

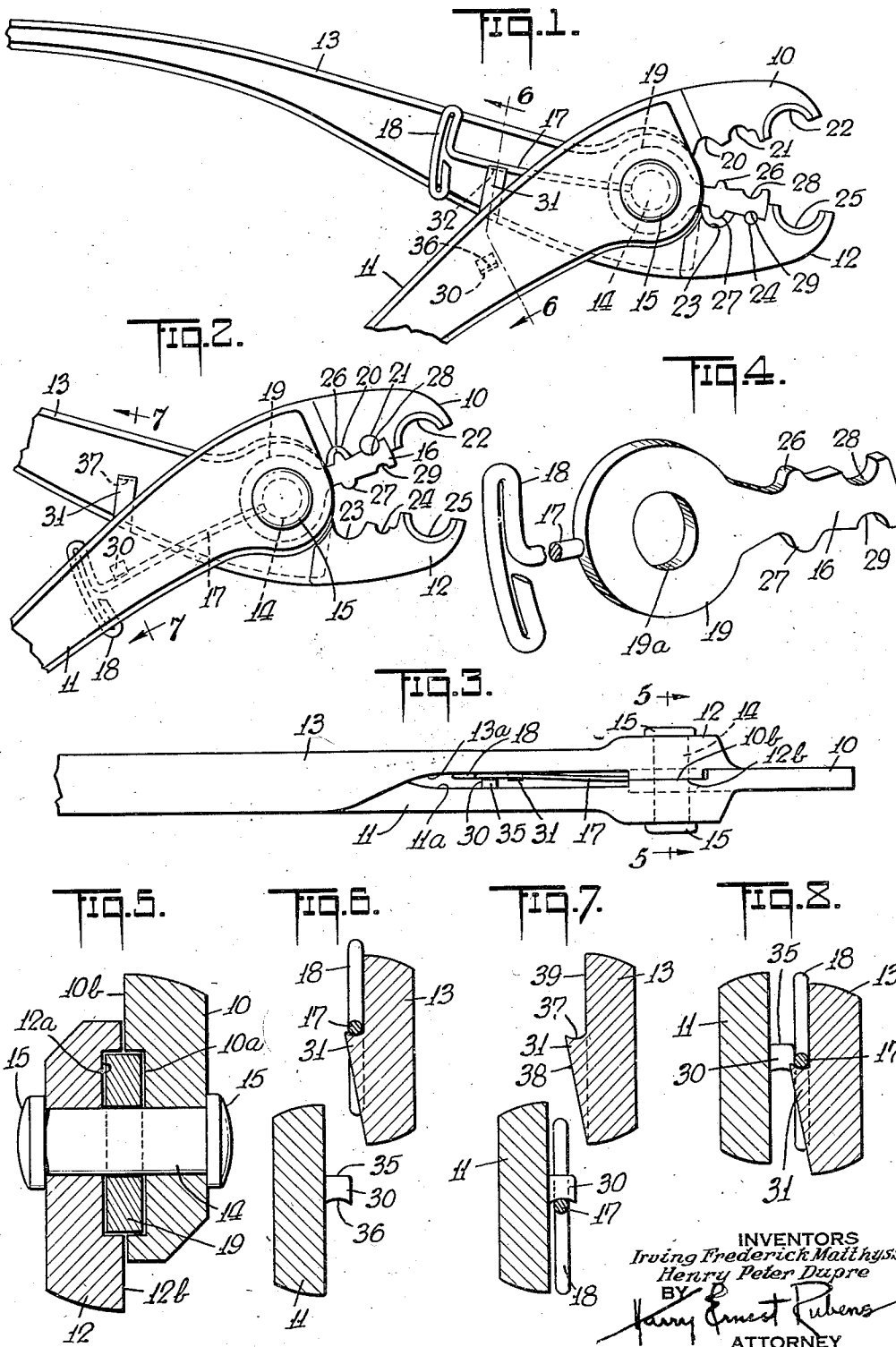
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I. F. MATTHYSSE ET AL

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INTERMEDIATE JAW PLIERS

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INVENTORS
 Irving Frederick Matthysse
 Henry Peter Dupre
 BY *Harry Ernest Rubens*
 ATTORNEY

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INTERMEDIATE JAW PLIERS

Irving Frederick Matthysse and Henry Peter Dupre, New York, N. Y., assignors to Burndy Engineering Company, Inc., a corporation of New York

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Our invention relates to pliers, more particularly to pliers used for installing solderless electrical connectors.

A common method for installing solderless electrical connectors on small sizes of single or multiple strand electrical conductors or wires is by indenting, crimping, or otherwise distorting the wire-receiving barrel of the connector by means of crimping pliers designed specifically for that purpose. Such electrical connectors frequently employ insulation grips to give additional support to small wires. Crimping pliers, therefore, also may have insulation grip closing grooves to compress or close the insulation grips about the insulation on the wire.

Such pliers has on its jaws at least two working positions, one for crimping the wire-receiving barrels of electrical connectors and one for closing the insulation grips of such connectors. However, to eliminate the necessity for having different pliers for each size of electrical connector, pliers have been made with a number of different working positions for crimping different size wire-receiving barrels and different size insulation grips. In the past, all these positions have been placed on a single set of jaws. For example, one popular type of pliers has three positions, namely, one position for installing three different sizes of wire receiving barrels, a second position for closing the insulation grips on two of these connector sizes and a third position for closing the insulation grip of the third size of connector.

This principle of employing a single position to install a number of different sizes of electrical connectors usually results in electrical joints somewhat inferior to those made in pliers, having working positions specifically designed to fit only one size of connector. In addition it is desirable to have the pliers close fully when the connector is completely crimped, in order to relieve the operator from exercising any judgment as to when the pliers is closed sufficiently to have properly crimped the connector. This desirable feature usually cannot be obtained in a working position designed to crimp more than one size of electrical connector since if the pliers makes a good joint when fully closed on the smallest size of connector, it usually cannot be closed all the way on the largest size of connector accommodated without requiring excessive force and without damaging the connector by excessive crimping.

Therefore, it is desirable to have a different working position for the wire receiving barrels and the insulation grips for each size of electrical

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connector accommodated. This usually cannot be accomplished in a single set of plier jaws since the jaws would then be quite long and the mechanical advantage obtained in those working positions furthest from the fulcrum of the pliers would be too low to permit adequate crimping pressure on the connector. We have found that three working positions are approximately the maximum that can be placed in a single set of jaws if adequate pressure is to be obtained in all positions.

Accordingly, it is an object of our invention to provide pliers having more working space in the jaws than is available in the conventional form of pliers having an equal jaw length, so that additional working positions may be provided with adequate mechanical advantage and pressure in every position.

Another object is to provide such pliers that may be completely closed to a stop when installing connectors in any of the working positions, thereby eliminating judgment on the part of the operator.

Still another object is to provide such pliers capable of producing electrical connections of uniformly good electrical conductivity and high mechanical pullout strength.

A further object is to provide pliers with two main jaws, the working positions on one jaw being different from the working positions on the other jaw, and having means for providing a complementary working position for each position on the main jaw.

A still further object is to provide pliers with a selective jaw, the position of which may be quickly and easily adjusted to expose different working positions for operation.

We accomplish these and other objects and obtain our new results as will be apparent from the device described in the following specification, particularly pointed out in the claims, and illustrated in the accompanying drawing in which:

Fig. 1 is a front elevation of our pliers provided with two open main jaws and an intermediate jaw secured to one of the main jaws.

Fig. 2 is a similar view with the intermediate jaw secured to the other main jaw.

Fig. 3 is a top view of our pliers in closed position, with the intermediate jaw secured to the same main jaw as is shown in Fig. 1.

Fig. 4 is a perspective view of the intermediate jaw.

Fig. 5 is a transverse sectional view through the jaws, taken in the planes 5-5 of Fig. 3.

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Fig. 6 is a transverse sectional view through the plier handles, taken in the planes 6—6 of Fig. 1.

Fig. 7 is a similar view taken in the planes 7—7 of Fig. 2.

Fig. 8 is a similar view indicating jaws in closed position, and the intermediate jaw locked to jaw 12.

The pliers shown in the drawing comprise jaw member 10 integral with handle 11, and jaw member 12 integral with handle 13. The jaws are pivotally mounted on pin 14, riveted at ends thereof, as at 15, to maintain the jaws in movable position.

An intermediate jaw 16 is positioned between the jaw members and has the shape illustrated in Fig. 4. Integral with the jaw is a latching spring 17 having a handle 18 and the jaw member is enlarged transversely at 19 to provide an aperture 19a for rotation on the pin 14.

In Fig. 5, I have shown a cross-section of the pliers, indicating how the two jaws are recessed to provide space for the central portion 19 of the intermediate jaw. Recess 10a is provided on the face 10b of jaw 10 and corresponding recess 12a is provided on face 12b of jaw 12. The central portion 19 of the intermediate jaw 16 is seated in the two recesses, with faces 10b and 12b of the jaws 10 and 12, respectively, abutting each other during the operation of the pliers. Thus the intermediate jaw is free to swivel between the main jaws of the pliers.

Additionally, the spring 17 extends from the intermediate jaw 16 into the recesses 13a and 11a of handles 13 and 11, respectively, as shown in Fig. 3, which recesses thus provide ample room for the movement of the latching spring between the handles of the pliers.

Jaw member 10 is provided with an indenting groove 20 and insulation crimping grooves 21 and 22. Similarly, jaw member 12 is provided with an indenting groove 23 and insulation crimping grooves 24 and 25. In the particular form of our pliers illustrated, indenting grooves 20 and 23, and crimping grooves 21 and 24, constitute four individual sizes. Grooves 22 and 25 are complementary insulation crimping grooves for a wire having a large diameter insulation.

The intermediate jaw member 16 may be selectively positioned on either of the main jaws. It contains four working positions, namely, indenting teeth 26 and 27, used in connection with indenting grooves 20 and 23, respectively, on jaws 10 and 12, and insulation crimping grooves 28 and 29 complementary to grooves 21 and 24, respectively, on jaws 10 and 12. By giving the jaw 16 a length less than the main jaws, the two main jaws may operate against each other for a large size crimping position.

The intermediate jaw may be locked into any one of two positions by means illustrated in Figs. 1 and 2. Such means comprise the latching spring 17, and latches 30 and 31 extending towards each other from handles 11 and 13, respectively. The latches are offset from each other so that they will pass one another when the jaws close, as is shown in Fig. 3. The space remaining between each of the latches and its opposite handle is sufficient to clear the latching spring when the handles are closed as shown in Fig. 8.

The latches 30 and 31 are provided with two slight grooves 36 and 37, respectively, so as to seat the spring 17 therein, depending on which position of the intermediate jaw is selected. When the pliers are in the closed position, and

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the intermediate jaw is secured to jaw 12, the spring will be seated in groove 37 of latch 31. In this position, the spring will be slightly sprung away from its longitudinal axis so that it will retain its seat in the groove, and insures that the intermediate jaw is firmly positioned against its main jaw while in use. The spring will be flexed in the opposite direction when seated in groove 36, of latch 30, as shown in Fig. 2. Surface 35 of latch 30, directly opposite groove 36, is tapered slightly, to release spring 17, allowing it to fall into groove 37 of latch 31 under the action of the spring tension.

Latch 31 is provided with an inclined surface 38 leading from the inside surface 39 of the handle 13, to groove 37. Thus, if the spring 17 should be positioned between the two latches, closing the pliers will cause the nearest surface 35 of latch 30 to retain the spring by the action of the inclined surface 38 of latch 31, camming it into seat 37 where it will be locked, as previously described. This automatic action is designed to expose the working positions most frequently used, or those positions on jaw 10, as shown in the drawings.

To expose the jaw that is used less frequently, namely, jaw 12, the spring 17 is unseated from latch 31 and pushed to the other position and lifted over latch 30 to rest in seat 36, under spring tension. This holds the intermediate jaw against jaw 10, exposing jaw 12. To bring the intermediate jaw jack to the other position, it is merely necessary to lift the spring over latch 30 and utilize the automatic action described above.

The latches and spring enable the intermediate jaw to be locked in the desired position. The latches and spring may be omitted, and the intermediate jaw manually placed in the desired position during the operation of the pliers.

The pliers may be equipped with any arrangement of working positions cooperating between the main jaws and the intermediate jaw for installing electrical connectors or any other purpose of which pliers may be used. Positions may also be arranged between the main jaws without cooperating with the intermediate jaw such as position 22 and 25 in Fig. 1.

The pliers may be equipped with more than one intermediate jaw to increase the number of working positions, all of which have adequate mechanical advantage. In such each jaw may have its own latching spring, and the latches provided with seats for simultaneously seating all the springs, when one main jaw is desired to be exposed.

We have thus described our invention, but we desire it understood that it is not confined to the particular forms or uses shown and described, the same being merely illustrative, and that the invention may be carried out in other ways without departing from the spirit of our invention, and, therefore, we claim broadly the right to employ all equivalent instrumentalities coming within the scope of the appended claims, and by means of which, objects of our invention are attained and new results accomplished, as it is obvious that the particular embodiments herein shown and described are only some of the many that can be employed to attain these objects and accomplish these results.

We claim:

1. A tool having a plurality of pivotally connected main jaw members, each containing a working surface, and each having a handle extending from said jaw members; an intermediate

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jaw member pivotally mounted on the same axis as said main jaw members and having working surfaces each complementary to a working surface on said main jaw members, said intermediate jaw member terminating in a spring latch; said handles each having a catch for engagement with said spring latch; one of said catches having a camming surface thereon for engaging said spring latch when positioned between the two catches and causing said latch to be cammed into and secured on the catch having said camming surface for predetermining the position of the intermediate jaw member when the handles are pressed towards each other, and the spring latch is positioned between the two catches.

2. A metal-working compression apparatus having a plurality of connected main compression members each having different working die surfaces for cold working the shape of a metal article, and a connected intermediate jaw member positioned between the main compression members, and having working die surfaces on opposite sides thereof, each complementary to a working die surface on said main compression members, means for transmitting pressure to the two main compression members sufficient to close the compression members and cold work the metal position between a selected main compression member and the intermediate jaw member, with the intermediate member jaw positioned against the remaining main compression member, latching means for predetermining the locked position of the intermediate jaw member to a main compression member when the compression members are open, whereby the intermediate jaw member will be locked solely to the predetermined compression member during the

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opening and closing of the main compression members thereafter, and means for latching the intermediate jaw member to the other main compression member when the main compression members are open whereby the intermediate jaw member will be locked to the other main compression member during the opening and closing of the main compression members thereafter.

3. The metal-working apparatus of claim 2 wherein the main compression members and the intermediate jaw member are pivoted on the same axis, and an extended arm is provided on the intermediate jaw member, said intermediate jaw member and extended arm being positioned between the main compression members at the axis of pivot, and between the means for transmitting the pressure to the main compression members respectively.

4. The metal-working apparatus of claim 3 wherein the extended arm from the intermediate jaw member may be flexed in the direction of movement of the main compression members.

IRVING FREDERICK MATTHYSSE.
HENRY PETER DUPRE.

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