KS-21749

CONNECTING TOOL

1. GENERAL

1.01 This section provides identification, operation, and maintenance information on the KS-21749 connecting tool (Fig. 1 and 2).

1.02 Whenever this section is reissued, the reason for reissue will be listed in this paragraph.

2. IDENTIFICATION

2.01 The KS-21749 connecting tool is a portable, hand-operated device designed for connecting KS-coded plugs and receptacles of the 50-pin solderless miniature ribbon type to D inside wiring cable or to A- and B-type connector cables. It is intended primarily for installation and modification jobs on customer premises. Use of the connecting tool allows the fabrication of interconnection cables of specific required lengths, reducing waste and saving space. It weighs 11-1/2 pounds and is 14-3/4 inches long, 5-5/8 inches wide, and 6-5/8 inches high.

2.02 ***Ordering Guide***

(a) ***Basic Unit***

- Tool, Connecting, KS-21749, List 1

(b) ***Replaceable Components***

(1) The following two items would normally be replaced because of excessive wear:

- Knife, KS-21749, List 2
- Blade, Insertion, KS-21749, List 3

(2) The following two items would normally be replaced only because of damage:

- Comb, Wire Guide, KS-21749, List 4
- Nest, KS-21749, List 5

(c) ***Associated Apparatus (Order Separately)***

- Case, KS-21749, List 6 (optional carrying case for KS-21749, List 1 connecting tool)
- Tool, Connecting, Hand, KS-21872 (for making single lead terminations)

2.03 The connecting tool should be used on a sturdy table, bench or shelf, or on the floor, wherever it is most convenient for the installer. There must be sufficient unobstructed space behind the tool for the handle to be opened completely. It can be carried by its operating handle when the handle is locked down or by the rubber-covered pivot bar on the top of the tool.

2.04 The optional carrying case is made of black 1/8-inch semirigid plastic and is approximately 15-1/8 inches long, 4-5/8 inches high, and 6-3/8 inches wide. The connecting tool is inserted into the case through the hinged end and locked in by closing the door. The top pivot bar of the tool is left exposed to provide a carrying handle. The case contains a storage compartment for spare connectors, spacers, and a hand connecting tool.

2.05 The connectors and cable which can be joined by the connecting tool are summarized in Table A, and the connectors are illustrated in Fig. 3 through 8. A plug is defined as a male connector and a receptacle as female.

2.06 Older D inside wiring cable found in existing installations may be of the thick-jacket type, while newer cable, currently identified by four longitudinal ribs, has a thinner jacket. ***Do not use connectors intended for thin-jacket cable with thick-jacket cable, and vice versa; the connector hoods will not fit***

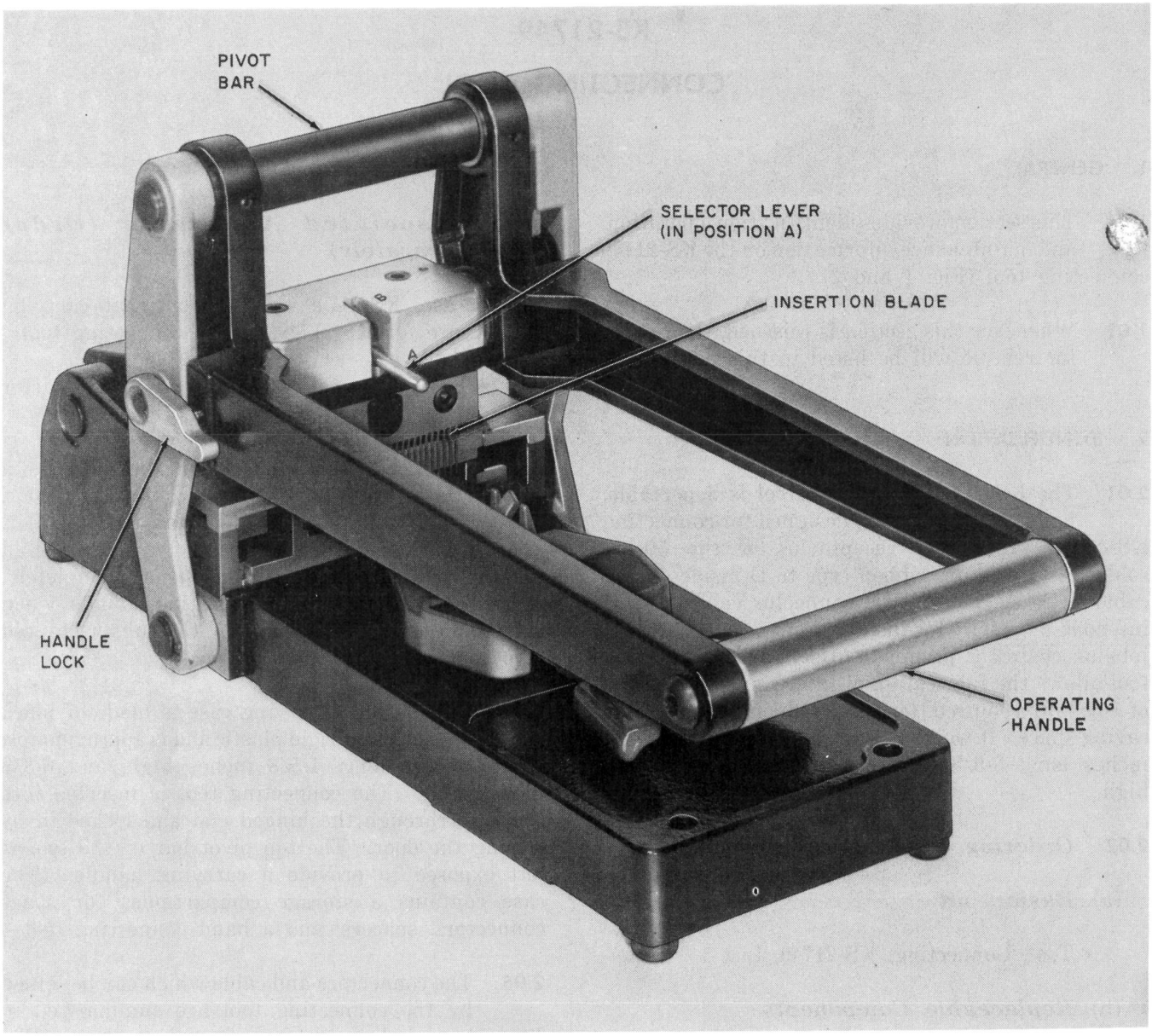


Fig. 1—KS-21749 Connecting Tool, Front View With Handle Closed

properly and adequate strain relief may not be provided.

2.07 Terminal numbers are molded into the plastic part of each connector and can be found by close examination.

It is essential that connector numbers be correctly identified before the connector is placed in the connecting tool for wiring.

3. OPERATION

3.01 The most important requirements in successfully joining a cable to a connector are (1) to make all connections mechanically and electrically sound, and (2) to put the right wire on the right terminal every time. Proper use of the connecting tool, as described in this practice, will take care of the first requirement. The installer must be completely familiar with all aspects of operating the tool. The second requirement depends entirely

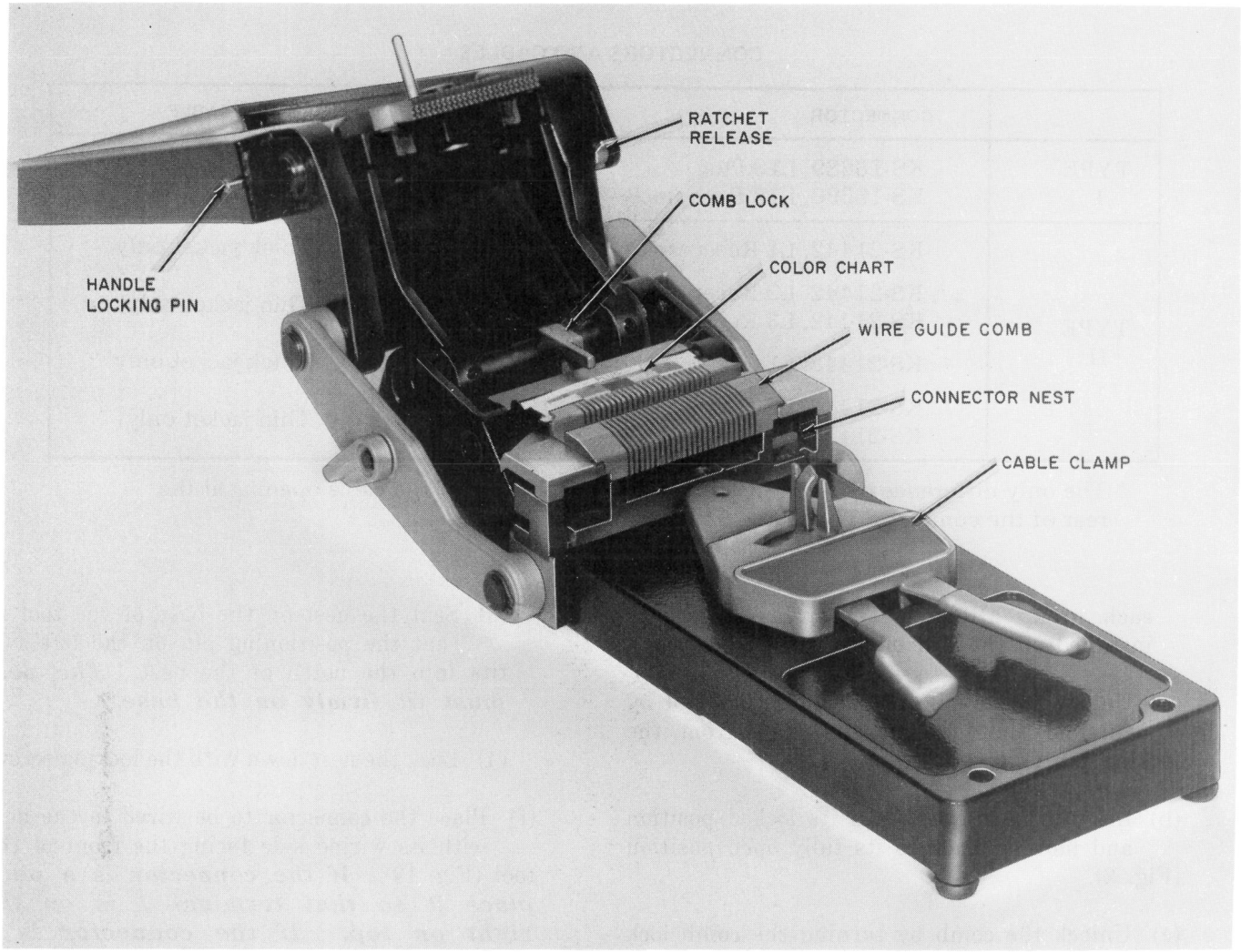


Fig. 2—KS-21749 Connecting Tool, Front View With Handle Open

on the installer's knowledge of wire color codes and his attention to the job. One mistake can ruin a connection.

3.02 ***Standard Even-Count Color Cutdown***— Table B lists the fifty terminals of the connectors covered in this practice and the corresponding colors of the leads connected to them. ***Make no changes to this arrangement.***

3.03 ***Inspection of Connecting Tool***—Before using the tool to make any terminations, inspect it for the following conditions:

- Comb clean and free of wire clippings
- Forward edge of knife (Fig. 30) sharp and free of nicks; change if necessary (4.03)
- Insertion blade (Fig. 1) not bent; replace if necessary (4.04)
- Comb, knife, insertion blade, and nest securely mounted
- Other parts of tool in good condition.

3.04 ***Step-by-Step Procedure***—Perform the following steps to connect a 25-pair cable to one of the connectors listed in Table A.

Note: If a cable has more than one 25-pair group, this same procedure will be used for

TABLE A

CONNECTORS AND CABLES

	CONNECTOR	FIG.	CABLE
TYPE I	KS-16689, L18 Plug KS-16690, L12 Receptacle	3, 4 3, 5	Thick or thin jacket
TYPE II	KS-21442, L1 Receptacle*	6, 7	Thick jacket only
	KS-21442, L2 Receptacle* KS-21442, L3 Receptacle	6, 7 10	Thin jacket only
	KS-21443, L1 Plug*	6, 8	Thick jacket only
	KS-21443, L2 Plug* KS-21443, L3 Plug	6, 8 10	Thin jacket only

* The only difference between List 1 and List 2 is the size of the cable opening at the rear of the connector hood (Fig. 9).

each group after an appropriate sleeve is installed on the end of the cable (see 3.05).

(a) Unlock the handle of the insertion tool by flipping the lock up and back from the locking pin (Fig. 1).

(b) Lift the handle up from its locked position and move it back to its fully open position (Fig. 2).

(c) Unlock the comb by turning the comb lock to the right (Fig. 2).

(d) Open the comb by lifting it up and back.

(e) Look at the connector nest (Fig. 2) to determine if it is in the correct position for the connector being wired. Table C lists the proper nest positions for the various connectors. "TYPE 1" or "TYPE 2" will be visible facing upward on the right side of the nest (Fig. 11 and 12). If the nest is in the correct position, go directly to step (f). It it is not, perform the following procedure first:

(1) Remove the nest locking screw (Fig. 11).

(2) Lift the nest up from the base and turn it around so that the correct nomenclature shows on the right side.

(3) Seat the nest on the base of the tool so that the positioning pin on the left side fits into the notch of the nest. ***The nest must fit firmly on the base.***

(4) Lock the nest down with the locking screw.

(f) Place the connector to be wired in the nest with its wiring side facing the front of the tool (Fig. 13). ***If the connector is a plug, place it so that terminal 1 is on the right on top. If the connector is a receptacle, place it so that terminal 1 is on the left on top.***

(g) Flip the color chart to the "PLUG" or "RECEPTACLE" position depending on the type of connector being wired.

(h) Close the comb downward over the connector and lock it in position by turning the comb lock to the front (Fig. 14).

(i) Set the selector lever to the proper position according to the type of connector being wired (Table C and Fig. 15).

(j) Remove about 5 or 6 inches of jacket off the end of the cable to be terminated. ***Do not strip the individual leads.***

(k) Grip the cable in the cable clamp of the tool with the end of the jacket even with

TABLE B

WIRE CONNECTIONS TO KS-CODED SOLDERLESS CONNECTORS

TERM. NO.	WIRE COLOR	TERM. NO.	WIRE COLOR
1	BL-W	26	W-BL
2	O-W	27	W-O
3	G-W	28	W-G
4	BR-W	29	W-BR
5	S-W	30	W-S
6	BL-R	31	R-BL
7	O-R	32	R-O
8	G-R	33	R-G
9	BR-R	34	R-BR
10	S-R	35	R-S
11	BL-BK	36	BK-BL
12	O-BK	37	BK-O
13	G-BK	38	BK-G
14	BR-BK	39	BK-BR
15	S-BK	40	BK-S
16	BL-Y	41	Y-BL
17	O-Y	42	Y-O
18	G-Y	43	Y-G
19	BR-Y	44	Y-BR
20	S-Y	45	Y-S
21	BL-V	46	V-BL
22	O-V	47	V-O
23	G-V	48	V-G
24	BR-V	49	V-BR
25	S-V	50	V-S

ABBREVIATIONS:

BL — Blue	W — White
O — Orange	R — Red
G — Green	BK — Black
BR — Brown	Y — Yellow
S — Slate	V — Violet

the ridge behind the jaws and the free wires extending beyond the back of the comb (Fig. 16).

(l) Turn the cable clamp all the way to the right so that the cable enters the tool from the right. (This will allow the connector hood to be mounted more easily when wiring is finished.)

Remember that with a plug mounted in the tool as specified in (f), the first comb notch on the right corresponds to connector terminal 1; with a receptacle in the tool, the first comb notch on the left corresponds to connector terminal 1.

(m) Press the first 25 wires of the cable into notches 1 through 25 in the comb using Table B or the color chart as a guide (Fig. 17). Pull the end of each wire to one side to hold it in its notch (Fig. 18). Arrange the wires neatly so there is a minimum of slack and tangling.

Note: The color chart on the tool provides the same information in pictorial form as Table B. The numbers on the chart correspond to the end terminal numbers of the connector properly mounted in the tool. Read the colors from bottom to top beginning at the terminal number (Fig. 19).

(n) Be sure that all 25 wires are in their proper notches, that there is only one wire per slot, the selector lever is in the correct position, and the comb lock closed.

(o) Bend the remaining 25 wires out of the way so they will not interfere with the next operation (Fig. 20).

(p) Pull the handle forward in a smooth, steady motion until it is ***completely closed, inserting the wires into the connector (Fig. 21).***

Note: After the handle ratchet engages and starts to click, the handle cannot be reversed until the connection operation is complete or unless the ratchet release is opened (Fig. 2).

(q) Open the handle completely.

(r) Remove the wire cuttings from the comb and discard them.

(s) Open the comb, release the cable clamp, and reverse the partially wired connector in the nest so that the cable is entering the tool from the left. Turn the clamp all the way to the left and grip the cable with it (Fig. 22).

(t) Close and lock the comb.

Remember that with a plug in the tool, the first comb notch on the left corresponds to connector terminal 26; with a receptacle in the tool, the first

comb notch on the right corresponds to connector terminal 26.

(u) Press the remaining unconnected 25 wires into notches 26 through 50 in the comb using Table B or the color chart as a guide (Fig. 23).

(v) Be sure that all 25 wires are in their proper notches (Fig. 24).

(w) Close the handle as described in (p) to make the connections.

(x) Open the handle completely.

(y) Remove the wire cuttings from the comb and discard them.

(z) Open the comb and the cable clamp and remove the completely wired terminal (Fig. 25).

3.05 ***Termination of Cable With More Than 25 Pairs***—In cable with 50, 75, 100, or 125 pairs, each 25-pair group is identified by a colored binder: blue for the first group, orange for the second, green for the third, brown for the fourth, and slate for the fifth. When attaching connectors to such cables; perform the following steps to prepare the cable for termination:

(a) Remove about 8 inches of jacket off the end of the cable. ***Do not strip the individual leads.***

(b) Separate the cable into its binder color groups and tie off each group with its own binder. Be sure that leads from one group do not get mixed with another group.

(c) Select an appropriate molded plastic sleeve (Table D) and insert the cable into it. One color group will occupy each finger of the sleeve, the blue group in the first finger, the orange group in the second finger, etc.

Note: On 5-fingered sleeves, RS-17272 pulling grips can be used to pull the cable through the sleeve.

(d) Fit the sleeve down over the cable so that its wrist extends well below the end of the cable jacket.

3.06 Terminate the blue group first using the detailed procedure of 3.04 [omit step (j)]. Terminate the orange group next, and then, if they are used, the green, brown, and slate groups.

TABLE C

TOOL SETTINGS

CONNECTOR	NEST POSITION	SELECTOR LEVER POSITION
KS-16689,L18 Plug	Type 1	A
KS-16690,L12 Receptacle	Type 1	B
KS-21442,L1 Receptacle	Type 2	A
KS-21442,L2 Receptacle	Type 2	A
KS-21442,L3 Receptacle	Type 2	A
KS-21443,L1 Plug	Type 2	A
KS-21443,L2 Plug	Type 2	A
KS-21443,L3 Plug	Type 2	A

TABLE D

MOLDED PLASTIC SLEEVES

NUMBER OF FINGERS	ORDER NO.
2	RS-9129-A
3	RS-9129-B
4	RS-9129-C
5	RS-9129-D

3.07 ***Connector Inspection***—Carefully inspect both sides of the connector to be sure that all wires are properly terminated.

Type I: Each conductor should extend between and be securely gripped by both sets of terminal jaws. Each conductor should be fully bottomed in each terminal.

Type II: Each conductor should extend between and be securely gripped by both sets of slots. Each conductor should be positioned approximately in the center of the narrow (lower) slot.

3.08 ***Rewiring***—If only a few wires have been connected to the wrong terminals, it may be possible to change them without a complete rewiring. Carefully remove each improperly connected wire with long-nose pliers (Fig. 26). Lift the wire upward with a twisting motion of the pliers so that the terminal jaws are not damaged. ***Do not pull the wire sideways from the terminal; this might damage the jaws so badly that the connector would have to be discarded.*** Cut off the used tip of each wire and reterminate with the hand connecting tool (Fig. 27) as follows:

(a) For Type I connectors (Table A), position the pawl on the hand connecting tool parallel to the handle.

(b) For Type II connectors, position the pawl perpendicular to the handle so that it will engage the notch when the tool is operated.

(c) Partially insert the wire into the proper terminal with a KS-6320 orange stick or an equivalent tool.

(d) Approaching the connector from the front (contact) side, use the hand tool to attach the wire. Hold the tool so that the insertion blade presses the wire into the terminal while the anvil supports the opposite surface. Squeeze the handles firmly until the wire is well seated.

The terminals in the connectors covered in this practice can be rewired a maximum of 5 times without excessive damage.

3.09 If a large number of leads, or an entire side or both sides of the connector, appear to be poorly terminated, it is likely that the connecting tool was used incorrectly. In such a case, it will be necessary to repeat the entire connecting procedure:

(a) Carefully remove each wire from the connector as described in 3.08.

(b) Remove more jacket.

(c) Terminate the cable again, following the instructions in 3.04.

3.10 ***Installation of Hood***—To protect the wiring side of the connector, always install the hood supplied with the connector.

3.11 ***Strain Relief***—On Type I connectors (metal hoods), provide strain relief for the cable by putting an RM-729159 split tube spacer around the cable under the clamp and tightening the clamp screw (Fig. 28). Test the cable for adequate strain relief by holding the connector and pulling on the cable; there should be no movement of the cable under the clamp.

3.12 All Type II connectors (plastic hoods) are designed to provide sufficient strain relief without the use of spacers when they are properly installed on the cables for which they are intended (Table A). When mounting the hood on Type II L1 and L2 connectors, be sure that the three tabs which hold the halves together are tightly engaged. The L3 connector has a separate strain relief clamp which must be installed on the rear of the hood to secure the cable.

When the jacket is removed and a plastic sleeve is mounted on the cable in a multiconnector termination, or when a cable with less than 25 pairs is terminated, always test for adequate strain relief. Install a split tube spacer if necessary.

3.13 ***Dust Cover***—If the terminated cable is not to be used immediately, leave the dust cover on the connector.

4. MAINTENANCE

4.01 The only maintenance to be performed on the insertion tool by the installer is replacement of the wire guide comb, the knife, the insertion blade, and the nest when these parts are damaged or excessively worn. The knife especially will have to be serviced periodically because it receives much more wear than the other parts. ***Whenever the tool starts failing to cut the wires cleanly and easily, the knife probably needs to be changed.***

4.02 ***Wire Guide Comb***—To take off the comb, use a 3/32 Allen wrench to remove the 2 screws which hold it down. Lift the comb away from the tool (Fig. 29). Mount a new comb on the tool with the 2 screws.

4.03 ***Knife***—The knife is reversible; both edges can be used before it is replaced. To take out the knife, first remove the comb. Then open the comb lock and turn the comb hinge back to get access to the 3 screws which secure the knife (Fig. 12). Remove the screws with a small screwdriver.

4.04 Note that the upper side of the blade has a wide notch in the middle while the underside is completely flat (Fig. 30). Always mount the knife with its notched side upward.

4.05 Also note the arrow stamped on the notch surface and its position relative to "NEW" and "OLD" stamped on the surface behind the knife. If the arrow is pointing to NEW, then the rear edge of the knife is fresh; turn the knife around 180 degrees and put the screws back in. However, if the arrow is pointing to OLD, both edges have been used and the knife should be replaced with a new one. ***Always install a new knife with its arrow pointing to NEW.***

4.06 ***Insertion Blade***—To take off the insertion blade, use a 5/32 Allen wrench to remove the two screws which hold it (Fig. 15). Lift the part away from the tool. Mount a new insertion blade on the tool with the 2 screws.

Caution: Do not disturb the adjustment screw behind the insertion blade.

4.07 ***Nest***—To replace a damaged or defective nest, first remove the locking screw (Fig. 11) and lift off the nest. Put a new nest in position and lock it down with the screw.

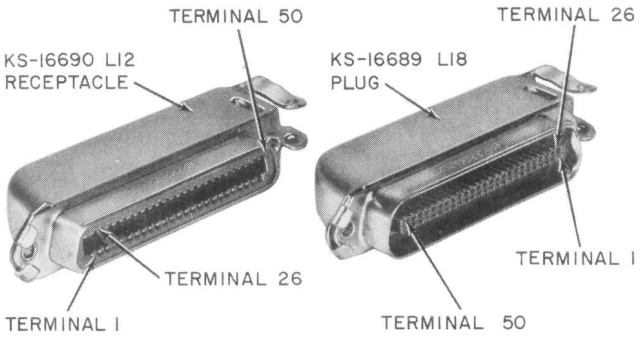


Fig. 3—KS-16689, L18 Plug and KS-16690, L12 Receptacle

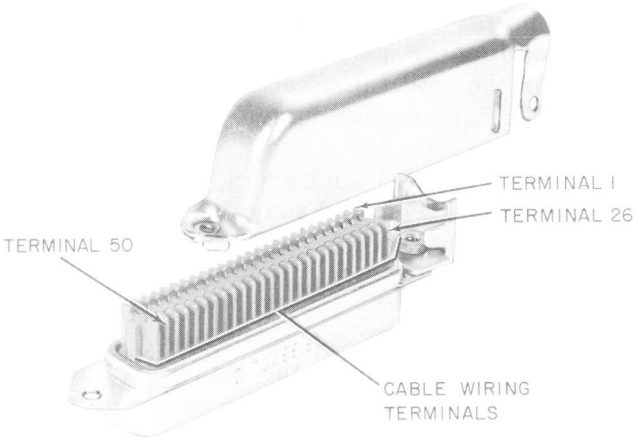


Fig. 4—KS-16689, L18 Plug, Hood Removed

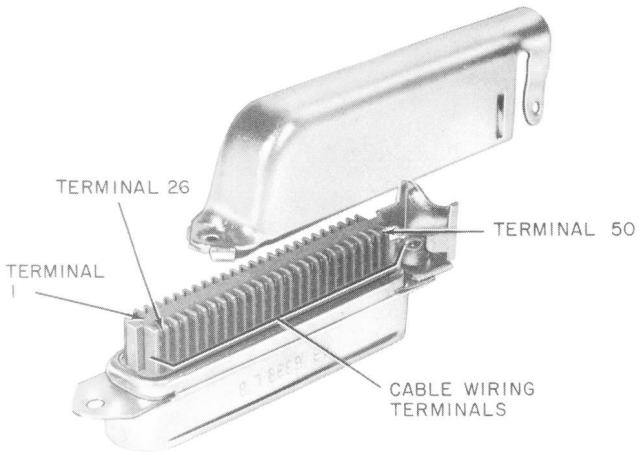


Fig. 5—KS-16690, L12 Receptacle, Hood Removed

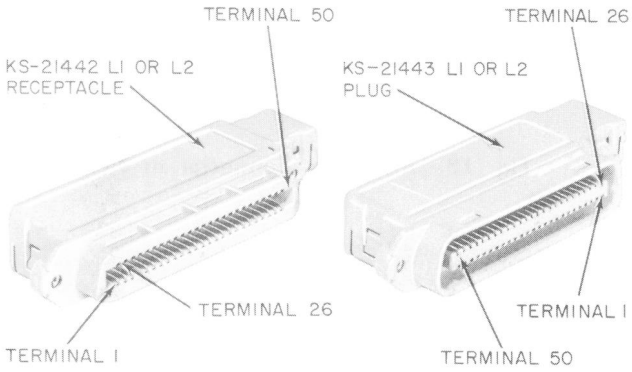


Fig. 6—KS-21442, L1 or L2 Receptacle and KS-21443, L1 or L2 Plug

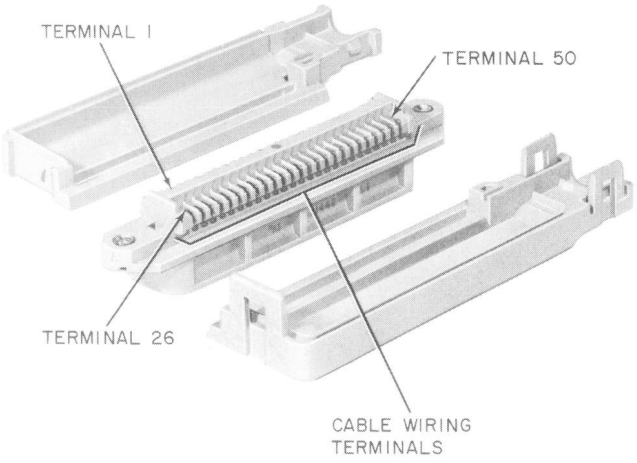


Fig. 7—KS-21442, L1 or L2 Receptacle, Hood Removed

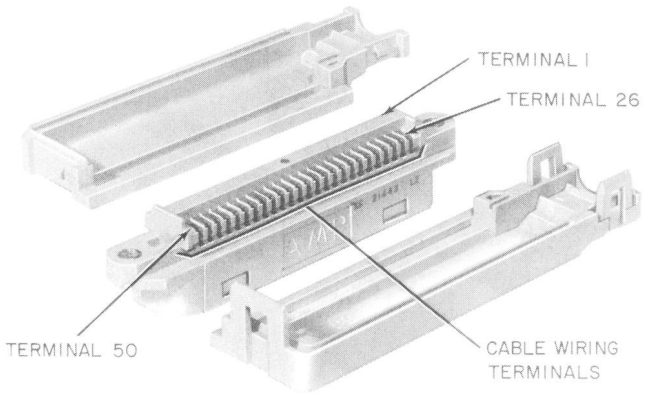


Fig. 8—KS-21443, L1 or L2 Plug, Hood Removed

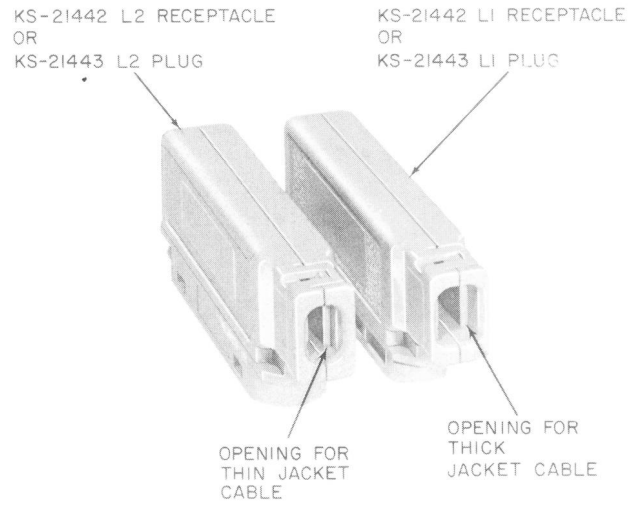


Fig. 9—Comparison of Cable Openings in Plastic Connectors

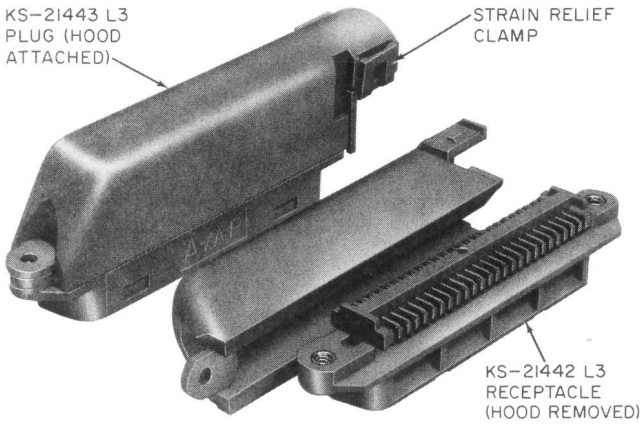


Fig. 10—KS-21442, L3 Receptacle and KS-21443, L3 Plug

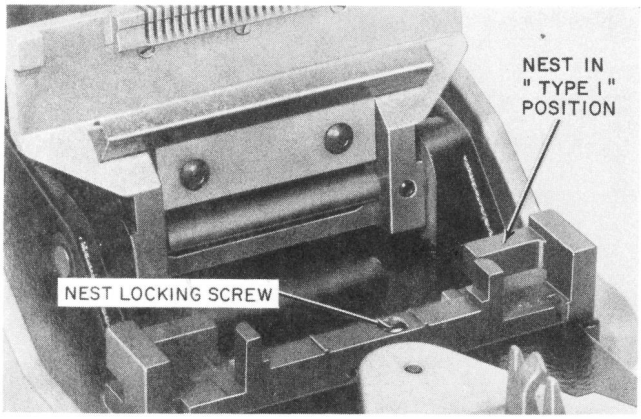


Fig. 11—Connector Nest in Type 1 Position

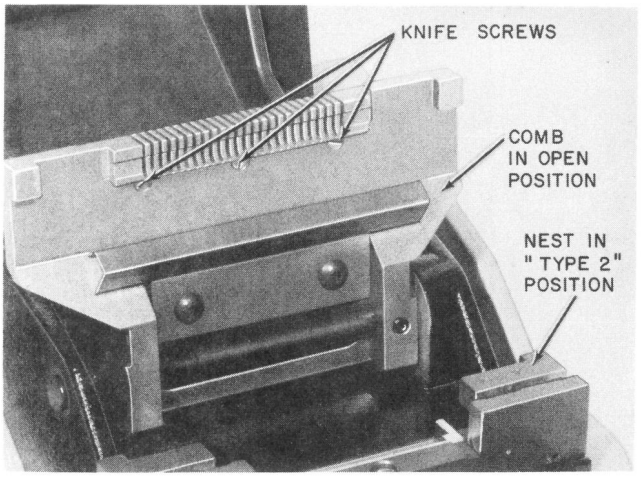


Fig. 12—Connector Nest in Type 2 Position

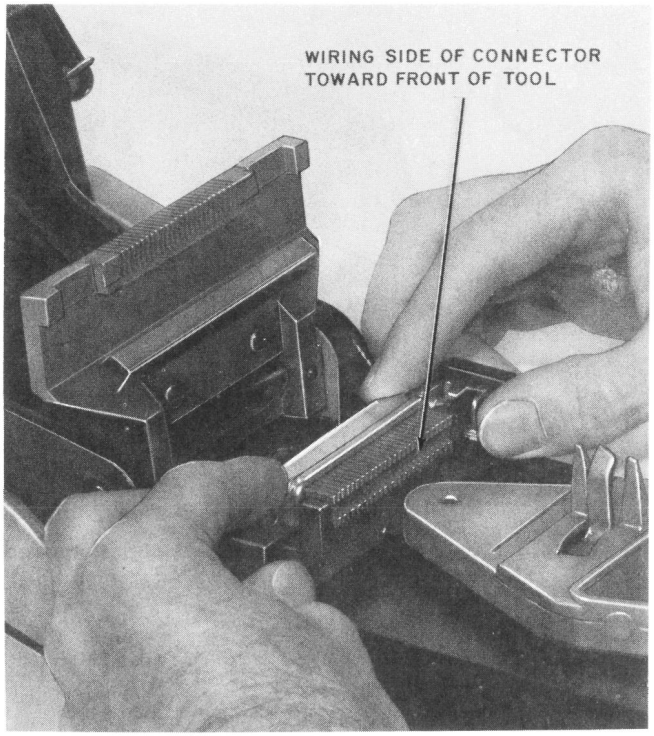


Fig. 13—Mounting Connector in Nest

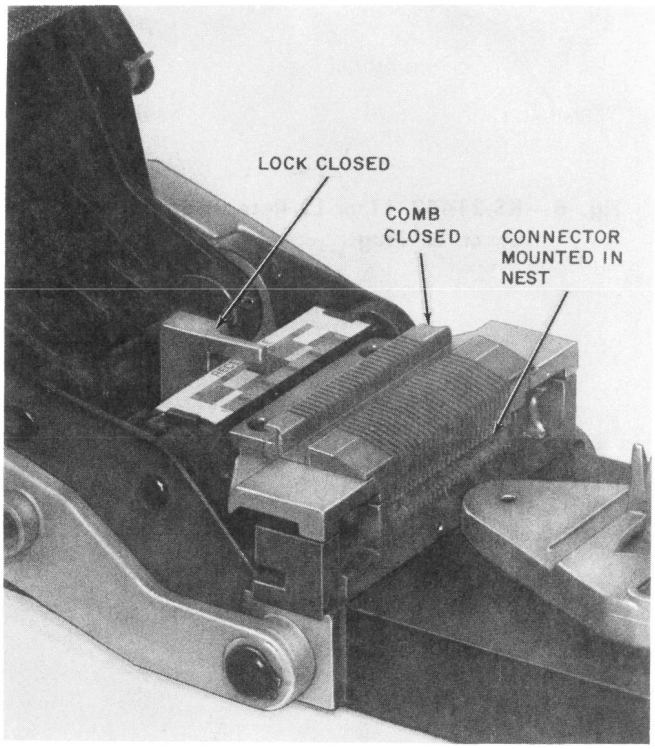


Fig. 14—Connector Locked in Tool

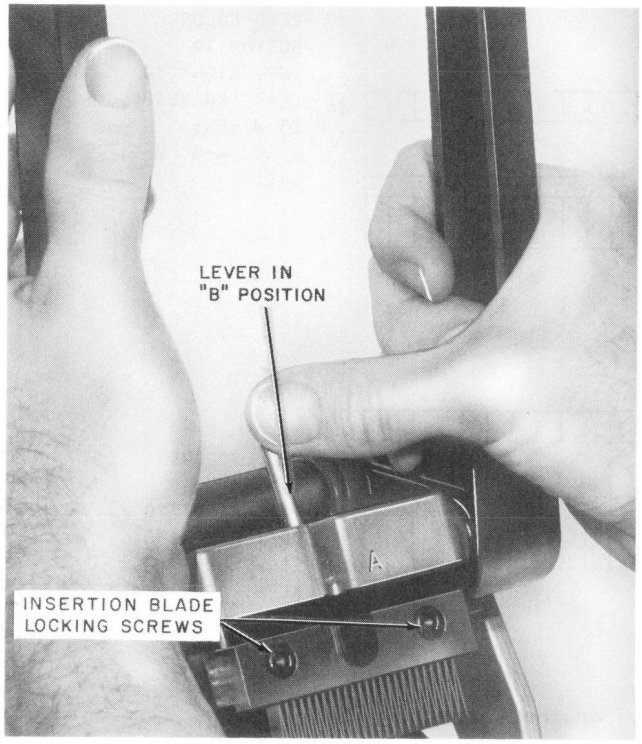


Fig. 15—Setting Selector Lever

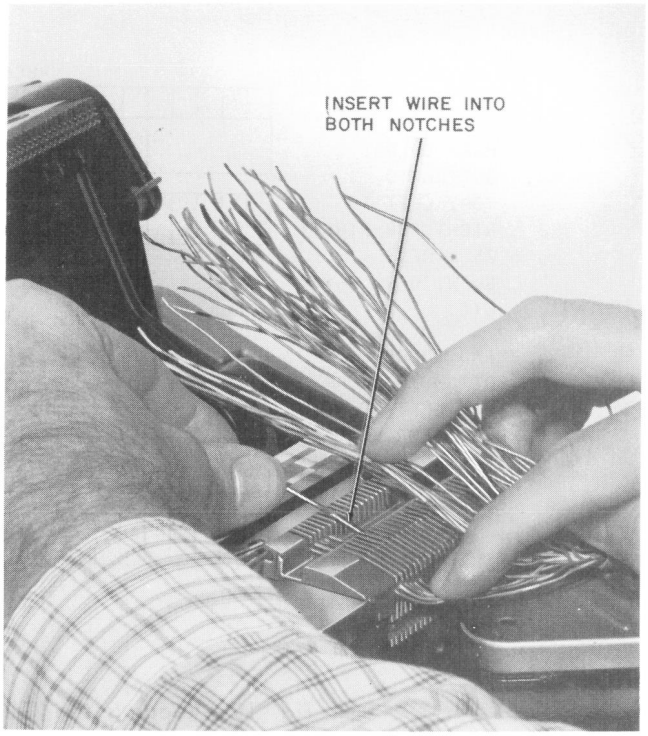


Fig. 17—Inserting Wires in Comb

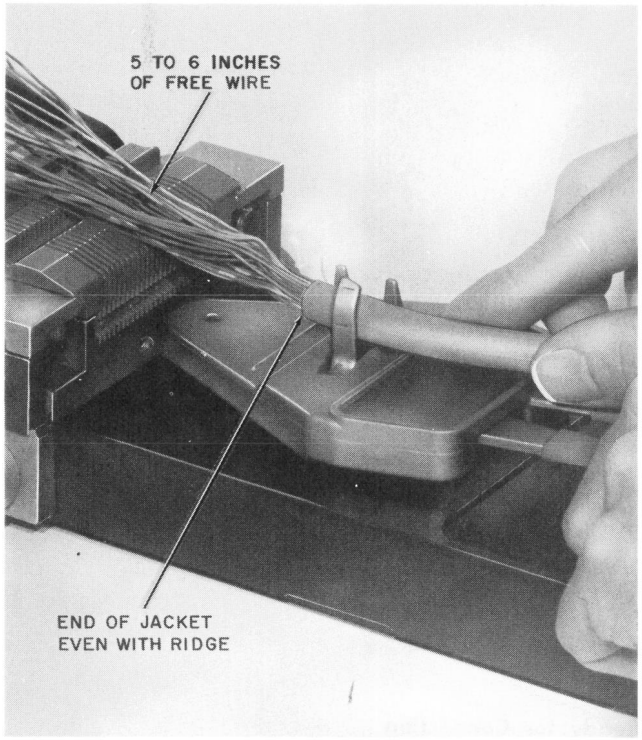


Fig. 16—Mounting Cable in Tool

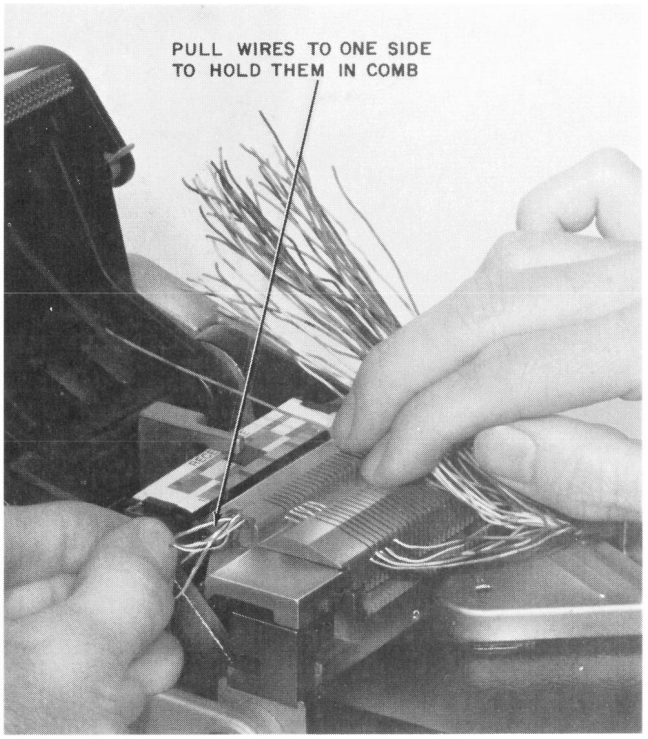


Fig. 18—Arranging Wires in Comb

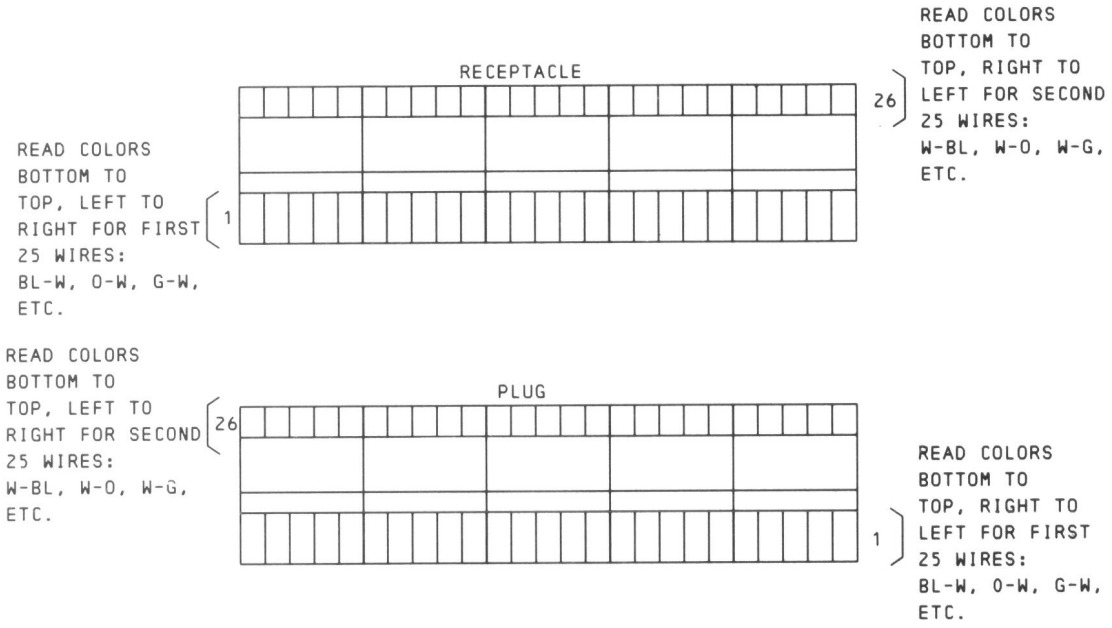


Fig. 19—Reading the Color Chart on the Connecting Tool

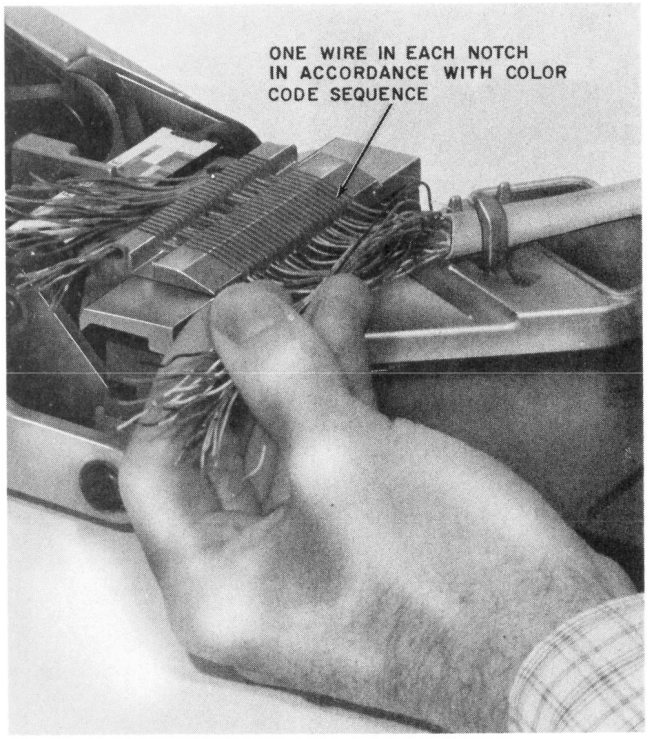
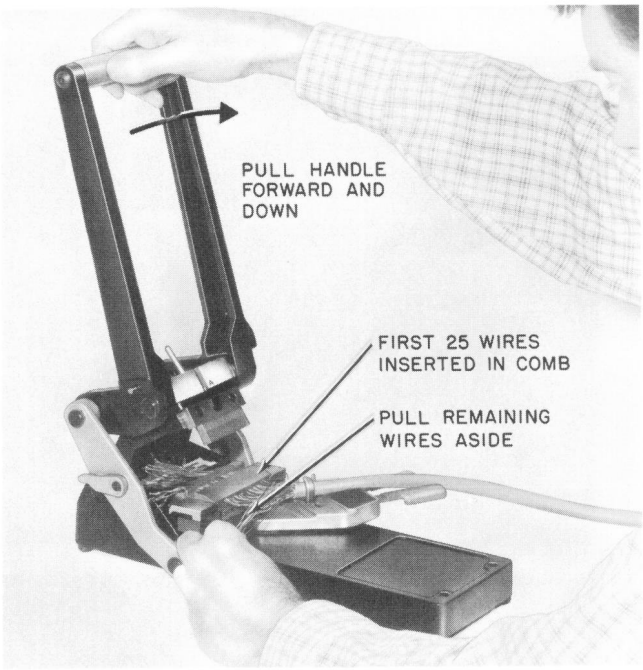


Fig. 20—First Half of Cable Ready for Connection



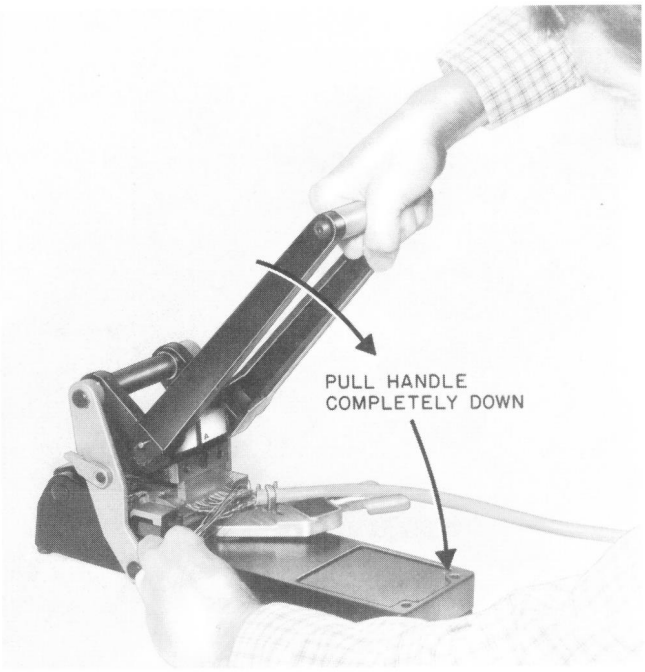


Fig. 21—Making the Connection

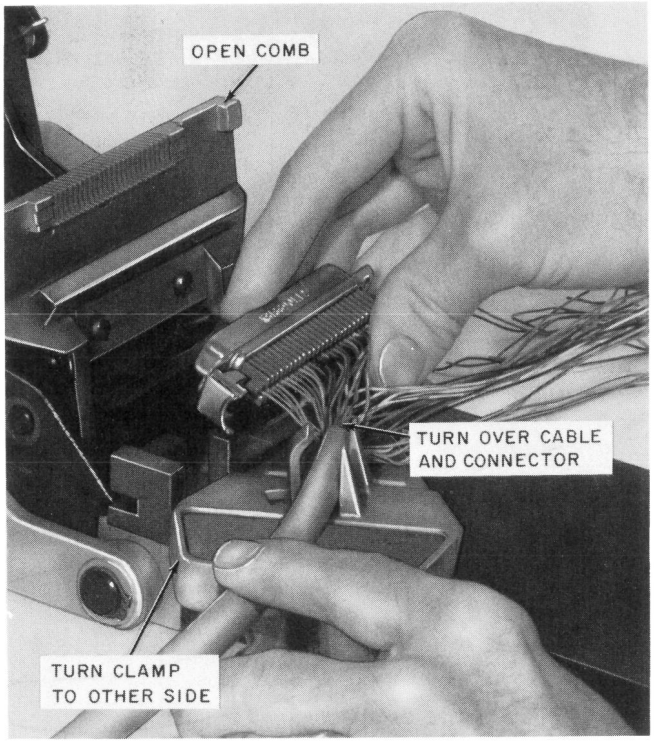


Fig. 22—Mounting Connector for Second Half of Connection

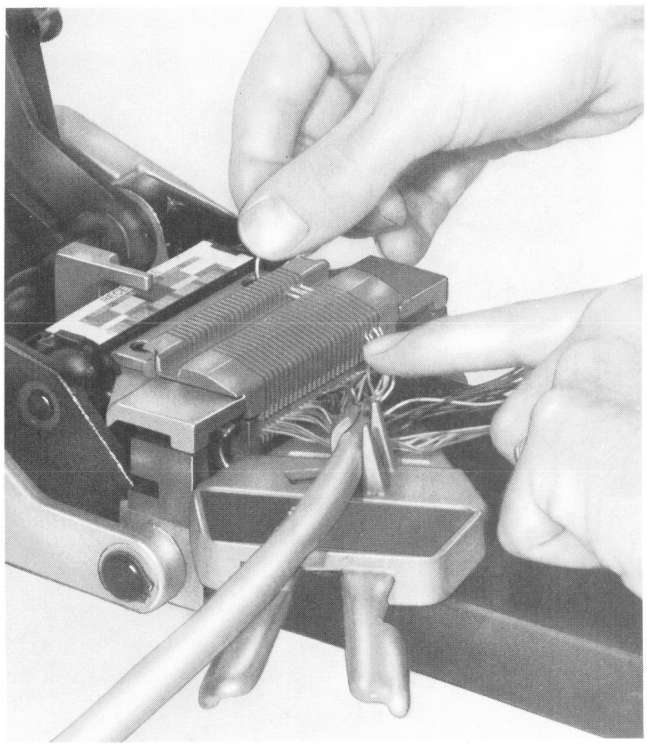


Fig. 23—Arranging Second Half of Cable in Comb

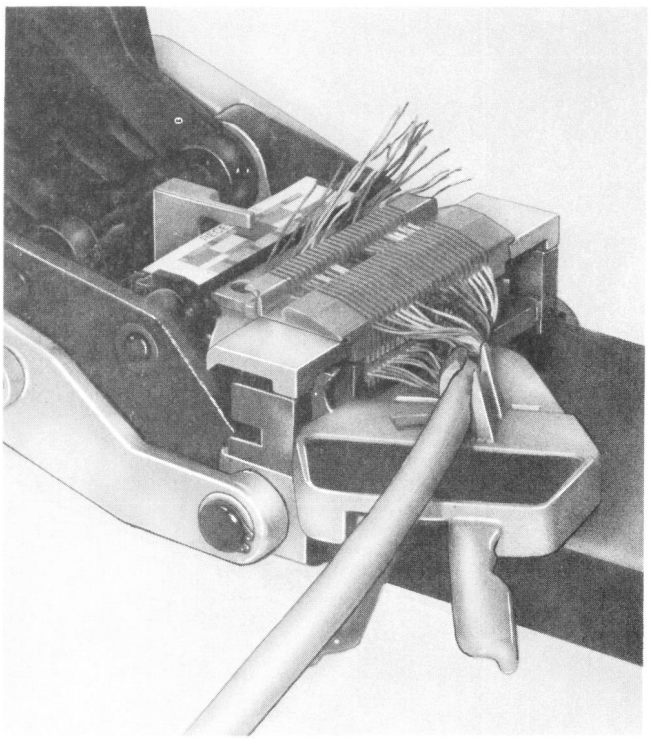


Fig. 24—Second Half of Cable Ready for Connection

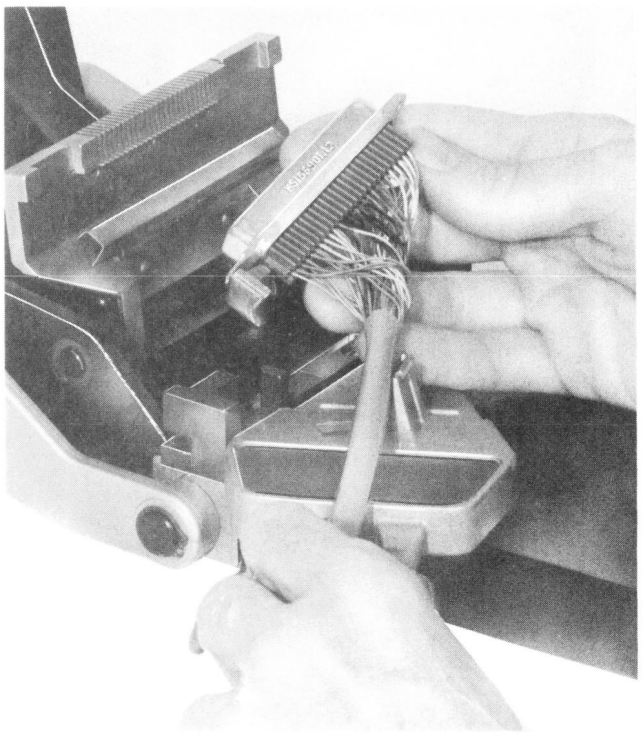
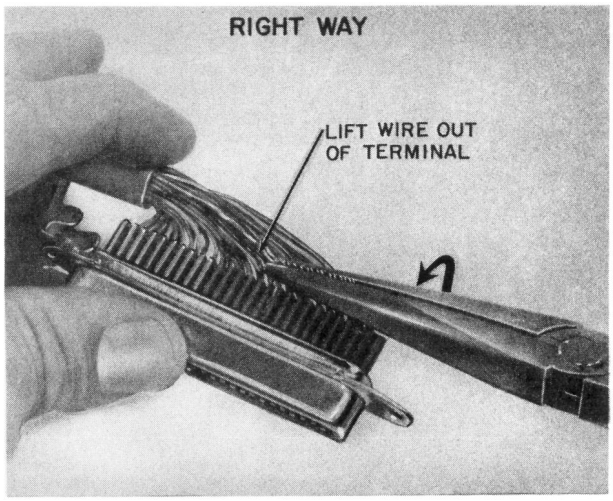


Fig. 25—Removing Completely Wired Connector from Tool



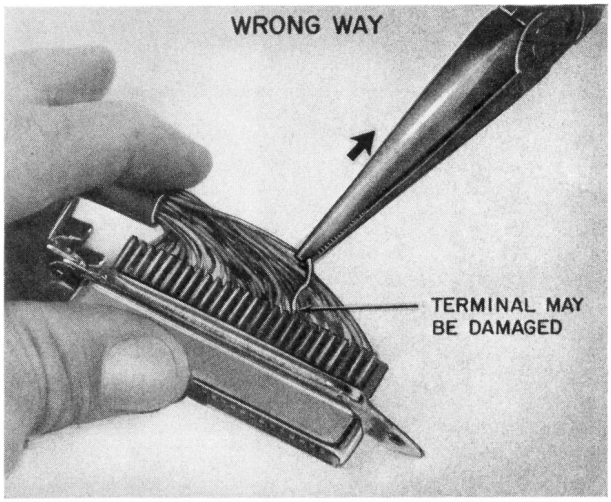


Fig. 26—Removal of Improperly Terminated Wire

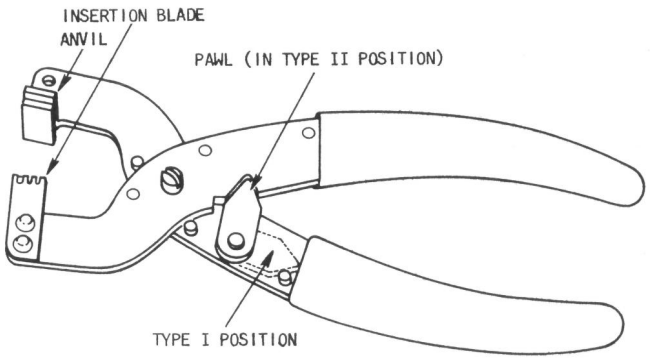


Fig. 27—KS-21872 Hand Connecting Tool

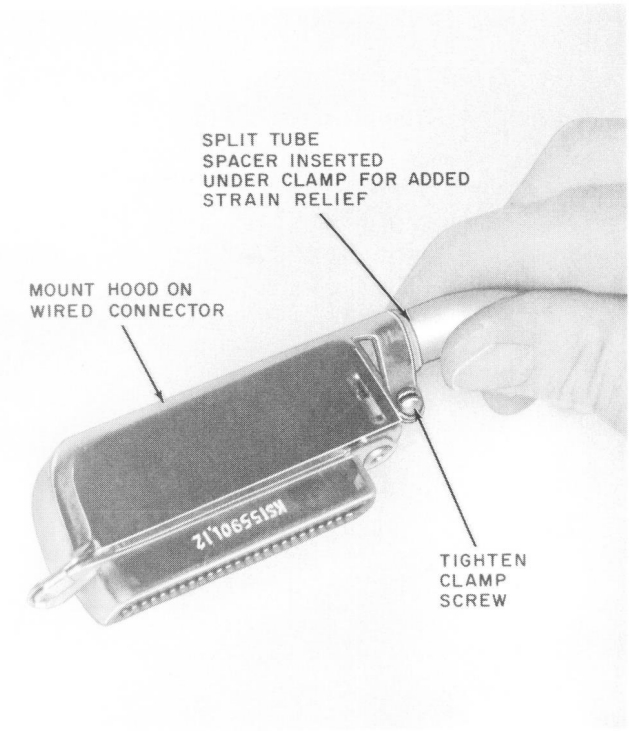


Fig. 28—Installation of Metal Hood

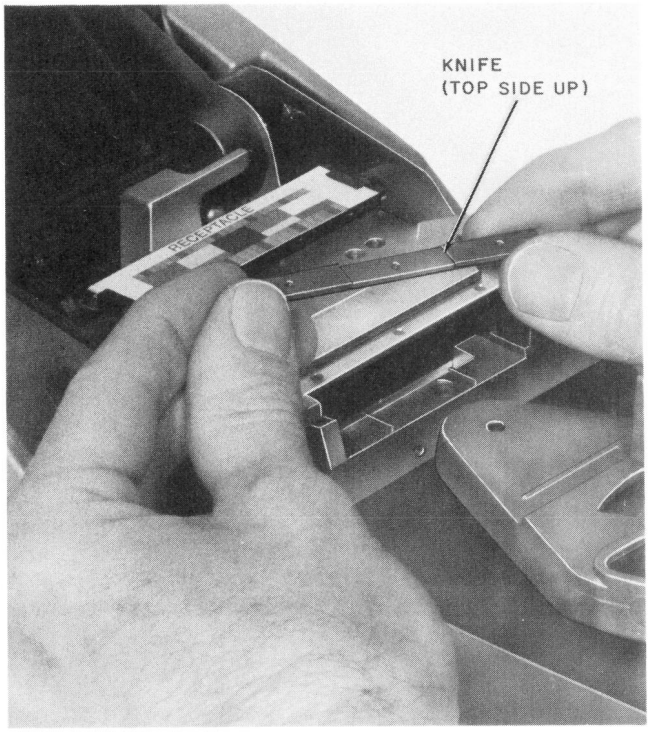


Fig. 30—Removal of Knife

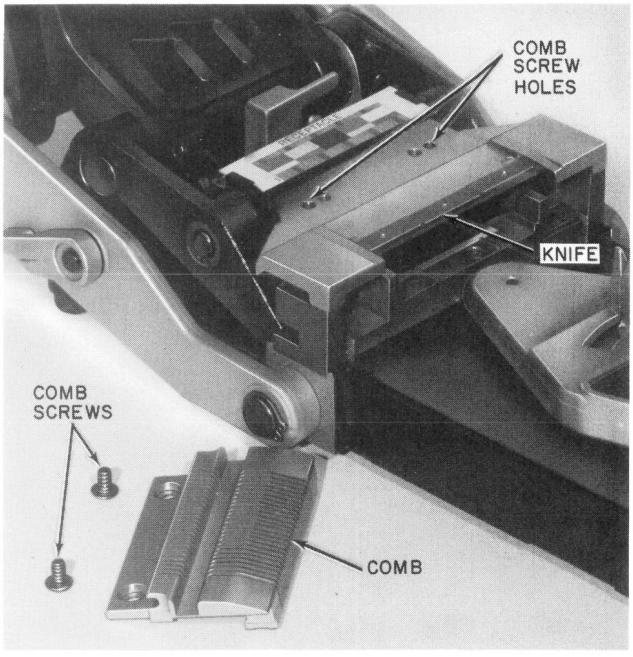


Fig. 29—Removal of Comb