April 24, 1956 F. L. McGARY ET AL 2,742,698

CABLE CUTTING AND SWAGING TOOL

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FIG. 1.

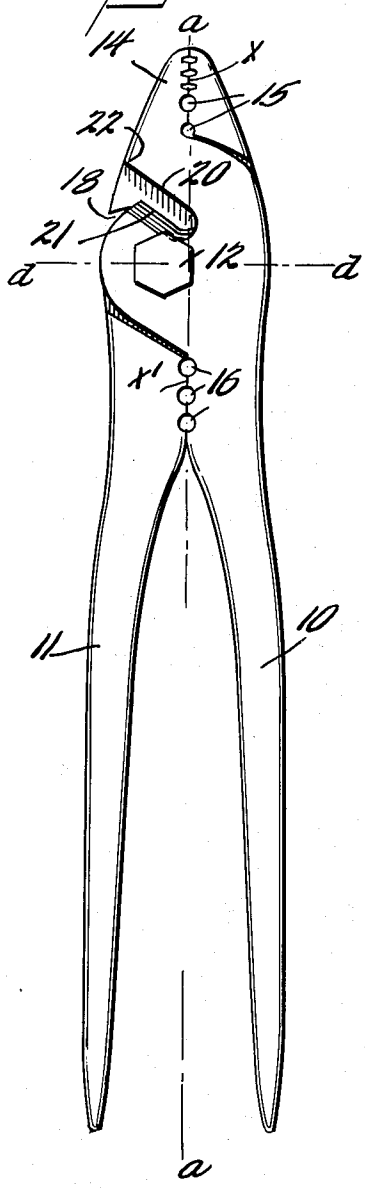


FIG. 2.

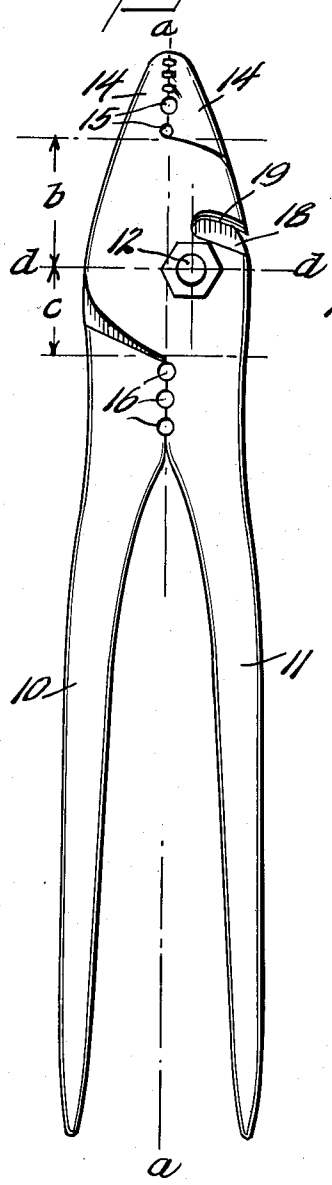
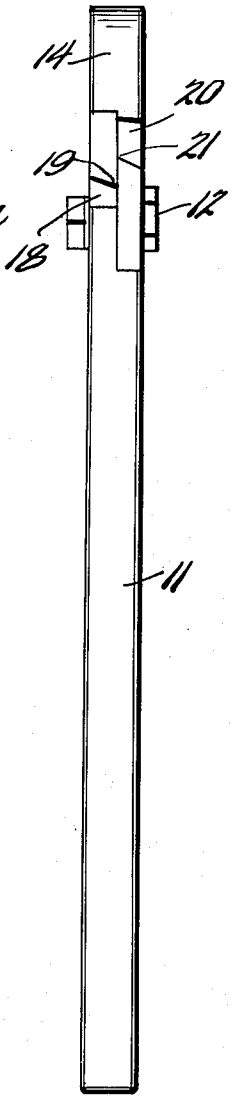


FIG. 3.



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CABLE CUTTING AND SWAGING TOOL

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FIG. 4.

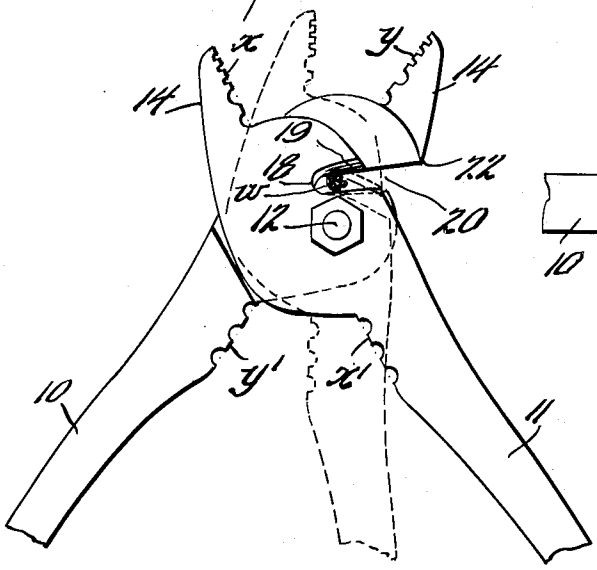


FIG. 5.

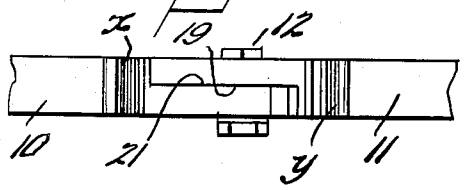


FIG. 6.

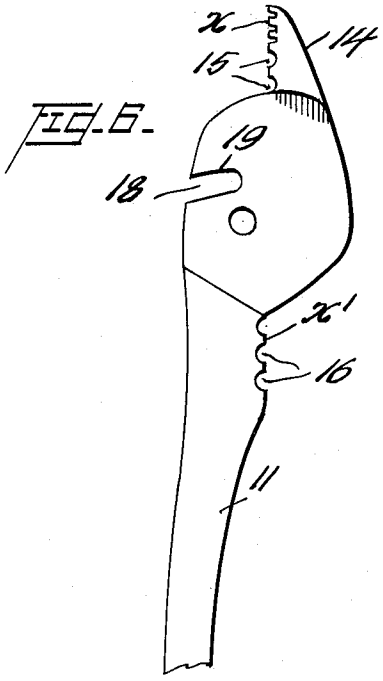
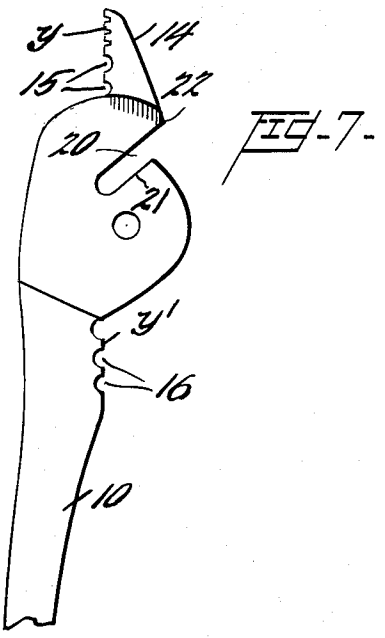


FIG. 7.



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CABLE CUTTING AND SWAGING TOOL

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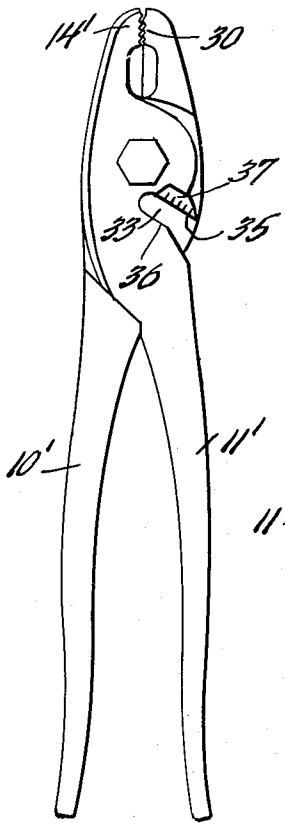

FIG. 8.

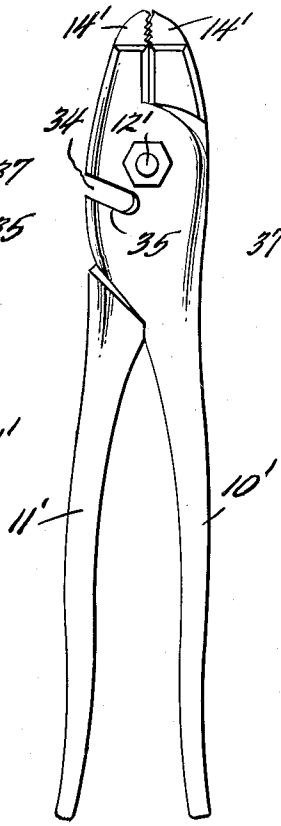

FIG. 9.

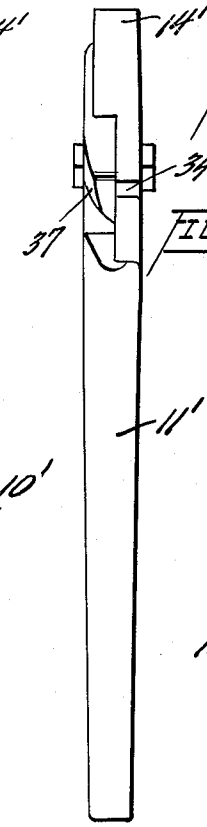

FIG. 10.

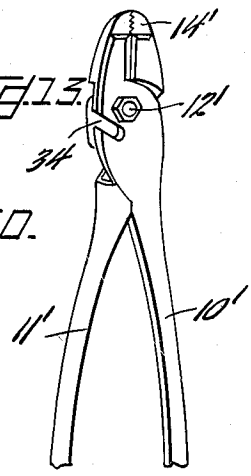

FIG. 13.

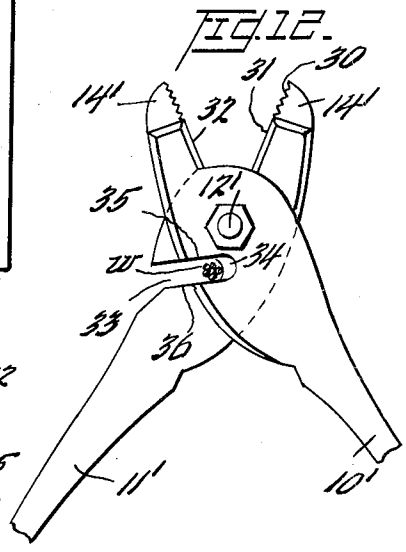

FIG. 12.

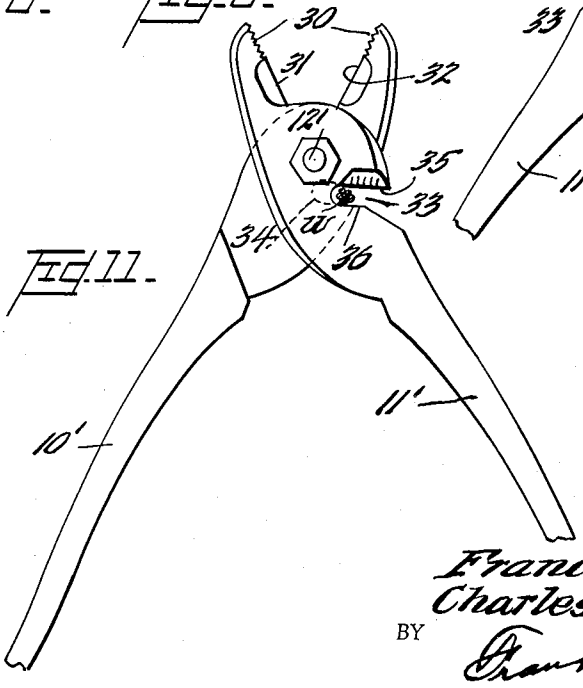

FIG. 11.

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United States Patent Office 2,742,698 Patented Apr. 24, 1956

2,742,698

CABLE CUTTING AND SWAGING TOOL

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Application November 27, 1951, Serial No. 258,484

6 Claims. (Cl. 30—237)

Our invention relates to a cable cutting and swaging tool here shown as in the form commonly known as pliers, and it is an object of the same to provide a tool of this character that is designed particularly for use in airplane service and production lines, though it is highly useful also in any other field wherein wire or wire cable is used or manipulated, such as electrical work, telephone and telegraph installation and service, etc.

Another object of the invention is to provide a tool of the character described, with improved means for cutting off wires and wire cables.

Another object of the invention is to provide a tool of the character described with improved means for guiding a cable into position to be severed.

Another object of the invention is to provide pliers of improved shape, such that they can be inserted among wires or other objects with a minimum of resistance to such insertion.

Another object is to provide a tool that will cut off a cable consisting of numerous wires twisted together, without crushing the cable, and in such manner as to leave the cut ends twisted together as a round cable.

Referring to the drawings, which are made a part of this application and in which similar parts are indicated by similar reference characters:

Fig. 1 is a view of a tool of the invention above referred to, showing one face thereof.

Fig. 2, a similar view showing the opposite face of the tool.

Fig. 3, a view showing one edge face of the tool,

Fig. 4, a view showing the upper end of the tool, with the jaws in open and in partially closed positions, respectively.

Fig. 5, an end view of the tool in open position, with parts omitted,

Fig. 6, a view of the inner face of one of the two lever members of the tool,

Fig. 7, a like view of the other lever member,

Fig. 8, a face view of another form of the invention,

Fig. 9, a similar view of the opposite face of said form,

Fig. 10, a view showing one edge face of the same,

Fig. 11, a side view of the same with its jaws open,

Fig. 12, a view showing the opposite face of the tool, with its jaws open, and

Fig. 13, a view like Fig. 11, but with the tool nearly closed.

In the drawings, reference characters **10** and **11** indicate respectively the two crossing lever members of the tool which are pivotally connected by a bolt **12**. The lever members **10** and **11** have opposed inner faces above and below the pivot as shown at *x*, *x'* in Fig. 4 on member **11** and at *y*, *y'* in said figure on member **10**, these faces refining the median plane or center line of the tool at line *a*—*a* in Figs. 1 and 2, which faces meet when the tool is closed, as in Figs. 1 and 2. The faces at *x* and *y* are corrugated transversely of the tool to form gripping faces adjacent the outer ends of the jaws **14**, as is common practice, and both sets of faces, *x*, *y* and *x'*, *y'* have

oppositely placed approximately semi-circular slots **15** and **16** that serve to swage wires to straighten them. These slots may be of various sizes to act on wires differing in diameter.

The body portion or head of each member **10** and **11** is that part located between the lowest boundary of the lowest slot **15** in the jaw **14**, as shown in Figs. 6 and 7, and the uppermost boundary of the uppermost slot **16** of the set nearest the handle end of said members, or that portion lying between the unlettered parallel cross lines respectively above and below the pivot of the tool members as shown in Fig. 2, where the distance *b* is the length of said body portion above the axis of members **10** and **11** while distance *c* is the length of the body portion below the axis, as shown in said figures. If a line be drawn horizontally across Fig. 1 or Fig. 2 midway between said parallel lines, the intersection of said line with the vertical line is the center of the body portion or head of each of members **10** and **11**.

As clearly shown in the drawings, the body of the tool is ovate, the tool being tapered or stream-lined at its jaw end from the widest part of its body portion at line *d*—*d* in Fig. 2 to a very small width near the extremity of the jaws, so that it can readily be inserted among tangled wires or other obstacles. The handles may diverge somewhat beyond the slots **16** for better fitting in the user's hand. The lever member **11** has a slot **18** that extends inwardly and slightly upward from the outer edge of its body portion to a point approximately as far from the center line *a*—*a* of the tool as is the axis of bolt **12**, providing an inclining shear edge at **19** inclined slightly upward toward the jaw end of member **11** in the drawings.

The lever member **10** has an inclined slot at **20**, extending inwardly and downwardly from a point near the upper end of its body portion, or near the base of its tapered jaw **14**, toward the handle end of said member nearly to line *d*—*d* in Fig. 1 and past vertical center line *a*—*a* in said figure or very nearly to the level of bolt **12** in Fig. 1, said slot providing a shear edge at **21**. The shape of the body portion of members **10** and **11** and the relation of the slots **18** and **20** is such that when the tool is opened to the position shown in solid lines in Fig. 4 (or nearly to fully open position), the slots **18** and **20** will register, the shear edges **19** and **21** will be parallel and separated, and the lip **22** and adjacent jaw **14** will project laterally beyond the normal outline of the tool so as to hook over an adjacent cable that is to be cut and guide it toward the center line *a*—*a* of the tool, which tool for the most effective action is pulled or drawn toward the user, but whether drawn toward or moved away from the user it is urged in a direction to move the closed ends of the shear slots toward such a cable, i. e., to the right in Fig. 4, and is then closed. As the tool approaches closed position, the parts again assume the normal streamlined position of Figs. 1 and 2. The shape of slot **20** is such that the under face of lip **22** is a continuation of the shear edge **19** of slot **18** in the position of Fig. 4 to facilitate entry of the cable into the slots. The wall of the slot adjacent edge **19** is beveled, and the wall of the slot adjacent edge **21** is still more strongly beveled to increase their cutting action.

The pivot of the lever members is displaced laterally away from the median plane of the tool as indicated by line *a*—*a* toward that edge of the tool at which the slots open out of the body portion of the same (the left hand side in Fig. 1), said plane being determined by the faces at *x*, *x'* and *y*, *y'*, and said pivot is also displaced longitudinally of the tool toward the jaw end of the same, as shown by the relative lengths of lines *b* and *c* in Fig. 2, which indicate the position of said pivot relatively to

upper and lower ends of the body portion of each of the lever members **10** and **11**.

The effect of the lateral displacement is to cause the adjacent jaw to swing laterally away from the normal outline of the closed tool as the tool is opened, i. e. toward the position indicated in solid lines in Fig. 4, and cause the upper end of lever member **11** to swing into the full-line work-guiding position of Fig. 4 as the tool is opened and to return to normal stream-lined position when the tool is closed. The effect of locating the axis of the jaws near an end of the tool is, first, to cause every point on the cutting edges to travel in an arc about the longitudinally offset pivot of the lever members in the closing movement of the tool, thereby causing each shear edge to twist or wind the wires of a cable about the axis of the cable as it is being severed, leaving the cut ends smooth and avoiding crushing of the cable; second, to increase the efficiency of the tool by decreasing the length of the weight arm of each lever to a minimum by locating the shear edges close to their fulcrum (the jaw pivot of said levers) relatively to their power arms; and, third, to render the cutter more effective by reason of the draw cut had because of the movement of the translation of said edges across the work, in addition to their circumferential movement about the work. The double draw action of the cutting edges (i. e., the wiping action of each shear edge relatively to the other) enhances the cutting action of the jaws, so that the cutter will sever cables and the like made of hardened steel or copper, such as cannot be cut by old-time pliers of equal dimensions but having radial cutting edges, as in the patent to Fisher 1,545,135, July 7, 1925, or by the well-known pliers of shear type, such as disclosed in the patent to Hardy et al., No. 777,412, December 13, 1904, and having cutting edges at the opposite side from the handles and approximately in line with said handles, so positioned that the shear edges lie in the same plane at opposite sides of the work and meet along their entire length as the work is severed.

The position of the shear-edged slots is such that they terminate near the pivot **12**, but the slots are set toward the forward end of the tool so as to lie between the said forward end and a line drawn transversely of the tool through the axis at the center of the pivot. The shear edges terminate as close to the pivot as is possible while leaving the necessary space for the work to be received in the slots and thus the length of the weight arm of each lever member is reduced to a minimum to enhance the cutting efficiency of the tool, while the location of the pivot at one side of the median plane of the tool and the location of the shear edges in offset relation to the pivot lengthwise of the tool cause the shear edges at every point to move in an arc about the axis of the tool to give them a wiping or draw action with respect to the work and to the other shear edge, thus both increasing the efficiency of the cutter in severing the work and also rotating or twisting the individual wires about the axis of a cable to cause the end to be smoothly rounded.

It should be noted in Fig. 4 that when the jaws are in the solid line position, the work (indicated as a wire *w*) can encounter the lip **22** at a point considerably to the right of any other part of the tool, and is then guided toward the closed end of each slot **19** and **20**. Then as the tool is being closed, the slots move out of registry as shown by the dotted line position of slot **20**. Now the work is trapped at the closed ends of the slots and usually it is so trapped beyond possibility of escape before any cutting action takes place, depending somewhat on the diameter and cross-sectional shape of the work. The cutting edges, of course, move in parallel planes immediately adjacent to each other.

As will be seen in Fig. 4, the jaw **14** of lever member **10** extends far outward beyond the parts of lever member **11** lying immediately below it when the tool is held upright in fully-open, work-receiving position, this being due to the relation of the slots with reference to the shape of the body portions of the lever members and to the location of the pivot connecting said body parts so that the tool can readily be hooked over a wire that is to be cut, which is a matter of great convenience to a telephone lineman, a fire fighter dealing with burning aircraft, etc. Desirably, as best shown in Figs. 11 and 12, the tool may be hung upon a wire located deep in the slots near their closed end, and, if a tool be so suspended and then partly closed, the wire will be trapped as indicated at *w* in Fig. 4. This trapping feature is of importance in the ordinary use of the tool since the wire or cable or the like is thus prevented from escaping out of the tool by accident as the tool is being closed, or before closing it.

It should be noted that the "lip" **22** extends far out from one side of the tool in its open position by reason of the location of the pivot **12** in laterally offset relation to the median line of the tool, which enables this part of the tool to move far out from its normal position, and to return to normal position when the tool is closed.

The form above described is the preferred form, and the tool shown in Figs. 8–13 is generally similar to that shown in Figs. 1–7, but the shape of the teeth **30** on jaws **14'**, **14'** differs slightly and the median plane of the tool (or the median line of Figs. 8 and 9) is defined by the meeting line of contact of the cutting edges **31**, **32**.

As in the form first described, the slots **33**, **34** are open at the same side of the tool and have shear edges **35**, **36** but shear edge **35** is crossed at right angles by narrow grooves **37** dividing that part of the jaw into separate teeth somewhat like saw teeth, for better cutting action. The slot **34** in this form of the invention is located in lever member **10'** in slightly inclined position, slanting downward toward the handle end of the tool and terminating at such a point that its shear edge **35** lies lower on the tool than the pivot, the closed inner end of the slot **33** lying below the bolt **12'** and close to it. The slot **33** is so located in its lever member **11'** as to register with slot **34** when the tool is open (Figs. 11 and 12), the shear edge **35'** being at the opposite side of a cable or wire lying in said slots, and said edges moving in a plane close to that of edge **36**.

In both of the illustrated forms of the invention, the two work-receiving slots open at the same side of the tool and extend inward in non-radial direction with respect to the pivot of the tool, i. e., toward a point spaced from said pivot. Thus, in the form of Figs. 1–7, the slots **18** and **20** are located in the jaw end of the respective lever members beyond the bolt **12**, or, otherwise expressed, the pivot is offset toward the handle end with respect to the slots.

In the second form of the invention, a similar double draw action takes place as in the tool of Figs. 1–7, the slots **33** and **34** being located between the pivot and the handle end of the tool (or where the pivot is offset toward the jaw end of the tool). Here the slots register when in an open position of the tool, and every point on each shear edge wipes past the opposed shear member, not moving with a mere movement of rotation or ordinary shear action past points on the opposed shear member or past points on the work, but exhibiting also a movement of translation across the work, i. e., a so-called draw cutting action, one result of which is a smooth tightly-wrapped end on a cut-off cable instead of a crushed flattened end.

This application is a continuation-in-part of our applications Nos. 606,390, filed July 1, 1945; and 772,682, filed September 6, 1947 (both now abandoned).

As a matter of convenience, the jaw end of the tool is referred to herein as the upper end, while the handle end is referred to as the lower end, in correspondence with the showing in the drawings. The jaw end may also be referred to as the forward end because of the usual position in approaching the work, while the handle end may then be referred to as the rear end.

It will be obvious to those skilled in the art that many changes may be made in the devices herein disclosed, and that the improvements disclosed can be embodied in other tools and devices, all without departing from the spirit of the invention; and, therefore, we do not limit ourselves to what is shown in the drawings and described in the specification, but only as indicated in the appended claims.

Having thus fully described our invention, what we claim is:

1. A plier type tool having crossed lever members, each having a handle at one end and a head at the other, a pivot connecting said members, a shear-edged slot in each head, said slots each extending inward from the same side of the tool and having cutting edges in non-radial relation to the pivot, said slots being so located in their respective heads as to register when said lever members are in substantially the maximum open position of the tool, the forward edge of one of said slots being concavely curved from its inner to its outer end whereby said edge in cooperation with one of the edges of the complementary slot traps the work at the start of the closing movement of the tool.

2. A device as in claim 1, wherein said slots are oppositely inclined with reference to the length of the tool.

3. A device as in claim 1, wherein said slots are located between the forward end of the tool and said pivot.

4. A device as in claim 1, wherein one of said slots is inclined from its open end toward the handle end of its lever member and the other slot is inclined from its open end toward the head end of its lever member.

5. A device as in claim 1 with an overhang on one of said heads for guiding the work into the registering slots, which overhang returns to normal position behind the head end of the other lever member when the tool is closed.

6. A device as in claim 1, wherein the slots are located between the rearward end of said tool and said pivot.

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