July 19, 1966 W. D. ELLISON 3,261,243

TOGGLE CLAMP HAVING A LOCK MECHANISM ENGAGEABLE AS AN OVER-CENTER POSITION IS APPROACHED

Filed Sept. 18, 1964 3 Sheets-Sheet 1

Fig. 1

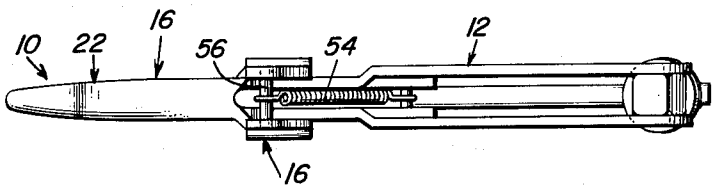


Fig. 2

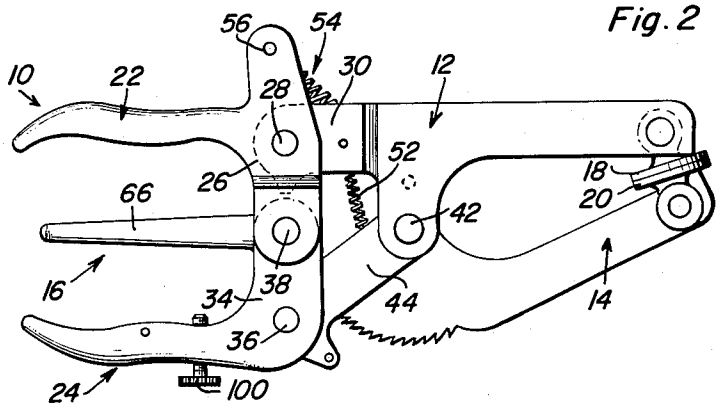
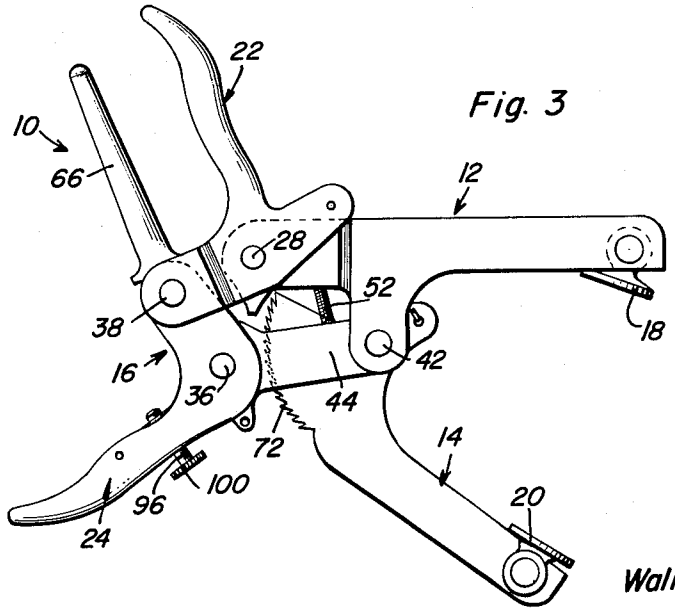


Fig. 3



Wallace D. Ellison
INVENTOR.

BY Thomas A. O'Brien and Harvey B. Jackson
Attorneys

July 19, 1966 W. D. ELLISON 3,261,243

TOGGLE CLAMP HAVING A LOCK MECHANISM ENGAGEABLE AS AN OVER-CENTER POSITION IS APPROACHED

Filed Sept. 18, 1964 3 Sheets-Sheet 2

Fig. 4

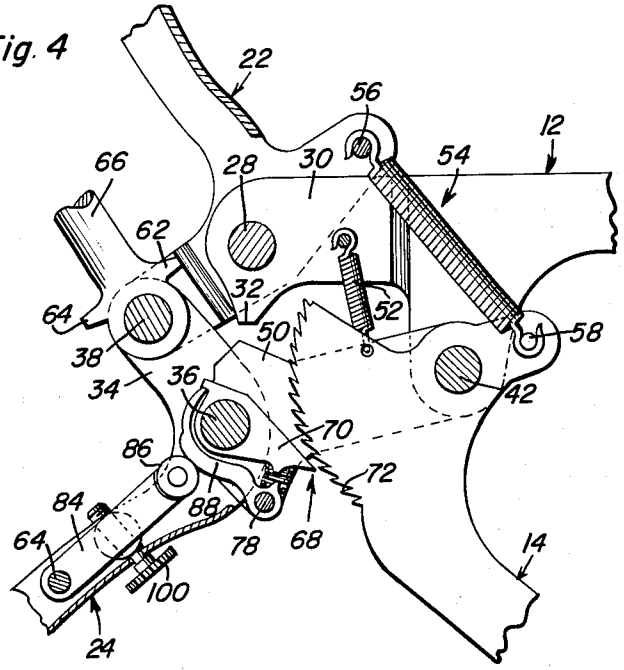
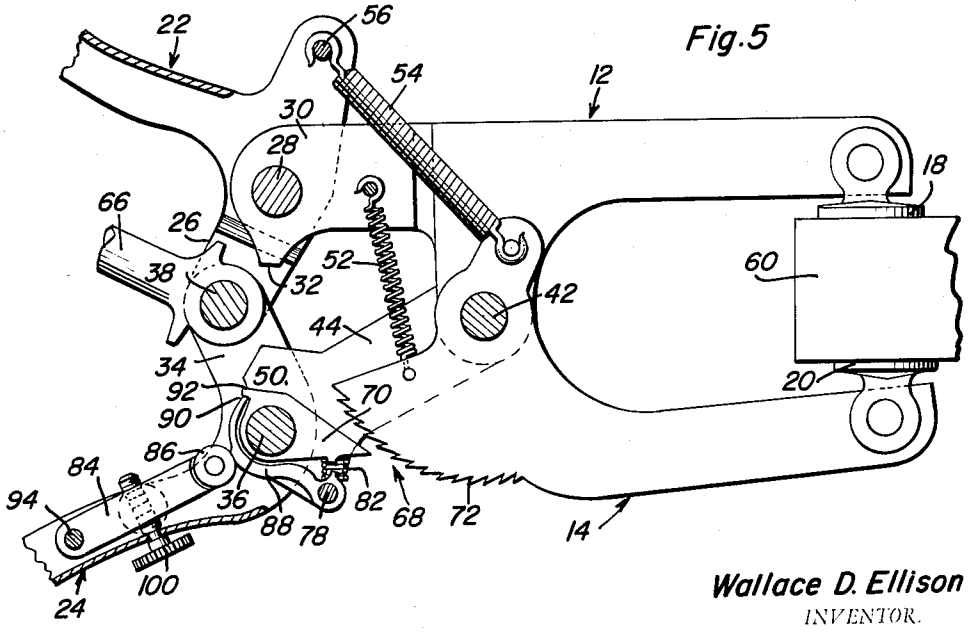


Fig. 5



Wallace D. Ellison
INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson
Attorneys

July 19, 1966 W. D. ELLISON 3,261,243

TOGGLE CLAMP HAVING A LOCK MECHANISM ENGAGEABLE AS AN OVER-CENTER POSITION IS APPROACHED

Filed Sept. 18, 1964 3 Sheets-Sheet 3

Fig. 6

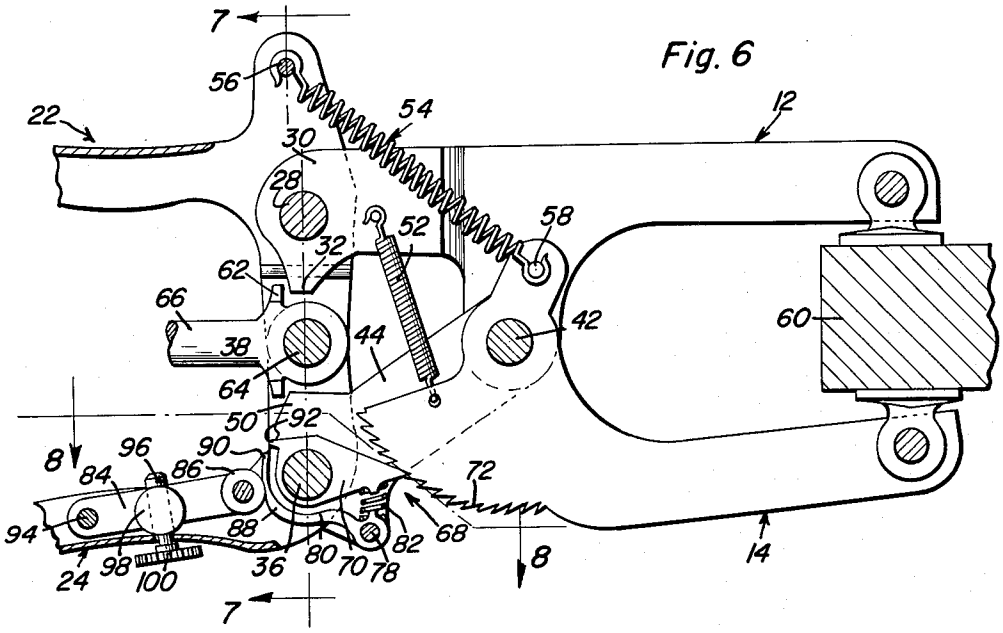


Fig. 7

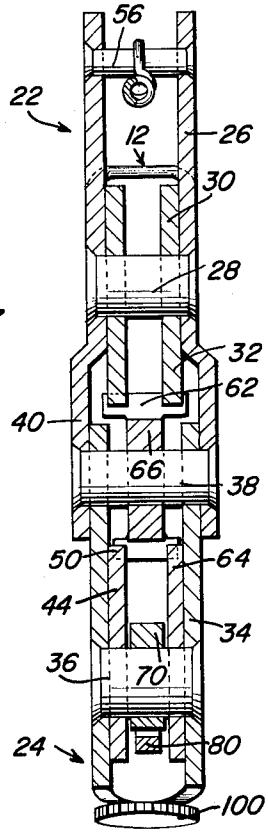


Fig. 8

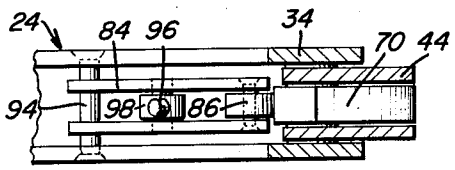
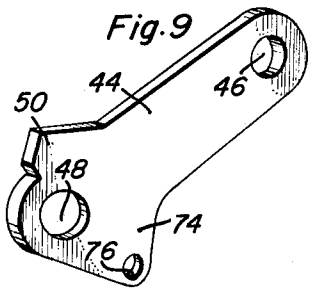


Fig. 9



Wallace D. Ellison
INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson
Attorneys

United States Patent Office

3,261,243

Patented July 19, 1966

3,261,243

TOGGLE CLAMP HAVING A LOCK MECHANISM ENGAGEABLE AS AN OVER-CENTER POSITION IS APPROACHED

Wallace D. Ellison, 3116 Glendon Ave.,
West Los Angeles, Calif.

Filed Sept. 18, 1964, Ser. No. 397,458
7 Claims. (Cl. 81—351)

This invention relates to a toggle-type of work engaging clamp device.

An important object of the present invention is to provide a toggle locking type of clamp which is adjustable so as to automatically lock the clamping jaws thereof in a work engaging position for holding workpieces or objects of different sizes.

An additional object of the present invention is to provide a toggle locking clamp device which is operative to rapidly engage an object to be clamped between the jaws thereof and then more slowly clamp the object with an increasing force until the jaws are locked in their clamped position.

In accordance with the foregoing objects, the clamp device of the present invention features a yieldable link element by means of which the jaw members are rapidly engaged with a workpiece or object after which an increasing clamping force is applied until the jaw members are locked in their clamping position. Also, the clamping device features a clamp regulating lock mechanism which is engaged to render one of the jaw members rigid with one of the toggle locking handles as the toggle arms of the handles approach an over-center locking position. The locking mechanism is therefore held released by an adjustable cam mechanism by means of which the point at which locking occurs may be preadjusted in order to accommodate objects of different hardness or compressibility.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a top plan view of the clamp device of the present invention.

FIGURE 2 is a side elevational view of the clamp device shown in a closed condition.

FIGURE 3 is a side elevational view of the clamp device shown in an open condition.

FIGURE 4 is an enlarged partial side sectional view of the clamp device in its open condition.

FIGURE 5 is a partial side sectional view of the clamp device in a work engaging condition.

FIGURE 6 is a partial side sectional view of the clamp device just prior to locking thereof in its work clamping condition.

FIGURE 7 is a sectional view taken substantially through a plane indicated by section line 7—7 in FIGURE 6.

FIGURE 8 is a sectional view taken substantially through a plan indicated by section line 8—8 in FIGURE 6.

FIGURE 9 is a perspective view of a rigid link member forming part of the clamp device.

Referring now to the drawings in detail and initially to FIGURES 1 through 3, it will be observed that the clamping device generally denoted by reference numeral **10** includes a pair of jaw members **12** and **14** which are connected to a toggle locking handle assembly generally referred to by reference numeral **16**. Each of the jaw members pivotally mounts at the ends thereof, remote

from the handle assembly, work engaging pads **18** and **20**. When released, the jaw members are biased to an open position as illustrated in FIGURE 3. The jaw members may also be locked in a closed position as illustrated in FIGURE 2 by the handle assembly.

The handle assembly includes a pair of handle members **22** and **24** as more clearly seen in FIGURES 6 and 7. The handle members extend generally parallel to each other when the jaw members are in the closed position illustrated in FIGURE 2 and diverge from each other as illustrated in FIGURE 3 when the jaw members are in the open position. As more clearly seen in FIGURES 6 and 7, the handle member **22** includes a toggle arm portion formed by a pair of laterally extending parallel spaced sides **26** which are interconnected by a link pin **28** to which the jaw member **12** is pivotally connected. The jaw member **12** is therefore provided with a pair of parallel spaced end portions **30** having aligned apertures through which the link pin **28** extends, said end portions **30** being received between the toggle arm sides **26** of the handle member **22** and including laterally extending projections **32** by means of which the handle assembly is released from its toggle locking condition as will hereafter be further explained. The other handle member **24** is also provided with a toggle arm portion formed by the sides **34** between which a second toggle link pin **36** is secured. The toggle arm portion of the handle member **24** is pivotally connected by the toggle joint pin **38** to the sides **26** of the toggle arm portion of handle member **22**. Accordingly, the sides **26** of the toggle arm of handle member **22** have laterally widened portions **40** which straddle the sides **34** so that the toggle joint pin **38** may pivotally interconnect the handle members.

The jaw members **12** and **14** are pivotally interconnected in spaced relation to the toggle joint pin **38** by means of the jaw pivot pin **42**. While the jaw member **12** is directly pivotally connected to the handle member **22** by the link pin **28**, the other jaw member **14** is connected to the handle member **24** by a pair of parallel spaced link elements **44** which form a rigid link connection between the jaw pivot pin **42** and the link pin **36** carried by the handle member **24**. Accordingly, as more clearly seen in FIGURE 9, the rigid link elements are provided with apertures **46** and **48** for respectively receiving the jaw pivot pin **42** and the link pin **36**. Also formed along one edge of the link elements **44**, are laterally extending projections **50** by means of which the handle assembly may be released from its over-center locking position as will hereafter be explained. When the handle assembly is unlocked, as shown in FIGURE 3, the jaw members are moved to the open position illustrated by means of a jaw opening spring **52** the opposite ends of which are connected to the jaw members **12** and **14** between the toggle joint pin **38** and the jaw pivot pin **42**. When the handle members **22** and **24** are pivotally displaced toward each other from the positions illustrated in FIGURE 3 to the positions illustrated in FIGURE 2, they will cause pivotal displacement of the jaw members about the jaw pivot pin **42** and against the bias of the spring **52** in order to bring the work engaging pads **18** and **20** toward each other.

Inasmuch as the handle member **24** is connected to the jaw pivot pin **42** through the rigid link elements **44**, pivotal displacement of the handle members toward each other will cause the jaw members to be pivotally displaced about the jaw pivot pin **42** only because of the constraint of yieldable link means **54** which in the illustrated embodiment of the invention, is in the form of a relatively stiff tension spring. The opposite ends of the yieldable link spring **54** are therefore pivotally connected

to the handle member 22 by means of the anchor pin 56 and to the jaw member 14 by means of the anchor pin 58. It will therefore be apparent, that as the handle members are pivotally displaced toward each other, the jaw members will move the work engaging pads into engagement with an object 60 for example, as illustrated in FIGURE 5, before any deformation of the yieldable link spring 54 occurs. Thereafter, continued displacement of the handle members toward each other will cause extension of the yieldable link spring 54 inasmuch as further pivotal movement of the jaw members will be resisted by the object 60. The extension of the yieldable link spring 54 will thereby permit clamping of objects of different thickness and allow movement of the jaw members until they are locked in their clamping position when the handle members displace the toggle joint pivot 38 to an over-center locking position just past the center line which joins the toggle link pins 28 and 36. In this over-center locking condition of the handle assembly, the projections 32 and 50 will be engaged by the laterally extending projections 62 and 64 formed on a release handle 66 to prevent further movement of the handle members toward each other. The release handle 66 is therefore pivotally mounted on the toggle joint pivot 38 and extends rearwardly therefrom between the handle members 22 and 24. It will therefore also be apparent, that release of the handle assembly from its over-center locked condition, may be effected by pivotal displacement of the release handle 66 toward either the handle 22 or the handle 24 in which case either projection 62 or projection 64 cams the toggle arm portions of the handles and the toggle joint pivot 38 rearwardly away from the jaw pivot pin 42 in order to unlock the handle assembly.

A clamp regulating lock mechanism 68 is provided as more clearly seen in FIGURES 4 through 6, whereby the link element 44 may be directly coupled to the jaw member 14 in order to form a rigid link therewith as the toggle joint pin 38 approaches the over-center locking position. The lock mechanism includes a pawl element 70 one end of which is engageable with ratchet teeth 72 formed along an adjacent rear portion of the jaw member 14. The pawl element 70 is pivotally mounted on the link pin 36 between the end portion of the rigid link elements 44 through which the link pin extends. The rigid link elements are provided with a laterally extending portion 74 having aligned apertures 76 through which a pivot pin 78 extends for pivotally mounting thereon, a lock releasing cam element 80. The pawl element 70 is normally biased into engagement with the ratchet teeth 72 by the pawl spring 82 so as to form a rigid coupling between the pivot pin 36 and the jaw member 14 only when force is being transmitted in one direction from the handle member to the jaw member. Accordingly, during final movement of the handle members relative toward each other as the toggle joint pivot 38 approaches the over-center locking position, force is directly applied by the handle member 24 to the clamping jaw 14 in order to apply the final clamping force to the object being held between the pads. The point at which the pawl element 70 is permitted to engage the ratchet teeth 72 may therefore be adjusted so as to accommodate objects of different hardness which differently limit the pivotal closing stroke of the jaw members.

The handle member 24 is therefore provided with an adjustable element 84 rotatably mounting at one end follower roller 86 engageable with the cam surface 88 on the lock releasing cam element 80. Accordingly, as shown in FIGURES 4 and 5, the follower roller 86 engages the cam surface 88 on the cam element 80 so as to position the end stop portion 90 thereon in the path of a stop lug 92 which projects from the pawl element 70 in order to hold the pawl element out of engagement with the ratchet teeth against the bias of the pawl spring 82. Inasmuch as the cam element 80 is pivotally mounted by the rigid link elements 44, pivotal movement of the handle member 24 relative thereto will at some phase of its movement bring the follower 86 to a drop-off portion of the cam surface 88 of the cam element in order to permit the stop portion 90 to move out of the path of the stop lug 92 on the pawl element whereupon the spring 82 biases the pawl element into engagement with the ratchet teeth 72, as shown in FIGURE 6. The point at which the pawl element is released for engagement with the ratchet teeth may therefore be adjusted by adjustable positioning of the element 84 on which the follower roller 86 is mounted. Accordingly, the element 84 is pivotally mounted by the pivot pin 94 secured to the handle member 24. An adjustment screw member 96 is threadedly received within a nut element 98 connected to the adjustment element 84 for positioning thereof within the handle member 24 by rotation of the adjustment knob 100 connected to the screw element 96.

From the foregoing description, the construction, operation and utility of the clamp device of the present invention will be apparent. Objects of different sizes may therefore be clamped by the pads 18 and 20 on the ends of the jaw members 12 and 14 when the handle members 22 and 24 are displaced toward each other from their open position. The jaw members are pivotally interconnected to each other about a jaw pivot 42 which in turn is pivotally connected by a rigid link to one of the handle members 24, the other handle member being directly pivotally connected to one of the jaw members 12. Initial closing movement of the jaw members is however produced by closing movement of the handle members because of a yieldable link spring 54 which is interconnected between the jaw member 14 and the handle member 22. The yieldable link spring 54 is therefore substantially stiffer than the jaw opening spring 52 against the bias of which the jaw members are closed. When the jaw members engage the object however, continued closing movement of the handle members causes elongation of the yieldable link spring 54 in order to accommodate objects of different thickness. Final clamping force is applied to the object by locking of the link element 44 to the jaw member 14 as the handle members approach the over-center locking position. The locking of the link element 44 to the jaw member 14 is accomplished by the cam controlled release of the locking pawl 70 which engages the ratchet teeth 72 on the jaw member 14, the locking pawl overrunning however when the handle members are released. The locking pawl 70 is however held disengaged at an adjustable controlled phase position of the handle so as to accommodate objects of different hardness.

After the handle has been displaced to the over-center locking position thereby locking the jaw members in their clamping position, release of the handles may be effected by pivotal displacement of the releasing handle 66 toward either of the handle members 22 or 24. The jaw opening spring 52 will then bias the jaw members to the fully open position.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A clamping device comprising, a pair of work engaging jaws, a jaw pivot interconnecting said jaws, a clamp opening spring interconnecting said jaws, a pair of handles having toggle link pins secured thereto, a toggle joint pivotally interconnecting said handles between the link pins, one of said jaws being pivotally connected to one of the handles by the link pin thereon, a rigid link member pivotally connected between the link pin of the

other of said handles and the jaw pivot, yieldable link means interconnected between the other of said jaws and said one of the handles for resisting displacement of the toggle joint toward an over-center position between the link pins after the jaws engage a workpiece, clamp regulating lock means mounted on the link member for rigid interconnection thereof to the other of said jaws after engagement of the workpiece and clamp adjusting release means mounted on link member and the other of said handles for holding the lock means disengaged until the toggle joint approaches said over-center position.

2. The combination of claim 1 wherein said lock means comprises a pawl pivotally mounted on the link pin of said other of the handles, ratchet teeth formed on the other of said jaws for engagement by the pawl and means biasing the pawl into engagement with said ratchet teeth.

3. The combination of claim 2 wherein said release means comprises, a cam element pivotally mounted on the link member and having a stop portion engageable with the pawl to prevent engagement thereof with the ratchet teeth, and a follower element mounted on the other of said handles and engageable with the cam element for effecting pivot displacement of the stop portion out of engagement with the pawl.

4. The combination of claim 1 wherein said release means comprises, a cam element pivotally mounted on the link member and having a stop portion engageable with the pawl to prevent engagement thereof with the ratchet teeth, and a follower element mounted on the other of said handles and engageable with the cam element for effecting pivot displacement of the stop portion out of engagement with the pawl.

5. A clamping device comprising a pair of pivotally interconnected jaws, means biasing said jaws to an open position, handle means, toggle means interconnecting said handle means with the jaws for locking the jaws in a clamping position, yieldable link means operatively connecting the handle means with one of the jaws for resisting displacement of the toggle means to an over-center position wherein the jaws are locked in the clamping position, clamp regulating means responsive to approach of the toggle means to said over-center position for rigidly

connecting the handle means to the other of the jaws, and adjustment means mounted on the handle means and operatively connected to said clamp regulating means for varying the distance from the over-center position at which the handle means is rigidly connected to the other of the jaws, whereby workpieces of different hardness may be clamped between the jaws.

6. In a clamping device, a pair of work engaging jaws, a jaw pivot interconnecting said jaws, a pair of handles having toggle link pins secured thereto, a toggle joint pivotally interconnecting said handles between the link pins, one of said jaws being pivotally connected to one of the handles by the link pin thereon, a rigid link member pivotally connected between the link pin of the other of said handles and the jaw pivot, yieldable link means interconnected between the other of said jaws and said one of the handles for resisting displacement of the toggle joint toward an over-center position between the link pins in response to engagement of an object between the jaws, and clamp regulating means for rigidly connecting the rigid link member to the other of said jaws following elongation of the yieldable link means.

7. The combination of claim 6 including adjusting means operatively connected to the clamp regulating means for initiating operation of the clamp regulating means prior to arrival of the toggle joint at said over-center position.

References Cited by the Examiner

UNITED STATES PATENTS

2,341,654	2/1944	Richter	81—368 X
2,825,525	3/1958	Kellam	81—367 X
2,853,910	9/1958	Petersen	81—368
3,051,028	8/1962	Kreger	81—371 X
3,170,345	2/1965	Poingt	81—374 X

FOREIGN PATENTS

188,089	12/1956	Austria.

WILLIAM FELDMAN, *Primary Examiner.*

MILTON S. MEHR, *Examiner.*