United States Patent [19]

Smith et al.

[11] **3,825,987**

[45] **July 30, 1974**

[54] **WIRE CONNECTOR PRESSER TOOL**

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[73] Assignees: **Western Electric Company Incorporated,** New York, N.Y. ; by said Spenninger; **Bell Telephone Laboratories, Incorporated,** Murray Hill, N.J. ; by said Smith

[22] Filed: **Apr. 9, 1973**

[21] Appl. No.: **349,348**

[52] **U.S. Cl.**..... **29/203 H,** 29/212 D, 29/400 R

[51] **Int. Cl.**..... **H01r 43/04,** B23q 7/10, B23p 17/00

[58] **Field of Search**..... 29/203 H, 212 D, 203 R, 29/207, 203 DT, 400 R

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Primary Examiner—Thomas H. Eager
Attorney, Agent, or Firm—Jack Schuman

[57] **ABSTRACT**

Plier-like tool, for compressing connectors about wires to be electrically connected, has toggle-operated presser and opposed anvil with a space therebetween to receive unpressed connectors from a magazine supply. A fixed gauge is provided on either side of the space, which gauge is separated from the anvil by a distance equal to the height of a properly pressed connector. Hinged plates, each with a series of spaced semicircular grooves adapted to register with apertures in the connector, are provided adjacent the fixed gauges, whereby wires laid in the grooves will automatically register with their respective apertures in the connector. The hinged plates pivot against the force of a spring to permit withdrawal of the pressed connector from the tool. The rear of the magazine has an open slot adapted to receive pressure-sensitive tape attached to a series of unpressed connectors, the connectors being loaded into the magazine by feeding the tape into the slot and then pulling the tape to strip it from the connectors.

12 Claims, 8 Drawing Figures

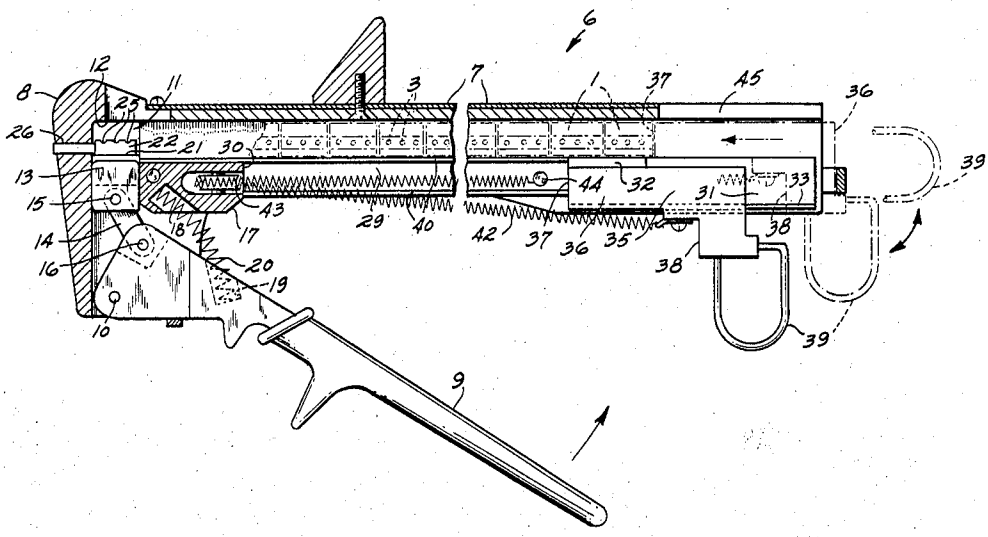


Fig. 1

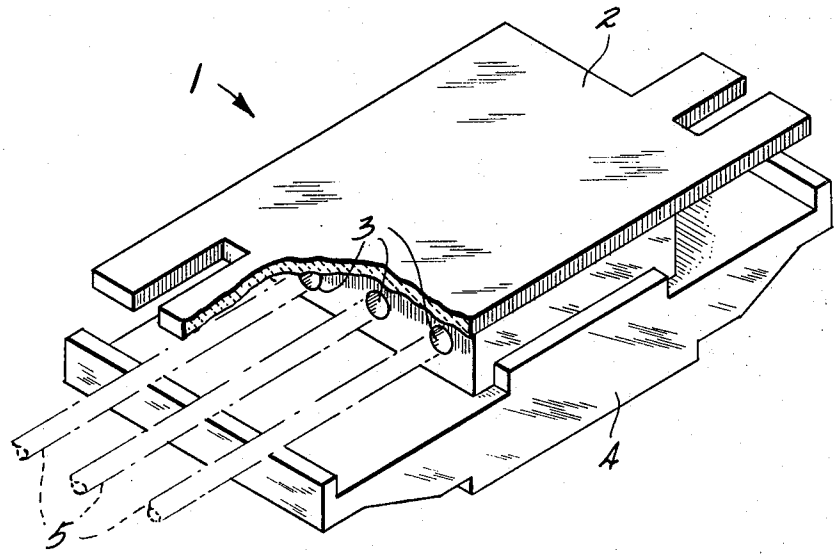
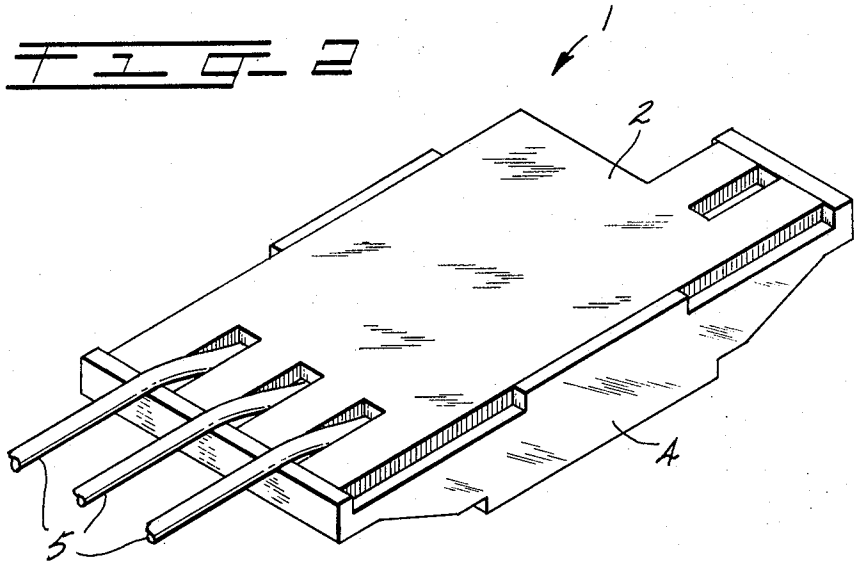


Fig. 2



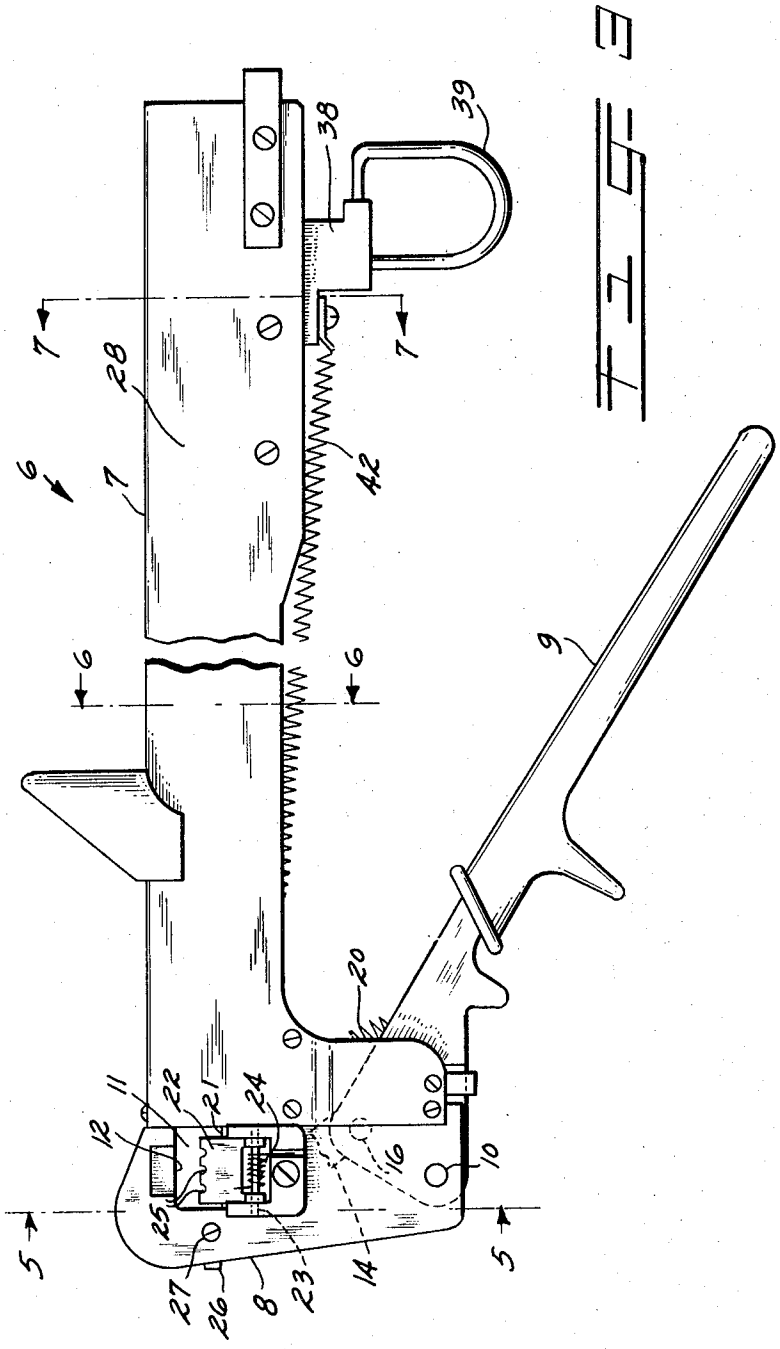


FIG 3

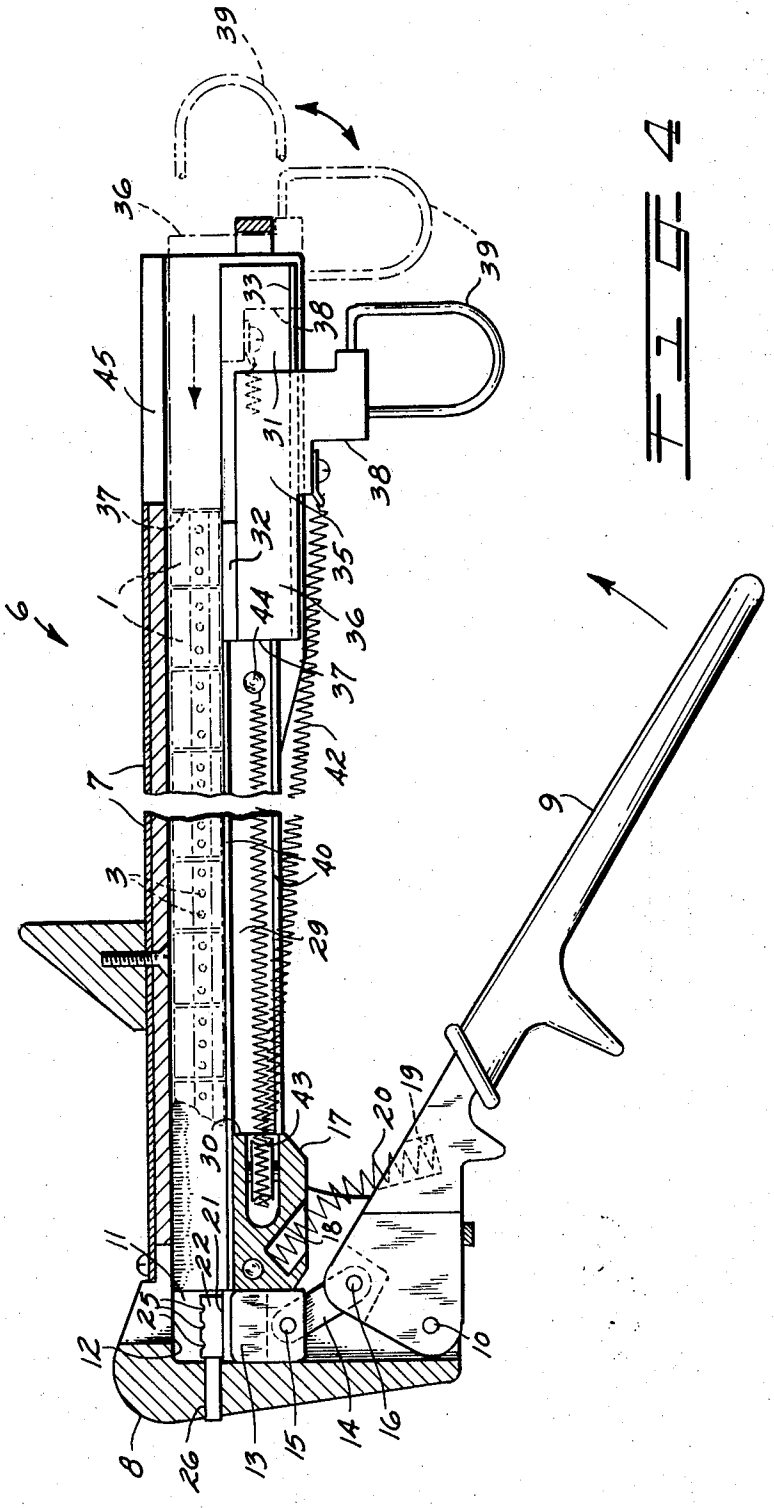
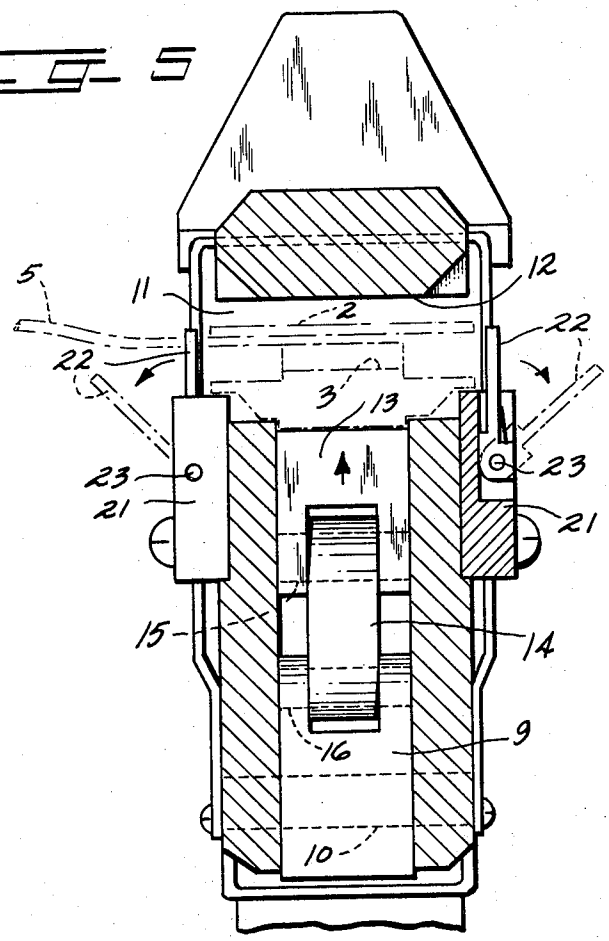

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FIG. 4

FIG 5



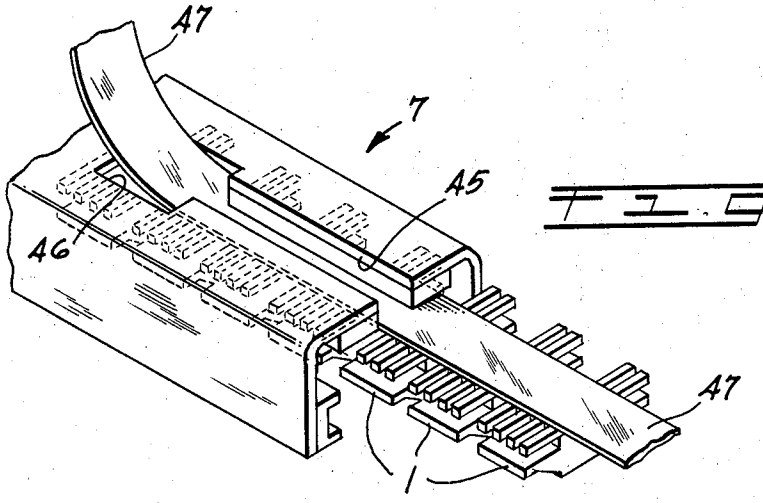
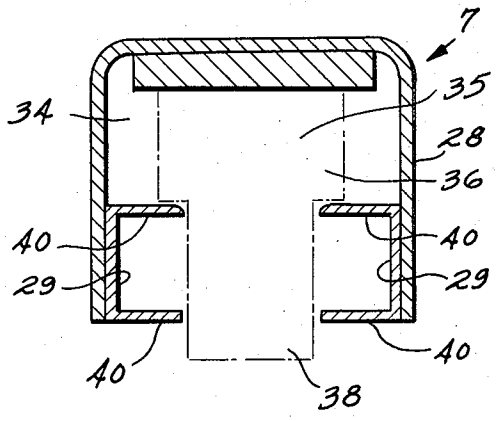


FIG 8

FIG. 6


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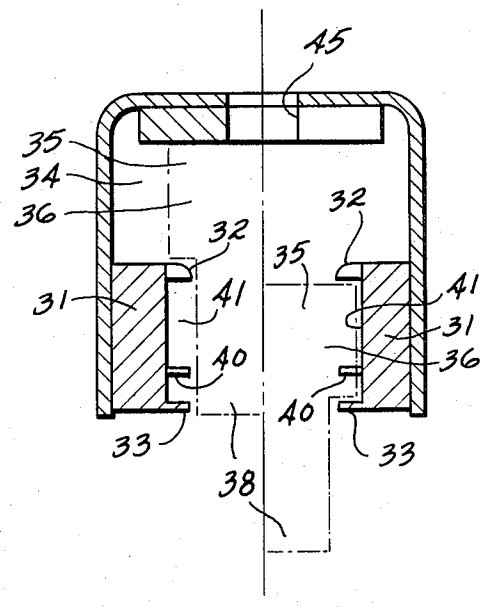

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FIG. 7

WIRE CONNECTOR PRESSER TOOL

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to a plier-like tool. More specifically, this invention relates to a tool for pressing together parts of a connector about a plurality of wires to make a secure electrical connection.

2. Description of the Prior Art

Plier-like tools are known, and such instruments have been adapted for use with connectors to force the connectors into secure electrical contact with wires. However, such prior art tools have not been provided with means for registering each of a plurality of wires to be connected by the connector with their respective apertures in the connector, nor have such prior art tools been provided with gauging means to insure discharge from the tool of only completely pressed connectors and, further, such prior art tools have not been provided with simple magazine loading.

SUMMARY OF THE INVENTION

One of the objects of the present invention is to provide an improved plier-like tool.

Another of the objects of the present invention is to provide an improved tool for pressing together parts of a connector about a plurality of wires to make a secure electrical connection.

Yet another object of the present invention is to provide a plier-like tool for making electrical connections with means to guide each of the plurality of wires to their respective apertures in a connector, with gauging means to insure discharging from the tool of properly pressed connectors, and with an improved simple magazine loading arrangement.

Still other and further objects of the present invention will become apparent by reference to the specification and to the appended claims and drawings.

Briefly, we have discovered that the foregoing objects may be attained by providing a plier-like tool having a toggle-operated presser and an opposed anvil with a space therebetween adapted to receive a two-part semi-open (i.e., unpressed) apertured connector from a magazine supply. A fixed gauge is provided on either side of the space, which gauge is separated from the anvil by a distance equal to the height of a properly pressed connector, thereby to insure that only fully and properly pressed connectors can be withdrawn from the space and thereby removed from the tool. Hinged plates, each with a series of spaced semicircular grooves adapted to register with the apertures in the connector, are provided adjacent the fixed gauges, whereby wires laid in the grooves will automatically register with their respective apertures in the connector. The hinged plates pivot against the force of a spring to permit withdrawal of the pressed connector from the tool. The rear of the magazine has an open slot adapted to receive a tape previously attached by pressure-sensitive adhesive to a series of connectors, the connectors being loaded into the magazine by feeding the tape into the open slot and then pulling the tape to strip it from the connectors and advance the connectors into the magazine.

BRIEF DESCRIPTION OF THE DRAWINGS

Referring now to the drawings in which like numerals represent like parts in the several views:

FIG. **1** represents a view in perspective, partially broken away, of an electrical connector in the semi-open or unpressed state, wires to be connected thereby being indicated in phantom;

FIG. **2** represents a view in perspective of the electrical connector after pressing;

FIG. **3** represents a view in side elevation of the tool;

FIG. **4** represents a medial longitudinal section of the tool;

FIG. **5** represents a transverse section of the tool taken along the line **5—5** of FIG. **3,** with one of the fixed guages being broken away to show the mounting of the hinged plate thereto;

FIG. **6** represents a section taken along the line **6—6** of FIG. **3**;

FIG. **7** represents a section taken along the line **7—7** of FIG. **3,** split centrally to show the follower in position in the magazine and in inoperative position laterally adjacent the magazine; and

FIG. **8** represents a view in perspective, partially fragmentary, of the rear end of the magazine, showing a series of connectors being fed into the magazine by a tape.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention has been designed for use with connectors **1** of the general type shown in FIGS. **1** and **2.** Such connectors **1** are seen as comprising connector half **2** with spaced apertures **3,** and connector half **4.**

Connector **1** as shown in FIG. **1** is in the semi-open or unpressed state. Wires **5,** which are to be electrically connected to each other and secured in connector **1,** are shown in phantom. Connector halves **2** and **4** are pressed together by means of the present invention to close the connector **1,** as shown in FIG. **2,** thereby securing wires **5** thereto and electrically connecting the said wires **5** by means of a metal bridge (not shown) in the connector **1.**

Although three wires **5** have been shown in FIGS. **1** and **2,** it should be understood that connectors **1** may be provided with sufficient apertures **3** to receive only two or more than three wires **5** for connection, and that the present invention is designed to press any such connectors **1.**

The present invention is embodied in tool **6** having base portion **7,** housing **8,** and operating handle **9** pivoted thereto at **10.** Housing **8** has opening **11** formed therethrough bounded at one end by anvil portion **12.** Slidably mounted within opening **11** and reciprocable toward and away from anvil portion**12** is pressing element **13** which is connected through toggle link **14** to operating handle **9,** the said toggle link **14** being pivotally mounted at **15** and **16** to pressing element **13** and operating handle **9** respectively. Block **17** in housing **8** is provided with recess **18,** and operating handle **9** is provided with recess **19,** the said recesses **18** and **19** receiving compression spring **20** which normally urges operating handle **9** to the position shown in FIG. **4.** It will be seen that, when operating handle **9** is pivoted toward base portion **7,** in the direction of the arrow in FIG. **4,** spring **20** is compressed and pressing element

13 is advanced toward anvil portion 12. Conversely, when operating handle 9 is released, compression spring 20 urges operating handle 9 away from base portion 7 and pressing element 13 moves away from anvil portion 12. The foregoing elements are so proportioned that, when operating handle 9 is forced by spring 20 to its most remote position relative to base portion 7, the clearance between anvil portion 12 and pressing element 13 is greater than the height of connector 1 in its semi-open or unpressed condition (i.e., as shown in FIG. 1), and, further, when operating handle 9 has been pivoted to its closest position relative to base portion 7, the clearance between anvil portion 12 and pressing element 13 is equal to the height of connector 1 when fully pressed to its proper closed position about wires 5 as shown in FIG. 2.

At either side of opening 11 a fixed guage 21 is mounted to housing 8. The distance between the end of fixed gauge 21 and anvil portion 12 is equal to, or very slightly greater than, the height of a connector 1 when fully pressed to its closed position about wires 5 as shown in FIG. 2. The purpose of fixed gauges 21 is to insure that, regardless from which side of tool 6 wires 5 are introudced into the connector 1 (i.e., whether the tool 6 is used in a left-handed or a right-handed manner), the only connectors 1 that can be withdrawn from the tool 6 after being pressed closed about wires 5 are those connectors 1 which have been fully and properly pressed closed by the operator. If a connector 1 after pressing cannot be removed from tool 6, the operator thereof knows that he has not properly and fully pressed the said connector 1 to closed position and must reoperate operating handle 9 to fully press the said connector 1 to closed position 1.

Plates 22 are hingedly mounted on shafts 23 for pivotal movement relative to fixed gauges 21, as shown in FIGS. 3 and 5. Shafts 23 are located below those ends of fixed gauges 21 facing anvil portion 12. Springs 24 are mounted on shafts 23, in operative interposition between their respective plates 22 and fixed gauges 21, and are biased to resiliently urge the said plates 22 to a position adjacent fixed gauges 21 as shown in solid lines in FIG. 5. As will hereinafter be described, when a pressed connector 1 is removed from opening 11, plates 22 will be urged, against the bias of springs 24, to the position shown in phantom in FIG. 5, thereby to permit the passage of connector 1, and upon the passage of connector 1 from the tool 6, springs 24 will force plates 22 to their initial position.

Plates 22 are provided with a series of semicircular grooves 25 formed on the free unhinged edge. These grooves 25 are placed to register with apertures 3 when a semi-open or unpressed connector 1 is discharged from the magazine into the opening 11. The purpose of grooves 25 is to facilitate operation of tool 6. The operator need only place straight ends of wires 5 to be connected in connector 1 in the grooves 25 and advance the said wires 5 into opening 11. The wires 5 wwll thereupon automatically feed into their respective apertures 3 in connector 1.

Advantageously, tool 6 is designed to handle connectors 1 of various widths, the narrower-width connectors 1 having fewer apertures 3 than the maximum-width connectors 1, the pitch between apertures 3 in all cases being substantially the same, and the distance between the endmost apertures 3 and the end of the connector 1 in all cases being substantially the same. To this end, opening 11 is proportioned to receive connectors 1 of maximum width. When tool 6 is employed with connectors 1 of less than maximum width, adjustable stop 26 is advanced into opening 11 the appropriate amount as shown in FIG. 4, and is held in such advanced position by means of set screw 27. It will be understood that apertures 3 in the smaller size connectors 1 will register with less than all of the grooves 25 of plates 22. Thus, if a connector 1 is employed having only two apertures 3 whereby only two wires 5 will be connected thereby, adjustable stop 26 is advanced the proper amount into opening 11, and the two apertures 3 of connector 1 will, when connector 1 is introduced into opening 11 from the magazine, register with the two rightmost (as viewed in FIG. 4) grooves 25 of plates 21.

Base portion 7 of tool 6 comprises a generally U-shaped member 28 with channels 29 secured to the insides of the legs thereof, as shown in FIG. 6, and extending from rear shoulder 30 of block 17 rearwardly. Blocks 31 aresecured to the insides of the legs of member 28, as shown in FIG. 7, extending from the rear of channels 29 to the rear of member 28. Blocks 31 each have upper and lower projections 32 and 33, respectively, extending inwardly as shown. The top surfaces, as viewed in FIGS. 6 and 7, of channels 29 and blocks 31 lie in a common plane, defining with member 28, a longitudinal magazine opening 34 extending all the way from opening 11 adjacent the front end of base portion 7 to the rear end thereof, the said opening 34 having a transverse cross section adapted to slidably receive unpressed connectors 1 with their respective apertures facing to one side thereof as shown in FIG. 4.

Follower 35 is slidably mounted in opening 34, and comprises a body portion 36 having a forward end 37 adapted to bear against the rear of the rearmost unpressed connector 1 in opening 34, a leg portion 37 secured to the body portion 36, and a handle 39 pivotally mounted thereto.

The clear horizontal distance, as viewed in FIGS. 6 and 7, between the flanges 40 of channels 29, between upper projections 32 of blocks 31, and between lower projections 33 of blocks 31, is slightly greater than the width of leg portion 38 of follower 35 so as to slidably receive and guide the same.

The inner surfaces of blocks 31, and the facing surfaces of projections 32 and 33 of each of said blocks 31 constitute a guideway 41 adapted to slidably receive body portion 36 when the follower 35 is removed from the magazine opening 34. It will be noted that the rear end of the lower flanges 40 of channels 29, as shown in phantom in FIG. 7, register intermediate the upper and lower projections 32 and 33 of each block 31 and thereby constitute means to limit forward movement of follower 35 in guideway 41.

Follower 35 is connected to one end of a spring 42 which is looped around pulley 43 in block 17 and which doubles back and is anchored to base portion 7 at 44. Spring 42 is normally in tension and urges follower 35 toward opening 11 when follower 35 is in operative position in magazine opening 34, as shown in outline in the left half of FIG. 7 as well as in phantom outline in FIG. 4. Spring 42 likewise urges follower 35 against the rear ends of the lower flanges 40 of channels 29 when follower 35 has been removed from magazine opening 34 and placed in guideway 41, as shown in outline in the right half of FIG. 7 as well as in solid outline in FIG. 4.

Base portion 7 has a slot 45 extending forwardly from the rear end thereof and widening at opening 46. Advantageously, magazine opening 34 is loaded with unpressed connectors 1 in the following manner. A plurality of unpressed connectors 1 is fastened to a pressure-sensitive tape 47 of width greater than the width of slot 45 and less than the width of opening 46. Tape 47 is introduced into magazine opening 35 under slot 45 and is pulled from opening 46 as shown in FIG. 8 whereupon the unpressed connectors 1 attached thereto are pulled into magazine opening 34, stripped from tape 47 as the latter is pulled through opening 46, and forced forwardly in magazine opening 34 by unpressed connectors 1 to the rear thereof being pulled into the said magazine opening 34 by tape 47.

In operating tool 6, magazine opening 34 is loaded with unpressed connectors 1 as hereinabove described, the apertures 3 therein being on the left or side thereof to accommodate the operator, who may be right or left handed, for his convenience in feeding wires 5 thereto, and follower 35 is removed from guideway 41 and inserted in magazine opening 34 in which, under the influence of spring 42, the said follower 35 will bear against the rear of the rearmost unpressed connector 1 and urge all the unpressed connectors 1 in the magazine opening 34 forwardly. An unpressed connector 1 will thereby be introduced into opening 11. The operator places wires 5 in grooves 25 of that hinged plate 21 adjacent apertures 3 of the unpressed connector 1 and then feeds the said wires 5 into opening 11 whereupon the wires 5 will enter their respective apertures 3 in the unpressed connector 1. Operating handle 9 is pivoted toward base portion 7, forcing presser element 13 against connector 1 and pressing or closing the same about wires 5. Pressed connector 1 with wires 5 secured thereto is removed from opening 11 by pulling on wires 5, hinged plate 21 pivoting against spring 23 to permit withdrawal of the connector 1. If connector 1 cannot be removed in this manner from opening 11, the operator knows that he has not fully closed connector 1 and must reoperate handle 1 to press the blocked connector 1 to its fully closed or pressed condition.

What is claimed is:

1. Tool adapted to press closed about a plurality of wires an open connector having a plurality of spaced apertures, each of said apertures being adapted to receive one of said wires, whereby to secure said connector to said wires, said tool comprising:

a. an anvil portion;

b. a presser element;

c. a chamber between said anvil portion and said presser element and adapted to receive an open connector with the apertures therein facing toward a first side of said tool;

d. operating means to reciprocate said presser element toward or selectively away from said anvil portion, the minimum distance between said anvil portion and said presser element being substantially equal to the height of a closed connector, the maximum distance between said anvil portion and said presser element being greater than the height of an open connector;

e. a gauge mounted to said tool along the first side thereof, the distance between said anvil portion and said gauge being substantially equal to the height of a closed connector;

f. a plate hingedly mounted along one edge thereof to said first side of said tool adjacent said chamber and being pivotable between a first position adjacent the first side of said tool and a second position remote from the first side of said tool, said plate having along a free edge a plurality of spaced grooves adapted to register with the spaced apertures in an open connector in said chamber, said grooves further being adapted to receive and guide a plurality of wires into their respective apertures in the open connector.

2. Tool as in claim 1, further comprising:

g. spring means resiliently urging said plate to said first position.

3. Tool as in claim 1, further comprising:

g. a magazine having a rear end and a forward end communicating with said chamber;

h. said magazine having a slot extending forwardly from the rear end thereof;

i. said magazine having an opening at the forward end of said slot, the width of said opening being greater than the width of said slot;

j. whereby said magazine may be loaded with a plurality of open connectors mounted on pressure-sensitive tape and width greater than the width of said slot and less than the width of said opening.

4. Tool as in claim 1, wherein:

g. said chamber is open at one side to a first side of said tool and is open at the opposite side to a second side of said tool, said tool further comprising:

h. a second gauge mounted to said tool along the second side thereof, the distance between said anvil portion and said second gauge being substantially equal to the height of a closed connector;

i. a second plate hingedly mounted along one edge thereof to said second side of said tool adjacent said chamber and being pivotable between a first position adjacent the second side of said tool and a second position remote from the second side of said tool, said second plate having along a free edge a plurality of spaced grooves adapted to register with the spaced apertures in an open connector in said chamber, said grooves further being adapted to receive and guide a plurality of wires into their respective apertures in the open connector.

5. Tool as in claim 4, further comprising:

j. spring means resiliently urging said plates to their respective first positions.

6. A magazine adapted to feed a tool with a plurality of elements, said magazine comprising:

a. a housing having a rear end and a forward end communicating with said tool;

b. said housing having a chamber extending therethrough from said rear end to said forward end;

c. said chamber being adapted to receive a plurality of elements and to deliver said elements one-by-one to said tool;

d. said housing having a slot through one wall thereof communicating with said chamber, said slot extending forwardly from the rear end of said housing;

e. said housing having an opening through one wall thereof communicating with said chamber at the forward end of said slot, the width of said opening being greater than the width of said slot.

7. Apparatus to feed a tool with a plurality of elements, said apparatus comprising:
a. a magazing having a rear end and a forward end communicating with said tool;
b. said magazine having a chamber extending therethrough from said rear end to said forward end;
c. said chamber being adapted to receive a plurality of elements and to deliver said elements one-by-one to said tool;
d. said magazine having a slot through one wall thereof communicating with said chamber, said slot extending forwardly from the rear end of said housing, the width of said slot being less than the width of said elements;
e. said magazine having an opening through one wall thereof communicating with said chamber at the forward end of said slot, the width of said opening being greater than the width of said slot and less than the width of said elements;
f. an elongated flexible strip of material of width less than the width of said chamber and said opening and greater than the width of said slot;
g. said strip being adapted to be temporarily secured to a plurality of said elements;
h. whereby said magazine may be loaded with a plurality of elements by introducing into the rear end of said chamber said strip temporarily attached to said plurality of elements and by withdrawing said strip from said chamber through said opening thereby detaching said elements from said strip in said chamber.

8. Apparatus as in claim 7, wherein:
i. said strip is coated with pressure-sensitive adhesive.

9. Apparatus to feed a tool with a plurality of elements, said apparatus comprising:
a. a magazine having a rear end and a forward end extending communicating with said tool;
b. said magazine having a chamber extending therethrough from said rear end to said forward end;
c. said chamber being adapted to receive a plurality of elements and to deliver said elements one-by-one to said tool;
d. said magazine having a slot through one wall thereof communicating with said chamber, said slot having a first end and a second end, the width of said slot being less than the width of said elements;
e. said magazine having an opening through one wall thereof communicating with said chamber at the second end of said slot, the width of said opening being greater than the width of said slot and less than the width of said elements;
f. an elongated flexible strip of material of width less than the width of said chamber and said opening and greater than the width of said slot;
g. said strip being adapted to be temporarily secured to a plurality of said elements;
h. whereby said magazine may be loaded with a plurality of elements by introducing into said chamber said strip temporarily attached to said plurality of elements and by advancing said strip and said elements temporarily attached thereto from a station in said chamber adjacent the first end of said slot to a station in said chamber adjacent the second end of said slot and by withdrawing said strip from said chamber through said opening thereby detaching said elements from said strip in said chamber.

10. Apparatus as in claim 9, wherein:
i. said strip is coated with pressure-sensitive adhesive.

11. Method of loading a magazine having an inlet end adapted to receive a plurality of elements, an outlet end adpated to feed said elements to a tool, and an opening intermediate the inlet and outlet ends, said method comprising:
a. temporarily attaching an elongated flexible strip of material to a plurality of elements to be inserted in said magazine;
b. introducing said strip and said elements temporarily attached thereto into the inlet end of said magazine;
c. pulling said strip from said magazine through said opening, thereby detaching said elements from said strip in said magazine and advancing said elements toward the outlet end of said magazine.

12. Method as in claim 11, wherein:
d. step (a) is performed by coating said strip with pressure-sensitive adhesive and then by contacting said pressure-sensitive adhesive to said plurality of elements.

* * * * *

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(6-69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,825,987 Dated July 30, 1974

Inventor(s) DONALD T. SMITH - WILLIAM R. SPENNINGER

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the specification, Column 3, line 24, "introudced" should read --introduced--; line 59, "wwll" should read --will--. Column 4, line 5, "as shown in FIG. 4," should read --as shown in phantom in FIG. 4,--; line 20, "aresecured" should read --are secured--; line 36, "leg portion 37" should read --leg portion 38--.

In the claims, Column 6, claim 3, line 25, "tape and width" should read --tape of width--. Column 7, claim 9, lines 37 and 38, "forward end extending communicating" should read --forward end communicating--. Column 8, claim 11, line 28, "adpated" should read --adapted--.

Signed and sealed this 8th day of October 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents