April 19, 1938. E. J. DE RIGHT ET AL 2,114,736

ELECTRICAL CONNECTER

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Fig. 1

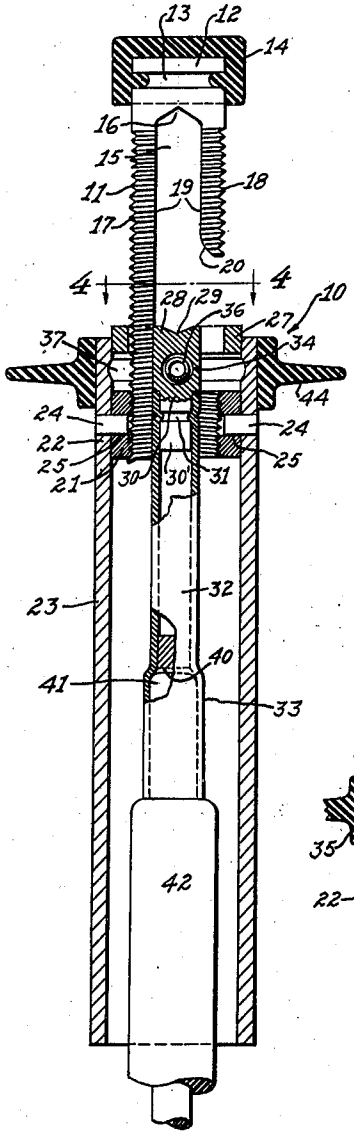


Fig. 5

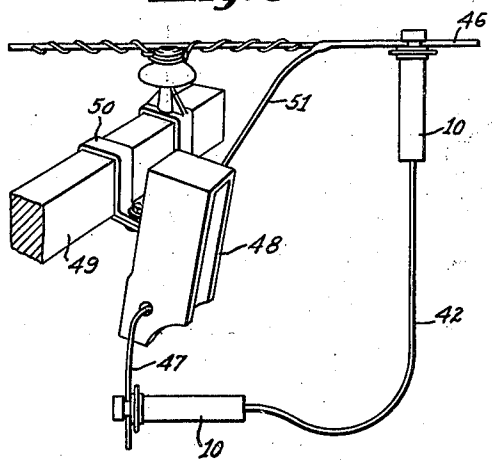


Fig. 2

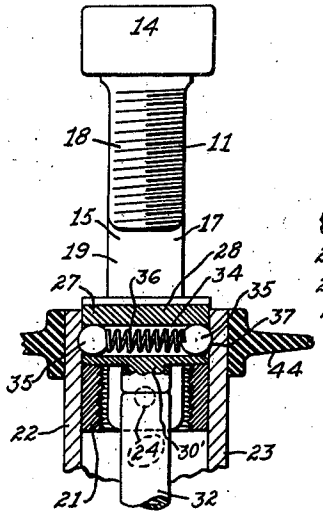


Fig. 3

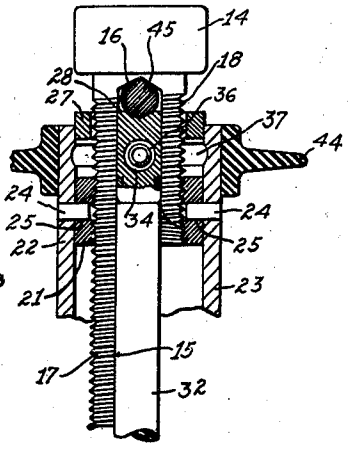


Fig. 4

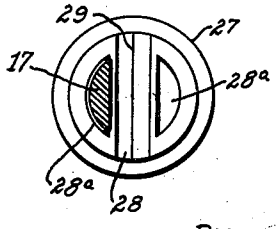
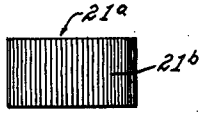


Fig. 6



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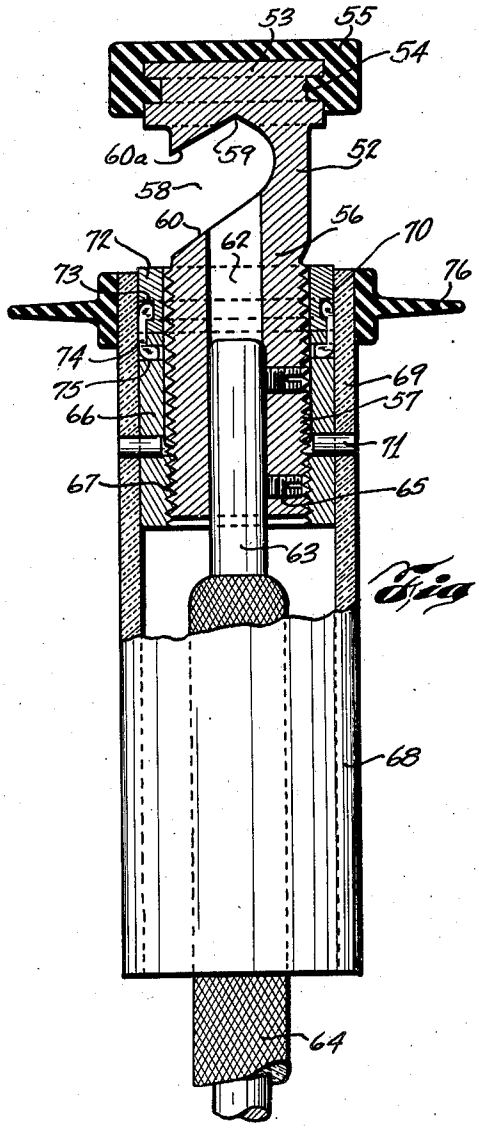


Fig. 7.

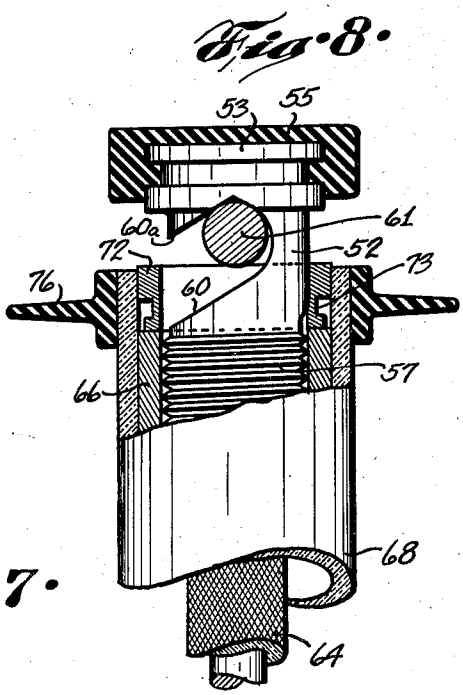


Fig. 8.

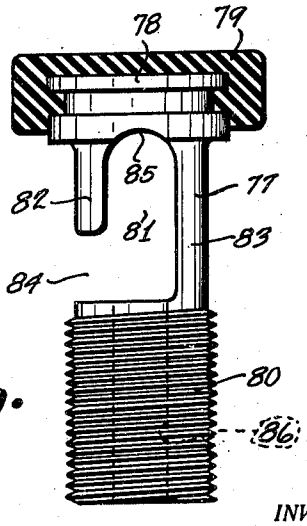


Fig. 9.

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ELECTRICAL CONNECTER

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Application September 23, 1935, Serial No. 41,730

3 Claims. (Cl. 173—273)

This invention relates to electrical connecters, and more particularly to an improved terminal connecter or clamp for jumper lines or the like.

An object of the invention is to provide an improved connecter or jumper clamp comprised of a minimum number of parts which may be simply and economically manufactured and assembled, the assembled clamp being thoroughly reliable in operation and capable of withstanding hard usage and frequent applications. Another object is attained in the provision of an improved connecter or clamp which may be readily and easily applied with one hand, and in which the metallic parts of the clamp are completely insulated, whereby to protect the operator and to protect the clamp against accidental contact with live conductors or other electrically charged apparatus.

Another object is to provide an improved clamp having a threaded jaw engaging a clamping nut, said threaded jaw being adapted for lateral application to a conductor, and said jaw and said nut being maintained in engagement during application thereof. Yet another object is to provide an improved clamping device of the type described, which may be readily capable of a wide variety of uses, and which is adapted for temporary or permanent installation.

More specifically, the foregoing objects are attained in an improved clamping device comprising a clamping jaw threadedly engaging a collar or nut, an insulated operating handle for actuating the clamping jaw into clamping relation with respect to a conductor-bearing seat element, means within the handle for maintaining the bearing element in assembly with respect to the nut, and insulating means on the metallic clamping elements for protecting the clamp against accidental contact with live conductors or charged electrical apparatus.

Further objects and advantages will appear from the following description of parts, and from the drawings, in which,

Fig. 1 is a vertical, sectional elevation of one form of the connecter or clamping device of the present invention;

Fig. 2 is a fragmentary, longitudinal, sectional elevation of the form of the invention illustrated in Fig. 1, but viewed from a different angle;

Fig. 3 is a sectional elevation of the clamping head portion of the device of Figs. 1 and 2, showing the clamping elements in clamping relation about a conductor, the conductor being shown in cross section;

Fig. 4 is a cross section on line 4—4 of Fig. 1;

Fig. 5 illustrates one application of the connecter or clamping device of the present invention;

Fig. 6 is a side elevation of a modified form of the nut of the device of Fig. 1;

Fig. 7 is a view, partly in longitudinal section and partly in elevation, of another form of the device of the invention;

Fig. 8 is a fragmentary, sectional elevation of the clamping head portion of the device of Fig. 7, showing the clamping elements in clamping engagement with a conductor, the conductor being shown in cross section; and

Fig. 9 illustrates a modified form of clamping jaw for the device of Fig. 7.

Referring now to the drawings, wherein are shown for the purpose of illustration, merely, several embodiments of the invention, 10 designates generally in Figs. 1 to 5 a form of device embodying the improvements of the present invention. The device 10 comprises a body member or clamping jaw 11 which may be a bolt having a head portion 12 provided with a circumferential groove 13. A protective insulating cap 14 of molded rubber or other suitable insulating material is secured about the head 12, with portions thereof engaging the groove 13 for maintaining the cap in assembly with the bolt head. The shank of the bolt is longitudinally slotted, as at 15, the inner end of the slot terminating in a conductor seat or contact portion 16 on the underside of the bolt head. The slot 15 divides the bolt shank into spaced shank portions 17 and 18 having flat parallel inner faces 9. The outer surfaces of the shank portions are threaded, as shown. As best appears in Fig. 1, the shank portions are of unequal length, the shank portion 18 being shorter than the shank portion 17 to facilitate the entrance of a conductor into the slot 15, as will more fully appear hereinafter. The free end of the shank 18 is preferably rounded, as at 20, the rounded end serving as a camming surface for aiding in directing a conductor into the slot 15.

A collar or clamping nut 21 threadedly engages the shank 11, the nut being sleeved within one end portion 22 of a tubular operating member or handle 23. The handle is preferably formed of a molded phenolic condensation product, such as bakelite, although any other suitable insulating material may be employed in forming the handle, as desired. The operative connection between the nut and handle 23 may be effected in any suitable manner, such as by spaced pins or dowels 24 extending through wall portions of the handle end 22, with their inner ends frictionally seated in

suitable apertures 25 in the nut 21. As the nut 21 is electrically charged during the operation of the clamp, the pins 24 engaging the nut are formed of fibre or other suitable insulating material. In addition to the pins 24, a thermo-plastic cement may be employed between the engaged surfaces of the nut and handle, the further use of the cement being presently preferred, as it effects a secure binding between the nut and handle, which will maintain an operative connection therebetween should the pins become loose and ineffective. Also, instead of employing the pins 24 for securing the nut 21 in place within the handle 23, we may provide said nut with a knurled outer face, as indicated in Fig. 6, wherein the nut is designated by the reference character 21a and the knurled face thereof is designated by the reference character 21b. When the nut 21a is employed, the nut is forced into the interior of the handle so that the knurled face thereof frictionally grips the inner face of the handle, so as to secure the nut in place within the handle. In this case also, if desired, a thermo-plastic cement may be employed between the engaged faces of the nut and handle.

Located within the hollow handle 23 in spaced relation with respect to the nut 21 is a ring element or conductor-bearing washer 27. The washer 27 is preferably provided with an integral bridge portion 28 extending diametrically across the washer, and of a width substantially equal to that of the bolt slot 15, as best appears in Fig. 4. The bridge thereby provides spaced segmental openings 28a through the washer, adapted for receiving therethrough the shanks 17 and 18. The bridge portion may be provided with a conductor seat portion, such as the grooved seat 29, corresponding to the grooved seat 16 in the bolt head 12. The washer is maintained in operative relation with the nut 21 and handle 23 by an improved means to be presently described.

The bridge portion 28 of the washer 27 serves as means for maintaining the bolt 11 in assembly with the nut 21 when the clamp parts are disposed in open position (Fig. 1), with the threaded shank 18 free of threaded engagement with the nut. In this position of the clamp elements, the bridge element 28 maintains the body shank portion 17 in threaded engagement with the nut 21, in a manner which is clearly shown in Fig. 2.

As will be observed from an inspection of Figs. 1 and 4, the ring or washer 27 is arranged for rectilinear movement only, endwise of the bolt shank, as the shank portion 17 extends through one of the segmental openings 28a in the washer and is maintained in threaded engagement with the nut 21 throughout the operation of the device. Hence, the means presently to be described for securing the washer in assembly with the nut 21 and handle 23 must necessarily provide for relative rotation of the clamping jaw 11 and the nut and handle 23.

The bridge portion 28 of the washer 27 is extended downwardly beyond the main body portion of said washer, as shown most clearly in Fig. 1 wherein the reference character 30 designates the extended portion of the bridge portion. Also this extended portion of the bridge portion has extended therefrom an extension 30', circular in cross-section, which is provided with an annular groove 31 formed in its outer face. A stem 32 is secured to the extension 30', an end portion of said stem being in embracing relation with said extension and an annular portion of said stem being pressed inwardly into the annular groove 31 of the extension so as to lock the stem to the extension. The stem 32 extends through the nut 21 and longitudinally of the handle 23 within same, the free end of said stem being enlarged, as shown at 33 in Fig. 1. The extended portion 30 of the bridge portion 28 of the washer 27 has an opening 34 formed longitudinally therethrough which is of reduced diameter at its opposite ends, as shown most clearly in Fig. 2, and arranged within said opening is a pair of balls 35 formed of steel or other suitable material which are urged away from each other by a coil spring 36, which is interposed between said balls as shown in Fig. 2. The balls 35 are forced by the coil spring 36 into the reduced opposite ends of the opening 34, so that portions of said balls extending outwardly beyond the opposite end faces of the extended portion 30 of the bridge portion 28 of the washer 27. The extended portions of the balls 35 are seated in an annular groove 37 formed in the inner face of the handle 23, and as a result of that arrangement the washer 27 and the stem 32 are held in assembled relation with respect to the handle 23, inasmuch as the seated relation of the balls 35 in the annular groove 37 of the handle 23 prevents unintended relative longitudinal displacement of the handle and the washer 27. Also, the manner of attaching the washer and stem assembly to the handle as just described permits free rotation of the handle relative to said assembly, the annular groove 37 of the handle moving about the balls 35 as the handle is rotated.

The washer 27 and stem 32 are, by preference, adapted to serve as the electrical contact portion of the connecter or clamp device, and to this end the enlarged portion 33 of the stem is provided with an axial bore 40 for receiving one end 41 of an insulated conductor 42. The conductor end 41 may be secured in the bore 40 through the instrumentality of a soldered connection.

A flanged guard element 44 may be secured, in any suitable manner, to the end 22 of the handle 23 as a protection to the operator during manipulation of the clamp device. The guard element may be formed of rubber or any other suitable insulating material, as desired.

Fig. 3 illustrates the clamp device in clamping engagement with a conductor 45, the conductor being shown in cross section. In this position of the clamp structure, the threaded portions of both shanks 17 and 18 engage the clamping nut 21, thereby effecting a uniform and symmetrical distribution of the clamping stresses occurring in the bolt 11 and nut 21.

The application of the clamp device to a conductor, such as the conductor 45, is effected in the following manner: The clamping head or jaw 11 is predisposed in open position, as illustrated in Figs. 1 and 2, preferably by manual manipulation of both the bolt 11 and handle structure 23. The operator then grasps the handle 23 in one hand and hooks the jaw structure 11 laterally over a portion of the conductor 45, seating the conductor in the jaw seat 16 at the inner end of the slot 15. The camming surface 20 on the free end of the shank 18 and the guide surfaces 19 facilitate the disposition of the clamp jaw structure in engagement with a conductor. The conductor 45 is now in position to be clamped between the jaw head 12 and the washer 27, clamping operation being effected by manual ro-

tation of the handle structure 23 in a direction to thread the nut 21 toward the head 12. The conductor 45 extending transversely through the slot 15 effectively prevents rotation of the jaw 11 with rotation of the handle. Rotation of the handle is continued until the seat 29 of washer 27 engages the conductor so as firmly to clamp the conductor between the head 12 and the washer 27. The final clamping relation of the several elements of the clamp structure is shown in Fig. 3. To effect disengagement of the clamp from the conductor, the handle 23 is located in a direction to unthread the nut 21 a sufficient distance from the head 12 to permit a ready removal of the jaw from its hooked engagement with the conductor. From the description of the application of the clamping device, it will be readily seen that an operator need employ but one hand in effecting clamping or unclamping actuation of the device, a feature which facilitates rapid installation or removal of the clamp. Furthermore, it will be observed from Fig. 3 that with the device in clamping relation with a conductor, the insulating cap 14 and handle 23 co-operate substantially to enclose the metallic portions of the clamp, thereby effecting an insulation of the clamp against accidental contact with charged conductors or other electrical apparatus.

Fig. 5 illustrates, by way of example, one application of the presently preferred clamp device. A jumper cable or conductor 42 is provided on its ends with clamps 10, one of which engages in clamping relation a line lead 46. The opposite clamp 10 engages a lead 47 which is connected on one end to an electrical apparatus 48. The apparatus 48 may be secured to a cross arm 49, as by the straps 50. A tapping lead 51 connects the apparatus 48 with the line 46. As will be readily observed, the jumper cable 42 is in shunt relation with the apparatus 48, the electrical bridging of the apparatus being effected, in practice, for providing continuation of service in case of damage to the apparatus, and while necessary repairs or replacement of the apparatus is being made.

Fig. 7 illustrates a modified form of clamp, in which certain of the structural elements of the preferred device of Fig. 2 are eliminated. The modified clamp comprises a clamping head or jaw member 52 provided with a head 53 having a circumferential groove 54 to receive and seat an insulating cap 55 thereupon. The jaw is provided with a shank portion 56 which is threaded over the lower portion thereof, as at 57, the upper portion of the shank adjacent the head 53 being provided with a notch or jaw aperture 58 terminating in a conductor seat 59 under the head 53. The portion 60 of the shank defining the aperture 58 is, by preference, provided as a sloping camming surface for facilitating engagement of the jaw laterally with a conductor, such as the conductor 61 shown in section in Fig. 8. The portion 60^a also defining a portion of the aperture 58 is provided as a jaw lip or short shank portion for retaining a conductor in the seat 59. The shank 56 is preferably provided with a longitudinally extending bore 62 for the reception of one end 63 of a conductor 64, the conductor end being retained in the bore in any suitable manner such as by the set screws 65.

Threadedly engaging the shank 56 is a clamping collar or nut 66, which is by preference internally threaded over only a portion of its length, as at 67. An insulating handle 68 of tubular form has one end portion 69 sleeved over the collar 66, the end 69 being extended beyond the collar to form a shouldered seat 70 for a purpose which will presently appear. The handle 68 may be formed of any suitable insulating material, such, for example, as a molded phenolic condensate like bakelite. The handle is operatively secured to the nut 66 as by equally spaced pins 71 extending laterally through wall portions of the handle end 69 and into suitable apertures provided therefor in the collar 66. The pins 71 may be formed of fibre or of any other suitable insulating material. The operative connection between the handle and collar may be further assured by the application of a suitable thermoplastic cement between the engaging surfaces of the members.

The shouldered seat 70 is provided to receive a conductor-bearing member or ring 72, the ring being formed with a circumferentially grooved portion 73 for receiving one end of substantially C-shaped retaining elements 74. The opposite ends of the retaining elements are seated in recessed apertures 75 in the upper portion of the collar 66. The elements 74 are confined in operative engagement with the ring and collar by overlying wall portions of the handle end 69, as best appears in Fig. 7. The provision of the circumferential groove 73 permits relative rotation of the bearing ring and collar 66, whereby in the clamping actuation of the device through normal rotation of the handle 68 and collar 66 the bearing ring may be maintained in fixed relation to a conductor frictionally engaged thereby.

A hand guard 76 may be secured in any suitable manner to the end portion 69 of the handle 68. As in the clamping device of Figs. 1 to 5, the guard may be formed of rubber or of any other suitable insulating material, as desired.

Fig. 8 illustrates the clamp structure in clamping engagement with a conductor 61, the conductor being clamped between the seat portion 59 of the head 53 and the rim portion of the bearing ring 72. The clamping and unclamping manipulation of the modified clamp device is essentially similar to that described for the device of Figs. 1 to 5.

In Fig. 9 is illustrated a modified clamping head 77 for the device of Fig. 7. The modified clamping head or jaw comprises a head portion 78 provided with an insulating cap 79, as in the device of Fig. 7, and a threaded shank 80. The shank 80 is provided with a longitudinal slot 81 which divides the upper portion of the shank into spaced shank sections 82 and 83. A portion of the shank section 82 is removed or cut away, as at 84, to provide for the entrance of a conductor into the slot 81. The shank portion 82 is by preference of a length which will allow it to slidingly engage the washer 72 of Fig. 7 when the parts are in clamping position as illustrated in Fig. 8, thereby effecting a substantially symmetrical distribution of the clamping stresses occurring in the clamping head. The inner end of the slot 81 may terminate in a conductor seat 85 adjacent the underside of the head 78.

The improved clamp devices herein described are capable of a wide variety of uses and fully attain the foregoing objects. The devices are particularly adapted for use by linemen and troublemen in effecting temporary jumper or bypass connections around defective electrical equipment, an example of such application being illustrated in Fig. 5. Moreover, the devices are formed of a minimum number of readily re-

placeable parts formed and constructed to withstand long and hard usage.

Among other uses of the connecters or clamps embodying the improvements of the present invention may be mentioned the employment of the clamp as a holder for welding rods or other electrode elements. Such application of the device will be readily appreciated, as will many other uses thereof.

It will be understood, of course, that substantial alterations and/or modifications may be made in the presently described clamp structure embodying the improvements of the present invention, without departing from the spirit and full intended scope of the invention, as defined by the following claims.

We claim:

1. An electrical connecter comprising a jaw member provided with a split threaded shank providing an opening between spaced shank portions in which a member to which the connecter is connected is disposed, an element threadedly engaging said shank, a tubular operating member fixed to said element, a bearing member movable into and out of clamping relation with respect to said jaw member, means for connecting said bearing member in assembled relation with said element and said operating member so that the assembly comprised of said element and said operating member may be rotated with respect to said bearing member, and means associated with said bearing member adapted to receive an electrical conductor in electrical connection therewith.

2. An electrical connecter comprising a jaw member provided with a screwthreaded shank and having an opening adapted to receive a member to which the connecter is connected, an element screwthreadedly engaging said screwthreaded shank, a tubular operating member fixed to said element and adapted for rotation so as to cause said element to move longitudinally of said screwthreaded shank, a bearing member cooperatively associated with said element, means whereby said element and said tubular operating member may rotate with respect to said bearing member, and an electrical conductor extended longitudinally within said tubular operating member, said electrical conductor being in electrical connection with said jaw member.

3. An electrical connecter comprising a jaw member provided with a screwthreaded shank and having an opening adapted to receive a member to which the connecter is connected, an element screwthreadedly engaging said screwthreaded shank, a tubular operating member fixed to said element and adapted for rotation so as to cause said element to move longitudinally of said screwthreaded shank, a bearing member cooperatively associated with said element, means whereby said element and said tubular operating member may rotate with respect to said bearing member, and an electrical conductor extended longitudinally within said tubular operating member, said electrical conductor being in electrical connection with a part of the connecter.

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