tube of conducting material having one of its end portions mounted in an apertured support, an open-seamed tubular portion extending outwardly of said support, an apertured trough-shaped end portion extending from said open-seamed portion, a wire extending through said tube and in looped formation through the open seam, a conductor extending into said trough-shaped end portion and in looped formation through the aperture therein, said open-seamed portion being laterally pressed to entrap said wire in the open seam and said trough-shaped end portion being laterally pressed to entrap the looped portion of said conductor in the aperture in said trough-shaped end portion, and into electrical connection therewith.

7. In a terminal connection for wires comprising an apertured support and a tubular member of conducting material mounted on said support, a peripheral enlargement on said tubular member engaging one face of said support, a spun-over end portion of said tubular member engaging the other face of said support, an open-seamed tubular portion extending outwardly of said support, a trough-shaped end portion extending from said open-seamed tubular portion, a wire extending through said open-seamed tubular portion and in looped formation through the seam therein, a conductor extending into said trough-shaped end portion, and said open-seamed tubular portion and said trough-shaped end portion being compressed into a substantially flat condition to entrap and hold said wire and said conductor in electrical connection with said tubular member.

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