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PLIER TYPE TOGGLE WRENCH WITH UNLOCKING MEANS

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This invention relates to tools of the plier wrench type, and more particularly to plier type toggle wrenches having a toggle mechanism wherein the jaws are locked in engagement with the work upon approaching movement of the handle sufficient to cause the toggle mechanism to pass dead center and yieldably lock the jaws against separation.

The principal objects of the present invention are to provide a plier type toggle wrench which includes a lever pivotally engaged with one link of the toggle mechanism and acting on the handle with a force multiplying means to unlock the toggle and open the work gripping jaws with a force less than that required to close the same; to provide a plier type toggle wrench with a release lever extending longitudinally relative to the handle and pivoted on the toggle link and having a portion acting on the handle to force the toggle link away from said handle upon swinging of said lever to move the toggle mechanism over dead center in jaw opening direction; to provide such a wrench wherein the release lever has rolling engagement with the handle for reduced friction and resistance in the unlocking action of said lever; and to provide a plier type toggle wrench with unlocking means which is simple in construction, inexpensive to manufacture, compact, easy to manipulate and that is effective for the purpose for which it is produced.

Other objects and advantages of this invention will become apparent from the following description taken in connection with the accompanying drawings, wherein are set forth by way of illustration and example certain embodiments of this invention.

Fig. 1 is an elevational view of a plier type wrench embodying the present invention and with the jaws thereof locked about an article.

Fig. 2 is a similar view to Fig. 1 with certain parts broken away to show the operating mechanism and with the release lever moved to toggle unlocked position.

Fig. 3 is a transverse sectional view through the plier type wrench taken on the line 3-3, Fig. 1.

Fig. 4 is a transverse sectional view through the plier type wrench taken on the line 4-4, Fig. 1.

Fig. 5 is a transverse sectional view through the plier type wrench taken on the line 5-5, Fig. 1.

Referring more in detail to the drawings:

1 designates a plier type wrench which includes a stationary handle 2 which is substantially U-shaped in cross-section and having a fixed jaw 3 at one end thereof. The jaw 3 is preferably of relatively hard metal and provided with teeth or serrations 4 along the work-engaging face thereof. The rear portion 5 of said jaw extends into the forward end of the handle 2 with the side faces 6 engaging the inner surfaces 7 of the side flanges 8 of said handle 2. The jaw 3 is fixed to the handle 2 by suitable means, for example, by a pin or rivet 9 which cooperates with the engagement of the outer edge surface 10 of said rear portion 5 of the jaw with the bottom 11 of the forward portion of the handle

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2 to substantially securely and permanently fix the jaw to the handle.

A movable jaw 12 of relatively hard metal is movably mounted on the handle 2 in opposed relation to the fixed jaw 3 and has teeth or serrations 13 along the work-engaging face thereof. In the illustrated structure, the movable jaw 12 is pivotally mounted to and between the flanges 8 of the handle 2 by a suitable pivot pin 14. A tension spring 15 is connected at one end 16 by a portion extending through an aperture 17 in an area of reduced thickness 18 at the rear of the jaw 12 in spaced relation to the pin 14. The opposite end 19 of the spring is connected to the handle 2 by having a portion extending through an aperture 20 intermediate the ends of said handle 2 whereby the spring urges the jaw 12 away from the fixed jaw 3 toward open position. The movable jaw 12 is actuated by means of a toggle mechanism 21 which includes an operating lever 22 and a toggle link 23. The operating lever 22 is a second handle member and is the primary actuating lever of the toggle mechanism. The operating lever 22 is of channel or U-shaped cross-section and is pivotally connected at one end by suitable means such as a pivot pin 24 to the movable jaw 12 and extends rearwardly therefrom and is disposed in the plane of the handle 2. It is preferable that the forward end of the operating lever 22 be notched as at 25 at the bottom of the channel whereby the forward ends of side flanges 26 of said lever straddle the portion of the jaw 12 adjacent the pivot pin 24 which is at a rear portion of said jaw.

The toggle link 23 is pivotally engaged or connected by a pivot pin 27 to the flanges 26 of the operating lever 22 intermediate the length of said operating lever. The end of the toggle link 23 connected to the operating lever preferably is positioned between the flanges 26 of said operating lever and has a rounded tapered nose 28 adapted in unlocked position to abut the inner surface 29 of the bottom of the channel of the operating lever to limit outward movement of said lever in a direction away from the stationary handle. The opposite end 30 of the toggle link 23 engages an abutment 31 on the handle 2 to form a fulcrum or pivotal engagement therewith, and, in the illustrated structure, the abutment 31 is in the form of a screw threaded member 32 threadedly engaged in a bore 33 in the rear end 34 of the handle 2, said screw threaded member preferably having a finger-engaging knob 35 to facilitate adjustments thereof to move the portion engaging the toggle link forwardly and rearwardly relative to said handle 2. In order to hold said opposite end 30 of the toggle link 23 in the channel between the flanges 8 of the stationary handle 2, the toggle link is formed with oppositely directed lugs 36 for engagement with retaining members formed by deforming the edges of the flanges 8 laterally and inwardly as at 38 to define a slot of greater width than the thickness of the toggle link 23 but of less width than the lugs 36 so the toggle link 23 can move freely in the slot during use of the pliers.

In a work gripping operation with a work piece between the jaws 3 and 12 and the abutment 31 in suitable adjusted position, the operating lever 22 is swung toward the stationary handle 2, and due to the engagement of the toggle link with the abutment, the movement of the operating lever 22 will swing the jaw 12 toward the jaw 3, and when in work gripping position the pin 27 will move beyond a line passing through the pin 24 and the fulcrum point of the toggle link against the abutment 31 moving the toggle mechanism past its dead center position. The movement of the jaw 12 and the extent of the movement of the toggle mechanism past dead center position by a lug or stop portion 39 on said toggle link 23 engages the inner face 29 of the operating lever 22 and prevents further movement

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of the operating lever toward the stationary handle 2. When the toggle mechanism is moved past dead center, force applied to the operating lever 22 to open the jaws requires as much force as was expended in closing the jaws. Also, such opening by the grasping of the handle 2 and operating lever 22 to pull them apart frequently will cause them to fly apart as the pin 27 moves past dead center position in the direction of jaw opening position, and such quick opening can result in injury to the user.

The present structure has a toggle release mechanism 40 to apply the force to the toggle mechanism to move the same past the dead center position to open the jaws and operates as a force multiplying means whereby the force applied thereto is materially less than was required in closing the jaws. This release or toggle unlocking mechanism includes a lever member 41 arranged in the plane of the handle 2 and lever 22 and disposed therebetween. The unlocking lever 41 has its forward end pivotally connected to the toggle link 23 intermediate its ends by a pivot pin 42, and said unlocking lever extends rearwardly therefrom and is curved as at 43 to be positioned close to the inner portion of the rear of the operating lever 22 when in jaw locked position. The unlocking lever 41 preferably extends rearwardly beyond the rear end 44 of said operating lever 22 to present a portion 45 of said unlocking lever that may be easily engaged by a finger for moving same. The forward portion of the unlocking lever 41 is preferably U-shaped in cross-section and is notched as at 46 at the forward end to form a bifurcated portion with spaced arms 47 that straddle the intermediate portion of the toggle link 23, said arms being connected to said link 23 by the pivot pin 42. The lever 41 has lateral extensions or arms 48 which extend into the channel of the handle 2 forwardly of the end 36 of the toggle link 23, said extensions or arms 48 having a cam portion 49 carried thereby for engagement with the bottom surface 50 of the intermediate portion of the handle 2. It is preferable that the arms 48 be arranged at an acute angle to the surface 50 and thereby to a line perpendicular to the surface 50 extending through the pin 42 when the pliers are in work gripping position and the unlocking lever is positioned as illustrated in Fig. 1. In the illustrated structure, a roller 51 is disposed between the arm extensions 48 and rotatably mounted thereon by a pin 52 to provide rolling engagement in the cam action against the surface 50 of the handle 2 when the unlocking lever is moved as, for example, the rear portion of the lever 41 moved toward the rear of the handle 2 from the position illustrated in Fig. 1. The rear portion of the unlocking lever 41 is positioned relative to the extension arms 48 whereby when the pliers are in work-engaging position with the toggle mechanism locked, swinging movement of the unlocking lever 41 in the space between the handle 2 and operating lever 22 will move the arm extensions 48 relative to the surface 50 of the handle 2 to force the forward portion of the toggle link 23 away from the handle 2 effecting unlocking of the toggle mechanism.

In operation, with a work piece positioned between the jaws 3 and 12, and the operating lever in jaw open position, the handle 2 and operating lever 22 are squeezed by the hand of an operator and moved together to swing the pin 27 past dead center position in the toggle mechanism to lock the jaws in work gripping position. During the first part of the movement of the toggle mechanism toward work gripping position, the unlocking lever is positioned whereby the roller 51 is moved into engagement with the surface 50 and then the further movement of the toggle mechanism to the work gripping position causes the unlocking lever to swing to the position shown in Fig. 1. Then, when it is desired to release the jaws from the work, the rear portion 45 of the unlocking lever is pressed toward the handle 2 moving the extension arms 48 and the roller 51 forwardly in the chan-

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nel of the handle 2 which moves the pin 42 away from the handle 2 and thereby swings the forward portion of the toggle link and pin 27 thereon past dead center toward the jaw opening position, thereby unlocking the toggle mechanism and the jaws.

It is to be understood that while I have illustrated and described one form of my invention, it is not to be limited to the specific form or arrangement of parts herein described and shown except insofar as such limitations are included in the claims.

What I claim and desire to secure by Letters Patent is:

1. In a plier type toggle wrench including an elongated handle having a fixed jaw at one end, an opposing jaw pivotally mounted on said handle, resilient means for moving said pivoted jaw away from said fixed jaw, and a toggle mechanism for moving said pivoted jaw towards said fixed jaw, said mechanism including an operating lever pivotally engaged at the forward end thereof to the pivoted jaw and a toggle link pivotally engaged at one end to said operating lever intermediate its ends, the opposite end of said toggle link engaging said handle, said mechanism being so proportioned and cooperative with the handle to move the jaws into clamping engagement and lock the toggle mechanism in response to squeezing the handle and lever together, and a toggle release lever having a portion between the handle and operating lever and extending longitudinally and rearwardly of the space therebetween, said release lever being pivotally connected to said toggle link intermediate its ends for swinging movement from adjacent one of said handle and operating lever toward the other, said release lever having a portion extending from its pivotal connection and engaging said handle at an acute angle relative thereto forwardly of said opposite end of said toggle link whereby movement of said release lever moves said extending portion thereof along said handle to apply force thereagainst to urge the forward portion of said toggle link away from the handle to a position to release said toggle mechanism.

2. In a plier type toggle wrench including an elongated handle having a fixed jaw at one end, an opposing jaw pivotally mounted on said handle, resilient means for moving said pivoted jaw away from said fixed jaw, and a toggle mechanism for moving said pivoted jaw towards said fixed jaw, said mechanism including an operating lever pivotally engaged at the forward end thereof to the pivoted jaw and a toggle link pivotally engaged at one end to said operating lever intermediate its ends, the opposite end of said toggle link pivotally engaging said handle, said mechanism being so proportioned and cooperative with the handle to move the jaws into clamping engagement and lock the toggle mechanism in response to squeezing the handle and lever together, and a substantially L-shaped toggle release lever having one leg portion between the handle and operating lever and extending longitudinally and rearwardly of the space therebetween, said release lever being pivotally connected to said toggle link intermediate its ends for swinging movement of said one leg portion from adjacent one of said handle and operating lever toward the other, said release lever having a second leg portion extending from adjacent its pivotal connection and engageable with said handle at an acute angle relative thereto forwardly of said opposite end of said toggle link when the toggle mechanism is in locked position whereby movement of said release lever moves said second leg portion thereof longitudinally of said handle in engagement therewith to apply force thereagainst to urge the forward portion of said toggle link away from the handle to a position to release said toggle mechanism.

3. In a plier type toggle wrench including an elongated handle of substantially U-shaped channel construction and having a fixed jaw at one end, a movable jaw mounted on said handle to move relative to the fixed jaw, resilient means for moving said movable jaw away from said fixed

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jaw and a toggle mechanism for moving said movable jaw towards said fixed jaw, said mechanism including an operating lever pivotally engaged at the forward end thereof to the movable jaw and disposed in the plane of said handle and a toggle link pivotally engaged at one end to said operating lever intermediate its ends, the opposite end of said toggle link engaging an abutment on said handle, said mechanism being so proportioned and cooperative with the handle to move the jaws into clamping engagement and lock the toggle mechanism in response to squeezing the handle and lever together, and an unlocking lever having a bifurcated forward portion in straddling relation to the toggle link, means pivotally connecting said forward portion of said unlocking lever to said toggle link intermediate its ends, said unlocking lever extending longitudinally and rearwardly in the space between said handle and operating lever in the plane thereof and being adjacent said operating lever when in toggle locking position, spaced arms on said unlocking lever and extending rearwardly from the pivotal connection thereof in inclined relation to said handle, means on the free ends of said arms and engaging the bottom of said handle forwardly of the other end of said toggle link to apply a force to said handle as the unlocking lever is swung toward the handle to urge separating movement of the forward portion of the handle and toggle link and unlocking of said toggle mechanism.

4. A structure as specified in claim 3 wherein the means on the free ends of said arms is a roller rotatably mounted between said arms and adapted to roll on the bottom of said U-shaped channel handle.

5. In a plier type toggle wrench including an elongated handle of substantially U-shaped channel construction and having a fixed jaw at one end, a movable jaw mounted on said handle to move relative to the fixed jaw,

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resilient means for moving said movable jaw away from said fixed jaw and a toggle mechanism for moving said movable jaw towards said fixed jaw, said mechanism including an operating lever pivotally engaged at the forward end thereof to the movable jaw and disposed in the plane of said handle and a toggle link pivotally engaged at one end to said operating lever intermediate its ends, the opposite end of said toggle link pivotally engaging an abutment on said handle, said mechanism being so proportioned and cooperative with the handle to move the jaws into clamping engagement and lock the toggle mechanism in response to squeezing the handle and lever together, and an unlocking lever having a bifurcated forward portion in straddling relation to the toggle link, means pivotally connecting said forward portion of said unlocking lever to said toggle link intermediate its ends, said unlocking lever extending longitudinally and rearwardly in the space between said handle and operating lever in the plane thereof and being adjacent said operating lever when in toggle locking position, an arm projecting laterally from the unlocking lever adjacent its pivot and in the direction of said handle, said arm having a camming portion engageable with the bottom of said handle for applying a force thereagainst when the rearward portion of said unlocking lever is actuated in a direction toward the handle for urging separating movement of the forward portion of the handle and toggle link and unlocking of said toggle mechanism.

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