June 22, 1954 S. E. DAVIS 2,681,447

MACHINE FOR CRIMPING ELECTRIC CONNECTOR MEMBERS ON THE ENDS OF WIRES

Filed Aug. 11, 1953

4 Sheets-Sheet 1

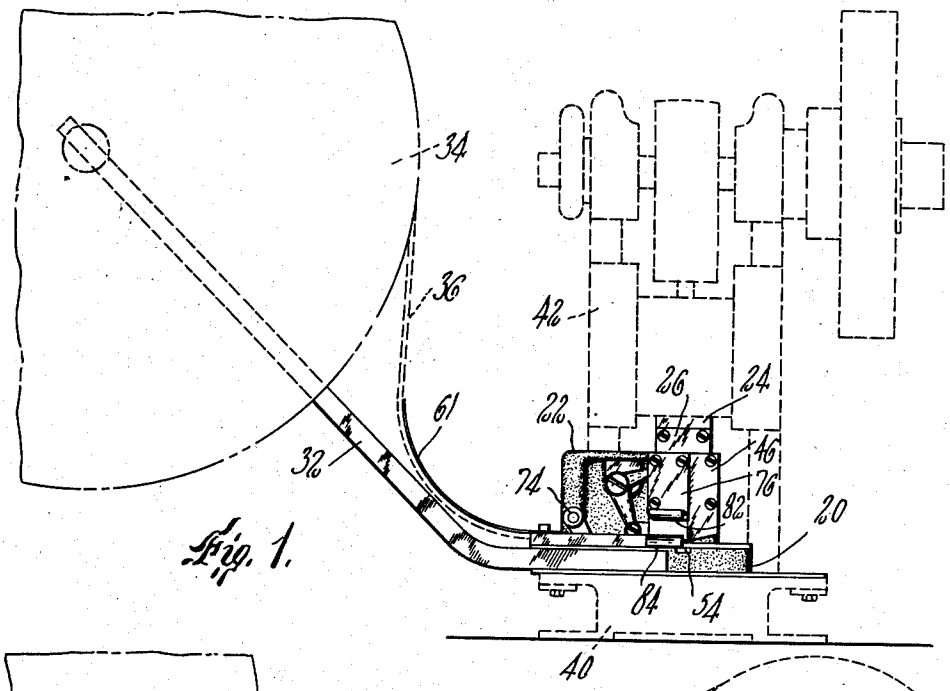


Fig. 1.

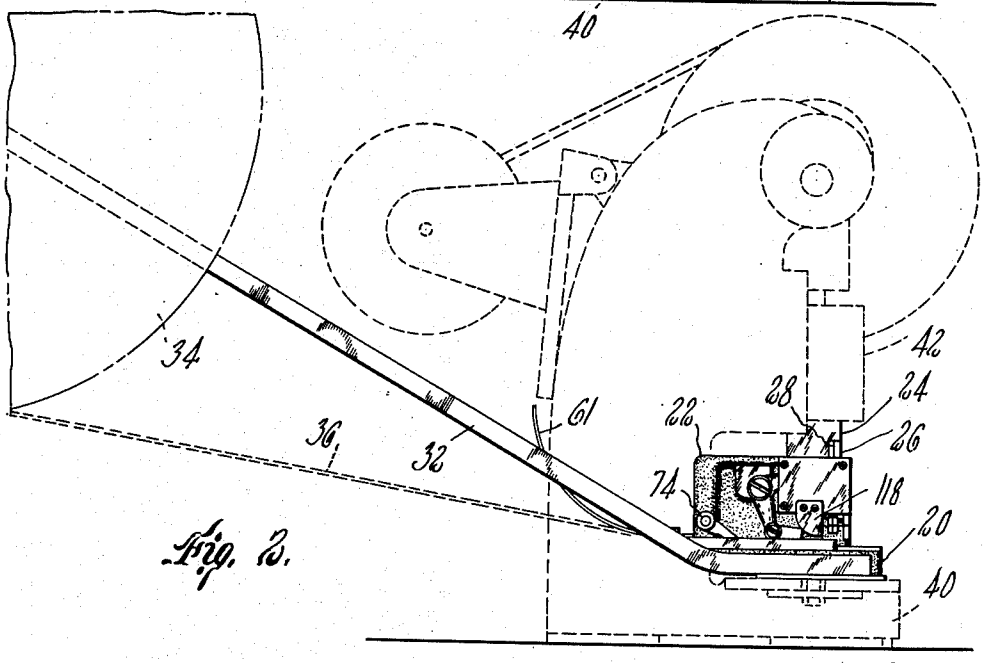


Fig. 2.

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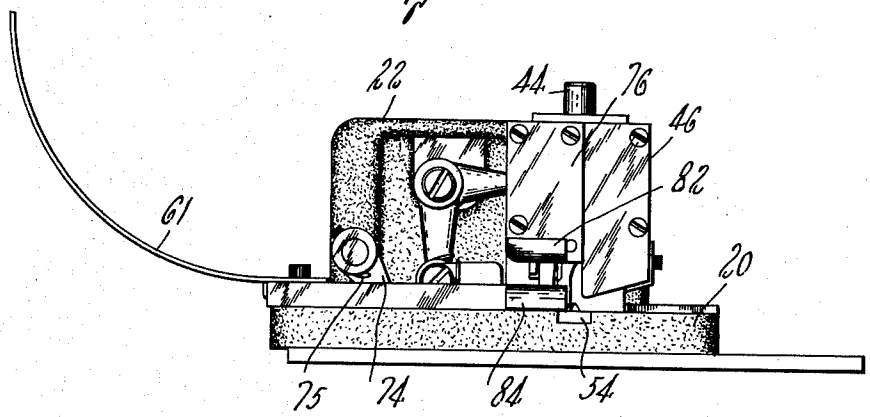
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Fig. 3.



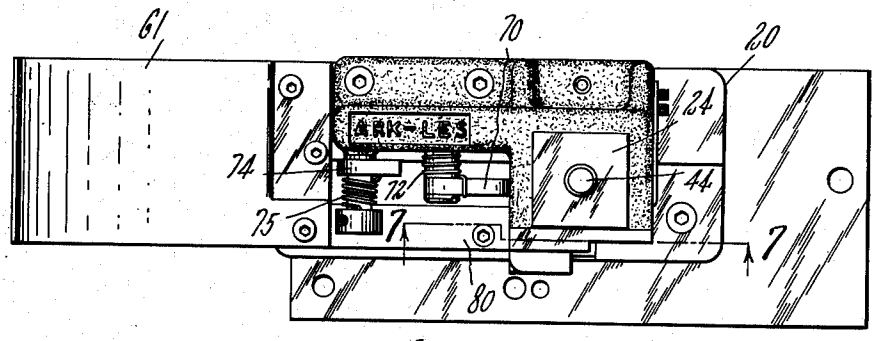


Fig. 4.

Fig. 5.

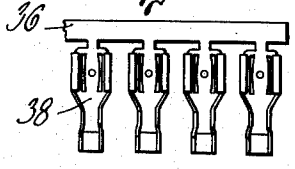
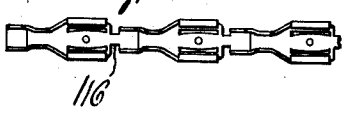


Fig. 6.



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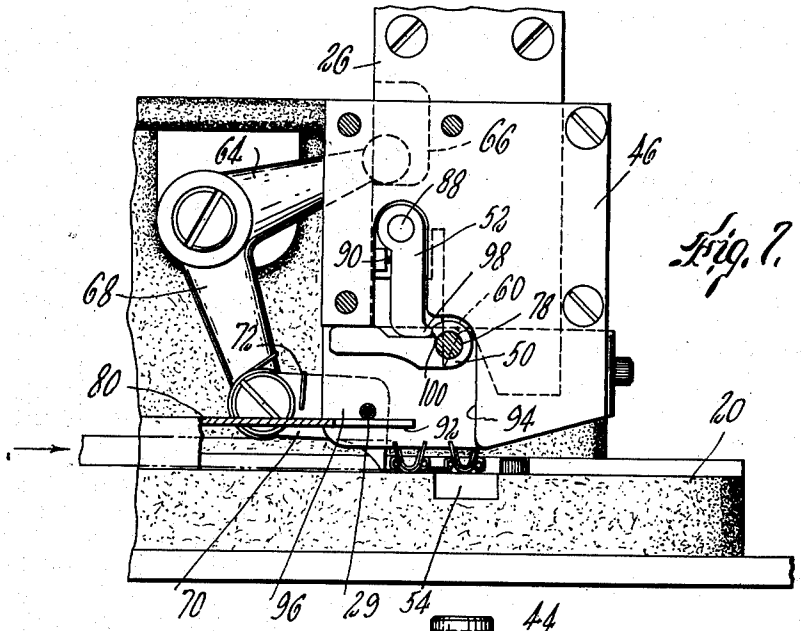


Fig. 7.

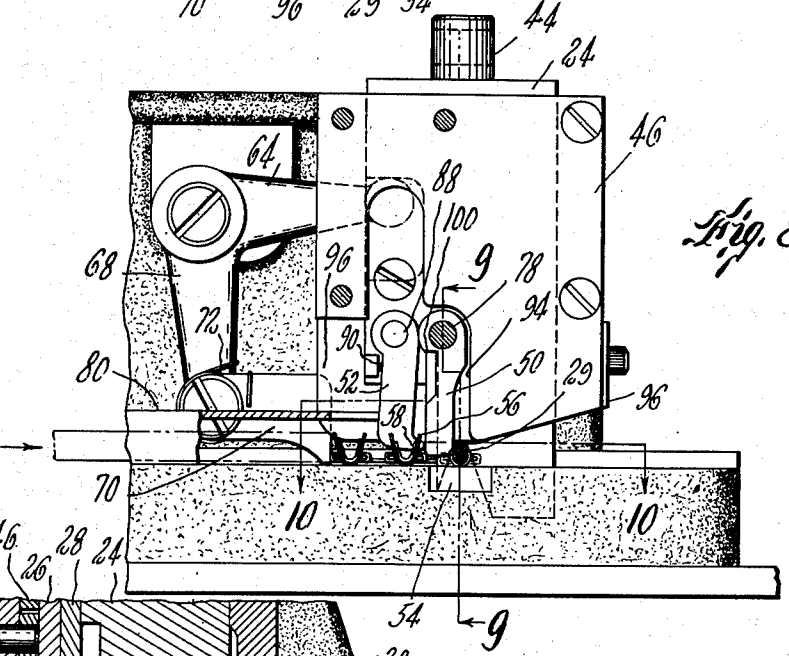


Fig. 8.

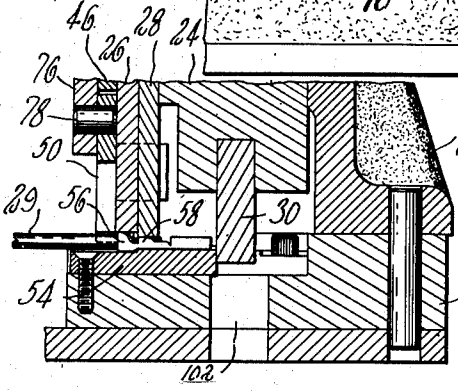


Fig. 9.

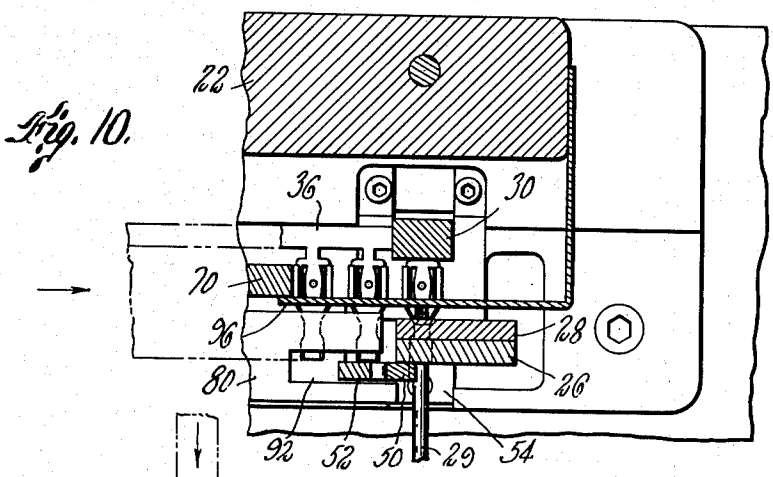
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Fig. 10.



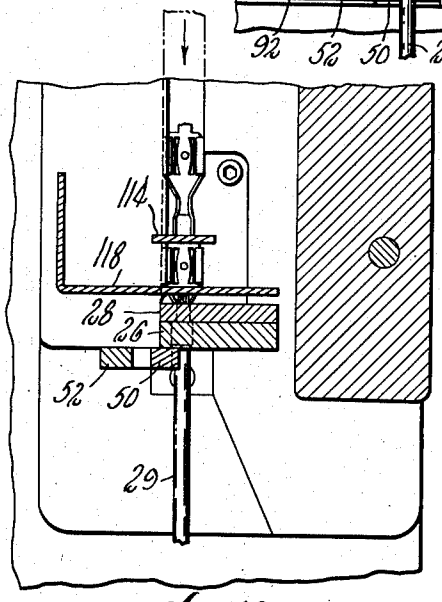
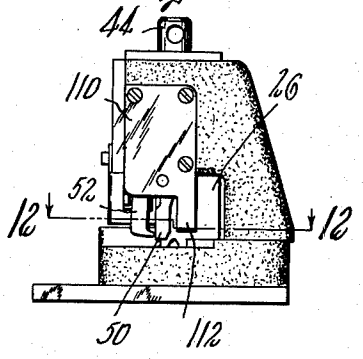


Fig. 12.

Fig. 11.



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Patented June 22, 1954

2,681,447

UNITED STATES PATENT OFFICE

2,681,447

MACHINE FOR CRIMPING ELECTRIC CONNECTOR MEMBERS ON THE ENDS OF WIRES

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Application August 11, 1953, Serial No. 373,603

4 Claims. (Cl. 1—177)

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This invention relates to a machine for crimping electric connector members on end portions of wires which have been skinned to receive them. In many kinds of electric appliances such as electric ranges, refrigerators and radios, wiring connections are to an increasing degree made with pre-cut lengths of wire having a connector member mounted on each end. By this means, low-resistance connections are quickly and easily made, and the time required for assembling the appliance is considerably reduced with a consequent saving in labor costs.

An object of the present invention is to provide improved mechanism for mounting connector members on the end portions of pre-cut wires rapidly and certainly so that the number of defective connections is minimized. For this purpose a power-driven press is employed having a fixed die or anvil and a co-operating movable die or hammer. The connector members are supplied in series of indefinite length, the individual members in a series being held together by bonding elements which are cut by the machine when the leading element is crimped by the machine onto the end portion of a wire. The wires to which the connector elements are to be attached are inserted one by one into the machine. According to the invention, means are provided for moving the end portion of the inserted wire into the proper position between the anvil and the hammer so that when the hammer descends, the crimping operation will be correctly performed.

For a more complete understanding of the invention reference may be had to the following description thereof, and to the drawings, of which—

Figure 1 is a front elevation of mechanism embodying the invention;

Figure 2 is a side elevation of a slightly modified form of the invention;

Figure 3 is a front elevation, on a larger scale, of the mechanism shown in Figure 1;

Figure 4 is a plan view of the same;

Figure 5 is a fragmentary plan view of a continuous series of connector members, arranged side by side;

Figure 6 is a fragmentary plan view of a continuous series of connector members arranged end to end;

Figures 7 and 8 are sectional views, on a larger scale, on the line 7—7 of Figure 4, showing the moving parts in different positions of operation;

Figure 9 is a fragmentary section on the line 9—9 of Figure 8;

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Figure 10 is a fragmentary section on the line 10—10 of Figure 8;

Figure 11 is a front elevation of the modified form of the invention shown in Figure 2; and

Figure 12 is a fragmentary section, on a larger scale, on the line 12—12 of Figure 11.

The machine shown in Figures 1, 3, 4, 7, 8, 9 and 10 is designed to operate on a strip of connectors such as is shown in Figure 5, the connectors being arranged side by side in the strip. The portion of the machine shown in full lines in Figure 1 includes a bed 20 on which is mounted a housing 22. Vertically reciprocable in the housing is a plunger 24 of rectangular cross-section. Mounted on the front face of the plunger are two crimping dies or hammers 26 and 28 (Figures 9 and 10) and a cutter 30 to sever the leading connector from the strip. A bracket arm 32 is secured to the bed 20 to support a reel 34 on which is wound a strip 36 of connectors 38. The bed may be supported on a suitable base 40 on which is also mounted power press mechanism 42 by which the plunger 24 is reciprocated, the plunger having a tang 44 projecting upward therefrom by which it is secured to the power press mechanism. The housing includes a front plate 46, the lower edge of which is shaped to accommodate a positioning arm 50 and pusher 52 hereinafter described.

Mounted in the bed 20 is an anvil or stationary die 54 on which the leading connector 38 rests when the dies 26 and 28 descend to crimp it to the end portion of a wire 29. Each connector 38 is supplied with two pairs of upstanding fingers 56 and 58, the fingers 56 being arranged to be crimped around the end portion of the insulation on the wire, the fingers 58 being arranged to be crimped around the end portion of the wire from which the insulation has been previously removed. The crimping is performed by suitable notches 60 (Figure 7) in the lower ends of the moving dies 26 and 28.

Feeding mechanism by which the strip 36 is drawn step by step from the reel 34 and around a curved guide plate 61 to the anvil 54 comprises a bell-crank having one arm 64 projecting into a recess 66 in the plunger 24 so as to rock the bell-crank when the plunger is moved down and up. The other arm 68 of the bell-crank carries a pivoted ratchet 70 which is held yieldingly on the strip 36 by a spring 72. When the plunger 24 descends, the ratchet 70 is retracted toward the left. When the plunger 24 rises, the ratchet 70 is advanced toward the right to feed a new connector into position on the anvil 54. A piv-

oted pawl 74 pressed by a spring 75 prevents retrograde movement of the strip 36.

An outer plate 76 is secured to the front plate 46 to cover the cut-out portions of the front plate and the pivoted members 50 and 52 which are located in the cut-outs. The positioning arm 50 is supported by a pivot pin 78 which is mounted in the outer plate 76. The lower edge of the outer plate 76 is spaced sufficiently above a narrow table 80 (Figures 7 and 10) for the reception of end portions of wires to which connectors are to be attached. To faciiltate the manual insertion of wire ends into the space between the outer plate 74 and the table 80, flaring guides 82 and 84 are mounted on the outer plate and table respectively. The table 80 is above the level of the strip 36 of connectors and terminates at the anvil 54. A special feature of the invention is the device by which the wire ends which are inserted more or less at random between the guide plates 82 and 84 and the table 80 are moved into the path of the dies as they descend toward the anvil 54. This device comprises the positioning arm 50 which is rocked back and forth 90° by the pusher 52. The pusher is pivotally attached at its upper end by a pin 88 to the front plate 46 and is pressed toward the right (Figures 7 and 8) by a spring 90. When the plunger 24 descends to perform a crimping operation, the pusher 52 descends with it and swings the arm 50 from the horizontal position shown in Figure 7 to the vertical position shown in Figure 8, both members 50 and 52 passing down through an open slot 92 in the end of the table 80. When the arm 52 is thus swung down it sweeps the wire end off the end of the table 80 and against a vertical edge 94 of the front plate 46. The wire end is thus held accurately over the anvil 54 between the arm 50 and the edge 94. The descending dies 26 and 28 push it down onto the anvil and crimp the fingers 56 and 58 over the end portions of the insulation and bared wire. To prevent the wire from being inserted too far, a stop plate 96 is mounted on the housing behind the dies 26 and 28. When the plunger 24 rises, a nose 98 on the pusher engages a shoulder 100 on the arm 50 and rocks the arm back to its horizontal position. Since the wire end is definitely positioned each time directly over the anvil which supports the leading connector, imperfect crimping operations are rare.

When the plunger descends, the cutter 30 (Figure 9) moves down past the rear end of the anvil 54 and shears off the link by which the leading connector has been attached to the strip. The severed link falls through a discharge hole 102.

A modified form of the crimping mechanism is shown in Figures 2, 11 and 12 to accommodate a strip 104 of connectors 106 such as is illustrated in Figure 6, the connectors in the strip being arranged end to end. This form of the machine is essentially the same as the other except that the strip of connectors is fed toward the operator instead of in a transverse direction. Figure 11 shows a front plate 110 which is a removable part of the housing. This plate has a downward extension 112 providing a vertical edge against

which the inserted wire is pushed by the positioning arm 50. The arm 50 is actuated by a pusher 52 as hereinbefore described. Crimping dies 26 and 28 (Figure 12) operate in the manner described and a cutter 114 severs the bond 116 between the leading connector member and the one after. A back stop 118 is mounted on the housing to serve as an abutment against which the end of the wire is thrust. As the plunger descends the arm sweeps the end portion of the inserted wire over against the edge of the extension 112, thus locating it directly below the notches of the dies 26 and 28 which force it down between the upstanding fingers tightly around the base wire and the end portion of the insulation.

I claim:

1. In a crimping machine which includes a base, a stationary die on said base shaped to support an electric connector member, a housing on said base, a die reciprocable in said housing above the stationary die and adapted to crimp portions of said connector member about a wire, a stationary vertical guide edge at one side of said stationary die, a table at the other side of said stationary die and at a higher level, a back-stop behind said table to limit the rearward movement of a wire thrust in on said table, and a positioning member movable by downward movement of said reciprocable die to push an inserted wire laterally from said table into engagement with said guide edge, whereby said wire is located directly in the path of the descending die.

2. Mechanism as in claim 1, and two spaced guide plates for said wires, one of said plates extending forward from said table and curving downward, the other plate extending forward from the housing and curving upward.

3. Mechanism as in claim 1, said positioning member comprising an arm pivotally mounted at its upper end and swingable from a horizontal position down to a vertically depending position.

4. In a crimping machine having a stationary die shaped to support an electric connector member, a vertically reciprocable die directly over the stationary die, and means for feeding successive connector members into position on said stationary die; a table at one side of said stationary die and above the level of the upper face of the die, said table having an edge adjacent to said stationary die, a vertical abutment element adjacent to and on the opposite side of said stationary die, a back-stop mounted behind said table to limit the distance of insertion of a wire end, and means actuated by downward movement to the reciprocable die to push laterally a wire end inserted on said table into contact with said abutment element, said means comprising an arm pivotally supported at its upper end at a fixed point above the table and swingable from a horizontal position down to a vertical position adjacent to said stationary die, and a pusher element vertically reciprocable with said reciprocable die and operating on its downward movements to swing said arm down from its horizontal position to its vertical position.

No references cited.