

May 29, 1962

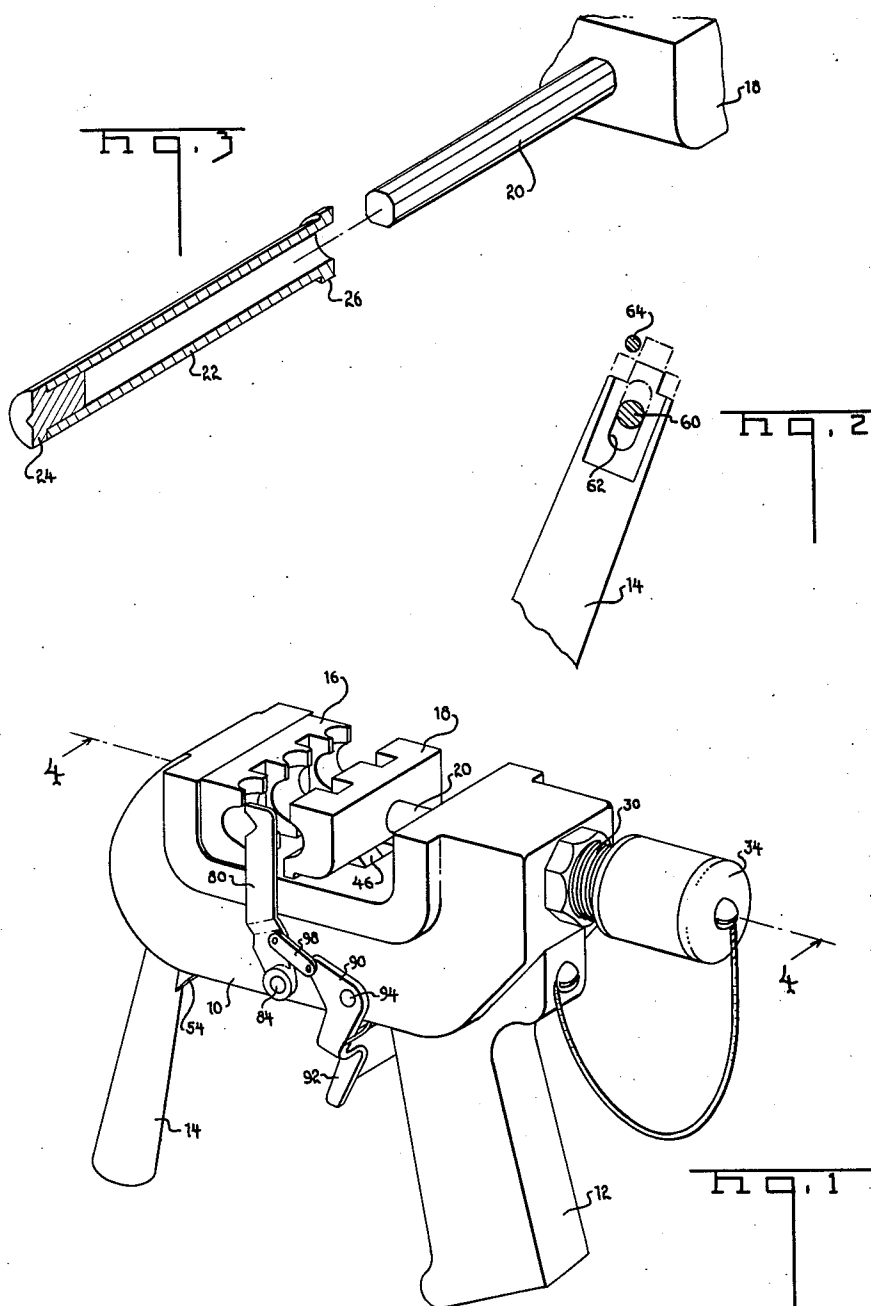
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3,036,308

HAND TOOL FOR CRIMPING ELECTRICAL CONNECTORS ONTO CONDUCTORS

Filed Aug. 18, 1959

4 Sheets-Sheet 1



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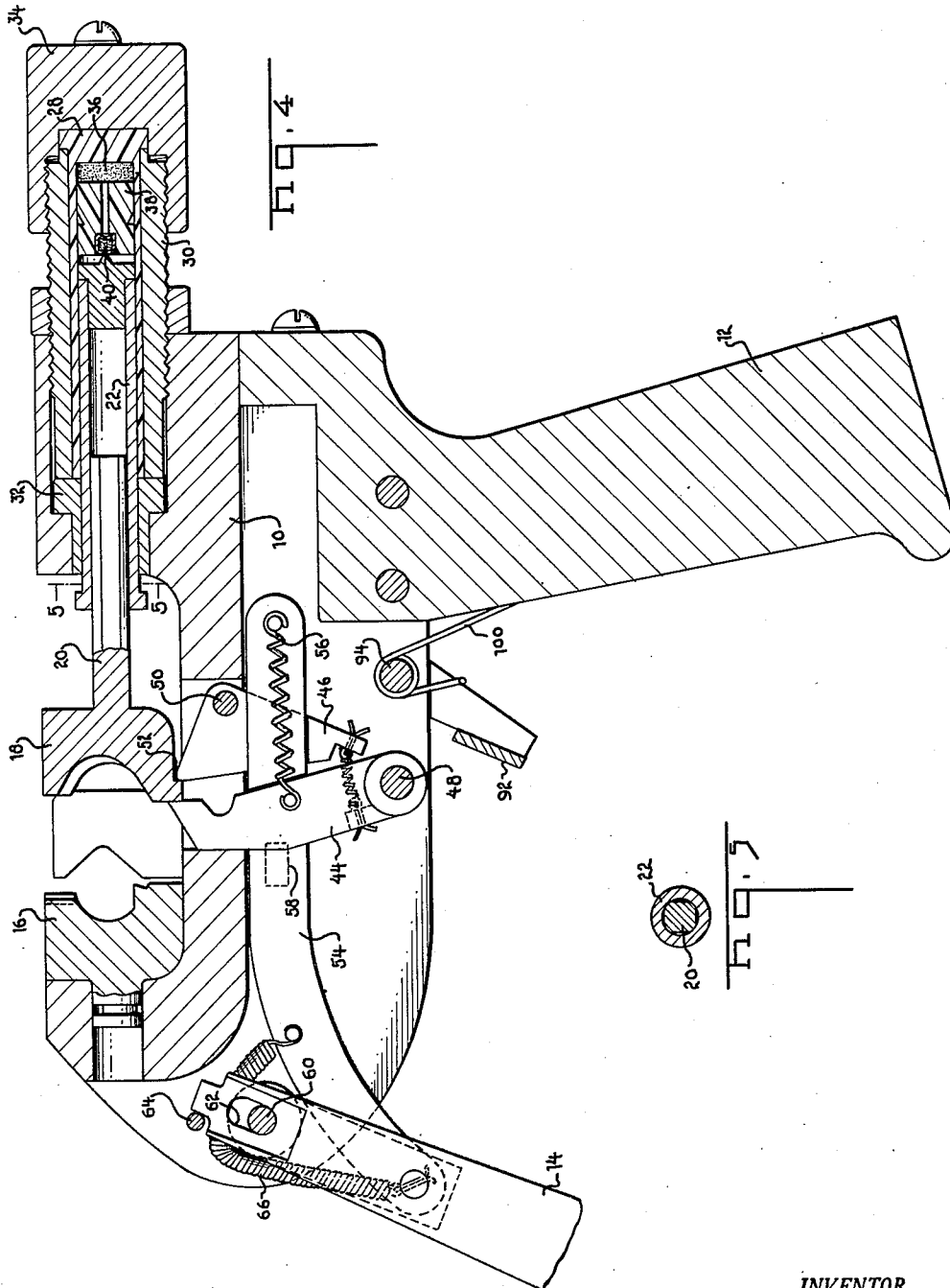
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4 Sheets-Sheet 2



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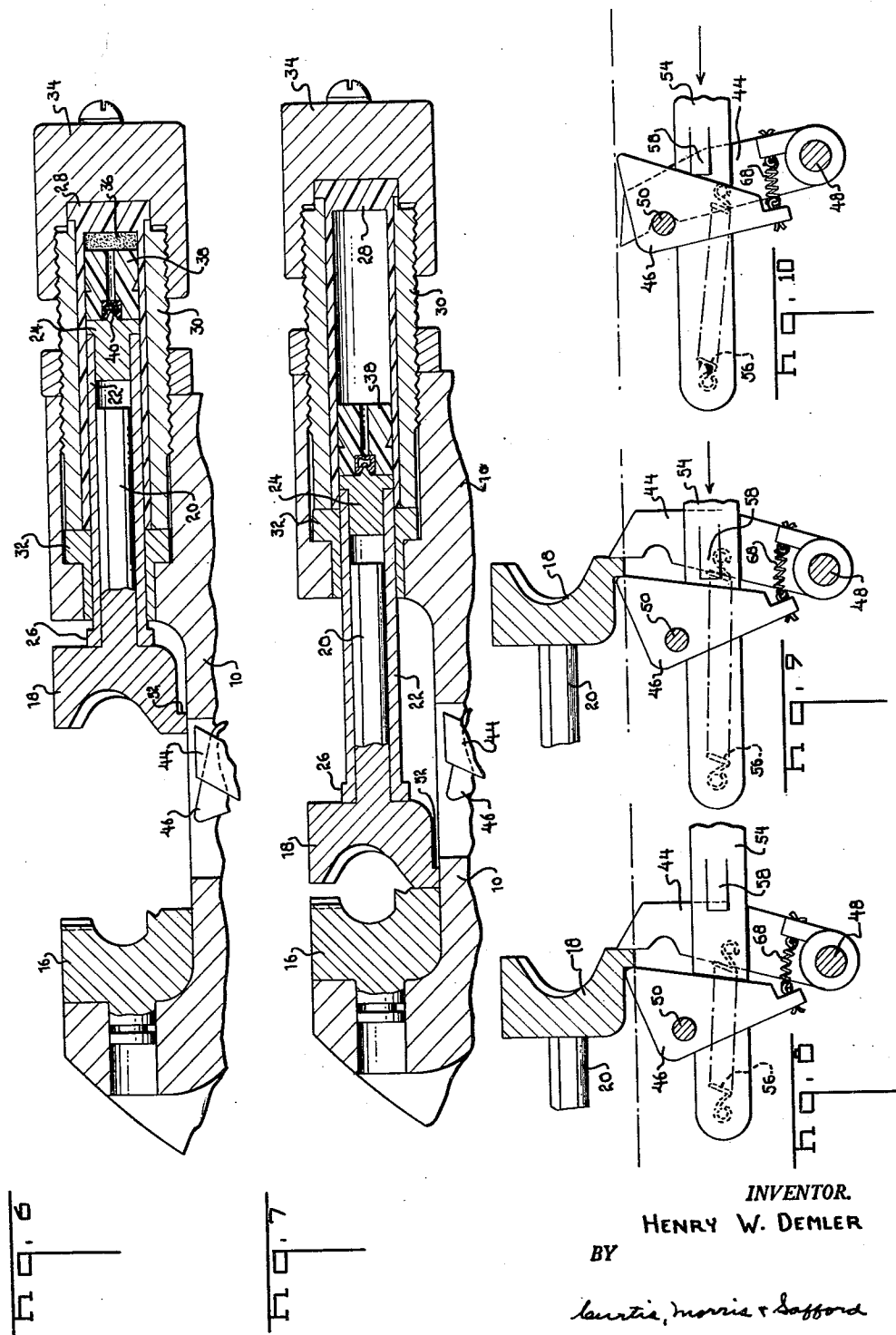
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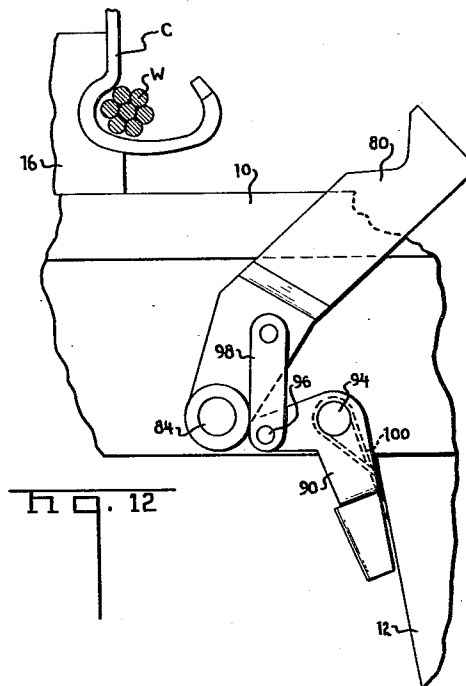
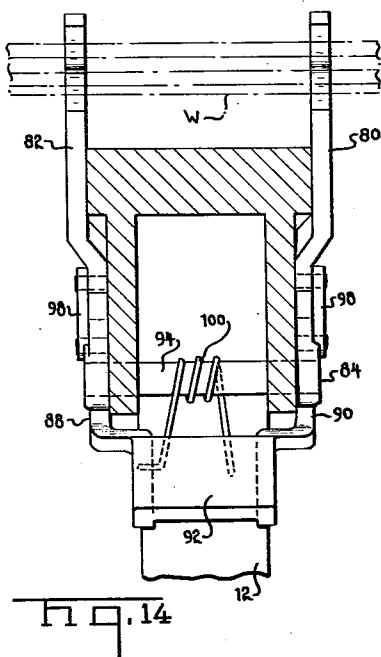
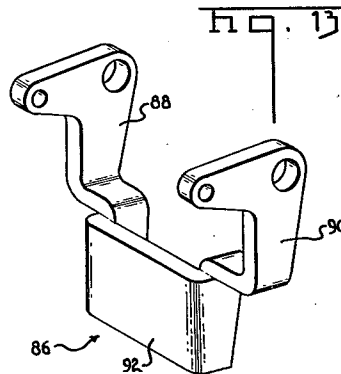
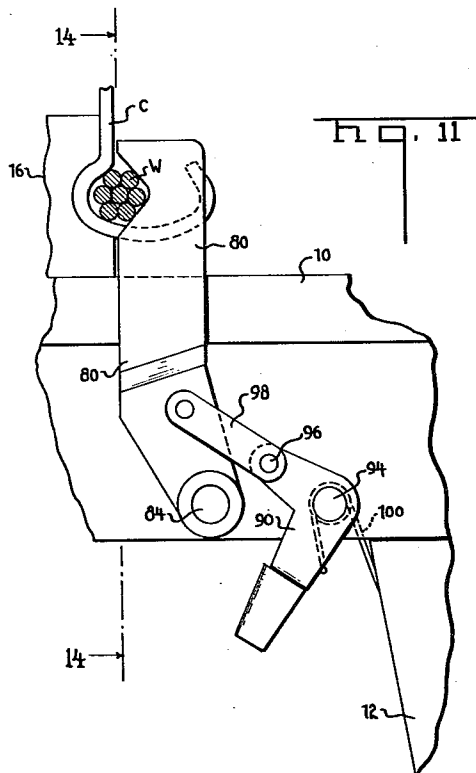
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4 Sheets-Sheet 4



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HAND TOOL FOR CRIMPING ELECTRICAL CONNECTORS ONTO CONDUCTORS

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5 Claims. (Cl. 1—215)

This application constitutes a continuation-in-part of my previously filed application (CMS No. 123,148), filed May 19, 1959, Serial No. 814,339, now U.S. Patent No. 2,968,043 granted Jan. 17, 1961 for "Hand Tool for Crimping Electrical Connectors Onto Conductors."

My previously filed application, identified above, relates to an explosively-operated hand tool capable of crimping electrical connectors onto conductors. A feature of this tool involves its ability to fire a cartridge internally, i.e., the firing mechanism is constructed so as to enter the cylindrical cartridge and detonate a primer located centrally and internally of the cartridge. Detonation of this primer causes actuation of an explosive material which drives a die toward a second cooperating die in the tool to crimp a connector placed therebetween. One of the problems involved is the formation of an air pocket in the cartridge which tended to prevent the detonating means from developing sufficient force to explode the primer. Addition of a spring sufficient to overcome this resistance made the tool difficult to operate, and relieving the detonating means to permit air to escape weakened the device and permitted "blow-out" at the point of relief.

It is an object of this invention to provide an explosive tool of the type described, whereby the detonating ram completely supports the plug in the cartridge but does not compress air in the cartridge. It is also an object of this invention to provide a tool having a pair of telescopic members with the inside member being relieved to permit air to be expelled during the detonation stroke; that is, the rearward travel of the ram. On the forward travel of the ram, the ram and the telescopic sleeve move together as a unit.

It is also an object of this invention to provide an explosively-operated tool wherein the actuating trigger or handle may not be inadvertently cocked or released. This is accomplished by a locking means, including the actuating means, to be moved downwardly first before being moved rearwardly. To re-set the device, the ram again must be moved forwardly and then downwardly to permit it to be retracted past the locking means. The net result is that the device may neither be cocked nor released inadvertently. Another object of this invention is to provide an improved and efficient article holding means.

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 drawing 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 the 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 principles of this invention;

FIGURE 2 is a fragmentary view of the linkage on the front handle;

FIGURE 3 is a perspective exploded view of the ram and the plunger;

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FIGURE 4 is a sectional view taken along plane 4—4 of FIGURE 1;

FIGURE 5 is a sectional view taken along plane 5—5 of FIGURE 4;

FIGURES 6 and 7 are sectional fragmentary views of the dies and actuating mechanism in their pre-operated and post-operated conditions respectively;

FIGURES 8 through 10 are partial views of the device for actuating the die during the firing cycle;

FIGURE 11 is a fragmentary view of the article holding means;

FIGURE 12 is a view similar to FIGURE 11 showing the article holding means in retracted position;

FIGURE 13 is a perspective view of the trigger and linkage of the article holding means; and

FIGURE 14 is a view taken along plane 14—14 of FIGURE 11.

As shown in FIGURE 1, the device comprises a C-shaped body member 10, a fixed handle 12 and a pivoted handle 14. A pair of dies 16 and 18 are positioned within the C-shaped body member. One die 16 may be fixed therein with the other die 18 slidable longitudinally relative to die 16. Actuation of the slidable die toward the fixed die effects the crimping of an electrical connector placed therebetween.

A ram 20 on one end of the fixed die 18 projects into a tube or sleeve 22 (FIGURE 4), which is also slidable in the body member. The ram 20 may be square or hexagonal, or otherwise relieved, so that it slides freely within the tube 22 without forming an air cushion in the closed end of the tube.

One end of the tube 22 is closed by a plug 24 with a detonating point projecting outwardly therefrom. A shoulder 26 on the other end of the tube 22 engages the die 18 when the ram is telescoped into the tube 22.

A cartridge 28 is located in the body member so that the cartridge is received within a sleeve 30 threaded into the body member. The sleeve 30 abuts a bushing 32 which is force-fitted into the body member and slidably accommodates the sleeve 22. A cap 34 is detachably secured to the sleeve 30 to retain the cartridge 28 therein. The cartridge includes an explosive powder 36, a plug 38 and an internal primer 40 in the plug 38 to detonate the powder 36. The cartridge and plug may advantageously be made of plastic. A connector locating means (described in my previous application) may be secured to the tool.

It is observed that when the device is in the position shown in FIGURE 4 with an electrical connector between the dies, actuation of the die 18 driving it rearwardly causes the die 18 to strike the shoulder 26 of the sleeve 22. This, in turn, drives the plug 24 percussively against the primer 40 to detonate the primer and thereby ignite the explosive mixture 36. The force of the explosion expels the plug 38 outwardly, driving the sleeve 22 and the telescopic ram 20 ahead of it. Since the die 18 is on the front end of the ram, the die is also hurled toward the fixed die 16 to crimp the connector therebetween (note FIGURES 6 and 7). Closing of the dies limits the travel of ram 20, plug 38, etc.

In the illustrated embodiment, the device for actuating the ram includes a first link or lever 44 pivoted in the body member at 48, and a second link or lever 46 pivoted at 50. The lever 44 abuts the front end of the die 18, whereas the lever 46 abuts a shoulder 52 on the opposite side of the die 18. The bar 54 is slidable between the levers 44 and 46 and is spring loaded at 56 with one end of the spring secured to the link 44. Hence, the link 46 locks the die 18, and consequently the link 44, against rearward motion. During the firing cycle, rearward motion of the bar 54 loads the spring 56. A tab 58 is struck out of the bar 54 so that the path of the tab overlaps the link 46.

Continued rearward movement of the bar 54 causes the tab 58 to strike the link 46, thus rotating the link in a counter-clockwise direction and moving it out of the path of the die 18. Since the die 18 is no longer locked against rearward motion, the link 44 throws the die and ram rearwardly under the action of the spring 56. The link 44 is moved in a clockwise direction driving the die 18 rearwardly to cause the detonation of the primer and explosive as previously described.

The handle 14 is pivoted about a pin 60 located in an elongated slot 62. The head of the handle projects upwardly so that a pin 64 located in the body projects into the path of the handle. A spring 66 normally retains the handle in this upward or locked position.

When it is desired to actuate the device, the handle 14 must be moved downwardly against the action of spring 66 to permit the slot 62 to slide relative to the fixed pin 60. This moves the rotational path of the head of the handle away from the pin 64 and permits the handle to be pivoted in a counter-clockwise direction to actuate the trigger mechanism. After the device is fired, the spring loaded means 66 again retracts the handle so that the handle cannot be moved back into cocking position until it is moved downwardly so that its path is not intersected by the pin 64. This prevents inadvertent cocking or firing of the device.

As shown in FIGURES 8-10, the bottom portion of the two links are joined by a spring member 68. These spring members are under tension when the device is cocked and released when the device is fired. This permits the device to be re-set by moving the handle forwardly. Motion of the handle forwardly (after it has been released from the path of the pin 64) moves the link 44 back into position. The tension of the spring 68 causes the opposite link 46 also to be rotated into its actuating position. The die 18 may be manually moved into firing position to reset.

An embodiment of an improved article holding means is best illustrated in FIGURES 11-14. As shown in FIGURE 14, the holding arms 80 and 82 are positioned, one on each side of the tool. One end of the arm is adjacent the dies, and the other is pivoted by a common pivot pin 84 which is located transversely of the axis of the tool. A trigger mechanism (FIGURE 13), generally designated 86, includes a pair of arms 88 and 90 joined by a common finger piece 92. The link 90 is also pivoted about a pin 94 located in the tool. The link 90 is substantially V-shaped and has another pivot pin 96 at the free end thereof. The other end of the link is off-set and secured to the finger piece 92. A second link 98 is also secured to pivot pin 96 and, in turn, is pivoted to the link 80. A spring means 100 normally holds the link 80 in its forward or article holding position. As shown in FIGURES 12 and 11, movement of the finger piece 92 in a counter-clockwise direction causes the link 98 to be rotated clockwise. The link 98 moves the wire holding mechanism 80 counter-clockwise, as shown in FIGURE 12, to retract it from the connector and wire. When the finger piece 92 is released, the spring 100 returns the link 80 to the wire holding position as shown in FIGURE 11. The opposite link 82 operates in the same manner at the same time.

When it is desired to crimp a connector "C" and a

wire "W" in the tool, the article holding means is retracted and the connector is placed in the fixed die with a wire therein. The finger piece is released so that the links 80 and 82 snap forwardly to bind the wire and connector against the die. After the crimp is made, depression of the trigger means 92 retracts the links 80 and 82, thus permitting the connector and wire to be removed from the tool.

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 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 crimping electrical connectors including a pair of relatively movable dies adapted to crimp the connectors therebetween, explosive means for actuating said dies, means for detonating said explosive means including a first detonating member and a second impact member telescopically slidable with respect to said first member, die means carried by said second member, and means for driving the second member against the first member to detonate the explosive.

2. A tool for crimping electrical connectors including a body member, a fixed die in said body member, a slidable die in said body member, a ram having one end secured to said slidable die, said ram projecting into the body member, said ram adapted to detonate a cartridge in said body member of the type having an explosive charge therein and a detonating means located internally in said cartridge, means on the free end of the ram for actuating said detonating means, a slidable tube means in said body member surrounding said ram, and means on said ram for bleeding air from said tube means when the ram is driven toward said detonating means.

3. The device of claim 2 wherein the means for bleeding the air from the tube means comprises at least one flat side on the periphery of the ram.

4. A tool for crimping terminals including a pair of relatively movable dies, explosive means actuating said dies, means for detonating said explosive means comprising a pivoted handle on said tool, and means for locking said handle against pivotal movement disengageable to permit the handle to be released and permitted to pivot.

5. The device of claim 4 wherein the means for locking the handle includes a pin on the tool in the path of the handle, and means for varying the path of the handle so that it does not intersect the pin.

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