

[54] **PLIER JAWS**

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[58] **Field of Search**.....81/418, 5.1, 425, 426, 3-6; 7/5.4, 5.5; 140/106, 118, 123, 123.5, 121; 128/321, 326, 322, 346; 294/8.5

[56]

**References Cited**

**UNITED STATES PATENTS**

2,394,807	2/1946	Robinson.....	7/5.2
3,420,280	1/1969	Allyn.....	140/118
1,413,690	4/1922	Slocum.....	81/3.06 X
621,327	3/1899	Conrad.....	81/425 X
651,121	6/1900	Potterton.....	294/8.5

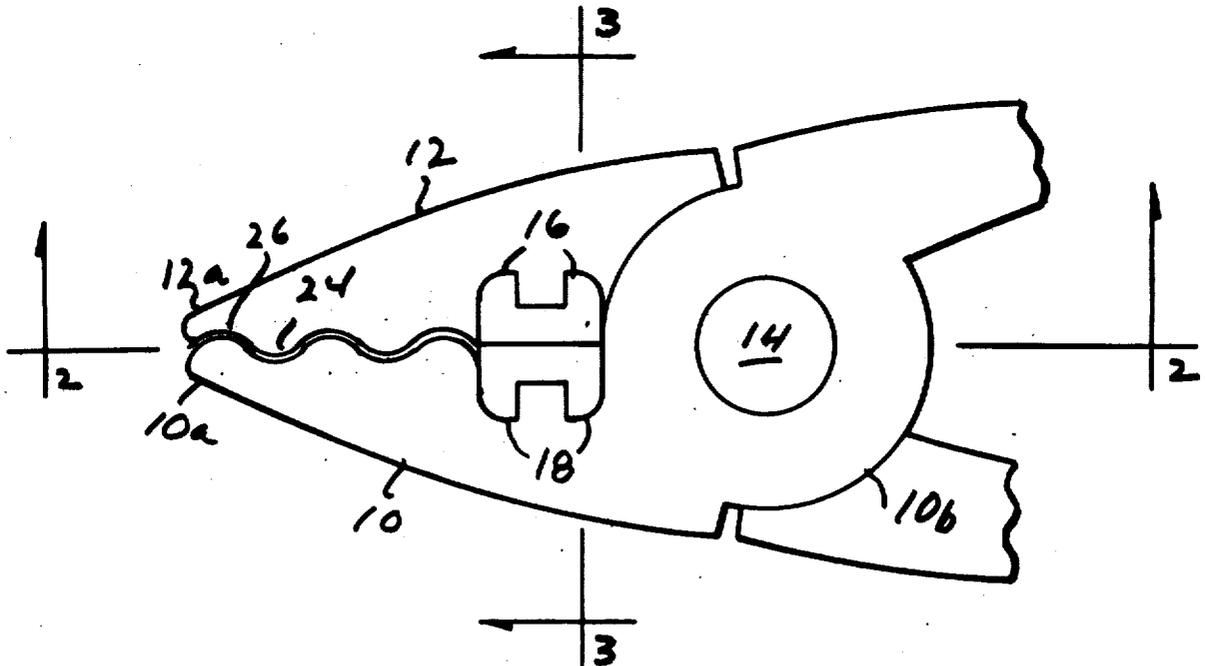
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**ABSTRACT**

A pair of pliers having wire gripping jaws wherein the opposing wire engaging surfaces are formed as undulating surfaces without sharp bends to increase the linear contact with the wire to be engaged without nicking or scraping the wire.

**8 Claims, 3 Drawing Figures**



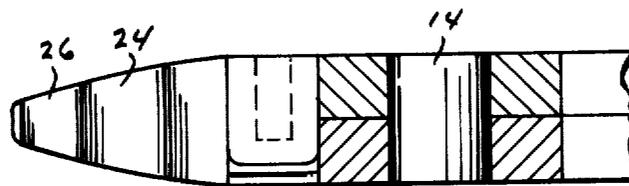
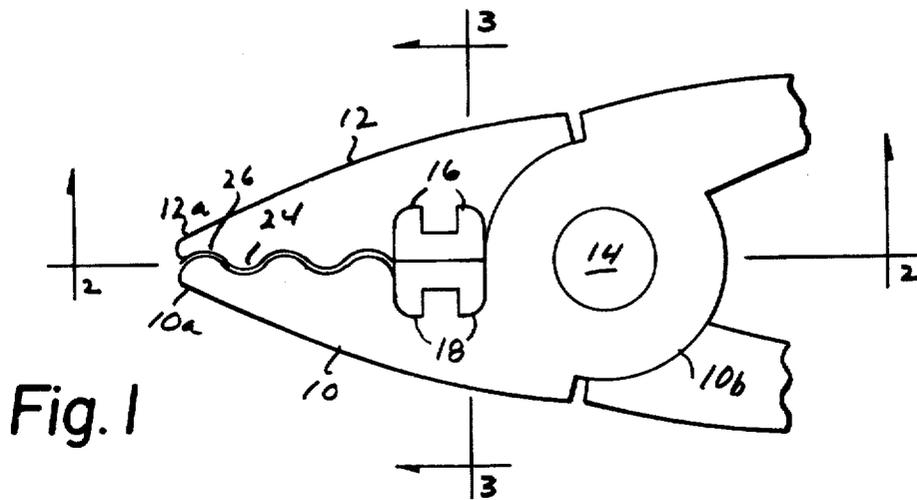


Fig. 2

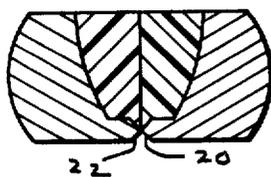


Fig. 3

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## PLIER JAWS

This invention relates to wire gripping pliers and to improvements in the gripping surfaces of the jaws particularly useful in wire twisting pliers.

Heretofore, it has been common practice to capture or lock certain screws or bolts on machinery, subject to considerable vibrations, such as on engines for airplanes and the like, by drilling holes in the screw heads, then passing one end of a high tensile steel wire through the holes of two or more screws twisting the two ends together, then passing one of the free ends beyond the twist through the head hole in the adjacent screw and twisting the remaining ends together to prevent the wire from coming out of its relationship with the screw heads; as many as three screws may be secured with one lock wire to lock the screws against turning. The final securing of the wire included pulling the wire to take up the slack, as well as twisting the ends together. After the wire is twisted, the ends beyond the twisted part are cut off. This may be done at an intermediate part of the twisted position. The twisted stub that is left is bent over out of the way. U.S. Pat. Nos. such as 3,420,280, 2,737,983 and 2,394,807 are exemplary of such devices. The inner faces of the jaws of such pliers, as shown at FIG. 1 of U.S. Pat. No. 2,737,983 and No. 2,394,807, are commonly provided with transverse serrations which, when the wire ends are gripped, bite into the wire and prevent the wire from slipping out from between the jaws.

The problem has been that the sharp serrations which enable a good functional grip also dug into and caused nicks in the wire resulting in weakened sections that frequently caused a failure or breakage of the wire during the actual twisting and limited the amount of twisting and the resultant tension that could be applied.

The present invention contemplates an improved form of jaws whereby an improved grip is provided with the wires and whereas the possibility of the wire being nicked is eliminated. Briefly, this is effected by providing a jaw structure which enables a greater length of wire to be gripped without any short bends or cutting into the wire. In addition, the jaws are so shaped that the twisting operation may be performed in a confined space.

Still other advantages of the invention and the invention itself will become more apparent from the following description of an embodiment thereof which is illustrated by the accompanying drawings and forms a part of this specification.

In the drawings:

FIG. 1 is a side elevational view of the jaw ends of a pair of pliers, the handles being broken away, constructed according to the invention;

FIG. 2 is a plan view of the inner face of one of the jaws, and taken from the line 2—2 of FIG. 3; and

FIG. 3 is a section on the line 3—3 of FIG. 1.

Briefly, the invention comprises forming the wire engaging surfaces of the jaws to an undulating form of generally sine wave. This may take the form of a true sine wave or a damped sine wave.

As shown in FIG. 1, the jaws 10—12 are tapered from the tips 10a—12a to base portions such as 10b, which are provided with openings and are secured together at their bases by the usual hinge pin structure 14 which passes through the openings and is headed over on the outer sides.

As can be seen from FIG. 2, the jaws also preferably taper from the base toward the tips. The jaws may also be formed with wire cutting means adjacent their bases as best shown in FIGS. 1 and 3. To this end the jaws are formed with a pair of spaced parallel grooves 16—18 which extend inward from one side and curve toward each other and terminate short of the other side, the portion beyond the grooves at the other side of the jaws being formed to provide a pair of surfaces that may be ground to provide wire cutting edges 20—22. The space between the jaws therein provided is filled with a suitable resilient material whereby the parts of wire cut off are retained between the jaws and do not drop into unwanted places.

As best seen from FIG. 1, the inner faces of the jaws are formed to provide undulating or wavy surfaces that extend from the tips to the wire cut-off means longitudinally of the jaws with the hills 24 and valleys 26 extending transversely across the jaws. These surfaces, as viewed from the edge, may best be defined as being of sine wave form where the crests and valleys are of equal length and height, or damped wave form where they decrease in height from one end to the other. Obviously, they need not be of true sine or damped wave form, the main desiderium being that they do not have any sharp curves to make sharp bends or nick the wire. It is also apparent that the crests and valleys need not extend transversely, since they could extend diagonally, although obviously extending straight across the face of the jaws providing a highly improved result.

It will be noted that the hills on one jaw face extend into the valleys on the other jaw face. In addition, it can be seen that the so formed faces need not actually be in contact with each other when the jaws are closed and may be spaced apart a distance approximately equal to the radius of the diameter of the smallest wire that is to be twisted. It is also pointed out that the spacing between the jaw faces, with the jaws closed, may be wider at the base than at the tips to thus provide a more even pressure of the wire for the full length of the jaws.

When the ends of the wire are to be gripped, they are placed in as nearly parallel relation as is feasibly possible between the open jaws. As the jaws close upon the wire, the wire is formed into undulating form, thus a greater length of the wire or wires is disposed between the jaws than in previous jaws, and there is a greater linear gripping surface and resultant friction with the wire than was possible with prior art jaws. It can be seen that, when the spacing between the jaws is equal, the extremities of the wire are engaged as the jaws are clamped down, and that actually by virtue of this, the wire is actually drawn into the jaws to a certain extent which decreases the amount of stretching of the wire during its deformation.

The wire is thus deformed, and because of the snubbing effect of the hills and valleys, greater tension may be applied as it is twisted, and there is no cutting into or scraping of the wire surface as was present in the prior art. The above is particularly valuable where coated wire is used, since with the above operation, the coating remains undisturbed.

I claim:

1. A wire gripping pliers including a pair of jaws for gripping a wire and a pair of handles in extension from the jaws with the jaws pivotally secured together

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spaced from the ends, the improvement which comprises a pair of wire gripping surfaces on the jaws formed to grip the wire and free from sharp bends said gripping surfaces being in the form of at least two continuous undulations extending longitudinally of the jaws with their median meeting line extending through the axis of the point where they are pivotally secured together.

2. A pair of pliers are described in claim 1 wherein said undulations are in the form of a sine wave.

3. A pair of pliers as described in claim 1 wherein said undulations are in the form of a damped sine wave.

4. A pair of pliers as described in claim 1 wherein said undulations have high and low portions extending

substantially equally spaced on each side of a center line through the jaw pivot.

5. A pair of pliers as described in claim 4 wherein said high and low portions extend transversely across the jaw surfaces.

6. A pair of pliers as described in claim 5 wherein the high portion on one jaw is arranged to extend into the low portions of the other jaw.

7. A pair of pliers as described in claim 6 wherein the jaws taper from the hinge portion toward the tips.

8. A pair of pliers as described in claim 1 wherein said jaws are formed with cutting surfaces at one side of the jaw adjacent the hinge point.

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