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CRIMPING TOOL WITH A PLURALITY OF MOVABLE DIES OPERABLE SINGLY OR TOGETHER

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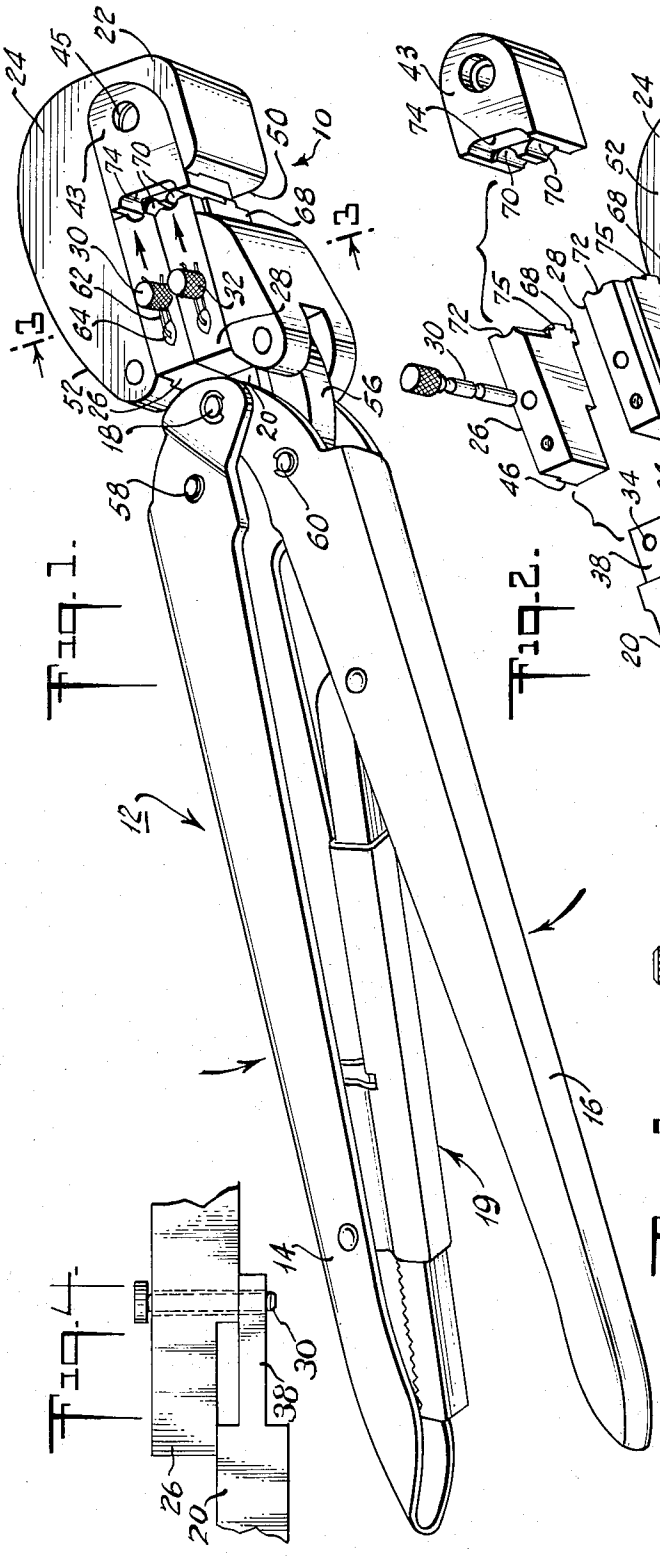


Fig. 1.

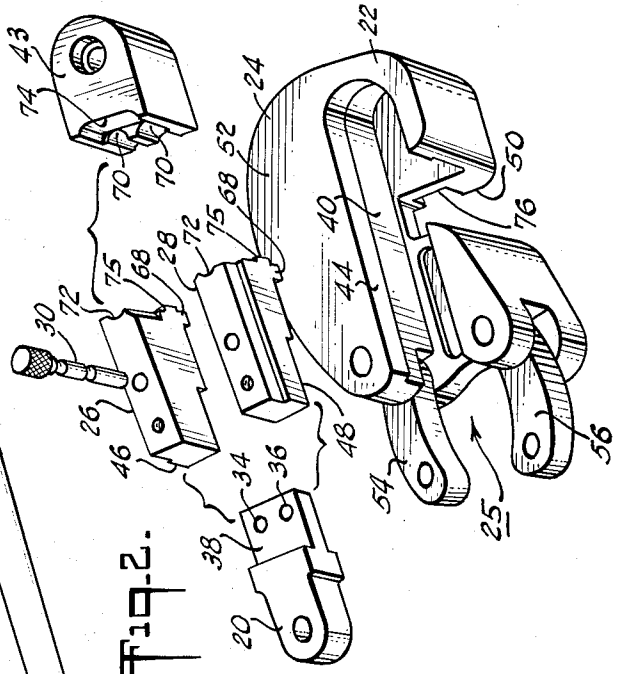


Fig. 2.

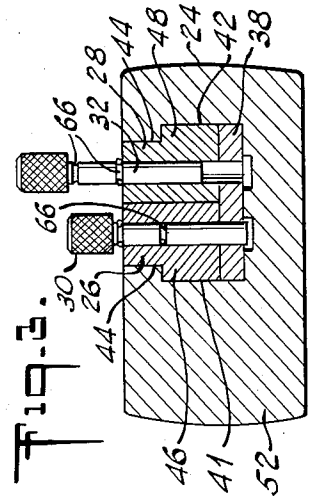


Fig. 3.

Fig. 4.

INVENTOR:
WILLIAM R. EVANS.

BY
Curtis, Morris & Safford.
ATTORNEYS:

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CRIMPING TOOL WITH A PLURALITY OF MOVABLE DIES OPERABLE SINGLY OR TOGETHER

William R. Evans, Oberlin, Pa., assignor to Aircraft-Marine Products, Inc., Harrisburg, Pa.

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5 Claims. (Cl. 81—15)

This invention relates to crimping tools and is illustrated and described particularly as embodied in a hand tool for applying solderless connectors to electric conductors.

Solderless connectors commonly are fastened to electric wires by crimping the connector to the wire, for example, by compressing the connector between suitably shaped die surfaces carried in the head of a tool. These connectors are of various types and shapes, depending upon the various applications for which they are intended, but preferably they are precisely formed and manufactured to within very close tolerances. Also, the formation of the crimp in the connector is a precision operation, and the dies for use with a particular connector are precisely shaped and arranged to be closed to an accurately predetermined position in order to secure a firm bond between the wire and connector.

In accordance with one aspect of the present invention a crimping tool is provided which is adapted to be used with a connector having a pair of ferrules or barrels each of which ferrules or barrels may include insulation supporting and gripping portions.

In accordance with another aspect of this invention the tool is readily adapted to crimp either one of the barrels of the connector, or to crimp both simultaneously and thus, alternatively a single or double connection may be made. In cases where only a single connection is made, the other barrel of the connector remains uncrimped and may be used subsequently.

A further aspect of the present invention provides a double nest die surface opposed by a pair of separate crimping dies, slidably mounted on parallel tracks extending toward the double nest surface.

It is an advantage of the present invention that the adaptation of the tool for single or double connections is quickly and easily made.

A further advantage of the present invention is that during the crimping operation the opposing die pieces are driven toward each other along rectilinear paths, whereby the closing motion of the jaws is precisely controlled and equal leverage is obtained from the handles for all portions of the die surfaces. Thus, when two connections are made simultaneously, equal crimping forces are obtained.

The various features, objects, and advantages of the invention will be in part pointed out in, and in part apparent from, the following description considered in connection with the accompanying drawings, in which:

Figure 1 is a perspective view of a hand tool embodying the invention;

Figure 2 is an exploded view of the head of the tool including the die pieces and the driver therefore;

Figure 3 is a cross sectional view of the head of the tool taken along the line 3—3 of Figure 1; and

Figure 4 shows the relationship of the driver and one of the movable dies.

The hand operated crimping tool shown in Figure 1 comprises a head assembly, generally indicated at **10**, and

a pair of handle grips, generally indicated at **12**, in the form of grip levers **14** and **16**, pivoted at **18** and normally biased toward the open position by a suitable spring, not shown. These handles as shown are made by die forming them with a generally U-shaped cross-section from sheet steel to give the necessary rigidity with light weight. Connected between the handles is a ratchet device **19** which operates to insure that the full crimping pressure has been exerted on the handles in order to provide a completed crimp before the handles can be released. Such a ratchet device is more fully described and claimed in the co-pending application of Vernon E. Carlson, Serial No. 2,261, filed January 14, 1948, now U. S. Patent 2,618,993, issued November 25, 1952.

As explained above, a hand tool incorporating the invention may be used with a connector having a pair of ferrules or barrels into either one or both of which an electrical conductor or conductors may be crimped, and the operation of the tool is such that either one or both of the connector barrels may be crimped by closure of the handles **14** and **16**.

In general, the action of the tool is such that as the handles **14** and **16** are moved toward one another a driver **20**, shown best in Figure 2, is slid forwardly toward the opposing jaw **22** of a head **24**, which forms the frame for the whole head assembly **10**, as explained below. A pair of plungers **26** and **28**, each having an indenter or crimping die surface on the end facing the jaw **22**, are arranged to be locked to the driver **20** by means of a pair of slidable pins **30** and **32**, which may be slid into a pair of co-operating holes **34** and **36** in the tongue **38** of the driver. In operation, if it is desired simultaneously to crimp both barrels of a connector, then both of the knurled headed pins **30** and **32** are slid through the holes **34** and **36** in the driver **20**. When it is desired to crimp only one or the other of the barrels of a connector, then one or the other of the crimping dies is released by removing the proper pin from engagement with the tongue **38** of the driver. For instance, as shown in Figure 3, the pin **32** is disengaged from the tongue **38**, and thus the crimping die is released, whereby it can exert no crimping force during actuation of the tool.

The head assembly **10** comprises a heavy unitary head **24** (see Figure 2) having a base portion, generally indicated at **25** and formed with a longitudinal channel **40** therein having a pair of side walls **41** and **42** (see Figure 3) providing tracks adapted to guide and hold the slidable plungers **26** and **28**. An opposing double nest die **43** is secured in the jaw **22** by a machine screw **45**. In order to hold the plunger dies **26** and **28** in the channel **40** and at the same time to permit their being slid along their respective rectilinear tracks toward the nest **43**, an overhanging lip **44** is provided on both sides of the channel and each of the indenter dies is rabbeted to provide anchoring and guiding shoulders **46** and **48**, respectively (see particularly Figure 3).

To provide clearance for the insertion of the connector and the wire or wires to be crimped, the head frame **24** is formed with a transverse clearance notch or inlet **50** which extends substantially the full width of the bottom of the channel **40**. The head frame **24** is formed with a relatively heavy curved section **52** opposite the clearance inlet **50** so that the die nest **42** is held in accurate alignment with respect to the die surfaces on the plungers **26** and **28**.

A pair of links **54** and **56** are pinned to the base **25** of the head **24** opposite the jaw **22** and are respectively connected to pivots **58** and **60** on the handles **14** and **16**, while the driver **20** is pinned to the pivot **18**. Thus, as the handles are squeezed toward each other, the pivot **18** and the driver **20** move toward the jaw **22**, while at the same time the pivots **58** and **60** pull the whole head

frame 24 and nest 43 toward the driver 20 to provide a strong accurately guided crimping action.

When either of the pins 30 or 32 is pushed down so as to engage its respective hole 34 or 36 in the tongue of the driver, the tongue 38 projects only a short distance beneath the thicker center portion of the respective plunger, merely far enough for the pin to engage the hole therein. This leaves a considerable space between the shoulder at the base of tongue 38 on the driver and the shoulder near the center undersurface of the plunger, as shown in Figure 4.

When either of the pins is pulled up, the respective plunger is free to slide back relative to the driver until the shoulder at the base of tongue 38 engages the shoulder near the center of the undersurface of the plunger and the end of tongue 38 engages the shoulder 68 near the die surface on the plunger.

Thus, the plunger is permitted to slide back sufficiently far so that it does not exert any crimping force on a ferrule in front of it.

On the top surfaces of each of the plungers are provided retaining springs 62 of a generally hair pin shape suitably secured as by small machine screws 64. The shank of each of the pins 30 and 32 is provided with a pair of identical upper and lower indentations 66 corresponding to the locking and releasing positions of each of the pins. The retaining springs 62 snap into these indentations 66 to hold the pins in the desired positions. It is understood that the force exerted by the driver 20 as it moves toward the nest 43 is transmitted to the plungers 26 or 28 solely by the pin 30 or 32, respectively, in shear. To transmit this force, the pin must be slid into its lower locking position in which it projects into the tongue 38. Thus, in Figure 3, plunger 26 is conditioned for crimping action, while plunger 28 is released. The released plunger 28 is free to slide back during the crimping operation, or it may be manually slid back away from the nest 43 before crimping, until the lower shoulder 68 (see Figure 2) on the plunger 28 abuts against the forward end of the tongue 38. This shoulder 68 appears on both plungers and prevents them from sliding back too far and interfering with the pivot 18.

It should be noted that the double nest 43 has a pair of nests 70 to accommodate both barrels of a connector, while each of the plunger dies 26 and 28 has a single die surface 72 each arranged to co-operate with one of the nests 70 to crimp one of the barrels of the connector. A relieved area 74 is cut into the top of the face of the nest die 43 as seen in Figure 2 to accommodate the insulation supporting portion of the connector extending between the barrels of the connector.

In using this connector crimping tool either one or two wires having their insulation stripped back an amount approximately equal to the length of the barrel are inserted into the barrel or barrels, as the case may be, and the terminal is placed adjacent the double nests 70 on die 43. The insulation on the wire is received on the insulation supporting portion of the connector, which is adapted to be received by the relieved area 74 on the die 43. Then the handles 14 and 16 are squeezed together to crimp either one or both of the barrels firmly on the bare end or ends of the wire or wires inserted therein, and at the same time to crimp the insulation supporting portion of the connector around the end of the insulation adjacent the bare wire. The handles are closed until a shoulder 75 on the plunger 26 or 28 strikes the edge of the opposing die 43, and then the handles are further squeezed and slightly deflected to release the ratchet 19, thus insuring a fully crimped connection.

Some of the double barrel connectors with which this tool may be used are provided with a spring-like prong on the end thereof opposite to the insulation supporting portion. In order precisely to locate this spring prong with respect to the connection formed by the dies 26, 28, and 43, the prong may be bent over to lie within a longitudinal recess 76 extending along the underside of the head frame 24 toward the jaw 22. A similar recess may be provided in the base portion of the head frame opposite the recess 76 for similar purposes.

From the foregoing, it is apparent that the crimping tool described above is well suited to attain the ends and objects herein set forth, can be manufactured easily by conventional fabrication techniques, and that its various features and arrangements of parts can be modified readily to suit it to a particular use. Certain features of the tool may be used to advantage in particular applications without a corresponding use of other features, and the elimination or modification of such features is to be considered within the scope of this invention unless specifically excluded by the following claims or required by the scope of the prior art.

I claim:

1. For use with an electrical connector having a pair of barrels either or both of which are adapted to be crimped, a connector-crimping tool comprising operating means for actuating said tool during crimping, a head frame having a base portion and a jaw portion, means fastening said head frame to said operating means, a double die surface carried by said jaw and having a pair of spaced dies facing said base portion, a pair of parallel tracks on said base portion and extending toward said double die surface, a pair of plungers, one of said plungers slidably mounted on each of said tracks, each one of said plungers having a plunger die surface facing one of the spaced dies on said double die surface, a driver located at the base of said head frame and connected to said operating means and during actuation of the tool being driven along a rectilinear path toward said jaw, and a pair of releasable locking means one associated with each of said plungers and with said driver, each of said locking means having a locked and released position and when in its locked position serving to engage its plunger with the driver and when in its released position disengaging its plunger therefrom, whereby either or both of said plungers may be operated.

2. A connector-crimping tool comprising a head, operating means for actuating said head during crimping, said head including a frame having a base portion and a jaw portion, means fastening said frame to said operating means, said base portion having a pair of parallel side walls defining a channel extending toward said jaw, a double nested die surface carried by said jaw and having a pair of concave nests facing said channel, a pair of plungers mounted side by side in said channel and slidable along said side walls toward said concave nests, an overhanging lip on said side walls for retaining and guiding said plungers, each one of said plungers having a die surface facing one of the nests on said double nested surface, a driver located near the base of said frame and connected to said operating means and during actuation thereof being driven along said channel toward said double nested surface, and a pair of locking pins, one of said pins located in a hole in each of said plungers, and a pair of cooperating holes in said driver, each of said pins having locked and released positions and when in its locked position projecting into said cooperating hole in the driver and serving to engage its plunger with the driver and when in its released position disengaging its plunger therefrom, whereby either or both of said plungers may be actuated by said operating means.

3. A crimping tool for connecting electrical terminals to the bared ends of conductors comprising a head frame having a base portion and a jaw portion, said jaw portion having a pair of spaced dies, a pair of plungers slidably mounted on said head frame and each having a crimping die surface facing one of said spaced dies, a driver mounted on said head for rectilinear motion toward said spaced dies, a pair of lever grips for actuating said tool, a pivot for said grips connected to said driver, means connecting each of said grips to said head frame, and a pair of re-

leasable locking means, one of said locking means being associated with each of said plungers and with said driver and each having a locked and a released position and when in its locked position serving to engage its plunger with the driver and when in its released position disengaging its plunger therefrom, whereby either or both of said crimping die surfaces may be driven toward said spaced dies during the crimping operation.

4. A tool for securing electrical connectors to a conductor of the type wherein a plurality of dies cooperate to deform the connector and conductor therebetween thus crimping the connector and conductor together in an efficient electrical connection and including: a head member, a first die mounted in said head member, a plurality of movable dies slidably mounted in said head member so as to be movable toward or away from said first die, means for actuating said movable dies, and releasable means for independently securing each of said movable dies to said actuating means, whereby the movable dies may be operated simultaneously or individually.

5. A tool for securing electrical connectors to a conductor of the type wherein a plurality of dies cooperate to deform the connector and conductor therebetween thus crimping the connector and conductor together in an efficient electrical connection and including: a head member, a stationary die mounted in the head member, a pair of movable dies slidably mounted in the head member, a pair of handles pivotally attached to the head member, a linkage means between said handles and said movable dies for moving said movable dies toward or away from said stationary die whereby said movable dies are actuated by said handles, and releasable means for securing each of said movable dies to said linkage independently of said other movable die.

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