June 13, 1950 J. C. MACY 2,511,806

ELECTRICAL CONNECTOR

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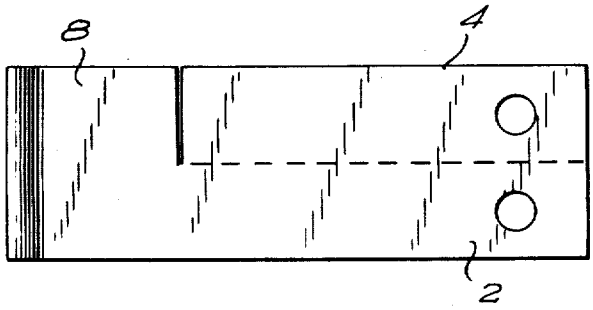

Fig. 1.

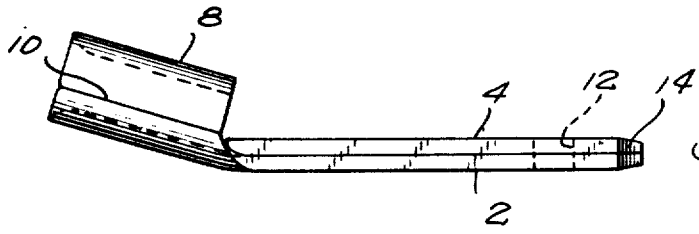

Fig. 2.

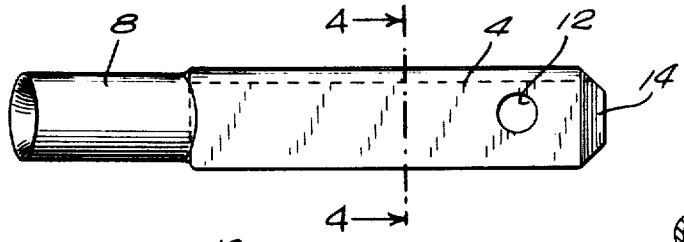

Fig. 3.

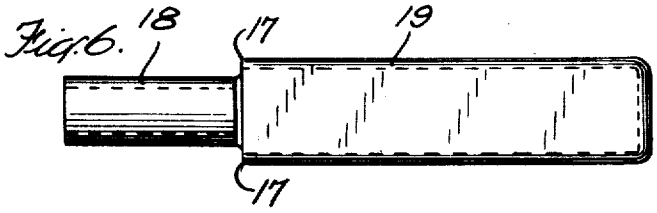

Fig. 6.

Fig. 9.

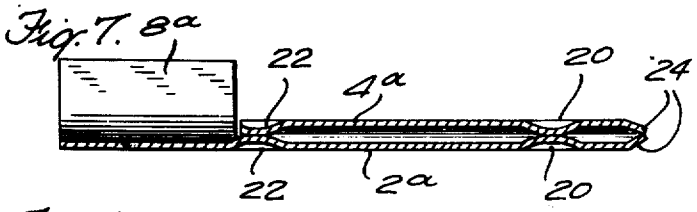

Fig. 7.

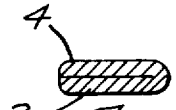

Fig. 4.

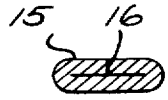

Fig. 5.

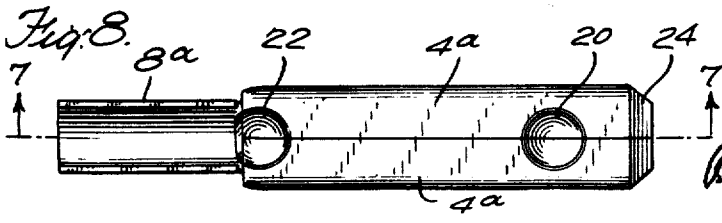

Fig. 8.

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ELECTRICAL CONNECTOR

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3 Claims. (Cl. 173—361)

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This invention relates to plug terminals of the type used on conductor cords for lamps, flat irons, etc., and particularly to those terminals the unexposed parts of which are permanently embedded in vulcanized rubber or other plastic material or suitable holder.

As made heretofore such prongs have been of heavy strip brass or other copper alloy or work hardened copper. Because these prongs have to go into a female outlet to make contact with a supply circuit they must hold their shape and parallelism. The plug connectors are ordinarily banged around as the end of the wire is whipped out of an outlet or dragged around obstacles and from place to place. It is essential therefore that these prongs have substantial strength. On the other hand these plug connectors have been the subject of the keenest price competition so that quality must be attained without increase in cost.

A general object of the invention is, therefore, to improve the quality of prongs and plugs for lamp cords and for power wires of small electrical appliances and the like. Another object is to reduce cost of such plugs without reduction of quality. Other objects will appear from the following specification.

With these objects in view, the present invention contemplates a prong designed so that it can be readily applied to the wire and subsequently molded into a plug by automatic or semi-automatic machinery. The plug is made with one end adapted to be crimped onto a wire with low contact resistance and high pullout strength. These prongs may then be crimped onto the ends of the wires by hand or machine and the prongs and wires put into a plug mold and the insulating base molded thereon to hold the prongs in proper relation and provide the necessary insulation.

In the past it had not been considered feasible to provide a crimped connection on such prongs because the thickness and character of metal required in the prong to give the requisite strength is so excessive in a ferrule or crimping portion as to impair the quality of the connection and, moreover, to waste material which serves no useful purpose. Even if a prong is made of doubled thickness of metal strip the stock is still thicker than is required in most cases for the crimped connection. It has now

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been found that a prong of adequate strength and conductance can be made of metal of thickness most suitable and economical for the crimped connection if the prongs are made of the usual external size and form but hollow. In this way a prong is made with greatest efficiency in operation and at the same time with substantial savings in cost.

In the accompanying drawings is shown certain preferred embodiments of the invention,

Figure 1 being a plan view of a sheet metal blank from which a plug terminal embodying the present invention can be stamped up,

Figure 2 a side elevation of a plug terminal embodying the present invention formed from the blank shown in Figure 1,

Figure 3 a plan view of the plug terminal shown in Figure 2,

Figure 4 a section of the terminal tongue on the line 4—4 of Figure 3,

Figure 5 a sectional view similar to Figure 4 but showing a modified form in which the required tongue thickness is obtained by folding over the material from both sides of the blank with the edges meeting in the middle line of the tongue,

Figure 6 a hollow plug terminal formed from a tubular blank,

Figure 7 a view in central longitudinal section taken on line 7—7 of Figure 8 showing a further modification of the invention using relatively thin stock to make a hollow prong;

Figure 8 a plan view of the modification shown in Figure 7; and

Figure 9 a view in cross-section of the ferrule portion of a prong connector as shown in Figure 7, but after crimping onto a wire.

In the form of the invention shown in Figures 1 to 4, inclusive, the plug terminal of the present invention is shown as formed from a sheet metal blank such as shown in Figure 1 which includes a double width tongue portion having two halves 2 and 4 each of substantially the same width as the required tongue and integrally connected to be folded over as shown in Figures 2 and 4 to give the tongue its required thickness for use with a standard outlet receptacle. As will be seen from an inspection of Figure 2, the sheet metal of the blank is of substantially one-half the required thickness of the tongue so that the part 4 when

folded over, as shown in Figure 2, is flattened into full face to face contact with the part 2.

A ferrule part of the terminal is formed from part 8 in the blank. In the terminal shown this is of the same width as the part 2—4 which forms the tongue. In Figures 2 and 3 the part 8 is shown rolled up into cylindrical form to form a ferrule for reception of the wire end, the edges meeting to form a seam or butt-joint 10 which may be brazed or otherwise secured, if so desired, but that is not required.

Different ferrule sizes as may be required for different wires may be provided by trimming some stock away or advantageously by stamping down the stock with lateral extrusion of the metal in one portion or the other.

Instead of forming a cylindrical ferrule to be crimped later after a wire has been inserted, the ferrule-forming portion may be left flat or merely bent to a U and closed directly onto the wire in a crimping operation with a lateral support tool.

As also shown in Figures 2 and 3, the axis of the ferrule is inclined to the longitudinal axis of the tongue by the stamping operation, so that the tongue forms a stop for the wire when it is inserted into the ferrule.

As shown particularly in Figure 3, the tongue part of the plug terminal is provided with the usual detent hole 12 as required by the underwriters. This hole may be formed either as shown in Figures 1 to 3, by stamping registering openings in the blank before folding over the part 4 of the tongue, or it may be punched through the tongue after the tongue has been formed. Preferably the end of the tongue after it is folded is swaged into the tapered form shown at 14 in Figures 2 and 3 to facilitate its insertion in the standard wall outlet.

In Figure 5 is shown a modification of the tongue form shown in Figures 1 to 3 inclusive. In this form the required thickness of the tongue is obtained, not by a single fold-over as shown in Figures 1 to 4, inclusive, but by folding in one half width from each side to meet at the middle of the tongue as shown at 15. For many purposes, this is a preferred form of the invention.

In the form of the invention shown in Figure 6, the terminal prong is formed, not by starting with a strip blank as in Figure 1, but with a piece of tubular stock or a drawn tube or deep cup substantially the required overall length of the terminal and of the diameter and wall thickness desired for the ferrule, in this case approximately one-half the required thickness of the tongue. In forming the terminal from the tubular blank the blank is cut part way through at the end of the ferrule part 18 and the remainder of the blank is flattened into the tongue 19 with double wall of thickness required. It is not necessary to cut the tubular blank before flattening the tongue, but it is an advantage since the shoulders 17 which result give better anchorage of the terminal in the molded body or other holder of the finished plug connector.

In the form of the invention shown in Figures 7 and 8 the plug terminal is made of sheet metal thinner than one-half the required tongue thickness. In this case the required strength is attained by maintaining a tubular form, as shown in Figure 7. In order to assure the maintenance of the tubular condition and to serve the need for detents in lieu of the holes 12 meeting, indentations 20 and 22 are formed in the tongue portions 2a and 4a. These serve the function

of the ordinary detent hole and at the same time act to space the fold or folds of the tongue sufficiently to assure the relatively greater strength of a tube. At the end of the tongue this spacing is also established, simultaneously with the formation of the end taper 24 by the meeting of the inwardly inclined ends 24 of the tongue portions.

As shown in Figures 7 and 8, the ferrule-forming portion of the terminal 8a is not closed over into a cylindrical or tubular form but is left in a U form to be closed forming a ferrule in direct engagement with a wire by means of a crimping die affording lateral support. For example, as set forth in the applications identified above. Such a crimped connection is shown in cross-section view in Figure 9, the free ends of the U in the ferrule-forming portion having been curled over in the crimping die and driven back into the wire with compression of the metal in the ferrule-forming portion so as to produce a secure mechanical connection and a high quality electrical connection.

An important advantage of this hollow prong as shown in Figure 7 example, is that the external dimensions of the prong are not limited by the thickness of the rolled stock, thus for example, the prong may be formed with a slight taper which allows it to fit better between spring contacts, with contacts lying flat against the surface and in any case the exact thickness and dimensions are more readily established and maintained by die pressing the hollow prong than where rolled stock is used and the tolerances of the raw stock have to appear in the finished prong.

From the foregoing description it will be seen that the present invention provides a simple plug terminal which can be manufactured easily and cheaply from stock of the minimum thickness required for the ferrule part of the terminal, the resultant product meeting all of the requirements for a good plug terminal and lending itself to production at a minimum cost both for material and labor.

I claim:

1. A plug prong connector comprising a ferrule open at both ends and an integral, laminated, long and narrow, rectangular tongue portion extending from one end of the ferrule in the same general direction as the ferrule axis, the component laminae of said tongue portion being integral along at least one long edge and being of equal composite overall width and length so that the upper and lower surfaces of the tongue are flat and parallel, said tongue portion being at least twice as thick as the wall of the tubular ferrule, the end of said tongue portion immediately adjacent the ferrule extending across a part of one open end of the ferrule to act as a stop for wire inserted in the ferrule.

2. A plug prong connector comprising a ferrule open at both ends and an integral, laminated, long and narrow, rectangular tongue portion extending from one end of the ferrule in the same general direction as the ferrule axis, the component laminae of said tongue portion being integral along both long edges and being of equal composite overall width and length so that the upper and lower surfaces of the tongue are flat and parallel, said tongue portion being at least twice as thick as the wall of the tubular ferrule, the end of said tongue portion immediately adjacent the ferrule extending across a part of one

open end of the ferrule to act as a stop for wire inserted in the ferrule.

3. A plug prong connector comprising a ferrule open at both ends and an integral laminated long and narrow rectangular tongue portion extending from one end of the ferrule in the same general direction as the ferrule axis, the component laminae of said tongue portion being integral along at least one long edge and being of equal composite overall width and length so that the upper and lower surfaces of the tongue are flat and parallel, said laminae including integral oppositely-directed dimples serving to space them apart so that the tongue portion is more than twice as thick as the wall of the tubular ferrule, the end of the tongue portion immediately adjacent the ferrule extending across a part of one open end of the ferrule to act as a stop for wire inserted in the ferrule.

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