Oct. 10, 1967 W. M. WERNER ET AL 3,345,856

TOOL FOR CRIMPING ELECTRICAL CONNECTORS

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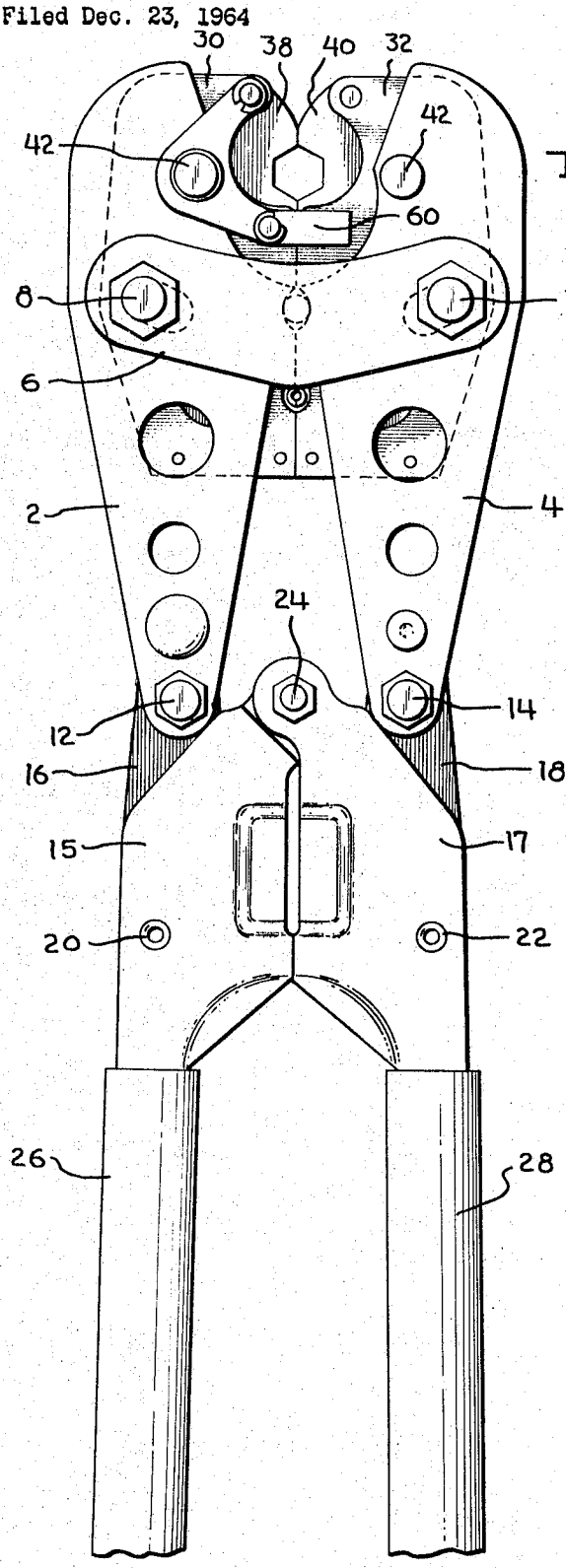


Fig. 1

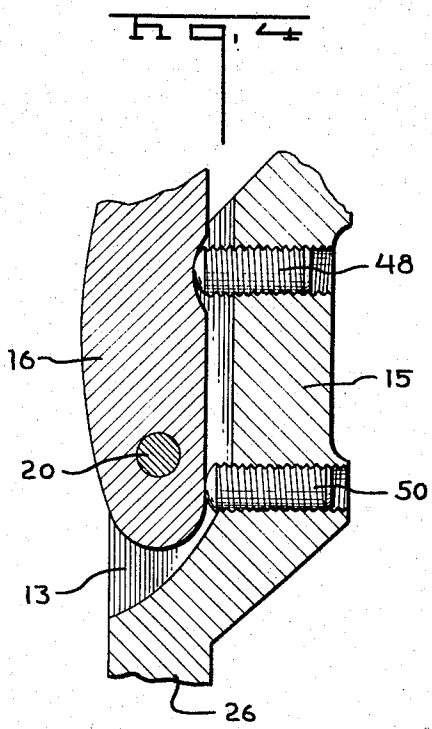


Fig. 4

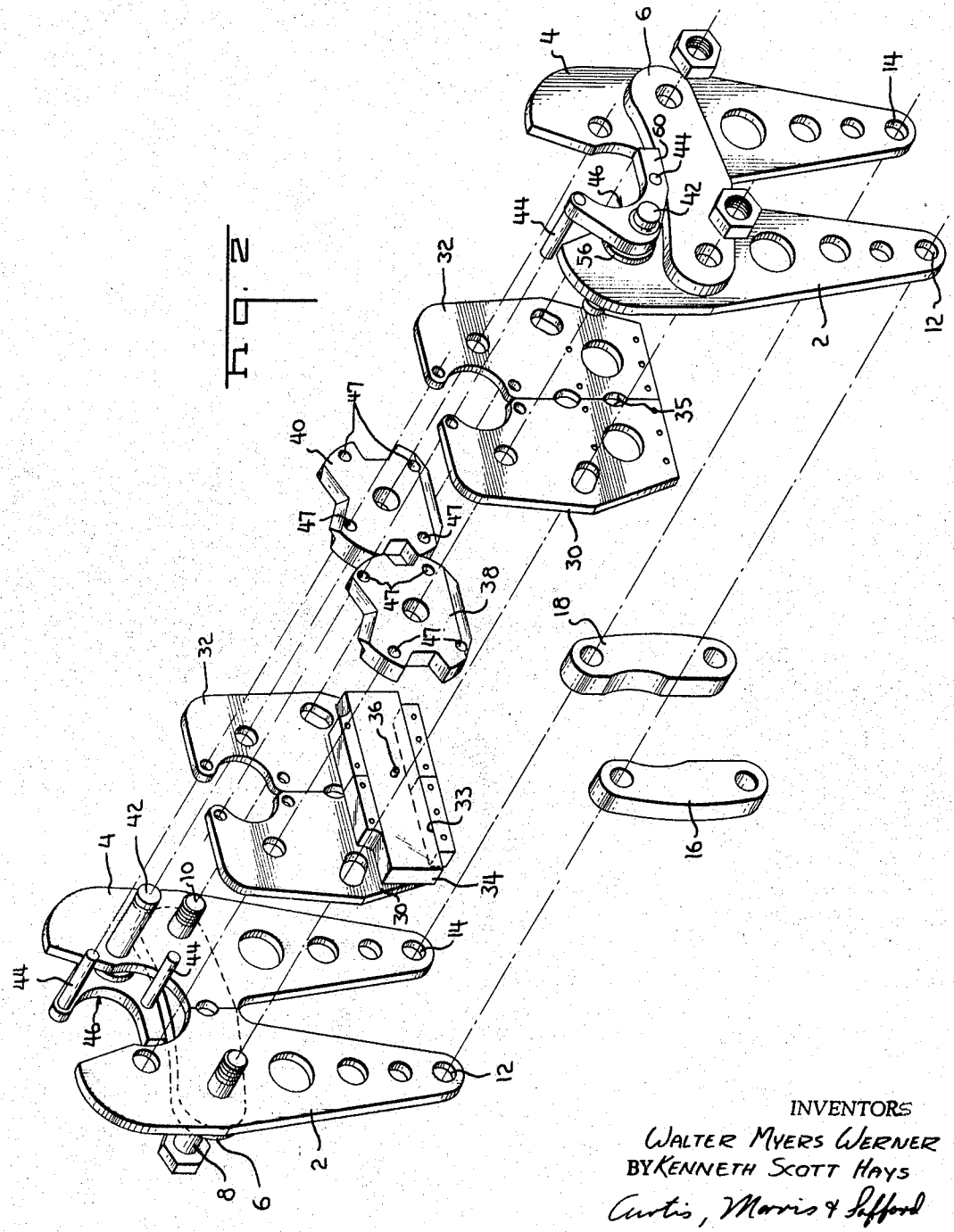
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Fig. 2



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Fig. 3

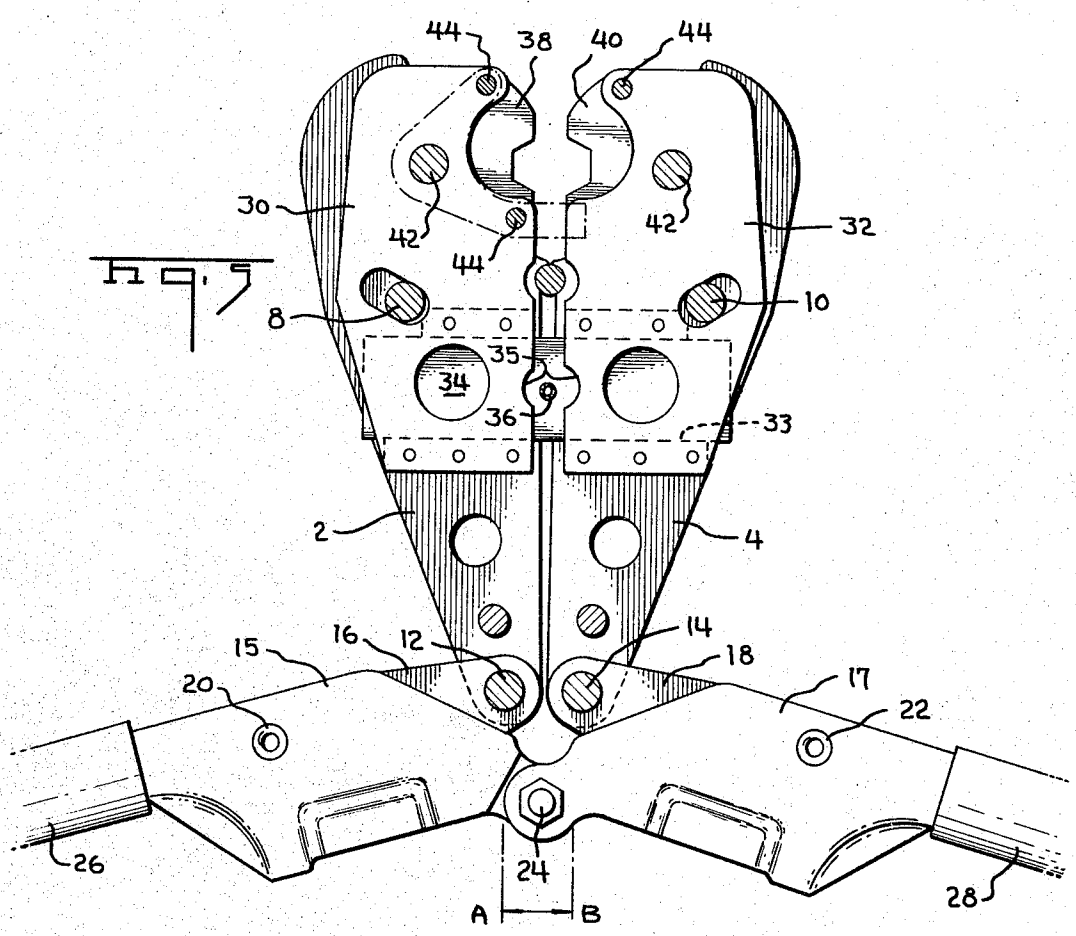
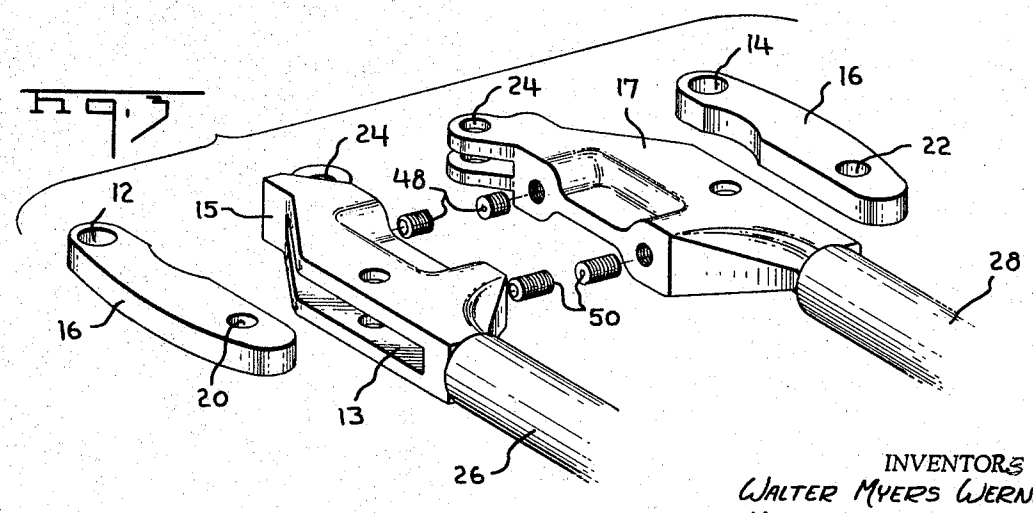


Fig. 4



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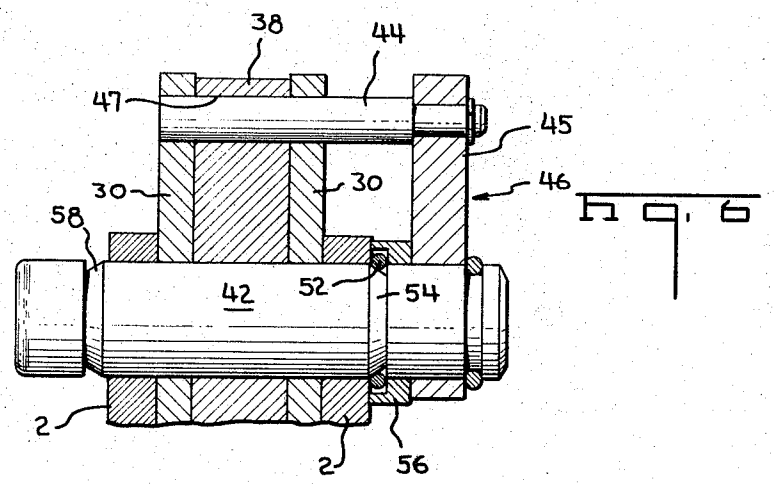


Fig. 6

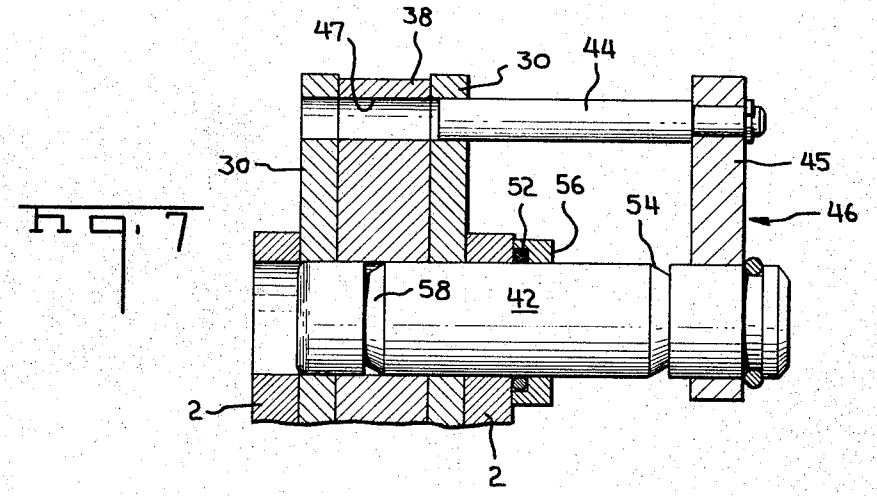


Fig. 7

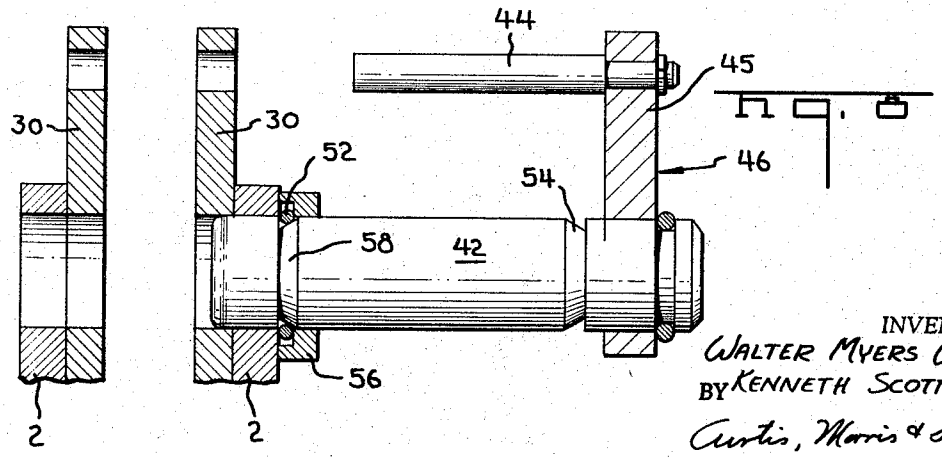


Fig. 8

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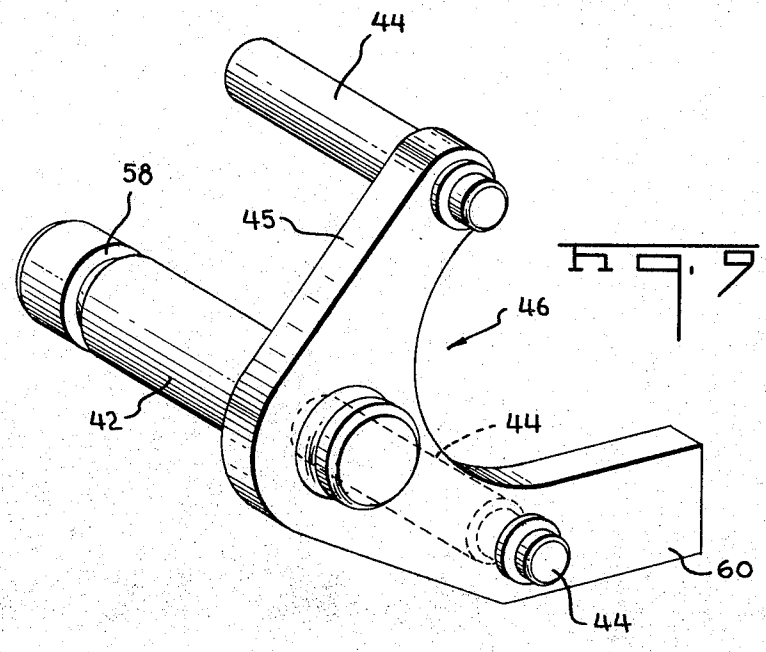


Fig. 9

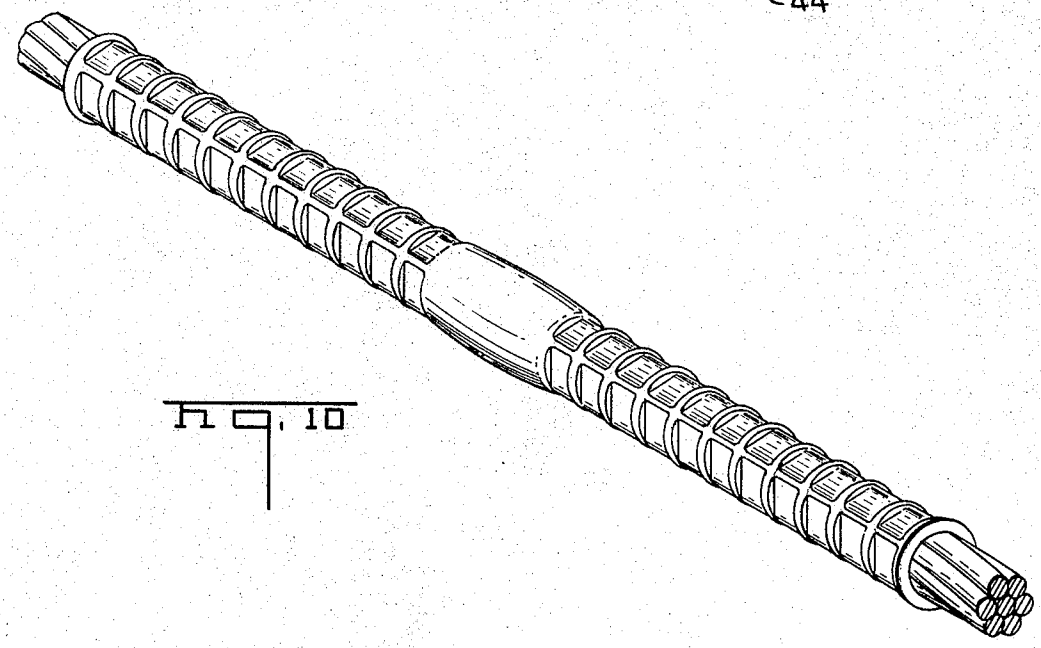


Fig. 10

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TOOL FOR CRIMPING ELECTRICAL CONNECTORS

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Filed Dec. 23, 1964, Ser. No. 420,586
7 Claims. (Cl. 72—410)

ABSTRACT OF THE DISCLOSURE

A crimping tool having link members pivotally connecting jaw members and handle members together. The jaw members carry crimping die members which are moved toward each other upon operation of the handle members to crimp a connector member onto a cable member. Guide means is provided to move the crimping die members along a straight-line path. Adjustment means are provided in opposing surfaces of the handle members on each side of the pivot point connecting the link members to the handle members for adjusting the crimping die members relative to each other. The crimping die members have multiple crimping stations and locking pin assembly means locks the the die members in one of the multiple crimping stations. Locator means are provided on the locking pin assembly means adjacent the crimping die means for locating a connector member between the crimping die members.

This invention relates to an electrical terminal crimping or compressing tool and more particularly to a tool which converts rotary handle movement to straight acting motion at the crimping dies.

Crimping tools which are hand-operated may be basically divided into tools in which the crimping dies describe an arc during the crimping operation and tools in which the crimping dies are moved towards one another in a straight line path in order to effect crimping. The instant invention is directed toward the latter type tool.

It is, therefore, a primary object of the present invention to provide a crimping tool which converts movement of a double lever type tool head into straight line movement at the crimping dies.

Another object of the present invention is to provide a crimping tool which produces a more uniform deformation of the wire strands being crimped.

A further object of the present invention is to provide a crimping tool which has self-contained, but replaceable multi-position, multi-purpose crimping, wirecutting and stripping features.

An additional object of the present invention is the provision for a crimping tool which uses many identical parts in assembly.

A still further additional object is the provision for a hand-crimping tool which has a unique adjustment feature to compensate for crimping dies and related parts wear.

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 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 front elevational view of a preferred embodiment of a tool in accordance with the invention;

FIGURE 2 is an exploded view showing the various parts of the tool head;

FIGURE 3 is a perspective exploded view illustrating the adjustment feature;

FIGURE 4 is a partial cross-sectional view of the adjustment feature;

FIGURE 5 is a front elevational view of the tool showing the adjustment feature;

FIGURE 6 is a cross-sectional view of a die locking pin locked between plates;

FIGURE 7 is a view similar to FIGURE 6 but showing the die locking pin in its partial withdrawn position to permit rotation of the die;

FIGURE 8 is also a view similar to FIGURE 6 but showing the die locking pin in its completely withdrawn position to allow removal of the die;

FIGURE 9 is a perspective view of the locking pin; and

FIGURE 10 is a perspective view of a completed termination made in accordance with the invention.

In the embodiment shown, the reference numerals **2** and **4**, see FIGURES 1, 2 and 3, denote a pair of lever jaw plates pivotally connected one to another by means of tie plates **6** and affixed to corresponding lever jaw plates by use of tie bolts **8** and **10**. Lever jaw plates **2** and **4** are pivotally connected by connecting bolts **12** and **14** at their respective base portions to one end of links **16** and **18** which are also pivotally connected by bolts **20** and **22** or the like within slots **13** of handle assemblies **15** and **17**. The two handle assemblies **15** and **17** are centrally connected one to the other by pivot means designated as **24**. Handles **26** and **28** with grips attached are provided on the handle assemblies.

Located between the previously-mentioned lever jaw plates **2** and **4** are two sets of carrier plates **30** and **32** (see FIGURE 2) which are retained in position by the tie bolts. Each carrier plate contains a channel **33**. The channels in each set of carrier plates are in opposed relationship and define cooperating die guide means for guide plate **34**. The guide plate has affixed at its centermost portion an axially aligned pin **36** which prevents the guide plate from being accidentally removed from the guide means when in use. Each carrier plate has an arcuate recess **35**, and pin **36** is disposed within these opposed recesses when the carrier plates of one set move toward the carrier plates of the other set.

Rotatable multi-position crimping dies **38** and **40** similar to those disclosed in U.S. Patent No. 2,900,854, which is assigned to the present assignee are located between pairs of lever jaw plates and are rotatably contained by means of die center pins **42** located on frames **45** of locking pin assemblies **46**. The dies are prevented from rotating by means of die indexing pins **44** which engage corresponding equally-spaced or positioned holes **47** in the dies, see FIGURE 2, which are also located on frames **45** of locking pin assemblies **46**. Additional die indexing pins can be provided in diametrical relationship on the frame **45** for engagement with corresponding holes on the dies so as to more effectively lock or retain the die in position. Pins **42** are similar to those described in U.S. Patent No. 3,080,184, and which is assigned to the present assignee. The detailed procedure for rotating the dies will be described hereafter.

In use, the tool handles **26** and **28** are manually opened far enough so that the connector with conductor to be crimped can easily be positioned between the dies. The first crimp or compressing operation takes place at one end of the connector and the second and each subsequent crimp is formed inwardly toward the center of the conductor. The other end of the connector is crimped in the

same manner. The view of the completed crimp can be seen in FIGURE 10. Most prior art lever type tools tend to crimp so as to result in a bent or twisted connection. That is, the crimp indentations are in twisted relationship one to another due to the arcing lever action of the crimping dies moving against the connector body. The present invention achieves a uniform deformation of the connector body because the crimping dies are in one plane or straight acting. The present invention also provides, due to the straight line die movement, a more uniform crimping of the wire strands when compared to prior art connecting tools.

When it is desired to rotate the multi-position dies **38** and **40** so as to provide another crimping die size, it is only necessary to pull the locking pin assembly **46** away from the lever jaw plate **2**, or **4** as the case may be, see FIGURE 7. This movement of the locking pin assembly is continued away from the tool head until the die indexing pin is in the position, as illustrated in FIGURE 7. The crimping die designated as **38** is free to rotate about the die center pin **42** to another die station. When the crimping die is at the proper position, the locking pin assembly is moved towards the lever jaw, as shown in FIGURE 6. O-shaped split ring **52** engages groove **54** so as to lock the locking pin assembly **46** in position.

To entirely remove die **38** from the tool head, it is only necessary to move the locking pin assembly **46** until O-shaped split ring **52** slides into the complementary receiving groove **58** on the center die pin, see FIGURE 8. This will, thus, move the center die pin out of the area between carrier plates **30**, as shown in FIGURE 8. The die can then be easily removed. For the sake of clarity, only one crimping die removal procedure has been described. However, the same procedure pertains to both dies. The locking pin assembly is prevented from being removed from the tool head by means of a spring retaining plate **56** affixed to the lever jaw plate by any suitable method and which retains ring **52** therein. To entirely remove assembly **46** from the tool, it is only necessary to move said assembly so that groove **58** on the center index pin is forced past spring **52**.

It is to be understood that each die has several crimping die stations and a wire-cutting surface. It is also possible for each die to be provided with multiple crimping die stations, as well as wire-cutting and wire-stripping means. It is also possible to replace the dies with those of another size or sizes so that a wide range of connectors can be crimped in the tool.

Adjustment for die surface, guide plate, or pivot point wear is compensated for and corrected by means of adjustment and lock screws **48** and **50** (see FIGURES 3–5) which are located on the inner area of the handle assemblies **15** and **17**.

To determine if the tool is in need of adjustment and to correct any die surface, guide plate or pivot point wear, it is only necessary to open the handles **26** and **28** (see FIGURE 5) to their respective open positions and then rotate the crimping dies until the dies for the size wire to be crimped are positionally aligned for crimping. Handles **26** and **28** are closed until the individual crimping dies contact each other, and then the distance is measured between handles **26** and **28** at points A and B.

If the space between points A and B is less than the desired distance, then the crimp is too loose and adjustment is corrected by equally turning adjustment and lock screws **48** and **50** in opposite directions the required amount. If the space between points A and B exceeds the desired distance, then the crimp is too tight for a satisfactory connection and adjustment is corrected by turning adjustment and lock screws **48** and **50** the required amount in opposite directions but reversely, as previously stated.

A connector locator and wire stop means **60** is provided as an integral part of frame **45** and is located at the extreme end away from die indexing pin **44** (see FIGURES 1, 2 and 9). The above-described means axially locates the connector body to be crimped in proper alignment for crimping as well as properly positions conductor wire strands between the cutting surfaces of the dies. The connector locator and wire stop means also prevents the wire strands from becoming accidentally pinched between parts of the tool head. It is also conceivable that the means described could be an integral part of the lever jaw plates or tie plates.

As can be noted from an examination of the specification and drawings, the tool is designed so that numerous identical parts are used, for example, the dies, tie plates, handle assemblies, locking pin assemblies, jaw plates, links and adjustment and lock screws are all identical to their respective counterparts. The handles are preferably of Fiberglas so as to reduce the weight of the tool in order that it can be easily handled while in operation. All parts used in the manufacture of the tool are economically and easily produced.

It is clearly noted that the tool converts and provides double lever handle action into straight path movement at the crimping dies; more uniform deformation of the wire strands when crimped due to the straight action; self-contained but replaceable multi-position, multi-purpose crimping, cutting and stripping means; a tool which uses many identical parts and unique adjustment means to compensate for parts wear.

It will, therefore, be appreciated that the aforementioned and other desirable objects have been achieved; however, it should be emphasized that the particular embodiment of the invention, which is shown and described herein, is intended as merely illustrative and not as restrictive of the invention.

What is claimed is:

1. In a tool for crimping or compressing electrical connector elements onto electrical conductor means, handle means pivotally connected together at a pivot point, jaw plate means pivotally connected to said handle means, tie plate means pivotally connected to said jaw plate means, carrier plate means carried by said jaw plate means, guide means on said carrier plate means, rotatable crimping die means carried by said carrier plate means, locking pin assembly means for locking said die means in a crimping position for crimping an electrical connector element onto electrical conductor means when the die means are moved in a straight line path via said guide means and said handle means, and locator means on said locking pin assembly means adjacent said crimping die means for locating a connector element between said crimping die means.

2. In a tool as described in claim **1** wherein the guide means engage channel means disposed in the carrier plate means and movable therein for longitudinally orienting the crimping die means.

3. In a tool as described in claim **1** wherein the locking pin assembly means comprises a pin for centrally receiving the crimping die means for rotation thereon and an indexing pin for engaging a corresponding hole in said crimping die means to prevent rotation thereof.

4. In a tool as described in claim **1** wherein the locking pin assembly means is slidably connected to the tool to allow said crimping die means to be rotatable to various positions and to allow said crimping die means to be removed from said tool.

5. In a tool for crimping or compressing electrical connector elements onto electrical conductor means, handle means pivotally connected together at a pivot point, link means having one end pivotally connected to said handle means, jaw plate means pivotally connected to another end of said link means, tie plate means pivotally connected to said jaw plate means, carrier plate means carried by said jaw plate means, guide means on said carrier plate means, rotatable crimping die means having multiple crimping die stations carried by said carrier plate means, locking pin assembly means for locking said die means in one of said multiple crimping die stations

for crimping an electrical connector element onto electrical conductor means when the die means are moved in a straight line path via said guide means and said handle means, and die adjustment means on said handle means in opposing surfaces thereof and on each side of the pivot for the one end of the link means for adjusting the crimping relationship of said die means.

6. In a tool as described in claim 5 wherein the die adjustment means comprise adjustment and lock screw means.

7. A tool for crimping a connector member onto cable means comprising handle means pivotally connected together at a pivot point, link means having one end pivotally connected to said handle means at pivot pin means disposed adjacent said pivot point, jaw plate means having one end pivotally connected to the other end of said link means at other pivot pin means, tie plate means pivotally connected to said jaw plate means, carrier plate means carried by said jaw plate means, crimping die means on said carrier plate means, guide means on said carrier plate means for guiding said crimping die means in straight-line movement when said handle means are operated to move said crimping die means toward each other to crimp said connector member onto said cable means, and adjustment means in opposing sections of said handle means on each side of said pivot pin means for the one end for adjusting the crimping die means relative to each other.

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