

Feb. 6, 1962

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3,019,517

WIRE UNWRAPPING TOOL

Filed Feb. 17, 1958

FIG. 1

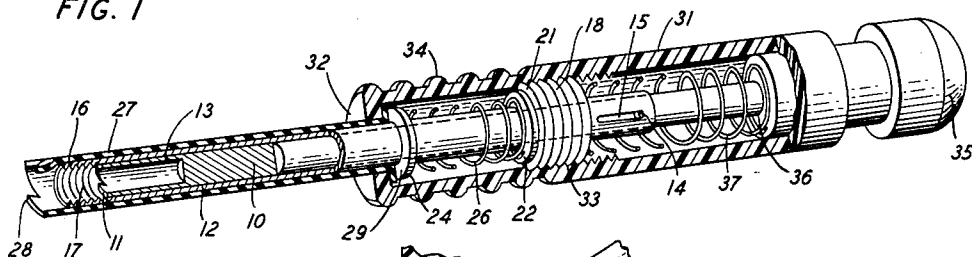


FIG. 3A

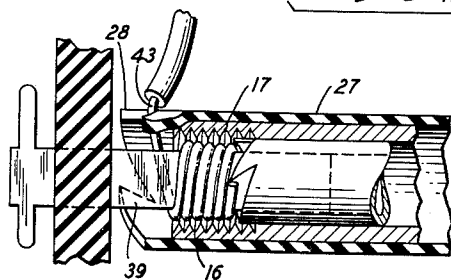


FIG. 2

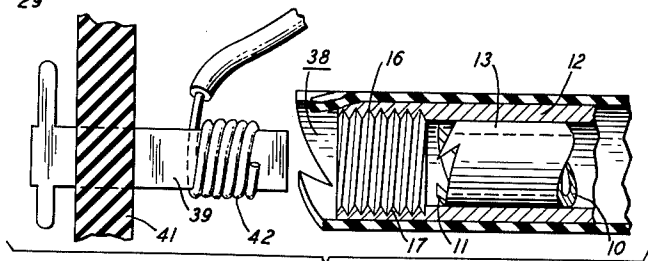


FIG. 3B

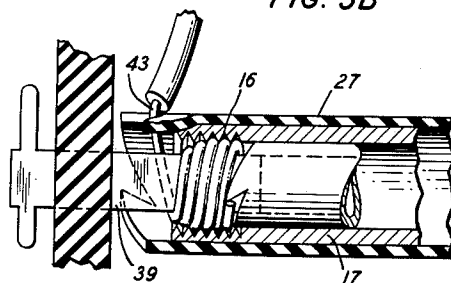
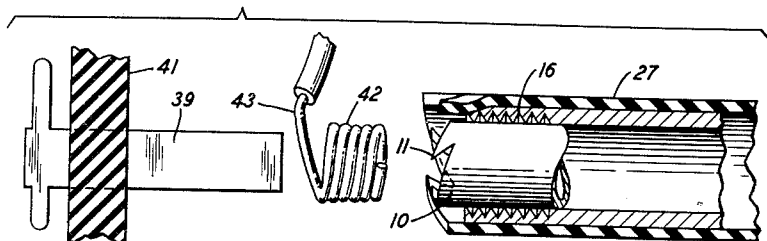


FIG. 3C



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3,019,517

WIRE UNWRAPPING TOOL

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Filed Feb. 17, 1958, Ser. No. 715,736
7 Claims. (Cl. 29-203)

This invention relates to wire handling tools and more particularly to tools of the type disclosed in Patent 2,804,887 to F. Reck issued September 3, 1957 for removing wrapped wire connections from terminals.

On many occasions it is desirable to relocate wire leads attached to a terminal bank by wrapped wire connections. In a central office of a telephone system, as an example, subscriber lines are often attached to a terminating bank by wrapped wire connections and many times are relocated due to increased or decreased telephone service requirements on the part of the subscribers served by the central office. The process of transferring a subscriber line requires the wrapped wire connection to be loosened and a new connection made at another terminal. The entire process is time-consuming and tedious. Since the number of transfers at one time or another may be large, it is desirable from a service standpoint to relocate the subscriber lines as rapidly and efficiently as possible.

An object of the invention is the rapid and efficient removal and relocation of wire leads attached to terminals by wrapped wire connections.

Another object of the invention is the reusing of a removed wrapped wire connection at another or the same terminal in the bank.

A feature of this invention resides in a tool which when brought into contact with a wrapped wire connection and rotated causes the connection to be loosened from the terminal and stored in the tool for use at another or the same terminal.

One feature of the tool is an unwrapping and ejecting shaft having tooth members for grasping the outermost turn of a connection on engagement of the tool and connection and loosening the succeeding turns on a terminal as the tool is rotated. Because of the application of the loosening force through the wire from the end turn, little or no torque is transmitted to the terminal. Thus the danger of twisting off terminals of minimum cross section is inhibited.

Another feature of the tool is an internally threaded sleeve surrounding the unwrapping and ejecting shaft for automatically receiving and storing the loosened turns of a connection as they are separated from the terminal.

Still another feature of the tool is an outer sleeve surrounding the internally threaded sleeve for preventing the wire lead to a connection from snaking out of the tool and short-circuiting to adjacent terminals during the unwrapping operation.

In an illustrative embodiment, an unwrapping and ejecting shaft having tooth members at one end thereof is positioned within an inner sleeve shorter in length than the shaft. The sleeve is threaded internally to cooperate with the tooth members of the unwrapping and ejecting shaft by storing the connection removed from a terminal by the tooth means. The sleeve is slotted near the other end to receive key members on the unwrapping and ejecting shaft. Located on the inner sleeve is an externally threaded enlarged diameter section one end of which serves as one working surface for a friction clutch assembly mounted on the inner sleeve. Surrounding, and extending partly along the inner sleeve is an outer sleeve having a flanged end that abuts the clutch assembly to provide a second working surface for the clutch. The other end of the outer sleeve has slots therein and it ex-

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tends beyond the internally threaded end of the shaft. A tubular handle having a section of internal threading engages the external threading on the enlarged diameter section to form a housing for the tool. The handle encloses the outer sleeve adjacent the flanged end and is adapted to receive a slidable plunger therein attached to that end of the shaft removed from the tooth means. Biasing means act against the plunger to position the one end of the shaft normally within the inner sleeve.

These and other objects and features of the invention will be more fully apprehended from the following detailed description taken in conjunction with the appended drawing in which:

FIG. 1 is a perspective view of one embodiment of the present invention with parts broken away to show the interior of the tool;

FIG. 2 is an enlarged view of a wrapped wire connection and the unwrapping end of the tool;

FIG. 3A illustrates the first position of the tool of FIG. 1 in the removing of a wrapped wire connection from a terminal;

FIG. 3B shows a wrapped wire connection being stored in the tool of FIG. 1 as it is separated from the terminal; and

FIG. 3C indicates the manner of ejecting a wrapped wire connection stored in the tool of FIG. 1.

As shown in FIGS. 1 and 2, an unwrapping and ejecting shaft 10 of a suitable metal, e.g., steel, having tooth members 11 at one end is positioned within an inner sleeve 12 which may also be of steel or similar metal.

Located within the shaft 10 is an orifice or axial passageway 13 (see FIG. 2) that extending inwardly from the tooth members 11 for a preselected distance. The shaft also includes a key or pin 14 which fits into a slot 15 of an inner sleeve 12 to form a lost motion connection that limits longitudinal movement of the shaft with respect to the sleeve and provides a rotation imparting connection between this sleeve and the shaft.

The end 16 of the sleeve 12 overlies the tooth members 11 and includes internal threading 17 which cooperates with the tooth members in a manner to be explained hereinafter. The sleeve 12 also includes an externally threaded enlarged diameter section 18. The end 21 of the section 18 provides a working surface for a thrust washer part 22 of a friction clutch assembly 23, said assembly consisting of thrust washers 22 and 24 and a compression spring 26 all mounted on the sleeve 12.

Extending substantially half the length of the sleeve 12 is a surrounding sleeve 27 advantageously of insulating material, one end of which includes notches or V shaped teeth 28 and extends beyond sleeve end 16. The insulating material of the sleeve prevents short-circuiting of electrically energized terminals by the tool during operation thereof. The sleeve may also be of conducting material when the tool is employed with terminals that are not electrically energized. Likewise, the notches or teeth 28 may be of a configuration other than that shown in the drawing which has been selected for reasons of convenience in explanation. A flanged end 29 is located at the opposite end of the insulated sleeve. The end 29 abuts the thrust washer 24 to provide a second working surface for the friction clutch assembly.

The assembly of FIGS. 1 and 2 thus far described is inserted in a tubular handle 31 having an internal shoulder or end 32 with a bore of reduced diameter and internal threading 33 located substantially near the center of the handle. The handle also includes a finger grip 34 to aid in manipulating the tool. The shaft 11, and sleeves 12 and 27, extend through the end 32 of the handle with the sleeve 12 being secured to the handle 31 by the engagement of the threading of the section 18 with the threading 33 of the handle. The distance of the thread-

ing 33 from the end 32 is selected so that upon full engagement of the section 18 and threading 33 the clutch spring 26 will be placed in sufficient compression to rotate the sleeve 27 with the sleeve 12 until a preselected force is applied to the sleeve 27.

To control the translational movement of the shaft 10 with respect to the sleeve 12, a plunger 35 is attached to the end 36 of the shaft 10 remote from the tooth members 11. An expanding or helical spring 37 is positioned between the section 18 of the sleeve 12 and the plunger 35 to bias the shaft 10 toward said plunger with its toothed end within the sleeve 12. The shaft being withdrawn inside the sleeve produces a cavity 38 of a predetermined length at the unwrapping end of the tool for receiving a terminal 39 positioned in an insulating panel 41 and having a wrapped wire connection 42 thereon.

The operation of the tool will now be described with the aid of FIGS. 3A, B and C. As shown in FIG. 3A, the terminal 39 is inserted into the cavity 38 and the passageway 13 of the shaft 10 until the tooth members 11 about the outermost turn of the connection. The lead portion 43 of the connection outside the tool normally wedges in one of the slots 28 of the sleeve 27. In the event that the lead 43 does not bottom in one of the slots 28 on engagement of the tooth members and the connection, it will be caught and bottomed during counterclockwise rotation of the tool as shown in FIG. 3B, the next step in the removal and relocation of a wrapped wire connection. It will be noted that the sleeve 27 rotates with the tool until the lead 43 bottoms in one of the slots 28 whereupon the friction clutch operates to disconnect the sleeve 27 from the remaining elements of the tool. The lead 43 is capable of withstanding greater forces than can be transmitted to the sleeve 27 by the clutch assembly 23, consequently the sleeve remains stationary while the remaining elements of the tool rotate. The holding of the lead 43 by the sleeve 27 prevents it from snaking out and short-circuiting to adjacent terminals as the connection is separated from the terminal. This holding of the lead by the sleeve 27 also aids the tool in withdrawing the separated connection from the terminal.

As the tool is rotated counterclockwise, the tooth members "bite" into and grasp the outermost turn of the connection. The continued rotation of the tool thereafter transmits force to the successive turns of the connection in the unwinding or unwrapping direction. As the wrapping tension of a turn is nullified, the turn springs loose from the terminal and is automatically lodged in the internal threading 17 of the sleeve 12 as shown in FIG. 3B. This is accomplished by the pitch of the threading being substantially the same as the pitch of the expanded connection. In the case of 24 gauge wire the pitch of the threading is approximately 40 threads per inch whereas in the case of 22 gauge wire the pitch would be 32 threads per inch. Generally the pitch of the threading is the same as the pitch of a connection expanded to a predetermined dimension or it may be coarser within certain limits but it should not be of a lesser pitch than the expanded connection.

In the removal of the connection, it should be noted that the shaft 10 does not translate with respect to or engage the terminal since the tooth members are held by the outermost turn of the connection lodged in the threading 17. As a result the torsional forces applied to the tool have little or no opportunity of being transferred to the terminal which enables the tool to be employed with little or no danger of twisting terminals of very small thickness.

Since wrapped wire connections may be made in either a clockwise or counterclockwise direction, the tool of the present invention will be constructed for operation in the proper direction, i.e., counterclockwise or clockwise, respectively, to loosen the connection from the terminal. To accomplish this result the teeth 11 must be appropriately shaped to grasp and transmit unwrapping

tension to the connection in accordance with the winding direction of the connection desired to be removed. Thus, the tooth members may have configurations that are the reverse of those shown in the drawing, e.g., tooth members slanted in the clockwise instead of the counterclockwise direction. A tool of this type may be adapted for removing wraps of either hand by making the shaft teeth double, i.e., hooked in both directions and having both left and right hand wire retaining threads within the inner sleeve. It is understood therefore that applicant should not be limited to the details of a tool that is operated by rotation in the counterclockwise direction only.

The storing of the removed connection in the threading 17 limits its diameter and allows it to be reused at another or the same terminal since the shape of the connection is not distorted in the unwrapping process. The tension within the connection, however, is inadequate for a wrapped wire connection therefore requiring the connection to be soldered to the terminal for satisfactory electrical connection between these two members.

The stored connection and wire lead may be conveniently transported to the next terminal by the tool where the connection can be ejected from the tool by depressing the plunger 35 (see FIG. 1) thereby urging the shaft 10 toward the sleeve end 16 as shown in FIG. 3C. An alternative method of ejecting the connection is to rotate the tool in the direction opposite to that employed in removing the connection which in the present embodiment is clockwise rotation of the tool. The stored connection may be either ejected onto the terminal or it may be ejected from the tool and slipped over the terminal by hand at the convenience of the operator.

Thus it may be seen that the present invention enables wire leads to be rapidly and efficiently removed from a terminal and relocated to another terminal. The tool may be quickly placed over a terminal, rotated a few turns and the connection removed. No extra effort is involved in reconnecting a lead to another terminal since the stored connection is ejected onto the new terminal location where it is soldered into place. It is apparent that the present invention incorporates a number of features which cooperate uniquely to achieve the desired result of relocating wire leads on a terminal bank in an expeditious and efficient manner. Laboratory tests have indicated that the tool of the present invention will considerably reduce the time required in relocating connections to a terminal bank.

It is to be understood that the above-described structure is illustrative of the application of the principles of this invention. Numerous other modifications of the structure disclosed may be devised by those skilled in the art without departing from the spirit and scope of the invention.

What is claimed is:

1. A tool for unwrapping a wrapped wire connection from a terminal comprising an unwrapping and ejecting shaft having at one end means for engaging a wrapped wire connection and a passageway for receiving a terminal, a sleeve enclosing said shaft, means coupling said shaft to said sleeve to limit axial movement of the shaft with respect to the sleeve, a handle enclosing the other end of said shaft and secured to the sleeve, a plunger that slides within said handle being attached to the other end of said shaft, and biasing means secured to said sleeve and acting against the plunger to withdraw the one end of the shaft within the sleeve.

2. A tool for removing a wrapped wire connection from a terminal comprising an unwrapping and ejecting shaft having at one end tooth means for engaging a wrapped wire connection and a passageway for receiving a terminal, a sleeve having a slotted opening therein enclosing a shaft, said shaft member having a key member thereon for engaging the slotted opening of the sleeve to limit axial movement of the shaft with respect to the sleeve, said sleeve including an enlarged diameter sec-

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tion having external threading thereon, a handle enclosing said other end of said shaft and including internal threading for engaging the external threading of said enlarged diameter section to secure said handle to said sleeve, the handle being adapted to receive a plunger which slides therein, said plunger being attached to the other end of the shaft, and biasing means positioned between the plunger and said enlarged diameter section for normally positioning the shaft with said one end within the sleeve.

3. A tool for removing a wrapped wire connection from a terminal comprising an unwrapping and ejecting shaft having at one end tooth means for engaging a wrapped wire connection and a passageway for receiving a terminal, a sleeve enclosing said shaft, coupling means limiting axial movement of the shaft with respect to said sleeve, said sleeve including means cooperating with said tooth means to store automatically a wrapped wire connection removed from the terminal by said tooth means, said sleeve being shorter in length than said shaft, a handle enclosing the other end of said shaft and internally secured to the sleeve, a plunger that slides within said handle being attached to the other end of said shaft, and biasing means secured to said sleeve and acting against said plunger to urge said one end of the shaft within the sleeve.

4. A tool for removing a wrapped wire connection from a terminal comprising an unwrapping and ejecting shaft having at one end tooth means for engaging a wrapped wire connection and a passageway for receiving a terminal, an inner sleeve enclosing said shaft, coupling means limiting axial movement of the shaft with respect to said inner sleeve, said inner sleeve including means cooperating with said tooth means to store automatically a wrapped wire connection removed from the terminal by said tooth means, an outer sleeve surrounding and extending along the inner sleeve a distance less than the length of the inner sleeve, the outer sleeve having a flanged inner end and a slotted outer end that extends beyond the cooperating means of the inner sleeve, means mechanically coupling said flanged end to said inner sleeve, a handle enclosing the outer sleeve adjacent the flanged end, said handle being secured to the inner sleeve and adapted to receive a plunger that slides therein, said plunger being attached to the other end of the shaft which extends beyond the inner sleeve, and biasing means secured to said sleeve and acting against said plunger to urge the one end of the shaft within the sleeve.

5. A tool for removing a wrapped wire connection from a terminal comprising an unwrapping and ejecting shaft having at one end tooth means for engaging a wrapped wire connection and a passageway for receiving a terminal, an inner sleeve enclosing said shaft, coupling means limiting axial movement of the shaft with respect to said inner sleeve, said inner sleeve having internal threading therein which cooperates with said tooth means to store automatically a wrapped wire connection removed from said terminal by said tooth means, said inner sleeve including an enlarged diameter section having external threading thereon, an outer sleeve one end of which is flanged and the other end of which includes slots located in the periphery thereof, said outer sleeve surrounding and extending along the inner sleeve a distance less than the length of the inner sleeve, a clutch assembly positioned on the inner sleeve between the flanged end and the enlarged diameter section, a handle enclosing the outer sleeve adjacent the flanged end, said handle including internal threading engaging the external threading of the enlarged diameter section to secure the handle to the inner sleeve, a plunger that slides within the handle being attached to the other end of the shaft

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which extends beyond the inner sleeve, and biasing means normally positioning between the plunger and said enlarged diameter section for urging the one end of the shaft within the sleeve.

6. A tool for removing wrapped wire connections from a terminal comprising an unwrapping and ejecting shaft having at one end tooth means for engaging a wrapped wire connection and a passageway for receiving a terminal, an inner sleeve enclosing said shaft, coupling means limiting axial movement of the shaft with respect to said inner sleeve, said inner sleeve shorter in length than the shaft and including internal threading which cooperates with said tooth means, an outer sleeve surrounding and extending along the inner sleeve a distance less than the length of the inner sleeve, said outer sleeve including slots located in the periphery of one end thereof, means mechanically coupling the other end of the outer sleeve to the inner sleeve, a handle enclosing the other end of the outer sleeve and secured to the inner sleeve portion extending beyond the outer sleeve, a plunger that slides within said handle being attached to the other end of the shaft which extends beyond the inner sleeve, and biasing means secured to said sleeve and acting against the plunger to urge the one end of the shaft within the sleeve whereby inserting a terminal having a wrapped wire connection thereon within the inner sleeve and rotating the tool causes the slots in the outer sleeve to hold the lead portion of the connection while the tooth means of the shaft engage the connection and transmit pressure to the successive turns of the connection to separate each turn from the terminal, each turn on separation being automatically stored in the internal threading of the inner sleeve.

7. A tool for removing a wrapped wire connection from a terminal, said tool comprising an unwrapping and ejecting shaft having a toothed outer end for engaging the free end wrap of a wrapped connection and a central orifice for receiving a terminal, an inner sleeve on the shaft, said inner sleeve having internal wire receiving threads at its outer end and a lost motion connection adjacent its inner end coupling said inner sleeve to an intermediate portion of the shaft for rotation with and limited longitudinal motion with respect to said shaft, said inner sleeve also including an enlarged, externally threaded section intermediate its ends, an outer sleeve of about half the length of the inner sleeve on said inner sleeve and extending beyond the outer end thereof, said outer sleeve having notches at its outer end and a flange at its inner end, a clutch connecting the sleeves together, said clutch including a spring surrounding the inner sleeve and compressed between two washers, one washer abutting the flange and the other washer abutting the enlarged section of the respective sleeves, a handle threaded on said enlarged section and having at one end an internal shoulder confining said flange, a plunger fitting within the other end of said handle and secured to the inner end of the shaft, and an expanding spring between the plunger and said enlarged section for biasing the shaft toward its inner end with its outer end withdrawn into the inner sleeve slightly beyond the wire receiving threads.

References Cited in the file of this patent

UNITED STATES PATENTS

1,803,518	White	May 5, 1931
2,688,449	Haagensen	Sept. 7, 1954
2,804,887	Reck	Sept. 3, 1957
2,839,823	Brancato	June 24, 1958
2,855,661	Forester	Oct. 14, 1958
2,885,771	Schinske	May 12, 1959