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3,252,361

PLIERS WITH TOGGLE MEANS

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2 Sheets-Sheet 1

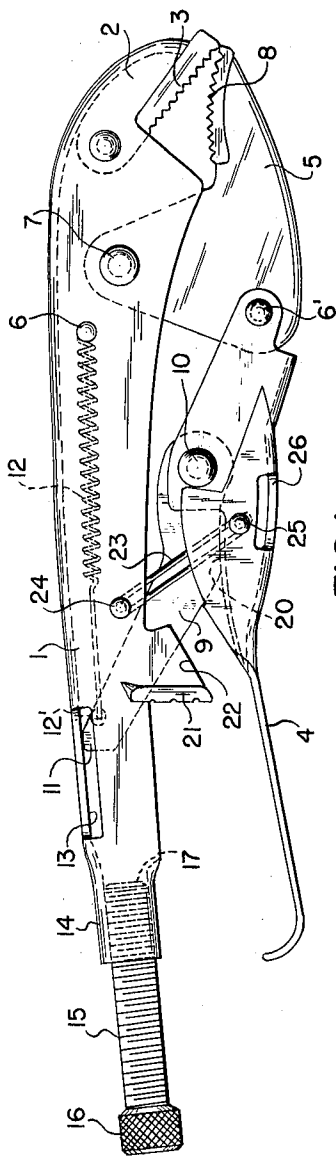


FIG. 1

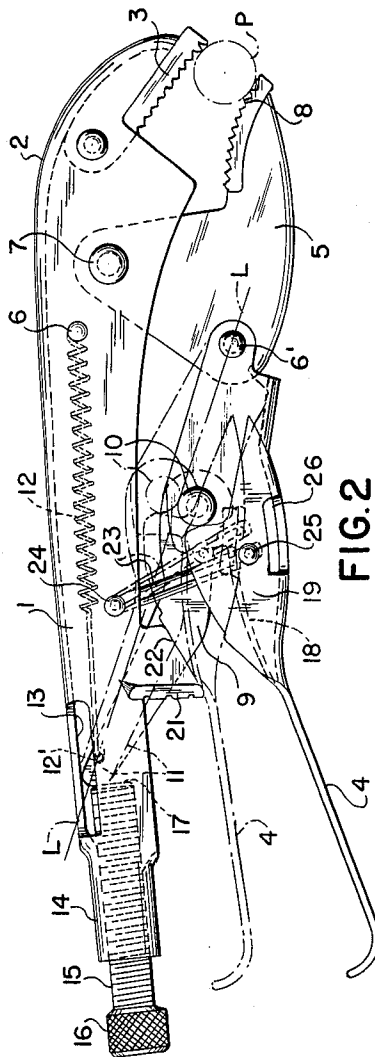


FIG. 2

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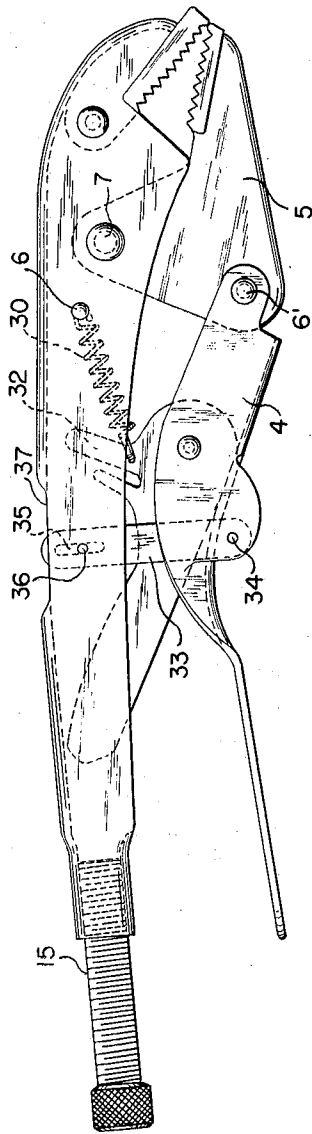


FIG. 3

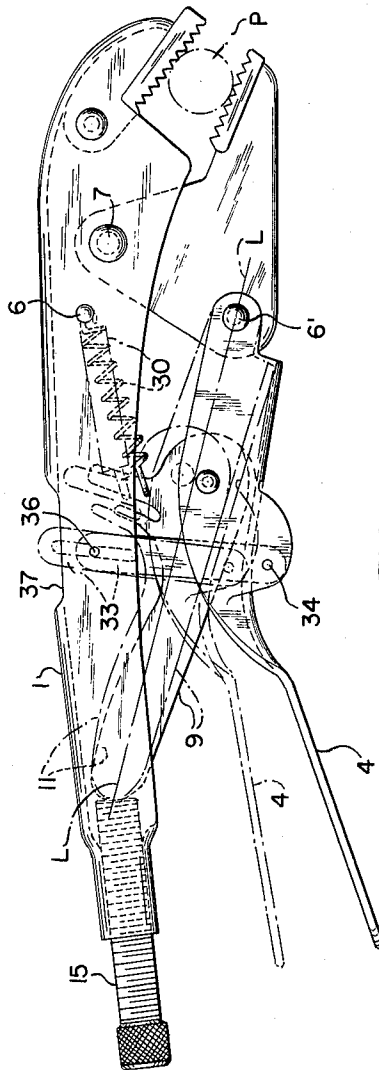


FIG. 4

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3,252,361

PLIERS WITH TOGGLE MEANS

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 4 Claims. (Cl. 81-379)

This invention is an improvement in pliers of the pivoted jaw vice grip type.

It is an important object of this invention to enable a workpiece to be firmly and initially held between the jaws of the pliers without the assistance of manual pressure and to provide means whereby a subsequent additional powerful gripping force may be exerted by the jaws on the piece to powerfully grip the piece while the pliers are in use.

Another object of the invention is a tool of the type defined in which the jaws are normally urged to closed position but in which the jaws may be manually separated sufficiently to receive and hold a piece therebetween, together with means to selectively limit the extent to which the jaws may be separated to grip the piece when the jaw opening force is released, and in which an additional powerful gripping force may be exerted on the piece through the closed jaws engaging the piece to prevent slippage of the jaws on the piece when the pliers are in use.

A further object of the invention is the extreme simplicity of the construction, thus assuring the user a maximum of freedom of the hands in handling the tool and more particularly in opening the jaws to receive a piece under an initial holding pressure and in applying a multiplied gripping force on the piece.

Another object is to enable the user to powerfully grip the piece between the jaws by only the application of a relatively light initial closing force or pressure on the handles of the tool and a subsequent multiplied gripping force and to permit the combined forces to be quickly and easily released by the user when desired.

Still another object of the invention resides in pliers of the type defined which are easily and quickly adjustable to multiply an initial light jaw closing force applied to the handles into a powerful and positive gripping force to pieces of a wide range of sizes and shapes.

A further object is to enable the user of the pliers to use the pliers with the force applied to the piece without danger of the force being released accidentally or prematurely not only when the pliers are in use but when they are at rest and untouched by the hands of the user while they are still powerfully gripping a piece between the jaws.

Other objects and advantages of this invention will become more apparent as the following description of an embodiment thereof progresses, reference being made to the accompanying drawing in which like reference characters are employed to designate like parts throughout the same.

In the drawings:

FIGURE 1 is a side elevation of pliers showing the jaws in their normally urged closed position prior to receiving a piece therebetween;

FIGURE 2 is a similar view showing a piece initially held between the jaws and illustrates in broken lines the position of the several parts upon application of a multiplied powerful gripping force on the piece;

FIGURE 3 is a side elevation similar to that shown in FIGURE 1 and shows a slightly modified form of the invention; and

FIGURE 4 is a view of the pliers in FIGURE 3 showing a piece initially held in the jaws under light gripping pressure, the broken lines showing the respective positions of the parts upon the application of stepped up powerful gripping pressure on the piece.

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In carrying out my invention and referring first to FIGURES 1 and 2 which illustrate a preferred form of the same, I provide a handle 1 terminating at its forward end in a relatively enlarged fixed jaw 2 having a toothed or serrated face 3 for biting engagement with a workpiece.

The pivoted handle 4 is pivotally connected to the movable jaw 5 as at 6', the jaw 5 being pivotally mounted at 7 on the forward enlarged portion of the handle 1. The jaw 5 also has a toothed or serrated face 8 opposed to the face 3 and cooperates with the face 3 to grip the workpiece held therebetween.

The handles 1 and 4 are both preferably of channel form in cross section through substantially their entire length. A pressure multiplying member in the form of a lever 9 is connected near its forward end in the forward channeled end of the pivoted handle 4, as at 10, and terminates at its opposite end in a portion 11 lying and movable within and along the channel portion 1. A coil spring 12 is connected under tension at one end to the pin 6 and at its other extremity is connected with the end 11 of the lever 9, as at 12'. The spring 12 functions to normally urge and retain this end of the lever 9 into sliding contact along the base 13 along the channeled handle 1 as the handle 4 is moved about its pivot 7 in opening and closing the jaws 2 and 5. The tension of the coil spring also serves to urge the movable jaw toward the fixed jaw as in FIGURE 1, even though there is no piece interposed between the jaws. This closing urge is transmitted through the lever 9, the pivot 10 and the pivot 7 to the jaw 5, but can be overcome manually by holding the handle 1 securely in one hand and pulling the handle 4 toward the left, as in FIGURE 1, against the tension of the spring 12, thereby sliding the lever 9 to the left along the channel of the handle 1 and against the tension of the spring. In order to limit the movement of the lever end in the channel in a direction toward the rear of the handle 1 and to provide means for selecting such limit of movement and to thereby determine the degree of separation of the jaws to receive and hold a piece therebetween, the rear end of the handle 1 terminates in an internally threaded cylinder portion 14 into which is threaded an adjusting stem 15, the outer end of the stem 15 being provided with a finger grip such as a knurled head 16 while its inner end is transversely flat at 17 to provide a surface or abutment against which the lower end 11 of the lever 9 is engaged in both the initial holding action on the piece shown in solid lines in FIGURE 2 and the application of the multiplied gripping force when the handle 4 is moved to the broken line position in that figure.

In this form of the invention, I provide a wall 18 contiguous with the handle 4 and which extends forwardly between the opposed spaced apart sides 19 of the handle. The wall 18 serves as an abutment to be engaged by the edge 20 of the lever when it is moved to the position shown in FIGURE 1. A thumb or finger rest 21 is formed on the handle 1 and extends toward the handle 4 presenting an inclined surface 22 to be engaged by the handle 4 whereby to limit its movement in the broken line position of FIGURE 2, as when applying a multiplied closing force on the jaws and consequently a gripping force on the piece P.

In order to limit the separation of the handles 1 and 4 and to provide means by which an outward movement of the handle 4, away from the handle 1, will produce a resultant force to draw the jaw 5 to open position and shift the lever 9 to the left so that its end 11 travels toward the adjusting stem or screw, there is provided a link 23 either in the form of a loop shown in FIGURES 1 and 2 or in the form of a flat slotted member, as in FIGURES 3 and 4. The loop link 23 is closed at its ends and embraces the pins 24 and 25 therein to limit the sep-

aration of the handles and also to provide fulcrums about which the longitudinal movement of the handle and lever is controlled in producing the aforesaid resultant force to open the jaws for inserting a piece therebetween and to hold the same while the screw 15 is adjusted to bring its end flat surface 17 into abutting engagement with the lever 9.

In such position, a multiplied force is applied through the jaws to powerfully and positively grip the piece. An opening 26 is formed in the handle 4 to give clearance for the end of the link embracing the pin 25 as the handle 4 is closed to the broken line position in FIGURE 2. It will be seen, from these figures that the link 23 has a limited rotary movement about the pin 24 in a clockwise direction when the handle 4 is operated to open the jaws to receive a piece, as in FIGURE 2, but this rotary movement is reversed upon application of the multiplied force on the jaws to its fullest extent, and is even extended to return the link to the position shown in FIGURE 1.

By virtue of the relationship of the several elements as disclosed herein, pliers embodying this invention permit the piece P to be gripped between the separated jaws and held under the tension of the spring 12 without any extra closing pressure being applied to the handles. It will be noted that under these conditions the pivot pin 10 will lie below the imaginary straight line L passing through the center 6' and the end 11 of the lever, while the pivot pin 10 will move to the opposite side of line L as shown in broken lines in FIGURE 2 when the handle 4 is brought to the broken line position in this figure.

Only light closing or squeezing pressure need be applied to the handles to effect this shift in the position of the pin 10 past the dead center represented by the line L, since the curved rear edge 20 of the lever will abut the wall 18 and provides a fulcrum about which the pin 10 can be shifted to either its full or dotted line positions in FIGURE 2. It will be observed that the movement of the pin 10 is both in a direction toward the handle 1 and forwardly thereof in the direction of the jaws, the resultant force on the piece through the jaws being greatly multiplied to exert a powerful and positive grip of the jaws on the piece.

To release the power grip and to remove the piece, the handles are easily manually separated to the full line position in FIGURE 2 thereby returning the pin 10 to its full line position, and the screw is then turned to withdraw it from contact with the end 11 of the lever 9 to release the multiplied gripping force. Then, by firmly holding the handle 1 in one hand and by applying a pulling force to the left on handle 4 to overcome the tension of the spring 12, the jaws are further separated and the piece is easily removed.

It is only necessary to axially adjust the screw in the handle 1 to permit the normally closed jaws to be separated for the insertion of pieces of various sizes and shapes therein and then to take up on the screw to bring its end 17 into abutting relation with the end 11 of the lever.

In FIGURES 3 and 4, I have illustrated a modified form of the invention in which the operation is somewhat similar to that already described, but in which certain structural changes have been made. For simplicity, certain reference characters are employed in common in FIGURES 1 to 4, inclusive.

In FIGURES 3 and 4 it is to be noted that the spring 30 is normally under tension and is connected at one end to the lever 31 at a point on an extension 32 near the forward end of the lever and at its other end to the fixed jaw and handle 1. The flat link 33 is preferably pivotally carried on the pivot pin 34 while a slot 35 of desirable length and closed at its ends is formed in the link and extends longitudinally along the link from a point near the end remote from the pin 34. A pivot pin 36 is provided in the handle 1 and is disposed across the channel formed in the handle and extends through the slot 35 limiting

the longitudinal movement of the link with respect to the pin 36.

The operation of this modified form of the invention is basically substantially the same as that shown in FIGURES 1 and 2, as previously described in that connection, the spring 30 being connected to the lever at its forward portion in the extension 32, as distinguished from the end 11 of the lever as in FIGURES 1 and 2, and the link being arranged to pass at one end through an opening 37 in the handle 1, whereby the projecting end of the link provides means for easily breaking the strong multiplied grip on the piece by merely pressing the upper end of the link downwardly, as in FIGURE 4, from the dotted line position.

My invention supplies a pliers structure of the vise grip type affording greater ease of operation in separating the normally closed jaws under tension of the spring, to insert a piece therebetween for the application of an initial holding force normally supplied to the jaws by the springs 12 and 30, while a subsequent adjustment of the screw 15 is made to back up the end 11 of the lever 9. Only a relatively light closing pressure on the handles is required to apply the multiplied gripping force to the jaws and to maintain it as long as desired, by virtue of the shifting of the center represented by the pin 10, past the dead center line L to the dotted line positions in FIGURES 2 and 4.

Furthermore, it will be seen that simplicity of construction with elective application of initial and multiplied powerful gripping forces on the piece result in a highly desirable tool which can be manufactured at extremely low cost.

Various changes may be made in the details of construction and arrangement of parts of the invention without departing from the spirit thereof or the scope of the appended claims.

I claim:

1. A tool of the vise grip pliers type comprising a channeled handle having a relatively fixed jaw, a movable jaw pivotally supported on said channeled handle and cooperating with the fixed jaw for gripping a workpiece therebetween, a movable handle pivotally connected to said movable jaw at a point rearwardly of the center defining the movable axis of the pivoted jaw, a lever pivoted at one end in said movable handle and having an opposite end portion slidable along and in the channel of said first mentioned handle, tension means lying substantially entirely within the channel of the first mentioned handle and connecting said handle with the said opposite end portion of the lever for drawing and maintaining the lever opposite end in and along the channel, a stop for selectively limiting the extent of movement of the lever end along the channel and providing an abutment against which the lever end is engaged when separating the jaws to receive a workpiece to be clamped therebetween, said stop being subsequently adjustable in the handle to effect an initial clamping grip on the workpiece preliminary to the application of a multiplied gripping force on the workpiece as a result of a closing movement of the handles sufficient to shift the center, defining the pivotal axis of the lever with the movable handle, past an imaginary straight line intersecting the said opposite end of the lever and the center defining the pivotal axis of the movable jaw in the second handle.

2. A tool of the vise grip pliers type comprising a channeled handle having a relatively fixed jaw, a movable jaw pivotally supported on said channeled handle and cooperating with the fixed jaw for gripping a workpiece therebetween, a movable handle pivotally connected to said movable jaw at a point rearwardly of the center defining the movable axis of the pivoted jaw, a lever pivoted at one end to said movable handle at a point rearwardly of said pivotal connection of the movable handle with the pivoted jaw, the opposite end of the lever slidable along and within the channel of the first mentioned handle, ten-

sion means lying substantially entirely within the channel of the first mentioned handle for urging and maintaining the said lever opposite end in the channel, said tension means being secured at one end within the channel of the first mentioned handle and secured at its opposite end to the forward end of said slidable lever, a link pivotally and slidably connecting said handles at its ends, an adjustable stop in the first handle for selectively limiting the sliding movement of the lever end in the channel in one direction, whereby to provide a fulcrum about which the center defining the pivoted one end of the lever may be shifted across an imaginary straight line passing through the turning axis connecting the movable jaw and movable handle and through the opposite end of the lever whereby to first apply an initial gripping force on the jaws to a workpiece therebetween and then to apply and retain a multiplied powerful gripping force to the jaws and on the workpiece when the said last mentioned center is shifted in one direction across said imaginary line.

3. A tool of the vise grip pliers type comprising a channeled handle having a relatively fixed jaw, a pivoted jaw pivotally supported on said channeled handle and cooperating with the fixed jaw for gripping a workpiece therebetween, a movable handle having a pivotal connection with said pivoted jaw at a point rearwardly of the center defining the pivotal axis of the pivoted jaw, a lever pivoted at one end to said movable handle at a point rearwardly of said pivotal connection, the opposite end of the lever slidable along and within the channel of the first mentioned handle, tension means for urging and maintaining the said lever opposite end in the channel, a link pivotally and slidably connecting said handles at its ends, said link having a fixed pivotal center at one end in said fixed handle and having at its other end a sliding pivotal connection with the movable handle, said movable handle having a wall engageable with a portion of said lever formed to provide, upon engagement with said wall, a fulcrum about which the pivoted end of the lever may be shifted, an adjustable stop in the first handle for selectively limiting the sliding movement of the lever end in the channel in one direction, whereby to provide a fulcrum about which the center defining the pivoted one end of the lever may be shifted across an imaginary straight line passing through the turning axis connecting the pivoted jaw and movable handle and through the opposite end of the lever whereby to first apply an initial gripping force on the jaws to a workpiece therebetween and then

to apply and retain a multiplied powerful gripping force to the jaws and on the workpiece when the said last mentioned center is shifted in one direction across said imaginary line.

4. A tool of the vise grip pliers type comprising a channeled handle having a relatively fixed jaw, a pivoted jaw pivotally supported on said channeled handle and cooperating with the fixed jaw for gripping a workpiece therebetween, a movable handle having a pivotal connection with said pivoted jaw at a point rearwardly of the center defining the pivotal axis of the pivoted jaw, a lever pivoted at one end to said movable handle at a point rearwardly of said pivotal connection, the opposite end of the lever slidable along and within the channel of the first mentioned handle, tension means for urging and maintaining the said lever opposite end in the channel, a link pivotally and slidably connecting said handles at its ends, an adjustable stop in the first handle for selectively limiting the sliding movement of the lever end in the channel in one direction, whereby to provide a fulcrum about which the center defining the pivoted one end of the lever may be shifted across an imaginary straight line passing through the turning axis connecting the pivoted jaw and movable handle and through the opposite end of the lever whereby to first apply an initial gripping force on the jaws to a workpiece therebetween and then to apply and retain a multiplied powerful gripping force to the jaws and on the workpiece when the said last mentioned center is shifted in one direction across said imaginary line, and a thumb grip formed integral with the channeled handle adjacent said link and projecting toward the movable handle, said grip having a wall engageable with said movable handle when the handles are in full gripping position.

References Cited by the Examiner

UNITED STATES PATENTS

2,489,895	11/1949	Kash	81—370
2,643,567	6/1953	Johnson	81—370 X
2,714,198	7/1955	Schloetzer	81—379 X
2,838,973	6/1958	Peterson	81—369 X
2,997,903	8/1961	Rommel et al.	81—379

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