March 24, 1964 R. E. CROWL ETAL 3,125,835

ELECTRICAL CABLE INSULATION TAPERING TOOL

Filed Sept. 18, 1961 2 Sheets-Sheet 1

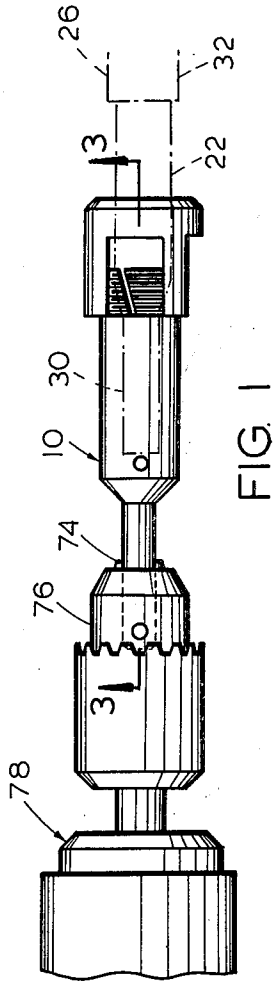


FIG. 1

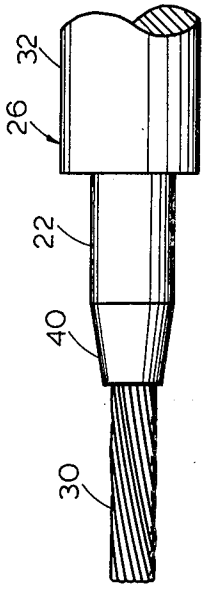


FIG. 2

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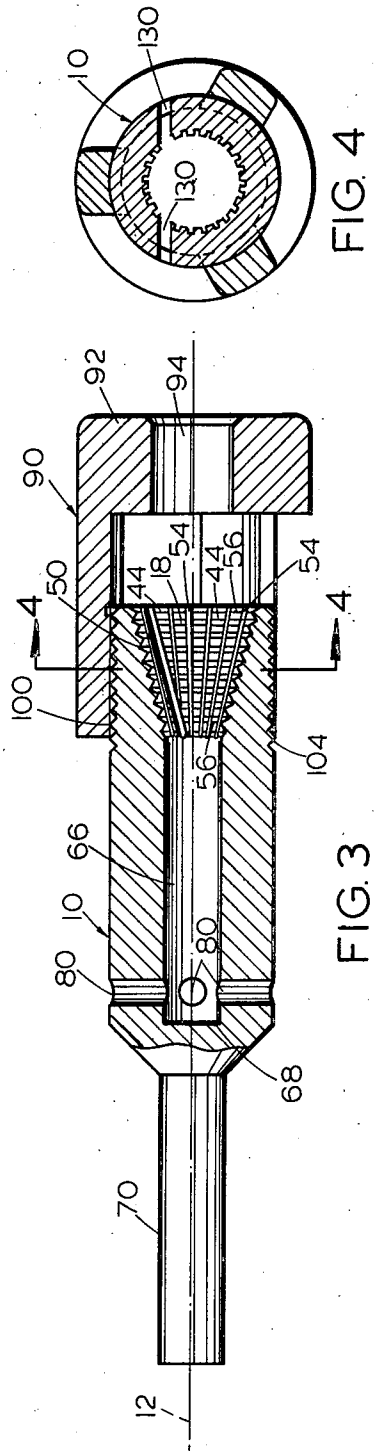
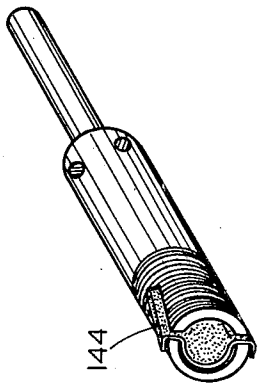


FIG. 3

FIG. 4



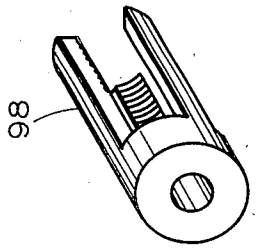


FIG. 5

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ELECTRICAL CABLE INSULATION TAPERING TOOL

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9 Claims. (Cl. 51—194)

This invention relates to electrical cable insulation tapering and more particularly it is an object of this invention to provide a tool for effectively and efficiently achieving this tapering to eliminate the hand methods now used.

I am aware that power tools have been devised for stripping insulation from electrical wire, however, to this day, it is the common practice to taper the insulation of high voltage wiring by hand. It is not sufficient that the insulation of high voltage wire be simply cut off at a right angle to the conductor, but at the end of the insulation where the conductor projects from the insulation in order to be formed into a splice, high voltage insulation must be tapered or pencilled with great efficiency and precision in order to prevent pockets of gas from forming where unevenness or depression in the pencilling form voids in which gas can explode causing the insulation to break down leading to possible damage to switches and equipment and power failure.

Because of this critical need for perfection, it has been the practice for electricians to not only very carefully use a knife to slowly and laboriously gain a taper, but also thereafter to use a rasp or file, and then fine emery cloth.

A particular problem is encountered with cable which is insulated with polyethylene materials, in which case, in order to make a sufficiently perfect splice, it commonly requires from one-half to three-fourths of an hour of an expert electrician's time.

We have found that with our tool the same work can be done in approximately two minutes.

We have also found that with our tool in pencilling rubber insulation, a time per pencilling of even less than a minute is possible.

Because of human errors and carelessness, even experienced electricians occasionally make a poor pencilling by the hand methods leading to gas explosion in the insulation. It is, therefore, an object of this invention to provide a method of making pencillings of a far higher and more uniform quality than has heretofore been possible. In the high voltage range of over 600 volts, and particularly in the range of 2,500 volts up to 15,000 volts, the quality of pencilling can be very important, especially in the many uses of high voltage wiring in the national defenses.

It is not uncommon during hand pencillings for the cutting knife to damage the conductor itself. When a strand of the conductor cable is damaged, it will likely break under flexing and this reduces the current carrying capacity so vital in high voltage installations.

Therefore, an object of this invention is to provide a tool which can be used with power means such as a power drill for abrading the insulation from electrical wire at a pre-determined angle, and also at a pre-determined distance from the end of the cable, and at a pre-determined length of taper.

A further object is to provide a guide for the pencilling tool whereby the cable is slidably passed through a guide opening which engages the outer side of an insulation layer for properly aligning the cable.

A further object of the invention is to provide a tool of this sort with a hollow center closed at one end so as to be engaged by the inner end of a conductor, and provided with a frustro-conical abrading recess disposed at

an outer end of the hollow center for properly positioning the pencilling.

Still another object is to provide a tool as described, the hollow center of which is provided with openings for the escape of insulation filing particles.

Still another object is to provide a tool as described, which has means thereon for receiving and positioning a piece of abrasive material such as emery cloth which can then lie against the wall of the pencilling recess to be used as a finishing or polishing element.

Other and further objects and advantages of the present invention will be apparent from the following detailed description, drawings and claims, the scope of the invention not being limited to the drawings themselves as the drawings are only for the purpose of illustrating a way in which the principles of this invention can be applied.

Other embodiments of the invention utilizing the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

In the drawings:

FIGURE 1 is a side elevation of the electrical cable insulation tapering tool shown as attached to a portion of a power drill, an insulated electrical cable being shown in the tool in dotted lines.

FIGURE 2 is a side elevation of the end of an electrical cable after it has been pencilled by the tool of this invention.

FIGURE 3 is a sectional view taken along the line 3—3 of FIGURE 1.

FIGURE 4 is a sectional view taken along the line 4—4 of FIGURE 3.

FIGURE 5 is a perspective exploded view with the body portion of the tool and a guide portion of the tool separated, and further showing the use of emery cloth with the tool.

Referring to FIGURE 1, it will be seen that the tool of this invention has a main body portion **10** which latter is preferably symmetrical about an axis **12**. The body portion **10** has a frustro-conical recess **18** extending inwardly from one end thereof, the recess **18** being generally symmetrical about the axis **12**.

The frustro-conical recess **18** preferably has a larger diametered outer wall surface opening upon the exterior of the body portion **10** for first engagement with an inner insulation coating **22** of an electrical cable generally indicated in FIGURE 2 at **26**.

The cable **26** is of a sort that has a twisted or cabled wire conductor **30** at its center, the inner insulation layer **22** about that, and an outer insulation layer **32** of still larger diameter than the layer **22**, and disposed outwardly of the layer **22**.

As best seen in FIGURE 2, that end of the innermost insulation layer **22** which is adjacent the terminal end of the conductor **30** is of a frustro-conical shape in an area **40** thereof when the pencilling done by the tool of this invention is finished. This frustro-conical shape has heretofore been attained by hand methods as above described.

The inner portion of the frustro-conical surface **18**, as best seen in FIGURE 3 is constricted so as to cause a tapering of the insulation in the area **40** by means of suitable means forming abrasive inwardly extending protrusions **44** at spaced apart positions on the frustro-conical abrasive surface **18**.

The protrusions **44** are actually teeth on the wall of the recess **18**, and are formed by a plurality of spaced apart segments of annular protrusions **44**, the protrusions being spaced preferably equidistantly apart along the axis **12**. Each of the protrusions **44** are of a shape in cross section

for forming an apex, or in other words, a triangular shape in cross section preferably, whereby manufacture can easily and economically be done by first making cuttings 50 forming the protrusions 44 therebetween and by later making cuttings 54 extending generally longitudinally of the axis 12 for spacing the protrusions to form teeth, 56.

The body portion 10 has a hollow inner portion 66 opening upon the inner side of frustro-conical recess 18 for receiving the conductor portion 30 of the cable.

The hollow inner portion 66 has an end wall 68 which is spaced from the frustro-conical portion 18 a distance equal to the desired length of the exposed portion of the conductor 30 whereby the terminal end of the conductor 30 can abut the wall 68 during pencilling as later described.

The hollow inner portion 66 can also be defined as a guide bore 66 inasmuch as its diameter is substantially the diameter of the inner constricted end of the frustro-conical wall of the recess 18.

As it is intended that the constricted end of the wall of the recess 18 have a diameter for the removal of the innermost portions of a conductor, it is, therefore, necessary that the inner constricted end of the frustro-conical wall be of substantially the same diameter as the diameter of the conductor of a wire being tapered.

And as the guide bore or hollow inner portion 66 has the same diameter as the inner constricted end of the frustro-conical wall of the recess 18, the guide bore diameter is substantially of a size for receiving and guiding a conductor along a line substantially axially of the frustro-conical wall of the recess 18.

The body portion 10 further has a shank portion 70 extended from that end thereof which is opposite the recess 18 for receiving the jaws 74 of the chuck 76 of the drill portion of which is indicated generally at 78.

It will be seen that any other means for power rotating the body portion 10 can be used.

The body portion 10 further has openings extending from the outer side thereof to the hollow center portion 66 as shown at 80.

The invention further preferably comprises a guide generally indicated at 90 having an outer portion 92 with a guide opening 94 extending therethrough axially of the axis 12.

The guide opening 94 is of a size for slidably and snugly receiving the insulation layer 22 for guiding it into pencilling recess 18.

The guide 90 is suitably attached to the main body portion 10 such as by means of fingers 98 connected to the outer portion 92 and disposed preferably in three places around the exterior of the main body portion 10, the fingers 98 preferably being attached to the main body portion 10 by means of having their inner surfaces threaded as at 100 for reception on threads 104 on the outer side of the main body portion 10 adjacent the recess 18.

The main body portion 10 further has a pair of slots 130 extending thereinto substantially on opposite sides thereof, the slots 130 extend inwardly from that end of the body portion 10 at which the recess 18 opens, and each slot 130 extends in substantially a straight line inwardly from the respective end of the main body portion and to one side of the axis 12 at an acute angle to the axis 12 and the slots 130 are substantially in alignment with each other whereby a piece of emery cloth, which latter is of a flexible abrading material as seen at 144, can be placed in the slots 130 so as to lie against a portion of the inner wall of the recess 18 whereby it is supported by the wall of the recess 18 and assumes the shape of a portion of a concave frustro-conical surface so as to be usable to apply a finer finish to the tapered portion 40 of the insulation layer 22 after a preliminary filing by means of the teeth 56 has been done.

It will be seen that applying the cable into the tool as seen in FIGURE 1 and rotation by means of the power drill will very quickly form the tapered portion 40 in a much faster and much more precise manner than heretofore as is so very important in the higher voltage installations.

It is to be understood that the finished cable end as shown in FIGURE 2 is usually spliced with another identical finished cable end whereby the ends of the conductor 30 are placed together and surrounded with a band not shown and the area between the end of the largest diameter insulation layer 32 in such a splice is then filled with other insulation material.

It is believed that this invention has fulfilled the objects above set forth.

From the foregoing description, it is thought to be obvious that an electrical cable insulation tapering tool constructed in accordance with our invention is particularly well adapted for use, by reason of the convenience and facility with which it may be assembled and operated, and it will also be obvious that our invention can be changed and modified without departing from the principles and spirit thereof, and for this reason, we do not wish to be understood as limiting ourselves to the precise arrangement and formation of the several parts heerin shown in carrying out our invention in practice, except as claimed.

We claim:

1. An electrical cable insulation tapering tool comprising: a body portion having an axis, a frustro-conical recess extending inwardly from one end of said body portion generally symmetrically about said axis, said frustro-conical recess having a larger diametered wall surface disposed outwardly for first engagement with an insulation coating to which the tool is applied, the inner portion of said frustro-conical surface being constricted so as to cause a tapering of the insulation, means forming filing teeth on the wall of said frustro-conical recess, said body portion further having a hollow inner portion opening upon the inner side of said frustro-conical recess and for receiving the conductor portion of an insulated cable, said body portion having a pair of slots extending thereinto substantially on opposite sides thereof, said slots extending inwardly from that end of said body portion at which said recess opens, said slots each extending in substantially a straight line inwardly and to one side of said axis at an acute angle to said axis and said slots being substantially in alignment, whereby a sheet of flexible abrading material can be placed in said slots so as to lie against a portion of the inner wall of said recess.

2. An electrical cable insulation tapering tool comprising: a body portion having an axis, a substantially frustro-conical recess extending inwardly from one end of said body portion generally symmetrically about said axis, said frustro-conical recess having a larger diametered wall surface disposed outwardly for first engagement with an insulation coating to which the tool is applied, the inner portion of the wall of said frustro-conical recess being constricted so as to cause a tapering of the insulation, means forming filing teeth on the wall of said frustro-conical recess, said body portion further having an elongated hollow inner portion of predetermined length opening at one end upon the inner side of said frustro-conical recess and closed at its opposite end for receiving a predetermined length of the conductor portion of an insulated cable.

3. The combination of claim 2 in which said body portion further has a shank extended from that end thereof which is opposite the end of said recess, said shank being adapted to be received in the jaws of a drill.

4. The combination of claim 2 in which said body portion further has openings extending from the outer side thereof to the hollow center portion for the escape of insulation particle filings from said hollow portion.

5. The combination of claim 2 in which a guide is provided, means for attaching said guide to the outer

side of said body portion, said guide having a guide opening therethrough for slidably and snugly receiving and guiding the outer side of an insulation layer being pencilled, said opening being generally cylindrical about an axis in alignment with the axis of said body portion.

6. The combination of claim 5 in which said body portion is threaded around its outer side adjacent the end having said recess and in which said guide portion has means for threadedly receiving the threads of the outer side of said body portion, thereby defining the said attachment of said guide portion to said body portion.

7. The combination of claim 2 in which said means for forming teeth on the wall of said recess comprises a plurality of spaced apart segments of annular protrusions spaced along said axis, each of a shape in cross section for forming an apex whereby manufacture can easily and economically be done by first making grooves for forming said protrusions therebetween and by later making other cuttings extending generally longitudinally of said axis for spacing said protrusions to form teeth.

8. An electrical cable insulation tapering tool comprising: a body portion having an axis, a substantially frustro-conical recess extending inwardly from one end of said body portion generally symmetrically about said axis, said frustro-conical recess having a larger diametered wall surface disposed outwardly for first engagement with an insulation coating to which the tool is applied, the inner portion of the wall of said frustro-conical recess being constricted so as to cause a tapering of the insulation, means forming teeth on the wall of said frustro-conical recess for tapering insulation to a frustro-conical shape, and means attached to said body portion and provided with a bore having a cylindrical wall for slidably receiving and guiding a portion of a cable, said wall of said bore being in axial alignment with the axis of said frustro-conical recess, said bore being of a diameter substantially the same as the diameter of the constricted end of said recess wall.

9. An electrical cable insulation tapering tool comprising: a body portion having an axis, a substantially frustro-conical recess extending inwardly from one end of said body portion generally symmetrically about said axis, said frustro-conical recess having a larger diametered wall surface disposed outwardly for first engagement with an insulation coating to which the tool is applied, the inner portion of the wall of said frustro-conical recess being constricted so as to cause a tapering of the insulation, means forming teeth on the wall of said frustro-conical recess for tapering insulation to a frustro-conical shape, and means attached to said body portion adjacent the larger diametered end of the wall of said recess and provided with a bore having a cylindrical wall for slidably receiving and guiding a portion of a cable, said wall of said bore being in axial alignment with the axis of said frustro-conical recess, said bore being of a diameter sufficiently greater than the diameter of the constricted end of said recess wall as to permit said bore to slidably receive the outside of the insulation portion of an insulated cable of a sort having a conductor portion substantially the same size as the diameter of said constricted end of said recess wall.

References Cited in the file of this patent

UNITED STATES PATENTS

941,631	George	Nov. 30, 1909
1,725,114	Van Gelderen	Aug. 20, 1929
2,284,483	Whitesell	May 26, 1942