Jan. 12, 1960 G. M. LA POINTE 2,920,518

TOGGLE-JOINT WRENCH WITH CAM RELEASE MEANS

Filed Sept. 10, 1957 2 Sheets-Sheet 1

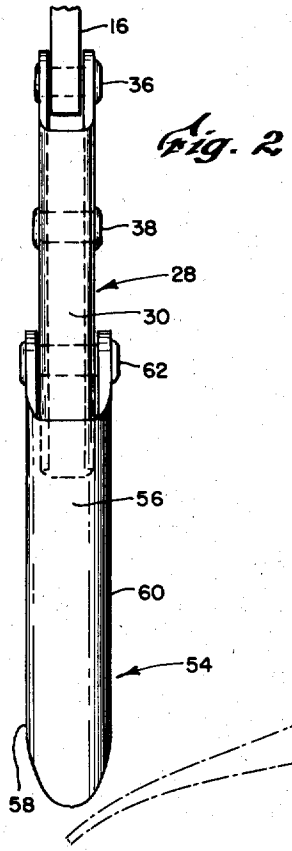

Fig. 2

Fig. 1

Fig. 3

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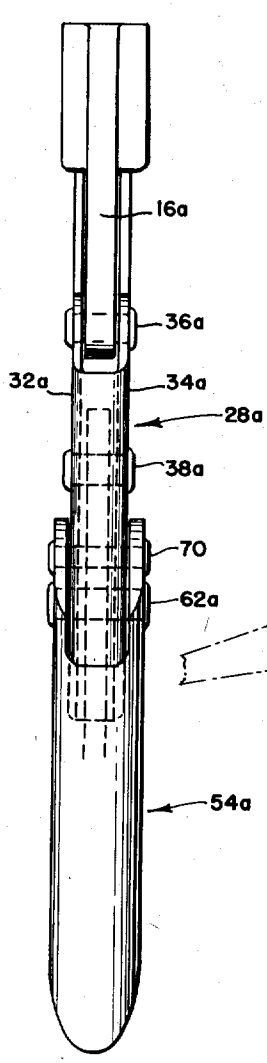

Fig. 5

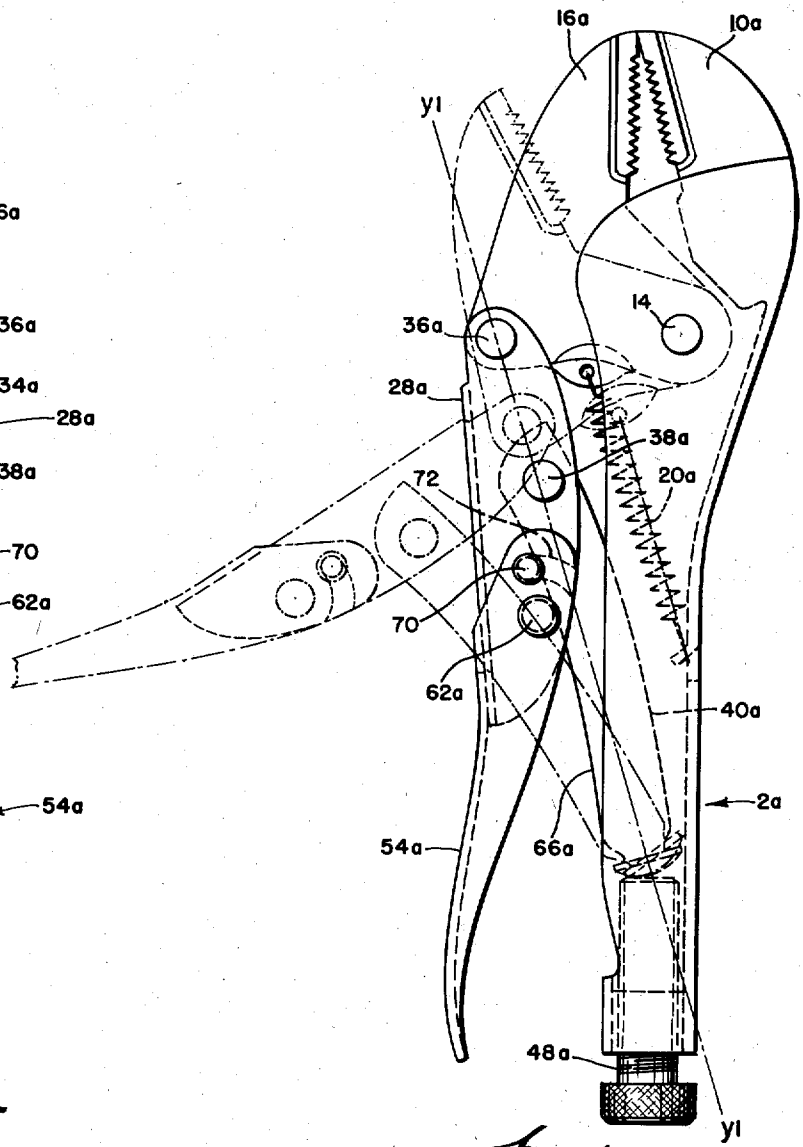

Fig. 4

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TOGGLE-JOINT WRENCH WITH CAM RELEASE MEANS

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3 Claims. (Cl. 81—370)

This invention relates to lever jaw wrenches and more particularly to an improved quick release mechanism for a lever jaw wrench.

As is well known, a lever jaw wrench generally comprises a fixed jaw attached to a handle, a movable jaw, means pivotally connecting the movable jaw to the handle, a lever pivotally connected at one end to the movable jaw and pivotally connected at a point removed from said one end to a link that is pivotally associated with the handle. The pivot between the lever and the link is known as a toggle joint. This toggle joint acts to lock the movable jaw against a work piece centered between the jaws with such force that considerable effort is required to break or release the toggle joint so as to effect releasing of the work piece.

Heretofore various various types of quick release mechanisms have been invented and incorporated in lever jaw wrenches to facilitate unlocking of the jaws. Although such quick release mechanisms are well known and have gained some measure of acceptance, they have not been entirely satisfactory. One common objection is that considerable effort is still required to effect releasing of the jaws. Another objection is that they materially increase the cost of the wrench. A further objection is that they become inoperative or are broken easily under arduous use. Still another great objection is that the operator's fingers are easily injured if not properly placed on the wrench. An additional objection is that the quick release mechanism requires or occupies too much space so that it can not be embodied in a relatively small, e.g. seven inch, lever jaw wrench.

Accordingly, the principal object is to provide a lever jaw wrench having an improved quick release mechanism which avoids the objections attendant to conventional quick release mechanisms and which is capable of being operated by only one hand of the user. A more specific object of this invention is to provide a lever jaw wrench comprising pivotally connected stationary and movable jaws, a handle fixed to the stationary jaw, a lever pivotally connected at one end to the movable jaw, a link, means pivotally connecting one end of the link to said lever intermediate the ends of said lever, means supporting the opposite end of said link in pivotal relation with said handle, said link and lever together constituting a toggle joint effective to hold the movable jaw fixed relative to the stationary jaw when the pivot of said link and lever is forced slightly beyond the line running from the pivot of said lever and said movable jaw to the pivot of said link and said handle, and a secondary handle pivoted to said lever provided with means for forcing said link-lever pivot to jaw unlocking position.

Another specific object of this invention is to provide a lever jaw wrench comprising a stationary jaw and a movable jaw secured in pivotal relation to said stationary jaw, a handle fixed to said stationary jaw, a lever pivotally connected at one end to said movable jaw, a link pivotally connected at one end to an intermediate portion of said lever and supported at the opposite end in pivotal relation

with said handle, said link and lever together constituting a toggle joint effective to force the movable jaw toward the stationary jaw when the pivot of said link and lever is forced toward said handle, a secondary handle pivoted to said lever, and means operated by said secondary handle and engaging said link for forcing the pivot of said link and lever away from said handle whereby to move the movable jaw away from the stationary jaw.

Other objects and many of the attendant advantages of this invention will become readily apparent as reference is had to the following detailed specification when considered together with the accompanying drawings wherein:

Fig. 1 is a view in elevation of a preferred embodiment of the present invention with certain parts broken away and shown in section;

Fig. 2 is a view in elevation of the same embodiment looking from left to right in Fig. 1;

Fig. 3 is a sectional view taken along line 3—3 of Fig. 1;

Fig. 4 is a view in elevation of a second form of the present invention taken from the same vantage point as in Fig. 1; and

Fig. 5 is a view in elevation looking from left to right in Fig. 4.

Looking now to Figs. 1, 2 and 3, the first form of the invention comprises an elongated handle 2 formed of sheet metal and bent at 4 in the form of a U-shaped channel so as to provide a pair of opposed substantially parallel sides 6 and 8. Welded to the top end of the handle and extending between opposed sides 6 and 8 is a steel jaw 10 preferably formed by casting or forging. Attached to jaw 10 is a hardened steel gripping block 12. Secured to the upper end of the handle by means of a pivot pin 14 is a movable jaw 16 provided with a second hardened steel gripping block 18. A tension spring 20 connected at one end to a lug 22 formed in movable jaw 10 and at the other end to a hook 24 formed in the handle 2 urges the movable jaw 16 away from the stationary jaw 10.

A lever 28 formed of sheet metal and bent at 30 so as to form a pair of opposed sides 32 and 34 is pivotally connected at one end to the movable jaw 16 by means of a pivot pin 36. Extending between sides 32 and 34 and attached to lever 28 intermediate its ends by a pivot pin 38 is a link 40 formed of metal rod stock. The link 40 is of rectangular cross-section. The opposite end of the link 40 is provided with an enlarged rounded head 44. This rounded head bears against the end of an adjusting bolt or screw 48 which is screwed into a threaded socket 50 secured to the bottom end of the elongated handle 2. The opposed sides 6 and 8 of the handle 2 are bent around the socket 50 and hold it fixed to the handle. The opposite end of the adjusting screw 48 is provided with an enlarged knurled head 52 by which it can be easily grasped and turned.

Pivotally secured to the lever 28 is an auxiliary handle 54 formed of sheet metal and bent at 56 to form opposed sides 58 and 60. The auxiliary handle is secured to lever 28 by means of a pivot pin 62. The pivot pin is fixedly secured to the auxiliary handle's sides 58 and 60 and is rotatable relative to the lever 28. Between the sides of lever 28 the pivot pin 62 is cut away so as to be approximately semi-circular in cross-section and so as to provide a flat cam surface 64 adapted to bear against the edge 66 of link 40.

The curved edge surface 56 of the auxiliary handle overlaps the curved edge surface 30 of lever 28, so that when the auxiliary handle is moved in the direction of the fixed handle 2, it will force the lever 28 to rotate in the same direction. In other words, the auxiliary handle 54 in one direction of movement is adapted to

function as an extension of lever 28. The auxiliary handle is free to rotate in the opposite direction relative to lever 28, the movement of the auxiliary handle relative to the lever in that direction being limited by the engagement of the end of the edge surface 56 of the auxiliary handle with the edge surface 30 of the lever 28.

The spacing between the jaws in open and closed position is determined by the position of adjusting screw 48.

The spacing between the jaws can be increased by backing off screw 48. Turning the screw so as to advance it toward the jaws, decreases the spacing between the jaws.

The general relative positions of lever 28 and link 40 when the jaws are in open position is shown in broken lines in Fig. 1. Closing of the wrench is effected by moving auxiliary handle 54 toward fixed handle 2. This pivots lever 28 toward handle 2 and forces the upper end of link 40 to move inwardly toward the handle 2. The pivot pin 38 moves in line with pivot pin 36 and the point of contact of head 44 of the link with screw 48. Broken line *y—y* in Fig. 1 runs from pivot 36 to the point of contact of head 44 and screw 48. Pivot pin 38 passes across line *y—y* and when the center of pin 38 has passed slightly beyond line *y—y*, it is stopped due to the engagement of the surface 64 of pin 62 with the edge 66 of link 40. With pivot pin 38 slightly to one side of center, the toggle joint is locked.

To release the toggle joint, the auxiliary handle 54 is moved away from the fixed handle 2. As it moves away from handle 2, it pivots relative to lever 28. When this occurs, pivot pin 62 rotates and the edge between its flat surface 64 and its curved surface bears against the edge 66 of the link, forcing the bottom end of lever 28 away from the link to release the toggle joint, whereupon spring 20 pulls the jaw 10 to open position. In releasing the toggle joint pivot pin 62 functions as a cam. The surprising ease with which the toggle joint is broken is due to the mechanical advantage provided by the length of the auxiliary arm acting as a lever to rotate the pivot pin 62. In practice it has been found that the toggle joint can be released by the fingers of the hand holding the wrench with ease. Whereas conventional ten inch lever jaw wrenches usually require approximately twelve pounds force to break the toggle joint, it has been found that as little as one-quarter of a pound of force is required to break the toggle joint of the wrench illustrated in Figs. 1 to 3.

The second form of the invention is quite similar to the form already described. In this form of the invention, the link 40*a* is slightly curved. This is different from the link 40 of Fig. 1 which is a straight bar. The auxiliary handle 54*a* in Fig. 4 is pivotally secured to the lever 28*a* by means of a pivot pin 62*a* which is of circular cross-section throughout its length. However, also attached to the auxiliary handle is a second pin 70. This pin extends through the sides 32*a* and 34*a* of lever 28*a*, the sides each being provided with an arcuate slot 72.

When the auxiliary handle 54*a* is moved from the dotted line position to the position shown in full lines (Fig. 4), lever 28*a* and link 40*a* are pivoted toward handle 2*a*, moving the jaw 16*a* toward jaw 10*a*. As the center of pivot 38*a* passes through the line *y*1—*y*1 corresponding to line *y—y* of Fig. 1, link 40*a* is engaged by pin 62*a* and/or pin 70. When this occurs the toggle joint is locked. It is not necessary that pin 62*a* and pin 70 both engage the edge 66*a* of the link to lock the toggle joint; either one or both may be positioned to engage the link.

When it is desired to open the wrench, the auxiliary handle 54*a* is moved away from the fixed handle 2*a*. As it moves, it rotates relative to the lever 28*a* forcing the pin 70 against the edge 66*a* of the link. The pin acts as a cam to move the bottom end of lever 28*a* away from the link. This moves the center of pivot 38*a* back in line with line *y*1—*y*1, breaking the toggle joint, whereupon spring 20*a* pulls jaw 16*a* to open position. The toggle joint is broken with substantially the same ease as the toggle joint of the embodiment of Fig. 1.

It is believed obvious that the two embodiments employ the same principles of operation. In both cases a pin acts as a cam against the link to break the toggle joint when the auxiliary handle is moved away from the fixed handle and pivots about the lever. The only difference is that in one case, the pin that functions as a cam is the same pin by which the auxiliary handle is pivoted to the lever and in the other case the pin which acts against the link is separate from the pin which pivotally secures the auxiliary handle to the lever.

It is to be noted that the links 40 and 40*a* are not physically secured to the screws 48 and 48*a*. Obviously they could be secured to a pivot block piloted on or resting against the adjusting screw, as shown in U.S. Patent No. 2,590,750, issued March 25, 1952. In the illustrated embodiments the links are prevented from moving out of contact with the screw bolts by the sides 6 and 8 of the fixed handle. The sides of the fixed handle curve inward toward each other at their edges just enough to prevent the head 44 from moving out from between the sides of the handle. In practice the adjusting screw is always engaged by the rounded end of the link, regardless of the position of the movable jaw.

The wrench may be made of various types of steel. Because of its particular construction, it is cheap and easy to manufacture and assemble. The quick release mechanism is not only superior to other quick release mechanisms heretofore embodied in lever jaw wrenches, but it is also strong, easy to assemble, and does not take up any space or limit operation of the wrench. The force required to release the toggle joint can be varied by changing the position of the pivot pin and can be adjusted to as little as one-quarter of a pound so that the wrench can be opened and closed with one hand.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. Therefore it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts as specifically described or illustrated, and that within the scope of the appended claims it may be practiced otherwise than as specifically described or illustrated.

I claim:

1. A lever jaw wrench comprising pivotally connected stationary and movable jaws, a handle fixed to the stationary jaw, a lever pivotally connected at one end to the movable jaw, a link, means pivotally connecting one end of the link to said lever intermediate the ends of said lever, means supporting the opposite end of said link in pivotal relation with said fixed handle, said link and lever together constituting a toggle joint effective to hold the movable jaw fixed relative to the stationary jaw when the pivot of said link and said lever is forced slightly beyond the line running from the pivot of said lever and said movable jaw to the pivot of said link and said fixed handle, a secondary handle, and a pivot pin connecting one end of said secondary handle to said lever, said pivot pin having a flat cam surface engageable with said link when said pivot of said link and lever is moved slightly beyond said line to a position where said toggle joint is effective to hold said movable jaw fixed relative to said stationary jaw, and operable against said link to shift said pivot of said link and lever to the other side of said line when said secondary handle is rotated relative to said lever away from said fixed handle.

2. A lever jaw wrench comprising pivotally connected stationary and movable jaws, a handle fixed to the stationary jaw, a lever pivotally connected at one end to the movable jaw, a link, means pivotally connecting one end of the link to said lever intermediate the ends of said lever, means supporting the opposite end of said link

in pivotal relation with said fixed handle, said link and lever together constituting a toggle joint effective to hold the movable jaw fixed relative to the stationary jaw when the pivot of said link and said lever is forced slightly beyond the line running from the pivot of said lever and said movable jaw to the pivot of said link and said fixed handle, a secondary handle, and a pivot pin connecting said lever with one end of said secondary handle whereby said secondary handle functions as an extension of said lever, said pivot pin being fixed to said secondary handle and rotatable relative to said lever, said pivot pin having a flat cam surface engageable with said link for forcing the pivot of said link and lever away from said fixed handle across said line to jaw-unlocking position when said secondary handle is pivoted relative to said lever in a direction away from said fixed handle.

3. A lever jaw wrench comprising a first jaw, a first elongated handle affixed to said first jaw, a second jaw pivotally secured to said first handle, a tension spring connected to said first handle and said second jaw normally urging said second jaw to open positon relative to said first jaw, a lever pivotally connected at one end to said second jaw, said lever having a U-shaped cross section defined by two opposed side walls and a third connecting wall, a link, a first pivot pin pivotally connecting one end of said link to an intermediate portion of said lever, means supporting the opposite end of said link in pivotal relation with said first handle, said link and lever together constituting a toggle joint effective to pivot said second jaw toward and away from said jaw when said first pivot pin is forced toward and away from said first handle, a

second handle, at least a portion of said second handle having a U-shaped cross section formed by two opposed side walls and a third connecting wall, said lever having its free end located within one end of said secondary handle with the side walls and connecting wall of said second handle overlapping the corresponding walls of said lever, and a second pivot pin pivotally connecting said portion of said second handle with the free end of said lever, said second pivot pin having its opposed ends fixedly secured to the side walls of said second handle, said second pivot pin also extending through the side walls of said lever in rotatable relation thereto, the portion of said pin located between the side walls of said lever having a flat cam surface engageable with said link for forcing said first pivot pin away from said first handle to unlock said jaws when said second handle is rotated relative to said lever in a direction away from said first handle.

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