May 13, 1969 W. H. ATKINSON 3,443,606

TWIN BIT WIRE WRAPPING TOOL

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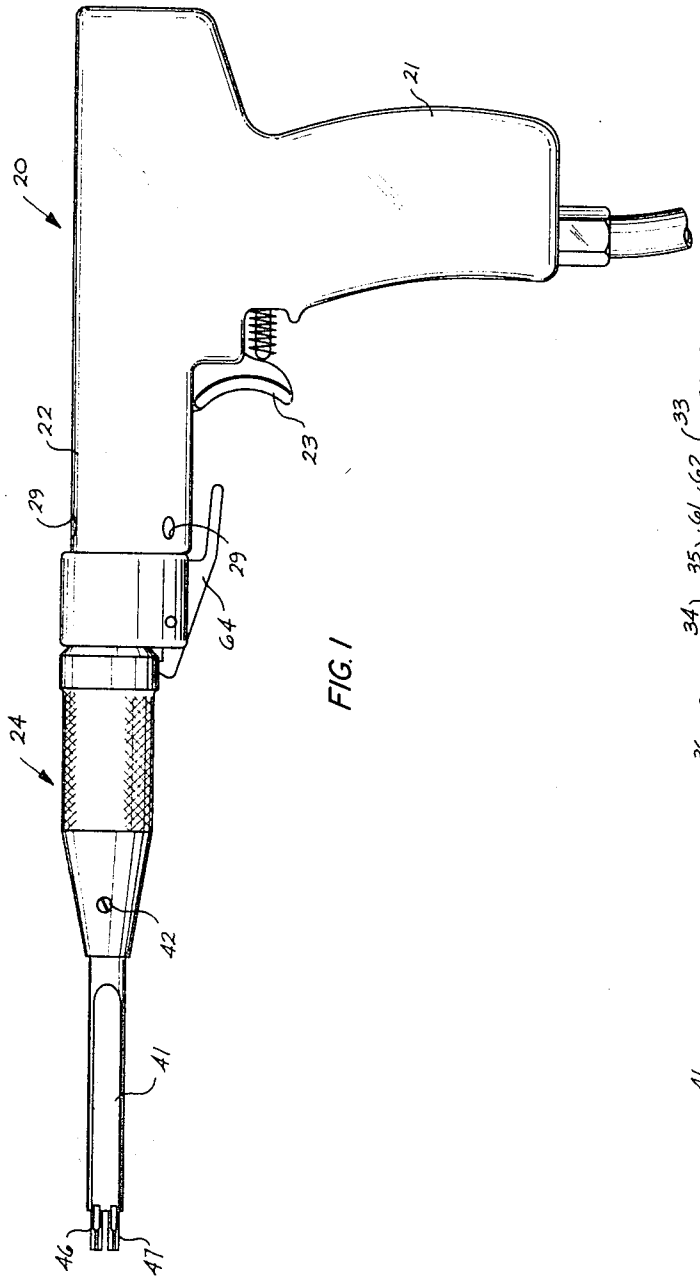


FIG. 1

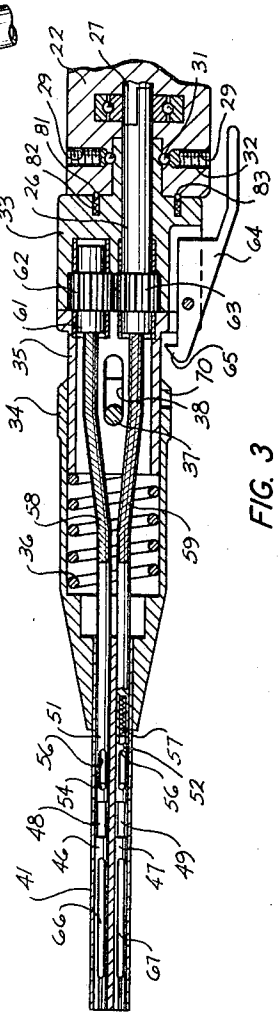


FIG. 3

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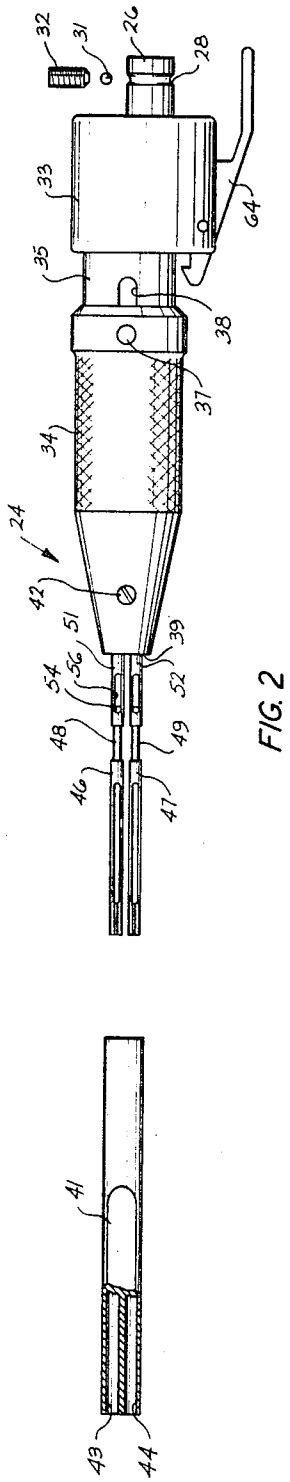


FIG. 2

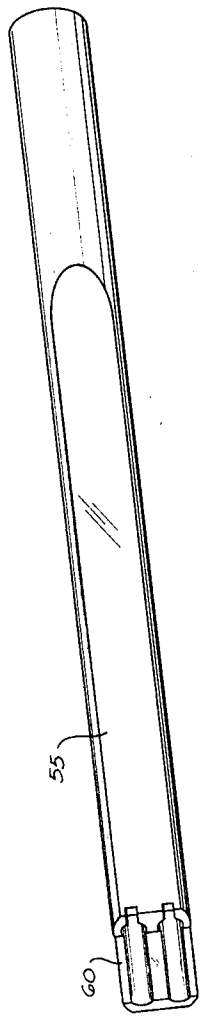


FIG. 4

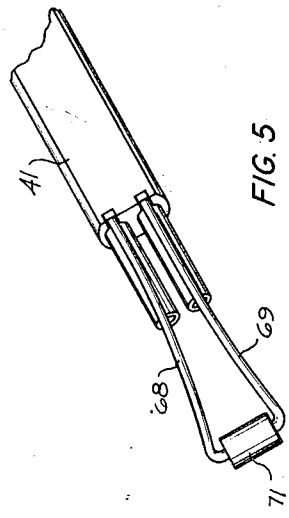


FIG. 5

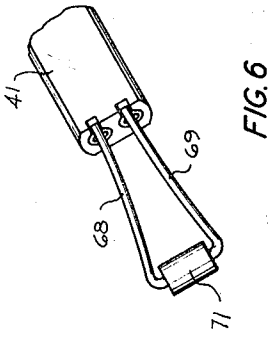


FIG. 7

FIG. 6

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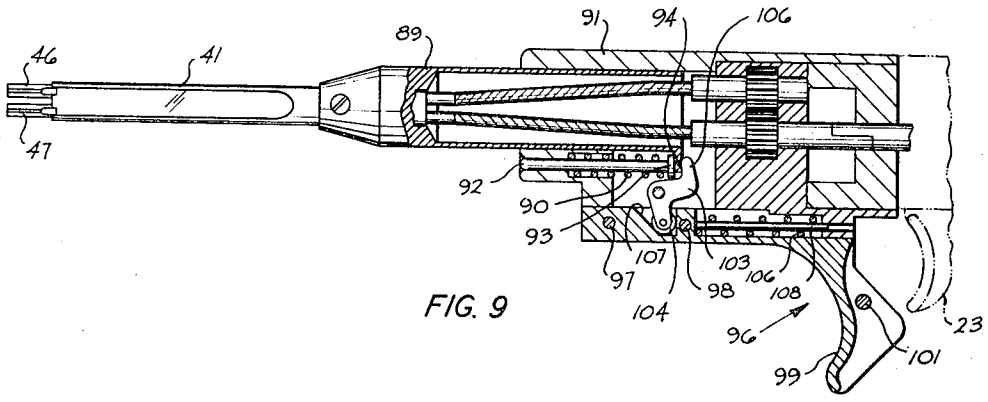


FIG. 9

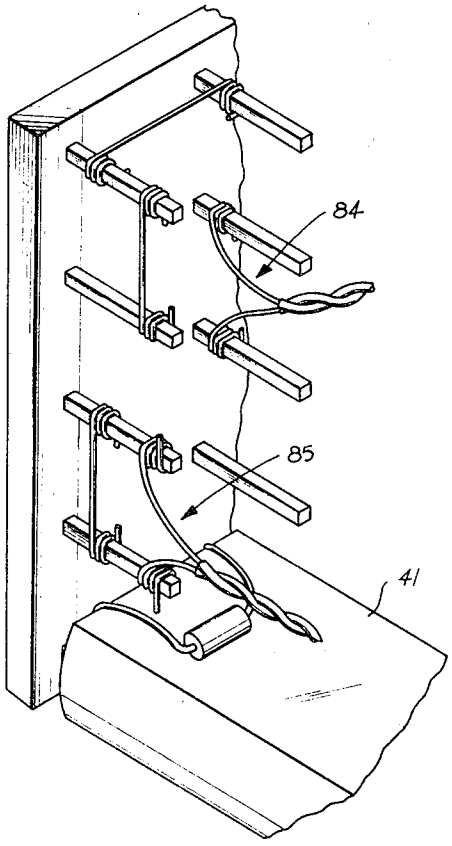


FIG. 8

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3,443,606

TWIN BIT WIRE WRAPPING TOOL

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Int. Cl. B21f 3/00; B65h 81/06
U.S. Cl. 140—124 9 Claims

ABSTRACT OF THE DISCLOSURE

A wire wrapping tool having twin wire wrapping devices for simultaneously wrapping two wires about a pair of electrical terminals and having adjustable facilities for spacing the wire wrapping devices to correspond to the spacing of the terminals.

In making wire wrapped connections, it is often desirable to simultaneously wrap a pair of wires, or both ends of one wire, about a pair of adjacent terminals. Heretofore, it was necessary to wrap first one terminal and then the other. While certain complex automatic apparatus of the type shown in Patent 3,019,822 issued to O. D. Jacobson, Feb. 6, 1962, can be used to simultaneously make two wire wrapped connections, such apparatus can only be utilized where a terminal board can be placed on a movable table or in a position where movable wiring devices can be aligned with the proper terminals to be wrapped. In making wire wrapped connections to terminal boards which are installed, for example, in cabinets or frames, or which do not lend themselves to the utilization of such complex wire wrapping apparatus for other reasons, such as economic ones, it is necessary to have operators make wire wrapped connections to the terminals utilizing a hand tool.

Since some pairs of terminals may be spaced differently than other pairs of terminals on a terminal board, it is desirable that a hand tool be easily adjustable to align the two wire wrapping devices to correspond to the spacing between different pairs of terminals. Furthermore, since pairs of terminals may be arranged either vertically, horizontally, or angularly with respect to one another, it is desirable to have a wire wrapping tool which is capable of being adjusted to position the two wire wrapping devices in a series of positions so that the operator can hold the handle of the tool in a normal upright fashion, or in some other position if more comfortable, and still have the wire wrapping devices aligned with the terminals so that the wire wrapped connections can be made with a minimum of effort.

Accordingly, it is an object of this invention to provide a new and improved wire wrapping tool for simultaneously making wire wrapped connections to spaced terminals.

Another object of this invention is to provide a new and improved wire wrapping tool having twin wire wrapping devices therein and having facilities for moving these devices laterally with respect to one another to align them with correspondingly spaced terminals.

It is a further object of this invention to provide a new and improved wire wrapping tool having twin wire wrapping devices which are rotated by flexible drive shafts and which are selectively spaced by using one of a plurality of interchangeable sleeves.

It is another object of this invention to provide an adapter having twin wire wrapping devices mounted therein which can be rotated relative to a motor housing to adjust the angular relationship of the wire wrapping devices with respect to the axis of the housing to correspond to the relative disposition of the terminals.

With these and other objects in view, the present invention contemplates a wire wrapping tool having twin wire wrapping devices mounted therein which are rotatable in opposite directions for simultaneously wrapping two wires, or both ends of one wire, onto adjacent terminals. Each wire wrapping device includes a bit and a spindle which is attached to driving facilities via a flexible drive shaft. The flexible drive shafts transmit rotary motion from the driving facilities to the spindles regardless of the lateral positioning of the spindles relative to one another. A sleeve having two spaced parallel bores therethrough is positioned over the wire wrapping devices to hold the devices a predetermined distance apart. A plurality of interchangeable sleeves having differently spaced bores therethrough are provided and can easily be installed by an operator to rotatably hold the wire wrapping devices in any desired spacing in order to properly align them with a pair of terminals. The sleeve is slidable over the wire wrapping devices and can be locked in a retracted position to expose the ends of the bits to facilitate the loading of wires thereinto. A second embodiment has a sleeve which is biased in a retracted position to expose the bits for loading. After wires are loaded into the bits, the operator pulls a trigger which forces the sleeve over the bits to capture the wires. Further movement of the trigger actuates the driving facilities to rotate the wrapping devices and wrap the wires loaded therein onto terminals.

Other objects and advantages of the present invention will be apparent from the following detailed description when read in conjunction with the accompanying drawings wherein:

FIG. 1 is a view of a wire wrapping tool embodying the principles of the present invention;

FIG. 2 is a partially exploded view of an adapter assembly showing a bit sleeve having two bores therein for spacing the wire wrapping bits a desired distance apart;

FIG. 3 is a cutaway view of the adapter assembly shown in FIGS. 1 and 2;

FIG. 4 shows a bit sleeve having a projection on one side thereof which permits second level wire wrapped connections to be made to a pair of terminals;

FIG. 5 is a partial exploded view of a bit sleeve in its retracted position exposing the ends of the two bits to illustrate how the wire leads of an electrical component are loaded therein;

FIG. 6 shows the sleeve in FIG. 5 having moved over the ends of the bits to capture the wire leads within the two bits;

FIG. 7 illustrates the position that an operator bends the electrical component prior to making the wire wrapped connections;

FIG. 8 is a view of a terminal board and a plurality of terminals illustrating some of the different ways and subject the tool can be used in making wire wrapped connections; and

FIG. 9 is a partially cutaway view of an alternative embodiment of the present invention having facilities for biasing the bit sleeve in a retracted position to expose the ends of the bits.

Referring now to FIG. 1, there is shown a wire wrapping tool **20** having a handle **21** and a barrel **22**. A conventional air or electrical motor (not shown) is enclosed within the barrel **22** and is actuated in response to retraction of a trigger **23**. An adapter assembly generally designated as **24** (shown separately in FIG. 2) has a shaft which engages a shaft **27** (see FIG. 3) driven by the motor. The rear portion of the shaft **26** has a peripheral groove **28** formed therein which aligns with three equidistantly spaced threaded apertures **29** in the barrel **22**. Steel balls **31**, inserted into the apertures **29**, are received within the groove **28** and are held therein by set screws **32** to prevent longitudinal movement of the adapter assembly **24** with respect to the barrel **22**. The set screws **32** are

adjusted to act against the balls **31** with sufficient force to permit rotary movement of the adapter assembly **24** relative to the barrel **22**, but not longitudinal movement.

The adapter **24** includes a housing **33** and an adapter sleeve **34** which slides over a reduced diameter portion **35** of the housing **33** and is biased away from the housing by a spring **36**. Movement of the sleeve **34** is guided by a pin **37** which extends through a slot **38** formed in portion **35** of the housing **33**. The sleeve **34** has an opening **39** for receiving a bit sleeve **41** which is secured therein by a set screw **42**. The bit sleeve **41** has two parallel longitudinal bores **43** and **44** therethrough, as shown in FIG. 2, for rotatably holding and spacing a pair of wire wrapping bits **46** and **47**. The bits have reduced diameter portions **48** and **49** which fit within hollow spindles **51** and **52**. Each reduced diameter portion has a depression (not shown) formed therein for receiving a ball **54** which is inserted through a slot **56** in each spindle. The slots **56** permit axial movement of the bits **46** and **47** against springs **57** (FIG. 3) which control the back force on the wrap and eliminates the necessity of having the operator move the tool backwards during the wrapping operation. The balls **54** are held firmly in the depressions when the bit sleeve **41** is inserted over the spindles and secured to the sleeve **34**. Thus, the bits **46** and **47** rotate with the spindles **51** and **52**. When it is desired to change to a new bit, or to a bit of a different configuration, the bit sleeve **41** is unfastened from the adapter sleeve **34**, balls **54** are removed from the slots **56** and the bits **46** and **47** are extracted from the spindles **51** and **52**. Then the new bits are inserted and the above procedure is reversed. Likewise the springs **57** may also be changed to vary the back force as required, such as when a different diameter wire is to be be used.

Referring to FIG. 3, the spindles **51** and **52** have their ends connected to flexible drive shafts **58** and **59**. Flexible drive shaft **58** is connected to a shaft **61** having a gear **62** mounted thereon which meshes with a gear **63** mounted on the shaft **26**. When the motor is actuated, the gear **62** is driven by the gear **63** and rotates flexible drive shaft **58**, spindle **51**, and bit **46** in a direction opposite to the rotation of flexible drive shaft **59**, spindle **52**, and bit **47**. Thus, when the drive shaft **27** is driven in a clockwise direction, bit **47** rotates in a clockwise direction while bit **46** rotates in a counterclockwise direction. Use of the flexible drive shafts **58** and **59**, permits the use of a plurality of interchangeable bit sleeves **41** having bores spaced different distances apart in order to make wire wrapped connections between terminals having corresponding distances therebetween. To replace a bit sleeve **41**, set screw **42** is loosened and the bit sleeve **41** is removed. A new bit sleeve having differently spaced bores is then inserted over the bits **46** and **47** and spindles **51** and **52** and set screw **42** is tightened. The bit sleeve **41** can also be replaced by a sleeve such as sleeve **55**, as shown in FIG. 4, having a projection **60** on one side thereof. This projection engages the terminal board and keeps the bits a predetermined distance away from the board so that the two wires may be wrapped on a higher or second level of the terminals.

A latch **64** is pivotally mounted to the housing **33** and has a hooked end **65** which engages a recess **70** in the sleeve **34** to lock the sleeve in a retracted position to expose the ends of the bits **46** and **47** and facilitate the loading of wires into longitudinal grooves **66** and **67** in the periphery of the bits. The bits **46** and **47** also have axial recesses **72** and **73** (FIG. 7) therein to receive the ends of the terminals.

In securing an adapter assembly **24** to the barrel **22** of the wire wrapping tool, set screws **32** are loosened and a pair of balls **81** are placed into opposed depressions **83** which are spaced at 90° intervals about the end of the barrel **22**. The balls **81** are forced into the depressions by springs **82** which are mounted in apertures in the housing **33**. The depressions are utilized for the purpose of locating the adapter in predetermined angular positions with respect to the barrel **22** and handle **21** so that an operator can hold the handle **21** in its normal upright position, or in any other desired position, while wrapping terminals which are either horizontally or vertically disposed from one another. For example, if an operator desires to make wire wrapped connections to two horizontally disposed terminals utilizing the tool shown in FIG. 1, he would first load a pair of wires into the bits **46** and **47** with the bits remaining in the vertical position as shown. After the bits are loaded, the adapter assembly **24** can be rotated by manually turning the housing **33** so that the balls **81** move out of the depressions **83** and into the next set of depressions 90° away. By rotating the adapter assembly **24** clockwise, the wires are wrapped with the ends thereof dressed between the terminals as shown at **84** in FIG. 8. By rotating the adapter assembly counterclockwise, the wires are wrapped with the ends projecting out from the terminals as shown at **85** in FIG. 8. Thus, the adjustable adapter permits an operator to select the way in which the wires are wrapped on the terminals as well as aligning the bits with the terminals so that the tool can be held in a comfortable position while making the wraps. In the event that it is desired to wrap primarily horizontally disposed terminals, another similar adapter can be secured to the barrel **22**, having its bits **46** and **47** horizontally disposed to one another instead of vertically disposed as shown in FIG. 3.

In operation, the adapter sleeve **34** is pulled back against the force of spring **36** toward the handle **21** until the hooked end **65** of the latch **64** engages the recess **70** to lock the sleeve **34** in a retracted position. Since bit sleeve **41** is fastened to the adapter sleeve **34** by set screw **42**, the sleeve **41** is also retracted and exposes grooves **66** and **67** in the bits **46** and **47**. A pair of wires or the wire leads **68** and **69** of an electrical component **71** are inserted into the slots **66** and **67** as shown in FIG. 5. The latch **64** is then pivoted to release the adapter sleeve **34** whereupon spring **36** urges the sleeve away from the housing **33** so that the bit sleeve **41** captures the leads **68** and **69** within the grooves **66** and **67** of the bits **46** and **47** as shown in FIG. 6. At this point the electrical component **71** is bent back until it lies adjacent to the sleeve **41** as shown in FIG. 7. This facilitates entry of the tool into the wiring field. The operator then positions the tool so that a pair of terminals enter recesses **72** and **73** in the bits. Then the trigger **23** is pulled to actuate the motor and simultaneously wrap the wire leads **68** and **69** onto the terminals. To wrap a new pair of differently spaced terminals, the operator merely removes the sleeve **41** and inserts in its place a similar sleeve having two differently spaced bores therein. The bores rotatably hold the bits **46** and **47** and laterally space them so that the recesses **72** and **73** are in alignment with the new pair of terminals.

It is to be noted that the subject tool may be utilized in many different wire wrapping situations such as, for example, in wrapping the ends of a twisted pair of wires onto two adjacent terminals, or in making a strap connection with a single piece of wire between two adjacent terminals, as shown in FIG. 8, as well as in wrapping the wire leads of an electrical component onto adjacent terminals.

Referring now to FIG. 9, there is shown an alternative embodiment of the wire wrap tool **20** shown in FIG. 1. In this embodiment, a sleeve **89** is slidably mounted within a housing **91** and is urged rearward by a spring **90** to expose the ends of the bits **46** and **47** to facilitate loading the wires thereinto. A guide pin **92** is mounted within the spring **90** and has a shoulder **93** which is urged against a rear flanged portion **94** of the sleeve **89**. A trigger assembly **96** is slidably mounted on pins **97** and **98** which extend into slots (not shown) in the sides of the housing **91**. The trigger assembly includes a trigger **99** having a projection **101** thereon which engages a motor trigger **102** when moved a predetermined distance. A pivotally mounted arm **103** has a roller **104** rotatably mounted on one end thereof and has the other end **106** in engage-

ment with the flanged portion **94** of the sleeve **89**. A sloped cam surface **107** on the trigger assembly **96** engages the roller **104** when the trigger **99** is retracted and pivots the arm **103** so that the end **106** forces the sleeve **89** and the bit sleeve **41** over the bits **46** and **47**. Further retraction of the trigger **99** results in projection **101** engaging the motor trigger **102** to actuate the motor and rotate the bits. This embodiment permits one handed operation of the wiring tool. A spring **106** mounted on a guide pin **108** urges the trigger assembly **96** to the left after the operator releases the trigger **99**. The operation of this alternative embodiment should be obvious by referring to the description of the operation of the preferred embodiment.

It is to be understood that the above-described embodiments are merely illustrative of the application of the principles of this invention and that numerous other arrangements and modifications may be made within the spirit and scope of the invention.

What is claimed is:

1. A tool for wrapping a pair of wires onto a pair of spaced terminals comprising:

a housing having a handle portion and a barrel portion;

a motor mounted in said barrel portion and having a first shaft extending therefrom parallel to the axis of said barrel, said first shaft having a first gear fixed thereto;

a second shaft having a second gear fixed thereto mounted in said barrel so that said second gear engages said first gear;

a first flexible drive shaft having one end thereof fixed to said first shaft;

a second flexible drive shaft having one end thereof fixed to said second shaft;

a first wire wrapping element connected to said first flexible drive shaft;

a second wire wrapping element connected to said second flexible drive shaft, said first and second wire wrapping elements projecting out of said barrel portion;

means for rotatably holding said first and second wire wrapping elements a predetermined distance apart so that said first and second wire wrapping elements are aligned with the pair of terminals; and

means for actuating said motor to rotate said first and second wire wrapping means.

2. A tool as set forth in claim **1** wherein said means for rotatably holding said first and second wire wrapping elements comprises a sleeve having a first longitudinal bore therethrough and a second longitudinal bore therethrough, said first and second bores being parallel to one another and laterally spaced a predetermined distance apart to align said wire wrapping elements with said pair of spaced terminals.

3. A tool for wrapping wires onto pairs of spaced terminals having a particular relative disposition comprising:

a housing having a barrel and a piston grip handle;

a motor mounted within said barrel;

an adapter housing having a pair of rotatable wire wrapping devices mounted in one end;

a shaft rotatably mounted in the other end of said housing and having means thereon for engaging said motor;

means interconnecting said wire wrapping devices and said shaft for rotating said devices in opposite directions upon actuation of said motor; and

means for mounting said adapter housing to said barrel to prevent relative longitudinal movement but to permit selective rotary movement relative thereto so that said pair of wire wrapping devices can be adjusted to correspond to the relative disposition of the pair of terminals.

4. A tool for wrapping wires onto pairs of spaced terminals having a particular relative disposition comprising:

a housing including a barrel and a pistol grip handle;

motor means fixed within said barrel;

an adapter assembly including an adapter housing;

a pair of selectively spaced wire wrapping bits rotatably mounted within one end of said adapter housing;

a drive shaft rotatably mounted in the other end of said adapter housing;

means interconnecting said drive shaft and said wire wrapping bits for rotating said bits in opposite directions to one another when rotary motion is imparted to said drive shaft; and

means for mounting said adapter assembly to said barrel to permit said drive shaft to engage said motor means and to permit rotation of said adapter housing relative to said barrel so that the position of said wire wrapping bits corresponds to the relative disposition of said terminals.

5. A tool for wrapping a pair of wires onto a pair of terminals comprising:

a housing;

a motor mounted in said housing;

a pair of wire wrapping members, each having one end thereof extending into an end of said housing, each of the other ends of said members having a longitudinal groove in the periphery for receiving a wire and an axial recess for receiving a terminal;

means interposed between said motor and said wire wrapping members for rotating said members upon actuation of said motor;

a sleeve disposed over said wire wrapping members, said sleeve mounted for slidable movement relative to said housing between a first position wherein a portion of said longitudinal grooves are exposed so that wires can be inserted therein and a second position wherein said longitudinal grooves are covered by said sleeves;

trigger means slidably mounted to said housing;

means responsive to the retraction of said trigger means for moving said sleeve from said first position to said second position; and

means responsive to further retraction of said trigger means for actuating said motor.

6. A tool for simultaneously wrapping a plurality of wires onto a plurality of spaced terminals, which includes:

means for receiving and supporting a sleeve in which a plurality of wire wrapping members are mounted for rotation;

a plurality of flexible drive shafts, mounted for rotation within said supporting means, to which said wire wrapping members may be connected; and

means for rotating said flexible drive shafts simultaneously to rotate the wire wrapping members and wrap wires, received by the wrapping members, about the terminals.

7. A tool for wrapping pairs of wires about pairs of spaced terminals, which comprises:

means for receiving and removably supporting one of a plurality of sleeves in which pairs of wire wrapping bits are mounted for rotation and are spaced apart by distances equal to the distance between the pairs of spaced terminals;

a pair of flexible drive shafts, mounted for rotation within said supporting means, to which pairs of wire wrapping bits spaced apart by various distances may be connected; and

means for rotating said flexible drive shafts simultaneously to rotate a pair of wire wrapping bits connected to said flexible drive shafts and wrap a pair of wires, received by the wrapping bits, about a pair of terminals.

8. A device for wrapping pairs of wires onto pairs of

terminals spaced apart by various distances, which includes:

an adapter for receiving and supporting any one of a plurality of sleeves in which pairs of wire wrapping bits are mounted for rotation and are spaced apart by various distances corresponding to the spacing between the pairs of spaced terminals;

a pair of flexible drive shafts, mounted for rotation within said adapter, to which the various spaced pairs of wire wrapping bits may be connected; and

means for rotating said flexible drive shafts simultaneously to rotate the wire wrapping bits and wrap pairs of wires, received by the wrapping bits, about the pairs of terminals.

9. A device for wrapping pairs of wires onto pairs of terminals spaced apart by various distances, as set forth in claim 8, which includes means for adjusting

the angular position of said adapter relative to the device to permit the wrapping of pairs of wires onto pairs of terminals arranged in various angular configurations.

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U.S. Cl. X.R.

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