Nov. 1, 1966 F. FRASTACI ETAL 3,281,926

MEANS FOR POSITIONING CONNECTORS

Filed Aug. 21, 1963 2 Sheets-Sheet 1

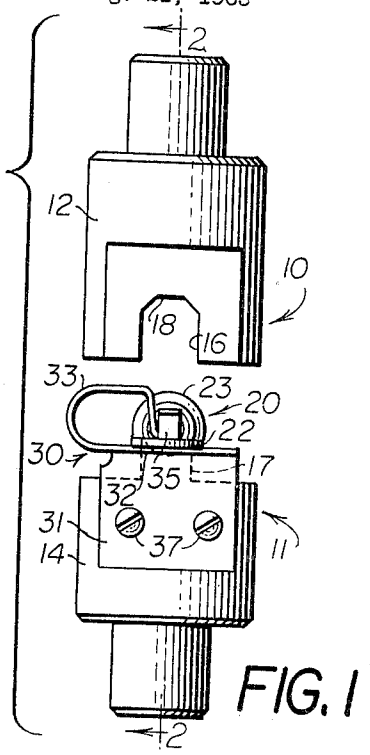


FIG. 1

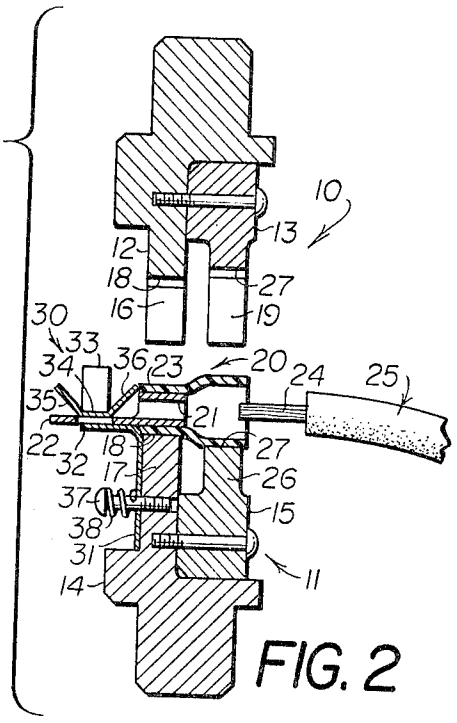


FIG. 2

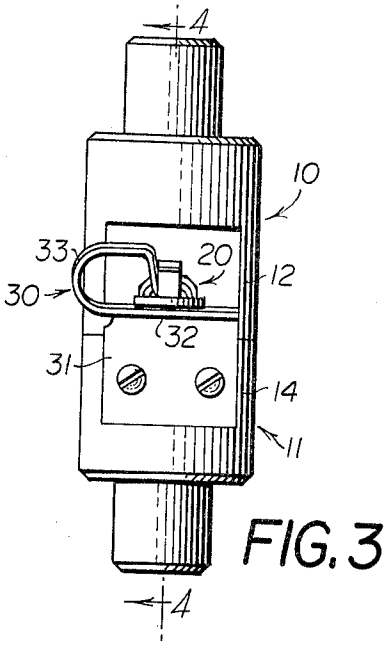


FIG. 3

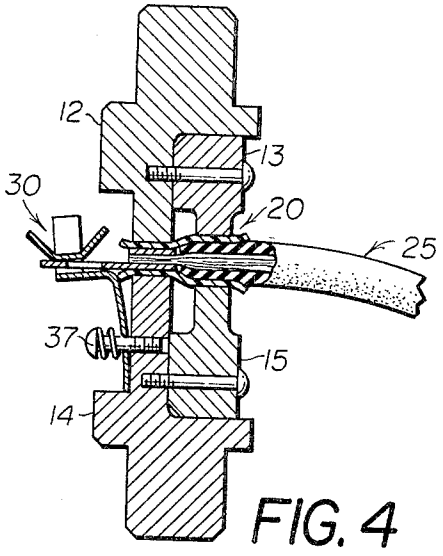


FIG. 4

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MEANS FOR POSITIONING CONNECTORS

Filed Aug. 21, 1963 2 Sheets-Sheet 2

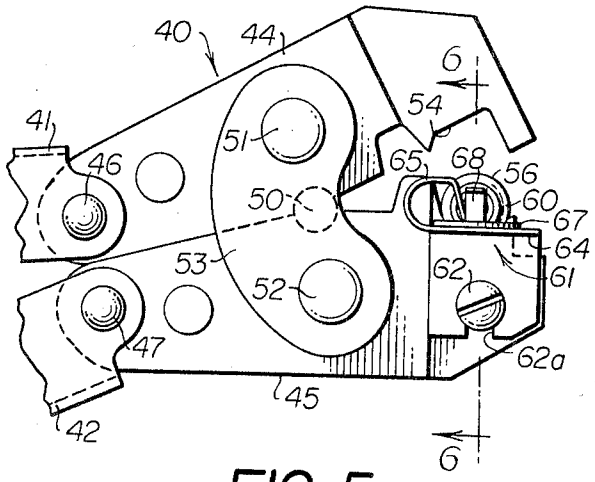


FIG. 5

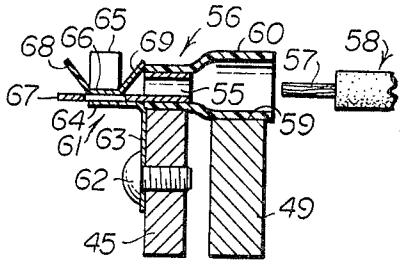


FIG. 6

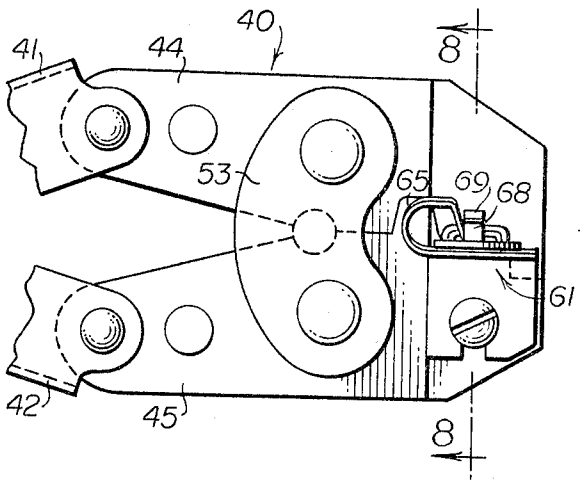


FIG. 7

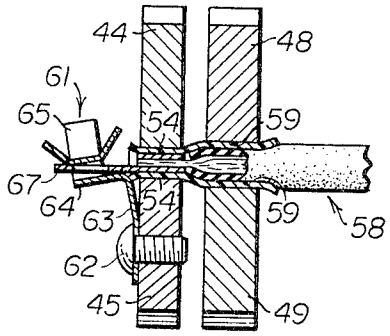


FIG. 8

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MEANS FOR POSITIONING CONNECTORS

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Filed Aug. 21, 1963, Ser. No. 303,476
7 Claims. (Cl. 29—203)

This invention relates to devices for positioning a work piece and, more particularly, to a device for positioning a terminal connector relative to a set of crimping dies and relative to the end of an insulated or non-insulated electrical conductor prior to attachment of the connector to the conductor by a crimping operation.

The invention is particularly concerned with applications involving the joining of either insulated or non-insulated, solderless electrical connectors to stranded and solid wire conductors for the purpose of either terminating the conductors or connecting them to other conductors, such joining being carried out by the known general procedure of telescoping a tubular ferrule portion of the connector over the bared conductor and then cold forging the elements into electrical and mechanical union. Such connectors may be, for example, any of the class comprising a tubular metal ferrule having any of a variety of axially projecting tongues or sockets, or the like at one end thereof for terminating a conductor at a panel or terminal block, or the like, or for receiving a mating part on the end of another conductor. They also may be, for example, any of the class comprising a tubular metal ferrule and projecting end portions, such as ring tongue, spade tongue, hook tongue, rectangular tongue, and flanged spade end portions.

As will be made more apparent, the same novel work piece positioning device to be hereinafter described may be used to advantage with both insulated and non-insulated connectors.

Typical procedures which have been employed in the past to crimp pre-insulated or uninsulated connectors to insulated or uninsulated wire conductors are characterized by either (a) pre-positioning the connector on the conductor by first telescoping the tubular ferrule portion of the connector over the bared conductor and then positioning the loosely assembled elements in the female portion of a crimping die, or (b) first inserting the tubular ferrule portion of the connector in the crimping die and then inserting the bared conductor into the pre-positioned tubular ferrule portion of the connector. These procedures involve precise positioning operations and often result in a crimped assembly having a conductor protruding too far beyond the ferrule portion of the conductor, or in a crimped assembly having a conductor extending only partially into the ferrule. If the conductor projects too far beyond the end of the ferrule in such an assembly, the end or ends of the conductor may cause shorting or arcing, or may prevent the connector from mating properly with another connector. If the conductor extends only partially into the ferrule, a poor electrical and mechanical connection results.

Attempts have been made to properly position a connector in a pair of crimping dies by providing stop or positioning mechanisms on one of the dies. These mechanisms are characterized by stop portions which are intended to determine and pre-position the connector prior to crimping by engaging either a portion of the ferrule or the opposite end of the connector, i.e., the mating or connecting end portion.

As is known, the aforementioned crimping operation produces an elongation of the ferrule portion and, consequently, movement of any projecting end portion of the connector axially outwardly relative to the crimping dies. The prior art stop mechanisms that engage the

ferrule portion of the connector were intended to function as a stop or positioning means prior to the crimping operation, and the ferrule portion of the connector was intended to clear the stop portion for its subsequent elongation by being reduced in cross section during the initial stages of the crimping operation. In actual practice, however, the intent that the ferrule be reduced in cross section without elongating during the initial stage of the crimping operation was not always achieved. Frequently the end of the ferrule would jam against the stop portion of the mechanism during the initial stages of crimping and interfere with the removal of the assembly after the crimping operation. This is particularly true if the ferrule portion of the connector is provided with a plastic insulating sleeve prior to crimping since such sleeves have a tendency to flare radially as well as axially during crimping.

The prior art stop mechanisms that engage the mating or connecting end of the connector are usually provided with spring devices to permit the ferrule and mating or connecting portions to elongate during crimping so that the connector will not jam in the dies. These devices have not been completely acceptable since a different stop mechanism was required for each different type of connector.

The prior art devices loosely positioned only the connector and its ferrule portion relative to the crimping dies. No attempt was made to also position the conductor relative to the connector. Manual skill and dexterity were required for this time-consuming and tedious operation. In some instances, if the conductor insulation were thick enough and if the conductor were stripped to expose a proper length of bared wire, the conductor insulation would butt against the ferrule when these elements were assembled and indicate that the ferrule was correctly positioned on the conductor and that the bared portion extended through but not too far beyond the ferrule. In many instances, however, the insulation is too thin to properly butt against the ferrule and/or too much or too little insulation is first stripped from the conductor. Obviously, the problem of properly locating a conductor relative to a ferrule is particularly acute when the conductor is uninsulated.

An object of the present invention is to provide a work piece positioning device that overcomes many of the problems of the prior art.

A more particular object of the present invention is to provide a device for resiliently clamping an electrical connector in a predetermined position relative to a pair of crimping dies prior to a crimping operation and for correctly positioning an insulated or uninsulated conductor relative to the connector when the connector has been positioned in the die or as the connector is positioned in the die.

A still further object of the present invention is to provide a device that will accomplish the above objects while preventing the crimped assembly from becoming jammed in the dies during crimping.

Other objects and advantages of the invention will become apparent from the following detailed description and the accompanying drawings.

In the drawings:

FIGURE 1 is an elevational view of a pair of opposed crimping dies provided with a positioning device according to one aspect of the invention, showing the dies in an open position with a pre-insulated terminal connector correctly positioned in the lower die;

FIGURE 2 is a sectional view of the device, the plane of the section being indicated by the line 2—2 in FIGURE 1 and showing an insulated conductor which is about to be inserted into the open end of the connector;

FIGURE 3 is a view similar to FIGURE 1 but showing the dies in a closed position;

FIGURE 4 is a sectional view of the device, the plane of the section being indicated by the line 4—4 in FIGURE 3 and showing the connector crimped onto its conductor;

FIGURE 5 is a fragmentary elevational view of a hand crimping tool having a pair of opposed crimping dies, one of which is provided with a positioning device according to another aspect of this invention, showing the dies in an open position with a pre-insulated terminal connector correctly positioned in one of the dies;

FIGURE 6 is a sectional view of the device, the plane of the section being indicated by the line 6—6 in FIGURE 5 and showing an insulated conductor which is about to be inserted into the open end of the connector;

FIGURE 7 is a view similar to FIGURE 5 but showing the dies in a closed position; and

FIGURE 8 is a sectional view of the device, the plane of the section being indicated by the line 8—8 in FIGURE 7 and showing the connector crimped onto its conductor.

Referring now to FIGURES 1 through 4 of the drawings, a set of opposed, upper and lower crimping dies **10** and **11**, respectively, is illustrated. The illustrated set of dies may be mounted in a suitable hand or power-actuated crimping tool or apparatus (not shown).

The dies **10** and **11** are illustrated as crimping a conventional terminal connector **20**. The connector **20** is intended to be merely illustrative of the general furrule-type, solderless connector construction to which the present invention is applicable, and has been selected only for the purpose of describing the principles of the invention and explaining how these principles may be followed when forming an electrical connection. It is to be understood, therefore, that the illustrated terminal connector is not limiting of the invention and is merely representative of the many practical applications for which the invention is particularly suited.

The illustrated terminal connector **20** is of the usual construction and comprises a cylindrical ferrule portion **21** and an attached tongue **22** adapted to cooperate with a binding post or the like. As is known to those skilled in the art, the connector **20** may be stamped from a flat sheet of a malleable, electrically conductive material, such as, for example, copper or a copper alloy, steel, aluminum and the like, into a shape having oppositely extending ear portions which are thereafter rolled or bent into edge abutment to form the ferrule **21**.

The terminal **20** is shown insulated in a known manner by a sleeve **23** of electrical insulating material which is telescopingly mounted around the ferrule **21**. The sleeve **23** may suitably be formed from any of a number of different plastic materials possessing the desired insulating qualities and which resist fracture during cold deformation. Typical plastic materials useful for this purpose are nylon, various vinyl chlorides, vinyl chloride-vinyl acetate copolymers, vinylidene chloride-vinyl chloride copolymers, and the like. If desired, an intermediate tube (not shown) of a soft brass or other deformable material may be interposed between the furrule **21** and the outer insulating sleeve **23**, as is known in the art.

In the formation of crimped electrical connections, the bared end **24** of a conductor **25** is positioned within the connector ferrule **21** which is then crimped to the conductor end to form a uniform, solid mass. In FIGURE **4**, the conductor insulation is shown as abutting the rear end of the ferrule; however, the rear end of the ferrule may be made with an enlarged diameter and extended in telescoped relationship over a portion of the conductor insulation, as is common practice in many connector constructions. The conductor **25** may be solid as shown, or a stranded conductor, or both, i.e., a heavy, solid conductor surrounded by a number of smaller strands.

The upper die **10** includes a first portion **12** for crimping the ferrule **21** of the connector **20** onto the bared conductor end **24** and a second portion **13** for crimping the insulating sleeve **23** of the connector **20** onto the insulation of the conductor **25**. Similarly, the lower die **11** includes a first portion **14** for opposing the portion **12** and crimping the ferrule **21** of the connector and a second portion **15** for opposing the portion **13** and crimping the insulating sleeve **23** of the connector **20** onto the insulation of the conductor **25**.

The portion **12** includes a female die nest or matrix **16** and the portion **14** includes a male die member **17** which is movable into cooperation with the matrix **16** to peripherally confine the ferrule **21** of the connector **20** during the crimping operation. The matrix **16** and the male die member **17** have concave die surfaces **18** which contact the ferrule **21** of the connector **20** and perform the ferrule crimping operation. It is to be understood, however, that the die surfaces **18** may have any suitable configuration for crimping.

The portion **13**, similarly, includes a female die nest or matrix **19** and the portion **15** includes a male die member **26** which is movable into cooperation with the matrix **19** to peripherally confine the insulating sleeve **23** of the pre-insulated connector **20** during the crimping operation. The matrix **19** and the male die member **26** have concave die surfaces **27** which contact the insulating sleeve **23** of the connector **20** and perform the operation of crimping the sleeve **23** onto the insulation of the conductor **25**. It is to be understood, however, that the die surfaces **27** may have any suitable configuration for crimping.

A connector and conductor positioning device **30** is resiliently fixed to a flat face of the portion **14** of the lower die **11**. The device **30** has a longitudinal portion **31** and a transverse shelf portion **32**. The shelf portion **32** includes a spring loop **33** which is formed at one side of the portion **32** and which is bent to loop over itself and over the shelf portion **32**. The free end of the loop **33** is provided with a flat face **34** which resilient clamps the tongue **22** of the connector **20** against the shelf portion **32**. The face **34** may press against the shelf portion **32** when the mating end of the conductor is not positioned between the face **34** and the shelf portion **32** or it may be normally spaced a slight distance from the shelf portion. If a space is provided between the shelf portion. If a space is provided between the shelf portion and the face, however, this space should be less than the thickness of the thinnest mating end of a connector that is to be inserted therein. The flat face **34** is bent upwardly at both ends to form ears **35** and **36**, the purpose of which will hereinafter become apparent.

The device **30** may be stamped from flat spring steel stock, bent to the shape indicated, and hardened and tempered by a suitable heat treatment. The device **30** may also be stamped or molded from other materials having the desired spring characteristics, such as, for example, certain grades of stainless steel, phosphor bronze, berryllium copper, brass, and plastics.

The longitudinal portion **31** of the device **30** is resiliently fixed to the lower die **11** by screws **37** and coil springs **38**. As may be seen in FIGURES 2 and 4, the coil springs **38** encircle the shafts of the screws to bias the portion **31** against the portion **14** of the lower die **11**. The force exerted by the springs **38** on the portion **31** may be varied by adjusting the screws **37**.

With the dies **10** and **11** in an open position, as shown in FIGURES 1 and 2, the pre-insulated connector is inserted into the dies. The tongue **22** is guided into a clamped position between the face **32** and the shelf portion by the ear **36**. When the ferrule **21** and/or the insulating sleeve **23** butt against the end of the ear **36** and a diametrically opposite portion of the insulating sleeve **23** butts against the curved zone of intersection between the longitudinal portion **31** and the shelf portion

32, the connector 20 is properly positioned in the lower die 11.

As may be seen in FIGURE 2, the end of the ear 36 and the portion of the aforementioned curved zone of intersection that are abutted by the end of the ferrule 21 and the insulating sleeve 23 lie in a plane that is normal to the axis of the connector and which is spaced slightly outwardly from the mating portions of the dies 10 and 11. This relationship permits the ferrule 21 and its sleeve to extend slightly beyond the die surfaces 18 to avoid the danger of causing the inner edges of the ferrule to bite into and damage the conductor during the crimping operation. For crimping ferrules that are not provided with an insulating sleeve or for crimping pre-insulated connectors in which the mating element is bent downwardly to be flush with the adjacent portion of the insulating sleeve, only the abutted end portion of the ear 36 need be in the aforementioned plane.

After the connector 20 has been positioned in this manner, the conductor 25 is telescoped into the open end of the insulating sleeve 23 and the ferrule 21 until the bared end 24 of the conductor butts against the sloping face of the ear 35. The sloping face of the ear 35 that is abutted by the bared end 24 comprises a stop means that is spaced axially outwardly from the end portion of the ear 36 which is abutted by the ferrule and insulating sleeve. The slight axial projection of the bared end 24 beyond the ferrule insures that the conductor has been properly inserted through the ferrule 21. This is a particularly advantageous feature in instances where the conductor is noninsulated, where the conductor is insulated but the insulation is too thin to butt against the open end of the ferrule, where a portion of the conductor insulation is intended to be confined by the ferrule, or where the bared end of the conductor has been overstripped. In all of these instances, the proper position of the connector within the ferrule may be determined prior to crimping.

The sloping surface of the ear 36, therefore, positions the end of the conductor and the end of the ferrule in an offset or axially staggered relationship, with the bared end of the conductor extending slightly outwardly past the end of the ferrule. Alternatively, the ear 36 may terminate below the position that is illustrated so that the edge of the ear 36 acts as a stop means for both the ferrule and the conductor and so that the ends of the ferrule and the conductor are flush and are both located in a plane that is spaced slightly outwardly from the die surfaces 18 and 27.

The connector 20 is crimped to the conductor by closing the dies 10 and 11 and confining the connector and conductor assembly between the die surfaces 18 and 27 as shown in FIGURES 3 and 4. As the ferrule 21, the bared end 24, and the insulating sleeve 23 are crimped and reduced in cross sectional area, both ends of the connector and the bared end of the conductor are axially extruded outwardly from the die surfaces 18 and 27.

As these elements are extruded axially, the ferrule 21 and/or the sleeve 20 may flare radially outwardly during the crimping operation. In this instance, and as may be seen in FIGURE 4, the device 30 will spring outwardly as the ferrule 21 and/or the sleeve 23 bears against the zone between the shelf portion 32 and the longitudinal portion 31. As the device 30 springs outwardly in this manner, the loop 33 will be forced open slightly so that the tongue 22 will not be bent downwardly.

After the crimping operation has been completed, the assembly may be removed easily from the dies, since, after the upper die has been raised, the outwardly sprung device 30 springs back to its normal position to dislodge the crimped assembly from the lower die 11. Thus, the above-described movement of the device 30 not only prevents the extruded connector from becoming jammed between the dies and the device 30 itself, but also aids in the removal of the crimped assembly from the lower die. The upwardly bent ear 35 insures the convenient removal

of the tongue 22 from its clamped position, since that end of the flat face 34 might otherwise become hooked in the terminal opening of the tongue 22. The ear 35 also permits the convenient removal of connectors having flanged or bent ends, such as, for example, flanged spade or quick disconnect connectors.

The previously described springing action of the device 30 is intended to be merely descriptive of a typical crimping operation which is performed on a typical connector. Obviously all connectors will not be extruded in the same manner. Some connector assemblies may be extruded primarily in an axial direction with little or no radial flaring. In these instances, the outwardly extruded end of the connector may clear the curved zone between the shelf portion 32 and the longitudinal portion 34 and tend to slide into the clamp defined by the face 34 and the shelf portion 32, being guided by the ear 36 which will ride over the top of the extruded assembly. In such a case, the longitudinal portion 31 will not be sprung outwardly from the die 11, but the loop 33 will be opened. If the ear 36 terminates below the position that is illustrated, so that the edge of the ear 36 acts as a stop means for both the ferrule and the conductor, the outward movement of the extruded connector will be permitted by the outward flexing of the device 30 relative to the die 11.

Referring now to FIGURES 5 through 8 of the drawings, a jaw portion of a hand crimping tool 40 is illustrated. The crimping tool 40 is intended to be merely illustrative of a conventional plier-type hand tool to which the present invention is applicable. The tool 40 includes a pair of handles or levers 41 and 42 which are pivotally connected at a pivot point (not shown) and are spring-biased in a normally separated condition, as is shown in FIGURE 5, by a spring (not shown). The levers 41 and 42 are pivoted at their upper ends to a pair of jaw plates 44 and 45, respectively, by a pair of pins 46 and 47.

A pair of insulation crimping plates 48 and 49 are carried by the jaw plates 44 and 45 and the jaw plates are pivoted for relative rocking movement about a rocking pin 50. The jaw plates 44 and 45 are connected to each other by pivot pins 51 and 52 and a strap 53. When the levers 41 and 42 are moved towards each other, the jaw plates will pivot about the pins 51 and 53 and rock about the rocking pin 50 to assume the closed position shown in FIGURES 7 and 8.

The jaw plates 44 and 45 are provided with opposed ferrule crimping die surfaces 54, which may be designed to provide any desired crimp to a ferrule 55 of a pre-insulated terminal connector 56 to attach the ferrule to a bared end 57 of an insulated conductor 58. The crimping plates 48 and 49 are provided with opposed insulating sleeve crimping die surfaces 59, which may be designed to provide any desired crimp to an insulating sleeve 60 of the connector 56 to attach the sleeve 60 to the insulation of the conductor 58.

A connector and conductor positioning device 61 is fixed to the jaw 45 by a screw 62. The device 61 has a longitudinal portion 63 and a shelf portion 64. As may be seen more clearly in FIGURE 5, the vertical position of the shelf portion 63 relative to the die surfaces 54 may be adjusted by loosening the screw 62 and moving the device 61 vertically. This movement is permitted by a slot 62*a* provided in the longitudinal portion 63. The shelf portion 64 includes a spring loop 65 which is formed at one side of the portion 64 and which is bent to loop over itself and over the shelf portion 64. The free end of the loop 65 is provided with a flat face 66 which resiliently clamps a tongue 67 of the connector 56 against the shelf portion 64. The face 66 may press against the shelf portion 64 when the mating end of a conductor is not positioned between the face 66 and the shelf portion 64 or it may be normally spaced a slight distance from the shelf portion. If a space is provided between the shelf portion and the face, however, this space should be less than the thickness of the thinnest mating end of a connector that

is to be inserted therein. The flat face 66 is bent upwardly at both ends to form ears 68 and 69 which function in a manner similar to the ears 35 and 36 which are illustrated in FIGURES 1 through 4.

The device 61 may be stamped from flat spring steel or non-ferrous stock, formed, and then heat treated to provide the desired spring characteristics.

The pre-insulated connector 56 is inserted into the tool 40 with the jaws 44 and 45 in an open position, in a manner similar to the insertion of the connector 20 into the die 11. A particularly advantageous feature of this aspect of the invention is that the connector 56 is firmly held in a proper position for crimping, and will not drop out of the jaws regardless of the particular position of the tool. This feature facilitates operations that involve the crimping of connectors onto conductors that are difficult to reach.

As the connector and conductor assembly is crimped, the assembly will be extruded outwardly as is shown in FIGURE 8. This extrusion is permitted by the flexing of the longitudinal portion 63 and/or the opening up of the loop 65, depending upon the particular type of connector being crimped.

It should be appreciated that the devices 30 and 61 may be used interchangeably, i.e., the device 30 may be used with a crimping tool and the device 61 may be used with dies 10 and 11.

In the light of the above teachings, many other modifications and variations of the invention will become apparent to those skilled in the art. It is to be understood, therefore, that within the scope of the appended claims, the invention may be practiced otherwise than as specifically disclosed.

What is claimed is:

1. In combination with a plurality of relatively movable dies having die surfaces for crimping a ferrule portion of a connector to an electrical conductor, a device for axially positioning the ferrule portion of the connector in a fixed position relative to the die surfaces prior to a crimping operation, comprising means fixed to one of the dies for resiliently clamping a projecting end of a connector in a predetermined position so that the ferrule portion is properly positioned on a die surface prior to a crimping operation, said clamping means permitting axial and radial elongation of said ferrule portion and permitting said projecting end to move axially within the clamping means during a crimping operation.

2. In combination with a plurality of relatively movable dies having die surfaces for crimping a ferrule portion of a connector to an electrical conductor, a device for axially positioning the ferrule portion of the connector in a fixed position relative to the die surfaces prior to a crimping operation, comprising resilient stop means fixed to one of the dies and abutting an end of the ferrule portion only when said ferrule portion is properly positioned on a die surface prior to a crimping operation, means fixed to one of the dies for resiliently clamping a projecting end of the connector to retain said ferrule portion in its position on the die surface, said resilient stop means and said clamping means permitting axial and radial elongation of said ferrule portion and permitting said projecting end to move axially within the clamping means during a crimping operation.

3. In combination with a plurality of relatively movable dies having die surfaces for crimping a ferrule portion of a connector to an electrical conductor, a device for axially positioning the ferrule portion of the connector in a fixed position relative to the die surfaces and for axially positioning a conductor relative to a surrounding ferrule portion prior to a crimping operation, comprising means fixed to one of the dies for resiliently clamping a projecting end of a connector in a predetermined position so that the ferrule portion is properly positioned axially on a die surface prior to a crimping operation, resilient stop means fixed to one of the dies and abutting an end of the conductor only when said conductor is properly positioned within said ferrule portion, said resilient stop means and said clamping means permitting axial elongation of said conductor and permitting said projecting end to move axially within the clamping means during a crimping operation.

4. In combination with a plurality of relatively movable dies having die surfaces for crimping a ferrule portion of a connector to an electrical conductor, a device for axially positioning the ferrule portion of the connector in a fixed position relative to the die surfaces and for axially positioning a conductor relative to a surrounding ferrule portion, comprising resilient stop means fixed to one of the dies and abutting an end of the ferrule portion and an end of a conductor only when said ferrule portion is properly positioned on a die surface and only when said conductor is properly positioned within said ferrule, means fixed to one of the dies for resiliently clamping a projecting end of the connector to retain said ferrule portion in its position on the die surface, said resilient stop means and said clamping means permitting axial and radial elongation of said ferrule portion and permitting said projecting end to move axially within the clamping means during a crimping operation.

5. In combination with a plurality of relatively movable dies having a die surface for crimping a ferrule portion of a connector to an electrical conductor, a device for axially positioning the ferrule portion of the connector in a fixed position relative to the die surfaces, comprising a resilient sheet having a longitudinal portion fixed to one of the dies and bent outwardly to form a shelf portion adjacent the die surface of the die, a resilient clamp fixed to said die and extending over said shelf portion for clamping a projecting end of a connector against the shelf portion in a predetermined position so that the ferrule portion is properly positioned on a die surface prior to a crimping operation, said resilient clamp permitting axial and radial elongation of said ferrule portion and permitting said projecting end to move axially within the clamp during a crimping operation.

6. In combination with a plurality of relatively movable dies having a die surface for crimping a ferrule portion of a connector to an electrical conductor, a device for axially positioning the ferrule portion of the connector in a fixed position relative to the die surfaces, comprising a resilient sheet having a longitudinal portion fixed to one of the dies and bent outwardly to form a shelf portion adjacent the die surface of the die, a resilient clamp fixed to said die and extending over said shelf portion for clamping a projecting end of a connector positioned in the die, said clamp having a stop portion for butting against an end of the ferrule portion only when the connector is properly positioned in the die, said clamp and its stop portion permitting said ferrule to elongate radially and axially and permitting said projecting end to slide within said clamp during a crimping operation.

7. In combination with a plurality of relatively movable dies having a die surface for crimping a ferrule portion of a connector to an electrical conductor, a device for axially positioning the ferrule portion of the connector in a fixed position relative to the die surfaces and for axially positioning a conductor relative to a surrounding ferrule portion, comprising a resilient sheet having a longitudinal portion fixed to one of the dies and bent outwardly to form a shelf portion adjacent the die surface of the die, a resilient clamp fixed to said die and extending over said shelf portion for clamping a projecting end of a connector positioned in the die, said clamp having a first stop portion for butting against an end of the ferrule portion only when the connector is properly position in the die and a second stop portion for butting against the end of a conductor only when the conductor is in a desired axial position within the ferrule, said clamp and its first and second stop portions permitting said ferrule and said conductor to elongate radially and axially and

permitting said projecting end to slide within said clamp during a crimping operation.

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