May 15, 1928. 1,670,250

F. FROSCHHAUSER

ARMOR CUTTING TOOL

Filed Feb. 17, 1925

Fig. 1

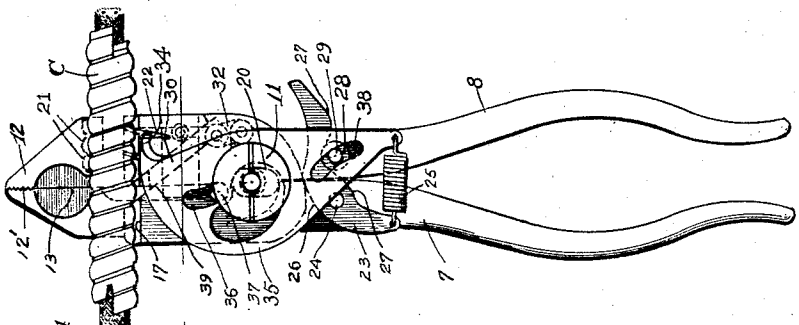


Fig. 2

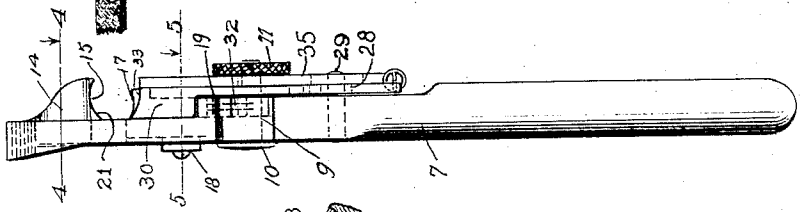


Fig. 3

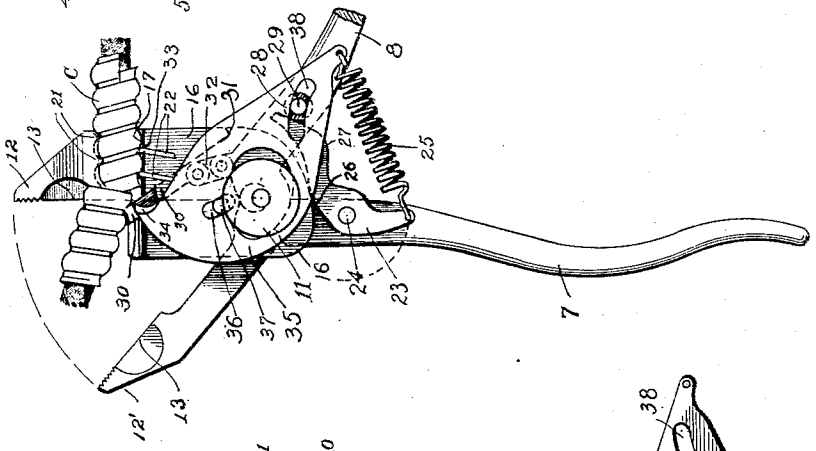


Fig. 4

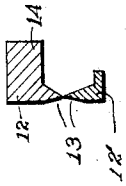


Fig. 5

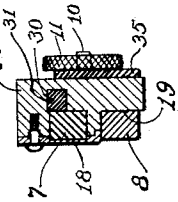
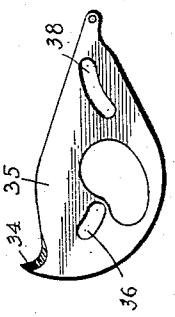


Fig. 6



Inventor

F. Froschhauser

By his Attorney John O. Seifert

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UNITED STATES PATENT OFFICE.

FLORIAN FROSCHHAUSER, OF ROCHELLE PARK, NEW JERSEY.

ARMOR-CUTTING TOOL.

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This invention relates to armor cutting tools and more specifically to a portable manually operated tool which is adapted to cut or sever an armor or conduit, it being understood that, while I shall employ the term "armor", this term is used to cover any arrangement of armor, conduit or tube which is formed of spirally wound interengaging metal coils or convolutions usually formed from a single strip of metal and so shaped that when coiled the several coils or convolutions will interengage or interlock, but will allow of flexibility of the armor, tube or conduit.

The tool is particularly adapted, however, for cutting metallic armor of electric conductor cables, commercially known as "B-X" cables. Heretofore, it has been the common practice when cutting such armor to use the ordinary hack saw. This is a trying and time-killing process. The workman usually holds the cable with one hand, supporting it either on his knee or on any other support, and endeavors to saw the armor all the way around without allowing the saw to cut sufficiently deep to cut into the insulation of the cable. If he does cut into the insulation of the cable, and he frequently does, it seriously affects the efficiency or the electric conductor and frequently results in short circuits which cause fires.

It is therefore the purpose of my invention to provide a tool, machine or apparatus, manually or otherwise operated, which can be easily and quickly controlled to cut or sever the armor without possibility of danger to the cable, and in carrying out this operation the tool performs three distinct functions in regular sequence. First, the armored cable is quickly clamped; next, the armor is broken by forcing one coil or convolution of the armor out of interlocking engagement with an adjacent coil or convolution; and, third, while the armor is so held the coil or convolution of the armor is cut in a direction longitudinally of the armor, transversely to the coil or strip forming the coil, and in a direction away from the cable so that there is no possibility of cutting or otherwise injuring the cable.

In carrying out the embodiment of the invention illustrated in the drawing I provide a pair of pivotally connected levers arranged at one end as hand grips and at the opposite ends as plier jaws and nippers, one of the levers at such latter end also being provided with a fixed jaw with which a movable jaw co-operates to firmly grip and hold the cable during the spreading and closing movements of the levers, with means operative from the levers during the spreading movement thereof to engage a coil of the armor to collapse and separate it from an adjacent coil, and during such movement a cutter is positioned relative to the separated portion of the coil, which cutter during the closing movement of the levers engages with said separated portion of the coil and severs the same.

In the drawing accompanying and forming a part of this specification Figure 1 is an elevational view of my improved tool showing the levers moved to closed position and with a portion of the armor cable engaged between the cable gripping jaws.

Figure 2 is a side elevation looking at the left of Figure 1 with the cable removed from the cable gripping jaws.

Figure 3 is a view similar to Figure 1 but showing the levers spread to their full extent and showing the armor collapsing and separating means in position after it has collapsed a portion of the armor, and showing the cutter relative to such collapsed portion of the armor and in position to engage and sever the same during the successive closing movement of the levers.

Figure 4 is a cross sectional view taken on the line 4—4 of Figure 2 looking in the direction of the arrow.

Figure 5 is a cross sectional view taken on the line 5—5 of Figure 2 looking in the direction of the arrow; and

Figure 6 is a front elevation of a plate arranged with an armor severing cutter.

Similar characters of reference designate like parts throughout the different views of the drawing.

In the drawing I have shown an embodiment of the invention as combined with a pair of pliers and nippers including a pair of levers 7, 8 pivotally connected intermediate their ends, as at 9, by a headed and threaded pivot 10 and retained upon the pivot by a knurled nut 11, one end of which levers is arranged as a hand grip as shown, while the opposite ends are in the form of gripping jaws 12, 12′ and nippers by arranging the jaws with cutting edges 13 to cut wire and the like and which may also serve to strip insulation from such wire.

The jaw 12 is arranged with an integral

laterally extending projection 14 having one face 15 in the form of a segment of a circle to serve as a fixed cable gripping jaw. A block 16 is arranged with a recess in one face whereby it is mounted upon the lever 7 intermediate its pivotal connection with the lever 8 and the jaw projection 14 to have reciprocatory movement toward and away from said jaw 14, said block having an end curved or in the form of a segment of a circle in opposed relation to the curved jaw face 15, as shown at 17, between which an armored cable C is adapted to be engaged and firmly clamped as the block 16 is moved toward the jaw projection 14. The block is held to the lever 7 by a strap 18 releasably secured to the block, as by a screw, and engaging at the side of the lever opposite to the block, as clearly shown in Figures 2 and 5. The block has an undercut portion 19 to lie contiguous to the pivotal connection of the levers in interposed relation to the lever 7 and the nut 11, said undercut portion of the block having a slot 20 (Figure 1) for the passage of the pivot pin of the levers and to permit of movement of the block transversely of said pin. The jaw face 15 is provided with integral transversely extending ribs 21 arranged as sections of a helix. The jaw face 17 is also provided with similar ribs 22, and while these ribs are shown as inserts they may be arranged integral with the block. In the position of the levers shown in Figure 1 the block 16 will be positioned relative to the projection 14 to permit of the engagement of the cable in the space between the jaw faces 15, 17 by a lateral movement of the cable, the ribs 21, 22 being so arranged that they will engage the successive joints of the cable armor and firmly hold the cable against longitudinal movement when gripped between the jaws, as clearly shown in Figure 3. During the initial spreading movement of the levers the block 16 is moved in a direction to grip the cable by a cam member in the form of a lever 23 pivotally supported on a pin 24 fixed in and projecting laterally from the lever 7, said cam lever being urged by a spring 25 in a direction with a cam edge 26 thereon into engagement with the curved edge of the block, and caused to exert a yielding force upon the block as the levers are spread to their full extent and during the closing movement of the levers by the engagement of the edge 27 of the cam lever opposite to the cam edge 26, which edge 27 is also in the nature of a cam edge, with a fixed abutment or cam follower in the form of an enlargement or shoulder 28 on a pin 29 fixed in and extending laterally from the lever 8.

To collapse and separate the armor at the joint thereof, a plunger or rupturing tool 30 is mounted in a recess 31 extending diagonally through the block 16 with one end cut through the cable gripping jaw face 17 of the block and adapted to have reciprocatory movement in said slot. This plunger has a link connection 32 at one end with the lever 8, and as the levers are spread the plunger through this link connection will have movement imparted thereto in a direction toward and into engagement with the cable engaged between the jaw faces 15, 17 forcing the cable casing or armor extending beyond the jaws laterally collapsing and separating the cable, as shown in Figure 3. After the armor has been collapsed the levers will have been spread to their full extent when the levers are moved to closing position or in a direction toward each other.

As the levers are moved to closing position the armor is severed at the collapsed and separated portion. For this purpose the edge of the block, as at 33, is arranged as a shear cutting edge, and a cutting edge 34 arranged on a plate 35 is adapted to engage within the separated portion of the armor and co-operate with the cutting edge 33 of the block to sever the armor strip in a direction longitudinally of the cable and transversely of the armor strip. The plate 35 is provided with an elongated perforation 36 whereby it is mounted upon a pivot pin 37 in interposed relation to the block 16 and the nut 11, the plate also having an opening for the passage of the pivot pin 10 of the levers, said opening being enlarged to permit of the plate 35 having swinging movement on the pivot pin 37 and movement laterally of said pin. Oscillatory movement is imparted to the cutter carrying plate 35 by the engagement of the reduced portion of the pin 29 in a segmental slot 38 in the plate, the plate being yieldingly urged in one direction by connecting one end of the spring 25 thereto. As spreading movement is imparted to the levers said plate due to the pin and slot connection 29, 38 with the lever 8 will participate in the movement of said lever with the upper curved end of the plate in engagement with the extended end of the cable gripped between the jaw faces 15, 17 and moving the plate laterally or downward of its pivot support 37. When the levers have been spread to their full extent and the plunger 30 has been operated to collapse the armor, as shown in Figure 3, the cutting edge 34 of the plate, which is of curved and hooked formation, will be positioned beyond the separated joint of the armor, and as the separated armor is moved laterally by the plunger the plate will be moved upward through the connection of the spring 25 so that the hooked end of the cutting edge will extend above the separated joint of the armor. As the levers are moved together or to closing position the hooked end of the cutting edge extending above the separated armor joint will engage within

the armor and co-operate with the cutting edge 33 of the block and sever the armor. During this closing movement of the levers the plunger 30 is moved in a downward direction or away from the cable, and as the plunger approaches its fully receded position, and the levers approach their fully closed position, a portion extending laterally from the plunger will engage a shoulder formed in the plunger recess of the block, as shown at 39, and move the block to cable releasing position.

It will thus be noted that in carrying out the operation of cutting or severing the armor, the cutter 34 will move through at least one coil or convolution of the armor, and not only longitudinally of the armor but in a direction away from the armor so that there will be no possibility of the cutter severing or disturbing the insulation of the cable in the armor. When a single coil or convolution is severed, the armor as a whole will be cut and one end thereof can be moved longitudinally off of the cable. My improved tool therefore performs three distinct operations. First, it grips and holds the armor; second, it breaks the armor by forcing one convolution of the armor away from another; and, third, it severs one coil or convolution of the armor at the break of the armor. I therefore desire to cover broadly the idea of a tool, preferably operated manually, which functions to sever a coil or convolution of an armor in a direction longitudinally of the armor after the armor is broken, the convolutions thereof separating so that not only can the operation be performed easily and quickly but such operation can be performed without any danger whatever of cutting or otherwise disturbing the insulation of the cable in the armor. The initial movement of the handhold ends of the levers 7 and 8 toward each other brings the clamp into operation and this clamp is only released when the levers reach their extremity of movement. The arrangement of slots and opening in the cutter member 35 allows the latter to perform its operations before the clamp is released.

The operation of the tool may be briefly stated as follows: With the levers 7 in the position shown in Figure 1 the tool may be placed with the clamping members over the conduit. When the levers are forced apart, the first operation is that of moving the clamping jaw 16 toward the conduit, and this operation is due to the fact that the enlargement 28 on pin 29 engages the cam face of lever 23, the latter being in engagement with the movable jaw. The cam face of this lever 27 insures a movement of the movable jaw to clamping position and holds it in clamping position throughout the separating movement of the levers 7 and 8 and throughout a partial return movement of the levers 7 and 8 toward each other. Another operation takes place when the levers 7 and 8 are spread apart, and that is, the plunger 30 is moved longitudinally toward the armor to break or separate the convolutions, and this movement is due to the fact that the plunger is directly connected to the lever 8 by the link 32. Also during these outward or separating movements of the levers 7 and 8, the cutter is swung on its pivot but is not moved outwardly due to the fact that the slot 36 allows the pin 37 to move in said slot. However, at the extremity of the separating means of the levers 7 and 8 the pin 37 is in the end of the slot 36 so that when the levers 7 and 8 are moved toward each other the cutter is swung in the arc of a circle, projecting the cutting end toward the armor and in position to engage a convolution of the armor, and due to the arrangement of slots in the cutter this movement is longitudinally of the cable and in a direction away from the cable and not toward the cable so that there is no danger of cutting the cable. As the levers 7 and 8 approach each other after the cutting operation is completed, the clamp is released and the tool can be removed from the armor.

While I have illustrated and described one embodiment of my invention it will be obvious that various modifications may be made in construction and arrangement of parts without departing from the scope of the invention, and that portions of the invention may be used without others and come within the scope of the invention.

Having thus described my invention I claim:

1. In means for severing the armor of cables, a pair of levers, a cutter carried by the levers and means operative by a movement of the levers to grip the cable and separate a portion of the armor, said cutter being adapted to be positioned relative to the separated portion of the armor by such movement of the levers and engage the separated portion of the armor by another movement of the levers so as to sever the armor.

2. In means for severing the armor of electric cables, a pair of pivotally connected levers, each lever being arranged at one end as a hand grip and one lever having a fixed jaw, a jaw movable toward and away from the fixed jaw and between which jaws a cable is adapted to be engaged, means operative by the movement of the levers in one direction to actuate the movable jaw to clamp the cable between the jaws, and a cutter operable by the movement of the levers in reverse direction to sever the armor of the cable while maintaining the cable clamped between the jaws.

3. In means for severing the spirally

wound flexible metal armor of electric cables, a pair of pivotally connected levers arranged with jaws for the engagement of the cable between the same and operative by the movement of the levers in one direction to clamp the cable between the jaws, and a cutter actuated during the reverse movement of the levers to sever a convolution of the armor of the cable while maintaining the same clamped between the jaws.

4. In means for severing the spirally wound flexible metal armor of electric cables, a pair of pivotally connected levers arranged with means for the engagement and holding of a cable during the spreading and closing movements of the levers and adapted to release the cable during the latter portion of the closing movement of the levers, and a cutter adapted to be moved and positioned relative to the cable held by the levers during the spreading movement of the levers so as to sever a convolution of the armor during the closing movement of the levers.

5. In means for severing the spirally wound flexible metal armor of electric cables, a pair of pivotally connected levers arranged with means for the engagement and holding of a cable during the spreading and closing movements of the levers and adapted to release the cable during the latter portion of the closing movement of the levers, means actuated during the separating movement of the levers to separate convolutions of the armor, and a cutter adapted to be positioned relative to the separated portion of the armor of the cable held by the levers during the separating movement of the levers and to engage the separated portion of the armor so as to sever a convolution of the same during the closing movement of the levers.

6. In a tool for severing the spirally wound flexible metal armor of electric cables, a pair of pivotally connected levers arranged as hand grips at one end and one lever having a fixed jaw at the opposite end, a block arranged as a jaw movably mounted on the lever having the fixed jaw and adapted to grip a cable engaged between the jaws during the movement of the levers, and a cutter pivotally supported to have movement on an axis eccentric to the pivotal connection of the levers and adapted to be positioned relative to a convolution of the cable gripped between the jaws during the spreading movement of the levers and engage the armor so as to sever a convolution of the same during the closing movement of the levers.

7. In a tool for severing the convolutely wound armor of electric cables, a pair of pivotally connected levers arranged as hand grips at one end and one lever having a fixed jaw at the opposite end, a block arranged as a jaw movably mounted on the lever having the fixed jaw and adapted to grip a cable engaged between the jaws during the movement of the levers, a plunger carried by said block operative during the spreading movement of the levers to engage the armor gripped between the jaws and separate the same, and a cutter pivotally mounted on the block and adapted to be positioned relative to the separated convolutions of the armor during the spreading movements of the levers so as to engage the separated portion of the armor and sever the same during the closing movement of the levers.

8. In a tool for severing the armor of electric cables, a pair of pivotally connected levers arranged as hand grips at one end and one lever having a fixed jaw at the opposite end, a block arranged as a jaw movably mounted on the lever having the fixed jaw and adapted to grip a cable engaged between the jaws during the movement of the levers, a plunger carried by said block operative during the spreading movement of the levers to engage the armor gripped between the jaws and separate convolutions of the armor, and a cutter mounted on the block adapted to be moved in one direction and positioned relative to the separated portion of the armor during the spreading movement of the levers, and moved in reverse direction into engagement with the separated portion of the armor and co-operate with the block to shear the same during the closing movement of the levers.

9. In a tool for severing the armor of electric cables, a pair of pivotally connected levers arranged as hand grips at one end and one lever having a fixed jaw at the opposite end, a block arranged as a jaw movably mounted on the lever having the fixed jaw to have movement toward and away from the fixed jaw, a cam pivotally carried by one lever and co-operating with an abutment on the other lever to move the block in a direction toward the fixed jaw and grip a cable engaged between the jaws during the spreading movement of the levers. a plate juxtaposed to the block and mounted thereon eccentric to the pivotal connection of the levers, said plate being arranged with a cutting edge contiguous to the jaw of the block, a spring to interconnect the cam and plate to yieldingly urge the cam into operative relation with the block, and a pin and slot connection between the cutter plate and one lever to position the plate with the cutting edge in predetermined relation to the armor gripped between the jaws during the spreading movement of the levers and in reverse direction to engage and sever the armor of the cable during the closing movement of the levers.

10. In a tool for severing the armor of electric cables, a pair of pivotally connected

levers arranged as hand grips at one end and one lever having a fixed jaw at the opposite end, a block arranged as a jaw movably mounted on the lever having the fixed jaw to have movement toward and away from the fixed jaw, a cam pivotally carried by one lever and co-operating with an abutment on the other lever to move the block in a direction toward the fixed jaw and grip a cable engaged between the jaws during the spreading movement of the levers, a plunger slidably mounted in the block to have movement independently of the block in a direction toward and away from the cable gripped between the jaws during the movement of the levers and in its movement toward the cable engaging with and separating convolutions of the armor, an operative connection between said plunger and one of the levers to impart said movement to the plunger by the movement of the levers, a plate juxtaposed to the block pivotally mounted thereon eccentric to the pivotal connection of the levers, said plate being arranged with a cutting edge contiguous to the jaw of the block, a spring to yieldingly urge the cam into operative relation with the block, and a pin and slot connection between the cutter plate and one lever to position the cutting edge of the plate in predetermined relation to the armor gripped between the jaws during the spreading movement of the levers and in reverse direction to engage and sever the armor of the cable during the closing movement of the levers.

11. A tool of the character described, including means for separating convolutions of a spirally wound metal conduit, and a cutter movable through a convolution of the separated conduit and in a direction longitudinally of the conduit and away from the conduit during this cutting movement.

12. A tool of the character described, including a clamp adapted to hold a spirally wound metal conduit, a device constituting a part of the tool and adapted to separate the convolutions of the conduit, and a cutter movable transversely of a convolution of the conduit to sever the same at the place of separation.

13. A tool of the character described, including a pair of pivoted levers, a clamp operated by the levers and adapted to grip a spirally wound metal conduit, a plunger moved by one of the levers to force the convolutions of the conduit apart, and a cutter operated by one of said levers to cut a single convolution of the conduit at the point of separation.

Signed at New York city, in the county of New York and State of New York, this 12th day of February, 1925.

FLORIAN FROSCHHAUSER.