WIRE WRAPPING TOOLS
DESCRIPTION AND USE

CONTENTS PAGE

1. GENERAL

1.01 This section describes the GTE System Standard wire wrapping tools and their use. For more specific information on types of solderless wrapped connections, and the techniques involved in making and removing solder-less wrapped connections, refer to Section -256-050-2 11.

1.02 This section is reissued to delete parts of the text which are now covered in Section 256-050-211. Due to the extensive revision of text, marginal arrows have been omitted. Remove and destroy all copies of Section 075-630-101, Issue 2.

1.03 Solderless wrapped connections must be applied only to terminals specifically designed for wire wrapping. Where ac power is available, solderless wrapped connections must be applied with the electric wrapping tool. The spring loaded hand operated wrapping tool may be used only in instances where ac power is not available and only by personnel properly trained in its use.

2. DESCRIPTION

2.01 A wire wrapping tool is basically a metal rod which contains a longitudinal hole and a longitudinal slot and is covered by a stationary metal sleeve. The skinned portion of the lead is inserted into a slot of sufficient clearance to accept the wire and the remaining hole is large enough to be placed over the terminal.

2.02 The wrapping bit (Figures 1 and 2) has an axial hole in one end which fits over the terminal on which a wrapped connection is to be applied. In the same end as the terminal hole is a wire feed slot (on the outer edge) which receives the skinned portion of the wire. The raised section on the face of the wrapping bit around the wire feed slot and terminal hole is used to wipe down the wire end on the last turn of a wrapped connection.

2.03 The sleeve (Figure 1 and 2) has two anchoring notices located opposite each other for holding the insulated portion of the lead and preventing the insulation from wrapping around the terminal when applying a wrapped connection. The sleeve is equipped with a sleeve positioning slot used to align the sleeve anchoring notches and to hold the sleeve stationary during the wrapping operation. The sleeves used with the 22-24 gauge combination wrapping bit are also equipped with a wire guide. The wire guide, used to facilitate wire insertion, is a funnel shaped flare on the end of the sleeve. It indicates to the operator where the wrapping bit wire feed slot is located and guides the skinned portion of the lead into the wrapping bit wire feed slot. The sleeves used with the 24, 26 and 28 gauge wrapping bits do not have a wire guide.

2.04 Two types of sleeves are authorized for use with the 22-24 gauge combination wrapping bit. One type has a coating of insulating material applied to its outer surface. The insulated sleeve is to be used by maintenance personnel working on or near equipment in service and by installation personnel working on frames, etc., associated with hot circuits. During installation and maintenance, when not working on or near hot circuits, the uninsulated sleeve should be used. The sleeves used with the 24, 26 and 28 gauge wrapping bits are not insulated.

2.05 The 24, 26 and 28 gauge wrapping bits and associated sleeves and the 22-24 gauge combination wrapping bit and associated sleeve are metal and are used with the electric and the spring loaded wrapping tools. The 22-24 gauge combination wrapping bit and associated sleeve can be used to wrap 22 gauge wire and 24 gauge wire on terminals designed for wrapped connections with the exception of electromechanical relay spring pileup terminals. E iectromechanical relay spring pileup terminals are designed specifically for 24 gauge wire, wrapped with the 24 gauge wrapping bit and associated sleeve.

2.06 The electrically powered wire wrapping tool is equipped with a three wire grounded twenty foot cord and is enclosed in an insulated plastic case. This small light-weight wrapping tool weighs approximately ten ounces and measures as illustrated in Figure 3. The wrapping tool is designed with a pistol grip handle and equipped with a trigger mechanism which, when operated, releases the index assembly and applies power to the wrapping tool motor and when released, interrupts power to the wrapping tool motor and engages the index assembly to stop rotation of the wrapping bit and to properly position the wrapping bit wire feed slot for the next wrapping operation.

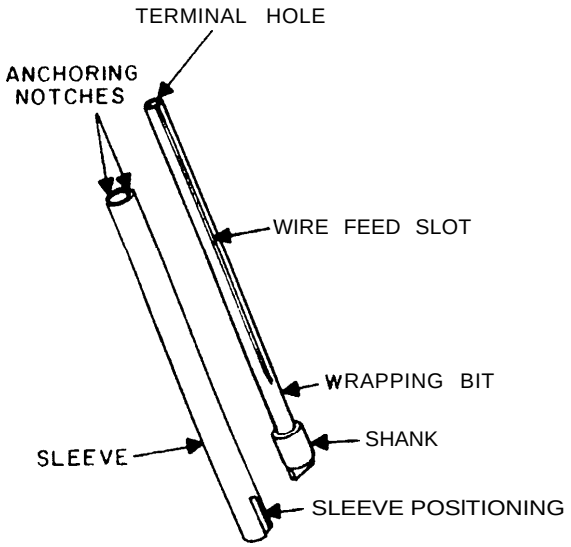

Figure 1. Wrapping Bit and Associated Sleeve.

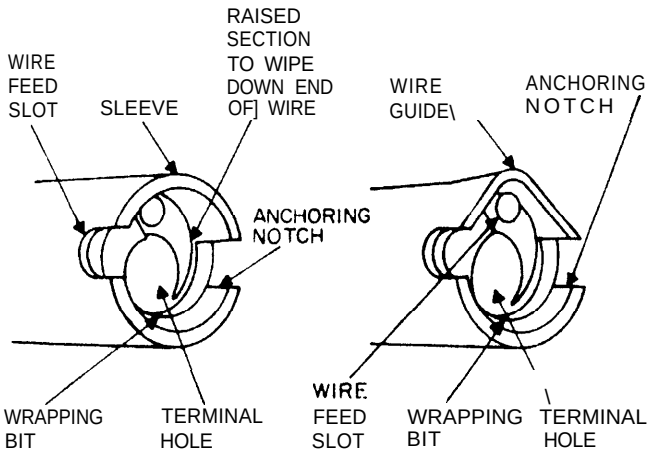

Figure 2. Wrapping Bit and Associated Sleeve-End View.

2.07 If the installer desires, the electric wire wrapping tool may be equipped with an optional anti-backforce device. Backforce is the pressure required on the wrapping tool when making a solderless wrapped connection, to make each wrap lie tightly against the previous wrap but not so much pressure as to cause the wrap to pile on top of the previous wrap. The anti-backforce device is a simple, easy to install, spring loaded cartridge which automatically produces the proper backforce. It is especially useful on 28 gauge wire where a very slight amount of backforce is required.

2.08 The metal spring loaded hand operated wire wrapping tool, measuring as illustrated in Figure 4, is designed with a pistol grip handle and equipped with a spring loaded trigger which, when operated, rotates the wrapping bit in the nosepiece to wrap a wire in a clockwise direction on the terminal and when released, causes the wrapping bit to rotate in an opposite direction until the trigger is fully released and the wrapping bit wire feed slot is in the proper position for the next wrapping operation. The spring loaded wrapping tool is light weight and is used only in instances where ac electric power is not available.

and Tool Corporation Model G100/K9375 is an alternate for the Gardner Denver Model 14H-LC (Figure 4).

2.09 The left hand unwrapping tool (Figure 5) is of one-piece construction, consisting of an insulated plastic handle, a metal unwrapping bit permanently attached to the straight handle, and an insulated sleeve attached to the unwrapping bit. The insulated sleeve may be retracted to remove the coiled unwrapped wire and is equipped with a small spring to return it to its normal position. It is used to unwrap 22, 24 or 26 gauge right hand wrapped connections. The P.K. Neuses Model N-3328 is an alternate for the model AMW-3328. Table 1 lists the System Standard wire wrapping tools.

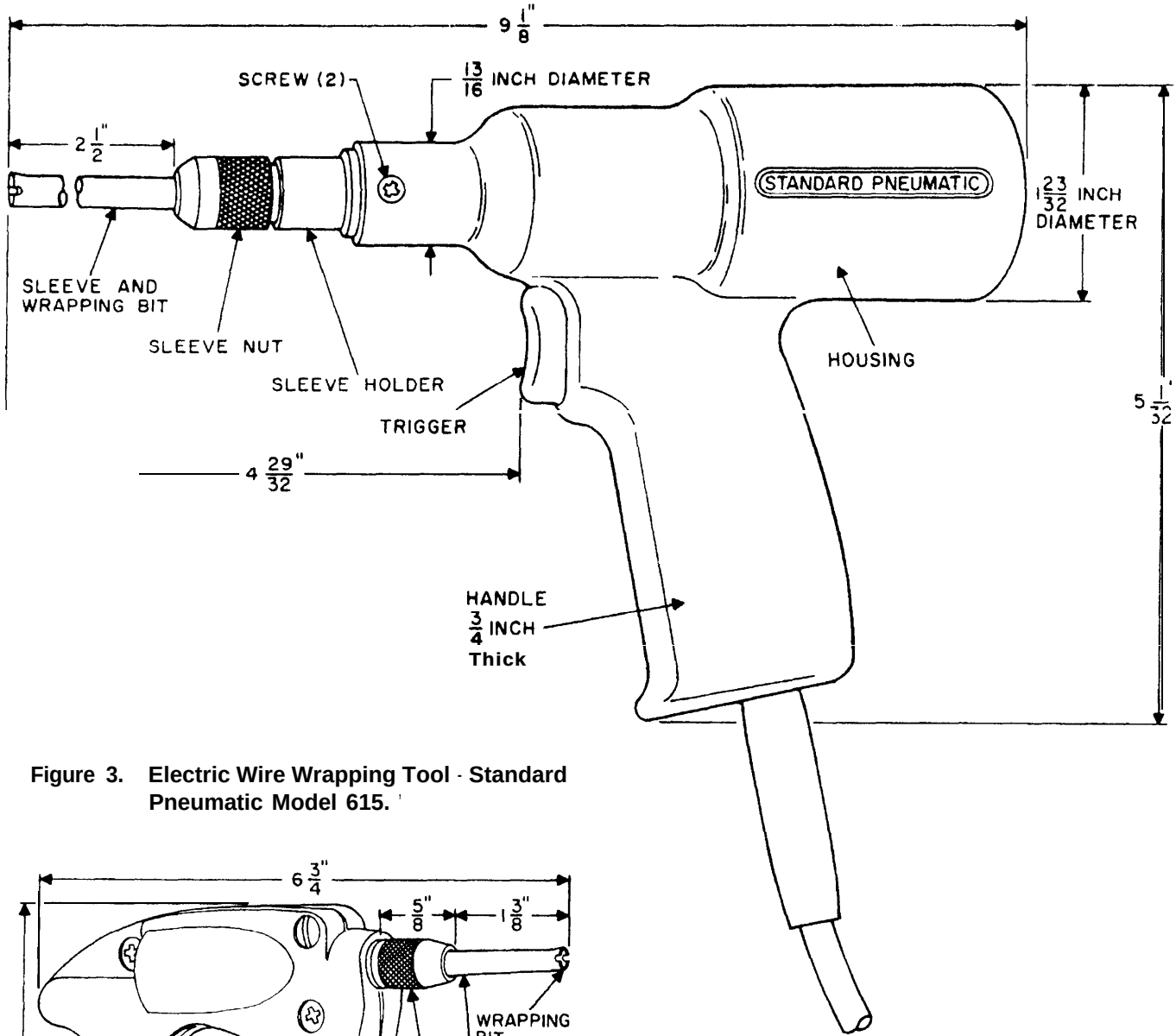

Figure 3. Electric Wire Wrapping Tool - Standard Pneumatic Model 615.

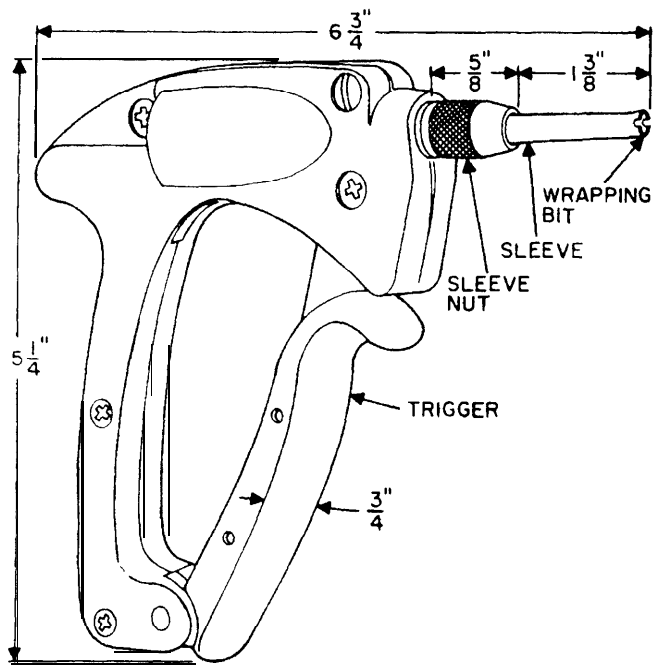

Figure 4. Spring Loaded Hand Operated Wrapping Tool.

2.10 The dual right and left hand unwrapping tool (Figure 6) is of one-piece construction, consisting of a plastic handle and right and left hand unwrapping bits. This tool be used to unwrap either 28,30,or 32 guage right or left hand wrapped connections in electronic exchanges.

3. PRECAUTIONS

3.01 Use care when working with wire wrapping tools and ensure that they are placed in a safe secure location when not in use. Wire wrapping tools are precision tools and can be easily damaged through misuse, carelessness, or improper storage.

Table 1. System Standard Wire Wrapping Tools.

TOOL	MANUFACTURER'S NUMBER	WIRE GAUGE	USE
Electric	Standard Pneumatic 615	22, 24, 26, 28	Used with wrapping bit and associated sleeve to apply wrapped connections.
Hand operated	Gardner Denver 14H-1C, OK Machine G10C/R3978 OK Machine G20C/R3278	22, 24, 26, 28	Used with wrapping bit and associated sleeve to apply wrapped connections only when ac electric power is not available.
Hand wire wrap	H. F. Wilson 23100-PI	22, 24	Used for making solderless connections. Will accept and wrap both 22 and 24 gauge wire.
Anti-backforce device	Standard Pneumatic 5724	24	Used with the Model 615 wire wrapping tool to apply the proper backforce pressure when making 24 gauge connections.
Anti-backforce device	Standard Pneumatic 5728	28, 30	Used with the Model 615 wire wrapping tool to apply the proper backforce pressure when making 28 gauge connections.
Bit 22/24	Gardner Denver 500131	22, 24	22-24 gauge combination wrapping bit, used with Gardner Denver 18840 and A-251 33-2 sleeves.
Bit 24	Gardner Denver 512058	24	24 gauge wrapping bit, used with Gardner Denver 512057 sleeve for wrapping connections on electromechanical relay spring pileup terminals.
Bit 26	Gardner Denver 502118	26	26 gauge wrapping bit, used with Gardner Denver 512057 sleeve for wrapping connections on electronic switching systems.
Bit 28	Gardner Denver 501389	28	28 gauge wrapping bit, used with Gardner Denver 502129 sleeve for wrapping connections on electronic switching systems.
Sleeve 22/24	Gardner Denver 18840	22, 24	Uninsulated 22-24 gauge combination sleeve with wire guide, used with Gardner Denver 500131 wrapping bit.
Sleeve 22/24	Gardner Denver A-25 133-2	22, 24	Insulated 22-24 gauge combination sleeve with wire guide, used with Gardner Denver 500131 wrapping bit.
Sieeve 24/30	Gardner 512056		24, 26 Uninsulated 24/30 guage sleeve without wire guide, used with Gardner Denver 512058 and 502118 wrapping bits.
Sleeve 28	Gardner Denver 502129	28	Uninsulated 28 gauge sleeve without wire guide, used with Gardner Denver 501389 wrapping bit.
Unwrap	Standard Pneumatic AMW-3328	22, 24,	Left hand unwrapping tool used to unwrap right hand wrapped solderless wrapped connections.
	P. K. Neuses N-3328	26	
Unwrap	Gardner Denver 505244	28, 30, 32	Dual right and left hand unwrapping tool used to unwrap right and left hand wrapped solderless wrapped connections.
Wire stripper/ cutter	Deaborn Tool and Mfg. R-3907		Used to strip insulation and cut wire to the proper length for gun wrapping.

3.02 When working on ladders follow adequate safety precautions, such as securing wrapping tools with cord or otherwise ensuring that the wrapping tools cannot fall.

3.03 The wrapping bit of both the electric and the spring loaded wire wrapping tools rotates in a thin-walled sleeve and, due to the close tolerance between the two parts, a severe bump or dropping the tool may result in damage to the wrapping bit, sleeve, or both, causing the wrapping bit to jam or fail to index (wire feed slot fails to line-up with the top of the sleeve).

3.04 Before connecting leads to terminals associated with operating equipment, contact the appropriate supervisor to have the equipment released if possible. When making connections to terminals near terminals associated with operating equipment, use care not to damage equipment and tools by grounding or shorting the terminals with the wrapping tools and follow appropriate safety precautions to avoid shock to personnel. The following should be noted:

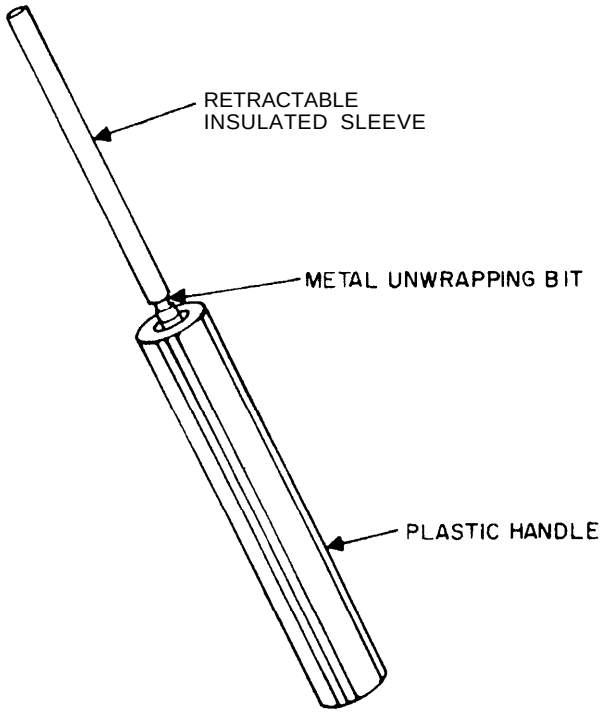

Figure 5. Left Hand Unwrapping Tool (22, 24, and 26 AWG).

(a) The spring loaded hand operated wrapping tool is a metal tool. No insulation is provided on the handle or the wrapping bit of the tool.

(b) The electric wrapping tool has a plastic insulated case. This case provides insulation from the motor assembly. The motor assembly is insulated from the bit, sleeve, and sleeve holder. One lead of the three wire power cord provides ground to the motor assembly.

(c) When working with 22 or 24 gauge wire on or near hot circuits, the insulated 22-24 gauge combination sleeve should be used. The 24, 26 and 28 gauge sleeves are not insulated.

(d) The left hand unwrapping tool has a plastic insulated handle and the metal sleeve covering the metal unwrapping bit is covered with insulating material.

(e) The dual right and left hand unwrapping tool has a plastic handle with metal unwrapping bits that are not covered by any insulating material.

4. USE

4.01 After selecting the proper wrapping bit and sleeve combination, inspect the wrapping bit and sleeve for defects or damage. Insert the wrapping bit into the sleeve and rotate the bit to ensure that it moves freely inside the sleeve. Binding may indicate a bent, damaged, or dirty wrapping bit or sleeve or an improper wrapping bit and sleeve combination. An improper wrapping bit and sleeve combination may also cause excessive free-play between the wrapping bit and sleeve.

Setting the Indexing Position for Model 615

4.02 The indexing position for the wrapping bit may be set at any one of 4 angular positions which are 90 degrees apart. The 0 degree position is the 12 o'clock position looking at the sleeve

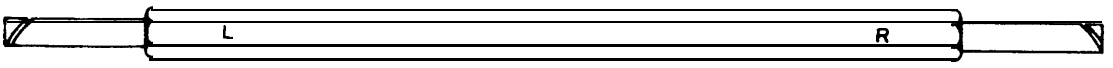

Figure 6. Dual Right and Left Hand Unwrapping Tool ~~(28 and 30 AWG)~~ (28, 30 and 32 AWG).

See Addendum.

holder with the handle of the wire wrapping tool at the 6 o'clock position. Under normal conditions, the wire feed slot in the wrapping bit should always be 90 degrees from the anchoring notches on the sleeve. To set the indexing position proceed as follows:

(1) Remove the wrapping bit and sleeve from the wire wrapping tool in accordance with Paragrpah 4.04.

(2) Remove the two screws located at the front of the housing (Figure 7), and remove the sleeve holder.

NOTE: The spacer may or may not come off with the sleeve holder. If the spacer comes off, check that it is in place before installing the sleeve holder.

(3) Pull the bit driver from the output shaft located within the housing.

(4) Place the bit driver in the desired position, then press it on the output shaft.

(5) Install the spacer, if necessary, and the sleeve holder. Secure the sleeve holder with the two screws removed in Step (2).

(6) Replace the wrapping bit and sleeve in accordance with Paragraph 4.03.

Installing Wrapping Bit and Sleeve in Model 615

4.03 Install the wrapping bit and sleeve in the wire wrapping tool as follows:

(1) Loosen the sleeve nut on the wire wrapping tool (Figure 3).

(2) Hold the wrapping bit so that the flat on the shank end is toward the key in the sleeve holder, and insert the wrapping bit into the sleeve holder.

(3) After the flat on the shank end of the wrapping bit has passed the key in the sleeve holder, turn the wrapping bit as required to seat it in the bit driver.

(4) Slide the sleeve over the wrapping bit; align the groove on the sleeve with the key in the sleeve holder; then, press the sleeve into the sleeve holder.

(5) Tighten the sleeve nut while operating the motor of the wire wrapping tool to secure the wrapping bit and sleeve in the proper position.

(6) Start and stop the motor a few times to ensure that the wrapping bit rotates freely inside the stationary sleeve and that the wrapping bit indexes properly.

(7) If the wrapping bit fails to rotate in the sleeve or to index properly, loosen the sleeve nut and reposition the bit and sleeve making sure that they are seated properly; then repeat Steps (5) and (6).

(8) If the wrapping bit continues to fail the rotation and index test, return the wire wrapping tool, wrapping bit, and sleeve to the storeroom for inspection and repair.

Removing Wrapping Bit and Sleeve from Model 615

4.04 Remove the wrapping bit and sleeve from the wire wrapping tool as follows:

(1) Loosen the sleeve nut on the wire wrapping tool (Figure 3).

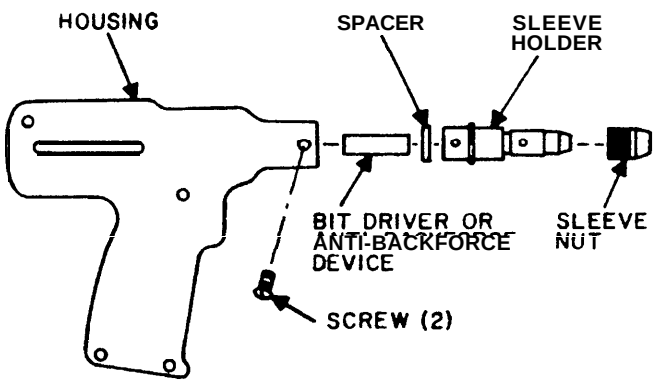

Figure 7. Electric Wire Wrapping Tool Disassembly For Setting Indexing Positions.

(2) Pull the sleeve free from the sleeve holder; then, slide the sleeve off the wrapping bit.

(3) Pull the wrapping bit free from the bit holder; then, rotate the wrapping bit as required and slide it from the sleeve holder.

Installing Optional Anti-Backforce Device in Model 615

4.05 To install the optional anti-backforce device in Model 615 proceed as follows:

(1) Remove the wrapping bit and sleeve from the wire wrapping tool in accordance with Paragraph 4.04.

(2) Remove the two screws located at the front of the housing (Figure 7).

(3) Remove the sleeve holder noting exactly how it is positioned.

CAUTION: When reassembling the sleeve holder, it must be positioned exactly the same as when it was removed if the same indexing position is desired.

See Addendum

(4) Remove the bit driver, noting the position of the "halfmoon" at the end of the bit driver.

(5) Install the anti-backforce device in place of the bit driver, positioning the "halfmoon" at the end of the device in the same position that the "halfmoon" at the end of the bit driver was in.

(6) Install the sleeve holder and the two screws at the end of the housing.

(7) Install the wrapping bit and sleeve in accordance with Paragraph 4.03.

Installing and Removing Wrapping Bit and Sleeve on MOdel 14H-1C

4.06 Installation and removal of the wrapping bit and sleeve on the Model 14H-1C is essentially the same as for the Model 615 except that the Model 14H-1 C is hand operated and therefore, tests for wrapping bit rotation and indexing must be done manually. Refer to Paragraphs 4.03 and 4.04 for the installation and removal of wrapping bits and sleeves on the Model 615.

Length of Skinned Wire

4.07 The type of wrapped connection intended, solderless or soldered, the number of required turns of wire, the wrapping pressure exerted on the wire by the wrapping tool, the wire size, and the dimensions and shape of the terminal to be wrapped determine the length of the skinned wire to be placed in the wrapping bit wire feed slot and wrapped around the terminal. The number of turns of wire in a connection is directly proportional to the length of the skinned wire and inversely proportional to the terminal size. For the proper length of wire to be skinned, minimum number of turns etc., refer to Section 256-050-211.

Wrapping a Wire

4.08 Insert the skinned portion of the wire into the wrapping bit wire feed slot, ensuring that the lead is inserted up to the insulation [Figures 8(a), (b), and (c)]. If the lead is not inserted up to the insulation, an exposed skinner may result in an improper wrap.

NOTE: When making a modified wrapped connection, part of the insulated portion of the wire is inserted into the wire feed slot.

4.09 After inserting the wire into the wire feed slot, bend the insulated portion of the lead into the sleeve anchoring notch as illustrated in Figure 8(d). Use of the left or right anchoring notch is determined by the direction the lead should be dressed. A lead dressed down or to the left of the terminal is placed in the left anchoring notch and a lead dressed up or to the right is placed in the right anchoring notch.

4.10 While holding the wire taut in the anchoring notch, insert the wrapping tool over the terminal Figure 8(e) to a point near the terminal shoulder or last previously wrapped connection. In no case should the sleeve straddle the terminal shoulder or overlap a previously wrapped connection at the beginning of the wrapping operation.

4.11 It is important that the wrapping tool be in direct line with the terminal before and during the wrapping operation. If the wrapping tool is not properly aligned with the terminal axis, the terminal may be bent and the resultant wrapped connection may be damaged.

4.12 Operation of the trigger will wrap the wire on the terminal. The wrapping tool will recede [Figure 8(f)] as the wire coils on the terminal, producing a finished connection [Figure 8(g)] . Approximately 2 pounds pressure on the wrapping tool should be exerted against the connection during the wrapping operation to ensure a closely wound connection.

4.13 Insufficient pressure on the wrapping tool during the wrapping operation may cause an open spiral or excessive separation between inside turns. Some excess space between the first turn and the last turn of a solderless wrapped connection is permissible, provided the space between each of the inside turns is not greater than 1/4 of the wire's diameter as gauged by the eye.

4.14 When the wrap is completed, remove the wrapping tool from the terminal and release the trigger. Releasing the trigger removes power from the wrapping tool motor and engages the index assembly to properly position the wrapping bit for the next wrapping operation.

4.15 With the spring loaded wrapping tool, hold the trigger operated when the wrap is completed, remove the wrapping tool from the terminal, then release the trigger, allowing the wrapping bit to rotate in the opposite direction until the trigger is fully released and the wrapping bit is positioned ready for the beginning of the next wrapping operation. Do not release the trigger while the wrapping bit is still on the terminal to avoid damage to the wrapped connection or to the terminal.

4.16 Removing power from the wrapping tool too quickly, not maintaining sufficient pressure on the wrapping tool near the end of the wrap, or an excessively worn raised section on the face of the wrapping bit around the wire feed slot and terminal hole used to wipe down the end of the wire, may cause an incomplete wrap or excessive pigtail protruding from the terminal.

Removing Wrapped Connections

4.17 The spiral of a solderless wrapped connection may be unwound with an unwrapping tool (Figures 5 and 6). No attempt should be made to pull the wrap from the terminal by pulling on the lead. This may bend the terminal or break the wire and make the wrap difficult to remove. Refer to Section 256-050-211 for the proper method of unwrapping solderless wrapped connections.

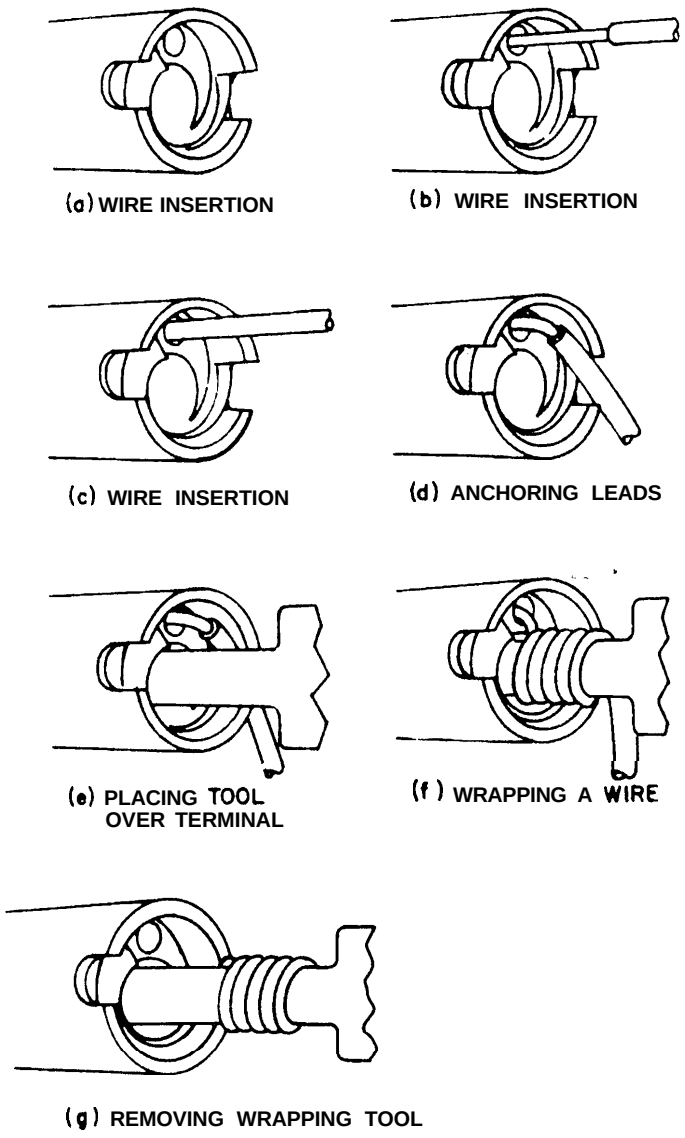

Figure 8. Wrapping Operation Sequence (Conventional Wrap Shown).