July 20, 1965 F. W. ROMMEL ETAL 3,195,382

TOGGLE PLIERS WITH MEANS FOR RELATIVE PARALLEL MOVEMENT OF JAWS

Filed May 21, 1963 5 Sheets-Sheet 1

Fig. 1

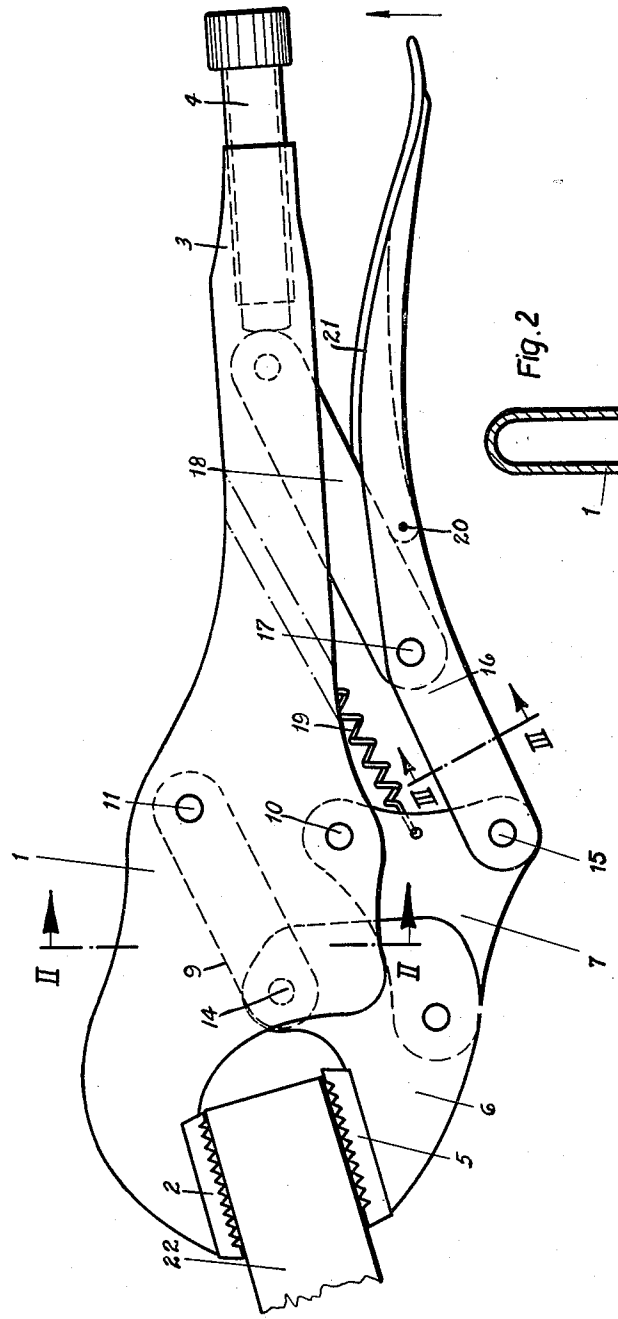


Fig. 2

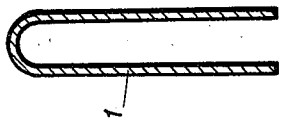


Fig. 3



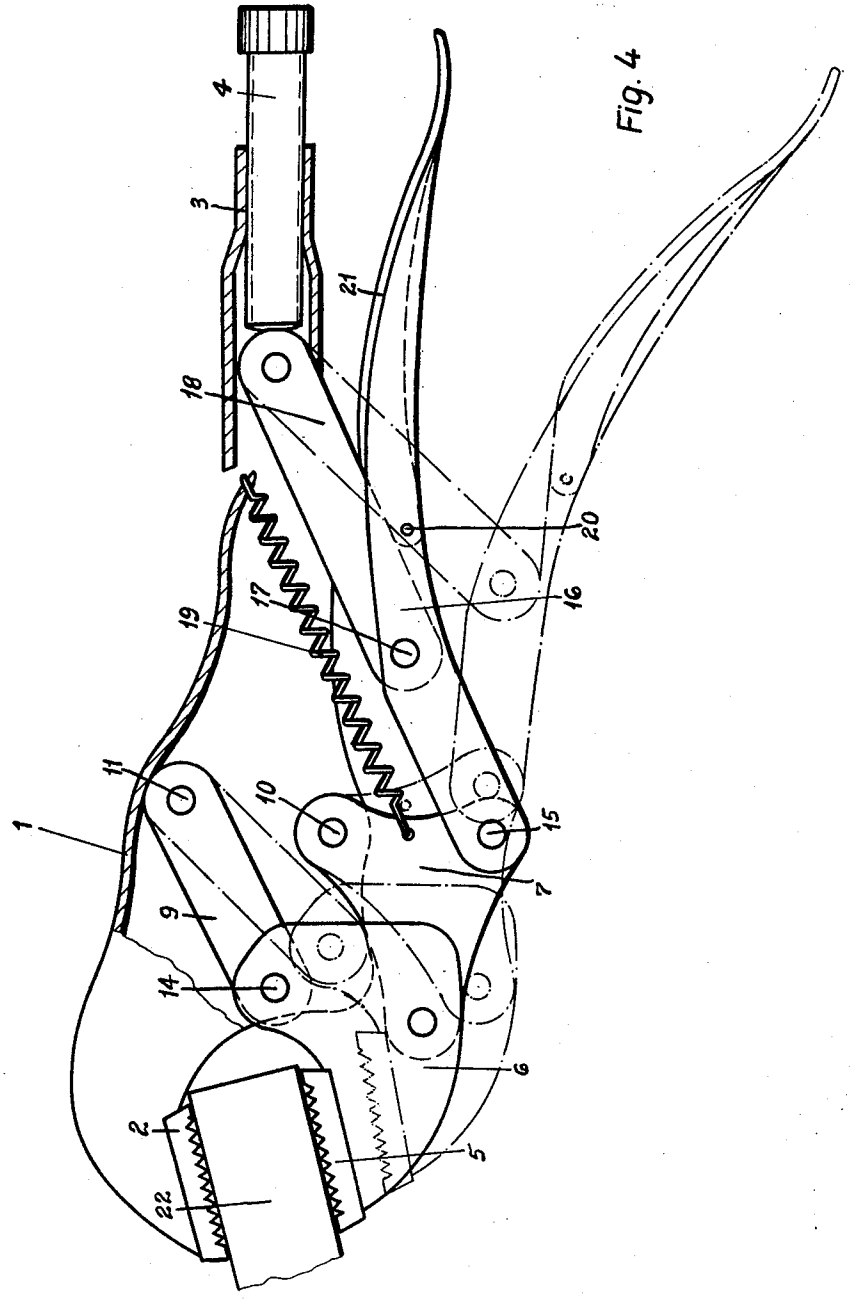
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July 20, 1965 F. W. ROMMEL ETAL 3,195,382

TOGGLE PLIERS WITH MEANS FOR RELATIVE PARALLEL MOVEMENT OF JAWS

Filed May 21, 1963 5 Sheets-Sheet 2

Fig. 4



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July 20, 1965 F. W. ROMMEL ETAL 3,195,382
TOGGLE PLIERS WITH MEANS FOR RELATIVE PARALLEL MOVEMENT OF JAWS
Filed May 21, 1963 5 Sheets-Sheet 3

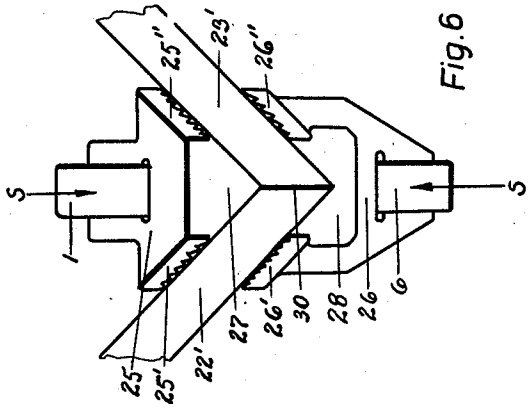


Fig.6

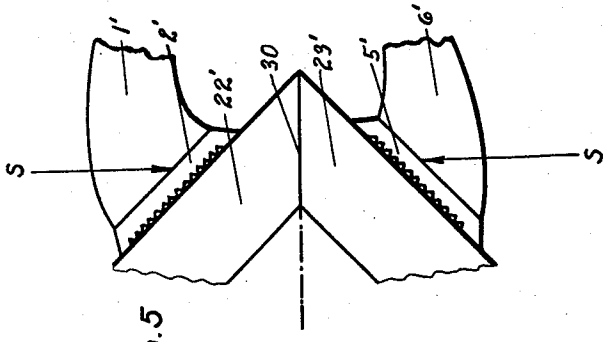


Fig.5

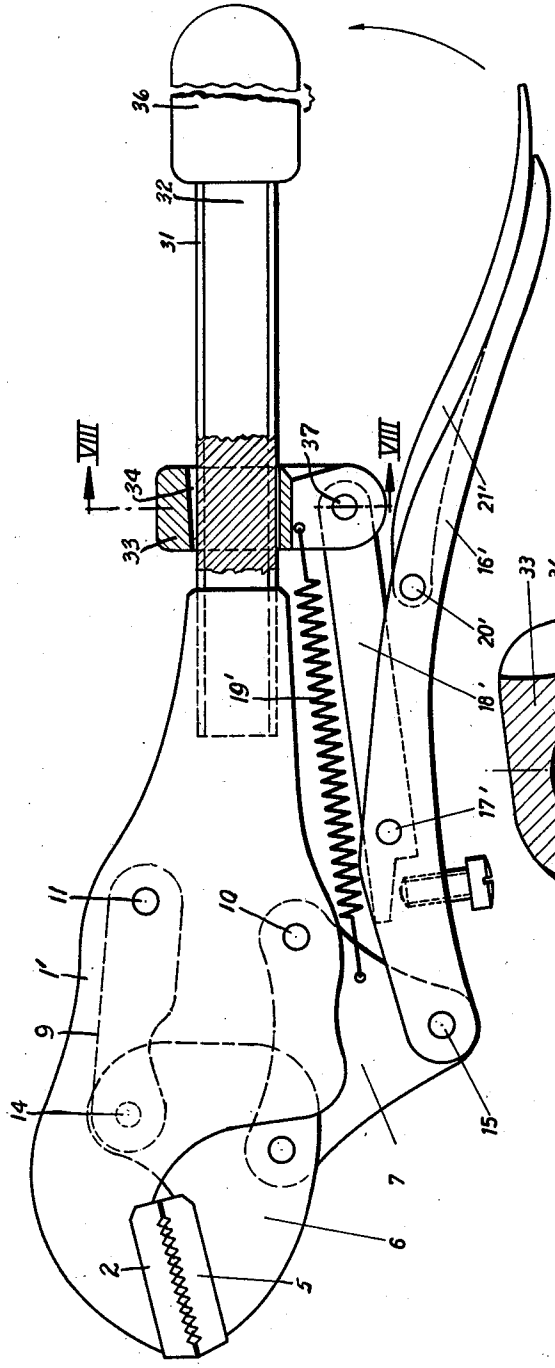
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TOGGLE PLIERS WITH MEANS FOR RELATIVE PARALLEL MOVEMENT OF JAWS

Filed May 21, 1963 5 Sheets-Sheet 4

Fig. 7



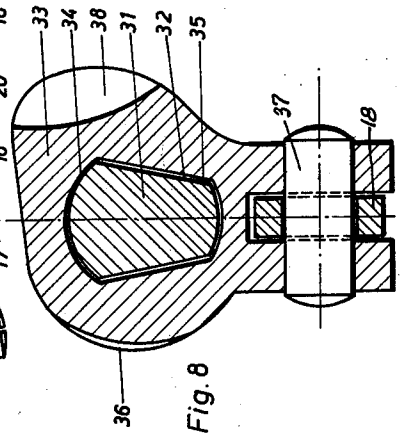


Fig. 8

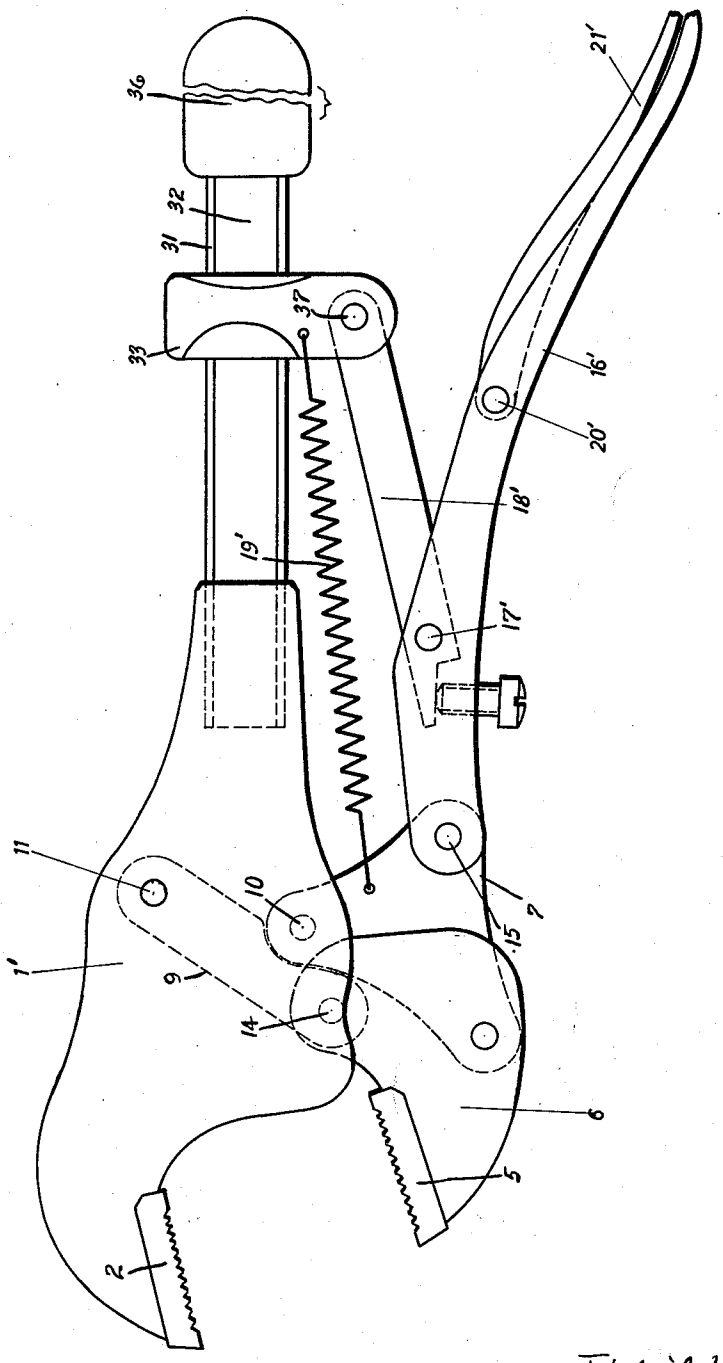
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TOGGLE PLIERS WITH MEANS FOR RELATIVE PARALLEL MOVEMENT OF JAWS

Filed May 21, 1963 5 Sheets-Sheet 5

Fig. 9



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TOGGLE PLIERS WITH MEANS FOR RELATIVE PARALLEL MOVEMENT OF JAWS

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6 Claims. (Cl. 81—373)

The present invention relates to pliers having jaws one of which can be moved parallel to the other jaw and locked in closed position by a toggle action, the movable jaw being hinged on the arm of the pliers which mounts the fixed jaw, by means of two links forming a parallel crank mechanism.

In known pliers of this type, the pivots of the parallel crank mechanism are arranged one behind the other on the rigid arm in longitudinal direction of the pliers, so that the movable jaw is slidable relative to the fixed jaw in the direction of the longitudinal axis of the pliers only.

The toggle means engages on the rear end of the movable jaw support. Therefore, the jaw width is very small only and injuries of the hand may occur by squeezing it between the movable parts during operation of the pliers. Operation of these pliers is difficult.

On the other hand, pliers are known in which the movable jaw is slidable parallel to itself in a guide on the fixed jaw and adjustable by means of an adjusting spindle. These pliers, too, have not proved satisfactory in practice. Both hands are required for their operation and a time-consuming adjustment to the dimensions of the workpiece to be gripped is necessary before each application.

It is one object of the present invention to provide pliers which avoid the drawbacks of the known pliers.

It is another object of the present invention to provide pliers, wherein the movable jaw is arranged on the arm carrying the fixed jaw, by means of links forming a parallel crank mechanism, one of these links forms a bell crank lever, the free end of which receives one end of the toggle means and the other end of which rests on an adjustable means in the rigid arm of the pliers.

It is still another object of the present invention to provide pliers, wherein the pivot pins of both links are spaced from each other and arranged on a line approximately transverse to the longitudinal axis of the pliers. The outer link is provided with an angle lever extending outwardly, while the movable jaw is pivoted on a member connecting the links, and the gripping lever of the pliers forming the forward part of the toggle means is journalled, in known manner, on the free end of the bell crank lever.

The mouth of the pliers, as well as the jaws, may be adapted to the shape of the different workpieces.

The toggle lever arrangement controlling the movable jaw may be adjusted either by means of an adjusting screw provided in the rigid arm of the pliers, or the adjustment may be made automatically in that a ratchet brake is used for the support of the toggle lever on the rigid arm which ratchet brake is connected with the movable jaw such that in slack condition of the pliers the movable jaw can be opened by retracting the brake for the purpose of adjusting a temporarily required maximum opening of the pliers. This arrangement is described in our U.S. Patent 2,997,903.

With these and other objects in view which will become

apparent in the following detailed description, the present invention will be clearly understood in connection with the accompanying drawings, in which:

FIGURE 1 is a side elevation of the pliers designed in accordance with the present invention;

FIG. 2 is a section along the lines 2—2 of FIG. 1;

FIG. 3 is a section along the lines 3—3;

FIG. 4 is a longitudinal section through the pliers;

FIGS. 5 and 6 are fragmentary views of different embodiments of the jaws;

FIG. 7 is a side elevation of a pair of pliers with self-adjusting means;

FIG. 8 is a section along the lines 8—8 of FIG. 7, shown on an enlarged scale; and

FIG. 9 is a side elevation of the pliers illustrated in FIG. 7 in wide open position.

Referring now to the drawings, the different parts of the pliers are made of stamped sheet steel, the arms of the pliers being of U-section, as can be determined from FIGS. 2 and 3.

In the embodiment of the pliers disclosed in FIGS. 1 to 4, an arm 1 forms the support for a stationary jaw 2. At its rear end, the arm 1 forms an internally threaded sleeve 3 to receive an adjusting screw 4 which will be described later.

A movable jaw 5 is mounted on a supporting member 6 carried by levers 7 and 9. The levers 7 and 9 are spaced from each other and pivot on pins 10 and 11 on arm 1. They form a parallel crank mechanism engaging on the pivots on the supporting member 6 for the jaw 5, the supporting member 6 forming a connecting member.

The pivot pin 15 is provided in the lever 7 and an actuating lever 16 is pivotally connected by means of the pivot pin 15 and which is also made of stamped sheet steel and of U-section (FIG. 3).

A toggle lever 18 is journalled in the actuating lever 16 on a pivot pin 17 and its free end bears against the inner end of the adjusting screw 4 in the arm 1. A pull spring 19 arranged between the arm 1 and the lever 7 ensures the engagement of the toggle lever 18 on the adjusting screw 4 and causes the jaws 2 and 5 to open automatically, when upon release of the toggle lever 18 the tension is removed.

Furthermore, a pivotable release lever 21 is arranged in the actuating lever 16 on a pivot pin 20, and has a part bent towards the inside which rests against the toggle lever 18.

When the pliers are opened, the different parts are in a position illustrated in FIG. 4 in dotted lines. The toggle lever arrangement formed of the levers 16 and 18 is bent in and the actuating lever 16 extends to the outside. The bent-in position of the toggle lever mechanism is ensured by the pull spring 19. By turning the adjusting screw 4 back which forms the stop for the toggle lever 18, the jaws can be closed to an extent so that the jaws 2 and 5 seize the workpiece 22.

Adjustment has to be made such that with the jaws 2 and 5 initially engaging the workpiece, the levers 16 and 18 are not in their stretched position, as shown in FIG. 1. Only after pressing the lever 16 against the rigid arm 1, do the toggle lever parts 16 and 18 reach their gripping position, in which they hold a workpiece 22 between the jaws 2 and 5, the clamping force being determined by the adjustment of the adjusting screw 4.

The grip of the pliers is released by moving the release lever 21 after release of the lever 16 in the direction of the arrow indicated in FIG. 1. The toggle lever parts 16 and 18 are forced out of their stretched position so that the clamping power of the jaws 2 and 5 is removed. The effective clamping force can be controlled by varying the position of the adjusting screw 4, i.e. by more or less turning of the adjusting screw.

Another embodiment of the jaws is shown in fragmentary manner as a side elevation in FIG. 5. These pliers are particularly suitable to press beveled workpieces 22' and 23' with their surfaces 30 against each other. For this purpose, the jaws 2' and 5' are arranged in the arm 1' and the supporting member 6', respectively, at a certain angle which corresponds to the bevel.

The jaws 2' and 5' form a right angle relative to each other which opens towards the pliers' front end. When closing the pliers, the resulting gripping force S acts, as indicated by arrows, perpendicularly to the surface 30, so that the two workpieces 22' and 23' are pressed against each other in their correct position without slipping out of the jaws. It is to be understood, that it is necessary to have different pliers or different jaws for different bevels.

In the embodiment of the pliers disclosed in FIG. 6 of the drawings in a front end view, the workpieces 22' and 23' to be connected are held transversely relative to the plane of the pliers. For this purpose, the arm 1 and the supporting member 6 have jaw retainers 25 and 26, the jaws 25' and 25'' being on jaw retainer 25 and the jaws 26' and 26'' being on jaw retainer 26. The respective jaws are arranged at an angle and have their operating surfaces correspond to the angle at which the workpieces 22' and 23' are to be connected. The jaws fixed to the jaw retainers 25 and 26 leave an opening 27 and 28, respectively, between them so that it is easily possible to weld the workpieces 22' and 23' together at their joint 30 by means of a welding apparatus.

To ensure the use of the pliers for a wide range of application, the jaw retainers 25, 26 in the jaw are exchangeable. Several pairs of jaws can be used in one pair of pliers, the different pairs being differently beveled or adapted to different shapes of the workpiece (flat, round, angular, or the like).

In the embodiment of the pliers disclosed in FIGS. 7 to 9, an automatic adjustment of the pliers is possible. In a shortened arm 1', the adjusting screw 4 is replaced by a bar 31 to operate as a guide which is provided with lateral guide surfaces 32 inclined relative to each other. A sleeve 33 is slidable on this guide and has a guide bore 34 corresponding to the wedge shape of the guide and having inclined pressure surfaces 35. As shown in FIG. 7, the guide bore 34 widens towards the rear, i.e. towards a handle 36. The sleeve 33 is engaged on a pivot pin 37 by the toggle lever part 18'. A lateral opening 38 in the sleeve 33 facilitates its retraction on the guide 32 against the action of the pull spring 19' which engages on the sleeve 33 and is fastened at the other end to the arm 1' or to the lever 7.

When the pliers are in open position, the hand lever 16' and the release lever 21' are in the position indicated in FIG. 9. Both toggle levers 16' and 18', which are linked together by means of the pin 17', are in angularly displaced positions relative to each other. When in this position of the toggle levers 16' and 18', the sleeve 33 is retracted on the guide bar 31 against the action of the spring 19', a position according to FIG. 9 is eventually reached. It is important that this actuation of the pliers can be made by the same hand which holds the pliers at the handle 36. The pliers are placed above the workpiece in open position. When releasing the sleeve 33, the latter is pulled back on the guide 31 by the spring 19'. At the same time, the pliers are closed, so that the jaws 2 and 5 rest on the workpiece. The hand

lever 16' is in a spread-off position. At the same time, the spring 19' has pivoted the sleeve 33 around the pin 37 in anticlockwise direction, so that the wedge-shaped surfaces 35 provided inside the sleeve 33 engage against the wedge-shaped guide surfaces 32 of the guide bar 31. When the hand lever 16' is then forced against the rigid arm of the pliers in the direction of the arrow shown in FIG. 7, both toggle levers 16' and 18' reach their stretched position. The sleeve 33 is thereby clamped on the guide 31 and considerable pressure is exerted on the jaws 2 and 5 and on the workpiece between them. This gripping force is adjustable by means of an adjusting screw 40 which determines the bent-in position of the toggle lever.

To open the pliers it is only necessary to return the pair of toggle levers 16' and 18' into their angularly spaced position by means of the release lever 21', which is pivotally arranged on a pin 20' in the hand lever 16'. Thereby, the pressure is relieved. Now, the relieved sleeve 33 can be pulled back on the guide bar 31 against the action of the spring 19' and the jaws 2 and 5 open completely.

While we have disclosed several embodiments of the present invention it is to be understood that these embodiments are given by example only and not in a limiting sense, the scope of the present invention being determined by these objects and the claims.

We claim:

1. In a pair of pliers, the combination of
an elongated, rigid arm provided at one end with a stationary jaw,
a supporting member,
a movable jaw mounted on said supporting member,
two levers spaced apart from each other,
one end of each of said two levers being pivoted to said rigid arm by first pivots and the other end of each of said two levers being pivoted to said supporting member by second pivots, said two levers to constitute a parallel crank mechanism,
one of said two levers being a bell crank lever,
an actuating lever pivoted at one end to said bell crank lever by a third pivot, and the other end forming a handle,
a toggle support pivotally connected at one end to said actuating lever by a fourth pivot and pivotally connected at the other end to adjustable position means for said other end by a fifth pivot movable longitudinally along the other end of said elongated, rigid arm, and
resilient means connecting said elongated rigid arm with said supporting member and biasing said movable jaw toward said stationary jaw.

2. The pair of pliers, as set forth in claim 1, wherein said first pivots of said two levers are spaced apart from each other and disposed on an imaginary line substantially transverse to the longitudinal axis of the pliers.

3. The pair of pliers, as set forth in claim 1, wherein both of said jaws are replaceable and form an angle opening towards the front end of the pliers, said angle being adapted to correspond to the angle of beveled workpieces to be joined together.

4. The pair of pliers, as set forth in claim 1, wherein both of said jaws are replaceable and relatively movable parallel to each other and have two contact surfaces inclined transverse to a plane extending longitudinally through the pliers and enclosing an angle adapted to correspond to the bevel of two workpieces to be joined.

5. The pair of pliers, as set forth in claim 1, wherein said adjustable position means of said rigid arm comprises a guide bar,
a slide connected with the rear end of said toggle support and movable along said guide bar, and

the rear end of said resilient means being secured to said slide.

6. The pair of pliers, as set forth in claim 1, wherein said adjustable position means of said rigid arm comprises a sleeve having an inner thread and is disposed at the rear end of said rigid arm,

a complementary adjusting screw being inserted in and received by the rear end of said threaded sleeve, and

the rear end of said toggle support abutting the front end of said adjusting screw.

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