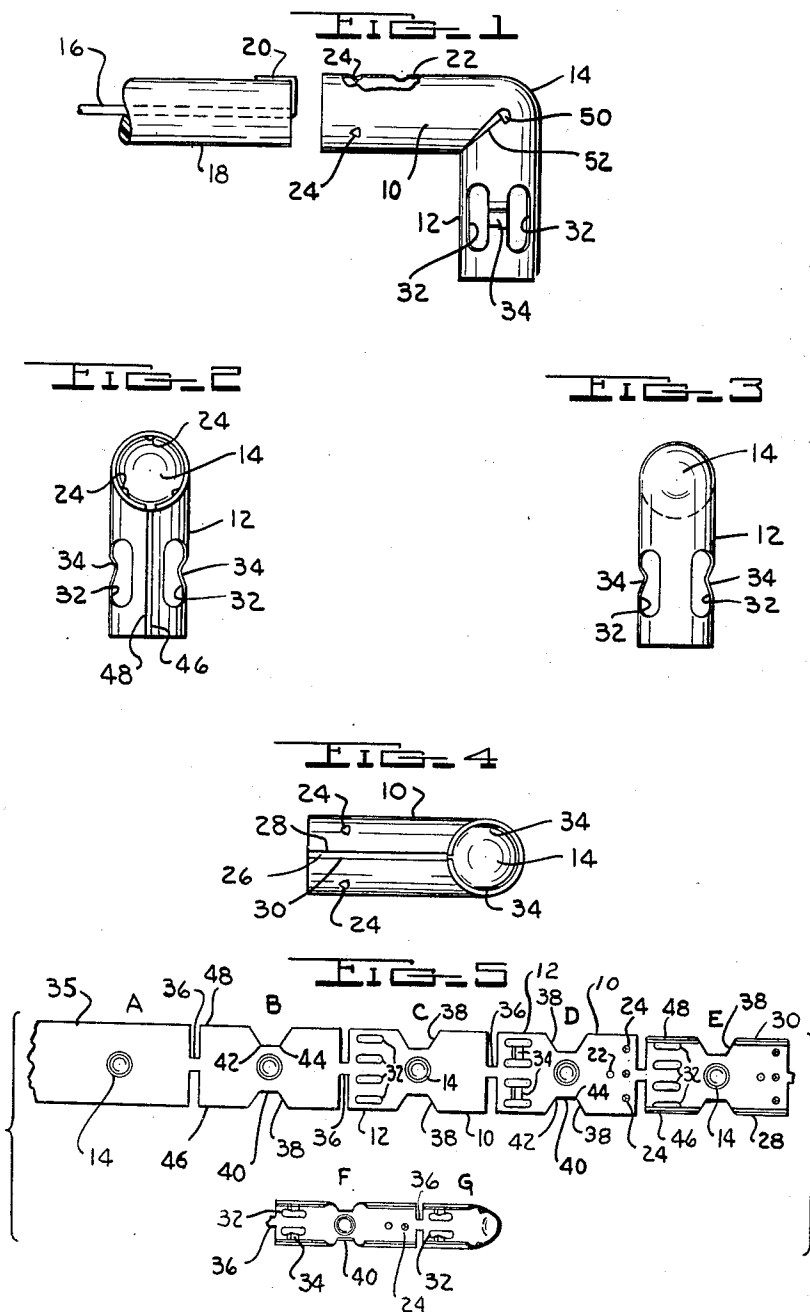


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H. A. ELLIOTT
SLEEVE TYPE ELBOW TERMINAL

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INVENTOR.
HOWARD A. ELLIOTT
BY
Arthur W. Smith
ATTORNEY

UNITED STATES PATENT OFFICE

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SLEEVE TYPE ELBOW TERMINAL

Howard A. Elliott, Detroit, Mich., assignor to
Essex Wire Corporation, Detroit, Mich., a corporation of Michigan

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The present invention relates to an improved sleeve type elbow terminal particularly but not exclusively adapted for use as an electrical terminal used with automobile ignition systems and the like.

Prior to the present invention, such sleeve type elbow terminals have been commonly fabricated from sheet metal stock to provide an essentially tubular L-type sleeve or socket open at both ends. One sleeve end of the terminal is adapted for permanently receiving in electrical contact the end of an insulated wire conductor. The other sleeve end serves as a female type sleeve terminal for detachably engaging the mating plug or male type terminal of another conductor. The bend at the elbow of such sleeve terminals has been a source of weakness in the conventional construction. In forming the elbow the metal is unequally stressed and is weakened so that the elbow bends too readily, resulting in breakage of the terminal at the elbow.

An object of the present invention is to provide an improved angular sleeve type terminal which is particularly resistant to bending or breakage at the elbow.

Another object is to provide an improved sleeve type elbow terminal which is particularly adapted for use with automotive ignition systems and which provides an angle at the elbow of less than 90°, so as to present the terminal in use at a particularly convenient angle to the operator.

Other objects are to provide an improved angular sleeve type terminal of the character described which is readily adapted for economical manufacture by mass production methods from strips of sheet metal stock; and to provide improved means in such a terminal for positively electrically contacting its permanently attached conductor and for securely gripping the insulation of the latter without the use of solder or other bonding material.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

In the drawings:

Fig. 1 is a fragmentary elevation showing a terminal embodying the present invention and an end portion of a conductor cable detached therefrom.

Figs. 2 and 3 are end elevations of the terminal shown in Fig. 1, taken from the left and right ends respectively.

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Fig. 4 is a front elevation of the terminal shown in Fig. 1.

Fig. 5 is a schematic plan view showing a strip of sheet metal from which the terminal of the present invention is fabricated, and indicating the essential steps in the manufacture of such terminal.

Before explaining the present invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

A preferred embodiment of the present invention comprises a sleeve type elbow terminal which is formed by passing a strip of an electrically conductive sheet material, such for example as a copper alloy, through a series of progressive die cutting and forming operations.

In one of the early operations, a bowl-shaped indenture comprising a spherical or spheroidal segment is embossed into the strip in such a manner as to provide a uniformly stressed area. This indenture later becomes the region of the bend of the elbow and provides great strength and resistance to bending of the formed terminal from its final angular shape. In the succeeding operations, the strip is punched and indented to provide gripping means and a plurality of jagged intumed tangs, the sides are rolled to the sleeve form, and the elbow shape is formed by bending the material at the spheroidal indenture.

One sleeve leg of the resulting terminal is adapted for securely and permanently gripping the end of an insulated wire conductor inserted therein, and is preferably clamped around the conductor in the manufacture of the terminal, although it may be clamped around the conductor on the job if desired. The jagged intumed tangs are provided by the said conductor receiving sleeve leg for embedding into and positively gripping the insulation of the conductor. Each tang is adapted in size so that the area of the insulation cut thereby will be insufficient to permit stripping of the insulation from the conductor.

The conductor receiving sleeve of the terminal also provides an inward projecting conductor contacting nib adapted to make positive electrical contact with an exposed portion of the conductor inserted into the sleeve. Prior to insertion of the conductor into the sleeve terminal, it is preferred

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that an end portion of the conductor is exposed and bent rearwardly in a U-bend against the external side of its insulation. Thereafter the conductor is inserted into the sleeve therefor with its exposed end portion aligned to contact the aforesaid inward projecting conductor contacting nib. Upon closing the sleeve tightly around the insulation, the said conductor contacting nib engages the exposed end portion of the conductor in positive electrical contact.

A particular embodiment of the present invention is shown in Figs. 1 through 4. The terminal comprises two sleeve legs 10 and 12 bent at a right angle around the essentially spheroidal embossment or indenture 14 at the cap or fold of the elbow. The sleeve leg 10 is adapted to receive and electrically contact the end of an insulated cable 16 having the insulation 18. In order to assure positive electrical contact with an exposed rearwardly bent end portion 20 of the cable 16, the sleeve leg 10 provides the inward projecting conductor contacting nib 22. Permanent and secure gripping of the insulation 18 is achieved by the plurality of jagged inturned tangs 24.

The insulated conductor 16 is preferably permanently and securely enclosed within the sleeve leg 10 during the formation of the latter, with the nib 22 contacting the exposed cable end portion 20 and with the inturned tangs 24 cutting into the insulation 18. However, the conductor 16 may be inserted on the job if desired by opening the sleeve leg 10 along its longitudinal slit 26 (Fig. 4) which spaces the adjacent sleeve edges 28 and 30 along the line of symmetry at the interior angle of the elbow. Thereafter the sleeve leg 10 is closed tightly around the inserted conductor cable 16—18 as described above.

The sleeve leg 12 of the completed terminal provides a plurality of axially extending oval-like recesses 32. Two of the opposed bars 34 between the recesses 32 are crimped slightly inward, so as to provide resilient retaining and electrical contacting means for detachably gripping a conventional male or plug-type terminal insert.

The terminal of the present invention may be economically fabricated from a thin flat strip 35 of a copper alloy such as bronze or other suitable electrical conducting material having the desired strength and forming characteristics. Fig. 5 schematically indicates one method utilizing a progression of cutting and forming operations through which any particular portion of the strip 35 or blank formed therein is subjected in the formation of a terminal embodying the present invention. It is to be understood, however, that said terminal may be made by other methods known to those skilled in the art. As here shown, the respective steps of a preferred process are lettered A through G for future reference, the first step being shown at A and the subsequent operations being indicated step by step to the right in Fig. 5.

The general principles of the die cutting and forming operations required for the fabrication of a terminal of the character described from a strip of sheet metal stock are well known to the tool and die making art and are accordingly not described herein. Briefly, the strip 35 is intermittently indexed from left to right through a series of progressive cutting and forming dies. Each progressive die performs its work operation on the portion of the strip indexed thereat, so that the resulting strip will appear somewhat as indicated in Fig. 5. A preferred sequence of operation in the formation of the terminal

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shown is described in more detail in my co-pending application, Serial No. 24,551, filed May 1, 1948, to which reference is hereby made for the disclosure of any additional details which may be required.

As a first step, the end of the strip 35 is embossed with the said spheroidal indenture 14 which later becomes the fold or cap of the elbow. It will be apparent to those skilled in the art that the indenture 14 may be formed at any one of various stages in the progressive formation of the terminal, provided that the portion of the strip 35 whereat the indenture 14 is formed is still essentially flat. The indenture or embossment 14 will be of less value as a reinforcement if formed after the sidewalls of the terminal are rolled inward in the later operations. Furthermore, the early formation of the indenture 14 permits its use for centering the strip 35 as it is progressively indexed to the subsequent cutting and forming operations.

The embossing of the indenture 14 stresses and work hardens the material of the strip 35 at the region which eventually becomes the fold of the elbow and also provides an essentially spheroidal surface for the elbow cap which uniformly distributes forces tending to distort the elbow from its final angular shape. Thus is provided an exceptionally strong angle type terminal which is particularly resistant to bending at the elbow. The strengthening afforded by the spheroidal indenture 14 may also be achieved by raising the latter in the strip 35, Fig. 5, so that the resultant elbow cap will be concave rather than convex. However, the preferred construction shown permits a folding and blending of the terminal about the convex indenture 14 and provides a terminal of improved appearance. Likewise, the present invention is obviously not limited to the spherical embossment 14 at the elbow, since embossed indentures having other surfaces, as for example a symmetric multi-facet indenture, will provide a work-hardened, stress-distributing elbow reinforcement within the spirit of the present invention.

In the step B, the strip 35 is blanked out around the indenture 14, leaving the resulting blank connected to the body of the strip by the connecting neck 36. Simultaneously the truncated triangular notches 38 are cut in the blank to remove the excess material at the lateral sides of the indenture 14 and to permit formation of the elbow bend. Each notch 38 is identified by the small axially extending base 40 terminating in the axially spaced points 42 and 44 referred to hereinafter.

In subsequent operations, indicated at C, the plurality of oval-like recesses 32 are formed. As indicated at D, the bars 34 between the two lateral pairs of recesses 32 are crimped upwardly, but the aforementioned nib 22 and jagged tangs 24 are raised from the underside of the portion of the blank which eventually become the sleeve leg 10.

In the operations indicated at E, the aforementioned lateral edges 28 and 30 of the leg 10 are bent slightly upward, and the corresponding lateral edges 46 and 48 of the leg 12 are similarly bent upward. At a later stage, the edges 28, 30, 46, and 48 are rolled further upward and toward each other to form the semi-closed sleeve member indicated at F. In the final operations, the legs 10 and 12 are bent at right angles to each other as indicated at G, and the sleeves thereof are closed to the final position indicated in Figs. 1

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through 4. If desired, prior to the final closing of the sleeve leg 10, the cable 16—18 is inserted and permanently secured therein by folding the sleeve leg 10 tightly around the insulation 18 as heretofore described.

In the elbow bending operation, the axially spaced points 42 and 44 at opposite ends of each base 40 are compressed and swagged essentially to a single thickened reinforcement 50, Fig. 1, at the base of the slit 52 which remains after the elbow forming operation as a remnant of the recess 38. Not only is the base of the slit 52 reinforced by the thickening of the excess material thereof resulting from the compression of the base 40 to essentially a single point, but the swagging and flattening operations work harden the thickened material 50 resulting in the formation of an exceptionally strong reinforcement for the bend of the elbow.

Although the present invention is illustrated by means of a right angle elbow, it is apparent that an elbow may be provided at other than a right angle. An essentially 45° angle is particularly desirable in some instances, as for example with certain types of automobile ignition systems, and permits the terminal to be conveniently faced toward the operator in use.

From the foregoing, it is apparent that I have disclosed a superior sleeve type elbow terminal which is readily adapted for efficient and economical manufacture by conventional progressive automatic die cutting and forming processes. The completed terminal provides means for securely and permanently gripping a cable in electrical contact therewith and is characterized by both an improved appearance and in greatly increased strength and resistance to bending at the elbow in comparison to similar terminals of conventional construction.

Having thus described my invention, I claim:

1. A sleeve type elbow terminal formed of a strip of sheet material and including a pair of joined legs, one leg being secured to a conductor, a work-hardened embossed spherical segment comprising the cap of the elbow which connects the adjacent ends of said legs to reinforce the apex of the elbow and form a smooth rounded

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contour thereat, said spherical segment comprising at least half the width of the strip at the point where it is formed, the elbow terminal including a slit in the bottom thereof which essentially bisects the angle of the elbow and extends toward and terminates short of said elbow cap.

2. An elbow terminal according to claim 1 and further characterized in that the center of curvature of the spherical segment lies upon the intersection of the longitudinal axes of said legs.

3. An elbow terminal according to claim 1 and further characterized in that the center of curvature of the spherical segment lies upon a line which bisects the angle of the elbow.

4. A sleeve type elbow terminal formed of a strip of sheet material and including a pair of joined legs, one leg being secured to a conductor, a work-hardened embossed spherical segment comprising the cap of the elbow which connects the adjacent ends of said legs to reinforce the apex of the elbow and form a smooth rounded contour thereat, said spherical segment comprising at least half the width of the strip at the point where it is formed, the elbow terminal including a slit in the bottom thereof which essentially bisects the angle of the elbow and extends toward and terminates short of said elbow cap, and a flat thickened reinforcing portion at the base of said slit on each side of the terminal which joins the side walls of the legs of the terminal.

HOWARD A. ELLIOTT.

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