March 18, 1941. J. T. TREHERN 2,235,274

GROUNDING CLAMP

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Fig. 1.

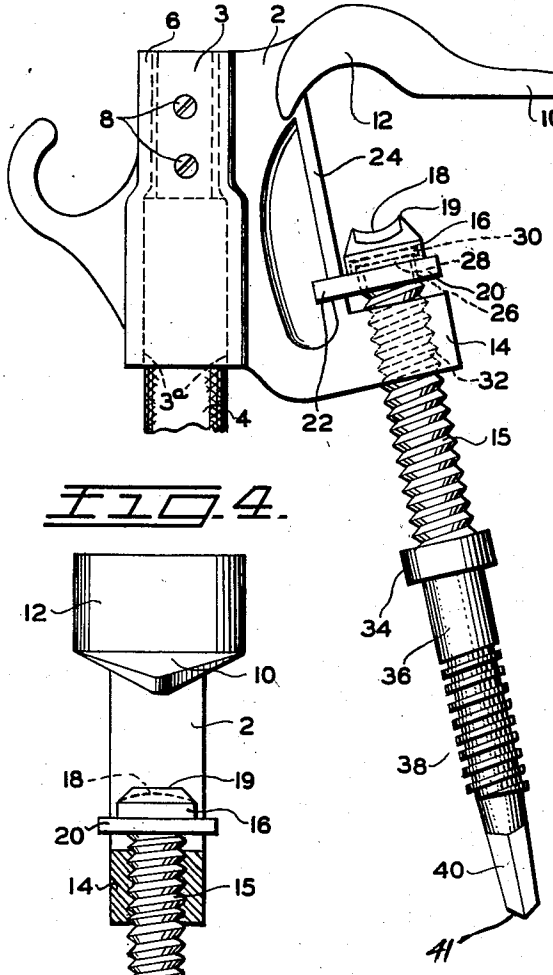


Fig. 2.

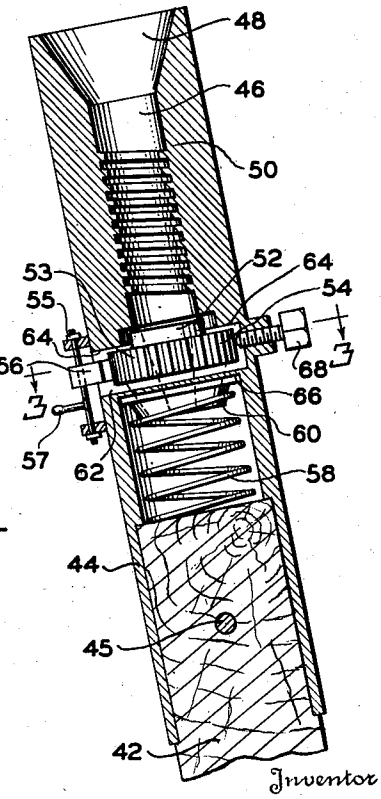
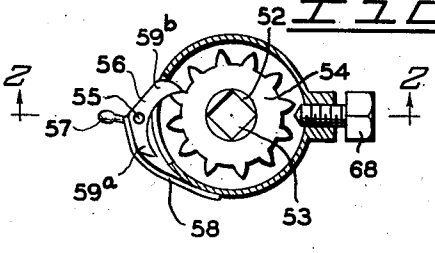


Fig. 4.

Fig. 3.



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GROUNDING CLAMP

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17 Claims. (Cl. 173—273)

The present invention relates to a grounding clamp for high power transmission lines, and an operating member therefor, these being known in the art as a hot clamp and hot stick, respectively.

Before working on high power transmission lines, it is necessary that the lineman first attach a suitable ground wire to the line. This is usually done with a clamp to which the ground wire is secured, and which is hooked over the line. In present practice, the line is then gripped between two jaws of the clamp, the jaws being tightened by a screw or cam. The stick is used to place or remove the clamp and to operate the jaws.

The main object of this invention is to provide a clamp which cannot slip off of the stick when it is being placed on or removed from the line. These are always the critical phases of the operation, for the clamp might then drop onto a live wire and cause considerable damage to the lines and equipment, and injure the lineman.

Another objective is the provision of improved line-engaging elements which insure constant electrical contact, and which may be readily applied at a substantial angle to the transverse axis of the line.

With special reference to the clamp stick, an object is to provide a readily engageable and disengageable operating member for the clamp, each being particularly adapted to the other.

It is further intended to provide a clamp stick which, after the clamp has been attached, must first be prepared in definite steps of operation by the lineman before it can be released from the clamp, and before the clamp can be loosened from the line, thus making accidental displacement from the stick impossible. Likewise, the steps must be reversed in detaching the clamp from the line.

It is also now proposed to provide means for permanently securing the stick to the clamp.

Together with the features of safety, ease and simplicity of operation, it is concurrently proposed to provide a rugged and foolproof device of economic manufacture, and of obvious application to analogous fields.

The invention is clearly described in the following specification and drawing, in which:

Fig. 1 is a vertical side elevation of the clamp;

Fig. 2 is a vertical cross section through the stick; and

Fig. 3 is a transverse cross section taken along the line 3—3 of Fig. 2;

Fig. 4 is a vertical front elevation of the clamp.

As shown in Fig. 1, the body of the clamp 2 has a hole 3, designated by the dotted lines 3*a*, for accommodating the end of a ground wire 4 which is engaged in the hole and held by the set screws 8.

The hook 10, which is rigid with the clamp body, forms the upper jaw 12 of the clamp at the crook portion. The lip 14 supports the clamp screw 15 with which it is threadedly engaged. Rotatably engaged on, and driven by the clamp screw 15, is the block 16 which forms the lower jaw, and which has the saddle-shaped groove 18, as shown by the dotted lines in Fig. 4, for cooperation with the upper jaw 12 to grip a power line. The top edges of the block are slightly flattened, as denoted in Fig. 4 by the reference numeral 19. Rigid with the block 16, the collar 20 is provided with a pair of spaced fingers 22 which slide along the guideway 24 therebetween and prevent rotation of the block 16.

The collar 20 is loosely engaged around the neck 26 of the clamp screw 15, which is provided with a head 28, the head being retained in the recess 30 of the block 16. Threads 32 in the lip 14 cooperate with the clamp screw for moving the block upon rotation of the clamp screw 15.

Part way down the clamp screw 15, a stop 34 divides off the lower stem portion 36 of the clamp screw, the lower stem having threads 38 and facets 40, the latter of which form a tapered, square end.

Fig. 2 shows the clamp stick 42, on the end of which is attached the socket 44 by means of the screw 45. The socket 44 has a bore 46 which has a funnel-shaped mouth 48 at its end. The bore 46 is threaded internally as shown at 50, the bore and threads being complementary to the stem 36 and the threads 38 on the clamp screw 15.

In the region of Fig. 2, through which the transverse cross-section Fig. 3 is taken, is a chuck 52 provided with a square central opening 53. The sides of the square opening 53 are tapered, as shown by the dotted lines in Fig. 2, and are complementary with the tapered square end 41 of the clamp screw 15.

A ratchet wheel 54 is rigidly secured around a portion of the chuck 52 and double pawl 56, which is supported on the pintle 55, is movable between two positions by the arm 57 for holding the ratchet 54 and chuck 52 against rotation in either of two directions. In Fig. 3, the pawl is set to allow clock-wise rotation of the ratchet. A leaf spring 58 is secured to the socket body 44 and bears against either of the flat sides 59*a* or 59*b* of the pawl 56, for maintaining the pawl in either position.

As may be seen in Fig. 2, an expansion spring 58 is compressed against the end of the stick 42 and is engaged around the externally tapered end 60 of the chuck 52 to press the ratchet 54 normally upward against the shoulders 64. The ratchet and chuck have a limited play along the axis of the stick in the recess 62 between the shoulders 64 and the ring 66. A set screw 68 is provided for preventing any rotation of the ratchet 54 and chuck 52 if desired.

In operation, the ground wire is secured in the hole 3 in the clamp body 2 held with the set screws 8 engaged against the end of the ground wire, which is exposed for good electrical contact between the wire and clamp.

The double pawl 56 is then set to allow only clockwise rotation of the ratchet 54 and chuck 52, the direction of rotation being considered from the standpoint of one looking down the bore from the open end of the socket.

Next, the end 44 of the clamp screw is inserted into the socket 44 until the threads 38 of the clamp screw engage the threads 50 of the socket bore, after which the socket is screwed up on the clamp screw by right-hand rotation.

As the socket is screwed up on the clamp screw, the square end 41 of the clamp screw engages into the centrally square and tapering portion of the chuck. Limited play of the ratchet 54 and chuck 52 in the recess 62 allows the facets 40 of the square end 41 of the clamp screw to coincide with the flat inner sides of the chuck 52, since the chuck will move downwardly against the spring 58 until the clamp screw end is engaged in the chuck. Meantime, the chuck and ratchet will have been free to rotate relative to the socket as the tapered square end of the clamp screw moves into full engagement with the chuck 52.

When the clamp screw 15 has been so placed in the socket 44, it is impossible to remove it by left-hand rotation of the stick, because of the pawl which is set to prevent counter-clockwise rotation of the ratchet in the socket. This will be especially important in removing the clamp from the line, as later to be explained.

After the socket 44 has been screwed over the stem of the clamp screw to engage the end 41 in the chuck 52, the double pawl 56 is then set to prevent any further right-hand rotation of the socket relative to the pawl. This does three things: First, it prevents further tightening or jambing of the socket around the clamp screw; secondly, it enables the lineman to reach up, hook the clamp onto the line to be grounded and then rotate the stick and clamp screw to the right. This drives the block 16 towards the upper jaw 12 to grip the line. Third, after the line is gripped between the upper jaw 12 and the block 16, the double pawl 56 permits left-hand rotation of the stick 2 relative to the clamp screw 15, which unscrews the socket from the clamp screw 15.

Since the socket 44 was not screwed tightly, or jambed over the clamp screw 15, and since the block 16 has been driven tightly against the line, left-hand rotation of the stick 42 will allow the socket to be unscrewed from the clamp screw without loosening the grip of the upper jaw 12 and block 16 on the line, the pressure of the threads against threads 32 in the lip serving to hold the clamp screw 15 against rotation until substantial torque is applied to the clamp screw.

A further function has been manifest by the guideway 24, which, together with the crook of the hook 10, prevents the line from jambing between the block 16 and clamp body 2, and insures certain and uniform electrical contact with the line between the saddle-shaped groove 18 and the upper jaw 12.

The saddle-shaped groove 18 in the block 16 facilitates installation when the lineman must install the clamp on a line far out from a pole, as, for instance, past a transformer, and where the longitudinal axis of the clamp will be at an angle to the transverse axis of the line. Flattening of the top edges 19 of the block prevents these portions from being bent over, and also prevents biting or cutting of the line against which they are applied.

When the clamp is to be removed, the double pawl is set to permit only clockwise rotation of the ratchet and chuck relative to the socket. The lineman grasps the stick and pushes the funnel-shaped mouth 48 over the end 41 of the clamp screw 15, and turns the stick to the right until the socket 44 is firmly engaged over the clamp screw. Since the pawl now will not allow counter-clockwise rotation of the ratchet 54, chuck 52, and, in turn, the clamp screw 15, left-hand rotation of the stick also rotates the clamp screw 15 to the left, thereby drawing the block 16 away from the upper jaw 12 to free the line from the clamp. It is, of course, impossible for the clamp to slip from the stick, since the pawl must be reset before the clamp can be removed from the socket.

Occasionally, it may be desirable to secure the stick 42 to the clamp 2 semi-permanently. In this case the set screw 68 is tightened against the ratchet 52 to prevent any rotation after the socket 44 has been placed over the clamp screw. The clamp screw may then be rotated in either direction without further setting of the pawl.

While the various elements have been specifically described, the full breadth of the concept is to be allotted in determining the range of equivalents, such as in the case of the term "square" tapered, which is intended to cover other non-round or polygonal geometrical forms.

The invention, while especially valuable for the uses above set forth, is readily adaptable for remote operation of analogous devices or tools. It is therefore clear that this invention is not limited to the specific description, but only by the breadth of contribution to the art, and by the following claims.

I claim:

1. A clamp of the type described, said clamp having a body portion, a fixed jaw, a movable jaw, and a screw for moving said movable jaw, said screw having two sets of threads thereon, the first of said sets being threadedly engaged with said body portion for moving said movable jaw upon rotation of said screw, the second of said sets being axially spaced along the shank of said screw and separated from said first set by a smooth shank portion, said smooth shank portion having a shoulder thereon whereby a clamp stick threadedly engaged with said second set cannot engage the first set.

2. A clamp comprising a body portion, a fixed upper jaw, a movable lower jaw, a screw having a head rotatably attached to said lower jaw, said screw having upper and lower threaded portions, said upper portion being threadedly engaged with said body for moving the lower jaw when the screw is rotated, non-threaded shoulder means on said screw between said upper and lower sets so as to separate the same whereby to prevent a

clamp stick threaded on the lower set from engaging the upper set, said screw having a square tapered lower end portion for engagement with a complementary socket on a clamp stick.

3. A manipulating member for clamps or the like comprising a handle having a hollow end, threads on the inner wall thereof for engagement with threads on a portion of said clamp or the like, a chuck rotatably mounted in the hollow of said end for non-rotating engagement with said portion, and means for selectively allowing only clockwise or counter-clockwise rotation of said chuck relative to said stick.

4. In a manipulating member as claimed in claim 3, means for locking said chuck against rotation.

5. A manipulating member for clamps or the like comprising a handle having an elongated socket on the top end, threads on the inner wall of said socket and set substantially inwardly from the open end thereof for engagement with threads on a portion of said clamp or the like, a chuck rotatably mounted in said socket below said threads for non-rotating engagement with said portion, and means for selectively preventing clockwise and counterclockwise rotation of said chuck.

6. A manipulating member as claimed in claim 5, said chuck being supported between axially spaced shoulders in said socket, and having axially spaced shoulder engaging portions, the distance between said shoulders substantially differing from the distance between said portions for providing limited play of said chuck along the axis of said bore, and spring means engaged between the chuck and socket for normally pressing said chuck towards said open end.

7. A manipulating member for clamps or the like comprising a handle having an elongated socket at the top end thereof, threads on the inner wall of said socket, a chuck rotatably supported in said socket below said threads and having a non-round central opening therein, a ratchet secured to said chuck for rotation therewith, and a pawl supported on said socket and engageable with said ratchet, said pawl being selectively movable between two positions and allowing, in first of said positions, only clockwise rotation of said ratchet, the second position of said pawl allowing only counter-clockwise rotation of said ratchet.

8. A manipulating member as claimed in claim 7, said chuck being rigidly secured to said ratchet, said chuck and ratchet being supported between spaced shoulders in said socket and being axially movable therebetween, and an expansion spring engaged between said chuck and the lower end of said socket.

9. A manipulating member for clamps or the like comprising a handle having a socket at the top end thereof, threads on the inner wall of said socket, said threads being spaced substantially downwardly from the open end of said socket, said socket having a circumferential recess in the inner wall thereof below said threads and having a second annular recess in said wall immediately below and extending radially outward from the first, an externally annular chuck having its top supported in the first recess and having a square central opening, said sides of said opening tapering inwardly from top to bottom, a ratchet integrally mounted around said chuck and supported in said second recess, a pawl mounted in said socket radially outward from said ratchet, the axis of said pawl paralleling the axis of said socket, said pawl being swingable on its own axis between two positions, said pawl, in the first of said positions engaging the teeth of the ratchet for allowing only clockwise rotation of said ratchet and chuck, and allowing only counter-clockwise rotation of said ratchet and chuck in the second of said positions, means for resiliently holding said ratchet in each of said positions, the lower portion of said chuck being exteriorly tapered towards the lower end, a coil spring having its lower end engaged against the bottom of said socket, the top end of said spring being engaged around the tapered portion of said chuck, a ring rigidly secured in said socket below said second recess, the top of said coil spring being engaged against said ring.

10. A manipulating member as claimed in claim 9, said socket having a set screw threadedly engaged through the wall thereof, said set screw being radially opposite said ratchet.

11. In combination, a clamp having a fixed jaw, a movable jaw, a member for moving said movable jaw, means on said member for releasably attaching the same to a clamp stick, said means comprising a threaded portion and a non-round portion, a clamp stick having a hollow end, inwardly extending threads on the inner wall thereof for engagement with the threads on said member, a chuck rotatably mounted in the hollow of said end for non-rotating engagement with said non-round portion, and adjustable means for selectively allowing only clockwise or counter-clockwise rotation of said chuck relative to said stick, the relative positions of said chuck and said inwardly extending threads in said stick corresponding to the relative positions of the threaded portion of said member and the non-rounded portion thereof.

12. In combination with a manipulating member as claimed in claim 9, a clamp comprising a body portion, a fixed upper jaw, a movable lower jaw, a screw having a head rotatably attached to said lower jaw, said screw having upper and lower sets of threads, said upper set being threadedly engaged with said body for moving the lower jaw when the screw is rotated, said lower set being separate from the upper set and being adapted for threaded engagement with the threads on the inner wall of said socket, said screw having a square tapered lower end portion.

13. In combination with a clamp as claimed in claim 2, a clamp stick having an elongated socket at the top end thereof, an internally threaded portion on the inner wall of said socket for threaded engagement with said lower threaded portion, a chuck rotatably supported in said socket below said internally threaded portion, said chuck having a square central opening, the sides of which taper inwardly from top to bottom for non-rotating engagement with the square tapered lower end portion of said screw, a ratchet secured to said chuck for rotation therewith, and a pawl supported in said socket and engageable with said ratchet, said pawl being selectively movable between two positions for allowing, in the first of said positions, only clockwise rotation of said ratchet, and allowing, in the second of said positions, only counter-clockwise rotation of said ratchet.

14. Manipulating means for operating, from a remote position, a clamp or the like having a fixed jaw, a movable jaw, and a rotatable element for driving said movable jaw towards open and closed positions upon clockwise or counter-clockwise rotation of said element, respectively,

comprising male and female members, one of said members being affixed to said element, the other of said members being secured to a handle, said male member having an externally threaded portion, said female member having a complementary threaded portion whereby said clamp may be detachably secured to said handle, one of said members having rotatable means thereon, and adjustable pawl means engageable with said rotatable means in either of two positions whereby to allow only clockwise or counter-clockwise rotation of said rotatable means, a portion of the other of said members and said rotatable means having inter-engaging faces providing non-rotating engagement between said rotatable means and the other of said members when said male member is inserted in said female member whereby selectively to allow only clockwise or counter-clockwise rotation of one member relative to the other.

15. Manipulating means for operating from a remote position, a clamp or the like having a fixed jaw, a movable jaw, and a rotatable element for driving said movable jaw towards open and closed positions with respect to the fixed jaw upon clockwise or counter-clockwise rotation of said element, respectively comprising male and female members, one of said members being affixed to said element, the other of said members being secured to a handle, said male member having an externally threaded portion and a non-threaded portion, said female portion comprising a socket having inwardly extending threads on the inner wall thereof and a chuck rotatably mounted therein, and adjustable means for selectively allowing only clockwise or counter-clockwise rotation of said chuck relative to said socket, the threads and chuck on said female member being respectively complementary with the threaded and non-threaded portions on said male member, said non-threaded portion having inter-engaging faces for preventing relative angular movement therebetween.

16. Manipulating means for operating, from a remote position, a clamp or the like having a fixed jaw, a movable jaw, and a rotatable element for driving said movable jaw towards open and closed positions with respect to the fixed jaw upon clockwise or counter-clockwise rotation of said element, respectively, comprising a threaded male portion and non-round portion on said member, and a second member detachably securable to the first member, said second member comprising an elongated handle portion, and a hollow female end portion, said end portion having inwardly extending threads on the inner wall thereof, a chuck rotatably mounted in said hollow end portion, said chuck and said non-round portion having inter-engaging faces providing non-rotating engagement therebetween and adjustable means for selectively allowing only clockwise or counter-clockwise rotation of said second member, the inwardly extending threads in said hollow end portion being complementary with the threaded portion of the first-mentioned member, the relative position of said chuck with respect to said inwardly-extending threads in said hollow end portion corresponding to the relative position of the threaded portion and the non-round portion of the first-mentioned member.

17. Manipulating means for operating, from a remote position, a clamp or the like having a fixed jaw, a movable jaw, and a threaded element for driving said movable jaw respectively towards or away from said fixed jaw upon rotation of said element, comprising an elongated male member integral with said element, said male member having threads thereon and a tapered end, and a female socket member complementary with and detachably securable to said male member, said female member comprising a handle and an elongated open-mouth socket at one end of said handle, said socket having threads on its inner wall complementary with the threads on the male member, a chuck rotatably mounted between said threads and the closed end of said socket, ratchet teeth on said chuck, and a double pawl engageable with said ratchet teeth and movable between two positions for selectively allowing only clockwise or counter-clockwise rotation of said chuck, said chuck and said tapered end of said male member having interengaging faces providing non-rotating engagement between said chuck and said male member when said male member is engaged in said socket.

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