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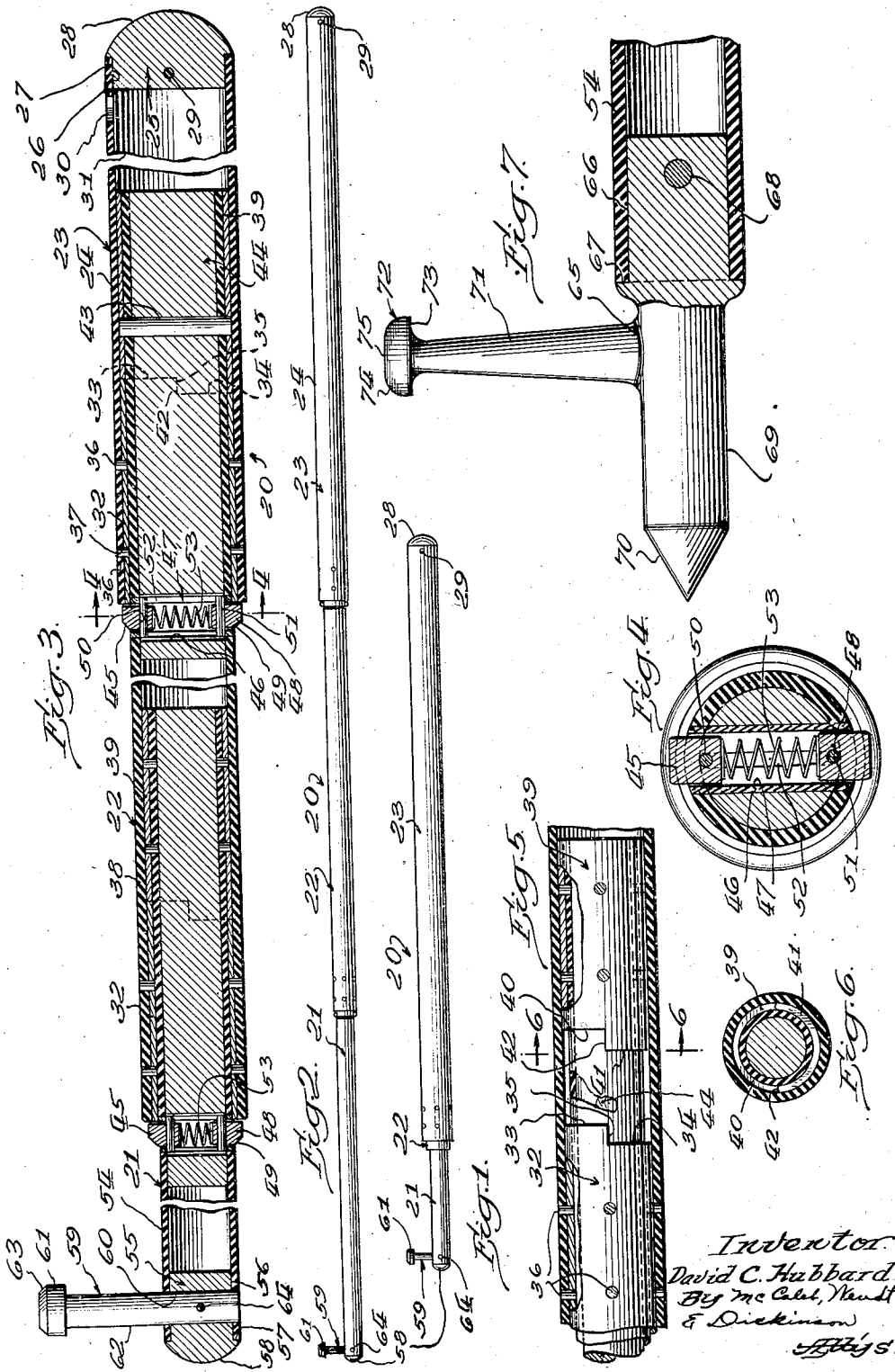
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OPERATING TOOL FOR HIGH TENSION ELECTRIC LINES

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OPERATING TOOL FOR HIGH TENSION ELECTRIC LINES

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The present invention relates to operating tools for high tension electric lines, and is particularly concerned with telescoping insulating sticks adapted to be used for supporting disconnects and various other types of tools or for use in measuring distances.

One of the objects of the invention is the provision of an improved telescoping disconnect stick which is adapted to be used for handling blade disconnects or fused cutouts of any style, and which is of light weight and collapsible, to be packed in a very limited space.

Another object of the invention is the provision of an improved telescoping insulating stick of the class described, which has a high mechanical and dielectric strength, a low moisture absorption, and which is adequately insulated so that it may be used on high tension circuits.

Another object of the invention is the provision of an improved telescoping insulating stick having an improved latching arrangement, all of the exposed parts of which may be made of insulating materials, and by means of which any or all of the sections may be latched in the extended position.

Another object of the invention is the provision of an improved telescoping insulating stick which is provided with an improved structure for preventing rotative motion between the various sections of the stick so that it may be used for exerting a relatively strong torque.

Another object of the invention is the provision of improved forms of latching mechanism for telescoping disconnect sticks or tools by means of which the sections may be secured in extended position or they may be collapsed at will.

Another object of the invention is the provision of an improved telescoping insulating stick adapted to be used for measuring the height or spacing of conductors.

Another object of the invention is the provision of an improved telescoping insulating stick adapted to be used with a universal head so that it is available for connection to a multiplicity of different types of tools and which is also provided with automatic latching means for latching the sections in extended position.

Other objects of the invention will be apparent from the following description and the accompanying drawings, in which similar characters of reference indicate similar parts throughout the several views.

Referring to the two sheets of drawings,

Fig. 1 is an elevational view of the telescoping insulating stick constructed according to the in-

vention, embodied in a disconnect stick, with its parts in collapsed position;

Fig. 2 is a side elevational view of the same disconnect stick, with the sections fully extended;

Fig. 3 is a transverse sectional view, taken on a plane passing through the axis of the stick and through the axes of the latches, showing the details of construction of the invention;

Fig. 4 is a transverse sectional view, taken on the plane of the line 4—4 of Fig. 3;

Fig. 5 is a fragmentary sectional view, taken on the same plane as Fig. 3, with the interlocking sleeves of two sections shown in elevation;

Fig. 6 is a transverse sectional view, taken on the plane of the line 6—6 of Fig. 5, looking in the direction of the arrows;

Fig. 7 is a fragmentary elevational view in partial section, showing an alternative form of head for the stick;

Fig. 8 is an elevational view similar to Fig. 7, showing a similar stick provided with a universal head for attachment to various different types of tools and at various angles;

Fig. 9 is a view similar to Fig. 1 of a modification comprising a multiplicity of extensible sections in a stick of the class adapted to be used for measuring the length of conductors;

Fig. 10 is a fragmentary longitudinal sectional view of another form of latching mechanism adapted to be used in the embodiments of Fig. 1 or Fig. 8;

Fig. 11 is a transverse sectional view, taken on the plane of the line 11—11 of Fig. 10, looking in the direction of the arrows;

Fig. 12 is a sectional view taken on the line 12—12 of Fig. 10, looking in the direction of the arrows;

Fig. 13 is a fragmentary elevational view of one of the joints of the type utilized in the insulating sticks of Fig. 9 which are also illustrated in section in Fig. 10.

Referring to Figs. 1 to 3, 20 indicates in its entirety the tool shown in this embodiment of the invention, comprising a disconnect stick. This disconnect stick includes the three sections 21, 22, and 23; but it should be understood that any number of sections of similar construction may be included, and the length is limited only by the strength of the materials used, and the size of the largest section, which is preferably of suitable size to be used as a handle.

The disconnect stick is shown in extended position in Fig. 2, and collapsed or partially collapsed in Fig. 1.

The sections 21—23 are all preferably made

of insulating material, there being no metal except the metal fitting at the end, and the metal springs used in the latches of this embodiment.

The tubing is preferably a canvas base, laminated plastic tubing, having a low rate of moisture absorption and a high mechanical strength. In some embodiments of the invention the tubing may comprise tubes of indurated fiber.

The section 23 preferably comprises an insulating tube 24 of suitable length to form one section of the stick, and at its lower end this tube is preferably provided with an insulating closure 25, such as a wooden plug, having a reduced cylindrical portion 26 fitting in the tube, and having an annular shoulder 27 fitting against the end of the tube.

The plug 25 may have its external surface 28 of partially spherical form, and it may have a tight frictional fit in the end of the tube 24, and may be secured in addition by means of an insulating pin 29 driven into an aperture in the plug and apertures in the walls of the tube 24.

The hole 30 in the tube 24 is for the admission or egress of air during the extension or collapse of the sectional stick. The break 31 in the tube indicates that the tube is of greater length than that shown in the drawings (Fig. 3) and the length of one section is determined by the convenient length for the collapsed stick, which should preferably be such that the stick can be carried behind the seat of a small business coupe or in the trunk of an automobile.

At its opposite end, that is, the left end of the tube 24 in Fig. 3, this tube is provided with an interlocking sleeve 32, which may consist of a short length of tube of the same material, having its left end cut off squarely and its right end formed with two squarely cut portions 33, 34, separated by two axially extending shoulders 35.

This is best illustrated in Fig. 5, where the interlocking sleeve 32 is seen in partial elevation. The interlocking sleeve 32 is fixedly secured to the tube 24 by means of a plurality of transverse pins 36, which have a tight frictional fit in a suitable aperture 37 in the tube 24 and sleeve 32.

In addition, the sleeve 32 may have a tight frictional fit inside the tube 24, where it is secured with the ends of the sleeve and tube flush at the right end of the sleeve 32. The next section 22 preferably comprises another insulating tube 38 of the same material and of such a size that it has a sliding movement inside the sleeve 32.

The tube 38 is provided on its right end, that is, the end which is located in the section 23, with an interlocking sleeve 39, shown in partial elevation in Fig. 5.

Interlocking sleeve 39 comprises an insulating sleeve, which may be of the same material as the tubes 24, 38, 32, and it is secured on the right end of the tube 38 (Fig. 3) with which it has a tight frictional fit.

The right end of this interlocking sleeve 39 may again be cut off squarely, but its left end is provided with two squarely cut portions, indicated at 40, 41, separated by two axially extending shoulders 42.

The offset between the surfaces 40 and 41 is the same as that between the surfaces 33 and 34 of the interlocking sleeve 32. The sleeve 39 may be further fixedly secured to the tube 38 by means of a plurality of transversely extending insulating pins 43, which pass through aper-

tures in the tube 38, sleeve 39, and in a cylindrical wooden plug 44. All of these parts preferably have a tight frictional fit with each other.

It will be apparent that when the tube 38 has a proper rotational position with respect to the tube 24, the sleeves 32 and 39 may be brought into interlocking relation with each other so that the axial shoulders 35 engage the axial shoulders 42 and rotation is prevented between these tubes 38 and 24.

The wooden plug 44 in the section 22 is preferably of sufficient length to extend from the right end of the interlocking sleeve 39 beyond the interlocking sleeve 32 of the section 23 so that it may also provide a support for a latching member 45, shown in Fig. 3 as a spring pressed plunger.

At a point just beyond the end of the tube 24 of the first section 23, when the second section 22 is fully extended and the interlocking shoulders 35 and 42 are engaging each other, the tube 38 and plug 44 are provided with a through bore 46. Wherever transverse pins, frictionally secured in apertures, are described, pins, rivets or screws may be employed.

This through bore may be lined with a transversely extending tube 47 of the same insulating material as the tubes 24 and 38, and tube 47 comprises a guide for the plungers 45, 48.

These plungers or latching members may be identical in construction, and each preferably comprises a substantially cylindrical insulating member 45, 48 of fiber, "Bakelite," or wood, having a sliding fit in the tube 47. One corner of each of these latches or dogs 45, 48 is preferably beveled as at 49 sufficiently so that the beveled camming surface 49 will engage the inside of the interlocking sleeve 32 and cam the plungers inwardly when the plungers are disposed in the tube 24 beyond the sleeve 32.

In order to limit the outward movement of the dogs 45, 48, they are preferably provided with through bores 50 extending at right angles to the axis and located near the inner end for receiving the cylindrical insulating pin 51, which has a tight frictional fit in the bore 50.

The pin 51 is of sufficient length to extend into the slot 52 in one or both sides of the tube 47, in which the pin is slidably mounted for movement with the plunger. The pins 51 prevent rotation of the plungers, and they are so located that the beveled surface 49 is located just outside the tube 38.

The two plungers 45, 48 may be outwardly pressed by means of a helical coil spring 53 located in the tube 47. This is the only part of the latching assembly which is made of metal. The compression spring 53 may be made of any suitable material, such as spring wire, brass, or bronze, or steel. At its opposite end, that is, the left end in Fig. 3, the section 22 is similar in construction to the same end of the section 23, previously described.

The other section 22 has an interlocking sleeve 32 fixed in the tube 38 to engage the interlocking sleeve 39 carried by the tube 54 of section 21.

Section 21 has its right end of a construction which is exactly similar to the right end of the section 22, except that the tube 54 is of smaller proportions, and so are the interlocking sleeves 32 and 39, so that tube 54 slides inside the interlocking sleeve 32 of tube 38. In the same way the tubular guide 47 for the latching dogs 45, 48 of section 21 is shorter, and the spring may be shorter, and each succeeding section has its

parts smaller, so that it may slide in the next bigger section.

As previously stated, any number of sections may be employed. The endmost section 21 may have the open end of its tube 54 closed by an insulating plug 55 of wood or other suitable insulating material, such as fiber, or a molded phenolic condensation compound, such as "Bakelite."

This insulating plug has a cylindrical portion 56, which fits inside the tube 54, and has an annular shoulder engaging the end of the tube. The outer end 58 of the plug 55 may be partially spherical, and the plug has a frictional fit in the tube 54. It is, however, preferably secured in place by means of the disconnect pin 59, which passes through the through bores 60 in the tube 54 and plug 55. The disconnect pin 59 comprises a substantially cylindrical pin, provided with a cylindrical head 61 carried by the cylindrical shank 62. The pin is preferably canvas base phenolic material.

The head 61 may be chamfered at 63, giving it a tapered outermost portion, which is more easily inserted into an aperture of a cover or a disconnect. The shank 62 is secured in the bore 60 by means of a transverse pin 64, which may be of insulating fiber or metal, and the transverse pin 64 has a tight frictional fit in the disconnect pin 59, in the wooden plug 55 and the tube 54.

Referring to Fig. 7, this is a fragmentary elevational view in partial section of another form of head for the end of the tool. In this case the end assembly comprises a metal member 65, having a cylindrical portion 66 fitting in the end of the tube 54, and having an annular shoulder 67 engaging the end.

The cylindrical portion 66 is secured in place by a transverse headless rivet 68, which passes through the cylindrical portion 66 and tube 54. The fitting 65 has a cylindrical shank 69 provided with a conically pointed end portion 70.

The cylindrical shank 70 has a transversely extending arm 71 at right angles to the shank 69, and preferably of smaller size, and the arm 71 may be tapered toward its outer end portion, where it is provided with a circular head 72. The circular head has an abrupt shoulder 73 on its inner side, and it is tapered around it at 74, near its outer face 75.

The tapered or rounded surface 74 is adapted to facilitate the entry of the head 72 into a hole in a cover or disconnect. The abrupt shoulder 73 is adapted to retain the arm 71 in such a hole.

The axially extending shank 69 in combination with the transverse arm 71 is useful in pushing members connected with a transmission line, and the tapered or conical point 70 serves to permit the shank 69 to be inserted in apertures more readily.

In addition to the tight frictional fit between the closure plugs, rivet pins, interlocking sleeves, and tubes, these members may be cemented in place wherever they are supposed to be fixedly secured to another member.

It should be understood that wherever a tight frictional fit is specified for fixed securement, cement may also be employed, and the cement is preferably of an insulating character.

Referring to Fig. 8, this is a view similar to Fig. 7, showing a universal head for use on the insulating stick of Fig. 1 or Fig. 9. This universal head is of the type having a securing

shank 66 of cylindrical shape adapted to fit in a tube 54, and with an annular shoulder 67 so that it is secured to the stick in the same manner as shown in Fig. 7.

The universal head has a substantially circular flange 76 carried by the shank 66, and having a centrally located threaded through aperture 77 for receiving the wing nut 78. The face 79 of the universal head 80 toward the head of the bolt 78 is provided with a plurality of regularly spaced lugs 81 arranged in a circle and separated by slots of the same width as the lugs 81. Thus this universal head is adapted to be attached to any of a multiplicity of tools, with the tool at various angles, the tool having a circular flange similar to the flange 76, except that it has a slot instead of an aperture 77.

The wing nut 78 and lugs 81 serve to secure the tool in any of a plurality of angular positions.

Among the tools which may be used on the end of a stick provided with such a universal head are clamp stick heads, wrenches, wire tong heads, tie stick heads, fork heads, ratchet wrench heads, cotter key remover and replacer, cotter key puller, locating pins, chuck blanks, fuse pullers, screw drivers, insulation knife, paint brushes, insulator brushes, folding rules, bolt headers, ball socket adjusters, mirrors, hack saws, pruning saws, etc.

Referring to Fig. 9, this is an elevational view similar to Fig. 1 of a measuring stick of similar construction, having its sections made of a plurality of telescoping tubes, according to the construction shown in Fig. 3 or 10. For example, such a measuring stick, including nine sections, each of which extends to about three feet, makes a 27 ft. insulating rod for measuring conductor heights. The sections can be provided with foot and inch markings, printed or painted on the sections, but the tubes are preferably not weakened by any marking grooves, since that would have an undesirable weakening effect on the stick when extended.

Such a measuring stick will readily indicate the length by the extension of a predetermined number of its sections and the distance between the end of a multiplicity of extended sections and the conductor to be measured, can readily be determined by the use of a rule, and added to the extended length of the stick.

Referring to Fig. 10, this is a sectional view, showing another form of latching mechanism for extensible sticks of the type shown in Fig. 1 or Fig. 9.

In this case the same latching mechanism may be used at the joints between all of the various sections. The ends of the endmost sections may be closed by means of an insulating plug similar to that shown at 25 in Fig. 3.

The sections are made of insulating tubes of the same material, previously described, and each successive section is made of tubes of the next smaller size, adapted to slide or telescope into the preceding section.

As all of the joints and latching mechanisms are similar, only one need be described in detail. In Fig. 10, 82 indicates the end of the larger of two sections, and 83 indicates the adjacent end of the smaller of two sections.

The insulating tube 83 is closed by means of an insulating cylindrical wooden plug 84, having a tight frictional fit in the end of the tube 83, and also secured by means of a transverse insulating

pin 85. Both the pin 85 and plug 84 may be cemented in place.

At a point spaced from the end of the tube 83, the plug 84 is provided with a transverse cylindrical bore 86, and the tube 83 is provided with a smaller counterbore 87. The counter-bore 87 is adapted to receive the cylindrical body 88 of a latching button 89. A circular head 90 on the latching button 89 is received in the bore 86, and the head limits the outward movement of the button.

A helical compression spring 91 is located in the bore 86 and engages the heads 91 of two of the buttons 89, to urge them outward. Each button 89 preferably has the end of its body 88 provided with a rounded, tapered, or partially spherical surface 92, to aid in bringing about the retraction of the button by camming action.

The larger tube 82 is provided on its end, surrounding the tube 83, with a cylindrical ferrule 93 of the same insulating material, having a tight frictional fit about the tube 82 and secured in place by cement and by means of a plurality of through pins 94 of insulating material.

The ferrule 93 has a radially inwardly extending annular flange 95, which is provided with a circular aperture 96 for slidably receiving the tube 83.

The flange 95 is spaced from the end surface 97 of the tube 82 sufficiently to provide space for the latching button 89 and pin 89.

At two diametrically opposite points the insulating tube 82 is provided with the tapered slots 98, adapted to engage the rounded end 92 of the latching button 89 and to cam the button inward when the buttons are in registry with the slots 98 and the two sections are pushed toward each other in such manner as to telescope the section 83 into section 82.

In some embodiments of the invention the space between the end 97 and flange 95 may be an annular groove so that the sections are not secured against rotation relative to each other, but are secured against collapse when each latching button 89 is rotated away from its release chute 98.

In other embodiments of the invention the inner tube 82 may have axially extending shoulders in the annular groove which receives the latching button 89, the annular shoulders engaging the button to prevent relative rotation between the sections. In such case the sections can be used to exert a torsion or a twist on a tool, as well as a pull or push.

The latching mechanisms of Fig. 10 may be used in the telescoping stick of Figs. 1 to 3 or that of Fig. 9.

It will thus be observed that I have invented a telescoping tool for use on live transmission lines, which is adapted to be collapsed to a minimum length or extended to provide an insulating pole for tools of various types. All of the exposed parts of the telescoping stick or pole are made of insulating material, and the stick is adapted to have a high insulating value. It has a high mechanical strength and may be used with various types of tools for transmitting torsion, push, or pull, or combinations of these forces upon the tool and the devices on which the tool works.

I have found that the mechanical strength of the stick is high enough to use on hot wire clamps of all kinds and on various types of tools customarily employed on the end of a wooden or other insulating stick.

While I have illustrated a preferred embodi-

ment of my invention, many modifications may be made without departing from the spirit of the invention, and I do not wish to be limited to the precise details of construction set forth, but desire to avail myself of all changes within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a telescoping tool for high tension lines, the combination of a pair of telescoping sections, each of said sections comprising insulating tube, and one section sliding within the other, the larger of said sections being provided on its inside, adjacent the joint between said sections, with an interlocking sleeve fixedly secured to said larger section, and adapted to slidably receive the smaller of said sections, and a similar interlocking sleeve carried by the smaller section and fixedly secured to the smaller section inside the larger section to determine the extended position of said sections.

2. In a telescoping tool for high tension lines, the combination of a pair of telescoping sections, each of said sections comprising insulating tube, and one section sliding within the other, the larger of said sections being provided on its inside, adjacent the joint between said sections, with an interlocking sleeve fixedly secured to said larger section, and adapted to slidably receive the smaller of said sections, and a similar interlocking sleeve carried by the smaller section and fixedly secured to the smaller section inside the larger section to determine the extended position of said sections, said interlocking sleeves being secured to the tubular sections by means of transverse securing means located in apertures in the sleeves and tubes.

3. In a telescoping tool for high tension lines, the combination of a pair of telescoping sections, each of said sections comprising insulating tube, and one section sliding within the other, the larger of said sections being provided on its inside, adjacent the joint between said sections, with an interlocking sleeve fixedly secured to said larger section, and adapted to slidably receive the smaller of said sections, and a similar interlocking sleeve carried by the smaller section and fixedly secured to the smaller section inside the larger section to determine the extended position of said sections, said interlocking sleeves being provided with axially extending shoulders engaging each other and preventing the relative rotation between the sections in one direction.

4. In a telescoping tool for high tension lines, the combination of a pair of telescoping sections, each of said sections comprising insulating tube, and one section sliding within the other, the larger of said sections being provided on its inside, adjacent the joint between said sections, with an interlocking sleeve fixedly secured to said larger section, and adapted to slidably receive the smaller of said sections, and a similar interlocking sleeve carried by the smaller section and fixedly secured to the smaller section inside the larger section to determine the extended position of said sections, said interlocking sleeves being provided with axially extending portions and recesses fitting within each other whereby relative rotation between the sections is prevented in either direction.

5. In a telescoping tool for high tension lines, the combination of a pair of telescoping sections, each of said sections comprising insulating tube, and one section sliding within the other, the

larger of said sections being provided on its inside, adjacent the joint between said sections, with an interlocking sleeve fixedly secured to said larger section, and adapted to slidably receive the smaller of said sections, and a similar interlocking sleeve carried by the smaller section and fixedly secured to the smaller section inside the larger section to determine the extended position of said sections, said smaller section having a radially projecting latching member located to engage the end of the larger section when said sections are extended.

6. In a telescoping tool for high tension lines, the combination of a pair of telescoping sections, each of said sections comprising insulating tube, and one section sliding within the other, the larger of said sections being provided on its inside, adjacent the joint between said sections, with an interlocking sleeve fixedly secured to said larger section, and adapted to slidably receive the smaller of said sections, and a similar interlocking sleeve carried by the smaller section and fixedly secured to the smaller section inside the larger section to determine the extended position of said sections, said smaller section having a radially projecting latching member located to engage the end of the larger section when said sections are extended, and resilient means urging said latching member into latching position.

7. In a telescoping tool for high tension lines, the combination of a pair of telescoping sections, each of said sections comprising insulating tube, and one section sliding within the other, the larger of said sections being provided on its inside, adjacent the joint between said sections, with an interlocking sleeve fixedly secured to said larger section, and adapted to slidably receive the smaller of said sections, and a similar interlocking sleeve carried by the smaller section and fixedly secured to the smaller section inside the larger section to determine the extended position of said sections, said smaller section having a radially projecting latching member located to engage the end of the larger section when said sections are extended, said latching member being slidably mounted in a transverse tubular guide.

8. In a telescoping tool for high tension lines, the combination of a pair of telescoping sections, each of said sections comprising insulating tube, and one section sliding within the other, the larger of said sections being provided on its inside, adjacent the joint between said sections, with an interlocking sleeve fixedly secured to said larger section, and adapted to slidably receive the smaller of said sections, and a similar interlocking sleeve carried by the smaller section and fixedly secured to the smaller section inside the larger section to determine the extended position of said sections, said smaller section having a radially projecting latching member located to engage the end of the larger section when said

sections are extended, said latching member being slidably mounted in a transverse tubular guide, and said latching member having a transversely extending pin for limiting its outward movement.

9. In a telescoping tool for high tension lines, the combination of a pair of telescoping sections, each of said sections comprising insulating tube, and one section sliding within the other, the larger of said sections being provided on its inside, adjacent the joint between said sections, with an interlocking sleeve fixedly secured to said larger section, and adapted to slidably receive the smaller of said sections, and a similar interlocking sleeve carried by the smaller section and fixedly secured to the smaller section inside the larger section to determine the extended position of said sections, said smaller section having a radially projecting latching member located to engage the end of the larger section when said sections are extended, said latching member being slidably mounted in a transverse tubular guide, and said latching member having a transversely extending pin for limiting its outward movement, said guide having a slot for receiving said pin to prevent rotation of said latching member.

10. In a telescoping insulating stick for manipulation of energized equipment, the combination of a plurality of tubular sections of electrical insulating material, said sections being of successively smaller size and said sections being slidably mounted with respect to each other in a series, with latching means of insulating material operating between said sections for securing said sections in extended position, and insulating means carried by the sections for preventing relative rotation between the successive sections, and an electrical tool carried by one of the insulating stick and adapted to be actuated in a rotary or longitudinal direction by said stick.

11. In a telescoping insulating stick of manipulation of energized equipment by means of the application of rotation or a push or pull, the combination of a plurality of tubular sections of electrical insulating material, said sections being of successively smaller size, and said sections being slidably mounted with respect to each other in a series, means for closing the endmost sections of said stick including an electrical tool carried by an end of the insulating stick and adapted to be actuated in a rotary or longitudinal direction by said stick, and insulating means carried by said sections and located at the ends of the sections where relative sliding movement occurs, comprising an insulating member located inside the end portion of the section and adapted to engage a part carried by the end of the larger section to prevent relative longitudinal and rotative movement between the sections.

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