

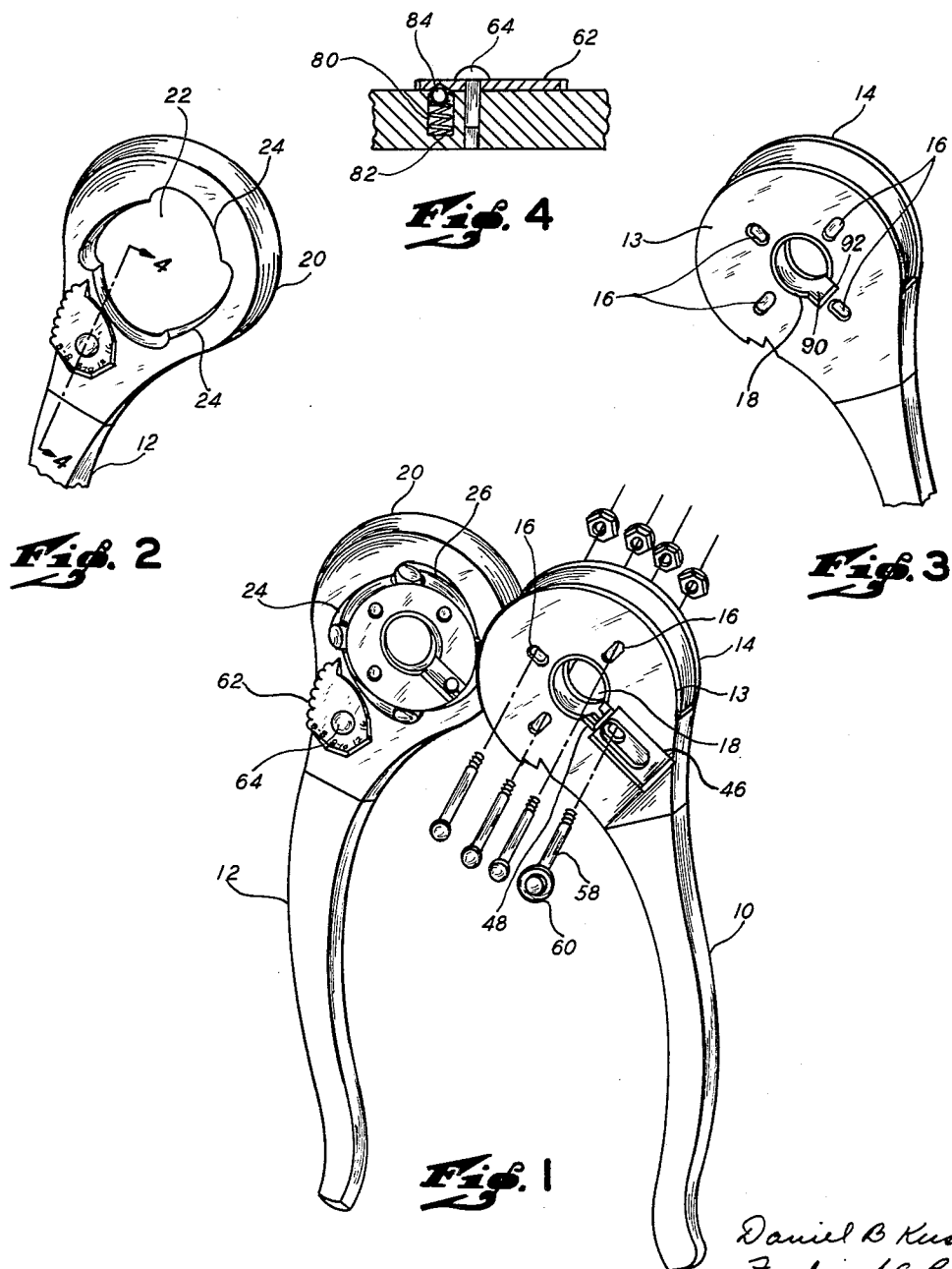
Aug. 9, 1955

D. B. KUSIV ET AL
CAM ACTUATED CRIMPING PLIERS

2,714,827

Filed Aug. 15, 1952

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

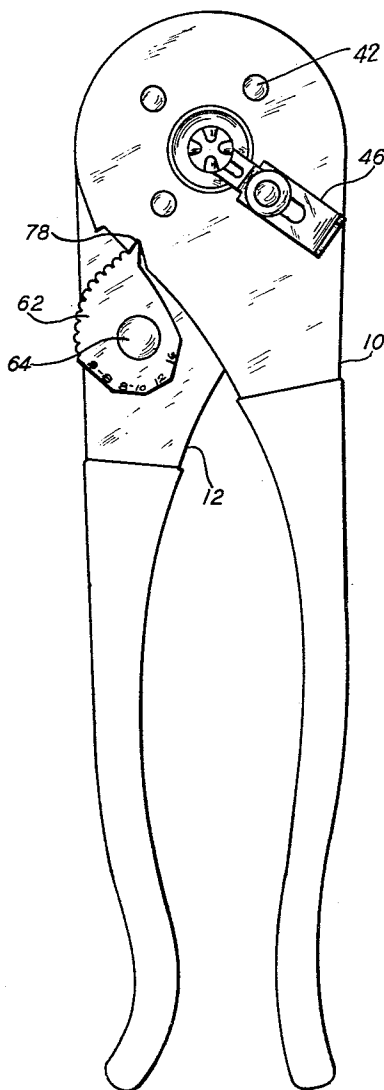


Fig. 5

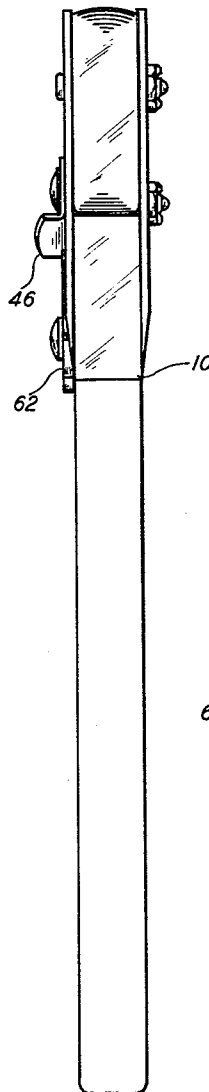


Fig. 6

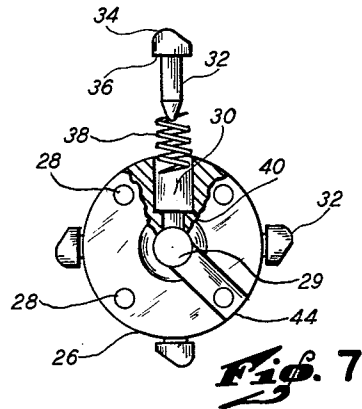


Fig. 7

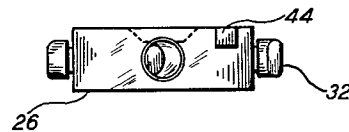


Fig. 8

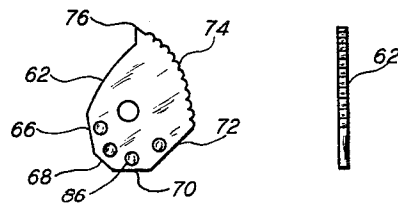


Fig. 9

Fig. 10

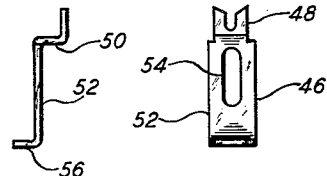


Fig. 11

Fig. 12

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CAM ACTUATED CRIMPING PLIERS

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1 Claim. (Cl. 81—15)

This invention relates generally to a tool for uniting an electric conductor or conductors with an electric connector having a tubular socket to receive the bared ends of the conductor, the socket having a closed end and a portion at the closed end adapted for attachment to an electric terminal. More specifically this invention is directed to an improved tool for swaging portions of the wall of a connector into intimate contact with the bared ends of the conductors so as to provide a mechanical and electrical bond between the two elements.

Electric connectors of the above mentioned type are often used to connect two conductors together in order to ensure a continuous flow of current between two predetermined points. The improved tool may also be employed to crimp an electric connector having a conductor-receiving portion and a terminal-engaging portion axially spaced and integral with the conductor-receiving portion, onto a conductor.

An object of this invention is to provide an improved connector positioning means on the tool so as to ensure the proper location of the indentations on the connector, formed by the crimping action of the tool.

A further object of this invention is the provision of novel means for controlling the crimping depth of the tool. It is important that the crimping depth be regulated in conformance with the size of connector involved. For illustration, the crimping depth required to mechanically unite a small connector with its associated conductor might easily injure a larger connector and its associated conductor, as the former requires a greater depth of crimp for mechanical unity. This is true because of the nature of the crimping action and not because a greater force is required. The crimping action is obtained by causing four forming pins to simultaneously move from four different directions against a connector with the conductor or conductors therein. In the smaller size connectors, the distance the forming pins move before resistance, as exemplified by the wire or wires, is encountered, is relatively greater than in the case where larger size connectors are united. Therefore, assuming an equal travel of the forming pins in each case, it may be readily appreciated that the large size connector receives a crimping action in excess of that required to form an efficient bond. This excessive crimping action manifests itself in fractured or sheared conductors and fractured or sheared connectors.

It is a still further object of this invention to provide a novel method of crimping a connector onto the bared ends of a conductor.

Briefly, a tool in accordance with the invention includes two relatively movable handle members, a die holder movable with respect to one handle member, crimping dies in the die holder and which converge as the handles are moved in one direction and diverge as the handles are moved in the other direction, and a member for properly positioning a connector in the die holder before the handles are moved in the direction to cause the dies to converge to crimp the connector onto

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a conductor. Preferably, an adjustable stop element is also provided to limit the movement of the handles in the direction in which they are moved to effect the crimp.

Other objects and advantages of this invention will be apparent from the following description and drawings. In the accompanying drawings:

Fig. 1 is an exploded view of the various elements, in perspective, that comprise the improved tool;

Fig. 2 is a perspective view of one of the handle members;

Fig. 3 is a view in perspective of the other handle member;

Fig. 4 is a sectional view of the stop element and means for holding the stop element in desired position;

Fig. 5 is a plan view of the assembled tool;

Fig. 6 is an end view of the assembled tool;

Fig. 7 is a plan view, broken away for clarity of the die holder;

Fig. 8 is a side elevation of the die holder;

Fig. 9 is a top plan view of the stop element for limiting relative movement of the handles;

Fig. 10 is an end view of the stop element;

Fig. 11 is an end view of the connector positioning member; and

Fig. 12 is a top view of the connector positioning member.

Hand-operated crimping or swaging tools have long been known to the electrical trade, and in recent years, have been accorded wide spread use throughout the industry. The invention here involved resides in certain improvements applicable to a tool of the kind described in United States Letters Patent 2,467,012 issued April 12, 1949 to Fritz Deuschle. The improvements include a novel means for limiting the crimping action and a novel means for positioning the connector in the tool preparatory to the crimping operation.

Briefly, the tool includes two handle members 10 and 12 substantially as shown in Fig. 1. Handle member 10 is channel-shaped in section so as to accommodate handle member 12 in a manner to be later described. At one extremity of the member 10 are enlarged portions 13 and 14. Four pairs of aligned openings 16 for the reception of fastening members and a pair of aligned openings 18 for the reception of an electric connector are located in the enlarged portions. Opening 18 in portion 13 has a notch 90 with an edge 92 radially aligned with one of holes 16 in portion 13, for reasons which will appear.

Handle member 12 is provided with an enlarged end portion 20 adapted to snugly fit between enlarged end portions 13 and 14 of handle member 10. An opening 22 considerably greater in area than the opening 18 referred to above, is formed through the enlarged portion 20. The circumference of the opening 22 is composed of a series of connected cam surfaces 24.

Rotatably disposed in the opening 22 is a cylindrical forming pin retainer or die holder 26 having an axial length substantially the same as the thickness of the handle member 12. Die holder 26 has a series of bores 28 adapted to be aligned with openings 16 in member 10 and to receive fastening members such as threaded bolts or the like. Also provided in member 26 are a plurality of forming pin receiving passages 30 extending radially from a central bore 29 of diameter substantially less than that of openings 18 through the enlarged portions 13 and 14 of handle member 10 and in which are located forming pins or dies 32. Each pin has at one end an enlarged head portion 34 providing a shoulder 36, for engaging the cam surfaces 24. The other end of the forming pin engages the connector during the crimping operation and may be formed of any suitable configuration. A spring 38, one end of which rests on a shoulder

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40 in the passage 30, urges the forming pin outwardly from the axial opening 29 as shown in Fig. 7.

In assembling the tool, the die holder 26 with dies 32 and springs 38 assembled therein as described above is placed in the opening 22 in member 12; the enlarged end portion 20 of handle member 12 is then inserted between enlarged portions 13 and 14 of handle member 10 and these parts are fastened together by means of three bolts 42 through aligned openings 16 in member 10, and 28 in die holder 26 and the three nuts shown aligned with bolts 42 in Fig. 1. Die holder 26 is thus made fast to handle member 10 and the dies are then projected across the central bore 29 by movement of the cam surfaces 24 on the forming pin heads 34 against the action of springs 38. The movement of the cam surfaces occurs where there is relative movement between the handle members 10 and 12. Such relative movement is effected by merely grasping the handles and forcing them toward each other by squeezing them.

Die holder 26 has in one end surface thereof a milled slot 44 extending from the central bore 29 to the edge of the member. As shown, one end of one of holes 28 lies at the bottom of slot 44, and die holder 26 is assembled with slot 44 in registry with notch 90. This slot 44 accommodates a stepped slide member 46 as shown in Figs. 11 and 12. Slide member 46 includes a forked end portion 48, a portion 52 parallel to portion 48, a portion 50 joining portions 48 and 52 and perpendicular thereto, and a portion 56 perpendicular to portion 52 and integral therewith. Portion 52 has a longitudinal slot 54 therethrough. This latter horizontal portion has a longitudinal slot 54 and a protuberance 56 for moving the slide member from an extended position over the aligned openings 18 and 29 to a retracted position in the slot 44. The slide member 46 is attached to the tool with forked portion 48 in sliding engagement with the bottom of slot 44 and portion 52 in sliding engagement with the outer surface of enlarged portion 13 of member 10, by bolt 58 passing through slot 54 and the nut shown aligned with bolt 58 in Fig. 1. A bowed washer 60 is placed beneath the head of the bolt in order to provide some drag or resistance to movement of the slide member. Thus slide member 46 may be moved from an operative position in which forked portion 48 is axially aligned with opening 29 of die holder 26 to a retracted position in which portion 48 does not cover opening 29 and is located entirely within slot 44 and in which notch 90 accommodates portion 50 of member 46. This can be accomplished by pushing in the appropriate direction on portion 56 of member 46. Movement is limited by the ends of slot 44 and/or edge 92 of notch 90.

Referring now to Figs. 9 and 10 an example of a novel stop means for limiting the movement of the handle members is illustrated. The stop member is designated by reference numeral 62 and is rotatably mounted through pin 64 on handle member 12. Abutment surfaces 66, 68, 70 and 72 extend about the periphery of stop member and each is located at a different distance from the center of rotation (64) of the stop member so that the stop member may be considered eccentrically mounted. The stop member also includes a serrated portion 74 about its periphery. This latter portion serves to aid an operator in indexing the stop member. At one end of the serrated portion, the lead serration 76 is enlarged. A notch 78 in the handle member 10 receives this enlarged serration when the tool is not in use. This arrangement enables the handle members 10 and 12 to be maintained in a close proximity to each other so as to conserve space when the tool is not being utilized.

Once the stop element has been rotated so that the proper abutment surface, as determined by the size of the conductors being united with a connector is in position to be engaged by the leading edge of handle 10, a novel arrangement as illustrated in Fig. 4 is utilized to maintain the stop element fixed throughout the crimping operation.

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A spring 80 is located in a bore 82 in handle member 12 beneath the stop element 62. The spring member supports a ball bearing element 84 in the bore and normally urges it to the upper end of the bore. The surface of handle member 12 adjacent the bore is staked over the bore thereby restraining the tendency of the spring to force the ball entirely out of the bore. Located on the underside of stop element 62 are a series of dimples 86, one for each abutment surface, adapted to receive the top surface of the ball bearing element therein thus providing restraint against rotational movement of the stop element 62. This restraint is sufficient to overcome any tendency of the stop element to rotate but may be easily overcome by an operator at the conclusion of the crimping operation.

When it is desired to use the improved tool, the slide member 46 is moved to its operative position with forked portion 48 over aligned openings 18 and 29. The stop member 62 is rotated so that the proper abutment surface, as determined by the size of the open end of the connector to be crimped, is available for contact with handle member 10 at the conclusion of the crimp. The connector is then inserted in the tool through openings 18 and 29 from the rear as viewed in Fig. 5 so that the open end of the connector abuts against the projected forked portion of the slide member 46. The connector is then properly positioned in the tool. The operator then applies a slight pressure to the handle members 10 and 12. This pressure is very slight and is of an intensity sufficient to merely maintain the connector in the tool as the slide member is retracted. The bared ends of the conductor or conductors are then inserted from the front as viewed in Fig. 5 to the full depth of the connector socket and a crimping pressure, sufficient to swage the connector into intimate contact with the conductor is applied. This pressure will be attained as handle member 10 engages the previously selected abutment surface on the stop member 62. After handles 10 and 12 are then separated to retract dies 32, the conductor-connector assembly may be removed from the tool either in the direction of insertion of the conductor or the connector.

It may be readily seen that the slide member has insured a proper positioning of the connector in the tool. Forked portion 48 of member 46 makes it possible to retract member 46 either before or after the crimping of the connector to the conductor or conductors, in accordance with the preference of the operator.

What is claimed:

A tool for crimping an electrical connector comprising a tubular body having an open end and a closed end onto an electrical conductor, said tool comprising a cylindrical die holder having an axial bore providing an opening through said die holder, a cylindrical outer surface, two flat end surfaces, a recess in one of said flat end surfaces extending radially outwardly from said bore and a plurality of ports extending radially from said bore to the cylindrical outer surface, crimping dies in said ports and having end portions extending outwardly of said cylindrical outer surface, means biasing said dies outwardly of said die holder, first and second relatively turnable members, said first member having an aperture therethrough having cam surfaces about its periphery, said second member including first and second wing portions having a pair of aligned openings therethrough, said die holder being in said aperture with said cam surfaces engaging the outwardly extending end portions of said dies, such wing portions embracing and being rigidly attached to said die holder with said first wing portion overlying one flat end surface and said second wing portion overlying the other flat end surface, so that relative turning movement of said members in one direction will cause said dies to move into said die holder bore against the action of said biasing means, turning means for said turnable members, and a movable latch member mounted on said first wing portion and including an end portion which lies within said

die holder bore when said latch member is in a first position and within said recess when said latch member is in a second position, and a portion on the outer side of said first wing portion adapted to be grasped to move said latch member, so that when in said first position the end portion of said latch member provides a stop adapted to position said connector in said die holder bore.

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