July 27, 1937. E. L. AIKEN 2,088,224

PLIERS

Filed Nov. 18, 1936

Fig. 1

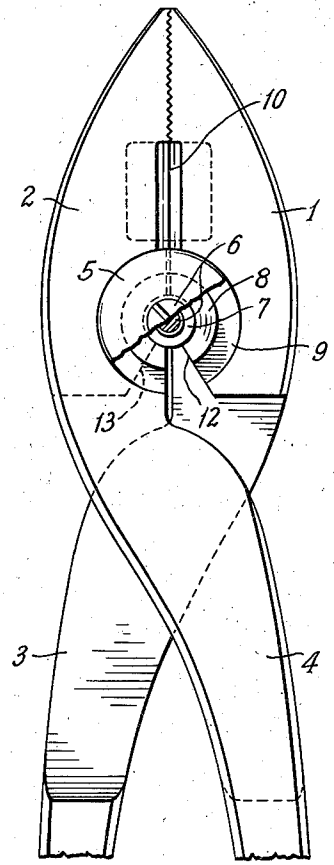


Fig. 2

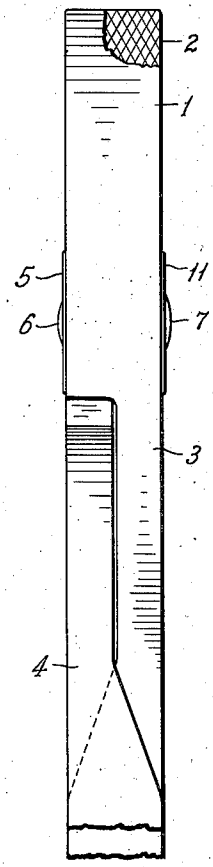


Fig. 3

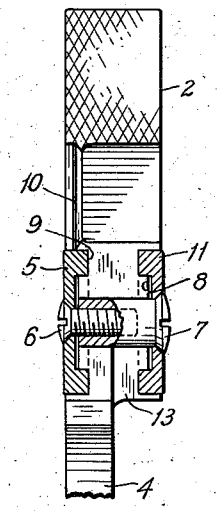


Fig. 4

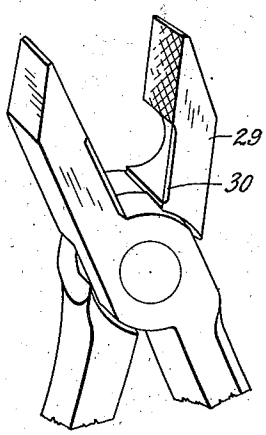
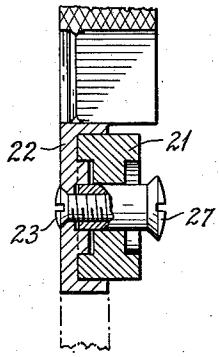


Fig. 5



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2,088,224

PLIERS

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Application November 18, 1936, Serial No. 111,377

2 Claims. (Cl. 81—51)

My invention pertains to hand tools and relates more particularly to that kind of such tools as are known as pliers.

Pliers as universally made employ two types of pivot joints. That more frequently used is known as the lap joint and the other seldom used now is known as the box joint. Both of these joints have a serious defect in that not more than fifty percent of the cross-sectional area of at least one of the jaws is available to resist the strain put upon the plier in use. This defect, while prejudicial in any type of pliers, is aggravated in side cutting pliers of the lap joint type as the cutting edge overhangs to a maximum extent the unsupported portion of one jaw. Thus when such pliers are used in cutting a torsional stress is added which greatly increases the probability of fracture of such jaw. This is proven by the fact that fractured jaws in pliers almost invariably occur in the jaw containing the overhanging cutting edge. Further, in both types of joints, a relatively small diameter pivot pin is utilized, which is usually riveted in place. Such pliers almost invariably bind when opened to their full extent and in fact when new and until they are given considerable use can very seldom be opened to their full extent, thus decreasing the effectiveness of the pliers.

One of the principal objects of my invention is to produce a pliers having a more effective and efficient pivoting means.

Another object comprises producing a pliers in which the possibility of breakage of the jaws at or near the pivot point is substantially eliminated.

A further object comprises producing a pliers in which the bearing areas at the point of pivot are greatly increased to reduce wear, resultant looseness and to eliminate binding.

A still further object comprises producing a pliers in which the ratio of leverage on opposite sides of the pivot point is increased to reduce the expenditure of energy by the operator to accomplish the same effective cutting or gripping.

I achieve all of the above noted desirable features and others which will hereinafter be apparent by means of the combination of the novel structures described in the following specification with reference to the accompanying drawing forming a part thereof.

In the drawing, in which like reference numerals designate corresponding parts:

Fig. 1 is a side plan view of my improved pliers with portions of the handles and one of the ring lock washers broken away.

Fig. 2 is a top plan view of the same with a portion of one of the jaws and the handles broken away.

Fig. 3 is a view of the jaw portion of one of the lever members with the handle portion broken away and the pivoting means partially sectioned.

Fig. 4 is a broken perspective view of the common lap joint side cutting pliers.

Fig. 5 is a partially broken view of the jaw portion of one of the lever members showing an internal arrangement of the pivoting means partially in section.

Referring now particularly to Figs. 1–3, inclusive, in which I have shown my invention as embodied in a side cutting pliers merely by way of example, two lever members each comprising a jaw portion 1 and handle portion 3 and jaw portion 2 and handle portion 4, respectively, are provided in the jaw portions with serrated grip portions as shown in Fig. 3 and cutting edges 10. Each of the lever members are, as shown in Fig. 1, formed so that the handles overlap at a point between the pivot point and the handle portion of the lever. The levers are flattened at this portion so that the handle portions and jaw portions when the levers are operatively articulated may be coplanar, as clearly shown in Fig. 2.

There are provided, as shown in Figs. 1 and 3, in each of the lever members, recesses forming shoulder portions 8 and channel portions 9. These recesses, forming arcuate shoulders and grooves or channels are so positioned in each of the members that when the members are placed as shown in Fig. 1 the arcuate shoulders and channels in one member become coplanar and coaxial with those in the other member to present almost completely annular shoulders and channels. Radial portions 12 and 13 are cut away in each of the members, respectively, to permit the pliers to be opened for use.

With the lever members in the position shown in Fig. 1, a pair of what may be called ring lock washers 5 and 11, formed with annular tongues and channels adapted to mesh with the grooves 9 and shoulders 8 formed by the recesses in the jaws 2 and 1 are inserted and are held in position pivotally articulating the lever members by means of the stud 7 which is internally threaded to receive a clamping screw 6. The stud 7 passes through a clearance aperture provided by substantially semi-circular openings in each of the jaw members 1 and 2 as shown in Fig. 3.

In operation the ring lock washers 5 and 11

cooperating with the shoulders and grooves provided in the jaw portions 1 and 2 function as pivoting means operatively articulating the lever members. It will be noted in Fig. 3 that preferably the central shoulders 8 are cut away to ensure that the bearing between the washers 5 and 11 and the lever members takes place on the circumferences of the shoulders of these washers in contact with the corresponding circumferences and bottoms of the grooves 9 provided in the jaw portions 1 and 2. The pivot area is thus greatly increased over that now provided by a single pivot pin to ensure that the pliers will not bind and that wear is reduced to eliminate looseness. Further, it will be noticed on reference to Fig. 4 which shows a side cutting pliers as now made with the usual lap joint, that the cutting edge 30 in the jaw portion 29 overhangs by fifty percent the solid cross-sectional area of the jaw 29. In the construction shown in Fig. 3, the cutting edge 10 overhangs the solid material of the jaw by only part of the depth of the arcuate grooves 9 and this can be readily seen to be very considerably less than fifty percent of the cross-sectional area of the jaw. Thus, in my improved pliers, the torsional strain added to the compression strain when the pliers is used is very considerably reduced, thus reducing the tendency of the jaw to fracture.

The ring lock washers 5 and 11 may be combined into one washer 21, as shown in Fig. 5, and the meshing arcuate shoulders and grooves in the jaw member 22 may be made in each jaw on the internal faces of the jaws to operatively articulate the lever members, and such articulation may be maintained as hitherto explained by means of the stud 27 and screw 23.

The lever members are of course made in the usual manner from any suitable material such as tool steel and the washers 5 and 11, Fig. 3, or 21, Fig. 5, may be likewise made of tool steel and if desired hardened for maximum resistance to wear.

It will be apparent from the foregoing that as the radius of the pivoting area is increased there will be less possibility of binding caused by twisting of the pliers in use and I have further found in pliers made in accordance with my invention that even when the pliers are new and before given any use they may be open to their full extent without binding. Because of the fact that with my pivot construction the cutting edge in the case of side cutting pliers can be located closer to the pivoting point than in the case of the usual lap joint or box joint pliers, the ratio of leverage on either side of the pivot point is increased so that the expenditure of energy by the operator to accomplish the same effective cutting or gripping act is reduced.

In test demonstrations which I have made, I have found that such reduction amounts to approximately seventy percent. Utilizing a standard testing machine the following cutting results were obtained:

In all cases the pressure on the handles was put at the same distance from the pivot point:

Cutting ⅛" steel rod: Ordinary type 8½" pliers required 135 lbs. pressure—8½" pliers made in accordance with my invention, 95 lbs. pressure.

Cutting insulated copper wire, diameter of wire .229", diameter over insulation .4": Ordinary 8½" pliers 230 lbs. pressure—with my improved 8½" pliers, 165 lbs.

It will be apparent from the foregoing that my invention provides a pliers having a more effective and efficient pivoting means; a pliers in which the possibility of breakage of the jaws at or near the pivot point is substantially eliminated; a pivoting means for pliers in which the bearing area at the pivot point is greatly increased to reduce wear, resultant looseness and to eliminate binding; and a pliers in which the ratio of leverage on opposite sides of the pivot point is increased so that the expenditure of energy by the operator is reduced to accomplish the same effective cutting or gripping act.

While I have for purposes of illustration disclosed and described my invention as embodied in a side cutting pliers, it will be obvious that it may be utilized to advantage with any type of pliers and that numerous changes may be made therein without departing from the spirit and scope of the invention as defined in the claims. Having thus completely described my invention, what I claim is new and desire to secure by United States Letters Patent is:

1. A hand tool comprising two lever members, each comprising a jaw and a handle, arcuate recesses in each of said members, said recesses being located between the grip portions of said jaws and said handles, the recesses in one of said members being coplanar with corresponding recesses in the other of said members when said members are operatively articulated, pivot bearing means forming with said coplanar arcuate recesses annular tongue and groove operative articulation for said members, and means for maintaining such operative articulation of said members.

2. A pair of pliers comprising, two lever members each comprising a jaw and a handle, arcuate recesses in each of said members, said recesses being located between the grip portions of said jaws and said handles, said recesses in one of said members being coplanar with corresponding recesses in the other of said members when said members are operatively articulated, a pair of ring lock pivoting washers forming with said coplanar arcuate recesses annular tongue and groove operative articulation for said members and means passing through said washers for maintaining the operative articulation of said members.

EDWARD L. AIKEN.