

Sept. 13, 1960

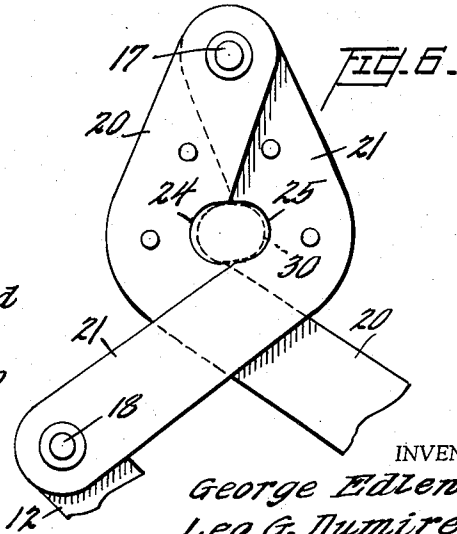
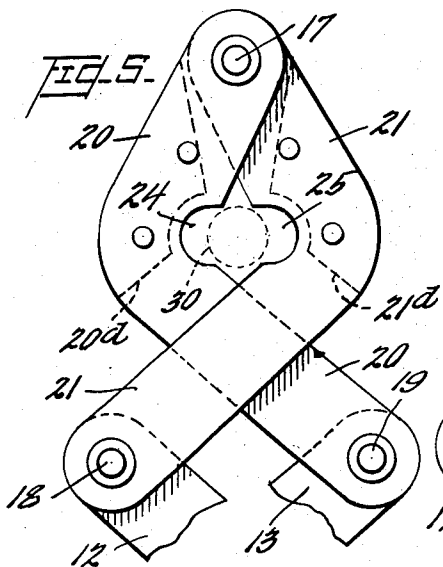
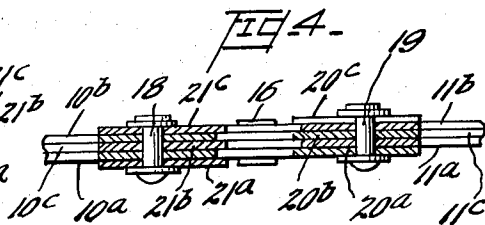
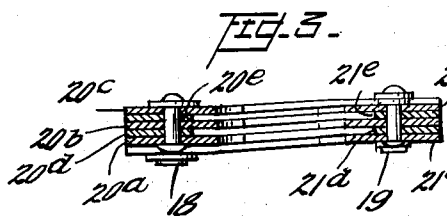
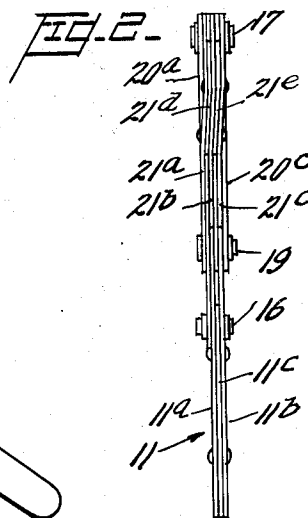
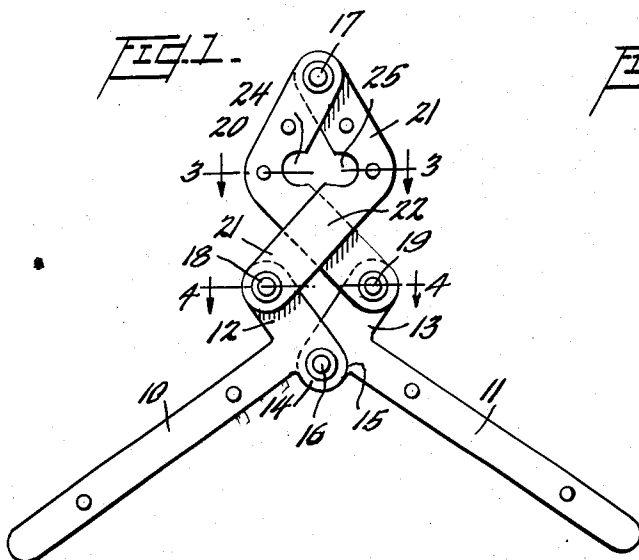
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2,952,175

CRIMPING TOOL

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2 Sheets-Sheet 1



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FIG. 7.

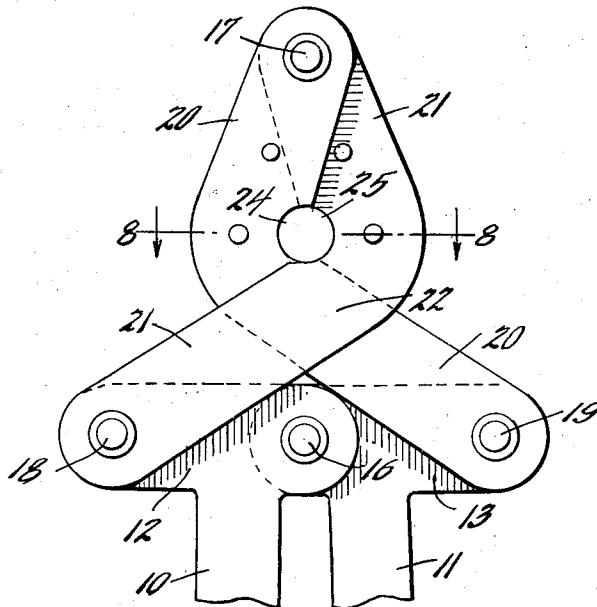


FIG. 8.

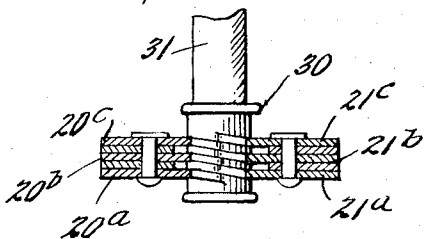
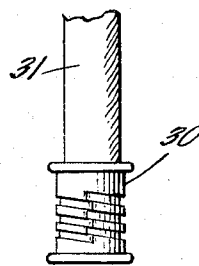


FIG. 9.



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2,952,175

CRIMPING TOOL

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6 Claims. (Cl. 81—15)

The present invention relates to crimping tools, and more specifically relates to a hand tool for crimping, particularly for necking or reducing the diameter of metal ferrules or the like.

There are known and available a number of crimping tools for reducing the diameter of, or necking, metal ferrules. For the most part, such tools are cumbersome and complex, relying largely upon cam or vise type operating linkages, and usually employing large castings for strength and mechanical advantage. Effectively, many of these prior art tools are useful only as bench installations. The crimping tool of the present invention, on the other hand, is small and compact, easily portable as any conventional hand tool, and readily and economically fabricated from simple metal stampings. Further, the present crimping tool is constructed basically upon a scissors type of linkage. Although scissors type crimping tools are also broadly known, they usually suffer from the defect that inherently in their operation they tend to pinch a portion of the ferrule being crimped, and thereby form a ridge on the ferrule running axially thereof.

It is accordingly one object of the present invention to provide a hand crimping tool for reducing the size of or necking metal ferrules, or the like.

Another object of the present invention is to provide such a crimping tool based upon a scissors type linkage.

Another object of the present invention is to provide such a crimping tool which will not pinch the ferrule in operation.

Still another object of the present invention is to provide such a crimping tool which may be readily fabricated from metal stampings.

Other objects and advantages of the present invention will become apparent to those skilled in the art from a consideration of the following detailed description of one exemplary embodiment of the present invention, had in conjunction with the accompanying drawings, in which like numerals refer to like or corresponding parts, and wherein:

Fig. 1 is a plan view of the crimping tool of the present invention, wherein the tool is shown open and in condition to receive between its jaws a ferrule to be crimped;

Fig. 2 is a side or edge view of the tool of Fig. 1;

Fig. 3 is a cross-sectional view taken along the line 3—3 of Fig. 1;

Fig. 4 is a cross-sectional view taken along the line 4—4 of Fig. 1;

Figs. 5 and 6 are enlarged plan views of the jaw portion of the tool, showing the operation of the tool in successive stages of closing;

Fig. 7 is a view similar to Figs. 5 and 6, showing the tool completely closed;

Fig. 8 is a cross-sectional view taken along the line 8—8 of Fig. 7, with the addition of a ferrule shown crimped on a tube by the jaws of the tool; and

Fig. 9 is a plan view of a ferrule crimped on a tube, as effected by the tool.

Referring particularly to Fig. 1, the crimping tool of

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the present invention comprises a pair of handles 10, 11, which terminate in outwardly divergent, angularly projecting crank arms 12, 13. Each handle on its inner edge is provided with a lug, lug 14 for handle 10, and lug 15 for handle 11. Lugs 14, 15 function to provide a pivotal connection between the handles 10 and 11, by receiving therethrough a suitable rivet eyelet, or the like 16. A pair of jaws 20, 21 are pivotally connected at 18 and 19 respectively to crank arms 12, 13, cross each other at 22, and are pivotally connected together at 17 remote from pivots 18 and 19. The crimping bite of the tool is provided by recesses 24, 25 in the jaws.

Each handle, and its associated crank arm and lug, is shown as formed from the lamination of two superposed stampings, 11a and 11b in the case of handle 11, and 10a and 10b in the case of handle 10. These stampings are spaced from each other by the interposition of a spacer stamping 11c for handle 11, and 10c for handle 10, the spacers being located only in the handle portions per se. The laminations and spacer for each handle are all secured together by suitable rivets or the like. It is apparent that more than two spaced laminations for each handle may be used, if desired. Because of the spaced lamination structure, the lug 14 of handle 10 is interleaved with the lug 15 of handle 11 when the handles are pivotally assembled by rivet 16.

Rivets, or the like, 18, 19 pivotally connect jaws 20, 21 to the ends of crank arms 12, 13. As will be described more fully subsequently, the jaws 20, 21 are angularly shaped to cross each other at 22 and to be pivotally connected together by a rivet 17, or the like, at their ends remote from the crank arms 12, 13. The actual crimping surfaces, or bite of the tool, are located between cross over area 22 and pivot 17, and are defined by the opposed recesses 24, 25. Recesses 24 and 25 are herein termed oblate semicircles. By this term it is meant that the base of each recess is semicircular, and that from the ends of the semicircle the recess extends along straight lines corresponding to tangents at the semicircle ends.

When the crank arms are formed of two spaced superposed stampings, as shown, each of the jaws 20, 21 is preferably constructed of three spaced laminations of metal stampings, as indicated at 21a, 21b, and 21c for jaw 21, and at 20a, 20b, and 20c for jaw 20, shown in Figs. 2, 3, and 4. Spacers are also used over a portion of the area of the jaws to separate the laminations thereof: spacer 21d between laminations 21a and 21b, spacer 21e between laminations 21b and 21c, spacer 20d between laminations 20a and 20b, and spacer 20e between laminations 20b and 20c. The jaw spacers extend over only a portion of the area of the jaws, as indicated in Fig. 5, in order that the jaw laminations may be interleaved at 22 and at the pivotal connection 17.

Thus, it will be appreciated that the three laminations of jaw 21 are symmetrically interleaved with the two laminations of crank arm 12, and the three laminations of jaw 20 are similarly symmetrically interleaved with the two laminations of crank arm 13. Since the laminations 11a and 11b of handle 11 are respectively located in planes one lamination thickness lower than the corresponding laminations 10a and 10b of handle 10, the same will be true of the laminations of jaw 20 with respect to the corresponding laminations of jaw 21. Consequently, the jaw laminations readily interleave as they cross one another in the area 22. The nose ends of the jaws at 17 likewise have their laminations interleaved where they come together and are pivotally joined at 17. In addition, in the transition from cross over area 22 to nose pivot 17, the laminations of one jaw are intertwined with respect to the laminations of the other jaw. In other words, at cross over area 22, laminations 21a, 21b, and 21c of jaw 21 are each respectively in a plane

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one lamination thickness higher than the corresponding laminations 20a, 20b, and 20c of jaw 20. However, at pivot 17 the jaw laminations are placed in the converse relationship; i.e., laminations 21a, 21b, and 21c are each respectively in a plane one lamination thickness lower than the corresponding laminations 20a, 20b, and 20c. The purpose of this intertwining of the laminations is to place the opposed crimping notches or recesses 24, 25 as nearly as possible in face-to-face working relationship, so that when the jaws 20, 21 are closed on a ferrule, the crimping forces will be balanced axially of the ferrule to avoid putting an axial bend in the ferrule.

In the operation of the present crimping tool, where it is desired to crimp a ferrule onto a length of hose, or other tubular or rod-like item, the ferrule is slipped over the item and placed in the position desired. With the tool open as shown in Fig. 5, for example, the item is fed through the jaw opening placing the ferrule therein. Numeral 30 denotes such a ferrule, shown in dotted lines in Figs. 5, 6, and 7. The jaws are then closed on the ferrule 30 by pivoting the handles 10, 11 toward each other about pivot 16, and thus causing crank arms 12, 13 to move outwardly along arcs having pivot 16 as their center. This movement of the crank arms causes jaws 20, 21 to close toward each other by pivoting on rivet 17. When the jaws are closed to the position shown in Fig. 6, because of the substantially oblate semicircular configurations of the recesses 24, 25, the ferrule is distorted into somewhat of an ovoid shape, as shown in Fig. 6, with the lesser diameter of the ovoid being substantially the ultimate diameter of the crimped portion of the ferrule. The jaws are then fully closed whereby recesses 24, 25 together define a circular opening, as shown in Fig. 7, and the ferrule is thus crimped or necked in the bite of the tool from the original dotted line diameter to the diameter of this circular opening. A ferrule 30 completely crimped on a tube or core 31, and still in the jaws of the tool, is shown in Fig. 8, while the finished crimped ferrule extracted from the tool after opening the jaws is shown in Fig. 9.

The afordescribed operation of the present tool in crimping or necking ferrule 30, obviously requires the application of a considerable amount of force at the bite of the tool. In order that this amount of force may be obtained from a small hand tool, an adequate mechanical advantage linkage must be provided. In the present tool, the primary source of mechanical advantage is through the crank arms 12, 13. As the handles of the tool are pivoted from the open position of Fig. 1 to the closed position of Fig. 7, the pivots 18, 19 travel over arcs defined by pivot 16 as the center and arms 12, 13 as the respective radii. During this movement there is always an outward component in the arcuate travel of the pivots 18, 19, except at the instant that pivot points 18, 19, and 16 lie in a straight line, as in Fig. 7—the fully closed position of the tool. For any given increment of angular movement of the handles 10, 11, it will thus be seen that the outward components of movement of pivot points 18, 19 are at a relative maximum starting with the position of Fig. 1, and diminish to zero with the position shown in Fig. 7. Thus, by this linkage, during the actual compression of the ferrule from the substantially ovoid form of Fig. 6 to the fully necked or crimped form of Figs. 7 and 8, the mechanical advantage of the tool rises rapidly toward infinity.

A second aspect of mechanical advantage is derived from the second class lever afforded by jaws 20, 21, with the fulcrum thereof at pivot 17, and pivots 18, 19 being the force applying points.

Having thus described one specific embodiment of the present invention, it is understood that it is presented by way of example only, and that such variations and modifications thereof as are embraced by the spirit and scope of the appended claims are contemplated as within the purview of the present invention. For example, the

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recesses 24, 25 are described specifically as oblate semicircles, in accordance with the definition of this term above set forth. However, it is apparent that if the ultimate cross section of the crimped body is desired to be other than circular, the recesses 24, 25 can be formed as an oblate of any appropriate geometric figure.

What is claimed is:

1. A crimping tool comprising first and second handles pivotally interconnected, a first crank arm carried by said first handle and extending angularly outwardly therefrom, a second crank arm carried by said second handle and extending angularly outwardly therefrom in a direction generally opposite from that of said first crank arm, a first jaw member pivotally connected to said first arm, a second jaw member pivotally connected to said second arm, said jaw members each having an angular formation and being disposed to cross each other adjacent the pivotal connections thereof to said arms, said jaw members being pivotally connected to each other at their ends remote from the last-mentioned pivotal connections, thereby providing opposed jaw member portions, said portions having opposed recesses formed therein providing the crimping bite for said tool, movement of said handles toward each other thereby causing said jaws to close toward each other, and said jaw members being each formed from a plurality of superposed laminations, said laminations of said two jaw members being interleaved at the cross over point and the pivotal connection therebetween, and being intertwined in the transition from said cross over point to said pivotal connection therebetween.

2. A crimping tool comprising first and second handles pivotally interconnected, a first crank arm carried by said first handle and extending angularly outwardly therefrom, a second crank arm carried by said second handle and extending angularly outwardly therefrom in a direction generally opposite from that of said first crank arm, a first jaw member pivotally connected to said first arm, and a second jaw member pivotally connected to said second arm, said jaw members crossing each other adjacent the pivotal connections thereof to said arms and being pivotally connected to each other at a point remote from the last-mentioned pivotal connections to provide opposed jaw member portions intermediate the pivotal connections of said members and said arms and the pivotal connection of said members to each other, said portions defining the crimping bite for said tool, movement of said handles toward each other thereby causing said jaws to close toward each other.

3. A crimping tool comprising a pair of opposed jaws pivotally connected together, opposed coacting crimping recesses formed in each jaw, said recesses being each substantially oblate in configuration, and said jaws being each formed from a plurality of superposed laminations, said laminations being interleaved at the area of pivotal connection of said jaws and being interleaved in an area to the side of said recesses opposite from said pivotal connection, said laminations further being intertwined in the transition between said two areas of interleaving, and means for opening and closing said jaws by movement thereof about said pivotal connection, said laminations and recesses being oriented to cause portions of said opposed jaws adjacent said recesses so slide past each other on crimping closure of said jaws.

4. A crimping tool comprising a pair of opposed jaws pivotally connected together, opposed coacting crimping recesses formed in each jaw, and said jaws being each formed from a plurality of superposed laminations, said laminations being interleaved at the area of pivotal connection of said jaws and being interleaved in an area to the side of said recesses opposite from said pivotal connection, said laminations further being intertwined in the transition between said two areas of interleaving.

5. A crimping tool comprising a pair of opposed jaws having opposed coacting crimping recesses formed in each jaw, said recesses being each substantially oblate in

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configuration, means interconnecting said jaws for relative movement of said recesses toward and away from each other, and said jaws being each formed from a plurality of superposed laminations, the laminations of one jaw being interleaved with the laminations of the other jaw in areas on each side of said crimping recesses, and the laminations of the two jaws being intertwined in the transition between said areas of interleaving on each side of said crimping recesses, said laminations and recesses being oriented to cause portions of said opposed jaws adjacent said recesses to slide past each other on crimping closure of said jaws.

6. A crimping tool as set forth in claim 1, wherein said opposed jaw member portions are located intermedi-

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ate the pivotal connections of said members and said arms and the pivotal connection of said members to each other, said opposed recesses are substantially oblate in configuration, and the recited parts of the tool are oriented to provide a full crimping closure of said jaw members when the three pivotal connections first recited are in a substantially straight line.

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