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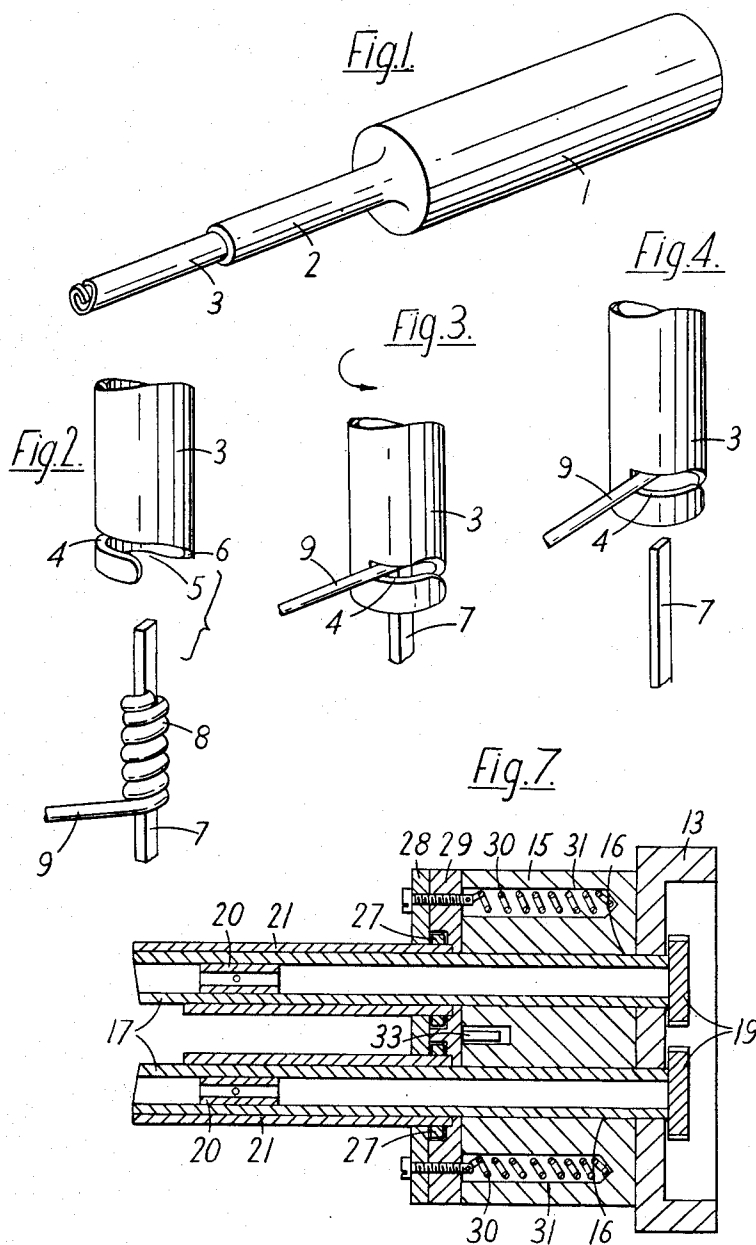
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TOOLS FOR UNWRAPPING WRAPPED ELECTRICAL CONNECTIONS

Filed Oct. 24, 1960

2 Sheets-Sheet 1



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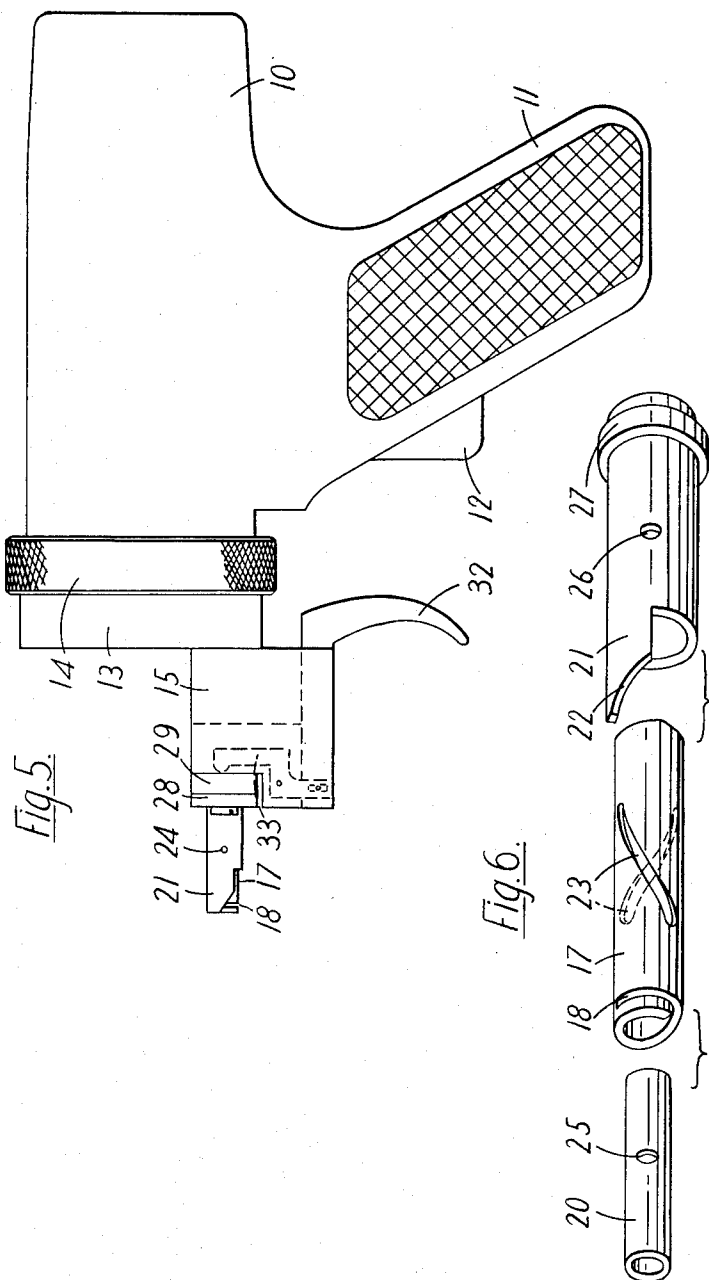
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TOOLS FOR UNWRAPPING WRAPPED ELECTRICAL CONNECTIONS

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This invention relates to tools for unwrapping wrapped electrical connections.

Wrapped electrical connections are now well known and comprise a terminal pin having one or more abrupt longitudinal edges, mounted on an electrically non-conductive base and one or more non-insulated wires having several turns wrapped around the terminal pin, one end of the connecting portion of each wire being wrapped closely against the pin and the other end projecting outwardly away from the pin. The pressure of each wire on the terminal pin is sufficient to ensure a good electrical connection between each wire and the terminal pin which serves to connect the one or more wires into a circuit without the use of any solder.

Wrapped electrical connections are becoming increasingly used due to their reliability and the speed and ease with which they may be made with the use of special tools. A difficulty arises, however, when it becomes necessary to remove the wrapped wire from the terminal pin. Merely pulling the wrapped portion of the wire axially from the pin often results in deformation of the terminal pin due to the movement of the tightly wound portion of wire along it and in extreme cases the terminal pin may be detached from the base. One known method which avoids damaging the terminal pin is to unwrap the wire by means of a tool having a tubular portion, which is placed over the terminal pin, and an offset protuberance parallel to the axis of the tubular portion which, when the tool is rotated, catches on the wire and unwraps it. With this tool the unwrapped wire is not held in any way and may easily be dropped into the equipment of which the terminal pin is a part. Since the unwrapped wire is in the form of a ragged helix it may catch on the connecting wires of the equipment, and if this occurs it is often difficult to remove.

Accordingly, it is an object of the present invention to provide a tool for unwrapping wrapped electrical connections which does not damage the terminal pin and which retains the unwrapped piece of wire.

According to the present invention, a tool for unwrapping wrapped electrical connections, of the type wherein one end of the connecting portion of a wire is wrapped closely around a terminal pin and the other end projects outwardly away from the pin, includes at least one rotatable tubular member having one end adapted to fit loosely over a wrapped connection, said tubular member containing adjacent but spaced axially from said one end a slot closed at one end and extending transversely to the longitudinal axis of said tubular member and an access to said slot from said one end of said tubular member so formed that when said tubular member is fitted over a wrapped connection the free or projecting end of the wire may pass by way of said access into said slot, whereby rotation of said tubular member in the opposite direction to that in which said wire is wrapped first causes the closed end of said slot to engage the free or projecting end of said wire and thereafter causes unwrapping of the wire, the internal diameter of said tubular member being large enough to permit expansion of the wrapped wire therewithin sufficiently to release the terminal pin, and means for ejecting the unwrapped piece of wire from

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said tubular member including an outer sleeve mounted on said tubular member in such manner that it is rotatable about the longitudinal axis of said tubular member, said outer sleeve having an axial projection for engaging the projecting portion of said unwrapped wire in said transverse slot and moving it to said access, and an inner sleeve slidable axially within said tubular member for thereafter pushing the unwrapped wire out of said tubular portion. As used herein, the term "free end" of a wrapped connection means the end of the wrapped portion of the wire which projects outwardly away from the terminal pin.

Said slot may take many forms. It may for example be T-shaped with the leg of T forming said access from said one end, or it may be L shaped, or said access from said one end may be a continuation of said transverse slot.

In a preferred embodiment, however, one wall of said access is formed as part of a turn of a helix to give a gradual entry to said transverse slot.

Two embodiments of the present invention will now be described by way of example with reference to the accompanying drawings in which:

FIGURE 1 is a perspective view of a tool for unwrapping wrapped electrical connections in accordance with the invention,

FIGURE 2 shows the operative part of the tool shown in FIGURE 1 about to unwrap a wrapped connection,

FIGURE 3 shows the unwrapping operation in progress,

FIGURE 4 shows the completion of the unwrapping operation,

FIGURE 5 shows a side elevation of a power driven tool in accordance with the invention,

FIGURE 6 shows an exploded view of a part of FIGURE 5, and

FIGURE 7 is a sectional plan view of a part of FIGURE 5.

Referring now to the drawings the tool shown includes a handle 1 having an extension 2 to the end of which is attached a tubular member 3, the internal diameter of which is such as to allow the tubular member 3 to fit loosely over a wrapped electrical connection which it is desired to unwrap. The tubular member 3 contains adjacent one end a transverse slot 4 and an access 5 from the end of the tubular member 3 to the transverse slot 4. One wall 6 of the access 5 is formed as part of a turn of a helix to give a gradual entry to the transverse slot 4.

To unwrap an electrical connection comprising a terminal pin 7 having several turns of a wire 8 wrapped around it in a clockwise direction as viewed from the upper end of the pin in FIGURE 2, the tubular member 3 is placed over the connection with the free end 9 of the wire 8 bearing against the end of the tubular member 3, usually after the outwardly projecting portion of the wire has been cut at a point relatively close to the terminal pin. The tubular member 3 is then rotated in the direction of the arrow in FIGURE 3, i.e., counterclockwise, oppositely to the direction in which the wire is wrapped around the pin 7, and this rotation causes the free end 9 of the wire 8 to pass through the access 5 into the transverse slot 4. Further rotation causes the end of the slot to bear against the free end 9 and unwrap the wire 8, the internal diameter of the tubular member 3 allowing sufficient room for the helix of the wire 8 to expand and permit the wire 8 to be removed from the terminal pin 7 in expanded helical form.

When the tubular member 3 is removed from the terminal pin 7 the expanded helix of wire 8 is retained inside the member 3 due to the free end 9 still engaging

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with the transverse slot 4. The wire 8 is subsequently removed from the tubular member 3 by holding the free end 9 and rotating the tubular member 3 in the opposite direction.

It will be appreciated that a tool to unwrap a connection in which the wire 8 has the turns of the helix in the opposite direction to that shown in FIGURE 2 would require the access 5 of the slot to be arranged at the opposite end of the transverse slot 4 and the wall 6 would also have to be formed as part of a turn of a helix in the opposite direction.

The slot contained in the tubular member 3 need not be of the kind described. If, for example, a tool is required to unwrap connections wound in either direction the tubular member 3 could contain a T-shaped slot, the arm of the T forming the transverse slot and the leg of the T forming the access from the end of the tubular member 3.

In practice wrapped electrical connections are often used to make electrical connections between two adjacent sub-assemblies of an apparatus. The two sub-assemblies to be connected have terminal pins disposed along adjacent edges and the pins of each corresponding pair of terminal pins on the two subassemblies are joined by a link of wire having its ends wrapped around the two pins. When it is required to separate the two sub-assemblies the link must be unwrapped to allow for subsequent re-connection and FIGURES 5, 6 and 7 show a power driven tool in accordance with the invention suitable for unwrapping such links. The tool shown also includes means for ejecting the unwrapped pieces of wire.

Referring now to FIGURES 5, 6 and 7, the tool shown includes a casing 10 housing an electric motor and having a handle 11 and a trigger switch 12 for controlling the operation of the electric motor. A head 13 is detachably secured to the casing 10 by a quick release nut 14.

The head 13 carries an offset block 15 which has two bores 16 (FIGURE 7) through which pass two tubular members 17 which are spaced apart by a distance equal to the spacing between the corresponding pairs of terminal pins. At their free ends the tubular members 17 each have a slot similar to that described above with reference to FIGURE 1, only one slot 18 being visible in the drawings. The opposite ends of the tubular members 17 project into a recess in the head 13 and are fitted with gear wheels 19 which are driven by the electric motor through a further gear wheel (not shown).

The wire ejecting mechanism includes for each of the tubular members 17 an inner sleeve 20 which slides freely within the tubular member 17 and which has an internal diameter such that it will fit freely over a terminal pin but not over a wire wrapped around the terminal pin. An outer sleeve 21 has an internal diameter such that it slides freely over the outer surface of the tubular member 17 and has a part of one end cut away to give an oblique face 22 (FIGURE 6). The tubular member 17 has a pair of diametrically opposed helical slots 23 and the sleeves 20 and 21 are assembled with the tubular member 17 by means of a pin 24 which passes through holes 25 and 26 in the sleeves 20 and 21 respectively, and through the helical slots 23 in the tubular member 17.

The outer sleeves 21 are each provided with a fixed collar 27 by means of which the sleeves 21 are secured between two plates 28 and 29 so as to be rotatable about their longitudinal axes. The plates 28 and 29 are normally held in contact with the block 15 by springs 30 housed in bores 31 in the block 15. A trigger 32 slidable axially within the block 15 operates a level 33 by means of which the plates 28 and 29 may be urged away from the block 15 against the action of the springs 30.

The dimensions of the components of the wire ejecting mechanism are such that when the plates 28 and 29 are held against the block 15 by the springs 30 each of

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the pins 24 is against the end of the slot 23 nearer to the plates 28 and 29, and the oblique face 22 of the outer sleeve 21 is adjacent the closed end of the slot 18, as shown in FIGURE 5.

In operation, to unwrap a link between a corresponding pair of terminal pins the cross-piece of the link is first cut and the two tubular members 17 are then placed over the wrapped connections. The electric motor is then operated to rotate the tubular members 17 and the two wrapped connections are unwrapped in the manner described previously with reference to FIGURES 2, 3 and 4, the unwrapped pieces of wire being retained in the tubular members 17 with one end of each piece of wire projecting from the slots 18. During the unwrapping operation the inner and outer sleeves 20 and 21 rotate with the tubular members 17.

To eject the unwrapped pieces of wire the trigger 32 is pulled. As the plates 28 and 29 are moved forward through the action of the lever 33 the pin 24 rides in the slots 23 and, since the tubular members 17 are stationary, the inner and outer sleeves are caused to rotate as they advance. As each outer sleeve 21 rotates the oblique face 22 engages the end of the unwrapped wire projecting from the slot 18 and pushes it towards the access from the free end of the tubular member 17. The length of the inner sleeve 20 is such that when the projecting end of the wire is opposite the access the forward end of the inner sleeve 20 engages with the portion of wire within the tubular member 17 such that with further advance of the plates 28 and 29 the unwrapped portion of wire is ejected. After ejection the trigger 32 is released and the action of the springs 30 retracts the plates 28 and 29, the inner and outer sleeves 20 and 21 being restored to their initial position due to the action of the pins 24 in the helical slots 23.

Power driving means and means for ejecting the unwrapped portions of wire as described above with reference to a tool for simultaneously unwrapping two wrapped connections may also be employed with tools for unwrapping a single wrapped connection.

What we claim is:

1. A tool for unwrapping wrapped electrical connections of the type wherein one end of the connecting portion of a wire is wrapped closely against a terminal pin and the other end projects outwardly away from the pin, comprising at least one rotatable tubular member having one end adapted to fit loosely over a wrapped connection, said tubular member containing adjacent but spaced axially from said one end a slot closed at one end and extending transversely to the longitudinal axis of said tubular member and an access to said slot from said one end of said tubular member so formed that when said tubular member is fitted over a wrapped connection the projecting end of the wire may pass by way of said access into said slot, whereby rotation of said tubular member in the opposite direction to that in which said wire is wrapped first causes the closed end of said slot to engage the projecting end of said wire and thereafter causes unwrapping of the wire, the internal diameter of said tubular member being large enough to permit expansion of the wrapped wire therewithin sufficiently to release the terminal pin, and means for ejecting the unwrapped piece of wire from said tubular member including an outer sleeve mounted on said tubular member in such manner that it is rotatable about the longitudinal axis of said tubular member, said outer sleeve having an axial projection for engaging the projecting portion of said unwrapped wire in said transverse slot and moving it to said access, and an inner sleeve slidable axially within said tubular member for thereafter pushing the unwrapped wire out of said tubular portion.

2. A tool as claimed in claim 1 in which said tubular portion contains two diametrically opposed helical slots, said inner and outer sleeves being connected by a pin passing through said helical slots, and in which means are provided for imparting an axial thrust to one of said sleeves, the direction of said helical slots being such that

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said thrust causes rotation of said outer sleeve in the correct direction for moving said projecting portion of said unwrapped wire to said access.

3. A tool as claimed in claim 2 in which said thrust imparting means includes an external collar on said outer sleeve, two plates between which said collar is secured in such manner as to allow rotation of said outer sleeve, and a lever for causing movement of said plates in a direction parallel to the longitudinal axis of said tubular member.

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