

Dec. 8, 1959

H. W. DEMLER
TOOL WITH LOST MOTION LINKAGE FOR
CRIMPING ELECTRICAL CONNECTORS

2,915,929

Filed Feb. 20, 1957

3 Sheets-Sheet 1

FIG. 1

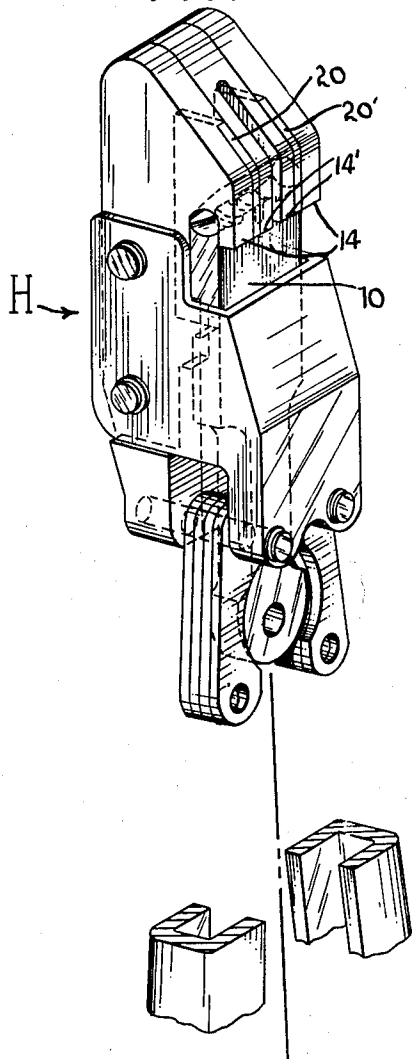
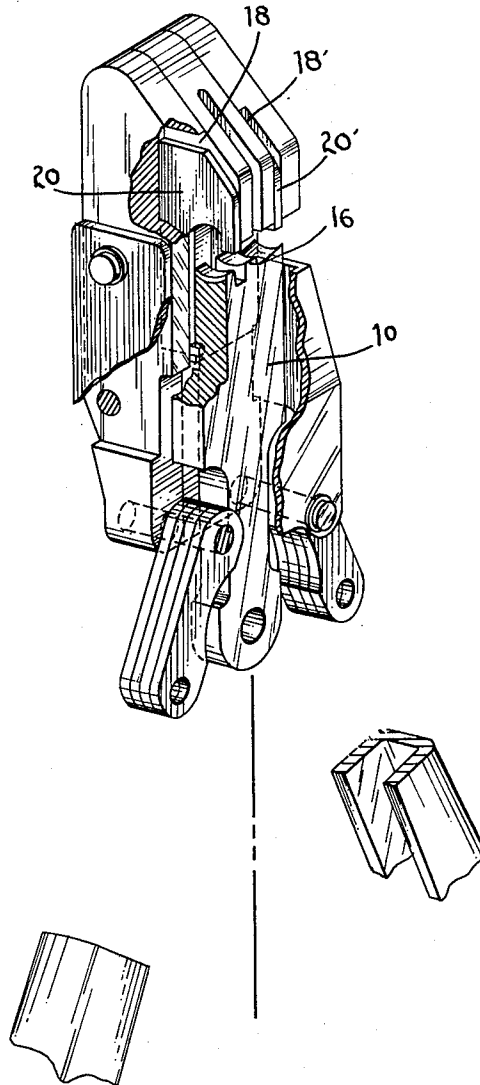


FIG. 2



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FIG. 3

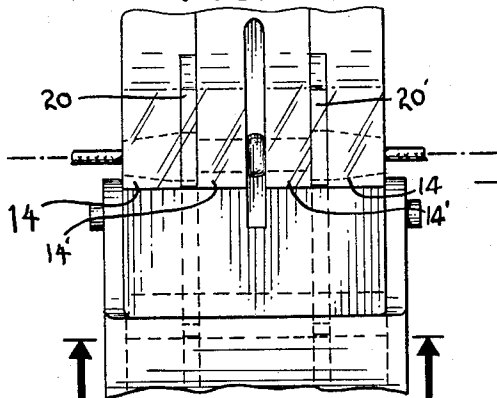


FIG. 4

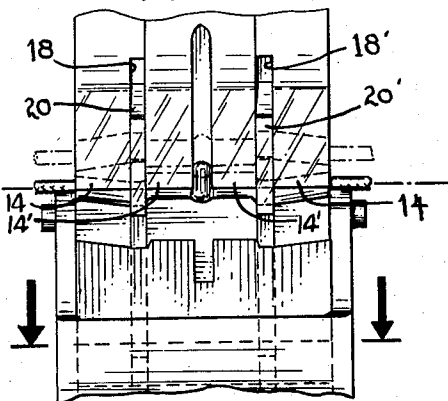


FIG. 5

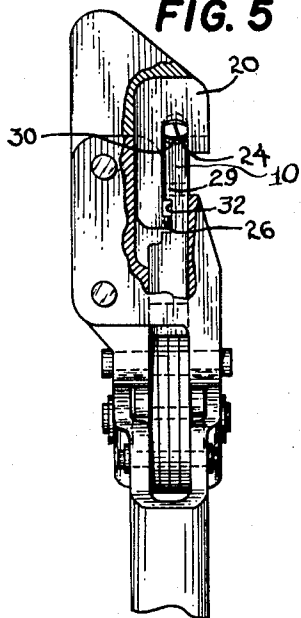


FIG. 6

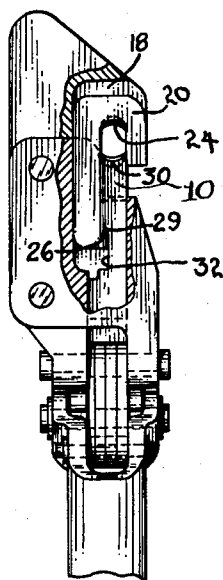
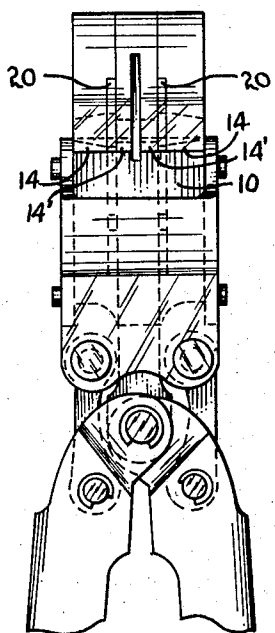


FIG. 7



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Filed Feb. 20, 1957

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FIG. 8

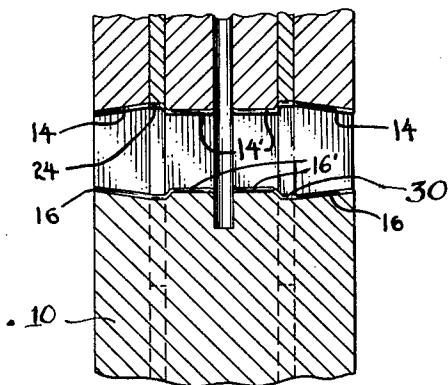


FIG. 9

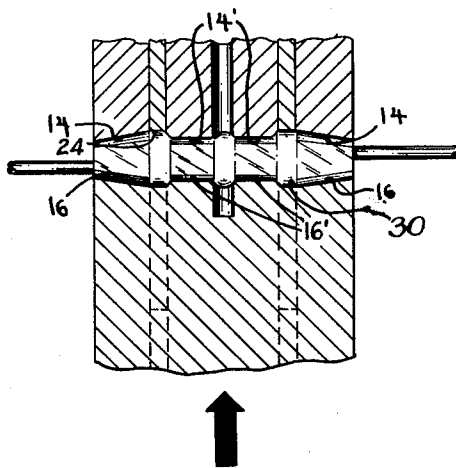


FIG. 11

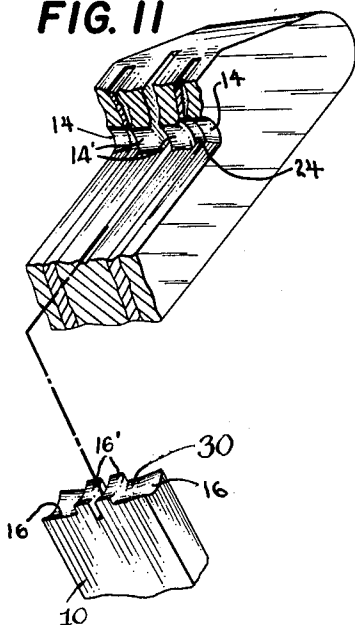
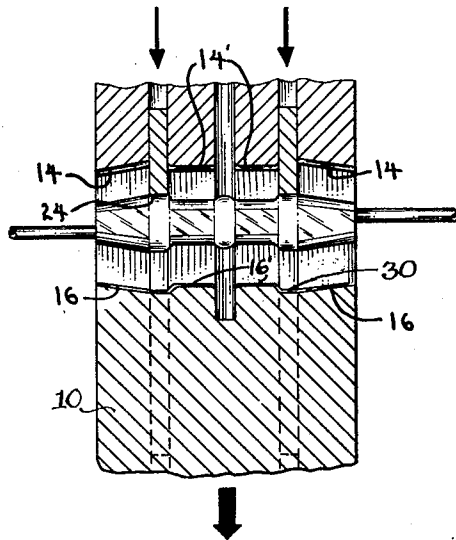


FIG. 10



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TOOL WITH LOST MOTION LINKAGE FOR CRIMPING ELECTRICAL CONNECTORS

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Application February 20, 1957, Serial No. 641,419

4 Claims. (Cl. 81—15)

When joining two electrical connectors together in an end-to-end relationship, it is desirable to cold forge the ends of the conductors within a metal ferrule encased in plastic insulation by application of crimping pressure to the exterior of the plastic. This may be accomplished by various tools, including a hand tool of the type shown in the patent to Byrem, 2,722,146, issued November 1, 1955. As shown in this patent a pair of cooperating dies crimp an electrical connector to a conductor. These dies are actuated by handles which are linked to the dies.

A second pair of dies are employed to crimp the electrical connector onto the insulation of the conductor thus forming a water tight seal; e.g., see patent application to Wahl, Serial No. 606,733, filed August 28, 1956. In an end-to-end connection, it is desirable that both of the conductors are simultaneously crimped within the connector. The connector set forth in the Wahl application supra contemplates stripping the insulation from the conductor during the crimping process. This operation is predicated upon radial extrusion of the conductor during the crimping operation.

It is an object of this invention to provide a set of crimping dies that will increase radial extrusion of the conductor by limiting the longitudinal extrusion of the conductor. This is accomplished by inwardly tapering the extremities of the crimping dies so that the outer ends of the connector are deformed before the central portion of the conductor is crimped. This forms a structure analogous to a closed fluid system and increases the crimping pressure in the central insulation stripping portion of the connector.

Another object of the instant invention is to provide an improved type of extractor means which also functions to crimp the connection. This extractor means is operative so that in one position it moves relative to the connector to dislodge the connector from the crimping dies, and in another position it is fixed so that it operates as a crimping die means. With this arrangement the crimped connection is completely sealed from one end to the other.

Other objects and attainments of the present invention will become apparent to those skilled in the art upon a reading of the following detailed description when taken in conjunction with the drawings in which there is shown and described an illustrative embodiment of the invention; it is to be understood, however, that this embodiment is not intended to be exhaustive nor limiting of the invention but is given for purposes of illustration in order that others skilled in the art may fully understand the invention and principles thereof and the manner of applying it in practical use so that they may modify it in various forms, each as may be best suited to the conditions of a particular use.

In the drawings:

Figure 1 is a perspective view of a tool embodying the principles of this invention showing the handles in closed position;

Figure 2 is a view similar to Figure 1, showing the handles in an open position;

Figure 3 is a front plan view of a portion of the tool shown in Figures 1 and 2, with a connector in crimping position;

Figure 4 is a view similar to Figure 3 showing the tool in open position after the crimping operation;

Figure 5 is a plan view similar to Figure 1, showing a portion of the head broken away to illustrate the position of the extractor means during the closing stroke of the tool;

Figure 6 is a plan view similar to Figure 2, showing a portion of the head broken away to illustrate the position of the extractor means during the opening stroke of the tool;

Figure 7 is a front view of the tool showing a connector in crimping position;

Figure 8 is a cross sectional view of the crimping die employed in the tool;

Figure 9 is a view similar to Figure 8, showing a connector being crimped therein;

Figure 10 is a view similar to Figure 9, showing the dies in open position and the ejector means retracting a crimped connection; and

Figure 11 is an exploded view of the die members.

As shown in Figure 1 the tool has a housing generally designated H. The housing contains a driven member 10, longitudinally slidable in the head. A handle and linkage mechanism, similar to the type set forth in the above-identified patent, operate to reciprocate the driven member 10 within the housing. A plurality of spaced stationary dies 14, 14' are located on the upper portion of the housing. The second set of cooperating dies 16, 16' comprise one end of the slidable member 10. The dies 14, 14' and 16, 16' are arranged to crimp an electrical connector onto a conductor and its insulation.

It is noted that the upper dies 14 are spaced one from the other as at 18, 18' to form trackways. These trackways contain extractor plates 20, 20' slidable therein. A projection 26 extends from the lower end of each extractor plate. Since these plates are identical only one of them will be described.

As shown in Figures 5 and 6 these extractor plates have a yoke-like portion which constitutes a crimping die 24. This yoke also operates to surround the crimped connection so that movement of the extractor plate in one direction will urge the connector in a direction to release it from the tool.

The driven die member 10 has an additional set of die forming surfaces 30 which cooperate with die 24 to crimp therein the intermediate section of the connector, not aligned with dies 16. This die member 10 cooperates with the extractor plates by means of a "lost motion" type of linkage comprised of a longitudinal slot 32 which accommodates the projection 26 so as to permit the projection 26 to slide therein. After the member 10 has traveled the length of the slot 32 continued movement of the driven member 10 causes the shoulder 29 of the slot to engage the projection 26, whereby the driven member 10 engages the extractor plates 20, 20' for simultaneous travel.

Referring now to the structure of the crimping dies, as shown in Figures 8—10, the working surfaces of the dies 14', 16' are parallel to the axis of the die set and to each other. These working surfaces are employed to crimp the connector to the conductor. The working surface of dies 14 and 16 are tapered outwardly toward the axis of the die set. The working surfaces 14, 16 crimp the connector to the insulation on the conductor, thus sealing the connection against the entrance of moisture.

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Operation.—After an electrical connector is inserted into the crimping dies, the driven member 10 is actuated by means of the handles until it binds the electrical connector in crimping position. A full stroke compelling mechanism such as is shown in the patent to Carlson 2,618,993 retains the driven member 10 in the partially closed position while conductors are fed into the conductor-receiving openings in the connector.

With the conductors properly positioned, further actuation of the driven member 10 causes the dies 14' and 16' to deform the connector onto the conductors. Simultaneously the outer portions of the connectors are deformed onto the insulation surrounding the conductors by dies 14 and 16.

The crimping stroke initially causes inward deformation of the inwardly tapered ends of the connector prior to the crimping of the central portion of the connector. This functions to seal the ends of the connector, thus preventing longitudinal extrusion. With the ends of the connector sealed, crimping pressure applied to the central portion of the connector functions to extrude the insulation on the conductor in a radial direction to divest the conductor of insulation.

As shown in Figures 3 and 5, the connector is severely deformed between the dies to effect the crimped connection. The plastic nature of the connector together with the high crimping thrust may cause the connector to be tightly wedged into the crimping die. Opening the handles causes retraction of the driven member 10. Due to the lost motion linkage, the driven member 10 moves relative to the extractor plates 20, 20' a distance equal to the length of the slot 32. Continued actuation of the driven member 10 causes engagement between the shoulder 29 and the projection 26, whereby the driven member causes downward longitudinal movement of the extractor plates. The yoke-like shape of the extractor plates causes the plates to grasp the connector. Further downward movement of these plates urges the connector to pry it loose from the crimping dies, see Figure 4.

This relationship of parts provides a tool that impresses a crimp along the total length of the connection. At the same time it provides an automatic means for retracting the crimped connection from the tool. In effect the plates 20, 20' are so fashioned and related to the other parts of the tool that they operate as crimping dies during one part of the cycle and become extractors to release the crimped connection during the remainder of the cycle.

Changes in construction will occur to those skilled in the art and various apparently different modifications and embodiments may be made without departing from the scope of the invention. The matter set forth in the

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foregoing description and accompanying drawings is offered by way of illustration only. The actual scope of the invention is intended to be defined in the following claims when viewed in their proper perspective against the prior art.

I claim:

1. A tool for pressure forging an electrical connector to a conductor including: a housing, a first plurality of spaced stationary dies in the housing, a second plurality of dies movable in the housing and opposed to the first plurality of dies, whereby a connector may be crimped therebetween, slidable plate means mounted in spaces formed by the first set of dies, said plate means having a combination crimping and extracting means thereon, said plate means being secured to the second plurality of dies by a lost motion linkage to permit relative motion therebetween in one direction and simultaneous motion therewith in the opposite direction, and means for actuating the movable dies.

2. A combination crimping and extracting means comprising a housing with a generally yoke-like plate slidable in the housing, said plate having a U-shaped crimping die nest formed at one end thereof and a projection on the other end co-planar with said crimping die nest, a second plate also slidable in the housing along the same path as the first plate, said second plate having a slot therein which accommodates the projection, one end of the second plate containing a crimping die which fits into said crimping die nest, means secured to said housing to actuate said second plate, and said slot and projection forming a lost motion linkage between the plates.

3. A tool for crimping an electrical connector to a conductor including: a housing containing a plurality of fixed spaced U-shaped dies with a plurality of movable U-shaped dies therebetween, a driven member with a plurality of dies on one end, each of said latter dies fitting into one of the U-shaped dies, means for actuating the driven member, and lost motion means for moving the driven member while the movable dies are stationary during part of the movement and after a delay moving said dies and driven member together between the driven member and movable U-shaped dies.

4. The device of claim 3 wherein the fixed and driven member dies taper inwardly toward their outer extremities.

References Cited in the file of this patent

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2,722,146	Byrem -----	Nov. 1, 1955
2,784,621	Klingler -----	Mar. 12, 1957