

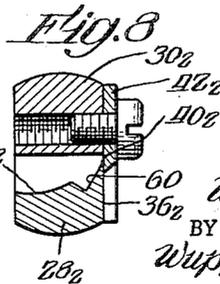
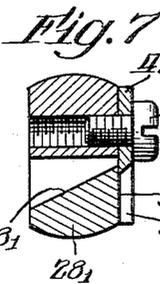
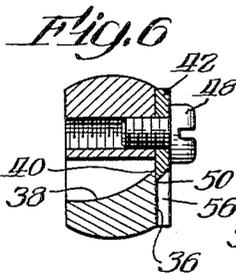
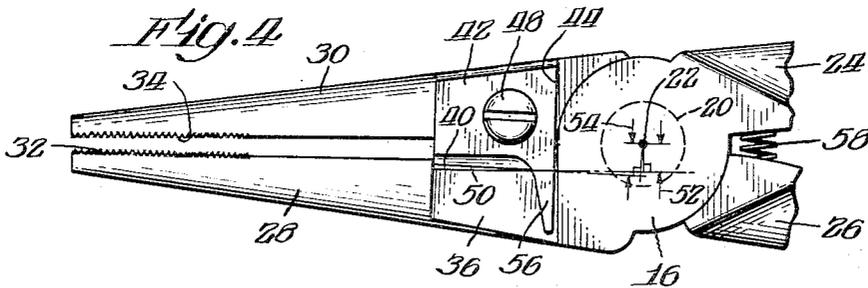
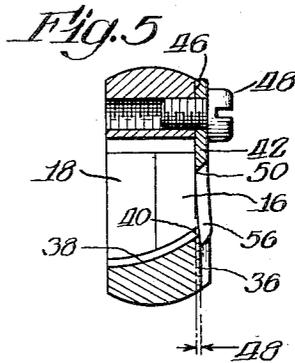
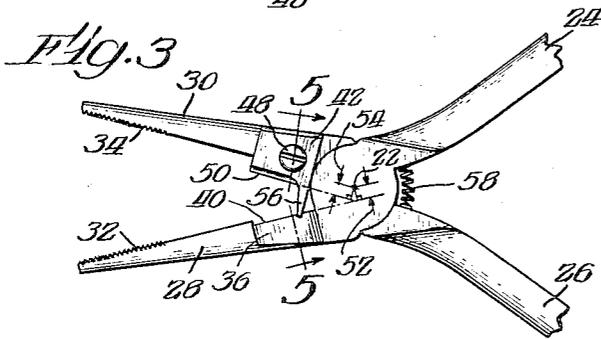
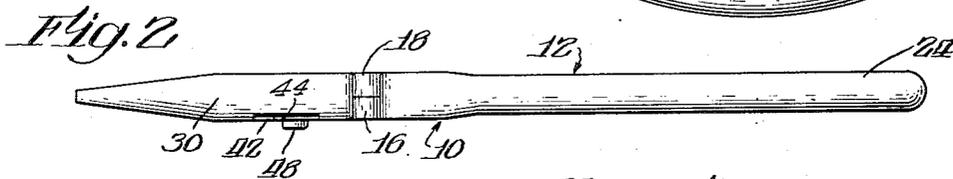
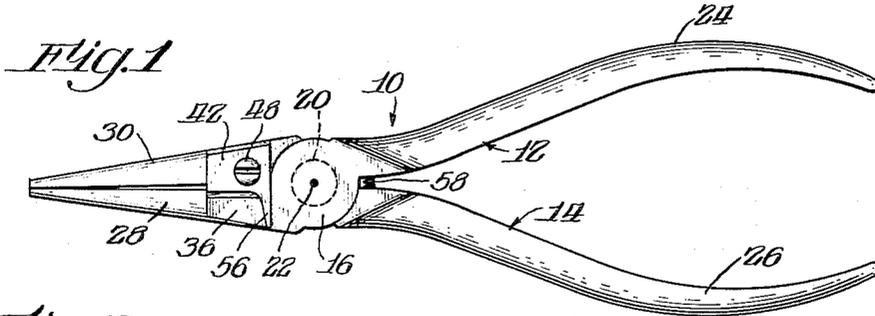
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2,848,810

LONG NOSE CUTTING PLIERS

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LONG NOSE CUTTING PLIERS

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3 Claims. (Cl. 30—261)

The present invention relates to side cutting pliers suited to cut, bend, and otherwise handle wires of small diameter.

One object of the invention is to provide improved side cutting pliers well adapted for gripping and bending wire of various sizes and having an extraordinarily durable capacity to efficiently cut wire of small diameter, even extremely fine wire formed of very hard materials.

Another object is to provide improved side cutting pliers in which the wire cutting capabilities recited in the previous object are provided with undiminished effectiveness over an extended service life in conjunction with a capability of the pliers to freely open and close through an angular range of movement at least equal to that of conventional pliers of a similar style.

Other objects and advantages will become apparent from the following description of the exemplary form of the invention shown in the drawings, in which:

Figure 1 is a side view of pliers forming the exemplary embodiment of the invention;

Fig. 2 is a top view of the pliers shown in Fig. 1;

Fig. 3 is a fragmentary side view showing the pliers in open position;

Fig. 4 is a fragmentary side view showing the pliers in an intermediate position illustrating the orientation of the shearing edges relative to each other;

Fig. 5 is a transverse sectional view taken along the line 5—5 of Fig. 3;

Fig. 6 is a view similar to Fig. 5 but showing the pliers in closed position;

Fig. 7 is a sectional view similar to Fig. 6 but showing a modification of the plier structure; and

Fig. 8 is a sectional view similar to Fig. 6 but showing a second modification of the plier structure.

Designed specifically to handle small wires, such as those used in electronic circuits, the improved pliers 10 forming the exemplary embodiment of the invention comprise a pair of elongated levers 12, 14 disposed in crossing relation to each other, as shown in Fig. 1. The intermediate longitudinal portion of each lever that crosses the other lever forms a lever hinge section which is pivotally connected to a similar hinge section on the other lever. As viewed from one longitudinal side of the pliers, Fig. 2, each of the hinge sections 16, 18 of the respective levers 12, 14 is sharply relieved at one side to accommodate and fit flat against the other hinge section. A pivot pin 20 fixedly anchored in the hinge section 16 extends through the other hinge section 18 to define with the latter a hinge axis, indicated by the dot 22, about which the two levers 12 and 14 swing in relation to each other.

The levers 12, 14 are operated by two opposed handles 24, 26 formed by the portions of the respective levers which extend in one direction from the lever hinge sections 16, 18.

The opposite ends of the levers 12, 14 form two jaws 28, 30 projecting in opposing relation to each other from the two lever hinge sections 16, 18. The jaws 28,

2

30 are elongated and shaped as shown to form two flat, yet serrated, gripper surfaces 32, 34 opposing each other in substantially parallel relation to the hinge axis 22 and extending with a gradually tapering width out to the extreme ends of the jaws.

Extremely efficient cutting by the pliers 10 of small diameter wires, even very fine wires, and very hard wires, is provided in a manner which preserves the cutting efficiency of the pliers undiminished over a long service life of hard usage.

The hinge section end of the jaw 28 is milled on one side to define a slightly recessed, flat surface 36 perpendicular to the hinge axis 22 and extending longitudinally along the jaw for a substantial distance. The longitudinal portion of the jaw 28 which defines the flat surface 36 is milled away at the side facing the other jaw 30 to define a concave surface 38, Figs. 5 and 6. The concave surface 38 intersects the flat surface 36 at an acute angle along a straight line to define at the intersection of the two surfaces a straight shearing edge 40 parallel to the adjacent gripper surface 32 and having a very substantial length along the jaw 28. In pliers designed to handle small wires, the shearing edge 40 should be approximately one-half inch long or longer. A wire (not shown) which is to be cut to a desired length is placed across the shearing edge 40 and sheared off by a flat shearing blade 42 projecting from the jaw 30 in opposing relation to the shearing edge 40.

The shearing blade 42 fits snugly into a shallow recess 44 milled into the hinge section end of the jaw 30. As shown in Fig. 5, the recess 44 has a flat base surface 46 substantially parallel to the jaw surface 36 but offset a very short distance inwardly of the jaw surface 36. More fundamentally stated, the orientation of the base surface 46 on the jaw 30 is such that upon closing of the jaws 28, 30 the plane of the base surface 46 intersects the opposing jaw 28 a very slight distance 48, Fig. 5, inwardly of the shearing edge 40.

The flat blade 42 is fitted snugly into the recess 44 as stated and held firmly against the base surface 46 by a single screw 48 extending through the blade and threaded into the jaw 30. Thus supported, the blade 42 projects toward the jaw 28 in a direction such that the projecting end of the blade must be physically forced to one side to pass the shearing edge 40 upon closing of the jaws 28, 30, Fig. 6.

The projecting end of the blade 42 is cut and beveled away from the plier jaws to form a straight shearing edge 50 extending along nearly the entire length of the jaw shearing edge 40 and having an orientation with respect to the latter edge such that the blade edge 50 is virtually parallel to the jaw edge 40, Fig. 4, when the shearing edges approach each other as the jaws 28, 30 swing together. This virtually parallel relationship between the two approaching shearing edges 40, 50 is achieved by orienting the two edges so that the distance 52 from the hinge axis 22 to the jaw edge 40, Figs. 3 and 4, measured perpendicularly to the jaw edge 40, is only slightly less than the distance 54 from the hinge axis to the blade edge 50, measured perpendicularly to the edge 50. This orientation of the shearing edges 40, 50 relative to each other also provides for slight overlapping of the blade 42 on the surface 36 when the jaws 28, 30 are fully closed, as shown in Figs. 1 and 6.

As shown in Fig. 3, the pliers 10 are free to open through an angular range of opening movement which is at least equal to that of similarly styled, long nose pliers of conventional construction. It is noteworthy that opening of the pliers 10 to the fully open position shown swings the entire length of the shearing edge 50 a very substantial distance away from the shearing edge 40.

Yet, despite the offset mounting of the blade 42, which tends to swing the shearing edge 50 into interfering relation to the opposing jaw 28, smooth closing of the pliers is provided for by a tang 56 on the blade 42 which projects from the hinge axis end of the blade edge 50 into overlapping relation to the jaw surface 36. As shown in Fig. 3, the tang 56 has sufficient length to extend beyond the shearing edge 40 when the tool is in its fully open position.

Hence, upon closing the pliers, the tang 56 rides across the jaw surface 36 to forcibly guide the adjacent end of the blade edge 50 into crossing relation to jaw edge 40, Fig. 4. At this time, and as closing the pliers continues, the resiliency of the blade 42 holds the blade edge 50 firmly against the jaw edge 40 as the two edges shear past each other.

The firm sliding engagement of the two shearing edges 40, 50, thus maintained by the spring action of the stressed blade 42, provides for highly efficient cutting of even extremely fine wire. There is no space between the adjacent portions of the two edges 40, 50 into which fine wire can bend rather than be cut in two by the shearing edges.

Moreover, any wear on either the jaw surface 36 or the blade 42 due to frictional sliding of the blade on the jaw surface is fully compensated for by the tendency of the stressed blade to swing the shearing edge 50 inwardly of the shearing edge 40. This resilient action of the blade also compensates fully for any wear on the pivotal support of the lever 12 on the hinge pin 20.

It will be appreciated that even though the coating shearing edges 40, 50 are held firmly together as they slide across each other, neither edge is blunted by its side engagement with the other edge. Hence, use of the pliers 10 dulls the shearing edges 40, 50 only to the extent they are worn by engagement with the wires cut in the pliers.

The edge dulling effect which might otherwise result from wear of the shearing edges 40, 50 by wires cut in the pliers is effectively nullified by the fact that the wear is distributed over the entire length of the rather long blade edge 50 and the corresponding portion of the jaw edge 40. This distribution of wear along the shearing edges 40, 50 and the resulting capacity of the tool to maintain its cutting efficiency undiminished over a very long service life arise from the capacity of the pliers to efficiently cut a wire placed across any portion of the straight jaw edge 40 opposing the long blade edge 50.

The virtually parallel relationship provided between the approaching shearing edges 40, 50 eliminates any tendency a wire might otherwise have to slide along the shearing edges as shearing pressure is applied from opposite sides of the wire. This capacity of the virtually parallel, straight shearing edges 40, 50 to hold a wire being cut against sliding along the edges applies even to wires formed of very hard material.

Preferably, the tool is biased toward its open position by a compression spring 58 mounted between the hinge section ends of the two handles 24, 26.

A modification of the pliers is illustrated in Fig. 7, in which structural counterparts of the previously described plier structure shown in Figs. 1 to 6 are designated by the same reference numerals used in Fig. 6 but with the addition of the subscript "1." The modified structure shown in Fig. 7 differs from that previously described only in that the inner face of the jaw 28 is milled to define a flat surface 38₁ (rather than the concave surface 38, Fig. 6) intersecting the jaw surface 36₁ at an acute angle.

In Fig. 8, which shows another modification of the plier structure, similar structural elements are designated by the same reference numerals, but with the addition of the subscript "2." In this form, the concave surface 38₂ is milled away at the shearing edge side of the

jaw 28a to define a narrow flat surface 60 which intersects the surface 36₂ at a sharp angle to form a very sharp shearing edge 40₂.

While I have shown a preferred embodiment of my invention, it will be apparent that variations and modifications thereof may be made without departing from the underlying principles and scope of the invention. I therefore desire, by the following claims, to include all such variations and modifications by which substantially the results of my invention may be obtained through the use of substantially the same or equivalent means.

I claim:

1. Long nose pliers comprising, in combination, two elongated levers each having an intermediate hinge section crossing the hinge section of the other lever, pivot means connecting said levers together at said hinge sections thereof to swing in relation to each other about a predetermined hinge axis, one end of each lever being shaped into a handle opposing the handle of the other lever, the end of each lever opposite from said handle thereon being shaped into a tapered plier jaw extending from the hinge section of the lever, each jaw defining a generally flat gripping surface opposing the gripping surface of the other jaw in substantially parallel relation to said hinge axis, one of said jaws defining on the hinge section end thereof a first plane surface substantially perpendicular to said hinge axis and having a substantial length along the jaw, said hinge section end of said one jaw defining a second surface facing the other jaw and intersecting said first plane surface at a sharp angle to define therewith a straight shearing edge extending a substantial distance along said one jaw, said other jaw defining on the hinge section end thereof a substantially flat blade base surface generally parallel to said first surface on said one jaw, the plane of said base surface being oriented on said other jaw to intersect said second surface of said one jaw a very slight distance from said shearing edge when said jaws are swung together, a flat shearing blade fixed to said blade base surface to project therefrom into overlapping slidable engagement with said first surface of said one jaw upon swinging of said jaws together, the side of said blade projecting toward said one jaw defining a straight shearing edge nearly equal in length to said jaw shearing edge and oriented to have a virtually parallel relationship to said jaw shearing edge as the two edges approach each other upon closing of said jaws, and a tang on said blade projecting from the hinge section end of said blade edge into overlapping relation with said first jaw surface to guide said blade shearing edge across said jaw shearing edge and having a length sufficient to remain in overlapping relation to said first jaw surface when said jaws are swung apart to completely separate said shearing edges from each other.

2. Pliers suited specifically for cutting and handling wires of small diameter and comprising, in combination, two levers disposed in crossing relation to each other and medially pivoted together for hinging movement about a common axis, said levers being shaped to define two opposed handles extending in one direction from said hinge axis and two opposed jaws extending in the opposite direction from said hinge axis, each of said jaws defining a wire gripping surface substantially parallel to said hinge axis and opposing the gripping surface of the other jaw, one of said jaws defining on one side thereof a shear surface extending a substantial length along the jaw in generally perpendicular relation to said hinge axis, said one jaw defining a second surface thereon facing the other jaw and intersecting said shear surface at a sharp angle to define therewith a straight shearing edge extending a substantial distance along said one jaw, a resilient shearing blade fixed to said other jaw and projecting therefrom to extend across said jaw shearing edge and have slidable overlapping engagement with said shearing surface when the jaws are swung together, and the projecting marginal edge of said blade which overlaps said shearing surface

5

being shaped into a straight shearing edge extending substantially the full length of said jaw shearing edge and having a spacing from said hinge axis measured perpendicularly to the jaw shearing edge which is only very slightly greater than the spacing from said hinge axis of said jaw shearing edge measured perpendicularly to the latter edge thus providing a virtually parallel relationship between the blade shearing edge and the jaw shearing edge when the two are in crossing relation to each other.

3. Pliers suited specifically for cutting and handling wires of small diameter and comprising, in combination, two levers disposed in crossing relation to each other and medially pivoted together for hinging movement about a common axis, said levers being shaped to define two opposed handles extending in one direction from said hinge axis and two opposed jaws extending in the opposite direction from said hinge axis, each of said jaws defining on the projecting end thereof a wire gripping surface opposing the gripping surface of the other jaw, a longitudinal portion of one of said jaws on the hinge axis end thereof defining on one side of the jaw a shear surface extending a substantial distance along the jaw in generally perpendicular relation to said hinge axis, said longitudinal portion of said one jaw defining a second surface thereon

6

facing the other jaw and intersecting said shear surface at a sharp angle to define therewith a straight shearing edge extending a substantial distance along said one jaw, a resilient shearing blade fixed to said other jaw and projecting therefrom to slidably overlap said shearing surface when the jaws are swung together, and the projecting marginal edge of said blade which overlaps said shearing surface being shaped to define a straight shearing edge extending substantially the full length of said jaw shearing edge and oriented to have a virtually parallel relation to said jaw shearing edge when the two are crossed by movement of said jaws toward each other, and a tang on said blade projecting from the hinge axis end of said blade shearing edge to overlap said shear surface of said first jaw.

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