

[54] **WIRE CUTTING PLIER WITH
SEVERED END HOLDING MEANS**

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[58] Field of Search **30/112, 124, 134**

[56] **References Cited**

UNITED STATES PATENTS

466,795	1/1892	Moors	30/134
2,715,769	8/1955	Liscomb	30/124
3,126,628	3/1964	Popek	30/134

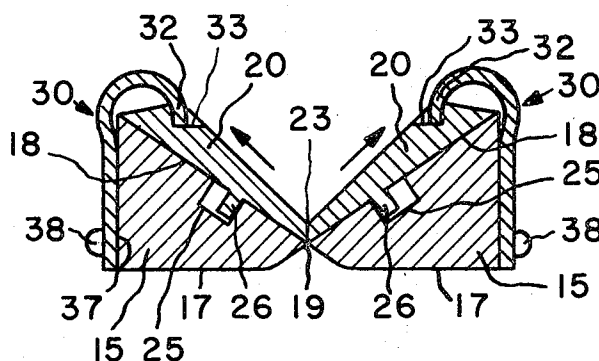
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[57]

ABSTRACT

A wire cutting plier with means for holding or gripping the severed or clipped wire end is described. The wire cutting plier part is of conventional construction. The severed end holding means comprises an additional pair of jaws each mounted on the inside surface of a plier cutting jaw and each provided with a bar engaging a slot in the cutting jaw and providing limited lateral sliding movement. Each holding jaw is resiliently held in place by one leg of a generally U-shaped spring clip anchored to the cutting jaw outer edge along a bight portion and provided with means along the other leg to prevent turning of the spring clip when the holding jaws are moved upon engagement with the wire end to be clipped.

8 Claims, 4 Drawing Figures



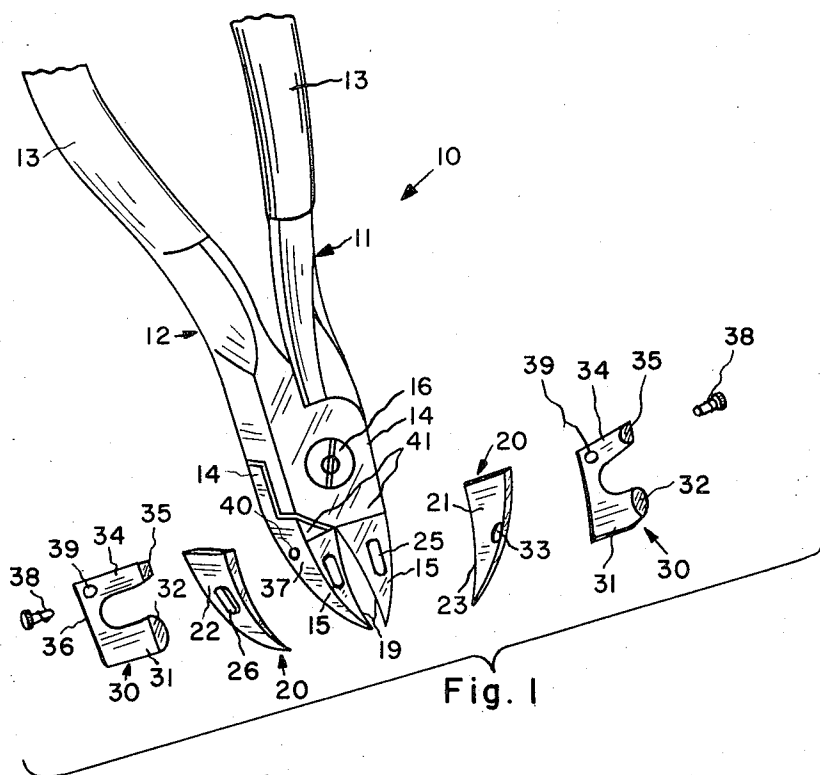


Fig. 1

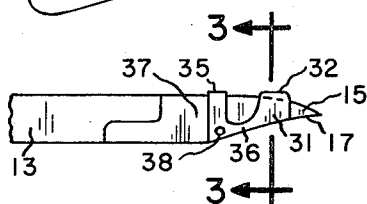


Fig. 2

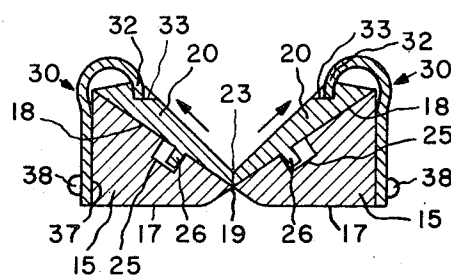


Fig. 3

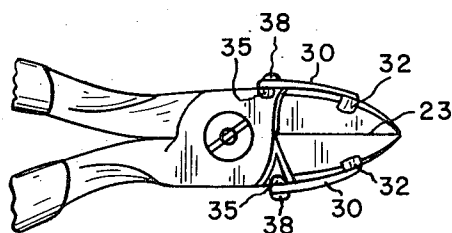


Fig. 4

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WIRE CUTTING PLIER WITH SEVERED END HOLDING MEANS

This invention relates to wire cutting pliers, and in particular to wire cutting pliers provided with means for holding or gripping the clipped or severed wire end.

The use of the conventional wire cutting plier to cut wires in for instance the manufacture or maintenance of electrical or electronics equipment often leads to difficulties due to the clipped or severed end of the wire, if not anchored to the equipment, flying off in unexpected directions during the clipping operation. This is not only potentially dangerous to the operator or neighboring employees, but it can also damage electrical equipment if the flying end lodges therein unnoticed in a position causing undesired electrical connections or short-circuits.

Many attempts have been made to cure this problem. U.S. Pat. No. 3,456,343 describes the provision of resilient material mounted in the recessed portions of the cutting jaws to hold the severed wire end. U.S. Pat. No. 2,715,769 describes the provision of anvils mounted by rivets which pass through holes in the cutting jaws and an elongated slot in each of the anvils, with a leaf spring disposed in the slot and held in place by the rivets to bias the anvils inward to grip the severed end. Neither of these or similar constructions affords a satisfactory solution to the problem. With the construction employing resilient material, after some use it is found that the resilient material becomes displaced from the cutting edge of the jaws and is thus unable to continue to perform its function of gripping the severed wire end, especially when cutting thin wires. The construction employing slotted anvils riveted in place through the cutting jaws is difficult to manufacture, and the rivet ends protruding through the non-recessed cutting jaws sides may interfere with the use of the pliers in certain situations involving manipulation of the plier side close to a particular element.

The main object of the present invention is wire cutting pliers provided with means for holding or gripping the severed wire ends and which is simple to manufacture, which locates the gripping means on the recessed side of the cutting jaws so as not to interfere with the use of the pliers under all operating circumstances, and which is sturdy and will give many hours of reliable use while continuing to perform its required function of gripping the severed wire end.

These and other objects of the invention as will appear hereinafter are achieved in accordance with the invention by the provision of an additional pair of gripping jaws, each mounted for limited sliding movement transverse to the plier cutting edges on the inside recessed surface of one of the cutting jaws. The mounting is accomplished by milling or grinding a slot on the recessed surface of each cutting jaw, which slot is engaged by a smaller bar protruding from the back of the associated gripping jaws. The gripping jaws are biased toward one another by a pair of U-shaped spring clips. One leg of each clip engages a small slot in a gripping jaw. The other leg has a small tab engaging a part of the plier adjacent the associated cutting jaw. The bight portion of the spring clip is anchored to the side edge of the cutting jaw.

The invention will now be described in greater detail with reference to the accompanying drawing wherein: FIG. 1 is an exploded view of the various parts of one

form of cutting plier in accordance with the invention; FIG. 2 is a side view of the working end of the assembled plier of FIG. 1; FIG. 3 is an enlarged cross-sectional view along the line 3—3 of the assembled plier of FIG. 2; FIG. 4 is a top plan view of the working end of the assembled plier shown in FIG. 2.

Referring now to the drawing, FIG. 1 shows an exploded view of the parts making up one form of cutting plier in accordance with the invention. The major part is a conventional cutting plier 10, which is of the diagonal cutting type, though it will be understood that the invention is not limited to such types of cutting pliers but can be applied generally to any form of cutting plier. The diagonal cutting plier illustrated is the most popular form of cutting tool in the electronics industry. It comprises a scissors-like assembly of two one-piece elements 11, 12 each comprising a handle end 13, an enlarged central part 14, and a working end comprising a cutting jaw 15. The two elements 11, 12 are pivoted together at their central parts 14 by means of the usual rivet 16. The cutting jaws 15 each comprise a generally outer flat side 17 (see FIG. 3) forming with an inner recessed or hollowed-out side 18 a cutting edge 19. The cutting edges 19 abut in the closed position of the plier. As illustrated in FIG. 2, the cutting jaws 15 are angled relative to the handles 13 in order to enable the working end to reach confined spaces and corners. In normal use, the flat sides 17 are placed precisely where the cut is to be made, the free end of the wire extending into the recessed sides 18 of the cutting jaws 15. It is important that the flat sides 17 remain free of other structure so as not to interfere with the use of the plier with respect to accurate location of the cut.

In accordance with the invention, the gripping means is located within the recessed sides 18 of the cutting jaws 15 and is secured thereto by means which does not encumber in any way the flat sides 17 of the cutting jaws. The gripping means comprises an additional pair of gripping jaws 20 each comprising a generally wedge-shaped metal segment, preferably of hardened tool steel, having top 21 and bottom 22 surfaces joining to form a slightly rounded gripping edge 23. Each gripping jaw 20 is mounted on an associated cutting jaw 15 as follows.

In approximately the center of the recessed side 18 of the cutting jaw is formed, as by milling or by grinding, a slot 25 having a length parallel to the cutting edge 19 and an width transverse to the cutting edge 19. The slot 25 forms a blind hole. The bottom side 22 of the gripping jaw contains a fixed bar-shaped projection 26 whose corresponding length is slightly smaller than that of the slot 25, enabling it to fit within the slot with loose tolerance, but whose corresponding width is substantially smaller than that of the slot 25, enabling the gripping jaw 20 to move from a closed position illustrated in FIG. 3 wherein its gripping edge 23 substantially aligns with the cutting edge 19, transversely to said edge 19 a small distance corresponding to the additional width of slot 25 to an open position wherein the gripping edge 23 is spaced inward the same small distance from the cutting edge 19. Any further lateral movement of the gripping jaw 20 is stopped or arrested by the bar 26 hitting the slot wall.

Each gripping jaw 20 is held in place on a cutting jaw 15 and simultaneously biased into its closed position by a U-shaped resilient retaining clip 30, preferably of spring steel. The clip 30 comprises a first leg 31 having a downturned edge 32 shaped to fit into a small slot 33 formed in the upper edge of the top surface 21 of the gripping jaws 20. Spring tension holds the edge 32 in the slot 33. The second leg 34 comprises a small tab end 35 which extends at right angles to the plane of the clip. The bight portion 36 of the retaining clip 30, which joins the legs together, is anchored to the side edge 37 of the associated cutting jaw 15, for example, by means of a drive screw 38 which passes through a hole 39 in the bight portion 36 and is held by a friction fit in a hole 40 in the side edge 37. The arrangement of the clip 30 is such that the tab end 35 engages the top flat surface 41 of the central part 14 of the scissor element to which the associated cutting jaw 15 is connected.

The operation of the plier is as follows. Without a wire to be cut present, the gripping jaws 20 occupy their closed position illustrated in FIG. 3 with their gripping edges 23 aligned with the cutting edges 19 whether the plier is opened or closed. When a wire is to be cut, it is usually inserted between the open plier jaws from the flat side 17 and the free end protrudes within or above the gripping jaws 20. When the plier jaws are closed during the cutting operation, the cutting edges 19 come together cutting through and clipping the wire. The gripping jaws 20 upon contacting the wire slide transversely in the opposite directions indicated by the arrows of FIG. 3 against the biasing action of the clips 30, whose legs 31 become slightly outwardly bent. Thus, the clipped wire end is tightly held by the inwardly biased gripping jaws 20, and will not go flying off as in the conventional plier. As the plier is opened, the gripping jaws 20 return to their closed position and upon further opening of the plier, the gripping jaws also open releasing the clipped wire end.

The tab end 35 stabilizes the position of the gripping jaw and keeps it aligned with its associated cutting jaw and prevents the retaining clip and gripping jaw from rotating out of its proper operating position. The bar 26 and slot 25, in addition to guiding the travel of the gripping jaw, also provide the additional function of preventing breaking of the spring clip if an attempt is made to cut a wire larger than that for which the plier was designed. Thus, if cutting of too large a wire is attempted, then before the cutting edges 19 reach one another, the gripping jaws will reach the limit of their sidewise travel when the bars 26 hit the end wall of the slots 25 and prevent further closing of the cutting jaws or excessive flexing of the spring clip. The slot can be given a width approximately one-half a wire thickness larger than the corresponding width of the bar. Thus, the construction of the invention protects against an impermissible use of the plier which may result in damage thereto.

As will be evident from the foregoing description, the plier construction of the invention provides means for gripping the clipped wire end and preventing it from flying off in unintended directions. The construction to attain this result is simple, and applicable to even a small cutting plier. The described construction takes up little additional space and leaves the flat cutting jaw

sides free of encumbrances which can interfere with accurate cutting of wires or placing of the plier in hard-to-reach locations or confined spaces, or can injure delicate electronic components such as printed circuit boards. Reliable and long operating life will be achieved due to the use of all metal parts and hardened tool steel where contact with the wire is effected. A further feature of the invention is that the holes 40 in the side edges 37 can be tapped, and the anchoring elements 38 given matching threads, which will enable ready assembly and disassembly of the gripping jaws by means of a simple screwdriver. This allows for easy replacement of the gripping jaws should they become worn, or for temporary removal of the gripping jaws should it become necessary or desirable to resharpen the cutting jaw edges.

While but one embodiment of the present invention has been illustrated and described, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention as expressed herein.

What is claimed is:

1. Cutting plier comprising a pair of pivotally-mounted cutting jaws, said cutting jaws each having a generally flat side and a generally recessed side forming at their intersection a cutting edge and a side edge remote from the cutting edge, and means for gripping the severed end of a wire introduced between the cutting jaws from their flat sides; said gripping means comprising a pair of gripping jaws each slidably mounted on a recessed side of a cutting jaw for sliding movement on the recessed side transverse to the cutting edges, each gripping jaw having a gripping edge generally aligned with the cutting edge and engaging the gripping edge of the other gripping jaw in the absence of the wire to be cut, resilient means for biasing each of the gripping jaws toward one another and for retaining the gripping jaws on the recessed sides of their respective cutting jaws, said resilient retaining and biasing means comprising a generally U-shaped spring clip having first and second leg portions interconnected by a bight portion, means on the first leg portion for engaging the gripping jaw, means on the second leg portion for engaging the associated cutting jaw, means for securing the bight portion to the cutting jaw side edge, and means for arresting the transverse sliding movement of each gripping jaw after it has travelled a limited distance.

2. Cutting plier as set forth in claim 1 wherein the upper edge of the gripping jaw has a slot, and the engaging means on the first leg portion comprises a downturned edge engaging the gripping jaw slot.

3. Cutting plier as set forth in claim 1 wherein the engaging means on the second leg portion comprises a tab end extending at right angles to the plane of the spring clip and abutting a flat surface of the cutting jaw.

4. Cutting plier as set forth in claim 1 wherein the securing means comprises a single pin passing through the bight portion and engaging a hole in the cutting jaw side edge.

5. Cutting plier as set forth in claim 1 wherein the recessed side of the cutting jaw contains a slot having a width transverse to the cutting edge, and the gripping jaw contains a projection on its bottom side and engaging the cutting jaw slot.

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6. Cutting plier as set forth in claim 5 wherein the slot has a width approximately half a wire thickness larger than the corresponding dimension of the projection.

7. Cutting plier comprising a pair of pivotally-mounted cutting jaws, said cutting jaws each having a generally flat side and a generally recessed side forming at their intersection a cutting edge and a side edge remote from the cutting edge, and means for gripping the severed end of a wire introduced between the cutting jaws from their flat sides; said gripping means comprising a pair of gripping jaws each slidably mounted on and in contact with a recessed side of a cutting jaw for sliding movement on the recessed side transverse to the cutting edges, each gripping jaw having a gripping edge generally aligned with the cutting edge and engaging the gripping edge of the other gripping jaw in the absence of the wire to be cut, plural

resilient means for biasing each of the gripping jaws towards one another and for retaining the associated gripping jaw on the recessed side of its respective cutting jaw, each of said resilient retaining and biasing means comprising a spring clip, means for securing each spring clip to a cutting jaw side edge, each spring clip having a portion extending over and into engagement with a gripping jaw and exerting thereon a combined downward pressure toward the cutting jaw and inward pressure toward the other gripping jaw, and means for arresting the transverse sliding movement of each gripping jaw after it has travelled a limited distance.

8. Cutting plier as set forth in claim 7 wherein each spring clip includes means for preventing rotation of the spring clip relative to the cutting jaw.

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