Oct. 27, 1970 J. J. MATTHEWS 3,535,785

CABLE SCORING TOOL

Filed Feb. 26, 1968 2 Sheets-Sheet 1

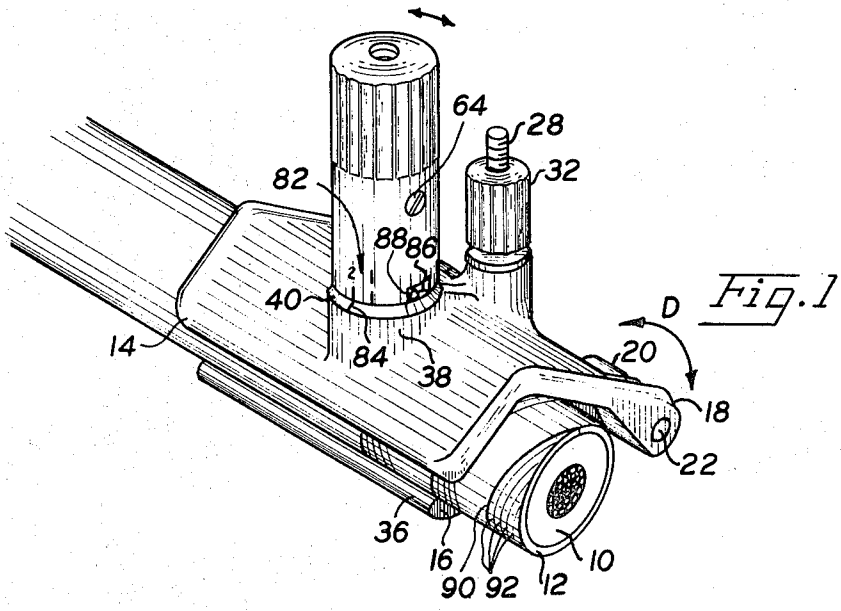


Fig. 1

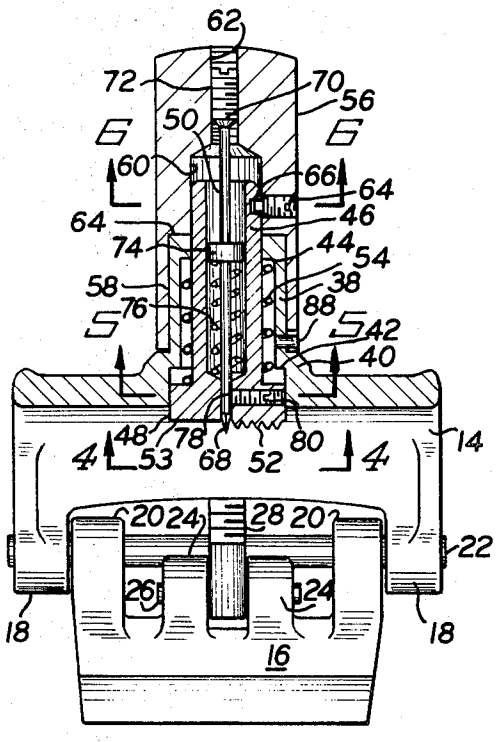


Fig. 3

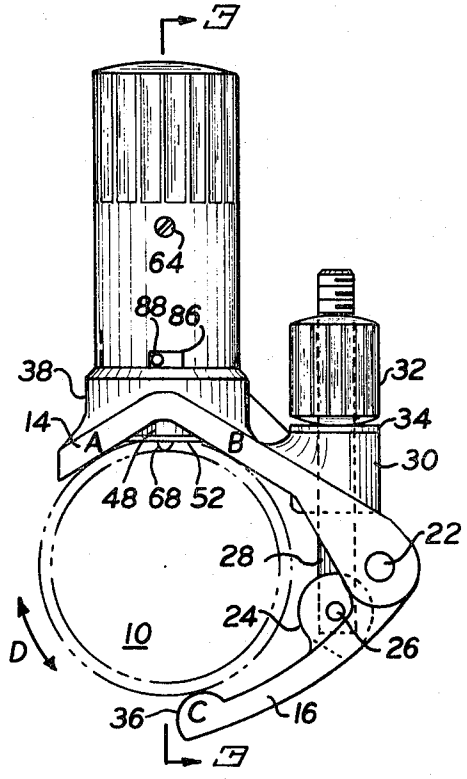


Fig. 2

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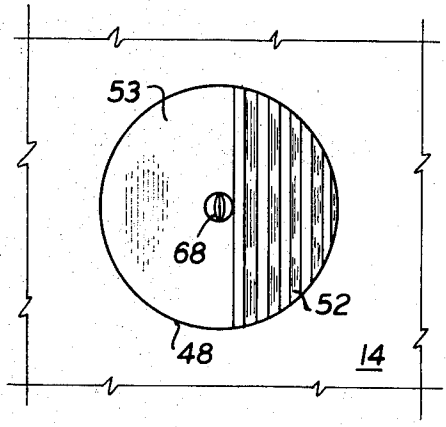


Fig. 4

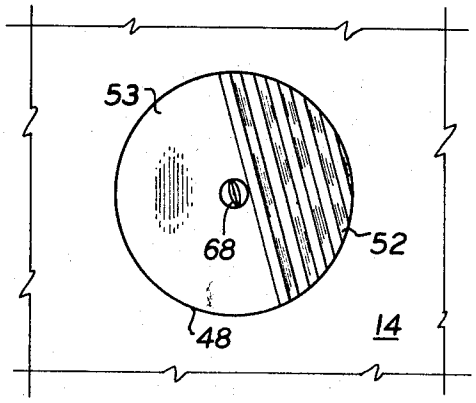


Fig. 4a

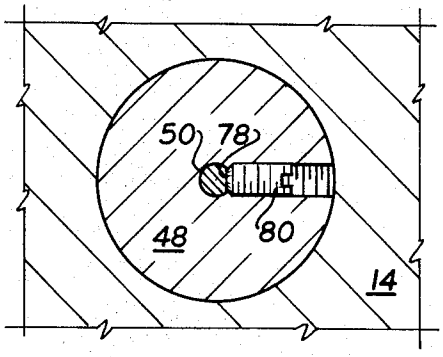


Fig. 5

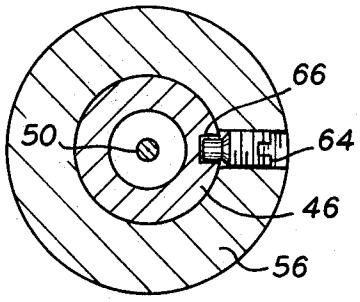


Fig. 6

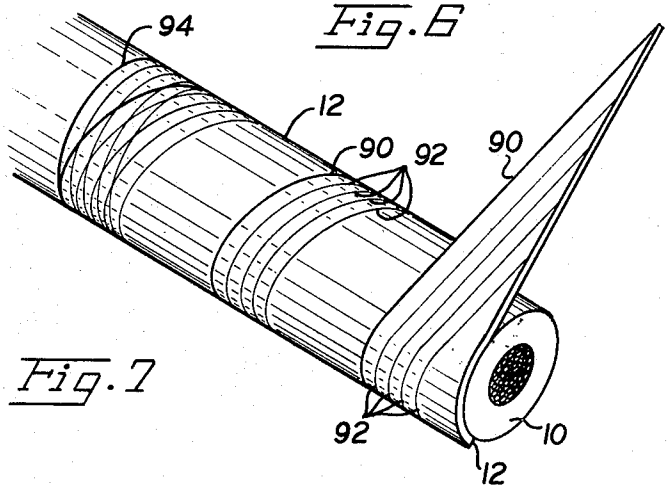


Fig. 7

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3,535,785

CABLE SCORING TOOL

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U.S. Cl. 30—91.2 10 Claims

ABSTRACT OF THE DISCLOSURE

A manually operable device for scoring the shielding jacket of insulated cable, having a body adapted to clamp about the cable, a rotatable knife mounted in said body, and means to position said knife either transversely or angularly to the longitudinal axis of the cable.

The present invention relates to apparatus for removing the shielding jacket from electrical conductors and, in particular, to a tool for scoring the semi-conducting jacket of high voltage cables preparatory to its manual removal therefrom.

High voltage electrical conductors comprise an inner core of wire, successively surrounded by a thin layer of dielectric or semi-conducting material, a thick layer of insulation such as polyethylene or polyvinylchloride, and, finally, a thin, but substantial jacket or shield of dielectric or semi-conducting material. The shield or semi-conducting jacket is laid on or molded about the thick insulation and thus is tightly formed about it. Thus, the jacket must be removed from the thicker insulation without marking, scoring or otherwise, in any manner, affecting the characteristics of such insulation.

The present invention has as its object the provision of a tool which easily scores the semi-conducting outer jacket of insulation preparatory to manually removing the same from the conductor.

The present invention has as a further object the provision of a tool which is capable of scoring the shielding layer of semi-conductive material in a special configuration.

It is a specific object of this invention to provide a tool capable of scoring electrical conductors of varying size.

It is another specific object of this invention to provide a scoring tool in which the scoring blade is adjustably mounted so that the depth of the score in the jacket may ba varied.

A further object of the invention is to provide a tool which will score the jacket to be removed without scoring or otherwise marking the insulation from which it is removed.

Various other objectives and advantages, as well as those enumerated above, will be apparent and fully understood from the following description wherein reference is made to the accompanying drawings in which:

FIG. 1 is a perspective view of the tool of the present invention positioned about a conductor and scoring a portion of the outer jacket.

FIG. 2 is an end view of the device shown in FIG. 1,

FIG. 3 is a sectioned view of the device taken along line 3—3 of FIG. 2,

FIG. 4 and 4*a* are two views of the scoring element of the device taken along line 4—4 of FIG. 3,

FIG. 5 is a sectional view of the device taken along line 5—5 of FIG. 3,

FIG. 6 is a sectional view of the device taken along line 6—6 of FIG. 3, and

FIG. 7 is a perspective view of an electrical conductor which has been scored and partially removed of its outer jacket.

The device of the present invention is, in FIGS. 1 and 2, positioned about a cable **10**, having a shielding jacket **12**, and comprises elongated upper jaw member **14** and a lower jaw member **16**, each having a pair of extending hinge arms **18** and **20**, respectively, hingedly connected together through a pin **22**. The lower jaw member **16** is provided with a second pair of arms **24** through which is secured a pin **26**. An elongated screw **28** is fixed, at one of its ends, to the pin **26** between the arms **24**. The screw **28** extends upwardly into and through a hub **30** formed on the upper jaw **14** and has its free end engaged within a corerspondingly internally threaded knob **32**. A washer **34** is located between the ends of the knob **32** and the hub **30** so that the knob **32** may be easily rotated thereon to thread the screw **28** upward into it or project the same down outward to adjust the length of the screw **28** and thereby pivot the jaws **14** and **16** with respect to each other. Thus, the jaw members **14** and **16** may be adjustably clamped about the cable **10** by merely rotation of the knob **32**.

The upper jaw **14** is V-shaped and has a smooth surface adpated to contact the cable along the entire lengths of portions A and B, as seen in FIG. 2. The lower jaw is curved and terminates along its edge in a longitudinal bead **36** which is adapted to contact the surface of the cable along its length at a position C as seen in FIG. 2. It will be observed that positions A, B and C form a triangular engagement with the circumference of the cable **10** and since they are elongated, they thus insure that the jaws **14** and **16** clamp a lengthwise extent of the cable securely and uniformly along the entire length of the device. The smooth surfaces of the jaws at points A, B and C, however, permit the device to be rotated about the cable in either direction shown by the arrows D in FIGS. 1 and 2. Furthermore, the adjustable jaws allow the device to be used on a variety of cables of different diameters.

Integrally formed on the upper surface of the upper jaw member **14** is a hollow cylindrical pedestal or post **38** having an external shoulder **40** along its base. The post **38** is further formed internally with a shoulder **42** at its base and an internal shoulder **44** at its upper end. Slidably located within the post **38** and extending outwardly from the upper end is a cylindrical hollow knife carrier **46**. The carrier **46** is provided with a substantially solid head **48** at its lower end, the inner surface of which is adapted to be limited in its upward movement by engagement with the lower shoulder **42** of the post **38**. The head **48** is provided with a central bore through which extends the shaft **50** of an insulation scoring knife. One-half of the outer surface of the head **48**, as seen in FIGS. 3 and 4, is formed with a series of parallel chordal serrations **52** while the other half of the head **48** is cut away to form a smooth surface **53** in a plane extending substantially shoulder **42** of the post **38** is a spring **54** adapted to bias tween the inner surface of the head **48** and the upper shoulder **42** of the post **38** is a spring **54** adapted to bias the carrier **46** normally downward.

Fitted over the outside of the post **38** is a knob **56** having an elongated depending cylindrical skirt. The knob **56** is formed coaxially with a first hollow section **58**, second hollow sectional **60** and a third hollow section **62** of decreasing diameters. The larger diameter hollow section **58** is adapted to fit rotatably over the post **38** with the shoulder **63** formed between it and the next section **60** resting on the upper end of the post **38**. The second section **60** is of a diameter which receives the carrier **46** therein. The last section **62** is of a relatively small diameter and is screw threaded along its entire length.

Extending radially through the wall of the knob **56** (FIGS. 2 and 6) is a set screw **64** which engages within a positioning hole **66** formed in the outer wall of the knife carrier **46** of a width substantially equal to the diameter

of the screw. This combination of screw **64** and the slot **66** acts to secure the carrier **46** to the knob **56** for reciprocal vertical movement of the carrier with the knob and for conjoint rotation. The bias of the spring **54** between the shoulder **44** and head **48** causes the head to project downward to its position shown in FIGS. 2 and 3. The connection of the set screw **64** between the carrier **46** and knob **56** serves to apply the spring bias to the knob to bring its lower end into abutment with the external shoulder **40**. Thus, the set screw **64** secures the carrier **46** and knob **56** respectively within and also about the post **38**.

Extending or disposed substantially radial relative to the cable **10** and within the central bore of the carrier **46** is the knife shaft **50**. The knife shaft **50** is needle shaped, i.e., long and thin, and has an oblong cutting or scoring edge **68**, as seen in FIG. 4, formed at its lower end. The shaft **50** extends upwardly through the carrier **46** and terminates in a head **70** located within the small bore section **62** of the knob **56**. A set screw **72** threaded into bore **62** limits the upward movement of the knife **50**. Centrally of the knife shaft, there is secured an annular guard or stop member **74**, between which and the internal lower end of carrier **46**, is located a spring **76** that biases the knife shaft **50** upward againht the set screw **72**. By adjusting the set screw **72** against the upward bias of spring **76** it is possible to extend or retract the oblong cutting edge **68** with respect to the outer face of the carrier head **48**. Thus, the depth or extent of the cut into the jacket **12** can be precisely determined and controlled.

The lower portion of the knife shaft **50** is provided with a flat side **78**, as seen in FIG. 5, extending along a substantial length. A positioning screw **80** is radially inserted through the head **48** before the same is secured in the knob **56** by the screw **64**. The end of the screw **80** lightly and slidingly engages the flat surface **78** of the knife shaft and stabilizes the same against rotation relative to the carrier **46** but permits the same to move axially or vertically in the head **48** and carrier **46**.

It will thus be observed that on rotation of the knob **56** relative to the post **38**, the carrier **46** and knife shaft **50** are also rotated due to the engagement of the set screw **64** in positioning hole **66** and the engagement of the set screw **80** with the flat side **78**. It is preferred that the rotation of the carrier **46** and knife **68** be limited to two positions. The first, as seen in FIGS. 2, 3 and 4, is where the cutting edge **68** of the knife is transverse of the longitudinal axis of the device. This position will allow the cutting edge to score the jacket in a circle about the cable. The second position is illustrated in FIG. 4*a*. In this figure the cutting edge **68** is shown as being at an angle to both the transverse axis and the longitudinal axis of the cable. Such an angular position will allow the cutting edge **68** to cut spirally along the circumference of the cable.

Suitable indicia **82** representing the two positions of the blade are engraved on the surface of the lower edge of the knob **56** (FIG. 1). The shoulder **40** is provided with a reference mark **84** engraved thereon for cooperative alignment with the indicia **82**. The knob **56** is provided with a slot **86** along a portion of its lower extremity and the post **38** is provided with a pin **88** radially extending therefrom through and into the confines of the slot **86**. The pin and slot arrangement act as a limiting or stop means for rotation of the knob **56** and, consequently, defines the position of the cutting edge **68** and limits the alignment of the indicia **82** with the stationary mark **84**.

The vertical movement of the carrier **46** and knife shaft **50** are effected by the vertical lifting of the knob **56**, the shaft **50** being constantly biased upward against the set screw **72**. The extent of the vertical movement of the knob **56** is limited by the upward engagement of the head **48** with the internal shoulder **42** of the post **38**. The space between the shoulder **42** and the head **48** is such that the carrier **46** will not slide upwardly completely out of contact with the cable jacket but will be retained in contact therewith so that the serrations **52** will scratch or lightly score the surface of the jacket **12**.

The purpose of the serrations is to act as a guide or tracking means for the device and to insure that the device, when rotated about the cable, maintains either a true circular movement thereabout or the circumferential spiral direction desired. The serrations are not designed to cut the jacket but rather to bite into or depress into it only the depth or extent that a threading motion is impared and, therefore, in this respect the constant of spring **54** must be critically designed. The smooth half **53** of the face of head **48** enables the head to move over the surface of the jacket without marring or bulging the unscored remaining portion of the jacket while rotation of the device about the cable is in progress, so that the portion of the jacket that will remain on the cable is left in its smooth and unscarred state.

In operation, the tool is first conditioned by presetting the position of the set screw **72** so as to determine the effective depth of the cutting edge **68**. It is to be preferred that this depth would be sufficient to score substantially through the jacket insulation but not completely therethrough so as to avoid scoring or nicking the underlying insulation. Thus, the exact position of the set screw **72** will be determined by the operator of the device through empiric observation or acquired skill.

The tool is then placed about the cable and the jaws **14** and **16** clamped tightly about the circumference by rotation of the knob **32**. It may be preferred that scoring of the cable jacket be made from the end of the cable inwardly, therefore, the tool is first placed so that the cutting edge **68** abuts the end of the cable **10** and the smooth surface of the carrier head **48** rests upon the cable. Since the cutting edge **68** will normally depend below the smooth surface **53** of the head, it will be easy to see whether the edge **68** will cut completely through the jacket thickness. Since it is also the object to score the jacket in a circumferential spiral to a position inwardly of the cable end, the knob **56** is rotated so as to position the head **48** and the oblong cutting edge **68** angular to the transverse and longitudinal axes of the cable.

The device is then rotated or moved bodily counterclockwise about the cable as indicated in the drawings and during this movement, the oblong cutting edge **68** cuts into the jacket material. As rotation of the device continues, the serrations **52** bite into the jacket at their preset angle to the axis of the cable to cause the device to progress in a spiral direction about the cable to score the jacket along the line **90** (FIGS. 1 and 7). As the spiral scoring continues, the serrated portion **52** of the head **48** engages the surface of the jacket material, biting into the same as at **92** to a lesser depth than the edge **68** and insuring the spiral tracking of the tool.

When a sufficient length of the cable is thus scored, the knob **56** is rotated so that the cutting edge **68** is positioned transversely of the longitudinal axis of the cable. The tool is thereupon rotated in a complete circle about the cable and the final perfectly circular scoring **94** is made as indicated in FIG. 7. The device is thereupon removed from the cable by loosening of the jaws **14** and **16**. The scored insulation is then manually removed as indicated in FIG. 7. Once scoring is accomplished, removal of the jacket is accomplished relatively easy by lifting the same manually from the lower insulation. The scored jacket will be removed in a spiral form because of its spiral scoring.

It may also be preferred that the jacket scoring operation be made from a point along the cable to the end of the cable itself. In this case, the device is of course clamped about the cable at the particular point at which the jacket scoring is to begin. With the oblong knife **68** transverse to the cable axis, the device rotated to initially make the circular cut **94**. The knob **56** is then rotated into the position where the cutting edge will produce the spiral cut **90** and the device is then rotated clockwise as seen in the figures of the drawings. The cutting may

then proceed until the device progresses completely to the end of the cable and runs off the edge.

It will, of course, be appreciated that operation of the device is similar in either of the two rotational modes of operation and they are clearly interchangeable. However, if the scoring of the jacket is to be made between the ends of the cable, the knob **56** is rotated to cause the edge **68** to form an ending circular score about the jacket. The knob **32** is rotated to part the jaws **14** and **16** from the cable and the knob **56** is then lifted to raise the head **48** up to the limit of shoulder **42**. This also raises the serrations **52** and the cutting edge **68** thereby assuring that they will not mark or scar the remaining portion of the cable jacket.

It will thus be seen from the preceding description that the tool provided by the present invention is simple in construction as well as in operation. The tool successfully and easily scores only the outer jacket of insulation preparatory to manual removal without endangering or subjecting the cable or insulation itself to any adverse mechanical action. Further, the tool is adaptable to adjustment for varying size cable and/or jacket by operation of its adjustable clamp jaws and knife positioning means. It is capable of scoring in a variety of spiral configurations by adjustment of the cutting edge position.

While I have pointed out, by showing and describing a preferred form, the novel features of this invention, it will be understood that various modifications, substitutions and changes in form may be made without departing from the spirit thereof. For example, the adjustable jaw clamping means shown may be replaced by another body form such as a split yoke, separable semi-spherical halves, etc. The adjustable mechanism may be replaced by other locking or clamping mechanisms as might the mechanism of rotating and positioning the cutting edge. It is the intention, therefore, that this invention be limited only as indicated by the scope of the claims appended hereto.

I claim:

1. A tool for scoring the jacket of electrical cable comprising

a body adapted to fit on said cable for rotation thereabout,

a knife mounted in said body having a cutting edge extending outwardly therefrom to pierce the surface of the jacket,

tracking means angularly adjustable relative to the longitudinal axis of the cable for biting engagement with the jacket,

means to position said cutting edge to pierce the surface of the jacket in accordance with the angular adjustment of said tracking means and to permit relative movement between said tracking means and knife with respect to the longitudinal axis of the cable while the cable jacket is being scored by the cutting edge,

and means to resiliently urge said tracking means into its engagement with the jacket.

2. The tool according to claim **1** wherein said body comprises a pair of opposed jaw members hingedly connected to fit about the cable,

and jaw positioning means for adjustably clamping said body about said cable.

3. The tool according to claim **2** wherein one jaw member has a V-shape adapted to engage the cable at two points and said other jaw member is curved and adapted to engage said cable at a third point opposed to said first two points.

4. The tool according to claim **1** including means for adjusting the extent of said cutting edge outwardly of said body.

5. The tool according to claim **1** in which said body is formed with a hollow pedestal,

and the means for mounting said knife forming a part of said tracking means having a hollow knife carrier reciprocally slidable in said pedestal,

said knife being axially mounted within said carrier and having its cutting edge extending outwardly therefrom,

resilent means urging said knife inwardly of said carrier,

and adjustable stop means engaging the head of said knife for limiting the inward movement thereof.

6. The tool according to claim **5** wherein the pedestal and carrier are cylindrical and relatively rotatable and including means for rotating said carrier so as to position the oblong cutting edge angularly with respect to the longitudinal axis of the cable.

7. The tool according to claim **6** wherein said carrier is provided with a coaxial knob for manually rotating said carrier,

said knob including indicia for locating the position of the cutting edge.

8. The tool according to claim **7** including means limiting the extent of rotation of said knob.

9. A tool for scoring the surface of a cable comprising

means to clamp the tool to a cable to be scored and for relative movement of said tool and cable,

scoring means on said tool disposed substantially radial to the clamped cable to score the surface thereof,

means on said tool to predeterminately adjust said scoring means to a depth of penetration of the clamped cable,

tracking means for biting engagement with the cable surface,

means resiliently urging said tracking means into engagement with the cable,

means on said tool and operatively connected with said scoring and tracking means to rotate said scoring and tracking means between a position transverse to the longitudinal axis of the clamped cable and a position angular to the longitudinal axis of the clamped cable,

and means between said scoring and tracking means to move the same conjointly to their transverse and angular positions and to permit relative radial movement therebetween while the cable is being scored by the scoring means.

10. A tool as in claim **9**,

means on said tool to limit the rotation of said scoring and tracking means.

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U.S. Cl. X.R.

30—90.7, 91.1