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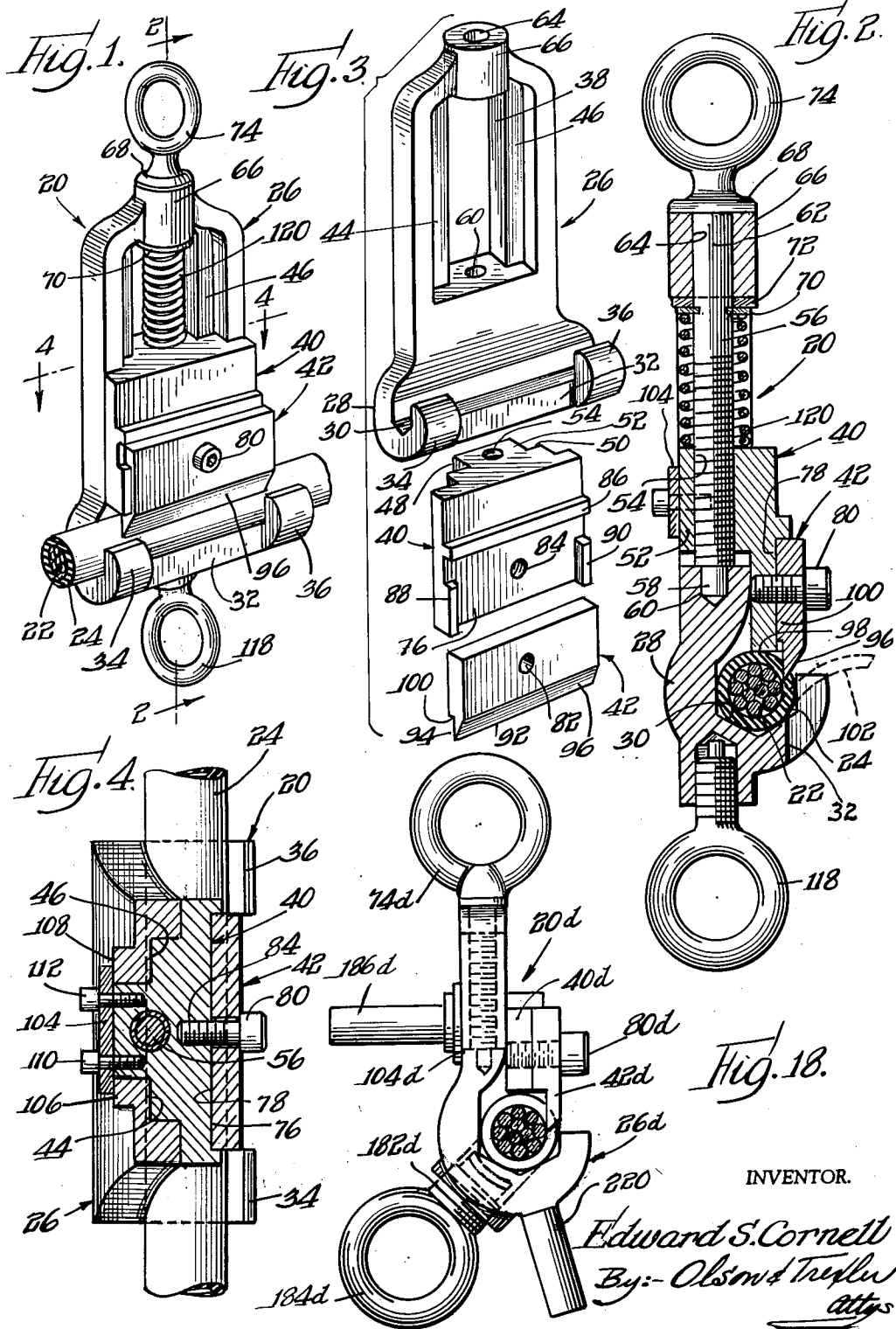
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STRIPPING DEVICE FOR INSULATED CONDUCTORS

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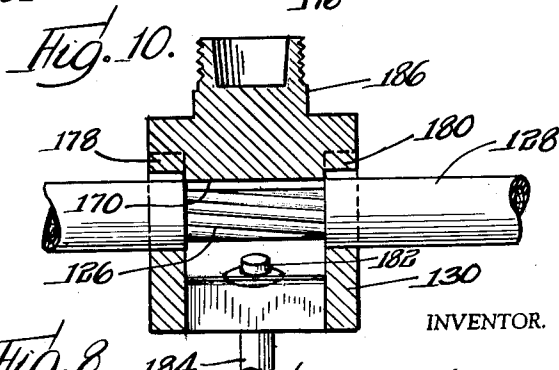
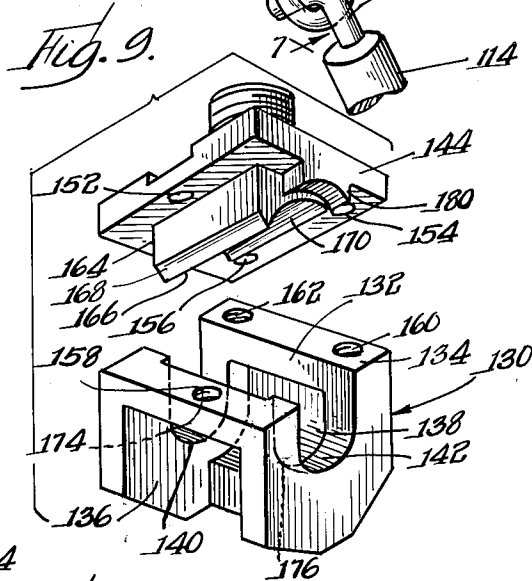
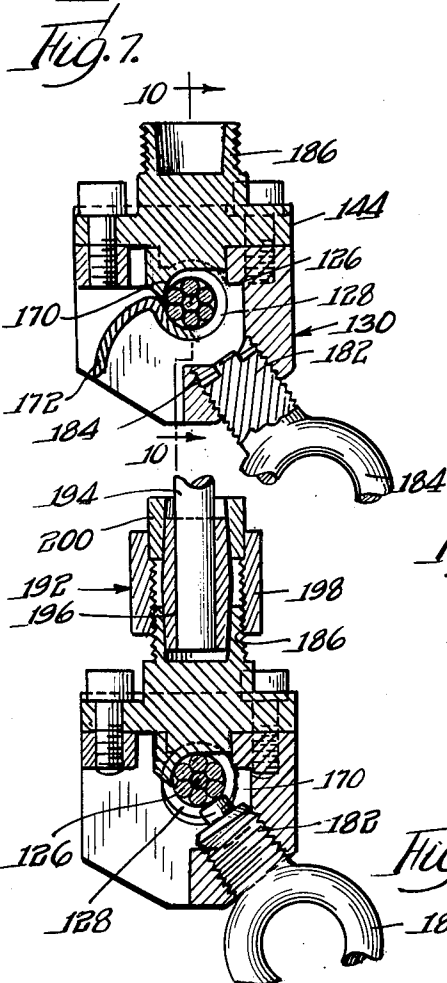
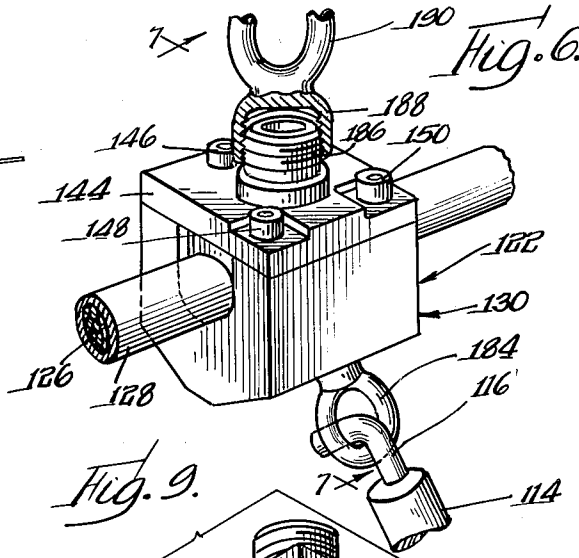
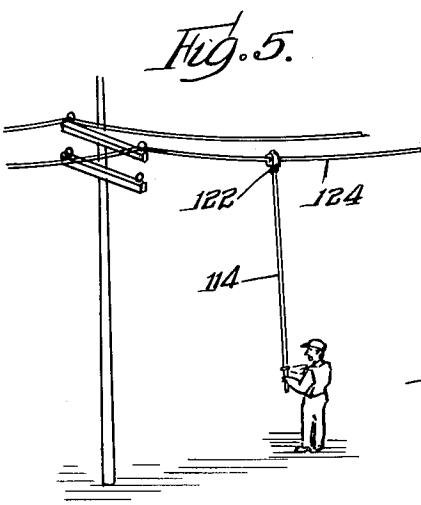


Fig. 8.

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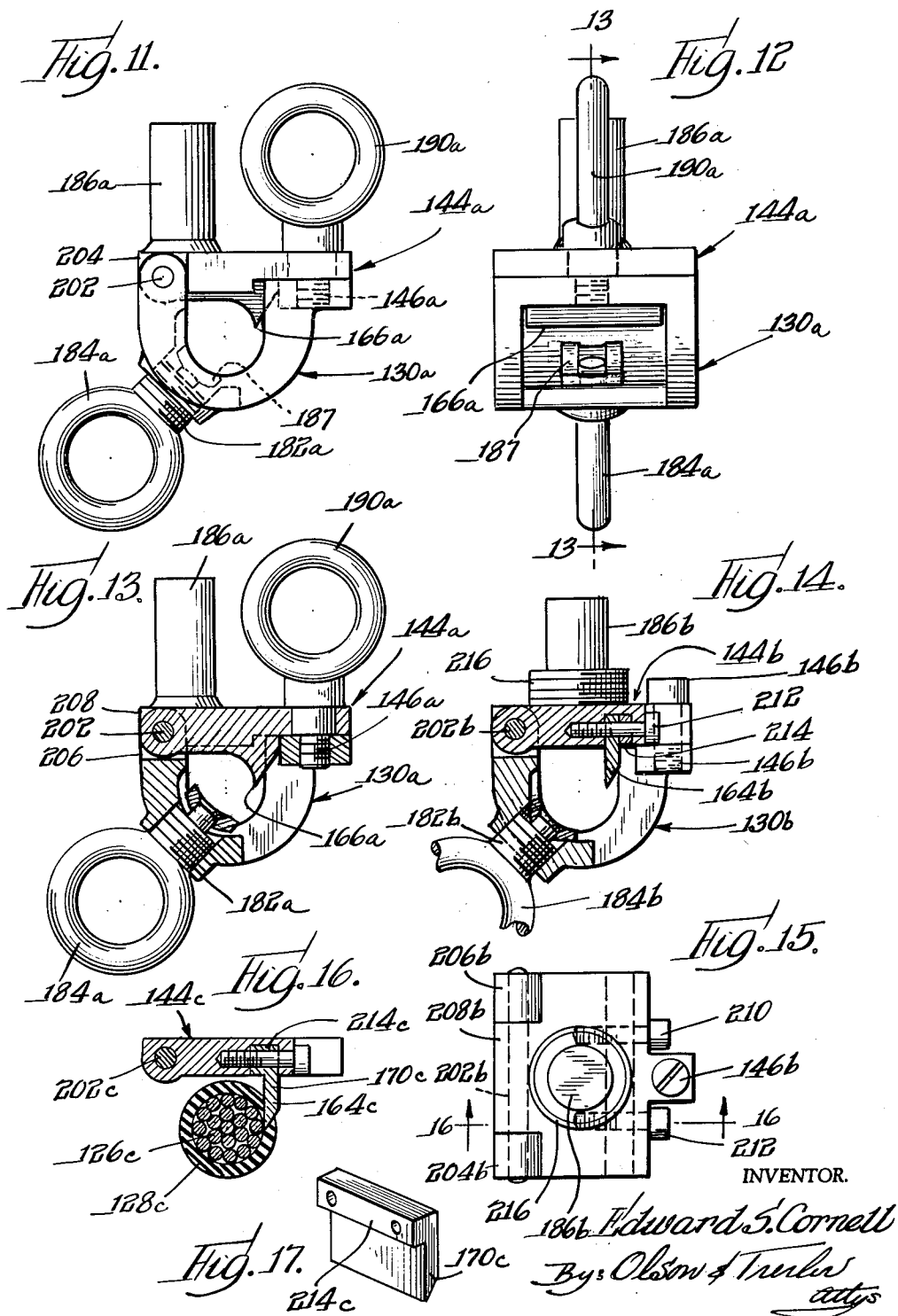
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STRIPPING DEVICE FOR INSULATED CONDUCTORS

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STRIPPING DEVICE FOR INSULATED CONDUCTORS

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5 Claims. (Cl. 81-9.5)

The present invention relates to novel means for facilitating the connection of a wire to an electrical power line or the like, and more specifically, the present invention relates to novel means for facilitating the removal of insulating material from an electrical conductor.

Electrical conductors have long been provided with sheaths of insulating material of various types including rubber and rubber like materials. It is frequently necessary to connect branch lines with intermediate portions of an electrical conductor or power line and in order to accomplish such connections it is necessary to remove small sections of the insulating material from the power line. When removing a section of insulation from a conductor or power line, it has heretofore been the general practice for a workman to make two annular cuts with a knife in the insulation at spaced points and a longitudinal cut between the annular cuts whereupon the section of insulation between the annular cuts is torn from the conductor. This procedure is relatively difficult and time consuming and also presents the danger that the workman will accidentally cut the wires of the conductor. In addition this prior procedure often subjects the workman to possible injury since it is frequently necessary to perform the work while the power line is "hot".

More recently developed electrical conductors or power lines have been provided with insulation made of tough plastic materials. The nature of such materials is such that it is, in many cases, impractical to attempt to remove a section of the insulation by hand cutting and tearing the insulation in the manner indicated above. Thus conductors or power lines utilizing insulation made of such plastic materials have been rejected for certain installations since the line could not be readily tapped even though such lines would otherwise be highly desirable.

It is an important object of the present invention to provide a novel device whereby plastic as well as other types of insulation may be easily stripped from an electrical conductor.

Another object of the present invention is to provide a novel device whereby insulation may be readily stripped from a section of a conductor in a manner which substantially eliminates any possibility of harmful cutting or marring of the electrical conductor.

Still another object of the present invention is to provide a novel device for readily removing a section of insulating material from an electrical conductor, which device is constructed so that it may be easily manipulated by a workman in a manner which enables the device to be used on "hot" lines without danger of injury to the workman.

A more specific object of the present invention is to provide a novel device of the above described type which may be readily adapted for use with electrical conductors or cables having different diameters.

Still another object of the present invention is to provide a novel device of the above described type which is constructed so that it may be readily electrically connected with a conductor or power line and also with a branch line so as to facilitate the connection of one line to the other.

A further object of the present invention is to provide

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a novel device of the above described type which is of simple, rugged and economical construction.

Other objects and advantages of the present invention will become apparent from the following description and the accompanying drawings wherein:

FIG. 1 is a perspective view of a device incorporating features of the present invention applied to an electrical conductor so that it may be manipulated to remove a section of insulating material therefrom;

FIG. 2 is an enlarged partial sectional view taken along line 2-2 in FIG. 1;

FIG. 3 is an exploded perspective view showing parts of the device of FIG. 1;

FIG. 4 is an enlarged sectional view taken along line 4-4 in FIG. 1;

FIG. 5 is a perspective view illustrating how devices of the type contemplated herein may be manipulated by a workman utilizing a long wood pole or the like to enable the workman to remove a section of insulating material from a hot power line without any danger of an electrical shock;

FIG. 6 is an enlarged fragmentary perspective view showing a modified form of the present invention;

FIG. 7 is a partial sectional view taken generally along line 7-7 in FIG. 6;

FIG. 8 is a sectional view similar to FIG. 7 but shows the device utilized as a conductor after a section of insulating material has been removed from the conductor;

FIG. 9 is an exploded perspective view showing elements of the device of FIG. 6;

FIG. 10 is a fragmentary sectional view taken generally along line 10-10 in FIG. 7;

FIG. 11 is an end view showing a device incorporating another modified form of the present invention;

FIG. 12 is a side view of the device shown in FIG. 11;

FIG. 13 is a partial sectional view taken generally along line 13-13 in FIG. 12;

FIG. 14 is a partial sectional view similar to FIG. 13 but showing another modified form of the present invention;

FIG. 15 is a plane view of the device shown in FIG. 14;

FIG. 16 is a fragmentary sectional view taken generally along line 16-16 in FIG. 15 but showing a further slightly modified form of the present invention;

FIG. 17 is a perspective view of a cutter element shown in FIG. 16;

FIG. 18 is a side elevational view showing another embodiment of the present invention which incorporates various features of previously mentioned embodiments.

Referring now more specifically to the drawings wherein like parts are designated by the same numerals throughout the various figures, a device or tool 20 constructed in accordance with certain features of the present invention is shown in FIGS. 1 through 4. The device 20 is adapted to remove an annular section of insulating material from an electrical conductor 22 having a sheath 24 of the insulating material. After the section of insulating material has been stripped from the conductor in the manner which will be described in detail below, the device 20, in accordance with this embodiment of the present invention, is to be removed from the conductor and any suitable connector may be applied to the exposed wire. The device 20 is provided with a main body member 26 that may be cast or otherwise suitably formed in desired material. One end section 28 of the body member is generally hook shaped so as partially to embrace an electrical conductor or line in the manner shown in FIGS. 1 and 2. Preferably the hooked section 28 is provided with a generally V-shaped surface 30 engageable with the insulation surrounding the electrical conductor so that the device may properly engage power lines or the like of different diameters. An intermediate

portion of a free terminal end of the hook section is cut away as indicated at 32 so as to leave an opening between the remaining opposite end finger like portions 34 and 36 to permit the discharge of insulating material during a stripping operation.

The body member 26 is provided with an axially extending elongated slot 38 for accommodating a slide member 40 which in turn is adapted to carry a blade or cutter member 42. The body member is provided with opposite side longitudinally extending shoulders or guide surfaces 44 and 46 within the slot for cooperating complementary surfaces 48 and 50 on the slide member. A nut portion 52 of the slide member which has an axially extending internally threaded bore 54 extends into the slot 38 beneath the surfaces 44 and 46 for cooperation with a screw member 56. The screw member has a reduced diameter smooth inner end portion 58 which extends into a bearing aperture 60 formed in the body member 26. An outer end portion 62 of the helically threaded screw member is also provided with a smooth surface and is rotatably supported in a bearing aperture 64 provided in a bearing section 66 of the body member. The screw member is provided with a shoulder or annular flange 68 adjacent its outer end, which flange is engageable with one end of the bearing section 66 for limiting axial movement of the screw member in one direction. Axial outward movement of the screw member is prevented by means of a snap ring 70 mounted in suitable groove means provided in the screw member adjacent the inner end of the bearing section 66. Preferably a washer 72 is provided between the snap ring 70 and the bearing member. It will be appreciated that with this arrangement, the slide member may be selectively advanced or retracted along the body member 26 by turning the screw member in the appropriate direction. In order to facilitate turning of the screw member, an eye 74 is secured to or made integral with the outer end of the screw member, which eye is adapted to be engaged by a suitable tool in the manner discussed below.

The slide member 40 is provided with a seat or surface 76 adapted to mate with a complementary surface 78 formed on the cutter member or blade 42. The cutter member is adapted to be secured against the surface 76 of the slide member by means of a screw 80 which extends through a suitable aperture 82 formed in the cutter member and is threaded into a tapped aperture 84 provided in the slide member. An elongated abutment 86 projects from the slide member and extends along a rear margin of the seat or surface 76 for engaging the trailing flat edge of the blade member. It will be appreciated that the abutment 86 serves positively to prevent the blade member from twisting or turning about the screw 80. Additional abutments 88 and 90 are provided at opposite sides of the seat 76 for assisting in retaining the blade member. It should be appreciated, however, that in many instances the abutment 86 will be sufficient for retaining the blade member. Therefore, the blade member 42 which is illustrated as having a length sufficient to extend completely between the side abutments 88 and 90 may be varied in width, if desired, so as to vary the width of the section of insulation to be stripped from the electrical conductor.

The blade or cutter member 42 is formed so as to provide a leading cutting edge 92. This cutting edge is at the intersection of an innersurface 94 which is substantially parallel to the axis of the movement of the slide member and an outer beveled surface 96. It is important to note that the construction is such that when the electrical conductor is properly seated against the V-shaped surface of the hook section 28 so that the axis of the conductor lies substantially in a plane disposed parallel to the direction of movement of the slide member and including the junction between the inclined sections of the V-shaped surface, the surface 94 and thus the cutting edge 92 of the cutter member are disposed in a plane

which is substantially tangent to but does not materially intersect the periphery of the electrical conductor or cable 22. In addition, the cutter member extends so that the cutting edge 92 thereof is located sufficiently forwardly of a leading edge 98 of the slide member so that the cutting edge 92 will pass substantially entirely through the insulation 24 surrounding the conductor 22 when the slide member has been advanced sufficiently to engage the leading edge 98 thereof against the insulation 24. This construction and arrangement of the parts is clearly shown in FIG. 2.

As indicated above, the cutting edge 92 is disposed in a plane substantially tangent to the conductor or wire 22 and this eliminates any possibility of injury to the wire during an insulation stripping operation since regardless of how far the slide member is advanced, the blade member will never materially engage the wire. In order to adapt the device for use with wires of different diameters, it is necessary to shift the cutting edge 92 laterally inwardly or outwardly as the case may require so that the edge remains in a plane tangent to the periphery of the wire. This adjustment of the cutter member may be accomplished by inserting shims, not shown, between the surfaces 76 and 78 of the slide and cutter members or by removing such shims or by providing a plurality of interchangeable cutter members having integral shim means of different thickness. In the embodiment shown, the cutter member 42 is provided with integral shim means 100. In other words, the cutter member is provided with a thickened body portion adapted to space the cutting edge 92 a predetermined amount laterally of the surface 76 of the slide member. It will be appreciated that the thickness of the integral shim means 100 or the cutter member body portion may be varied in accordance with the diameter of the electrical conductor to be worked upon in order to position the surface 94 and cutting edge 92 in the manner described above.

The device 20 is adapted to be used in the following manner for stripping an annular section of insulating material, see FIG. 2, from the electrical conductor 22. The screw member 56 is first turned so as to retract the slide member 40 and the blade member 42 sufficiently to enable the hooked section 28 of the body member 26 to be passed around the conductor. In many cases such as a power line arrangement as shown in FIG. 5, the section 28 may be hooked over the line so that the device or tool 20 will support itself in a depending position until the screw member has been turned so as to advance or tighten the slide member. As indicated, the screw member 56 is manipulated to advance the slide member after the device has been hooked over the electrical conductor, and this advancement is continued until the forward edge 98 of the slide member abuts the sheath of insulation 24 surrounding the electrical conductor 22 and at least loosely clamps the line against the V-shaped surface 30. As indicated above, the V-shaped insures proper orientation of the tool with respect to the line. As the slide is being advanced, the cutting edge 92 of the blade member is forced through the insulation 24. As indicated above, the cutting edge 92 is located with respect to the forward edge 98 of the slide member so as to sever or pierce the insulation substantially completely without materially engaging the wire. As a result of the substantially tangent arrangement of the cutter blade with respect to the wire, there will be a tendency for the cutter member and slide to shift laterally outwardly as the cutter member passes through the insulation so that transversely directed forces may be imposed upon the screw member 56. In order to accommodate such forces, a plate member 104 which overlies bearing surfaces 106 and 108 at the back of the body member 26 is secured to the slide member by screws 110 and 112 as shown in FIGS. 2 and 4.

After the device 20 has been applied to the electric line so that the line is confined between the V-shaped surface 30 and the slide member in the manner shown in

FIG. 2, it is merely necessary to rotate the device 20 about three hundred sixty degrees around the wire in order to strip the annular section 102 of insulation from the wire. As the device is rotated, the beveled surface 96 of the cutter member directs the section 102 of insulating material laterally outwardly through the opening provided between the finger portions 34 and 36 of the hook shaped section 28 as indicated in broken lines in FIG. 2. It has been found that the device 20 may be easily rotated so that the annular strip of insulating material may be removed quickly and easily. Furthermore, the opposite end edges of the beveled surface 96 apparently serve to cut into the insulating material during rotation of the device sufficiently to cause opposite edges of the annular section 102 to be torn or severed from the sheath of insulation relatively smoothly and evenly.

In the event the electrical conductor 22 is disconnected from its source of electricity, the device 20 may be easily turned by hand. However, it is frequently desirable to apply the device to a hot power line or the like, and this may be accomplished with complete safety to the workman by utilizing a pole-like tool in the manner indicated in FIGS. 5 and 6. Such a tool will include an elongated pole 114 constructed of wood or any other suitable insulating material, and a hook 116 secured to the end of the pole and adapted to be inserted through an eye on the device 20. When applying the device to a hot line, the hook 116 is inserted through the eye 74 and the device is raised over the line so that the hook shaped section 28 may be passed around the line. When this has been accomplished the pole 114 is utilized to turn the screw member 56 to advance the slide member in the above described manner. Then the pole 114 which is interconnected with the eye 74 by means of the hook element 116 is utilized for partially rotating the device 20 about the wire. In order to enable the device to be completely rotated about the wire, another eye member 118 is threadably or otherwise connected to the end of the body member 26 opposite from the eye 74. In order to resist any unauthorized retrograded rotation of the screw member 56 during rotation or manipulation of the device 20 around the wire, a compression spring 120 is provided between the snap ring 70 and the slide member so as to cause the slide member yieldably to bind on the threads of the screw member.

FIGS. 6 through 10 show a device 122 which incorporates a modified form of the present invention. The device 122 is constructed so that it is adapted to strip an annular section of insulating material from an electrical conductor or line 124 including an inner wire or cable 126 and an outer insulating sheath 128 in basically the same manner as the device 20 described above. However, one important difference between the devices 20 and 122 is that the device 20 is to be removed and replaced by some suitable connector after the stripping operation has been completed while the device 122 is adapted to serve as both a stripping tool and a connector.

The device 122 comprises a main body member 130 having a wire accommodating slot 132 extending longitudinally therethrough and opening at its upper surface 134. A lateral opening 136 is provided in one side of the body member 130 to permit an annular section of insulating material being stripped to be discharged, and the body member may be further internally recessed as indicated at 138 to effect a savings in the amount of material required. However, opposite end portions of the slot 132 have wire accommodating and locating bottom surfaces 140 and 142 which may be rounded or generally U-shaped in the manner shown or, if desired, the surfaces may be generally V-shaped in much the same manner as the V-shaped surface 30 of the device 20.

A top member 144 is provided which is adapted to be secured against the upper surface 134 of the body member 130. In this embodiment the top member is adapted to be secured against the body member by means of screws

146, 148 and 150 which respectively extend through apertures 152, 154 and 156 in the top member. These screws are adapted to be threaded into tapped apertures 158, 160 and 162 respectively in the body member 130.

The top member 144 is provided with a depending blade portion 164 which enters the slot 132 when the top member is secured to the body member 130. The blade portion includes a cutting edge 166 at the intersection of an outwardly facing beveled surface 168 and an inner surface 170. While the inner surface 170 is curved so as to provide a wire accommodating seat for the purpose described below, it is to be noted that the cutting edge 166 of this embodiment like the cutting edge of the embodiment described above is located so as to substantially completely penetrate the insulating material and so as to lie in a plane substantially tangent to the conductor or wire 126 and parallel to a plane containing the axes of the wire 126 and the curved seats or bottom surfaces 140 and 142. Thus the cutting edge 166 is located so that it cannot possibly materially mar or cut into the wire 126.

The device 122 may be rotated about the wire in substantially the same manner as the above described device 20 for stripping an annular section 172 of insulating material from the wire. It is to be noted that during the stripping action, inner edge portions 174 and 176 of the generally U-shaped surfaces 140 and 142 serve as shearing edges to insure substantially smooth and even separation of opposite end edges of the annular strip 172 from the sheath of insulating material 128.

In accordance with an important feature of the present invention, the device 122 is adapted to be securely electrically connected to the wire or conductor 126 after the strip 172 of insulating material has been removed, and in addition, the device 122 is adapted to be connected to a branch wire. More specifically, a clamping screw 182 is threaded into a tapped aperture 184 formed in a lower portion of the body member 130 and disposed so that its axis traverses the conductor 126 substantially centrally and extends somewhat radially with respect to the curved seat 170 of the cutter portion 164. Thus, when the screw 182 is tightened as shown in FIG. 8, it is effective for securely clamping the conductor 126 against the seat 170 so as to provide a good electrical connection between the wire and the device 122. Preferably an eye 184 is provided at the outer end of the screw so that both the screw and the entire device 122 may be manipulated by means of the above described pole 114 having the hook element 116 secured to its end. The top member 144 is provided with depending abutments 178 and 180 having downwardly facing arcuate surfaces or seats spaced outwardly of the seat 170. The abutments 178 and 180 are engageable with the sheath of insulating material when the conductor is clamped against the seat 170.

The top member 144 is provided with an upstanding threaded nipple 186. This nipple serves a double purpose. In the first place, an internally threaded cap 188 having an eye 190 may be applied to the nipple as shown in FIG. 6 to enable the device 122 to be rotated through three hundred sixty degrees by means of the pole 114. In the second place, the nipple may be used to receive connecting means 192 shown in FIG. 8 for connecting a branch wire 194 to the device 122. The connecting means may be of various suitable constructions, and in the embodiment shown, the connecting means comprises an insert 196 having its opposite end portions tapered in opposite directions. The insert is adapted to seat against a tapered surface provided at an inner end portion of the nipple 186. A nut member 198 having a tapered collar 200 welded or otherwise secured thereto is applied to the threaded nipple. Upon tightening of the nut member, the collar compresses the insert sufficiently to cause it to grip the wire 194.

In FIGS. 11, 12 and 13 there is shown another embodiment of a combined insulation stripping and connector

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device constructed in accordance with features of the present invention, which embodiment is similar to the structure shown in FIGS. 6 through 10 as indicated by the application of identical reference numerals with the suffix *a* added to corresponding elements. The primary distinguishing feature of this embodiment over the structure described above is that top member 144*a* is pivotally connected to the body member 130*a* by means of a pivot pin 202 extending through suitable interleaved finger portions 204 and 206 of the body member and 208 of the top member. In addition, the eye 190*a* is made integral with the screw member 146*a*. This pivoted arrangement of the top member facilitates application of the device to a wire and the initial piercing of the insulation by the cutting edge 166*a*. In this embodiment, the tap element 186*a* is shown as a smooth stem to which a compression type connector, not shown, of known construction may be readily applied for connecting the device to a branch wire. However, it will be appreciated that the tap element 186*a* may be similar to the corresponding element of the embodiment shown in FIGS. 5 through 10. It is further understood that the tap element or means for connection to a branch wire might be modified in various other ways. This device also shows the use of a clamping pad 187 rotatably connected to the inner end of the screw 182*a*, which pad may also be used with any of the other clamping screws.

FIGS. 14 and 15 show another modified form of the present invention which is similar to the embodiment of FIGS. 11-13 as indicated by the application of identical reference numerals with the suffix *b* added to corresponding elements. In this embodiment, the device is adapted to accommodate wires of various diameters. In order to accomplish this, the device is provided with a removable blade member 164*b* which is secured in a suitable seat formed in the top member 144*b* by a pair of screws 210 and 212. A shim 214 is provided in the blade member receiving seat or slot for insuring proper positioning of the blade member with its cutting edge disposed in a plane tangent to the metal electrical conductor. In this embodiment, a threaded nipple 216 has been provided at the base of the tap element 186*b* for accommodating an internally threaded cap and eye member of the type shown in FIG. 7. However, it is to be understood that, if desired, the screw member 146*b* could be provided with an integral eye in the same manner as the embodiment of FIGS. 11-13.

FIGS. 16 and 17 show another slightly modified embodiment of the present invention. This embodiment is identical to the structure shown in FIGS. 14 and 15 except that the blade member 164*c* has been modified so as to locate the cutting edge for accommodating a larger diameter wire. More specifically, the blade member 164*c* is provided with an integral shim portion 214*c* projecting laterally from the inner surface 170*c* of the cutting member for properly locating the inner surface and the cutting edge. It will be appreciated that this structure is essentially the same as the cutter blade structure of the embodiment shown in FIGS. 1 through 4. It will further be appreciated that the blade means shown in the embodiments of FIGS. 14-15 and 16-17 are interchangeable with various other blades, not shown, formed so as to accommodate wires of different diameters.

FIG. 18 shows another embodiment of the present invention which incorporates features of the above described embodiment shown in FIGS. 1 through 4 and also features of certain of the other embodiments as indicated by the application of identical reference numerals with the suffix *d* added to corresponding elements. This structure is essentially identical to the embodiment

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shown in FIGS. 1-4 except that it has been modified so that the device may be used not only as a stripping tool but also as a connector. In order to accomplish this, a tap element 186*d* is connected to or made integral with the retaining plate 104*d* of the slide means of the device. If desired, another tap element 220 may be formed integral with or connected to the main body member 26*d* of the device. It is also to be understood that these tap elements may be replaced by any other suitable means which enables the device to be electrically connected with branch conductors. The device 20*d* is also provided with a clamping screw 182*d* which is diagonally disposed with respect to the direction of movement of the slide so as to insure clamping of the exposed conductor into the corner or seat provided by the end of the slide member 40*d* and the blade member 42*d*.

While the preferred embodiments of the present invention have been shown and described herein, it is obvious that many structural details may be changed without departing from the spirit and scope of the appended claims.

The invention is claimed as follows:

1. A device for stripping a circumferentially extending section of insulating material from the conductive element of an insulated electrical conductor, and comprising means for relatively rotatably embracing the insulated conductor and including relatively angled surface portions engageable with the insulated conductor on opposite sides of the central axis thereof with the central axis of the conductor in a plane bisecting the angle between said surface portions, blade means mounted on said embracing means and having an elongated cutting edge extending parallel to said surface portions and laterally offset from one surface portion to the opposite side of said plane, and means connecting said blade means with said embracing means for movement along a predetermined path of travel into the insulating material of the conductor while avoiding substantial intersection with the conductive element thereof.
2. A device, as defined in claim 1, wherein said means connecting the blade means with said embracing means includes an elongated guideway on said embracing means, a slide member slidably associated with said guideway, and means detachably securing said blade means to said slide member.
3. A device, as defined in claim 1, which includes an eye element secured to said embracing means for facilitating manipulation of the device.
4. A device, as defined in claim 1, which includes a pair of generally oppositely extending eye elements at generally opposite sides of said embracing means for facilitating manipulation of the device.
5. A device, as defined in claim 1, wherein said embracing means and said blade means are separable from each other and said means connecting the blade means with said embracing means comprises a plurality of screw elements disposed parallel to said blade means.

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