April 13, 1965 B. H. NORWOOD 3,178,508

POWER CONDUCTOR CLAMPING AND INSULATING MECHANISM

Filed April 3, 1963

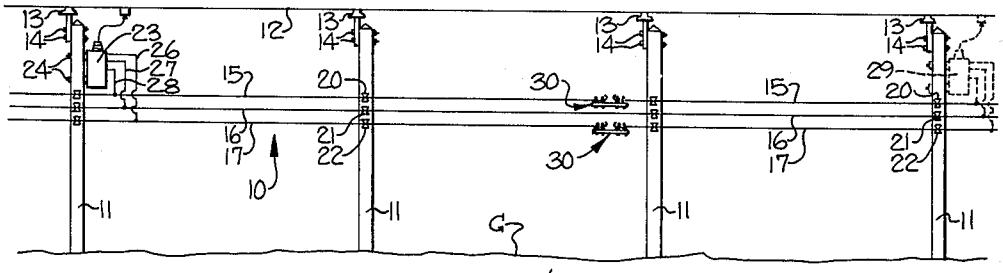


Fig-1

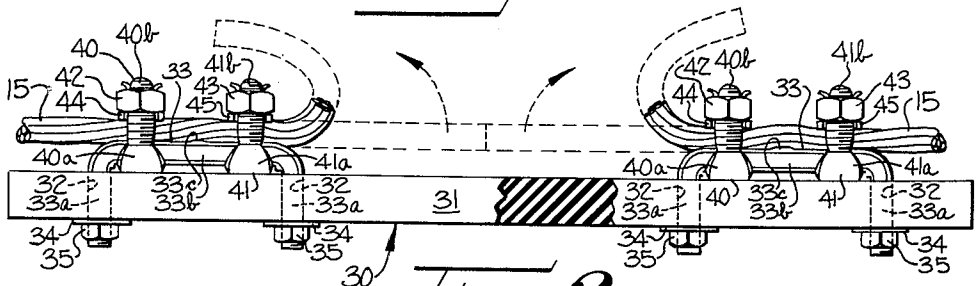


Fig-2

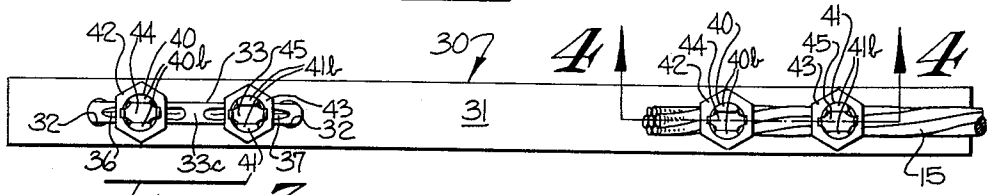


Fig-3

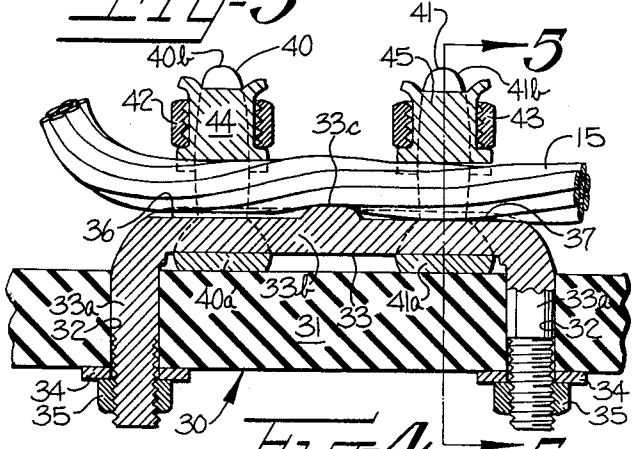


Fig-4

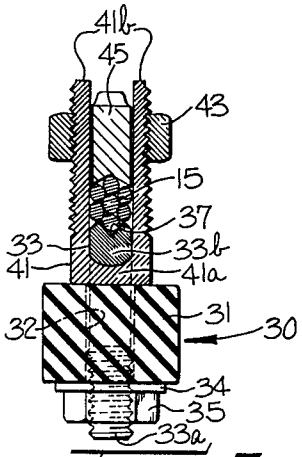


Fig-5

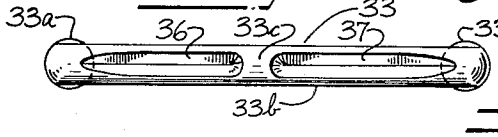


Fig-6

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POWER CONDUCTOR CLAMPING AND INSULATING MECHANISM

Bobby H. Norwood, Mount Holly, N.C., assignor of twenty-five percent to J. C. Little, Mount Holly, N.C.

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The present invention relates to a clamping mechanism, and more particularly to a clamping and insulating mechanism for clamping spaced portions of a tensioned power conductor to permit the power conductor to be severed between the spaced portions and to maintain the tension in the power conductor while insulating the two severed end portions of the conductor from each other.

In electrical systems and the like which include power conductors, it is frequently necessary to break or sever the power conductors to isolate two portions of the power conductors from each other. A typical example of when this procedure would be necessary would be a distribution circuit having transformers connected therein in which it is desired to connect another transformer to reduce the load upon the existing transformer or transformers. In such an instance, the power conductors of the distribution circuit would be severed at a point between the existing transformer and the point at which the new transformer is to be connected. The remaining portions of the severed power conductors would then be isolated or insulated from each other.

Conventionally, this breaking of a conductor and isolation of the remaining portions thereof is accomplished by mounting auxiliary insulator spools on opposite sides of a pole at the point where the conductors are to be severed, connecting a pair of block and tackle mechanisms to the conductor to be severed on opposite sides of the pole and to the pole or to the auxiliary spools mounted thereon, utilizing the block and tackle mechanisms for exerting tension on the conductor toward the pole to provide slack therein in the portion to be severed, severing the conductor adjacent the central portion of the slackened portion, winding the free ends thereof around the auxiliary insulator spools and clamping the same around the spools by suitable clamping means. In the event that the conductor does not have sufficient slack therein to permit the winding of the free end portion around the spools, the conductor is severed closer to one block and tackle mechanism than to the other with the longer free end portion being wound around an auxiliary insulator spool and the other end portion being spliced and then being wound around the auxiliary insulator spool. The block and tackle mechanism are then released from the conductor and the process is repeated for the other conductor in the distribution system to be broken or severed.

It can readily be appreciated that this conventional manner of isolating two portions of the conductor requires a considerable amount of time and is therefore quite expensive. In this regard, it usually requires a team of four experienced linemen, two of which must be on the pole and the other two must be on the ground to operate the block and tackle mechanisms, and takes the experienced linemen approximately one-half to three-quarters of an hour to mount the auxiliary insulator spools

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on the pole, sever two power conductors and connect the end portions to the auxiliary insulator spools.

It is therefore an object of the present invention to provide a clamping and insulating mechanism for power conductors which is operable by a single lineman and wherein spaced portions of the conductor are quickly and easily clamped to permit the conductor to be severed between such spaced portions and to maintain the tensioned condition of the conductor while insulating the spaced portions from each other, which mechanism is of simple construction, inexpensive to manufacture and capable of substantially permanent and/or repeated use.

A more specific object of the present invention is to provide a clamping mechanism of the character described wherein the conductor is clamped and held against sliding movement relative to the clamping mechanism with a minimum amount of compressive force being exerted thereon.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds, when taken in connection with the accompanying drawings, in which—

FIGURE 1 is a fragmentary view of an electrical distribution system showing the clamping mechanism of the present invention in use;

FIGURE 2 is a side elevational view of the clamping mechanism of the present invention showing spaced portions of a conductor clamped therein and with a portion of the clamping mechanism shown in section;

FIGURE 3 is a top plan view of the mechanism shown in FIGURE 2;

FIGURE 4 is an enlarged fragmentary sectional view taken substantially along line 4—4 in FIGURE 3;

FIGURE 5 is a transverse sectional view taken substantially along line 5—5 in FIGURE 4; and

FIGURE 6 is a top plan view of the U-bolt shown in the left-hand portion of FIGURE 3.

Referring more particularly to the drawing, there is shown a portion of an electrical distribution system generally indicated at 10, which includes a plurality of upright poles 11 mounted in the ground G. A primary power cable 12 is supported by insulators 13 mounted on the upper ends of poles 11 by any suitable means such as bolts 14.

A secondary or distribution circuit for customer delivery of the power from primary power cable 12 or the like is also mounted on poles 11 and comprises three conductors or lines 15, 16 and 17. Conductors 15, 16 and 17 are supported by insulators 20, 21 and 22, respectively, which are mounted on poles 11 by any suitable means. Conductors 15 and 17 define the power lines of the circuit and conductor 16 defines the neutral line of the circuit. A transformer 23 is mounted on one of the poles 11 by any suitable means, such as bolts 24, and is connected by a cable 25 to power cable 12. Transformer 23 is also connected to conductors 15, 16 and 17 by lines 26, 27 and 28, respectively.

As stated previously, when it is necessary or desirable to connect another transformer in the distribution circuit formed by conductors 15, 16 and 17, such as transformer 29 indicated in dotted lines in FIGURE 1, it is necessary to isolate the portion of the circuit to be served by transformer 23 from the portion to be served by transformer

29. The conductors 15 and 17 are therefore severed between the transformers 23 and 29 and the severed portions are maintained under tension and insulated by the mechanism of the present invention which is generally indicated at 30.

Mechanism 30 includes an elongate insulating member 31, preferably formed of rigid, self-sustaining, insulating material, such as resin impregnated fiber glass or the like, capable of withstanding the elements for an indefinite period of time. Member 31 preferably has a planar upper surface and has first and second spaced pairs of spaced openings 32 therein which receive leg portions 33*a* of inverted U-shaped bolts 33. Leg portions 33*a* of U-bolts 33 are externally threaded and receive washers 34 and nuts 35 thereon for maintaining U-bolts 33 on insulating member 31.

Bight portions 33*b* of U-bolts 33 are elongate and extend longitudinally parallel to the longitudinal center line of insulating member 31. Also, bight portions 33*b* have flat sides for reasons to be presently described. Each bight portion 33*b* of the inverted U bolts 33 has a pair of spaced elongate grooves 36, 37 formed therein, which grooves extend from opposite ends of the bight portion toward the central portion thereof and terminate adjacent this central portion in spaced apart relation such that a raised portion 33*c* is defined thereby at the central portion of the bight portion 33*b*.

A pair of bifurcated, split or slotted bolts 40, 41 are provided for each of the inverted U-bolts 33 and include head portions 40*a*, 41*a* and spaced apart leg portions 40*b*, 41*b*. Head portions 40*a*, 41*a* preferably have flat end surfaces which are disposed in intimate engagement with the upper planar surface of elongate member 31. Also, the inside surfaces of leg portions 40*b*, 41*b* defining the slots through the bolts are flat to cooperate with the flat sides of bight portions 33*b* of U-bolts 33 to prevent bolts 40, 41 from rotating on bight portions 33*b*. The head portions 40*a*, 41*a* are disposed beneath bight portions 33*b* of U-bolts 33 and the leg portions 40*b*, 41*b* are disposed in straddling relation to the bight portions 33*b* and extend upwardly therefrom. U-bolts 33 therefore clamp the head portions 40*a*, 41*a* between the bight portions thereof and the elongate member 31 which cooperates with bight portions 33*b* to maintain the spaced relation of bolts 40, 41. It is noted that leg portions 40*b*, 41*b* are externally threaded for receipt of nuts 42, 43. Nuts 42, 43 carry upper clamping members 44, 45 which are mounted for vertical sliding movement on leg portions 40*b*, 41*b* by the nuts 42, 43.

It is noted that upper clamping members 44, 45 are held against rotation by leg portions 40*b*, 41*b*, but move upwardly and downwardly with nuts 42, 43 relative to the bight portions 33*b* of the inverted U-bolts 33. Also, the lower surfaces of the upper clamping members 44, 45 are suitably contoured to conform generally to the curved surface of a conductor with which the same is adapted to be engaged. It is further noted that U-bolts 33 and bolts 40, 41, nuts 42, 43 and upper clamping members 44, 45 define spaced clamping means and that bolts 40, 41 are positioned relative to the bight portions 33*b* of U-bolts 33 such that the upper clamping members 44, 45 overlie the grooves 36, 37 in bight portions 33*b* and cooperate with the portions of bight portions 33*b* having the grooves therein whereby each clamping means comprises cooperating pairs of clamping jaws for clamping spaced apart portions of a conductor such as conductors 15, 17 therebetween and means between the cooperating pairs of jaws for deforming the conductor laterally of the longitudinal center-line thereof.

U-bolts 33, bolts 40, 41, nuts 42, 43 and upper clamping members 44, 45 should be constructed of material capable of withstanding the elements without deterioration and also capable of clamping the various types of conductors presently in use without oxidation. While any suitable material having these characteristics may be employed without departing from the scope of the present invention, it has been determined that cadmium plated steel has the aforementioned desirable characteristics and therefore may be employed in the construction of the aforementioned elements.

In operation, when it is desired to utilize the device of the present invention to interrupt a conductor and insulate two portions thereof from each other, the protective coating, if any, is removed from the portion of the conductor to be clamped by mechanism 30. The nuts 42, 43 are then removed from bolts 40, 41 and the conductor is placed between the leg portions 40*b*, 41*b* of bolts 40, 41 longitudinally of and in engagement with bight portions 33*b* of inverted U-bolts 33. Nuts 42, 43 are then replaced on the leg portions 40*b*, 41*b* of bolts 40, 41 and are turned in the appropriate direction to move the upper clamping members 44, 45 downwardly into engagement with the conductor to clamp the same downwardly against the bight portions 33*b* of U-bolts 33.

It is noted that the spaced apart relationship of bolts 40, 41 causes the upper clamping members 44, 45 to engage spaced apart portions of the conductor and to move such spaced apart portions downwardly into the grooves 36, 37 in bight portions 33*b*. Therefore, the portions of the conductor between bolts 40 and 41 engages the upstanding portion 33*c* of bight portions 33*b* and are deformed laterally of the longitudinal center-line of the conductor to form a hump between each pair of bolts 40, 41. These humps aid in maintaining the bolts 40, 41 in spaced apart relation on U-bolts 33 and facilitate the clamping of the conductor thereby so that a minimum amount of compressive force need be exerted thereon to maintain the spaced, severed end portions of the conductor in the clamping mechanism. The likelihood of the conducting being damaged by the clamping mechanisms is therefore considerably reduced and, in fact, is very remote.

After the conductor has been suitably clamped between bolts 40, 41 and web portions 33*b*, the portion of the conductor between the spaced apart clamping means is removed by severing the conductor at a point substantially centrally of elongate member 31 as indicated in FIGURE 2. The end portions of the severed conductor are then turned upwardly to further aid in maintaining the conductor the clamping mechanism and the length of the end portions may be reduced if desired by cutting portions therefrom.

It is noted that the mechanism 30 will maintain the portions of the conductor in tensioned condition and isolated from each other substantially permanently, i.e., at least for the life of the conductor, without a reduction in effectiveness. Also, if for any reason, the conductors are removed from the poles and mechanism 30 is not required, mechanism 30 may be removed and re-used with another conductor.

It will therefore be apparent that a novel clamping and insulating mechanism is provided for a power conductor wherein the tensioned condition of the power conductor is maintained while severed portions of the conductor are isolated from each other.

In the drawing and specification there has been set forth a preferred embodiment of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the claims.

I claim:

1. Mechanism for clamping a tensioned electrical conductor at spaced points to permit the conductor to be severed between the points and for maintaining the tensioned condition of the remaining portions of the conductor and for insulating said remaining portions from each other, said mechanism comprising

(*a*) an elongate member formed at least in part of electrical insulating material to prevent transmission of electrical current therethrough, and

(*b*) a pair of spaced apart clamping means mounted on said elongate member and including

(1) lower elongate jaw members extending longitudinally parallel to said elongate member, each of said lower jaw members having a pair of alined, elongate grooves in the upper surface thereof adapted to receive portions of the conductor therein, said grooves extending from opposite ends of said lower jaw member to medial points therein with the adjacent ends of said grooves terminating in spaced apart relation to define a projecting portion therebetween,

(2) a pair of upper jaw members for each lower jaw member and being disposed in cooperating relation with the corresponding lower jaw member at the spaced grooves therein, said upper jaw members having concave lower clamping surfaces and being movable toward and away from said lower jaw members for releasably clamping an electrical conductor therebetween, said upper jaw members being adapted to force spaced portions of the conductor into the pairs of spaced grooves to securely clamp the conductor in the grooves and to facilitate this clamping by forming a hump in the conductor between the adjacent ends of the grooves.

2. Mechanism for clamping a tensioned electrical conductor at spaced points to permit the conductor to be severed between the points and for maintaining the tensioned condition of the remaining portions of the conductor and for insulating said remaining portions from each other, said mechanism comprising

(*a*) an elongate, rigid, self-sustaining member formed of electrical insulating material to prevent transmission of electrical current therethrough and having spaced pairs of spaced openings therein, and

(*b*) a pair of spaced apart clamping means mounted on said elongate member and each clamping means including

(1) an inverted U-bolt having the legs thereof penetrating through one pair of the openings in said elongate member with the bight portion thereof disposed longitudinally of said elongate member, said bight portion having a pair of spaced elongate grooves extending longitudinally thereof in alined relation from opposite ends of said bight portion toward the central portion thereof and terminating in spaced relation to define a projecting portion therebetween,

(2) nut means mounted on the leg portions of said U-bolt on the opposite side of said elongate member from said bight portion for maintaining said U-bolt on said elongate member,

(3) a pair of spaced apart split bolts each having a head portion at one end clamped between said bight portion of said U-bolt and said elongate member and connecting spaced externally threaded leg portions disposed in straddling relation to the bight portion of said U-bolt, said spaced leg portions extending upwardly from said bight portion and being adapted to receive the conductor therein,

(4) nut means mounted on said leg portions for rotation relative thereto and movement longitudinally therealong, and

(5) upper clamping members carried by said nut means above said grooves in said bight portion and movable therewith toward and away from the bight portion of said U-bolt for moving spaced portions of the conductor downwardly into said grooves in said bight portion to clamp said conductor therebetween and to cause said projecting portion of said bight portion to deform a portion of the conductor laterally of the longitudinal center-line thereof to thus form a hump in the conductor between said split bolts which aids in maintaining said split bolts in spaced relation and facilitates the clamping of the conductor by said clamping means.

3. Mechanism for clamping a tensioned electrical conductor at spaced points to permit the conductor to be severed between the points and for maintaining the tensioned condition of the remaining portions of the conductor and for insulating said remaining portions from each other, said mechanism comprising

(*a*) an elongate, rigid, self-sustaining member formed of electrical insulating material to prevent transmission of electrical current therethrough and having spaced pairs of spaced openings therein, and

(*b*) a pair of spaced apart clamping means mounted on said elongate member and each clamping means including

(1) an inverted U-bolt having the legs thereof penetrating through one pair of the openings in said elongate member with the bight portion thereof disposed longitudinally of said elongate member,

(2) nut means mounted on the leg portions of said U-bolt on the opposite side of said elongate member from said bight portion for maintaining said U-bolt on said elongate memebr,

(3) a pair of spaced apart split bolts each having a head portion at one end clamped between the bight portion of said U-bolt and said elongate member and connecting spaced, externally threaded leg portions disposed in straddling relation to the bight portion of said U-bolt, said spaced leg portions extending upwardly from said bight portion and being adapted to receive the conductor therein,

(4) nut means mounted on said leg portions for rotation relative thereto and movement longitudinally therealong, and

(5) upper clamping members carried by said nut means and movable therewith toward and away from the bight portion of said U-bolt for clamping the conductor therebetween at spaced apart points therealong.

4. Clamping means for an electrical conductor comprising

(*a*) an inverted U-bolt having spaced apart legs connected by a bight portion, said legs being adapted to be mounted on a suitable base for supporting the clamping means, said bight portion having alined, elongate grooves in the upper surface thereof extending longitudinally thereof from opposite ends of said bight portion toward the central portion thereof and terminating in spaced apart relation to define a projecting portion therebetween,

(*b*) a pair of spaced apart split bolts each having a head portion at one end connecting spaced, externally threaded leg portions disposed in straddling relation to the bight portion of said U-bolt at one of said grooves and with said head portion extending beneath said bight portion on the opposite side thereof from said grooves, said spaced leg portions extending upwardly from said bight portion and being adapted to receive the conductor therebetween,

(*c*) nut means mounted on said leg portions of each of said bolts for rotation relative thereto and movement longitudinally therealong, and

(*d*) upper clamping members carried by said nut means above said grooves in said bight portion and movable therewith toward and away from said bight portion for moving spaced portions of the conductor downwardly into said grooves in said bight portion to clamp said conductor therebetween and to cause

said projecting portion of said bight portion to deform a portion of the conductor laterally of the longitudinal center-line of the conductor to thus form a hump therein between said split bolts which aids in maintaining said split bolts in spaced relation and facilitates the clamping of the conductor between said upper clamping members and said bight portion.

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JOHN F. BURNS, *Primary Examiner.*
JOHN P. WILDMAN, *Examiner.*