United States Patent [19]

Ackerman

[11] **3,756,522**

[45] **Sept. 4, 1973**

[54] **WIRE WRAP TOOL FOR HAND GUN APPLICATION**

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[73] Assignee: **Universal Instruments Corporation,** Binghamton, N.Y.

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[52] **U.S. Cl.** **242/7.17**

[51] **Int. Cl.** **H01b 13/00**

[58] **Field of Search**..... 242/7.06, 7.17, 7.18; 140/124; 7/1 R; 29/33.10

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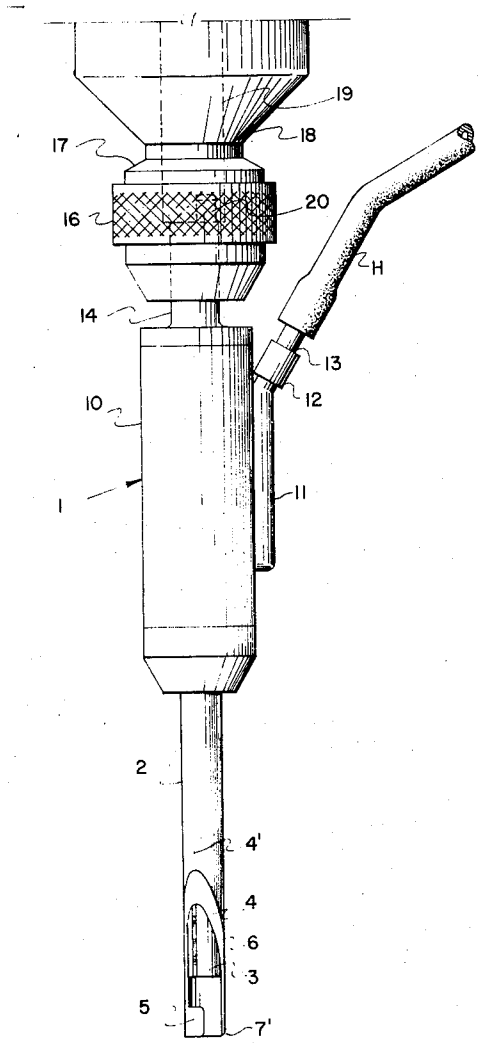
[57] **ABSTRACT**

A wire wrap tool capable of being received by a hand held wire wrap gun having an elongated cylindrical bit with an aperture in the end thereof for receiving a terminal stud and a wrapping sleeve which telescopes on the bit to lock a length of wire thereon, the telescoping of the bit and sleeve being accomplished on the hand tool by either a pneumatic, mechanical or similar type mechanism. The operator of the hand tool merely places the wire against a lip in the sleeve and, upon command, causes the mechanism to retract the sleeve and draw the wire into the wrapping tool whereupon it is ready for use.

2 Claims, 6 Drawing Figures



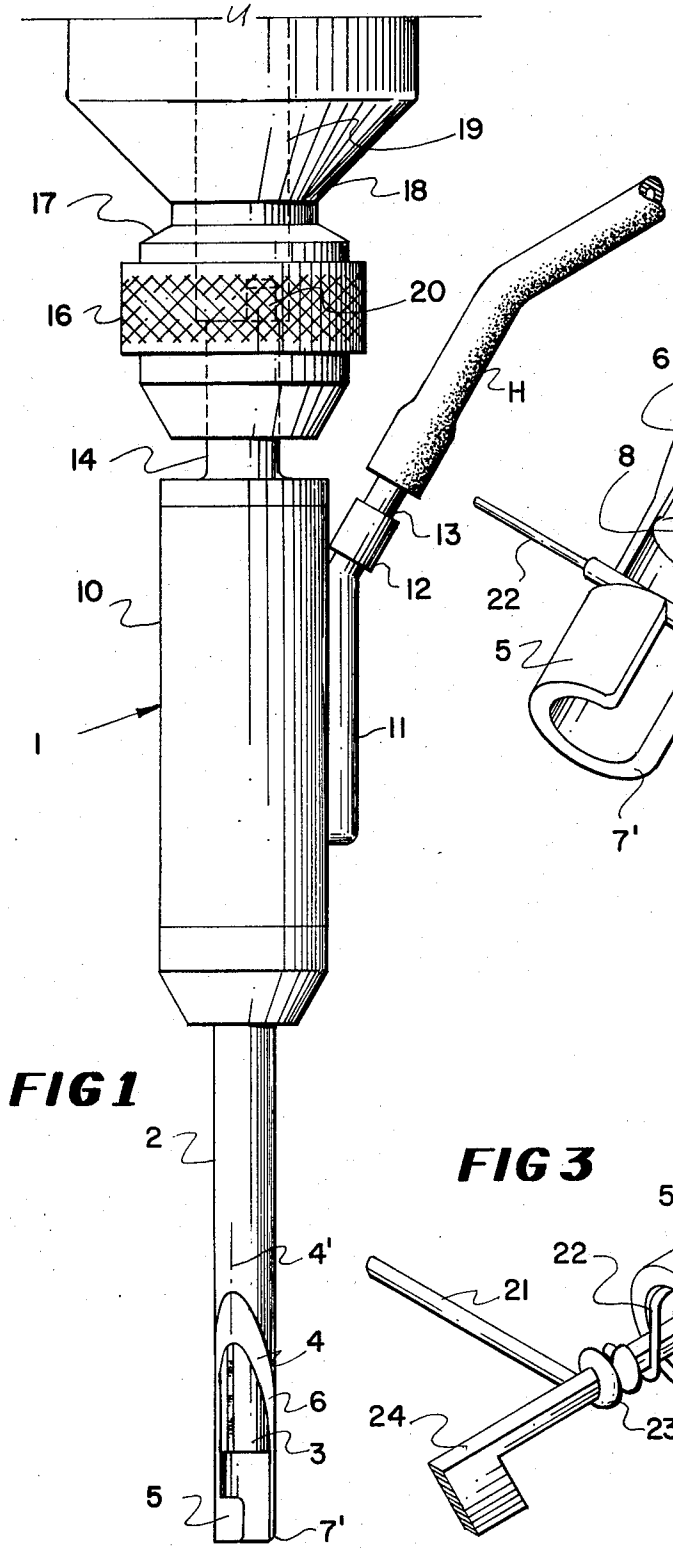


FIG 1

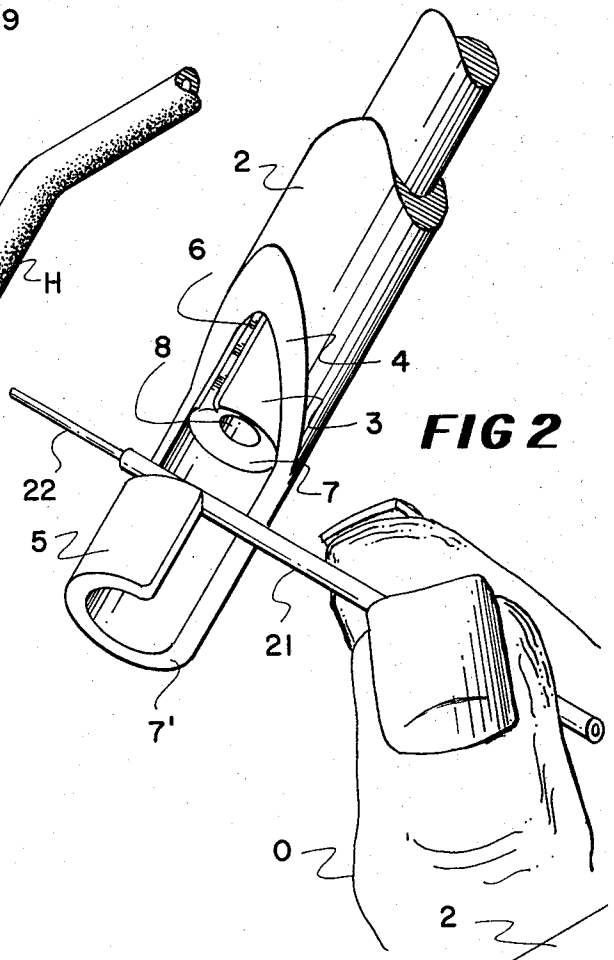


FIG 2

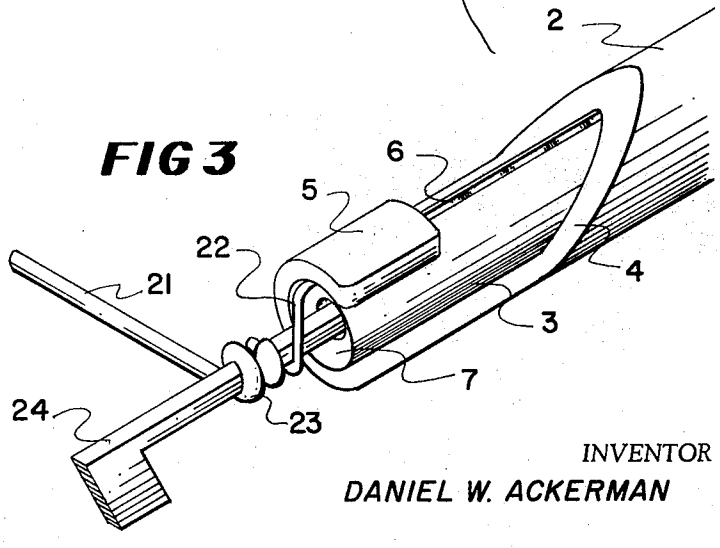


FIG 3

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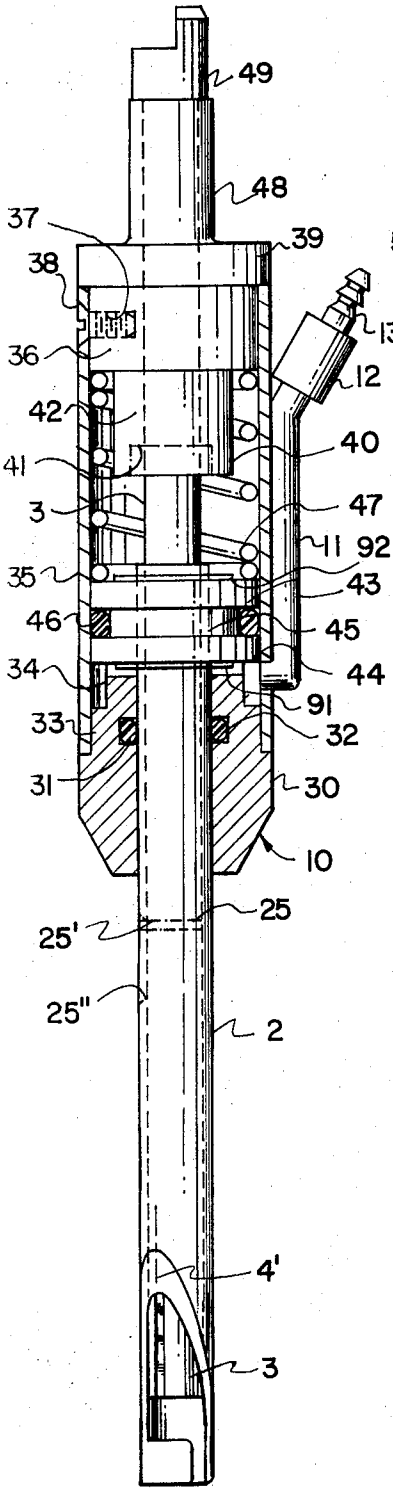

FIG 4

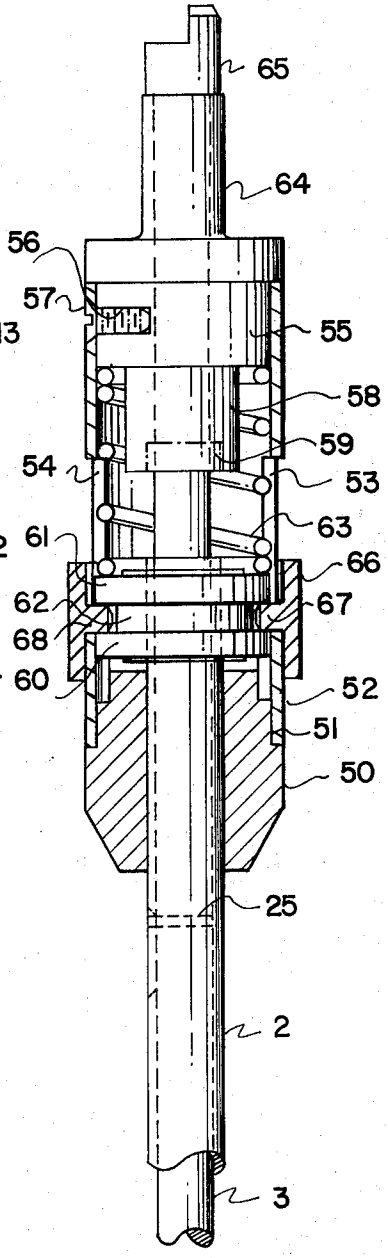

FIG 5

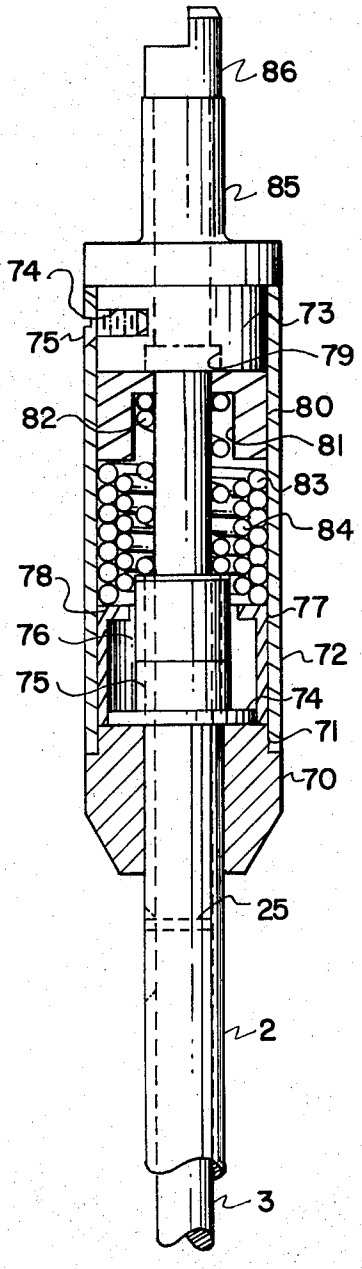

FIG 6

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WIRE WRAP TOOL FOR HAND GUN APPLICATION

This invention relates to a hand wire wrapping tool for use by an operator in a semi-automatic hand gun operation of wrapping wire leads around terminal studs and constitutes a further improvement of the tool shown and disclosed in my copending application Ser. No. 97,704, filed Dec. 14, 1970, now U.S. Pat. No. 3,701,367, and my copending application Ser. No. 62,825, filed Aug. 11, 1970, now U.S. Pat. No. 3,670,784 both entitled "Wire Wrap Tool" and the contents of those patents are hereby incorporated by reference.

In manufacturing electrical and electronic equipment, it is desirable to interconnect terminals and portions of equipment, for example on printed circuit boards. This is usually done by wrapping the stripped ends of a measured length of insulated wire strand onto the terminals to form wrapped connections. Most wrapping machines and hand operated wrapping guns today are semi-automatic and such operations can be performed at relatively high speeds.

The instant wire wrap tool comprising this invention achieves a proper wrap while allowing an operator to achieve the proper wrap at a high speed. In previous wire wrap tools, for hand guns, the operator has had to thread the thin wire into a hole in the bottom of the wrapping tool which resulted in a slow rate of work since such an operation was similar to threading a needle.

The present invention overcomes the loading difficulties discussed and allows an operator achieve a fast, proper wrap. The bit of the present invention has a convex wire bearing surface containing a relieved wire groove which merges with a wire slot and cooperates with a flange on the sleeve to securely and accurately hold the wire as it is being fed onto the stud as the tool rotates. The slot is of generally U-shaped configuration to properly support the length of the portion of the wire within the slot to insure proper presentation of the wire to the bit. In other words, to guide the wire into position. The bit is relieved at the end of the slot and a countersunk area merges with the relieved area and the merger is further relieved. Either a pneumatic, electrical or mechanical linkage or other type of controlled power can be used to shift the sleeve on the bit to lock the wire into position prior to applying it to a stud to be wrapped. This retraction mechanism can be actuated by the operator pressing down on a foot pedal, thus causing the sleeve to retract and draw the wire into the wrapping tool. The operator does not have to accurately position the wire since, as the sleeve retracts onto the bit, it will automatically locate the wire in the proper position for presentation to a stud.

Accordingly, it is an object of the present invention to provide a new and improved hand gun wire wrap tool.

A further object of this invention is to provide an improved wire wrapping tool for insuring proper presentation of the wire to the wrapping bit.

Another object of this invention is to provide a hand wire tool which does not necessitate the operator accurately locating the wire on the tool prior to presenting it to a stud to be wrapped.

A further object of this invention is to provide a hand wire wrapped tool by which high production rates and low operator fatigue can be achieved.

Another object of this invention is to provide a new and improved hand wire wrap tool with a sleeve and bit thereon whereby the operator, after he has located the wire within the sleeve, can actuate a new and improved retraction mechanism to accurately and automatically position the wire within the wrapping bit.

With these and other objects in view, reference is had to the accompanying drawings in which:

FIG. 1 is a side view of the tool comprising this invention showing the wrapping sleeve and bit and a pneumatic fitting for actuating the retraction mechanism;

FIG. 2 is a perspective view showing the method by which an operator places a wire to be wrapped into the operating end of the hand wire wrap tool;

FIG. 3 is a perspective view showing a wrap achieved by the operating end of the hand wire wrap tool;

FIG. 4 is a sectional side view of one embodiment of the retraction mechanism;

FIG. 5 is a sectional side view showing a second embodiment of the retraction mechanism;

FIG. 6 is a sectional side view showing a third embodiment of the retraction mechanism of this invention.

Referring now to FIG. 1, there is shown a side view of the tool and retraction mechanism of this invention, generally designated as **1**. The tool includes a sleeve member **2**, a bit member **3** which is adapted to retract within sleeve member **2** and a retraction mechanism generally designated as **10**. Sleeve member **2** is cut away as at **4** and has a flange generally designated as **5**. Bit **3** has a groove **6** therein adapted to receive a wire as the sleeve member **2** retracts over bit member **3**. A complete description of the interaction between the end of the sleeve and bit members can be found in U.S. Pat. No. 3,701,367 entitled "Wire Wrap Tool."

Retraction mechanism **10** has a pneumatic fitting **11** thereon terminating in a coupling member **12** which retains a hose fitting **13** on the end thereof. A hose H is fitted over the end of the nipple. Retraction mechanism **10** extends upwardly as at **14** and is engaged within a collet member **17** which may be tightened around portion **14** by an operative tightening knurled ring **16.** The collet member **17** is attached on the end of a hand gun **18,** the hand gun having a driving member designated as **19** which engages with the upper end **20** of an extension portion of bit member **3.** The driving member and upper portion of the bit member are shown in dotted lines in FIG. **1.**

As shown in FIG. **2,** an operator, designated as O, grasps an insulated wire **21** having a stripped portion such as **22** extending therefrom and places it within the opening of flange **5** of sleeve member **2** and bit member **3.** The sleeve and bit member in FIG. **2** are shown in the open position. As the sleeve member **2** retracts over bit member **3,** the wire is forced by flange **5** to engage within slot **6** in the bit member. The bit member has a central aperture **8** thereon which is designed to accomodate a wire receiving stud or terminal and the end face thereof is countersunk as at **7.** FIG. **3** shows the end of the wrapping tool applying a wire wrap to a terminal stud **24.** The lead **22** is shown extending from the bit notch **6** and wrapped as at **23** around the terminal stud along with approximately one and a half turns of the insulated portion of the wire.

The retraction mechanisms are shown in FIGS. 4 through 6 and are designed to retract the sleeve from the position shown in FIG. 2 to the position shown in FIG. 3 whereby the entire assembly may be rotated to achieve a proper wire wrap.

FIG. 4 shows the mechanism generally designated as 10 having a cylindrical member 30 which is arcuately relieved on one end as at 33 and further relieved arcuately as at 34. Member 30 has an internal groove 31 therein for receiving a seal (or gasket) 32. A hollow tubular member 35 engages in relieved area 33 of member 30, member 35 having a closed end portion as at 39. Depending from closed end portion 39 of member 35 is cylindrical portion 36 having a tapped hole 37 therein. A screw 38 secures member 35 onto portion 39. A further reduced diameter portion 40 of member 39 extends downwardly therefrom and contains a relieved area as at 41 and an internal bore as at 42 which continues up through member 39.

The upper end of sleeve member 2 carries a piston defined by circular portions 43 and 44 of equal diameter and a reduced diameter portion 45. Portions 43 and 44 are held on sleeve 2 by retaining rings 92 and 91 respectively. The piston has an internal bore or journal. Portion 45 accommodates a ring or gasket 46 in cooperation with portions 43 and 44. Surrounding portion 40 and abutting against portions 36 and 43 is a spring 47. Spring 47 maintains sleeve 2 in its extended position as shown in FIG. 4 and FIG. 2. When it is desired to retract the sleeve to effect a wire wrap, air is introduced through member 11 into the annular chamber created by the relieved area 34. The air presses against the bottom portion of the piston and counteracts the force of the spring to move sleeve 2 and the piston upwardly until it comes in contact with depending portion 40. At that point, the end face of the sleeve is coplanar with the end face of the bit 3.

Member 39 extends upwardly as at 48 in a narrow necked section and for insertion into the hand gun collet.

Bit member 3 extends beyond portion 48 and terminates in portion 49 to receive a rotational driving force from the hand gun driving member 19. Bit member 3 in turn rotationally drives sleeve member 2 by pin 25. Pin 25 is pressed into a receiving hole 25' in bit member 3 and into receiver slots 25'' in the lower section of bit member 3. Sleeve member 2 is free to retract but still receive the rotational driven force by receiver slots 25''.

A second embodiment of the retraction mechanism is shown in FIG. 5 and comprises a cylindrical member 50 having an annularly recessed area 51 for receiving the end of a tubular member 52. Members 50 and 52 can be secured together by any suitable means such as by threading or by welding. Member 52 has a pair of diametrically opposed slots 53 and 54 cut therein and has a closed end portion similar to tubular member 35. A stop member 55 is mounted in the closed end portion of tubular member 52 and has a threaded bore 56 therein for receiving a screw 57 which locks it in position within member 52. Member 55 has a depending portion 58, similar to portion 40 on mechanism 10, which has a recessed area 59.

A piston is journalled to the top end of sleeve member 2 and has portions 60 and 61 of equal diameter and reduced diameter portions 62 therebetween. A spring 63 surrounds depending portion 58 and abuts member 55 and portion 61 to maintain the sleeve member in position shown in FIG. 1 and FIG. 4. Member 52 has a reduced diameter portion 64 extending upwardly therefrom and a driving member engaging portion 65 at the end thereof, an extension of bit 3, whereby the tool can be inserted into a spindle or collet on a wire wrap gun.

A ring member 66 surrounds tubular member 52 and has a pair of inwardly extending, oppositely positioned projections 67 and 68, respectively. Projections 67 and 68 extend through slots 53 and 54 in member 52 and engage between portions 60 and 61 of the piston. A suitable linkage bar (not shown) can be attached to ring 66 and a wire wrap gun whereby actuation of the trigger on the wire wrap gun (not shown) automatically retracts ring 66, thereby retracting sleeve 2 to wire wrap position in relation to bit 3. In the alternative, the operator can simply grasp sleeve 66 and retract the sleeve and effect the wire wrap while holding sleeve 66 in its retracted position.

A third embodiment of the invention is shown in FIG. 6 and utilizes electromagnetic force to accomplish the retraction. It consists of a cylindrical member 70 having an annularly recessed area 71 for receiving the open end of a hollow tubular member 72. Member 72 is closed at one end thereof and receives a cylindrical member 73 therein having a threaded bore 74 for receiving machine 75 to prevent it from moving within member 72. Member 73 is relieved as at 79 and mounted within member 72 adjacent to member 73 is another circular member 80 having a centrally relieved cylindrical area 81.

The upper end of sleeve 2 has a wide flange 74 thereon between the outer periphery of which and the inner diameter 72 fits a circular member 77 having an inwardly directed annular flange 78. Mounted on sleeve 2 and flange 74 are members 75 and 76 made of a ferromagnetic material. A spring 82 surrounds bit 3 and abuts the top of member 76 and the bottom of relieved area 81 thereby keeping the sleeve in its initial position.

Mounted between flange 78 of member 77 and member 80 are a pair of electromagnetic coils 83 and 84. Coil 83 is a "pulling" coil designed, when activated, to act on member 76 which is secured to the portion of sleeve member 2 and to pull it upwardly against the action of spring 82. Coil 84 is a "holding" coil designed to maintain member 75 in position once coil 83 has acted thereupon. Member 75 is not secured to sleeve 2 and acts as a stop member for member 76 when the current to coils 83 and 84 is turned off, thereby allowing spring 82 to return the sleeve to its initial position. A reduced diameter portion 85 carrying an adapter section 86 extends upwardly from the closed end of member 72. The adapter section 86 and the portion 85 are adapted to be engaged by a spindle collet on a rotating power tool. It is understood that the mechanisms shown in FIG. 4 can be inserted in a standard wire wrap hand gun.

Thus, it is seen with any of the unique and novel retraction mechanisms shown in FIGS. 4 through 6 and described within the specification, an operator of a hand gun with this tool can easily insert the wire into the sleeve and allow the interaction of the sleeve retraction in the bit to position the wire, leaving the final step of merely placing the tool onto the terminal stud and activating the mechanism to rotate the bit and sleeve to effect a proper wrap.

With the aforedescribed tool, a faster loading technique for hand held wire wrapping guns is effected. Previously, where the operator had to thread the thin wire into a hole in the bottom of the tool, the operator now merely has to position the wire in the general area of the end of the tool and the retraction of the sleeve over the bit effects proper positioning prior to wrapping. The operator, additionally, merely places the wire against the lip of the opening in the sleeve and depresses a foot pedal, causing the sleeve to retract and draw the wire into the wrapping tool. This makes it much easier to correctly load a wire into the wrapping tool, resulting in less fatigue for the operator and a much faster and higher production rate.

It is also to be noted that the foregoing construction and arrangement is of a relatively simple form, requiring a minimum number of individual components and assemble of manufacture. The tool is extremely rugged, and due to its relatively simple construction, may be made of minimum size, for use in applications where space is at a premium. Furthermore, the tool is completely power actuated, of simple manipulation and foolproof in operation, enabling use by unskilled operators with optimum results.

While three embodiments of the telescoping mechanism have been shown and described, it is obvious that many modifications and changes will occur to those of ordinary skill in the art without departing from the scope of the appended claims.

I claim:

1. A wire wrap mechanism for adaptation to a hand-held wire wrap gun, said mechanism comprising:

a. a cylindrical bit;

b. a tubular sleeve member receiving said bit;

c. a first end of said sleeve member having an enlarged member journalled thereon;

d. a housing receiving said first end of said sleeve member;

e. said bit extending through said housing and adapted to be connected to said wire wrap gun together with an upper narrow-necked portion of said housing;

f. a spring means within said housing abutting said enlarged member on said sleeve member and normally biasing said sleeve member into a non-retracted position;

g. power means for retracting said sleeve member into a wrapping position upon activation including a tubular chamber within said housing, said enlarged member being of about the same external configuration as the internal diameter of said chamber and providing a substantially air-tight sliding fit therein, and a pneumatic pressure inlet located at the front of said chamber whereupon pneumatic pressure produced in said chamber by the admission of air through said inlet will counteract said spring means and retract said sleeve member;

h. a slot means on said bit for grasping a wire and bore means on said bit for receiving a terminal stud;

i. relieved area means on said sleeve member adapted to cooperate with the slot means on said bit whereby an operator lays a wire across said relieved area means when said sleeve is in a non-retracted position and the retraction of said sleeve to a wrapping position causes said wire to be grasped in said slot means; and

means operatively connected to said bit member and adapted for connection to a wire wrap gun whereby rotary motion may be imparted to said bit and sleeve members to effect a wrap of a wire grasped thereby on said terminal stud.

2. A wire wrap mechanism for adaptation to a hand-held wire wrap gun, said mechanism comprising:

a. a cylindrical bit;

b. a tubular sleeve member receiving said bit;

c. a first end of said sleeve member having an enlarged member of magnetic material journalled thereon;

d. a housing receiving said first end of said sleeve member;

e. said bit extending through said housing and adapted to be connected to said wire wrap gun together with an upper narrow-necked portion of said housing;

f. a spring means within said housing abutting said enlarged member on said sleeve member and normally biasing said sleeve member into a non-retracted position;

g. power means for retracting said sleeve member into a wrapping position upon activation, including a solenoid mounted in said housing and surrounding said spring means and said bit, whereby upon energization of said solenoid, the enlarged member is caused to move and retract said sleeve member;

h. a slot means on said bit for grasping a wire and bore means on said bit for receiving a terminal stud;

i. relieved area means on said sleeve member adapted to cooperate with the slot means on said bit whereby an operator lays a wire across said relieved area means when said sleeve is in a non-retracted position and the retraction of said sleeve to a wrapping position causes said wire to be grasped in said slot means; and

means operatively connected to said bit member and adapted for connection to a wire wrap gun whereby rotary motion may be imparted to said bit and sleeve members to effect a wrap of a wire grasped thereby on said terminal stud.

* * * * *