Sept. 1, 1931. C. G. KOPPITZ 1,821,167

STRAIN TYPE DISCONNECTING SWITCH

Filed Jan. 13, 1926 2 Sheets-Sheet 1

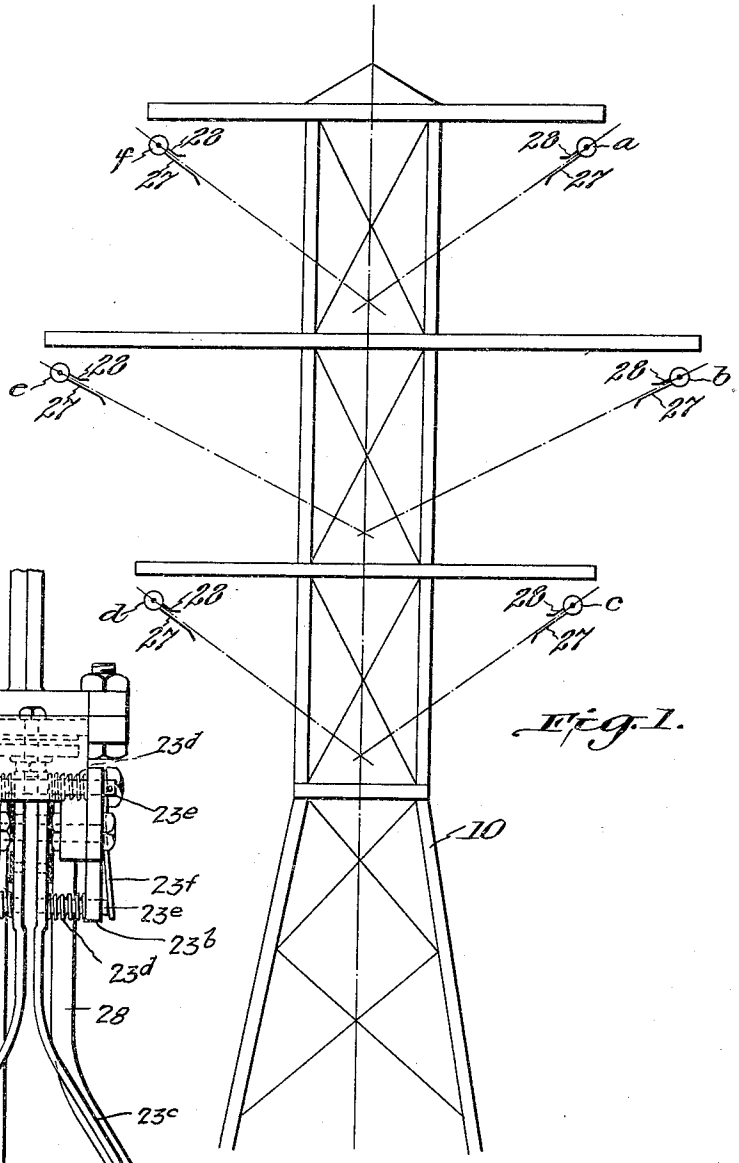
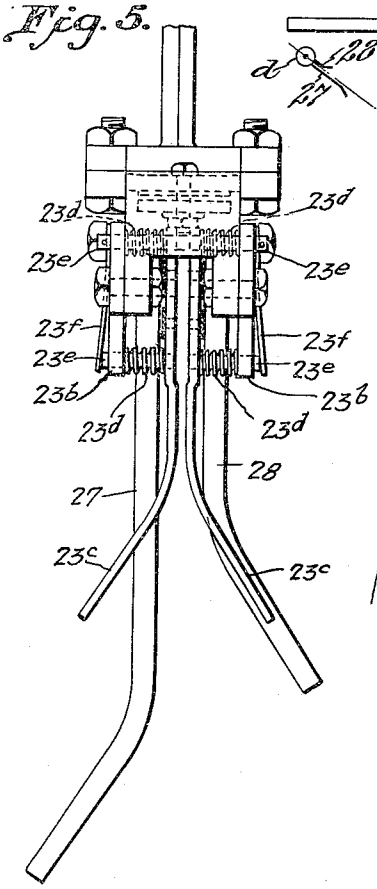



Fig. 1.

Fig. 5.

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STRAIN TYPE DISCONNECTING SWITCH

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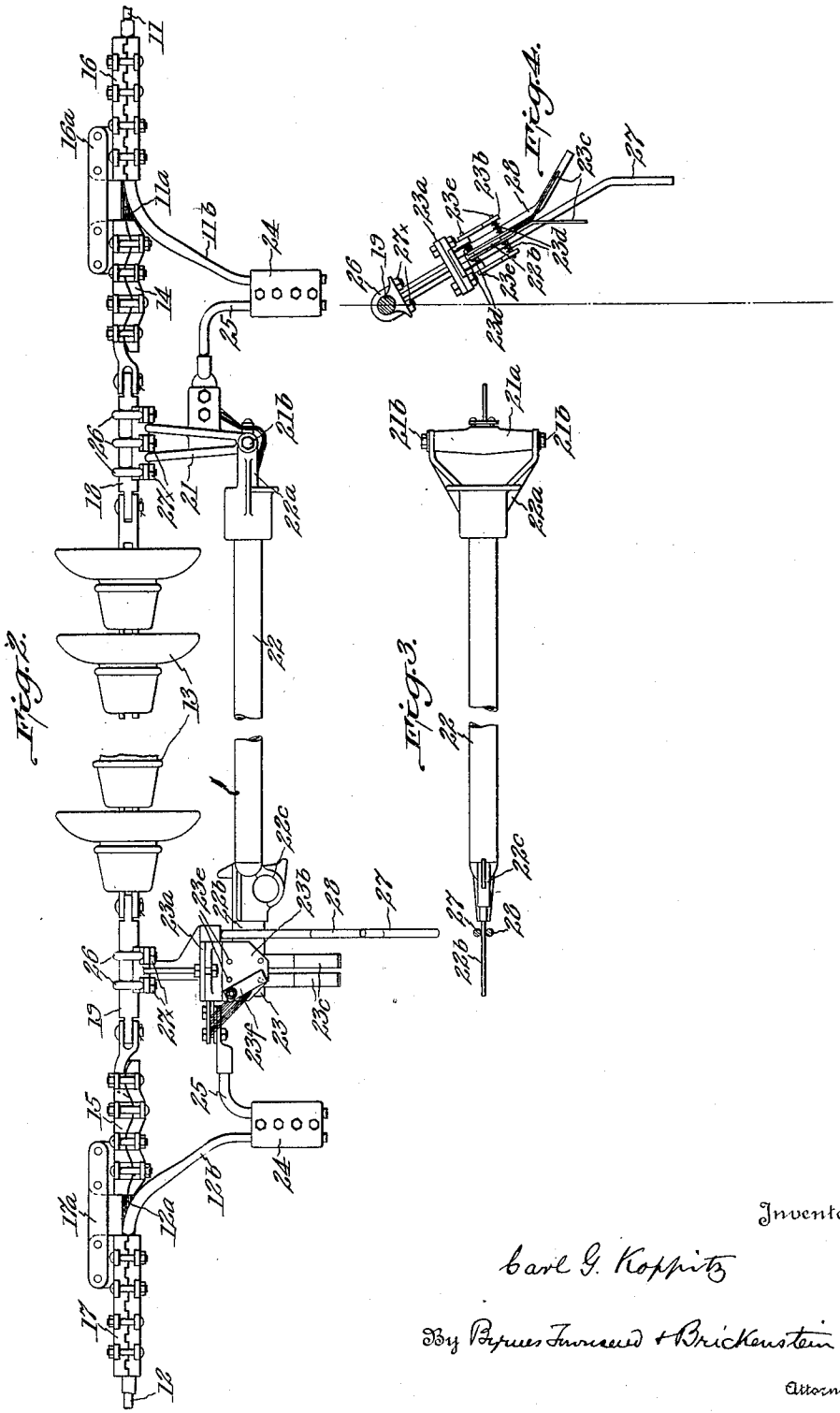

Fig. 2.

Fig. 4.

Fig. 3.

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# UNITED STATES PATENT OFFICE

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## STRAIN-TYPE DISCONNECTING SWITCH

Application filed January 13, 1926. Serial No. 81,117.

This invention relates to high-tension disconnecting switch mechanism of the type suspended directly from the line. Switches of this type are usually inserted directly into the line wires of a transmission system and placed near supporting insulators and have the purpose to open the line conductors at the particular points for isolating sections of the system in case of trouble or repair.

The object of the invention is an improvement upon switch mechanism of the type mentioned to facilitate adjustment of the position of the mechanism relative to the line wires.

For a full understanding of the invention and the points of novelty thereof reference is made to the accompanying drawings in which

Fig. 1 is a diagrammatic representation of a part of a transmission line to which the invention is applied;

Fig. 2 is a side view of a switch mechanism according to the invention; and

Fig. 3 a detail view of a switch blade; and

Fig. 4 is a sectional view of jaw mechanism for receiving the blade, and

Fig. 5 is a detail view of the contact jaw structure.

Having reference to Figs. 2–4, 11 and 12 indicate the sections of a line that may be interconnected or disconnected from each other by a switch. In the particular illustration the line is assumed to consist of a steel core surrounded by an envelope of aluminum. The connections to the switch are made by slitting the aluminum envelope and prying it away from the core ends 11*a* and 12*a*, respectively, and then connecting the aluminum ends 11*b* and 12*b* to the switch terminals while the core ends are interconnected by a string of strain insulators 13. The connection between the core ends includes clamps 14 and 15 between which the core ends are firmly clamped, clamps 16 and 17 just outwardly of the clamps 14 and 15 clamping the line ends around the aluminum envelope, links 16*a* and 17*a* rigidly interconnecting clamps 14 and 16 and clamps 15 and 17 respectively, and short round bars 18 and 19 connected between clamps 14 and 15 and the string of insulators 13 respectively.

To one of the bars, bar 18 in the illustration, is clamped the hinge casting 21 on which is pivotally supported the switch arm 22 while upon bar 19 is secured the jaw mechanism generally indicated by the numeral 23.

The arm 22 carries at one end a hinge element 22*a* pivotally mounted upon a hinge pin 21*a* of the hinge casting 21, cap nuts 21*b* being preferably used to screw upon the outer ends of the pin 21*a* to secure the hinge element 22*a* in position. At the opposite end switch arm 22 carries a knife blade 22*b* for engagement with spring jaws and an eye 22*c* for engagement by a hook stick for operating the switch arm in well known manner.

The jaw mechanism includes a supporting frame 23*a* connected to the round bar 19, parallel plates 23*b* secured upon the frame 23*a* and contact fingers 23*c* acted upon by coil springs 23*d*. The fingers 23*c* carry pins 23*e* passing through the coil springs 23*d* and openings in the plates 23*b* and are thus free to move toward and away from each other and at the same time remain in alignment with each other. The fingers 23*c* are formed to define inner portions for contacting with the blade 22*b*, outwardly flaring portions facilitating the entrance of the blade and portions pressed inwardly toward each other to afford retaining shoulders against movement of the blade 22*b* out of contact position, as indicated in Fig. 4. Thus, when the switch arm 22 is moved to close the switch, the blade 22*b* enters the mouth defined by the flaring ends of the fingers 23*c* opening the jaws against the tension of springs 23*d* and after it has reached its final position, the front portions of the fingers close upon each other. The retaining shoulders under the action of springs 23*d* effectively hold the blade in contact position against all usual forces tending to dislodge it. The arrangement is such that a considerably steady pull is required to pull out the

blade whereas a relatively easy jerk by means of the long operating hook stick effects a quick release. The action of the spiral springs 23*d* may be augmented by external leaf springs 23*f* provided with dished ends to fit over the ends of the two studs 23*e* nearer the mouth of the contact fingers, only one of the springs 23*f* being shown in Fig. 2. By means of such auxiliary springs the force for retaining the blade 22*b* in position may be increased to any desired extent. In practice a steady pull of about 100–200 lbs. is required to disconnect the blade from the jaws. The springs 23*f* are mounted upon the parallel plates 23*b*.

Connection between the ends 11*b* and 12*b* of the aluminum sheathing and the hinge casting 21 and jaw mechanism 23, respectively, may be made by means of clamps 24 having parallel grooves for receiving the said ends and connecting leads 25, as indicated.

The hinge casting 21 and the jaw mechanism 23 are attached to the round bars 18 and 19, respectively, by means of U-shaped bolts 26 embracing the bars. By this arrangement the hinge casting and the jaw mechanism may be adjusted lengthwise of the rods 18 and 19 and, above all, may be angularly adjusted to assume any desired position relatively to the horizontal. The practical significance of the latter adjustment is that the plane of movement of the switch arm 22 may be adjusted to suit particular requirements.

As has been schematically indicated in Fig. 1, in which 10 represents a line tower or mast carrying transmission wires, *a*, *b*, *c*, *d*, *e* and *f*, it is sometimes desirable to operate switch arms in planes such as indicated by the dotted lines. By means of the round bars 18 and 19 and the angular adjustment of the hinge casting 21 and jaw mechanism 23 about these rods the planes of movement of the switch arms may be accurately adjusted to afford the most expeditious operation of the switches.

Inasmuch as the mode of suspension of the switches involves susceptibility of the parts to torsional movement, I provide special means for facilitating the closing of the switch arms. I prefer the use of guide horns 27 and 28 flaring in opposite directions. The lower horns 27 are considerably longer than the upper horns 28, as indicated in Figs. 1 and 4.

While the switch is closed and all parts thereof are close to the line and the string of insulators 13 as indicated in Fig. 2, the torsional movement is relatively small. However, when the arm 22 is in open position, its lever action is considerable causing it to assume a practically vertical position. When the operator intends to close the switch he pulls the arm 22 toward him preparatory to upward movement in the intended inclined plane toward the mouth of the contact fingers 23*d*. However, the operation with the long operating stick and the unstable position of the arm make the closing operation uncertain. By the provision of the guide horns 27 and 28, it is merely necessary for the operator to push the arm 22 in the general direction of the jaw mechanism, but preferably aiming a little higher so that the knife blade 22*b* strikes the upper surface of the longer lower horn 27 and then the blade 22*b* may enter between the contact fingers 23*d* before a torsional movement of the jaw mechanism can defeat the purpose.

The construction of the jaw mechanism is an essential part of the particular switch mechanism inasmuch as it is self-aligning and readily adapts itself to the conditions of operation of the switch arm and the loose coupling between the hinge connection and the jaw mechanism. The contact fingers are freely movable toward and away from each other in the sense that each end may yield independently of the other end.

The arrangement described has considerable advantages inasmuch as the use of a standard suspension unit involves a lower first cost and less liability to breakage than a rigid post construction. Also in case of failure of any one unit of a string it can be cheaply replaced by stock of the same insulators as used on the line.

I claim:

1. The combination with a string of strain insulators for mechanically interconnecting two sections of a high-tension line, of a switch including an arm, a hinge support therefor and jaws and means for supporting the hinge support and the jaws on opposite ends of the string of insulators, said means including means for angularly adjusting the position of the hinge support and the jaws about the string of insulators as axis.

2. The combination with the ends of two sections of a high-tension line, of a switch including an arm, a hinge support therefor, means for connecting the hinge support to one of said ends including means for angularly adjusting its position about the said end as axis, jaws and means for connecting the same to the other of said ends including means for angularly adjusting the position of the jaws about the said end as axis and insulating means for mechanically interconnecting the two ends.

3. Construction according to claim 1 including means for adjusting the position of the hinge support and the jaws toward and away from each other in the direction of length of the string of insulators.

4. The combination with the ends of two sections of a high-tension line and insulating means for mechanically interconnecting the said ends, of a switch including a switch

arm, a hinge support therefor connected to one of said ends, jaws connected to the other of said ends, and means for angularly adjusting the position of the hinge support and the jaws about the said ends and the insulating connecting means as axis, the jaws comprising contact fingers freely movable toward and away from each other and spring means for pressing the fingers toward each other.

5. The combination with the ends of two sections of a high-tension line and insulating means for mechanically interconnecting the said ends, of a switch including a switch arm, a hinge support therefor connected to one of said ends, jaws connected to the other of said ends, means for angularly adjusting the position of the hinge support and the jaws about the said ends and the insulating means as an axis, the jaws comprising contact fingers freely movable toward and away from each other, spring means for pressing the fingers toward each other, stationary parallel plates, studs extending from the rear surfaces of said contact fingers outwardly through said plates, the spring means including coil springs surrounding said studs and bearing against said plates and leaf springs bearing against the projecting end of one of the studs.

In testimony whereof, I affix my signature.

CARL G. KOPPITZ.