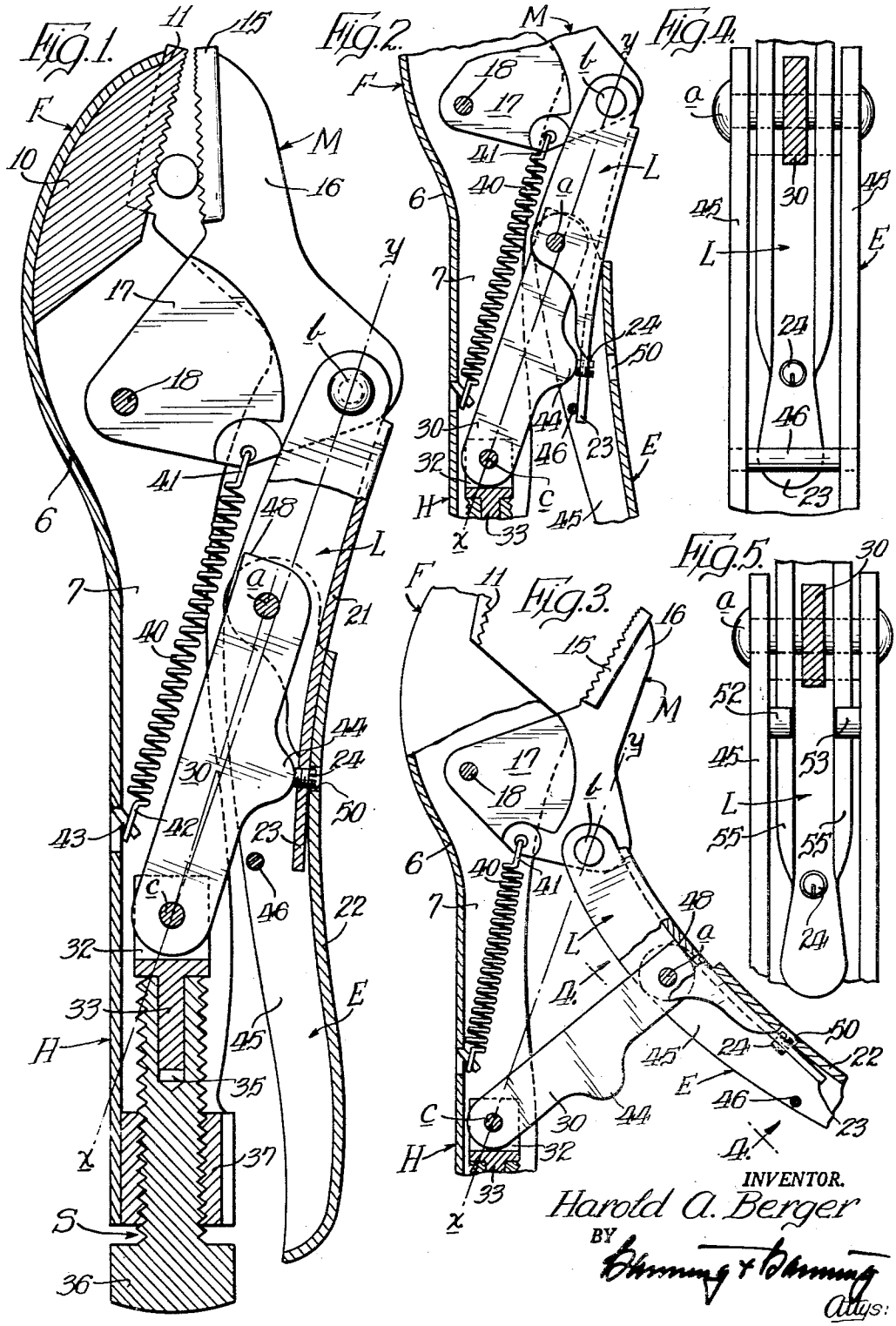
April 12, 1955 H. A. BERGER 2,705,899

RELEASE MECHANISM FOR A LEVER JAW WRENCH

Filed Oct. 20, 1951



United States Patent Office 2,705,899
Patented Apr. 12, 1955

2,705,899

RELEASE MECHANISM FOR A LEVER JAW WRENCH

Harold A. Berger, Plano, Ill., assignor to Metal Engineering Company, Plano, Ill., a corporation of Illinois

Application October 20, 1951, Serial No. 252,249

6 Claims. (Cl. 81—84)

This invention relates to a release device for the toggle mechanism of a lever jaw wrench. In such a tool the toggle mechanism comprises a lever in pivotal connection at one end with the movable jaw and at its opposite end in pivotal connection with one end of a link whose opposite end is in pivotal connection with the fixed jaw handle at a point relatively close to its rearward end. In use it sometimes happens that the pivot point of the connection between the lever and link crosses a line between the pivotal connections between (1) the lever with the jaw and (2) the link and the handle. When this occurs the movable jaw is locked to the work with such force as not to be readily disengageable therefrom, and a special release device to break the toggle joint in such circumstances becomes highly desirable.

The present invention is concerned with a mechanism for this purpose. It embodies certain desirable features, such as simplicity in its construction and dependability in its operation. Furthermore, no supplemental lever is required for operation when the toggle joint is to be broken, nor any part which, when operated, will engage the fixed jaw handle with possible injury to the fingers if caught therebetween.

These several objects and advantages, as well as others which will hereinafter appear, are accomplished in a highly satisfactory manner by the mechanism of this invention of which a suggestive embodiment is illustrated in the accompanying drawing in the manner following:

Figure 1 is a longitudinal sectional view taken centrally through the present lever jaw wrench, the toggle mechanism being shown as operated to a past-center position;

Fig. 2 is a similar view confined to the toggle mechanism and parts immediately associated therewith, showing the release device in the position where it is ready to start operation;

Fig. 3, which is a view similar to Fig. 2, shows the toggle joint broken as a result of operation of the release device;

Fig. 4 is a fragmentary view in elevation, looking along line 4—4 of Fig. 3; and

Fig. 5 which is a similar view shows a modification in the form of the release device.

The wrench herein shown comprises a streamlined body which may be produced from sheet metal reversely bent longitudinally upon itself at **6** to provide an open channel defined by a pair of interconnected spaced walls 7, the channel being somewhat deeper in the head end region than elsewhere. Away from the head the channel is relatively shallow for an extended distance to provide a fixed handle H. At the head end the spaced walls 7 receive between them a web **10** to which they are secured as by welding. This web extends centrally from a gripping block **11** that may be serrated or otherwise formed upon its work-engaging face.

The part of the wrench which supports the gripping block **11** may be termed the fixed or stationary jaw F as distinguished from a coacting movable jaw M which comprises a complementary gripping block **15** that extends crosswise of a finger **16** that is projected upwardly from a plate **17**. This plate is extended into the channel of the fixed jaw at the head end region of the wrench and is pivotally connected thereto near its inner lower corner by a cross pin or rivet **18** at a point that is relatively deep in the channel.

Extending adjacent the wrench handle H is a lever L, together with an extension piece E, each made desirably

of sheet metal and longtudinally arched at **21** and **22**, respectively, to provide a rounded outer wall and spaced side walls defining a channel which faces the channel of the handle H. This extension piece E constitutes a movable handle which lies adjacent the channeled handle of the wrench to be grasped therewith by the user for manipulation of the wrench. The lever L for part of its length is fitted within the channeled extension piece E. At a point intermediately of its length, the lever L is connected to the extension piece by a pivot pin *a* and at its forward end the lever is connected by a pivot *b* to the movable jaw M at a point near its outer lower corner. The extension piece E engages the lever L in the area of its overlap (see Fig. 1) and serves as an operating handle therefor, thereby to swing the movable jaw M inwardly when the extension piece is pressed toward the fixed handle H in response to manual gripping thereof. At its rear end the lever terminates in a heel **23** through which is formed a tapped hole for support therein of an adjustable set screw **24** that may be split to provide spring section for frictionally locking the screw in a selected position of axial adjustment.

At a point near the upper end of the extension piece a rearwardly extending thrust link **30** is in pivotal connection therewith and with the lever L. For this purpose I use the same pivot pin *a* which interconnects the extension piece E and lever L. The pivotal connection *a* comprised in the link-lever assembly is referred to sometimes hereinafter as "the toggle joint." At its rear end the thrust link **30** is pivotally connected, as by a pin *c*, with a bifurcated head **32** from which is axially extended a stem **33**. This head which constitutes a fulcrum is slidingly fitted within the channeled handle H to be guidingly supported thereby. For the pivotal connection *c* I may utilize a pin whose length is approximately the same as the inside width of the channel between the spaced walls **7**.

The stem **33** is received within an axial socket **35** at the upper end of an adjusting screw S having at its opposite end a manipulating head **36** which lies beyond the proximate end of the fixed handle. The shank of the screw is threaded for operative engagement with a bushing **37** that is welded or otherwise secured in place within the channeled handle H at its lower end. This assembly of adjusting screw S and parts associated therewith permits the fulcrum pin *c* to be adjusted lengthwise of the fixed handle H.

The lever L and its extension piece E constitute, with the thrust link **30**, a toggle mechanism capable of transmitting a powerful operating force to the movable jaw M. This jaw is normally maintained in an open position by a coiled spring **40** having one end **41** hooked through an opening in the jaw at a point outwardly of its pivotal mounting **18**, the opposite spring end **42** being connected to an inset lug **43** that is extended interiorly of the handle H at a point remote from the jaw. The tension of this spring normally pulls the movable jaw away from the fixed jaw to the extent that is permitted by the linkage in connection therewith. An ear **44** projects outwardly from the link oppositely of the set screw **24** to be engaged thereby (see Fig. 1) so that advance of the extension piece E toward the handle H may be halted at a desired point. This ear projects a sufficient distance to maintain a minimum separation therebetween, regardless of the axial position of the set screw.

The mechanism described up to this point provides a powerful lever jaw wrench capable of manual operation by a unitary swinging movement of the extension piece E and lever L toward the handle H of the fixed jaw. In this operation the toggle joint pivot pin *a* which interconnects the lever and link will move toward a line *x*—*y* which passes between the axes of the pivot pins *b* and *c*. If this movement be not too far, the movable jaw will readily swing back to open position when pressure is relaxed upon the extension piece; if, however, the pivot pin *a* be moved sufficiently close to the line *x*—*y* or be shifted over to the far side thereof (see Fig. 1), then difficulty is experienced in releasing the movable jaw from its engagement with the work. In such circumstances, to break the toggle joint it is necessary to employ

a release device of which a preferred form will now be described.

As indicated clearly in Fig. 4, there is extended between the side walls **45** of the channeled extension piece E an anchored cross pin **46** located inwardly of the lever heel **23** at a point near its lower free end. In the operated position of the wrench, where its jaws are in engagement with the work, this cross pin is relatively distant from the lever heel so as to occupy approximately the position of Fig. 1. This position is determined by the axial adjustment of the set screw **24**, as previously noted. If there be resistance to opening of the jaws, due to movement of the toggle joint to or beyond the line *x—y*, then the extension piece E should be swung outwardly and away from the fixed jaw handle H. The first stage of this movement is free up to the point of the cross pin **46** engaging the lever heel **23**. From this point on continued swinging movement of the extension piece E will carry it through a second stage in which the pin **46** transmits an outward motion to the lever L, thereby to break the toggle joint. In this operation the extension piece E acts as a lever of the second class with the pivot pin *a* serving as the fulcrum and the cross pin **46** as the resistance point. Due to the fact that the cross pin engages the lever at a point close to its free end, a powerful leverage is available to force the lever outwardly away from the handle H of the fixed jaw whereby to break the toggle joint and free the movable jaw M for disengagement from the work.

As soon as the pivot pin *a* has passed to the right of the line *x—y*, the spring **40** will exert its tension force through the movable jaw M and toggle linkage connected therewith to swing the extension piece E to its fully open position (see Fig. 3) which is reached when the link **39** is disposed transversely of the lever L at which point a shoulder **48** at the link end will be in engagement with the lever.

A hole **50** is formed in the arched wall **22** of the extension piece, oppositely of the set screw **24**, so as to expose its slotted outer end for manipulation by a screw driver or the like. This is a feature of advantage because of the desirability of adjusting the set screw from time to time according to the nature of the work upon which the wrench is required to operate. For example, it may be desired to lock the extension piece-lever assembly relative to the handle H when the jaws are engaged with the work so that the user's hand may be relieved from applying any further gripping pressure. When this is done, his hand is then free to manipulate the wrench through a turning movement without having to maintain any gripping pressure on the tool. While adjustment of the fulcrum pin *c* is effective to space the jaws apart a selected distance prior to one being operated toward the other for gripping of work therebetween, the distance of advance of the toggle joint toward the fixed handle is not directly affected thereby. The extent of this movement toward or beyond the line *x—y* is determined mainly by the position of the set screw **24**. A workman who operates the wrench for rotation of successive work pieces, all alike, will find it advantageous to make the proper adjustments initially before so proceeding.

In Fig. 5 I have illustrated a modified form of release device comprising two aligned pins **52** and **53** affixed to the extension piece side walls **45**, inwardly thereof, and in a position to engage the edges of the lever side walls **55**. The spacing between these two pins is such that the lever is free to execute its operative movements, but to be engaged by the pins when the extension piece E is swung about the pivot *a* in a direction away from the fixed jaw handle H. When such a movement takes place, the two pins **52** and **53** are effective to rock the lever L about its pivotal axis *b* so as to break the toggle joint thereby to release the jaws from the work.

In the preceding description I have used in a relative sense the terms "upper" and "lower" whose meaning is clear with reference to the illustrated wrench where its head is shown in the up position. In the claims the term "forward" and "rear" have been used with like meanings. These terms have been chosen for convenience in description, and are to be construed as having only relative meaning.

I claim:

1. A wrench of the class described comprising pivotally connected stationary and movable jaws, the stationary jaw being provided with a fixed handle, toggle operating mechanism for the movable jaw comprising a lever in pivotal connection near one end with the movable jaw and having a free end, a link in pivotal connection near one end with the lever intermediately of its ends, and a fulcrum pivotally interconnecting the link near its opposite end with the stationary jaw handle at a point relatively near its rear end, an extension piece pivotally connected at its forward end to the lever intermediately of its ends and extending rearwardly therefrom to engage therewith and provide therefor a handle opposed to the handle of the stationary jaw to be grasped simultaneously therewith for moving the lever inwardly to operate the movable jaw to closed position, said extension piece being channeled to face toward the fixed handle of the stationary jaw and having spaced side walls between which the lever is disposed, and means carried on the side wall of the extension piece, inwardly thereof, in spaced relation to the lever but in position to engage therewith at a point relatively close to its free end when the extension piece has been swung away from the fixed handle of the stationary jaw through a predetermined distance, for transmitting to the lever a retracting movement relative to the fixed handle of the stationary jaw.

2. A wrench according to claim 1 wherein said means is a pin fixedly extended crosswise between the spaced side walls of the extension piece in spaced relation to the lever.

3. A wrench of the class described comprising pivotally connected stationary and movable jaws, the stationary jaw being provided with a fixed handle, toggle operating mechanism for the movable jaw comprising a lever in pivotal connection near one end with the movable jaw, a link in pivotal connection near one end with the lever, and a fulcrum pivotally interconnecting the link near its opposite end with the stationary jaw handle at a point relatively near its rear end, an extension piece pivotally connected at its forward end to the lever and extending rearwardly therefrom to engage therewith and provide therefor a handle opposed to the handle of the stationary jaw to be grasped simultaneously therewith for moving the lever inwardly to operate the movable jaw to closed position, and a lost motion connection between said extension piece and the lever including means on said extension piece positioned to operably contact said lever only after the extension piece has been moved away from the fixed handle through a predetermined distance, additional movement of said extension piece transmitting to the lever a retracting movement relative to the fixed handle of the stationary jaw.

4. A wrench of the class described comprising pivotally connected stationary and movable jaws, the stationary jaw being provided with a fixed handle, toggle operating mechanism for the movable jaw comprising a lever in pivotal connection near one end with the movable jaw and having a free end, a link in pivotal connection near one end with the lever and a fulcrum pivotally interconnecting the link near its opposite end with the stationary jaw handle at a point relatively near its rear end, an extension piece pivotally connected at its forward end to the lever and extending rearwardly therefrom to engage therewith and provide therefor a handle opposed to the handle of the stationary jaw to be grasped simultaneously therewith for moving the lever inwardly to operate the movable jaw to closed position, and lost motion means carried by said extension piece underlying and normally spaced from the free end of said lever when said extension piece is in closed position, said lost motion means including means positioned to contact the free end of said lever only after the extension piece has been moved away from the fixed handle through a predetermined distance, additional movement of said extension piece transmitting to the lever a retracting movement relative to the fixed handle of the stationary jaw.

5. A wrench of the class described comprising pivotally connected stationary and movable jaws, the stationary jaw being provided with a fixed handle, toggle operating mechanism for the movable jaw comprising a lever in pivotal connection near one end with the movable jaw and having a free end, a link in pivotal connection near one end with the lever and a fulcrum pivotally interconnecting the link near its opposite end with the stationary jaw handle at a point relatively near its rear end, an extension piece pivotally connected at its forward end to the lever and extending rearwardly therefrom to engage therewith and provide therefor a handle opposed to the handle of the stationary jaw to be grasped simultaneously

therewith for moving the lever inwardly to operate the movable jaw to closed position, said extension piece being channeled to face toward the fixed handle of the stationary jaw and having spaced walls between which the lever is disposed, a pin fixedly extended crosswise between the spaced walls of the extension piece in position to engage therewith at a point relatively close to its free end when the extension piece has been swung away from the fixed handle of the stationary jaw through a predetermined distance, for transmitting to the lever a retracting movement relative to the fixed handle of the stationary jaw, and stop means between the extension piece and the toggle mechanism comprising a set screw carried by the lever in a tapped hole in its free end portion oppositely of the link and axially adjustable toward and from the link and oppositely of a hole in the extension piece through which the set screw is accessible for manipulation.

6. In a toggle mechanism, the combination of: a stationary handle; a toggle member pivoted on a first pin carried by said stationary handle; a movable handle pivoted at its upper end on a second pin to said toggle member; a link pivotally connected at its upper end to a

third pin located on said movable handle, and pivotally engaged to a fourth pin at its lower end, said fourth pin being engaged to the upper end of a first adjustable screw threaded in the lower end of said stationary handle; a second adjustable screw threaded in said movable handle in such a position that it coacts with a stop located intermediate the ends of said link limiting the position of said link to control the ultimate position of said link relative to said movable handle, said second adjusting screw having a tool-receiving means and being recessed in said movable handle so as to present a continual smooth surface on said movable handle.

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