May 31, 1949. T. H. BOWEN 2,472,000

ELECTRICAL JUMPER LINE AND CLAMP THEREFOR

Filed July 28, 1945

2 Sheets-Sheet 1

FIG. 1.

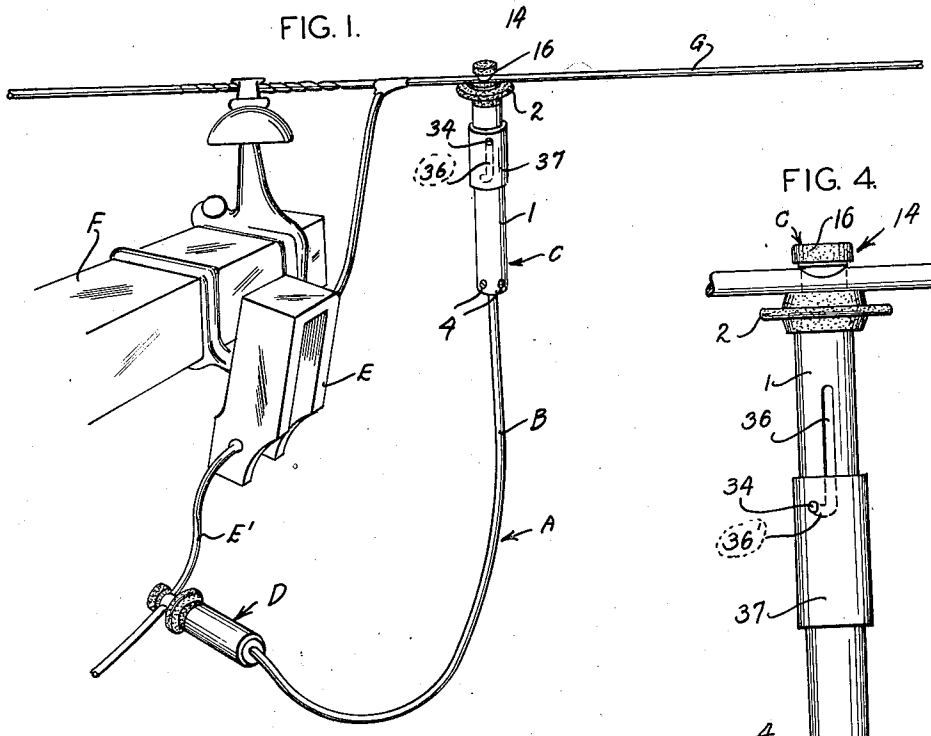


FIG. 4.

FIG. 5.

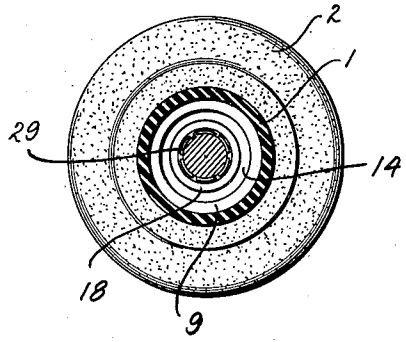
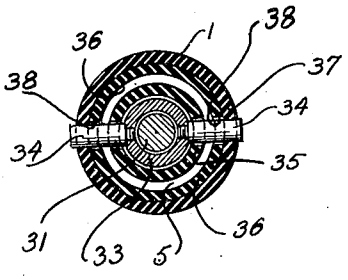


FIG. 6.



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2 Sheets-Sheet 2

FIG. 2.

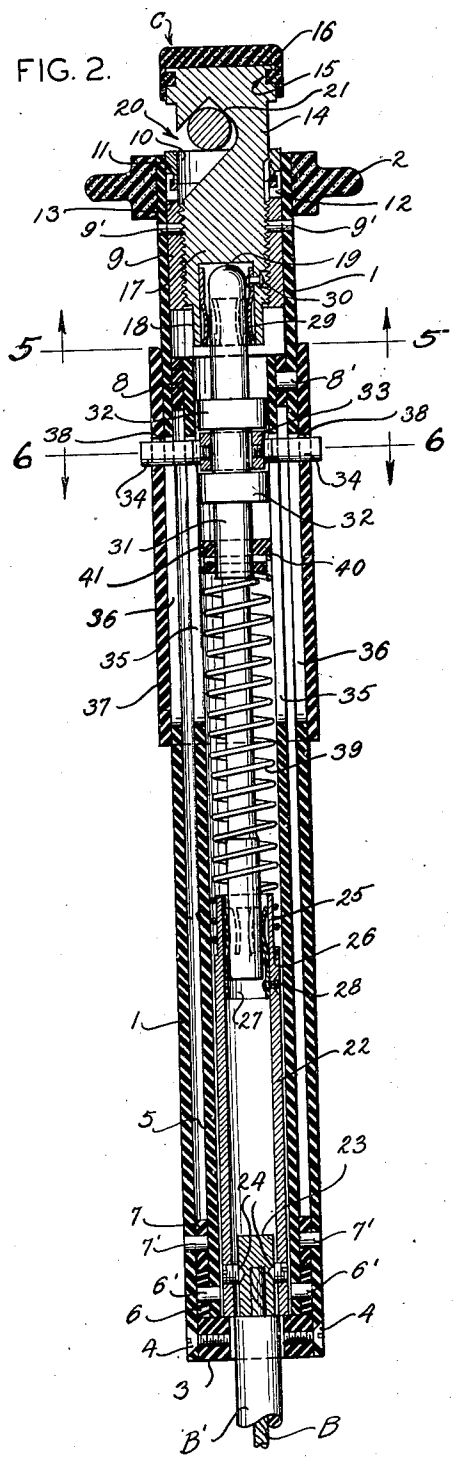
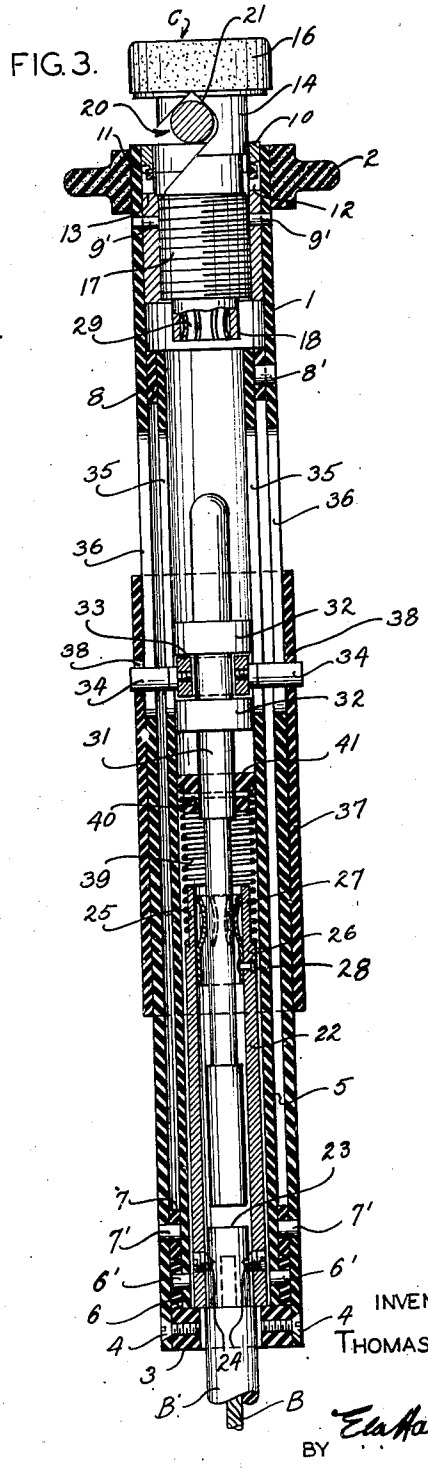


FIG. 3.



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2,472,000

ELECTRICAL JUMPER LINE AND CLAMP THEREFOR

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Application July 28, 1945, Serial No. 607,543

5 Claims. (Cl. 200—51.07)

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This invention relates generally to electrical connecting means, and more specifically to an improved clamp for jumper lines, and the like, the predominant object of the invention being to provide a clamp of the type mentioned which is so constructed and arranged that the electrical conductive path through the clamp may be completed or interrupted at will, in order that the clamp may be applied to an energized electrical conductor with the electrical path therethrough in an interrupted condition so that no electrical arcing occurs while the clamp is being applied to the energized electrical conductor.

Prior to this invention jumper lines were employed which comprised each a length of electrical conductor having clamps electrically connected at the opposite ends thereof, the clamps of these earlier jumper lines providing parts of permanently completed electrical conductive paths for the electrical energy passing through the jumper lines. While such jumper lines have been widely used for some years they were defective in one regard, in that when one clamp of such a jumper line had been applied to an energized conductor and the second clamp of the jumper line was being applied to an energized conductor, electrical arcing was produced at said second clamp which usually resulted in objectionable pitting of the conductor to which said second clamp was being applied.

In the application to energized conductor means of a jumper line provided with a clamp of the improved construction disclosed herein, however, the improved clamp may be set in a condition where the conductive path therethrough is interrupted. Thus, no current will pass through the jumper line while it is being installed in place with respect to the energized conductor means, and when such installation has been completed the improved clamp may be actuated to complete the conductive path therethrough, and consequently through the entire jumper line, in order that the jumper line may perform its intended function.

Fig. 1 is a perspective view illustrating an installation where a jumper line, which is provided with the improved clamp disclosed herein, is employed for the purpose of electrically by-passing a piece of electrical equipment.

Fig. 2 is a longitudinal section of the improved jumper line clamp of the present invention, showing same as it appears when the electrical conductive path therethrough is in a completed condition.

Fig. 3 is a view similar to Fig. 2 but showing

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the improved clamp as it appears when the electrical conductive path therethrough is in an interrupted condition.

Fig. 4 is an elevation of the improved clamp, on a larger scale than Fig. 1 and on a smaller scale than Figs. 2 and 3, and showing the clamp applied to an electrical conductor.

Fig. 5 is a horizontal section taken on line 5—5 of Fig. 2.

Fig. 6 is a horizontal section taken on line 6—6 of Fig. 2.

In the drawings, wherein is shown for purposes of illustration, merely, one embodiment of the invention, A designates generally in Fig. 1 a jumper line which comprises a length of electrical conductor B having electrically connected thereto at one end thereof a clamp C of the improved construction disclosed herein, and at its opposite end having electrically connected thereto a clamp D of the type which provides a permanently established conductive path for electrical energy. The installation illustrated in Fig. 1 shows the jumper line A arranged to cause electrical energy to by-pass a piece of electrical equipment E which is supported by a crossarm F of a pole (not shown), the clamp C of the jumper line being connected to a feed line G and the clamp D of said jumper line being connected to the outgoing conductor E' of the piece of electrical equipment E.

The clamp C includes an elongated, tubular member 1 which is formed of fiber, or other suitable electrical insulating material, said tubular member 1 having fixedly mounted thereon at its upper end a hand guard 2 which likewise is formed of electrical insulating material, rubber, for instance. At its lower end the tubular member 1 has arranged therein a retaining ring 3 which is formed of fiber, or other suitable electrical insulating material, said ring being secured in place within the lower portion of the tubular member 1 by a plurality of screws 4.

Arranged within the tubular member 1 is an elongated, inner tubular element 5, said inner tubular element contacting at its lower end with the upper face of the retaining ring 3, as is shown in Figs. 2 and 3, and being formed of fiber, or other suitable electrical insulating material. The inner tubular element 5 is of substantially less diameter than is the tubular member 1, and fixed, by pins 6', or otherwise, to the lower end portion of said inner tubular element is an annular member 6 which is formed of fiber, or other suitable insulating material, and which is disposed in the annular space between the wall of the tubular member 1 and the wall of the inner tubular ele-

ment 5. The lower face of the annular member 6 is substantially flush with the lower face of the inner tubular element 5 so that said lower face of said annular member contacts with the upper face of the retaining ring 3, the upper face of said annular member 6 contacting with the lower face of an annular member 7 which is formed of fiber, or other suitable insulating material, and which is secured to the tubular member 1 by pins 7' which likewise are formed of fiber, or other suitable insulating material.

Because the annular member 6, which is fixed to the inner tubular element 5, is interposed between the retaining ring 3 and the annular member 7, and because said annular members 6 and 7 are disposed in the annular space between the walls of the tubular member 1 and the inner tubular element 5, said inner tubular member is held in its proper position within the tubular member 1 so that it may not move vertically or horizontally with respect to said tubular member 1. Additionally, the upper portion of the inner tubular element 5 is maintained in its proper position within the tubular member 1 by an annular member 8 which is disposed within the annular space between the walls of said tubular member 1 and the inner tubular element 5, and which is secured to said tubular member 1 by pins 8', said annular member 8 and its securing pins 8' being formed of fiber, or other suitable insulating material.

Arranged within the upper portion of the tubular member 1 is a tubular, internally screwthreaded sleeve 9, said sleeve being formed of a material which is a good conductor of electrical energy and being secured to the tubular member 1 by securing pins 9' which are formed of fiber, or other suitable electrical insulating material. The upper edge of the sleeve 9 is located some distance below the upper edge of the tubular member 1, as is shown in Figs. 2 and 3, and disposed within the extreme upper end portion of said tubular member 1 and above the sleeve 9 is a clamping ring 10. The lower face of the clamping ring 10 rests upon the upper face of the sleeve 9 and the top face of said clamping ring is located slightly above the upper face of the tubular member 1, said tubular member 1 and the sleeve 9 being rotatable with respect to said clamping ring 10. The clamping ring 10 is provided with a circumferential groove 11 which receives the upper end portion of each of a pair of opposed, substantially C-shaped retaining elements 12, the lower portion of each of said retaining elements being seated in a recessed aperture 13 formed in the upper portion of the sleeve 9. The retaining elements 12 are confined in operative engagement with the clamping ring 10 and the sleeve 9 by the wall of the tubular member 1, and because of the use of said retaining elements the clamping ring 10 is retained in its proper position in the assembled device while permitting the tubular member 1 and the sleeve 9 to rotate with respect to said clamping ring, the upper portions of the retaining elements 12 rotating through the circumferential groove 11 of the clamping ring during such rotation of said tubular member 1 and said sleeve 9.

Cooperatively related to the sleeve 9 is a clamping jaw 14 which is provided with an enlarged head portion at the top thereof having a circumferential groove 15 formed therein. The enlarged head portion of the clamping jaw 14 has mounted thereon an insulating cap 16 which is formed of suitable electrical insulating material, rubber, for instance, and an annular portion of said cap is

disposed in the circumferential groove 15 of the head portion of the clamping jaw 14 so as to anchor the insulating cap in place. The clamping jaw 14 includes a shank portion 17 which is externally screwthreaded and extends through the sleeve 9, the external screwthreads of the shank portion of said clamping jaw 14 screwthreadedly engaging the internal screwthreads of said sleeve. The shank portion 17 of the clamping jaw includes an extension 18 of reduced diameter which extends downwardly from the screwthreaded portion of said shank portion, and formed in said extension and the portion of the shank portion of the clamping jaw located immediately thereabove is a recess 19 which is open at the lower end of said extension. The shank portion 17 of the clamping jaw 14 is provided with a notch, or jaw opening 20 which is shaped to provide an inverted V-shaped conductor seat 21 (see Figs. 2 and 3), the jaw opening 20 being open at a side of the shank portion of the clamping jaw, so that said jaw may be passed laterally onto a conductor, such as that indicated by the reference character G in Fig. 1, to cause the conductor to be interposed between the conductor seat 21 of the clamping jaw and the clamping ring 10.

Disposed within the lower portion of the inner tubular element 5 is a tube 22 which is formed of metal, or other material that is a good conductor of electrical energy, said tube 22 resting at its lower end upon the retaining ring 3. The lower end portion of the tube 22 receives an end portion of the electrical conductor B which is shown in Fig. 1, said electrical conductor being provided at its upper end with a cap 23 which is fixed to said conductor and is formed of metal, or other material that is a good conductor of electrical energy. The conductor B is mechanically and electrically connected to the tube 22 by screws 24 which are formed of electrical conducting material and which engage the cap 23, as is shown to good advantage in Fig. 2, the conductor B being provided with an insulating covering B' throughout its length, except for the upper end portion thereof which receives the cap 23.

The tube 22 is provided at its upper end with an extension 25 of reduced diameter, there being an annular shoulder 26 provided at the lower end of said extension. Disposed within the upper portion of the tube 22 is a tubular contact 27, said contact being secured to the tube by means of a suitable fastening device 28. The upper portion of the tubular contact is provided with a plurality of upwardly extended, circumferentially spaced slits which provide said contact with a plurality of circumferentially arranged resilient fingers, said resilient fingers being bowed inwardly, as is shown in Figs. 2 and 3. The clamping jaw 14 is provided with a tubular contact 29 which is similar to the tubular contact 27 just described, said tubular contact 29 being disposed wtihin the recess 19 of said clamping jaw and being secured to the clamping jaw by means of a fastening device 30, and said contact 29 being provided with a plurality of downwardly extended, resilient fingers which are bowed inwardly.

Arranged within the inner tubular element 5 for movement longitudinally with respect thereto is a movable contact 31. The movable contact 31 is in the form of an elongated rod which is provided with upper and lower portions that are of slightly greater diameter than an intermediate portion which integrally joins said upper and

lower contact portions. The upper portion of the movable contact 31 has fixedly mounted thereon a pair of spaced collars 32 between which is interposed a ring 33, said ring being loosely disposed about the portion of the movable contact between the collars 32 so that it may rotate freely about said contact portion. Extended outwardly in opposite directions from the ring 33 is a pair of pins 34, the outer portions of said pins being formed of fiber, or other suitable electrical insulating material, and these outer portions of said pins being fixed to inner pin portions which are screw-threadedly secured to the ring 33. The pins 34 extend through opposed slots 35 which are formed in the wall of the inner tubular element 5, and opposed slots 36 which are formed in the wall of the tubular member 1, said slots 35 and 36 being alined. The slots 35 of the inner tubular element are straight throughout their entire lengths and they extend longitudinally of said inner tubular element, which the slots 36 of the tubular member 1 are straight throughout substantially their entire lengths but are provided with oppositely extended offset portions 36' at their lower ends (see Fig. 4), the straight portions of said slots 36 being extended longitudinally of the tubular member 1.

Mounted in embracing relation with respect to the tubular member 1 is a sleeve 37 which is formed of fiber, or other suitable electrical insulating material, said sleeve being adapted for sliding movement longitudinally of said member 1. The sleeve 37 is provided with opposed, circular apertures 38 which are only large enough to permit the pins 34 to extend therethrough. The sleeve 37 serves, in the use of the device of the present invention, to move the movable contact 31 in a downward direction from the position in which said movable contact is shown in Fig. 2 to the position of said movable contact as illustrated in Fig. 3, the downward movement of said sleeve being transmitted by the pins 34 and the ring 33 to said movable contact. The movable contact 31 is urged in an upward direction by a coil spring 39 which is seated at its lower end on the annular shoulder 26 of the tube 22 and which bears at its upper end against a shoulder 40 of a spring seat 41 that is fixed to said movable contact 31, said spring seat being formed of fiber, or other suitable electrical insulating material.

In the use of a jumper line provided with the improved clamp C of the present invention the clamp D, shown in Fig. 1, is applied to an electrical conductor, the conductor E' of Fig. 1, for instance. At this time the movable contact 31 of the clamp C is in its lowered position, as shown in Fig. 3, said movable contact having been moved downwardly by downward movement of the sleeve 37, and said sleeve having been rotated slightly to cause the pins 34 to be moved into the offset lower portions 36' of the slots 36 of the tubular member 1, so as to lock said movable contact 31 in its lowered position against the tendency of the coil spring 39 to move said movable contact upwardly. With the movable contact in its lowered position as described, a substantial gap is provided between the upper portion of the movable contact 31 and the contact 29 of the clamping jaw 14, whereby the conductive path through the clamp is interrupted.

In order to prepare the clamp C for application to an electrical conductor, such as the conductor G of Fig. 1, the tubular member 1 is rotated with respect to the clamping jaw 14 in the proper direction, to cause said clamping jaw to be moved

outwardly relative to the upper portion of said tubular member 1, the coacting screwthreads of the sleeve 9 and the clamping jaw 14 causing such outward movement of said clamping jaw. When the clamping jaw has been moved outwardly a sufficient distance, the clamp is passed onto the conductor so that said conductor passes through the jaw opening 20 in interposed relation with respect to the clamping ring 10 and the seat 21 of said jaw opening. The tubular member is then rotated in the opposite direction so that the clamping jaw 14 is drawn inwardly because of coaction between the screwthreads of the sleeve 9 and said clamping jaw, with the result that the conductor will be tightly gripped between the seat 21 of the jaw opening 20 and the clamping ring 10.

It is to be noted that when the tubular member 1 is rotated, as described above, the inner tubular element 5 and the sleeve 37 rotate with said tubular member 1, because of the extension of the pins 34 through the slots of the tubular member 1 and the inner tubular element 5, and through the apertures of the sleeve 37, the ring 33, to which the pins 34 are fixed, rotating with the tubular member 1, the inner tubular element 5 and the sleeve 37, and about the portion of the movable contact 31 which it embraces. However, the tube 22, the movable contact 31, and the coil spring 39 do not rotate during rotation of the tubular member 1, but, instead these latter parts of the structure remain stationary. Also, due to the fact that the tubular member 1 and the internally screwthreaded sleeve 9 are rotatable relative to the clamping ring 10, this clamping ring is not rotated in contact with the conductor being engaged by the clamp, when the clamp is being tightened on the conductor.

Thus, the point is reached in the application of the jumper line to conductors where both of the clamps C and D are clamped to the conductors. However, no current passes through the jumper line at this time because the conductive path through the clamp C is interrupted because of the lowered and locked out position of the movable contact 31, and therefore no arcing occurred at the clamp C while it was being applied to the conductor. With both clamps of the jumper line applied and clamped to the conductors as described, the lineman need only rotate the sleeve 37 slightly to cause the pins 34 to be withdrawn from the offset, lower portions 36' of the slots 36 of the tubular member 1. This releases the movable contact 31 for rapid upward movement by the coil spring 39, the upper portion of said movable contact moving into contact engagement with the contact 29 of the jaw 14 and the enlarged lower portion of said movable contact moving into contact engagement with the contact 27 of the tube 22 to complete the electrical conductive path through the clamp, pick up the load, and place the jumper line in service.

Attention is directed to the fact that the offset, lower portions 36' of slots 36 of the tubular member 1 are inclined upwardly to a slight degree (Fig. 4). Because of this arrangement and due to the fact that the coil spring 39 tends to move the pins 34 upwardly, the sleeve 37 is locked against accidental independent rotation, which, in the absence of means to prevent it, might release the movable contact 31 for upward movement in response to force exerted by said coil spring. However, in the use of the improved clamp disclosed herein the sleeve 37 is positively locked by the upwardly inclined slot

portions 36' against such accidental, independent rotation, and the movable contact 31 may be released for upward movement only by applying sufficient rotative force to said sleeve 37 as will cam the pins 34 downwardly against the force of the coil spring 39 so as to permit said pins to move into the straight, vertical portions of the slots 36 of the tubular member 1.

I claim:

1. A clamp adapted for connection to an electrical conductor, comprising a tubular member having opposed elongated slots formed in the wall thereof, a jaw movable with respect to said tubular member and adapted to clampingly engage an electrical conductor, a fixed contact arranged within said tubular member, a movable contact disposed within said tubular member and adapted for movement longitudinally thereof into and out of contact engagement with respect to said fixed contact, opposed pins supported by said movable contact and extended therefrom through the elongated slots of said tubular member, a sleeve which embraces said tubular member and is movable longitudinally with respect thereto, said sleeve being provided with opposed apertures formed through the wall thereof which receive end portions of said pins, said sleeve being movable longitudinally of said tubular member to move said movable contact out of contact engagement with respect to said fixed contact, and spring means for moving said movable contact into contact engagement with respect to said fixed contact.

2. A clamp adapted for connection to an electrical conductor, comprising a tubular member having opposed elongated slots formed in the wall thereof which are provided with offset lower portions, a jaw movable with respect to said tubular member and adapted to clampingly engage an electrical conductor, a fixed contact arranged within said tubular member, a movable contact disposed within said tubular member and adapted for movement longitudinally thereof into and out of contact engagement with respect to said fixed contact, an element which embraces a portion of said movable contact and which is rotatable with respect to said movable contact, opposed pins supported by said element and extended therefrom through the elongated slots of said tubular member, a sleeve which embraces said tubular member and is rotatable and movable longitudinally with respect thereto, said sleeve being provided with opposed apertures formed through the wall thereof which receive end portions of said pins, said sleeve being movable longitudinally of said tubular member to move said movable contact out of contact engagement with respect to said fixed contact and being rotatable to cause said pins to be disposed in said offset portions of said slots of said tubular member so as to lock said movable contact out of engagement with respect to said fixed contact, and spring means for moving said movable contact into contact engagement with respect to said fixed contact.

3. A clamp adapted for connection to an electrical conductor, comprising a tubular member having opposed elongated slots formed in the wall thereof which are provided with offset lower portions, a jaw movable with respect to said tubular member and adapted to clampingly engage an electrical conductor, an inner tubular element arranged within said tubular member and having opposed slots formed in the wall thereof which are alined with portions of the opposed slots of said tubular member, a fixed contact electrically

connected to said jaw, a movable contact disposed within said inner tubular element and adapted for movement longitudinally thereof into and out of contact engagement with respect to said fixed contact, an element which embraces a portion of said movable contact and which is rotatable with respect to said movable contact, opposed pins supported by said element and extended therefrom through the slots of said inner tubular element and said tubular member, a sleeve which embraces said tubular member and is rotatable and movable longitudinally with respect thereto, said sleeve being provided with opposed apertures formed through the wall thereof which receive end portions of said pins, said sleeve being movable longitudinally of said tubular member to move said movable contact out of contact engagement with respect to said fixed contact and being rotatable to cause said pins to be disposed in said offset portions of the slots of said tubular member so as to lock said movable contact out of engagement with respect to said fixed contact, and spring means for moving said movable contact into contact engagement with respect to said fixed contact.

4. A clamp adapted for connection to an electrical conductor, comprising a tubular member having opposed elongated slots formed in the wall thereof which are provided with offset lower portions, a jaw movable with respect to said tubular member and adapted to clampingly engage an electrical conductor, an inner tubular element arranged within said tubular member and having opposed slots formed in the wall thereof which are alined with portions of the opposed slots of said tubular member, a fixed contact supported by and electrically connected to said jaw, a movable contact disposed within said inner tubular element and adapted for movement longitudinally thereof into and out of contact engagement with respect to said fixed contact, an element which embraces a portion of said movable contact and which is rotatable with respect to said movable contact, opposed pins supported by said element and extended therefrom through the slots of said inner tubular element and said tubular member, a sleeve which embraces said tubular member and is rotatable and movable longitudinally with respect thereto, said sleeve being provided with opposed apertures formed through the wall thereof which receive end portions of said pins, said sleeve being movable longitudinally of said tubular member to move said movable contact out of contact engagement with respect to said fixed contact and being rotatable to cause said pins to be disposed in said offset portions of the slots of said tubular member so as to lock said movable contact out of engagement with respect to said fixed contact, and spring means for moving said movable contact into contact engagement with respect to said fixed contact.

5. A clamp adapted for connection to an electrical conductor, comprising a tubular member having opposed elongated slots formed in the wall thereof which are provided with offset lower portions, a jaw movable with respect to said tubular member and adapted to clampingly engage an electrical conductor, an inner tubular element arranged within said tubular member and having opposed slots formed in the wall thereof which are alined with portions of the opposed slots of said tubular member, a fixed contact supported by and electrically connected to said jaw, a movable contact disposed within said inner tubular element and adapted for movement into and out

of contact engagement with respect to said fixed contact, an element which embraces a portion of said movable contact and which is rotatable with respect to said movable contact, opposed pins supported by said element and extended therefrom through the slots of said inner tubular element and said tubular member, a sleeve which embraces said tubular member and is rotatable and movable longitudinally with respect thereto, said sleeve being provided with opposed apertures formed through the wall thereof which receive end portions of said pins, said sleeve being movable longitudinally of said tubular member to move said movable contact out of contact engagement with respect to said fixed contact and being rotatable to cause said pins to be disposed in said offset portions of the slots of said tubular member so as to lock said movable contact out of engagement with respect to said fixed contact, a tube disposed within said inner tubular element, a fixed contact supported by said tube which is electrically contacted by said movable

contact, an electrical conductor connected to said tube, and spring means for moving said movable contact into contact engagement with respect to said fixed contact.

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