April 20, 1965 A. SILINS ET AL 3,179,130

DEVICES FOR WRAPPING WRAPPED CONNECTIONS

Filed Nov. 15, 1962

2 Sheets-Sheet 1

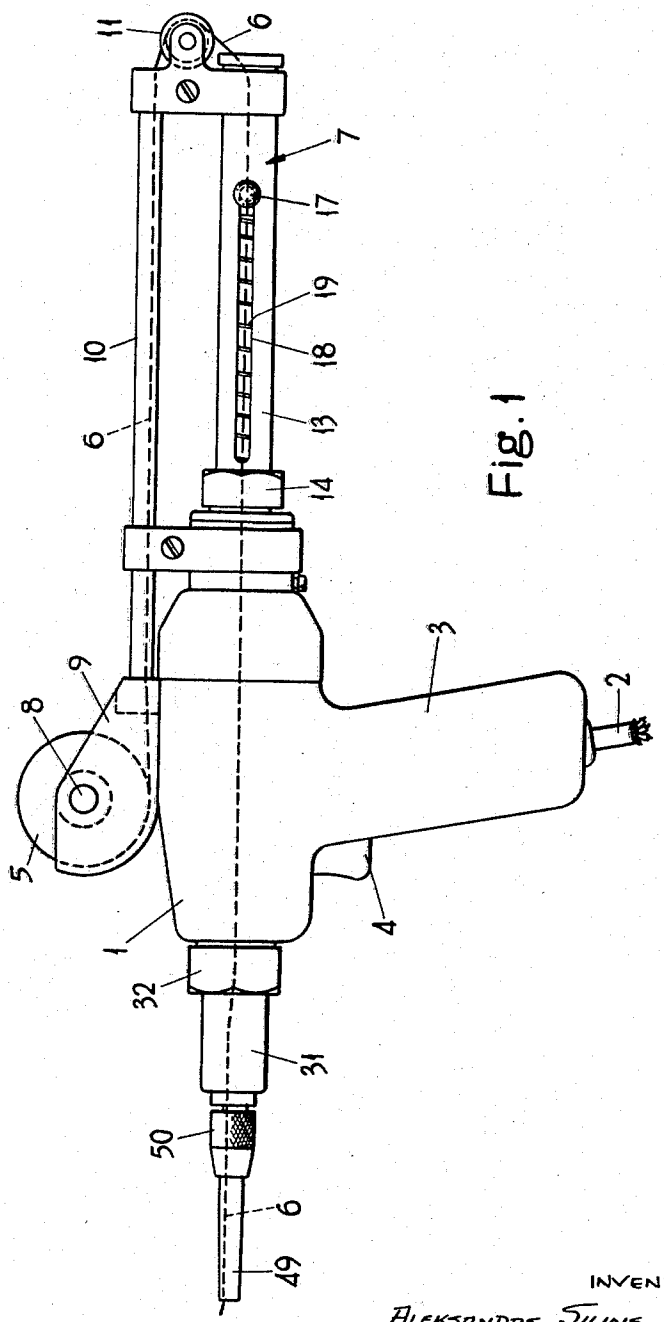

Fig. 1

INVENTORS

ALEKSANDRS SILINS

BERNARD NORMAN WOODS

BY Kirschstein, Kirschstein & Ottinger

ATTORNEYS

April 20, 1965 A. SILINS ET AL 3,179,130

DEVICES FOR WRAPPING WRAPPED CONNECTIONS

Filed Nov. 15, 1962

2 Sheets-Sheet 2

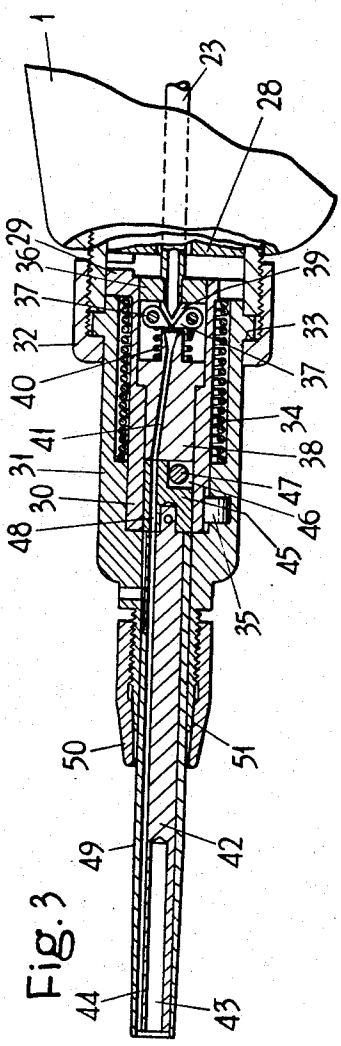

Fig. 3

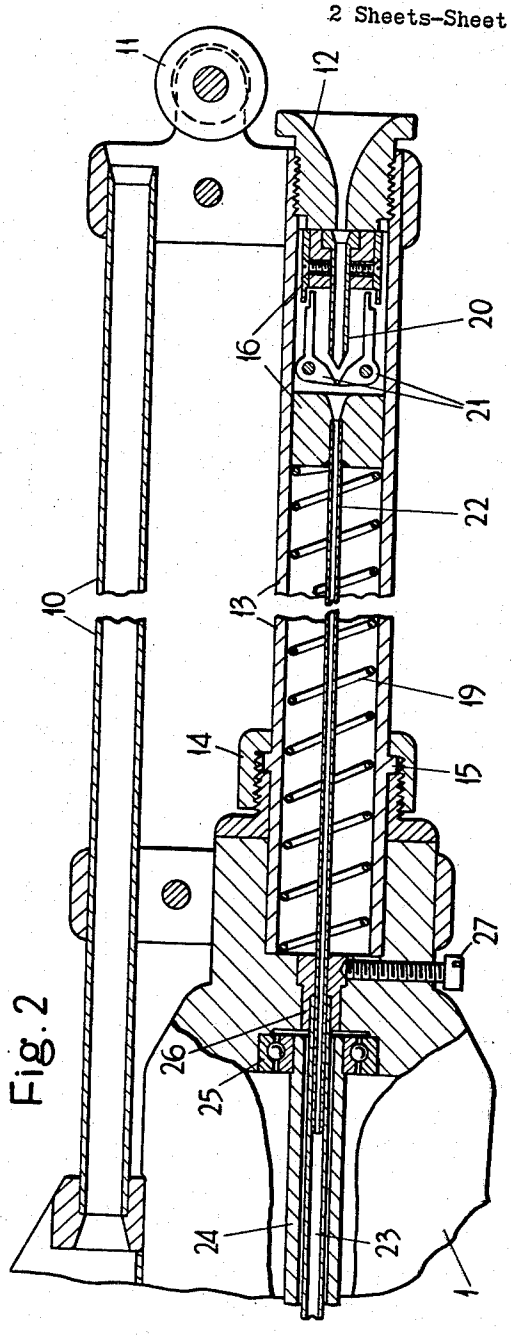

Fig. 2

INVENTORS
ALEKSANDRS SILINS
BERNARD NORMAN WOODS
BY Kirschstein, Kirschstein & Ottinger
ATTORNEYS

United States Patent Office 3,179,130 Patented Apr. 20, 1965

3,179,130

DEVICES FOR WRAPPING WRAPPED CONNECTIONS

Aleksandrs Silins and Bernard Norman Woods, Coventry, England, assignors to The General Electric Company Limited, London, England

Filed Nov. 15, 1962, Ser. No. 237,951
Claims priority, application Great Britain, Nov. 23, 1961, 41,937/61
6 Claims. (Cl. 140—124)

This invention relates to devices for wrapping wrapped connections.

In the Bell System Technical Journal for May 1953, page 525 et seq. there is described a method of forming a so-called "wrapped" electrical connection. Such connections are referred to in this specification, and the term "wrapped connection" when used in this specification should be taken to mean a connection which makes use of the method described in the above-mentioned periodical.

A number of different forms of wrapped connection are possible. In one form, a connection is established between a wire and a terminal, one end of the wire being wrapped around the terminal to form the wrapped connection. In another form, a connection is established between two terminals having portions which lie side by side with surfaces in contact. In this case a piece of wire is wrapped around the terminals so as to form a wrapped connection to both. Each turn of the wire encircles both terminals so that the terminals are bound together, and electrical connection between the terminals occurs as a result of conduction between the surfaces in contact and conduction through the wire. The present invention is particularly concerned with wrapped connections of this latter form, which will hereinafter be referred to as "wrapped connections of the form specified".

It is possible, although unusual, to use a wrapped connection of the form specified to connect more than two terminals having portions which lie side by side with surfaces in contact.

According to the present invention, a device for wrapping wrapped connections of the form specified comprises a spindle having at one end a hole which extends lengthwise of the spindle to receive the terminals on which a wrapped connection of the form specified is to be wrapped, a path over which wire may be supplied to said end of the spindle adjacent said hole whereby when the spindle is rotated the wire is wrapped around the terminals to form the wrapped connection, two adjacent portions of said path being in abutting, relatively rotatable members and said portions meeting at a point off-set from the axis of rotation of the members, means relatively to rotate said members when a wrapped connection is to be made so that the wire is cut at said point, the part of the wire cut off being of the required length for the wrapped connection, and means which operates to realign said portions of the path when the wrapped connection has been wrapped so that the wire can again be supplied to said end of the spindle.

A device for wrapping wrapped connections of the form specified, the device being in accordance with the present invention, will now be described by way of example with reference to the accompanying drawings in which:

FIGURE 1 shows a side elevation of the device,

FIGURE 2 shows an enlarged and partly broken away cross-section of a part of the device of FIGURE 1, and

FIGURE 3 shows an enlarged cross-section of another part of the device of FIGURE 1.

Reference will first be made to FIGURE 1 of the drawings for a brief description of the device. The device is a hand tool and includes a body 1 within which is mounted an electric motor which provides the power to drive the tool, the current for the motor being supplied by way of an electric cable 2. Attached to the body 1 is a handle 3, by means of which the tool may be gripped, a trigger switch 4 which controls the electric motor being provided adjacent the handle 3 where it may conveniently be operated by the user's index finger.

The tool is normally, although not necessarily, used in approximately the position shown in FIGURE 1, and the terms top and bottom etc., will be used with reference to the tool as shown in FIGURE 1. As shown, the front of the tool is on the left.

Mounted on the top of the body 1 is a rotatable reel 5 which carries a sufficient length of suitable uninsulated wire 6 to wrap a large number of wrapped connections. During use of the tool the wire 6 is supplied from the reel 5 by way of a wire feeding mechanism 7 at the rear of the tool and through the body 1 to the front of the tool, as shown.

Describing the tool in more detail, the reel 5 is rotatable on a removable spindle 8 which is supported by a bracket 9 mounted on the body 1. Removal of the spindle 8 enables the reel 5 to be replaced when the wire 6 wound on it is exhausted.

Referring now to FIGURE 2 of the drawings, the wire 6 passes from the reel 5 through a guiding tube 10 to the rear of the tool, where it passes around a grooved pulley 11. From the pulley 11 the wire 6 passes through a funnel-shaped hole 12 into a tube 13 which is secured to the body 1 by a nut 14 bearing against a shoulder 15. Referring also to FIGURE 1, from the hole 12 the wire 6 passes through a sliding block 16, to which is secured a handle 17. The handle 17 projects through a longitudinal slot 18 in the wall of the tube 13, and by moving the handle 17 the block 16 is moved forward against the action of a helical spring 19. The movement of the handle 17 is limited by the length of the slot 18. The normal position of the block 16 is, however, as shown in FIGURE 2, the handle 17 then resting against the rear end of the slot 18.

Referring only to FIGURE 2 now, the wire 6 is guided through the block 16 by a tube 20, the front end of which is shaped to guide the wire 6 between a pair of jaws 21. The jaws 21 are spring loaded and operate so that when the block 16 is slid forward they close together to grip the wire 6, so that the wire 6 is carried forward with the block 16, and when the block 16 slides to the rear they tend to open so as to slide over the wire 6. From the jaws 21 the wire 6 passes into a tube 22, the front end of which can slide telescopically within a tube 23 which passes through the body 1.

The electric motor is, for simplicity, not shown in the drawings, but its armature is mounted on a hollow shaft 24, the rear end of which is supported by bearings 25. The tube 23 passes through the shaft 24, but is not rotatable. Rotation is prevented by flats formed on the rear end of the tube 23, these flats co-operating with flats in the bore of a collar 26, which is prevented from rotating relative to the body 1 by a screw 27.

Referring now to FIGURE 3 of the drawings, at the front of the body 1 the tube 23 passes through one plate 28 of a dog clutch, the co-operating plate 29 of which is secured to the rear end of a hollow shaft 30. The shaft 30 is rotatable in an outer housing 31, which is secured to the body 1 by a nut 32 bearing on a shoulder 33. Encircling the shaft 30 is a helical spring 34, whilst at the front end of the shaft 30 is a spring operated ratchet pawl including a stop 35 which permits rotation of the shaft 30 in the sense in which it is driven by the electric motor, but limits rotation of the shaft 30 in the opposite sense to just less than 360 degrees.

Within the shaft 30 is a collar 36, jaws 37 and a block 38, none of which are rotatable. To hold these components still whilst the shaft 30 revolves around them, the front end of the tube 23 is formed with flats which co-operate with flats formed in the bore of the collar 36. Extending forward from the collar 36 are two projections 39 having flats which co-operate with flats on the block 38.

The front end of the tube 23 is also shaped to guide the wire 6 between the jaws 37. The jaws 37 are loaded by a helical spring 40, so that when the wire 6 is fed forward through the jaws 37 they tend to open so as to slide over the wire 6, but if there is a tendency for the wire 6 to be pulled back the jaws 37 close together to grip the wire 6 and prevent movement. From the jaws 37 the wire 6 passes into a bore 41 in the block 38, the rear end of the bore 41 being funnel shaped. The length of the bore 41 is inclined to the longitudinal axis of the block 38 so that although its rear end is on the axis, the front end is off-set.

The tool also includes a wire wrapping bit 42, the front end of which is formed with a hole 43 to receive terminals on which wrapped connections are required. The bit 42 also has a groove 44 on its periphery, the groove 44 extending the full length of the bit 42. The bit 42 is secured to a block 45 which has a cut-away portion 46 which co-operates with a pin 47 secured to the shaft 30, so that the block 45 and bit 42 rotate with the shaft 30. The block 45 has a bore 48 which is aligned with the groove 44.

Encircling the bit 42 is a sleeve 49 which is secured to the housing 31 by a nut 50, the housing 31 and the nut 50 having co-operating inclined surfaces 51 which cause the sleeve 49 to be gripped when the nut 50 is tightened. The diameter of the block 45 is a little greater than that of the bit 42, so that the block 45 is held within the shaft 30 by the rear end of the sleeve 49. On removal of the nut 50, the bit 42, block 45 and sleeve 49 can be slid out of the housing 31.

The operation of the tool will now be described. It is assumed that wrapped connections of the form specified are to be made around pairs of terminals of rectangular cross-section, the terminals having broad faces in contact so as to form a combined terminal of substantially square cross section. The cross section of the combined terminal is such that it will enter the hole 43. Referring also to FIGURES 1 and 2, it is further assumed that a reel 5 has been mounted on the body 1, and wire 6 from the reel 5 threaded through the tool to project by about a quarter of an inch from the front end of the bit 42. The threading is readily done by passing the wire 6 through the tube 10 and then pushing it into the hole 12. The various funnel-shaped surfaces assist the progress of the leading end of the wire 6, and the operation of the jaws 21 and 37 is such as not to impede its progress. The bores 41 and 48 are aligned in a manner that will be explained, so that the wire 6 can pass from the block 38 to the block 45.

To make the wrapped connection, the hole 43 is slid onto the combined terminal and the switch 4 is then operated. The leading end of the wire 6 is then held, for example, by being wedged in a hole provided for this purpose adjacent the base of the combined terminal, and the wrapped connection wrapped by rotation of the groove 44, which carries the wire 6 around the combined terminal. The spindle 42 has a helical end surface which ensures that the adjacent turns of the wire 6 in the wrapped connection are touching. When the wrapping is complete the switch 4 is released, the tool withdrawn, and the handle 17 pushed forward to its full extent and then released. The tool is then ready to wrap the next wrapped connection.

Considering the operation in more detail, operation of the switch 4 causes the electric motor to start and the dogs of the clutch plates 28 and 29 to engage. The shaft 30, block 45 and bit 42 are therefore rotated. The initial rotation of the block 45 causes the wire 6 to be cut at the junction of the blocks 38 and 45 as the bores 41 and 48 rotate out of alignment with one another. The length of the part of the wire 6 cut off is sufficient for the wrapped connection. This length can be varied by adjusting the travel of the handle 17 and by substituting for the spindle 42 and the sleeve 49 similar spindles and sleeves of greater or lesser lengths according to the length of wire 6 required.

Continued rotation of the bit 42 causes the cut piece of wire 6 to be drawn from the groove 44 and wrapped around the combined terminal. As the trailing end of the wire 6 is drawn from the groove 44, the switch 4 is released, the electric motor stops, and the dogs of the clutch plates 28 and 29 disengage.

The front end of the spring 34 is secured to the housing 31, but its rear end is merely in frictional engagement with the clutch plate 29. As the clutch plate 29 and therefore the shaft 30 rotates, the spring 34 will initially be wound up a little, but when the limiting value of friction is reached it will slip relative to the shaft 30. This means that when the shaft 30 stops rotating and the dogs of the clutch plates 28 and 29 disengage, the spring 34 will tend to unwind and in so doing will rotate the shaft 30 in the reverse direction. This rotation continues until the shaft 30 is held by the stop 35, this being at the position where the bores 41 and 48 are aligned. At the most, therefore, the spring 34 must be capable of rotating the shaft 30 by 360 degrees.

Operation of the handle 17 then causes the wire 6 to be fed forward, the length of the slot 18 being such as to give the required projection of the wire 6 from the groove 44 at the front end of the tool. It will be appreciated therefore that the length of the slot 18 will always be greater than the total length of the bore 48 and the groove 44. As the block 16 moves forward the jaws 21 grip the wire 6 to feed it forward and the jaws 37 slide on the wire 6. Conversely, as the block is returned by the spring 19, the jaws 21 slide on the wire 6 and the jaws 37 grip the wire 6 to prevent it being drawn back.

Although described as a hand tool, it will be appreciated that the invention is applicable to be device for wrapping connections and forming part of a larger machine. Such a machine may comprise several such devices which are controlled in their operation by a programme carried on a punched card or tape.

We claim:

1. A device for cutting from an effectively continuous supply of bare wire a predetermined length of wire and wrapping said length of wire around at least two terminals, so that the wire forms a wrapped connection to each of the terminals and each turn of the wire encircles both of the terminals, the device comprising (*a*) a housing, (*b*) a spindle having at one end thereof a hole to receive the terminals on which a wrapped connection is to be formed and a longitudinal groove which extends from said one end of the spindle to the other end of the spindle, (*c*) means to mount the spindle for rotation about its axis relative to the housing, (*d*) a member having a hole therethrough, (*e*) means to support said member relative to said housing so as to abut said other end of the spindle and so that one end of said hole therein, at a particular angular position of the spindle relative to said member, communicates with one end of the groove in the spindle at a point off-set from the axis of the spindle so as to form a path along which said wire may pass, (*f*) manually operable means to feed the wire along said path towards said one end of the spindle, (*g*) means to rotate the spindle relative to said member so that the wire is cut at said point by movement of the spindle relative to said member to produce said predetermined length of wire for the wrapped connection, and (*h*) means which operates to realign the spindle at said particular angular position when a wrapped connection has been formed so that the wire

can again be fed towards said one end of the spindle by said manual means.

2. A device according to claim 1 in which said manually operable means for feeding the wire along said path prior to wrapping each wrapped connection includes spring-loaded jaws which allow passage of the wire in one direction but which grip the wire against passage in the reverse direction.

3. A device according to claim 2 in which said means for feeding the wire along said path comprises a handle which may be slid from a rest position to a second position, a member which is attached to the handle and on which said spring-loaded jaws are mounted, and a spring which automatically returns the member and the handle to the rest position after the handle has been slide to the second position and released, the action of sliding the handle from the rest position to the second position causing said member to be moved in a direction parallel to the length of the spindle, this direction being such that said spring-loaded jaws grip the wire as aforesaid and the wire is therefore fed the desired distance along said path towards said end of the spindle.

4. A device according to claim 3 in which said path includes two tubes telescopically mounted so that, when said handle is slide from the rest position to the second position, one tube slides within the other tube.

5. A device according to claim 1 in which said means to realign said spindle includes an helical spring which is tensioned when the spindle rotates in a first sense to wrap a connection and which, when the connection has been wrapped, causes the spindle to rotate in the opposite sense until said portions of the path are realigned.

6. A device according to claim 1 in which the means to rotate the spindle relative to the terminals comprises an electric motor.

References Cited by the Examiner

UNITED STATES PATENTS

2,732,139	1/56	Shaff	242—7
2,793,419	5/57	Larsen	242—7
2,807,810	10/57	Belek et al.	140—124

CHARLES W. LANHAM, *Primary Examiner.*