Oct. 11, 1932. A. Z. MAMPLE ET AL 1,881,787

METHOD OF PERFORATING THE LEAD SHEATHING OF CONDUCTOR CABLES

Filed Dec. 11, 1930

Fig. 2.

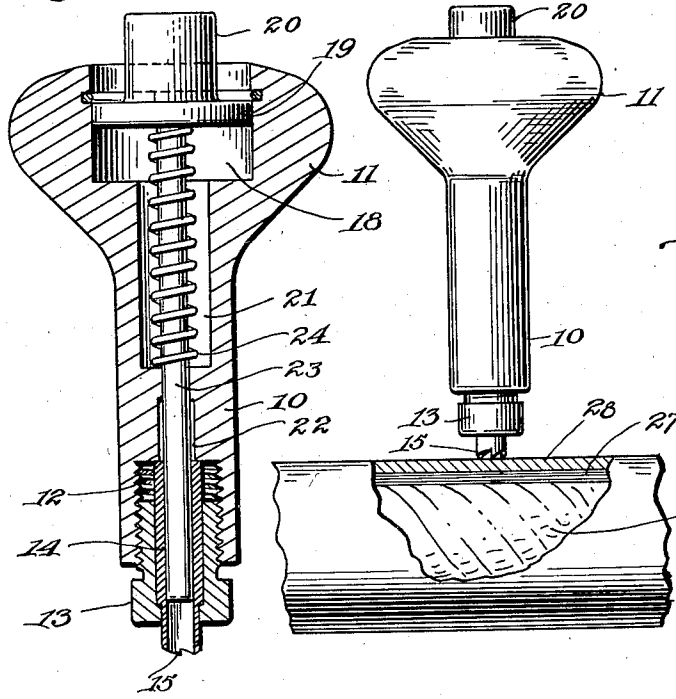


Fig. 1.

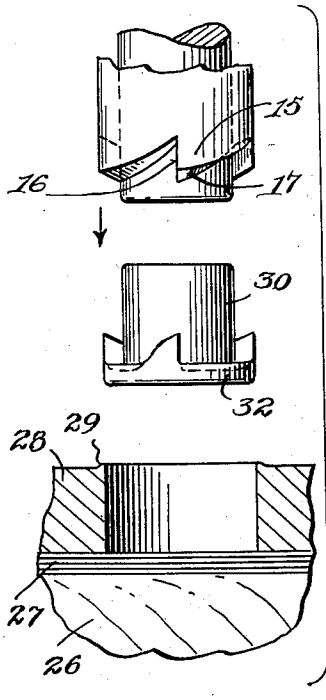
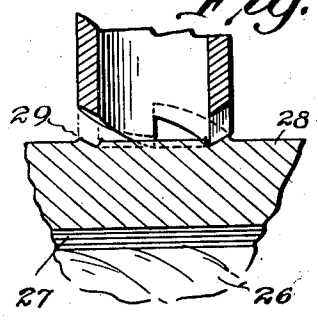


Fig. 6.

Fig. 3.



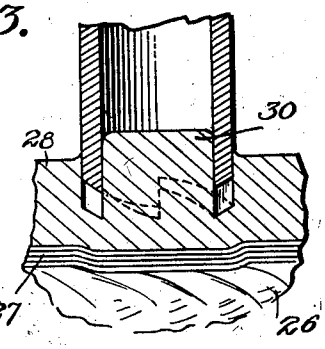


Fig. 4.

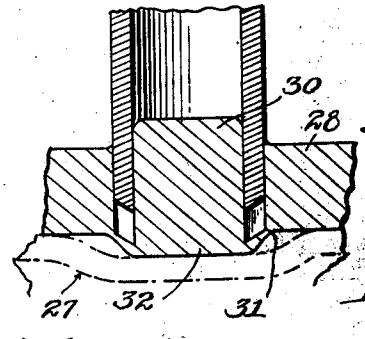


Fig. 5.

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UNITED STATES PATENT OFFICE

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METHOD OF PERFORATING THE LEAD SHEATHING OF CONDUCTOR CABLES

Application filed December 11, 1930. Serial No. 501,634.

This invention relates to a method of forming holes in the lead sheathing of conductor cables.

In the construction of multi-conductor cables it is usual to provide the individual conductors with paper insulation and to wrap the bundle of conductors insulated in this manner with a paper wrapping, after which a lead sheath is applied over the paper wrapping. It is frequently desirable, for the purpose of injecting material to dam off a section of the cable, or for injecting a gas in testing for leakage and for other like purposes, to make an opening in the lead sheath so that a nozzle or tube may be inserted therein. Much trouble has been experienced in forming such openings by means of various types of drills because of the tendency of the drill to penetrate the paper wrapping and even to expose or drill through individual conductors. Attempts have been made to overcome the defects of this method by placing stops on the drills but such attempts have been unsuccessful because drills and similar devices for the making of holes require points which must protrude beyond the under side of the sheath in order to make a full size hole and because of the impossibility of determining in advance of the drilling operation just how deep the drill should penetrate. To be properly made the opening must be formed without injury of any kind to the paper wrapping or without interference to the electrical circuits assigned to the conductors in the cable.

The important object of the present invention is, therefore, to provide an improved method of forming an opening in the lead sheath of a cable without injuring the paper wrapping and consequently without injury to the conductors or thin insulation.

With the above and other objects in view, the method will now be described in detail and specifically claimed, reference being had to the accompanying drawing showing a tool for carrying the method into effect and also illustrating several steps in the method.

Figure 1 is a view showing a portion of a lead sheathed cable partly in elevation and partly in section and showing the tool used in position to start operation.

Figure 2 is an enlarged section of the tool used taken diametrically through its axis.

Figure 3 is an enlarged detail section showing the initial step of the method.

Figure 4 is a view showing the tool as having progressed about half way through the sheath.

Figure 5 is a view similar to Figure 3 showing the hole just before its completion.

Figure 6 is a similar view showing the completion of the operation.

The method of the present invention may be briefly described as causing the metal within a small circular peripheral area or annulus of the lead sheathing to flow inwardly toward the center of said area or annulus and outwardly from the sheath to form a button or core having a head or flange on its lower end of substantially the same diameter as the opening to be formed, separating the core from the remainder of the sheath and withdrawing it through the formed opening.

To effect this operation, it is desirable to use a special tool which we have devised for this purpose. This tool has an elongated cylindrical body 10 provided at one end with an enlarged portion forming a handle 11. A threaded socket 12 is formed in the lower end of this body and receives a threaded bushing 13. A tubular tool 14 extends through this bushing, the exterior of the tool and the interior of the bushing being shouldered so that, when the bushing is screwed in, the upper portion of the tool is clamped between the shoulder in the bushing and the inner end of the socket 12. The lower end of the tool projects from the bushing and is provided with end serrations 15, each having a radial face 16 and an inclined face 17. The faces 17 are transversely bevelled so that their outer edges are higher than their inner edges. In the upper or handle end of the tool is a recess 18, wherein slides a head 19 having a button 20 projecting upwardly therefrom to extend from the recess. A recess 21 extends downwardly from the recess and connects with the socket 12 by a bore 22. A plunger pin 23 extends down from the head through

the recesses 18 and 21 and the bore 22 and enters the hollow tool. A spring 24 surrounds the upper part of this pin and bears at one end against the bottom of the recess 21 and at its upper end against the under side of the head 19 so that the head is normally held raised and the lower end of the plunger retracted. A snap ring 25 fitting in a peripheral groove in the wall of the recess 18 limits upward movement of the head 19.

In order to illustrate the action of this tool, we have shown a cable having a bundle of insulated conductors 26 surrounded by a paper wrapping 27 over which extends a lead sheath 28.

In operation, the tool is applied as in Figure 1 and is pressed against the cable and rotated. It is to be noted that the action of the serrations is not a cutting action but initially the pressure and rotation of the tool causing a small ring 29 (Figure 3) to rise around the tool. The rotation and pressure is continued and, due to the peculiar shape of the serrations, the lead will be forced to flow inwardly and will rise in the tool as in Figure 4. At the same time the bottom of the hole will bulge inwardly of the cable to a slight extent, forcing the paper wrapping also to bulge inwardly but not to an extent sufficient to rupture it. This action continues until the bottom of the annulus from which the metal has been forced by the tool is about level with the inner surface of the lead sheath, whereupon the friction between the inner wall of the tool and the core will cause sufficient torsional strain to cause the core 30 to shear from the balance of the sheath at 31, leaving a shoulder or head 32 on its lower end. The tool is now withdrawn and carries the button or core 30 with it, the latter being ejected from the hollow tool by pressure on the plunger 20. By reason of the presence of the head 32, the teeth on the tool are prevented from coming into contact with the paper wrapping, or with the insulation of the conductors. Thus the opening is formed in a rapid manner without the slightest injury to the conductors or the insulating coverings and wrappings.

We claim:

1. The method of forming a hole in the sheathing of a lead sheathed cable, which consists in forcing the metal from a circular peripheral area of the sheath, causing the metal displaced from the resulting hollow cylinder to flow toward the center of said area and to merge with the metal within said hollow cylinder, forming a circular core, applying a torsional stress to the core and thereby shearing said core from the metal at the inner wall of the sheath and withdrawing the core.

2. The method of forming a hole in a sheet or sheath of soft metal, such as lead, which consists in forcing the metal from an annulus of the sheet or sheath, causing the displaced metal to flow axially of the annulus and to merge with the resulting core within the annulus, and shearing the core together with an integral outstanding flange from the metal of the sheet or sheath at the outer peripheral edge of said annulus, and withdrawing said flanged core.

3. The method of forming a hole in the sheathing of a lead sheathed cable, which consists in exerting pressure radially of the cable and with torsional movement upon an annulus of the sheath, causing the metal thereby displaced to flow inwardly toward the axis of the annulus and merge with the resulting core within the annulus, continuing the radial pressure and torsional movement until the core together with an integral flange is sheared from the inner wall of the sheath at the outer peripheral edge of the annulus, and withdrawing the flanged core from the resulting hole, said flange protecting the cable insulation from abrasion or injury during the last stage of the pressure operation.

In testimony whereof we affix our signatures.

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