Sept. 15, 1942. D. HOPPENSTAND 2,295,899

METHOD OF MANUFACTURING CONDUCTOR TERMINALS

Filed April 19, 1940

Fig. 1.

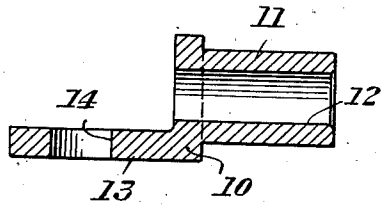


Fig. 2.

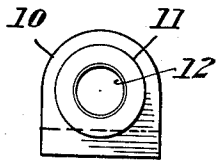


Fig. 3.

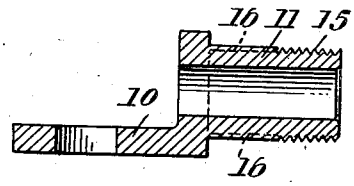


Fig. 4.

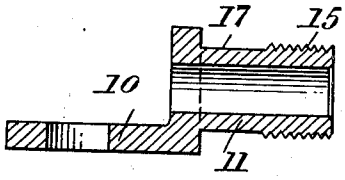


Fig. 5.

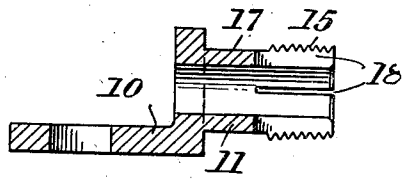


Fig. 6.

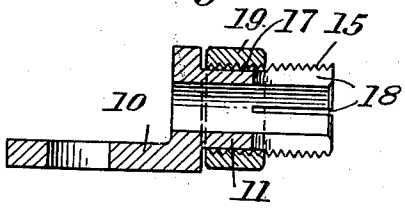


Fig. 7.

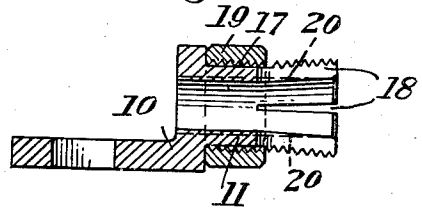


Fig. 8.

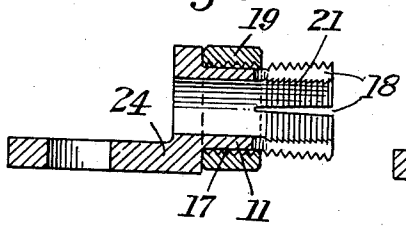


Fig. 9.

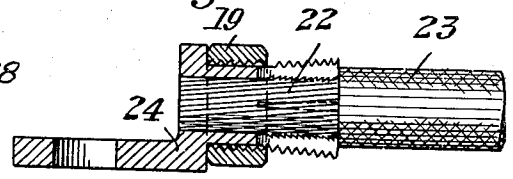


Fig. 11.

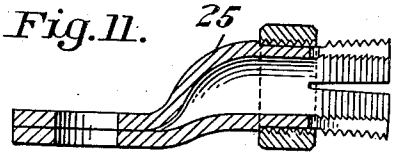
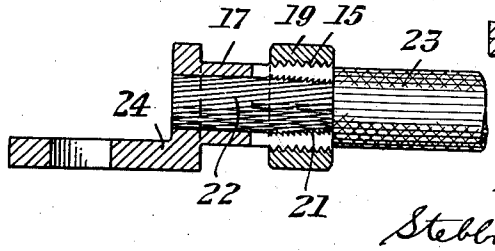


Fig. 10.



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UNITED STATES PATENT OFFICE

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METHOD OF MANUFACTURING CONDUCTOR TERMINALS

David Hoppenstand, Fox Chapel, Pa.

Application April 19, 1940, Serial No. 330,562

1 Claim. (Cl. 29—155.55)

This invention relates to a novel method of manufacturing a conductor terminal and, specifically, to a terminal having provision for attachment to the end of a conductor such as a cable, and means whereby the terminal may be secured to a switchboard panel, bus-bar, or the like.

Numerous forms of conductor terminals have been proposed heretofore. All of them, however, so far as I am aware, have been characterized by numerous objectionable features. In the first place, most terminals are composed of several parts and considerable difficulty is involved in the assembly thereof. Special tools are required in some cases. The cost of such terminals is relatively high because of their complex construction. A further defect common to all known terminals is that when they are tightened on the conductor, the movable portion of the terminal, such as a threaded sleeve, moves away from the end of the insulation remaining on the cable, thereby leaving a bare length of cable which has to be covered as by taping.

I have invented a novel method for the manufacture of a conductor terminal whereby the aforementioned objections to previous terminals are overcome. In a preferred embodiment, the terminal of my invention comprises a split sleeve having a tapered, threaded end. A connecting lug is formed integral with the sleeve and a nut is disposed on an unthreaded portion of the sleeve intermediate the threaded end and the lug. The method I have invented for the manufacture of such terminal comprises threading the tubular end of a blank such as a casting, turning down the intermediate portion, threading a nut on the latter, slotting the threaded end, and then forming a taper thereon in a manner to be explained in detail hereinafter.

For a complete understanding of the terminal of my invention and my method for the manufacture thereof, reference is made to the accompanying drawing illustrating a preferred embodiment and the successive stages of its manufacture. In the drawing:

Fig. 1 is a central sectional view through a terminal blank on a plane perpendicular to that of the connecting lug;

Fig. 2 is an end view such as would be seen on looking toward the tubular end of the blank of Fig. 1;

Figs. 3 through 8 are views similar to Fig. 1 showing successive stages in the manufacture of the terminal;

Fig. 9 is a view similar to Fig. 1 showing a completed terminal with a cable end inserted therein;

Fig. 10 is a view similar to Fig. 9 showing the terminal as finally set up to exert a tight gripping engagement on the conductor; and

Fig. 11 is a view similar to Fig. 8 showing a modified form of the invention;

Referring now in detail to the drawing, a terminal blank 10 comprises a tubular portion 11 having a longitudinal bore 12 therethrough and an integral lug 13 having a hole 14 therethrough to receive a securing screw or bolt. The blank 10 may conveniently be a casting composed of copper or other suitable conducting metal or alloy.

The first step in the manufacture of the finished terminal is illustrated in Fig. 3 and comprises simply the threading of the end of the tubular portion 11 of the blank 10, as indicated at 15. After the tubular end of the blank has been threaded, the intermediate portion thereof is turned down to the diameter indicated by the dotted lines 16, the result of this operation being illustrated in Fig. 4. The blank is thus provided with an intermediate portion of reduced diameter indicated generally at 17.

The threaded end of the blank is next slotted as shown at 18 in Fig. 5 and a nut 19 is threaded onto the tubular portion 11 as shown in Fig. 6. The nut, of course, may be threaded on before the slotting of the tubular end but the reverse procedure is preferred to prevent damage to the nut. The diameter of the turn-down portion 17 of the tubular end of the blank is such that the nut 19 is relatively loose thereon.

The next operation is the spreading of the slotted, threaded end of the blank as indicated in Fig. 7. This spreading may be accomplished by any suitable means such as the driving of a tapered plug into the threaded end of the terminal.

When the slotted end of the blank has been spread as shown in Fig. 7, the bore 12 is enlarged to the diameter indicated by the dotted lines 20 in Fig. 7. The original wall thickness of the tubular portion 11 of the blank is sufficient to permit this reaming without reducing the wall thickness below the desired final value. The result of this reaming operation, after the spreading operation, is to provide an inward taper in the thickness of the wall of the slotted end of the blank. The diameter indicated by the dotted lines 20 is chosen to accommodate a given size of cable and it will be apparent that when such cable is inserted into the tubular end

of the blank and the nut 19 turned up on the threaded end of the blank, the segmental portions of the latter will be contracted and caused to grip the cable at a point spaced from the end thereof.

The final operation in the manufacture of the terminal is the formation of annular grooves 21 on the interior of the threaded end thereof. These grooves are defined by annular surfaces perpendicular to the axis of the bore and frusto-conical surfaces forming sharp-edged, tooth-like projections which serve very effectively to prevent withdrawal of a conductor when the segmental portions of the threaded end of the terminal have been contracted thereabout.

Fig. 9 illustrates a conductor such as a cable 22 having an external layer of insulation 23 thereon, the insulation being removed from the end of the cable and the latter inserted into the bore through the tubular portion of a finished terminal 24 until the insulation left on the conductor abuts against the threaded end of the terminal. As previously indicated, the segmental portions of the threaded end of the terminal may be contracted and caused to grip the conductor tightly, by turning the nut 19 outwardly along the threaded end of the terminal.

Fig. 10 illustrates the relation of the parts when the nut 19 has been turned home. As there shown, the segmental portions of the threaded end of the terminal have been contracted into tight gripping engagement with the conductor and the teeth formed by the grooves 21 have been caused to bite into the surfaces of the wires forming the cable.

It is to be particularly noted that the end of the terminal, when positioned on a conductor, abuts the end of the insulation 23, thereby making it unnecessary to apply any supplemental insulating covering such as tape or the like. A further feature of novelty is that the terminal grips the conductor at a point spaced from the end of the latter, instead of at the extremity thereof, as do the terminals known heretofore, thereby exerting a much stronger grip thereon in opposition to forces tending to pull the cable out of the terminal.

Fig. 11 illustrates a modification which is similar in all respects to that described above except that it is formed from a blank 25 stamped from tubular stock. Terminals of various types have been so formed heretofore and no further detailed explanation of the method of forming the blank is necessary. As will be apparent, the steps in the manufacture of the terminal shown in Fig. 11 are the same as those for the manufacture of the finished terminal 24.

It will be apparent from the foregoing description that my invention is characterized by numerous advantages over terminals and methods for the manufacture thereof known heretofore. In the first place, my terminal is capable of exerting such a powerful grip on a cable that pull-out of the latter is practically impossible. This results from the fact that the tapered segments at the threaded end of the terminal grip the cable at a point spaced from the extreme end of the latter, as well as the fact that the edges of the grooves 21 bit into the cable conductors themselves. A further advantage has already been mentioned, the fact that the terminal abuts the end of the insulation left on the conductor. The terminal is relatively simple in construction and can be manufactured at relatively low cost since the several operations may be conducted in a turret lathe with a single chucking. A further advantage is the fact that the terminal comprises only two parts and these are permanently assembled in manufacture. This greatly facilitates use of the terminal in the field since each one is complete in itself and it is not necessary to assemble parts from different containers with the possibility that certain parts will be missing or exhausted. The terminal may be attached, furthermore, with an ordinary wrench and requires no special tools. The setting-up is a very simple operation and involves no particular skill.

A further important advantage of the invention is that the tapered segments exert a constant outward force on the nut tending to prevent loosening thereof under vibration or the like. The segments, furthermore, may be contracted sufficiently to exert gripping engagement on conductors several sizes smaller than the bore 20 so it is not necessary to provide a different terminal for each cable size.

Although I have illustrated and described but a preferred embodiment and practice of the invention with a modification of the former, it will be understood that changes in the construction and procedure disclosed may be made without departing from the spirit of the invention or the scope of the appended claim.

I claim:

In a method of making a conductor terminal, the steps including slotting and threading a cylindrical blank longitudinally from one end thereof, turning a nut onto the blank sufficiently to leave the segments between slots projecting beyond the nut, spreading the projecting ends of the segments sufficiently to deform them beyond the elastic limit and impart to their exterior surface a flare toward said end, and boring the blank axially to a uniform inside diameter for at least a substantial portion of the length of said segments inwardly from the outer ends thereof, thereby providing the segments with a longitudinal taper inwardly by reason of the flaring of the exterior thereof.

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