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TOOL FOR REMOVING MATERIAL FROM AROUND THE ELECTRICAL CONDUCTOR OF A CABLE

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6 Claims

ABSTRACT OF THE DISCLOSURE

This invention relates to the art of removing material from cable such as is used in conducting high voltage electric currents and is particularly concerned with a new hand tool which is simple in construction, is easy to operate and is effective in removing either the outer layer of semi-conducting material from around the insulation of such a cable or the outer semi-conducting layer and the insulation from around an inner layer of semi-conducting material which is around and in contact with the electrical conductor of such a cable.

BACKGROUND OF THE INVENTION

Devices have been proposed herefore for removing insulation from electrical conductors of cables carrying high voltage current. The prior art devices most nearly pertinent to the present invention and known to me are my U.S. Pat. Nos. 3,225,629 and 3,377,891. None of the tools of those patents was devised or fully suitable for the present purposes. When the end of the conductor is to be spliced or terminated, it is quite important that substantially all the outer layer of the semi-conducting material should be removed from the insulating material for a predetermined distance from the end of the conductor to provide an adequate creepage path. If substantial amounts of the outer semi-conducting material remain on the insulation, the resulting creepage path will not be of the desired length for the intended purpose. Similarly, when the inner layer of semi-conducting material is present between the conductor and the insulation, in some cases at higher voltages, substantially all the insulation should be removed from the inner semi-conducting material for a given distance from the end of the conductor before splicing the cables.

The present invention provides a tool which can be used to insure the presence of a creepage path of predetermined length whether only the outer coating of semi-conducting material is to be removed or both that layer and the insulation are to be removed from an inner layer of semi-conducting material.

SUMMARY OF THE INVENTION

A tool embodying this invention includes a body having an aperture extending longitudinally therethrough and including a frusto-conical inlet portion and a substantially cylindrical outlet portion. The body has an intermediate portion cut away to form plane surfaces which intersect the aperture and define an opening or slot into the inlet and outlet portions thereof. A cutting blade is positioned on the plane surface adjacent to the inlet portion to remove the outer layer of semi-conducting material or both that outer layer and the insulation from a cable as it is moved through the inlet portion of the aperture. A clean-up blade is positioned on the plane surface adjacent to the outlet portion of the aperture to remove any of the outer layer of semi-conducting material remaining on the insulation or both that layer and any insulation remaining on the inner layer of semi-conducting material in the outlet portion of the aperture.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of a tool embodying the present invention;
FIG. 2 is a longitudinal, sectional view taken on line 2—2 of FIG. 1 and showing a section of cable;
FIG. 3 is a transverse, sectional view taken on line 3—3 of FIG. 1;
FIG. 4 is a perspective view showing the tool of FIGS. 1 to 3 and a length of cable from which the outer layer of semi-conducting material has been removed from the insulation material surrounding the electrical conductor;
FIG. 5 is a perspective view similar to a portion of FIG. 4 showing a length of cable from which the outer layer of semi-conducting material and the insulation has been removed from an inner layer of semi-conducting material surrounding the electrical conductor.

The preferred form of the present invention, which is shown in FIGS. 1 to 4, includes a body 1 having cylindrical portions 3 and 5 and an intermediate portion 7 partly defined by plane surfaces 9 and 10.

The body 1 has a longitudinally extending aperture which includes a frusto-conical inlet portion 11 and a substantially cylindrical outlet portion 13. The trailing end of portion 11 merges with the leading end of portion 13. End portion 3 of the body may be provided with a bushing 15 if desired which has an axial aperture 17 of a diameter slightly larger than the outside diameter of the cable 19. As is shown in FIGS. 2 and 4, the cable 19 includes an outer layer of semi-conducting material 21 which extends around a layer of insulating material 23 and this insulating material extends around the electrical conductor 25. Bushing 15 may be retained in position in the body 1, while being free to rotate, by means of a set screw 27 which extends through the body and into an annular groove 29 in the outer surface of bushing 15.

A cutting blade 31 and a clean-up blade 33, having flat sides, are positioned on the flat surfaces 9 and 10, respectively, of the recessed portion 7 of the body. These surfaces 9 and 10 intersect with apertures 11 and 13 and define a longitudinally extending opening or slot 35 into the aperture. Blades 31 and 33 have cutting edges 39 and 41, respectively, which are positioned in a plane passing through the aperture or slot 35 and the longitudinal centerline of apertures 11 and 13. The leading end of blade 33 is rounded and beveled at 42 to form a continuation of edge 41 and for a purpose presently to appear. These blades are held in adjusted position on the body by any suitable means, for example, by cap screws 43. Cutting blade 31 is so positioned that the trailing end of its cutting edge 39 is disposed in a plane which is tangent to a circle having a radius which is substantially the same as the radius of the inner surface of the semi-conducting material 21. The clean-up blade 33 is positioned with its cutting edge 41 positioned tangent to a circle having a radius substantially equal to the outside diameter of the insulating material 23 of the cable.

The blades 31 and 33 are shown in end to end abutting relation but they need not be so positioned for blade 33 will perform its function even if spaced apart from the trailing end of the blade 31. It is to be noted that the blade 31 abuts at its leading end against a straight transverse wall of end 3 of the body and that the trailing end of blade 33 abuts against a similar wall of end 5. These end engagements, together with the cap screws 43, fixedly position the blades in predetermined position on the body, and slots 45 or elongated holes (not shown) permit adjustment of the blades toward and away from the slot 35.

The manner of operating the tool just described is as
follows: The tool is advanced axially over cable 19 and is simultaneously rotated to advance the blade against the cable. As the tool is so moved, the edge 39 of blade 31 engages the semi-conducting material 21 of the cable and severs it in a strand which engages the rounded and beveled end of blade 33 and is thereby diverted out of the tool. Continued axial and rotational movement of the tool relative to the cable brings the cable into the outlet portion 13 of the aperture and brings the edge 41 of blade 33 into contact with any semi-conducting material which was not removed by blade 31. This axial and rotational movement of the tool relative to the cable is continued until the semi-conducting material 21 has been removed from the insulation 23 for a suitable distance back from the end of the cable to furnish the desired length of creepage path.

Since the semi-conducting material 21 and the insulation 23 are not always strictly coaxial with conductor 25, some of the semi-conducting material 21 may not be removed by blade 31. However, substantially all the semi-conducting material which does remain on the outer surface of the insulation will be removed by the cutting edges 41 and 42 of blade 33.

When the semi-conducting material 21 has been removed from the desired length of cable 19, the tool may be pulled back off the cable and then the cable may be subjected to subsequent operations.

As is shown in FIG. 5, the cable 20 includes an outer layer of semi-conducting material 21 which surrounds a layer of insulation 24, this layer of insulation in turn extending around an inner layer of semi-conducting material 26 which encloses the electrical conductor 28.

When the outer layer of semi-conducting material 21 and the layer of insulation 24 are to be removed from the inner layer of semi-conducting material 26, a tool should be used which has dimensions suitable for removing both of said layers. In other words, the diameter of the outlet portion 13 should be only slightly greater than the outer diameter of the inner layer of semi-conducting material and the cutting blade 31 should be so positioned that the trailing end of its cutting edge 39 is disposed in a plane which is tangent to a circle having a radius which is substantially the same as the radius of the inner surface of the insulating material 24. The cleaning blade 33 should be so positioned that its cutting edge 41 is tangent to a circle having a radius substantially equal to the outside diameter of the inner layer of semi-conducting material 26 of the cable.

The manner of removing the outer layer of semi-conducting material 22 and the layer of insulating material 24 from the cable 20 is the same as has been described hereinabove in connection with the removal of the outer layer of semi-conducting material from the insulation of FIG. 2.

Having thus described this invention in such full, clear, concise and exact terms as to enable any person skilled in the art to which it pertains to make and use the same, and having set forth the best mode contemplated of carrying out this invention, I state that the subject matter which I regard as being my invention is particularly pointed out and distinctly claimed in what is claimed, it being understood that equivalents or modifications of, or substitutions for, parts of the above specifically described embodiment of the invention may be made without departing from the scope of the invention as set forth in what is claimed.

What is claimed is:

1. A tool for removing coating material from around the electrical conductor of a cable which comprises
   (a) a body having an aperture extending therethrough and including coaxial inlet and outlet portions, the inlet portion being frusto-conical and the outlet portion being substantially cylindrical and merging with and extending rearwardly from the smaller end of said inlet portion,
   (b) said body having plane surfaces intersecting said portions and partly defining a longitudinal slot extending for substantially the full length of said portions,
   (c) cutting and clean-up blades having flat surfaces positioned on said plane surfaces of the body adjacent, respectively, to the inlet and outlet portions of said aperture, said blades having cutting edges disposed in a plane passing through said slot and a longitudinal axis of said portions, the trailing end of the cutting edge of said cutting blade being disposed in a plane tangent to a circle having a radius which is substantially the same as the radius of the inner surface of the coating material to be removed in one cut, and the cutting edge of said clean-up blade being disposed in a plane tangent to a circle having a radius substantially that of the outlet portion of the aperture.

2. The combination of elements set forth in claim 1 in which the trailing end of the cutting edge of the cutting blade is disposed in a plane tangent to a circle having a radius which is substantially the same as the radius of the inner surface of the semi-conducting material to be removed in one cut.

3. The combination of elements set forth in claim 1 in which the trailing end of the cutting edge of the cutting blade is disposed in a plane tangent to a circle having a radius which is substantially the same as the radius of the inner surface of the semi-conducting and insulating material to be removed in one cut.

4. The combination of elements set forth in claim 1 in which the leading end of the cutting edge of the clean-up blade is rounded and beveled to direct upwardly thereover semi-conducting material being severed by said cutting blade.

5. The combination of elements set forth in claim 1 in which the blades are independently and adjustably fixed to the body.

6. The combination of elements set forth in claim 1 in which a bushing is positioned adjacent to the entry end of said inlet portion, said bushing being secured to the body for relative rotational movement and having an aperture coaxial with the aperture in said body and having a diameter slightly larger than the diameter of said semi-conducting material.

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