

July 23, 1963

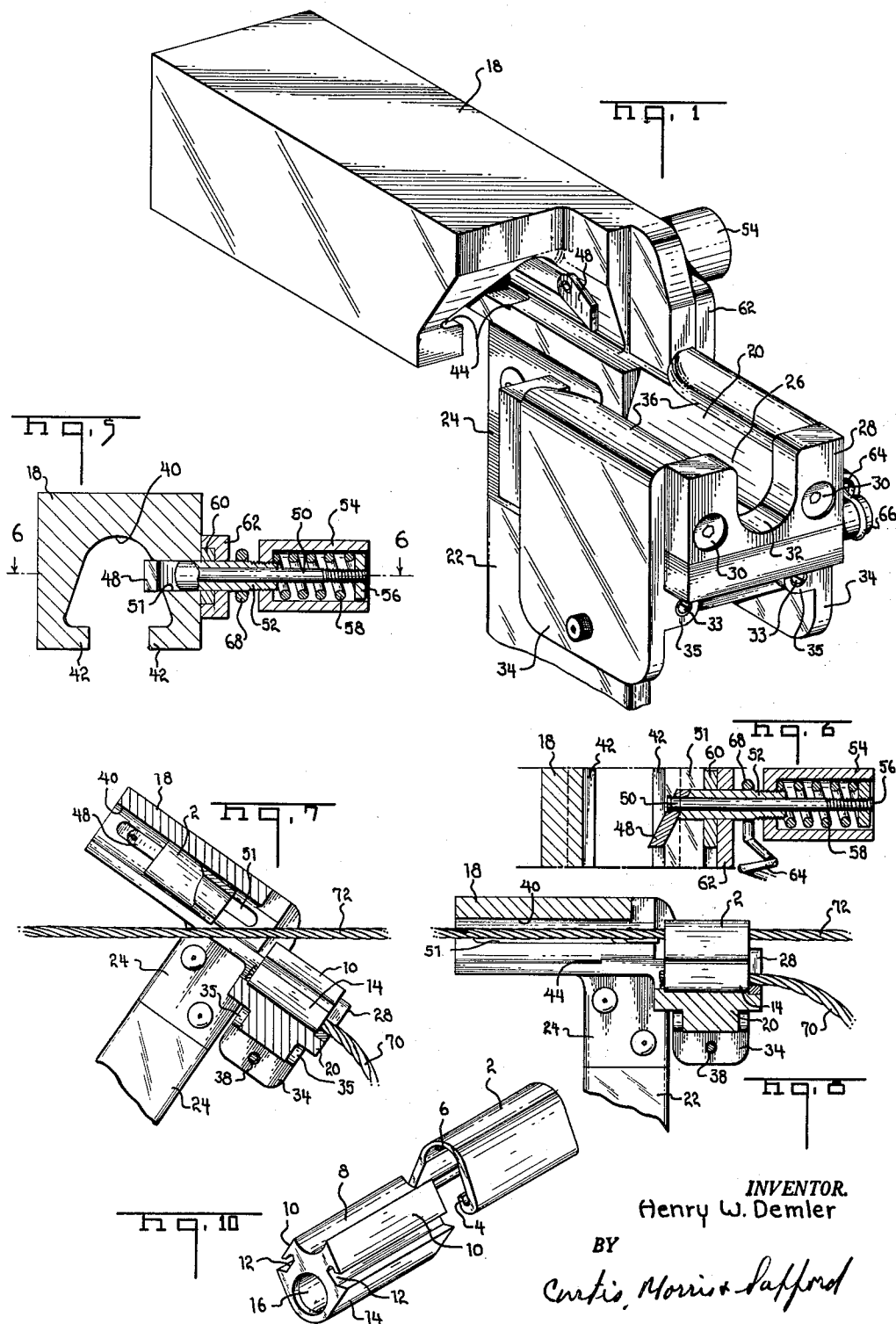
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CONNECTOR ASSEMBLING TOOL

Filed July 20, 1960

2 Sheets-Sheet 1



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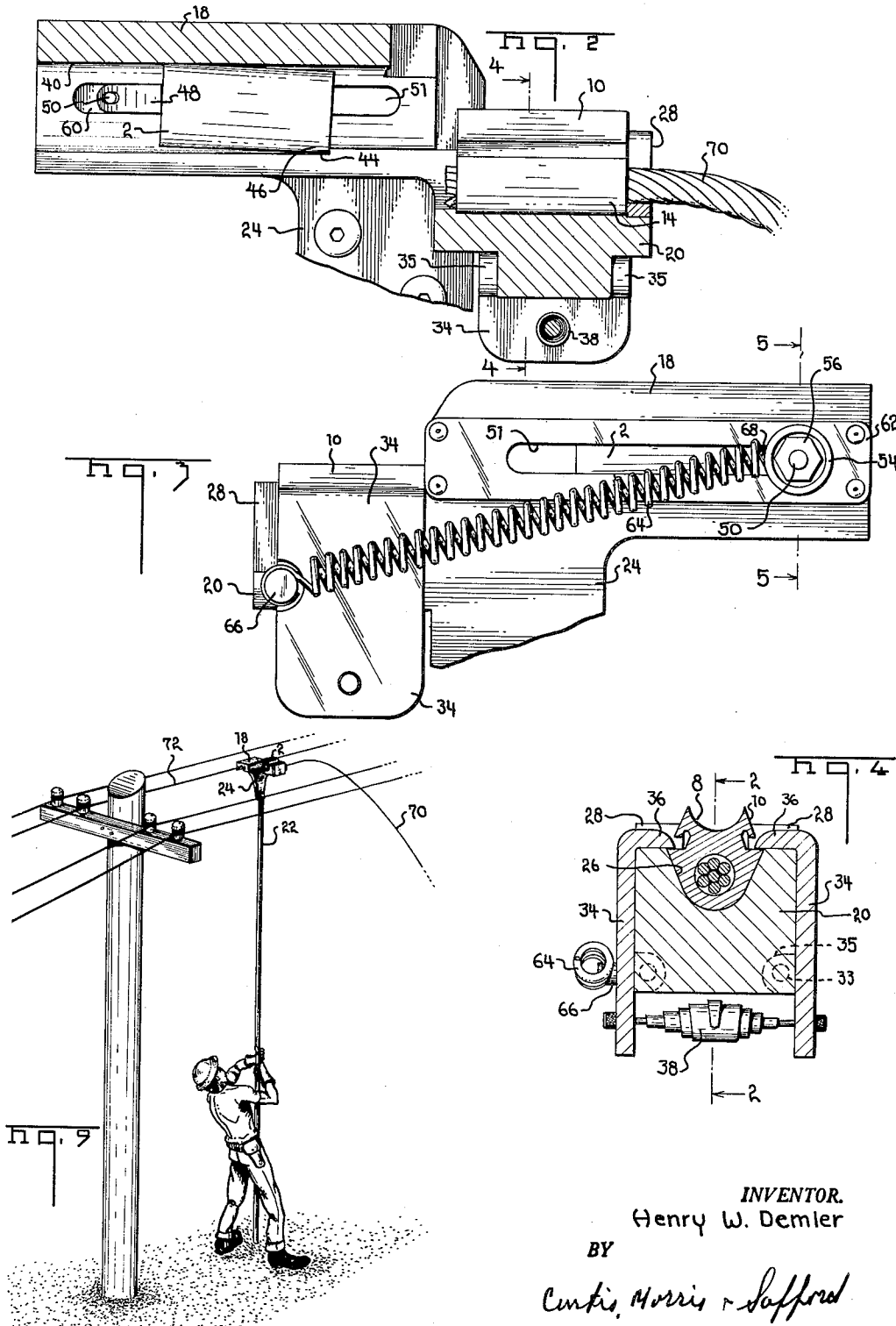
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2 Sheets-Sheet 2



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CONNECTOR ASSEMBLING TOOL

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8 Claims. (Cl. 29—203)

This invention relates to devices for assembling electrical connectors onto conductors.

One known type of electrical connector is composed of two separable parts which are axially slidable into engagement with each other to form a ferrule in surrounding relationship to a wire. Connectors of this general type can be applied to a conductor at any point intermediate its ends since the two parts are completely separable, and for this reason they are frequently employed where it is necessary to connect a branch conductor, such as a branch power line, to a through conductor, such as a power service line. The assembly of connectors of this type into a conductor presents no problem if the technician can work in close proximity to the through conductor and assemble the parts manually. However, it is frequently necessary to mount the connectors on the through conductors by means of remotely controllable tooling for the reason that power line connections must often be made when the through conductor has a high voltage applied thereto and safety considerations do not permit the technician to work close to this conductor. The present invention is addressed to the problem of mounting two part connectors on through conductors from a remote position.

An object of the invention is to provide an improved connector assembly tool. A further object is to provide a tool for assembling two slidably engageable connector parts onto a through wire. A still further object is to provide a tool which is simple in construction and which is actuated by the conductor upon which the connector is being mounted. A still further object is to provide a connector assembly tool which can be operated from a remote position without the use of levers or other linkage means between the tool head and the end of the handle.

These and other objects of the invention are achieved in a preferred embodiment comprising a track adapted to hold a first part of the connector and a nest which is adapted to hold a second connector part, the track being aligned with, and disposed in close proximity to, the nest portion of the tool. Means are provided on the tool in the form of a pawl for pushing the connector part which is in the track axially into engagement with the connector part which is disposed in the nest portion of the tool. In the preferred embodiment, the track portion has a shoulder which functions as a stop to prevent movement of the first connector part until the tool is properly aligned with respect to the conductor at which time the first connector part in the track is disengaged from the shoulder and pushed along the conductor until it engages the second connector part disposed in the nest. The actual triggering of the first connector part is effected by manipulating the tool in a manner described below so that the conductor disengages the first connector part from the shoulder and such disengagement is precluded until such time as the entire assembly is properly oriented with regard to the conductor.

In the drawings:

FIGURE 1 is a perspective view of a preferred embodiment of the invention.

FIGURE 2 is a frontal view, with parts broken away, showing the two parts of a connector disposed in the tool, this view being taken along the lines 2—2 of FIGURE 4.

FIGURE 3 is a view of the opposite side of the tool from that shown in FIGURE 2.

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FIGURE 4 is a view taken along the lines 4—4 of FIGURE 2.

FIGURE 5 is a view taken along the lines 5—5 of FIGURE 3.

FIGURE 6 is a view taken along the lines 6—6 of FIGURE 5.

FIGURES 7 and 8 are views illustrating the use of the tool in assembling a two part connector to a through conductor.

FIGURE 9 is a pictorial view showing the manner in which a two part connector is assembled to a through conductor.

FIGURE 10 is a perspective view of a connector of the type with which the preferred embodiment of the invention is intended to be used.

FIGURE 10 shows an electrical connector of the type disclosed and claimed in the copending application of Robert F. Coughlin, filed July 20, 1960, Serial No. 44,198, for Electrical Connector. Connectors of this type are intended to be used in forming connections between branch or tap conductors and through conductors and to this end the connector is formed in two completely separable parts. The first part 2 of the connector is of generally V-shaped cross-section and has inwardly and reversely turned edge portions 4 and a semi-cylindrical internal surface 6. This first part is adapted to slidably engage the second part which has a semi-cylindrical recess 8 on its upper surface which is complementary to the surface 6. The sides 10 which border this recess diverge and are complementary to the opposed internal surface of the upper part 2. Grooves 12 on the opposite sides 10 receive the inwardly turned edges 4 of the upper part of the connector and the lower body portion 14 is provided with an opening 16 through which the tap or branch conductor is adapted to be inserted. In use, the tap conductor is inserted through the opening 16 and temporarily secured therein as by bending one of the strands of the conductor. The upper part 2 is then positioned over the through conductor, the two parts are axially moved into engagement with each other, and the assembled connector is crimped by inward compression as described in the Coughlin application. If these operations can be performed by a technician working in close proximity to the through conductor, it is obvious that no special tooling is required since it is only necessary to slide the two parts into engagement with each other. However, where the two connector parts must be assembled from a remote position, special tooling in accordance with the instant invention is required which will now be described.

The preferred embodiment of the invention comprises a track portion 18 for the first connector part, and a nest portion 20, these two parts being formed as an integral metallic casting or plastic molding. The entire tool is mounted by means of a flange 24 on the casting on a relatively long handle 22 so that it can be manipulated by a technician from a remote position with respect to the through conductor 72.

Nest portion 20 is provided with a generally channel shaped recess 26 which conforms to, and receives, the second connector part as shown best in FIGURE 4. An end plate 28 is secured by fasteners 30 on the right hand side of the tool as viewed in FIGURE 1 and this plate is notched as shown at 32, the notch being of a cross sectional area somewhat smaller than that of the channel shaped recess 26 so that the connector part cannot move axially out of the nest. A pair of plates 34 are positioned on the opposite sides of the nest and are pivotally secured at 33 by means of ears 35 to the tool casting. These plates have inwardly turned flanges 36 which normally extend over the edge of the lower connector part to retain it in place and are resiliently urged against the sides of the

nest portion of the casting by means of a double volute spring 38 secured at each end of the lower ends of the plates. The arrangement is such that the plates can be pivoted outwardly to release the lower connector part.

The track portion 18 is provided with a generally channel shaped and downwardly facing recess 40 having inwardly directed edges 42 to support the upper connector part 2 in substantial alignment with the lower part in the nest portion. Shoulders 44 are provided on each of the inwardly directed edges to prevent sliding motion of the upper connector part when its lower corners 46 are in abutting relationship with these shoulders as shown in FIGURE 2. It will be apparent from this figure that the upper connector part cannot move rightwardly in this view, but could so move if it were raised so that the corners 46 could clear the shoulders 44. The inwardly directed edges 42 define a track which leads to the recess 26 in the nest portion of the tool. As will be apparent from the description which follows, this track serves to guide the connector part 2 into engagement with the connector part 14. The track portion 18 and the nest portion 20 are in substantial axial alignment in the sense that a connector part 2 positioned in the track portion will be in axial alignment with a connector part 14 positioned in the nest portion so that the two parts will engage each other when they are moved together.

The means for sliding the upper connector part into engagement with the lower part comprises a pawl 48 mounted on the end of a rod 50 which extends through a sleeve 52 and into a cylindrical spring housing 54 on the end of the sleeve. A nut 56 on the end of the rod 50 functions as a stop for a coil spring 58 interposed between the surface of this nut and the end wall of the housing 54 so that the pawl can be depressed relative to the surface of the track 40. Sleeve 52 extends through a slot 51 in the track portion and through a slide member 60 which is reciprocally mounted within a channel shaped guide member 62 secured to the side wall of the track housing. A spring 64 has one end secured to a stationary pin 66 on the nest portion of the casting and has its opposite end 68 secured to the sleeve 52 as shown at 68 so that the entire slide and pawl assembly is normally biased towards the nest portion of the tool.

In use, the operator first inserts the branch conductor 70 through the opening 16 of the lower connector part and temporarily secures it thereto by bending one of its strands as shown in FIGURE 2. This lower connector part is then positioned in the recess 26 of the nest portion and held there by the clamping plates 34, 36 as shown in FIGURE 4. The upper connector part is then held in alignment with the surface 40 and above the nest portion of the tool and pushed into the guide portion of the tool and along the guide tracks 42 until it passes the shoulders 44. It will be apparent that as this upper connector part is pushed into the guide portion of the tool, it will move the pawl 48 leftwardly as viewed in FIGURE 1 and expand the spring 64. After the upper connector part has been pushed beyond the shoulder 44 and after its edge 46 has been engaged with the shoulder, the tensioned pawl member, which tends to move rightwardly under the influence of spring 64, holds it in the position of FIGURE 2.

The operator then raises the tool by means of the handle 22 and positions it with the head extending obliquely of the axis of the through conductor 72 as shown in FIGURE 7. The operator thereafter swings the handle in a counter-clockwise direction as viewed in FIGURE 7, until the recess 8 of the lower connector part is in surrounding relationship to the through conductor 72. During such manipulation of the tool, the through conductor will engage the upper connector part and raise it relative to the track so that its edges 46 will be disengaged from the shoulders 44. When this happens, the upper connector part will be projected rightwardly as viewed in FIGURES 2, 7 and 8, along the axis of the conductor and will be guided into telescoping engagement with the lower

connector part. As the upper part moves in this manner, it spreads the clamping plates 34 apart so that neither of the connector parts which are now assembled to each other, are held in any way to the tool. The tool can next be removed from the connector by lowering it from the position of FIGURE 8 relative to the assembled connector and then moving it leftwardly and away from the assembled connector. The assembled connector is thereafter crimped by suitable remotely controlled crimping tools.

A principal advantage of the instant invention is that it dispenses entirely with the need of a lever or link system extending from the tool head along the handle to affect the actual assembling operation. The assembly is entirely controlled by the operator as he manipulates the tool relative to the through conductor 72. As shown in the pictorial view of FIGURE 9, the operator's hands can both be used for holding and manipulating the tool rather than, as with linkage type assembling tooling, both holding the tool handle and at the same time manipulating the actuating linkage for the tool head. A further advantage of the invention is that since the actual triggering of the tool mechanism is controlled by the through conductor itself, it is virtually impossible to actuate the tool until and unless the parts are properly aligned with respect to the wire. Finally, it will be apparent that the assembling tool of the instant invention is of extremely simple construction and relatively fool-proof in its operation.

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 axially moving two mating parts of an electrical connector into engagement with each other comprising, a track portion and a nest portion, said track portion having a track therein for guiding a first part of said connector towards said nest portion, said nest portion having a recess for holding a second part of said connector, said recess and said track portion being in substantial alignment with, but axially offset from, each other, whereby upon movement of said first connector part along said track portion, said first part is moved into engagement with said second part, resilient means for moving said first part along said track, and a stop in said track portion for retaining said first part against movement, said first connector part being disengageable from said stop to permit movement of said first part.

2. A tool for axially moving two mating parts of an electrical connector into engagement with each other comprising, a track portion and a nest portion, said track portion having a track therein for guiding a first part of said connector towards said nest portion, said nest portion having a recess for holding a second part of said connector, said recess and said track portion being in substantial alignment with, but axially offset from, each other, a pawl on said tool slidable along the axis thereof, resilient means biasing said pawl relatively towards said nest portion, said pawl being engageable with the side of said first connector part which is remote from said nest portion of said tool whereby, said first connector part is moved, under the influence of said resilient means, towards said nest portion, and a stop in said track portion to retain said first part against movement, said first connector part being disengageable from said stop to permit movement of said first part.

3. Apparatus as set forth in claim 2 wherein said stop comprises a shoulder on said track facing away from said nest portion.

4. A tool for axially moving two mating parts of an

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electrical connector into engagement with each other comprising, a track portion and a nest portion, said track portion having a track therein for guiding a first part of said connector towards said nest portion, said nest portion having a recess for holding a second part of said connector, said recess and said track portion being in substantial alignment with, but axially offset from, each other, whereby upon movement of said first connector part along said track portion said first part is moved into engagement with said second part, resilient means for moving said first part along said track, and a shoulder in said track portion facing away from said nest portion for retaining said first connector part against movement, said shoulder being engageable with the leading edge of said first connector part to retain said first part against movement until said first part is disengaged therefrom by a conductor.

5. A tool for assembling a two-part electrical connector onto a through conductor, said two-part connector comprising a generally V-shaped first part and a complementary second part, said two parts being axially movable together for assembly, said tool comprising, a track portion and a nest portion, said track portion having a track therein to receive said first connector part and guide said first part towards said nest portion, said nest portion having a recess for holding said second connector part, said recess and said track portion being in substantial alignment with, but axially offset from, each other, a shoulder in said track for retaining said first part against movement, and resilient means engageable with said first part for urging said first part towards said nest portion, said resilient means being effective to move said first part upon disengagement thereof from said shoulder.

6. A tool for assembling a two-part electrical connector onto a through conductor at a point intermediate its ends, said two-part connector comprising a generally V-shaped first connector part which is axially movable into engagement with a complementary second part, said tool com-

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prising, a track portion and a nest portion, said track portion having a track therein for supporting the longitudinal edges of said first connector part and guiding said first part towards said nest portion, shoulder means on said track facing away from said nest portion for retaining said first part against movement, resilient means in said track portion for urging said first connector part towards said nest portion, said nest portion having a recess in alignment with, but axially offset from, said track portion for supporting said second connector part, said tool being operable upon alignment thereof with said through conductor whereby said through conductor disengages said first connector part from said shoulder and said resilient means thereafter moves said first part along said conductor into engagement with said second connector part.

7. A tool as set forth in claim 6 including clamping means as said nest portion for holding said second connector part in said recess, said clamping means being engageable by said first connector part upon movement thereof to release said second connector part.

8. A tool for axially moving two mating parts of an electrical connector into engagement with each other comprising, a track portion and a nest portion, said track portion having a track therein for guiding a first part of said connector towards said nest portion, said nest portion having a recess for holding a second part of said connector, said recess and said track portion being in substantial alignment with, but axially offset from, each other, whereby upon movement of said first connector part along said track portion, said first part is moved into engagement with said second part, and moving means for moving said first part along said track, said tool being mounted on an elongated handle to permit placement of said connector on a remote conductor, and said moving means being controllable through said handle.

No references cited.