July 14, 1959 F. W. LAMPE 2,894,547

LEVER UNLOCKING MEANS IN TOGGLE ACTION CLAMPING DEVICES

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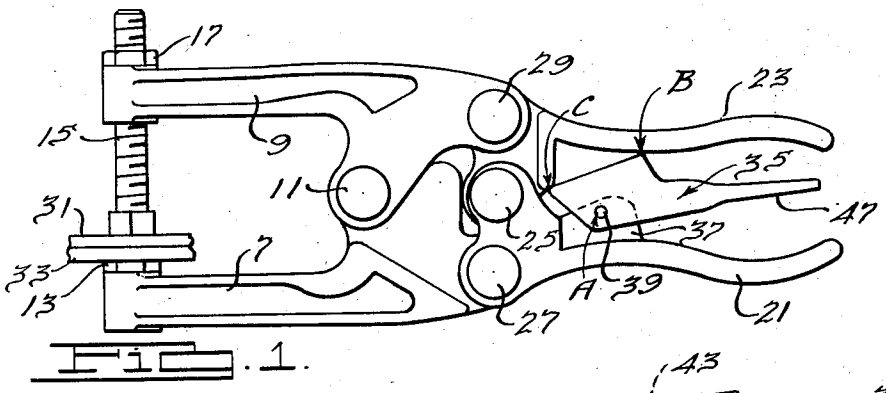


Fig. 1.

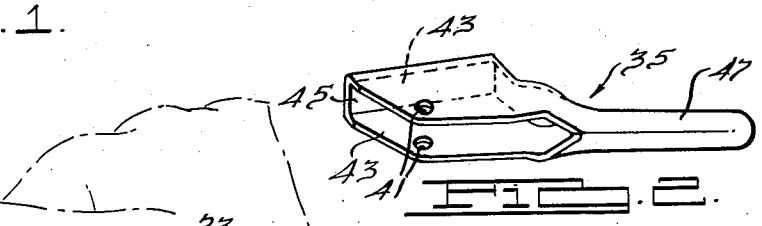


Fig. 2.

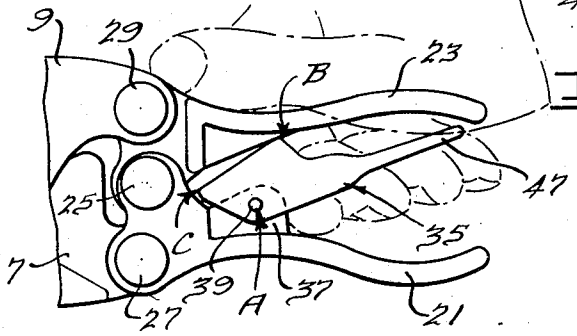


Fig. 3.

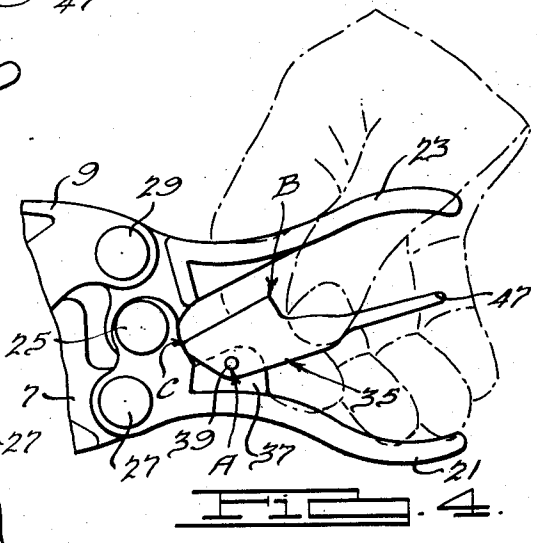


Fig. 4.

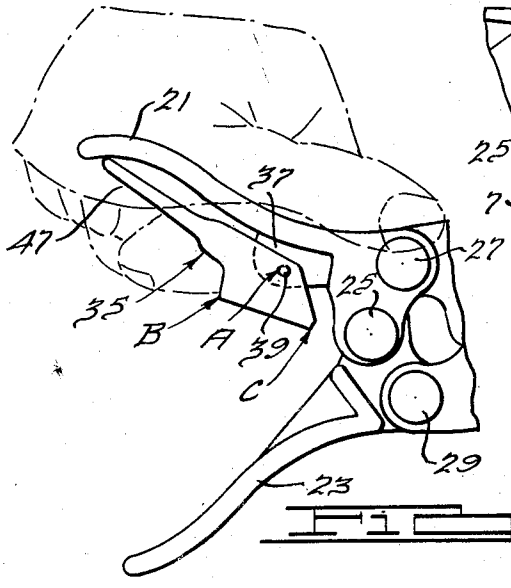


Fig. 5.

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LEVER UNLOCKING MEANS IN TOGGLE ACTION CLAMPING DEVICES

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2 Claims. (Cl. 144—302)

This invention relates to new and useful improvements in manually operated toggle action clamping devices and more particularly to improved lever unlocking means in devices of this type.

Lever unlocking means in toggle action clamping devices have been proposed for increasing the ease with which the handles can be separated for releasing the jaws from closed lock position. That is, with toggle action clamping devices having lever unlocking means, an operator can separate the handles with less force by reason of the lever. However such lever unlocking means for toggle clamping devices that have been heretofore proposed are deficient in that they provide no control over the swinging movement of the handles in opening. In other words the handles are free to spring open and swing to maximum separation which is beyond the hand span of the user so that two hands are required to reapply the device.

An important object of the present invention is to provide improved lever unlocking means in a toggle action clamping device which is so constructed in relation to the toggle linkage for the device and to the pair of handles for the same that the swinging movement of the latter in opening the jaws from closed lock position is controlled in that one handle always remains connected to the lever and the distance which it can swing open relative to the other handle is determined by the user and in that the lever and the other handle always remain within the hand span of the user.

Another important object of the invention is to provide unlocking means in toggle action clamping devices which includes means which pivotally mount the lever on one of the handles so that the fulcrum of the lever reacts on the other handle and the reaction of the lever is applied to the said one handle so that the lever and either handle may be squeezed and relatively moved together whereupon unlocking of the jaws and separation of the handles into open position occurs and whereby the swinging movement of the pair of handles occurring in one way of opening is controlled as indicated and wherein the construction of said lever unlocking means permits adjustment of the jaws to any desired position and their reapplication by only one hand of the operator relatively moving the said other handle and the lever leaving his other hand free to accomplish other results.

The above and related objects will appear more fully during the course of the following description taken in conjunction with the accompanying drawings.

In the drawings:

Fig. 1 is a front elevational view of a typical toggle pliers in combination with the improved unlocking means of the present invention, the position shown being closed lock position;

Fig. 2 is an enlarged perspective view of the lever shown in Fig. 1 looking at the inside of the same;

Fig. 3 is a fragmentary front elevational view of the handle-half of the pliers showing the lever unlocking means and handles in an intermediate position when the pliers are opened from one side;

Fig. 4 is a view similar to Fig. 3 showing the parts in a further open position when the pliers are opened from the same side as in Fig. 3; and

Fig. 5 is a view similar to Figs. 3 and 4 showing the handle-half of the pliers in wide open position when they have been inverted and opened from the opposite side from that in the previous figures.

Referring now to the drawings in greater detail there is shown therein the lever unlocking means of the present invention in combination with a typical toggle pliers, the latter comprising a pair of jaws **7** and **9** which are connected together by a common pivot connection indicated at **11**. At the free end of the jaws or throat of the pliers, an anvil **13** is secured on the inside of the jaw **7** and the jaw **9** is provided with an adjusting spindle **15** which it threadably carries. The spindle **15** may be rotated so as to move transversely with respect to the jaw **9** to adjust the gap between its lower end and the anvil **13**. Such adjustment is to accommodate different workpiece sizes and for a given workpiece size to vary the applied load. When the gap between the lower end of the spindle **15** and the anvil **13** is decreased for a given workpiece size the clamping force is proportionately greater. On the upper end of the spindle **15** a fastener **17** is threadably received for bearing against the outside of the jaw **9** to retain the spindle in any selected position.

A pair of handles **21** and **23** are connected together by a common pivot connection **25** and individually to the pair of jaws each by one of a pair of pivot connections indicated at **27** and **29** for the handles **21** and **23** respectively. The free ends of the jaws are brought together by separation of their pivoted ends at the pivot connections **27** and **29**, the jaws commonly fulcruming on their common pivot connection **11**. Conversely the jaws are opened by relative movement of their pivoted ends toward each other. The separation or bringing together of the pair of pivot connections **27** and **29** occurs by movement of the common pivot connection **25** for the handles **21** and **23** between the pivot connections **27** and **29**. Thus when the handles are squeezed together their common pivot connection **25** is caused to move inwardly toward the throat of the pliers thus separating the pivoted ends of the pair of jaws and actuating their free ends together so that the spindle **15** moves closer to the anvil **13**.

When it is desired to clamp two objects together such as those shown by way of illustration and indicated at **31** and **33** in Fig. 1, the same are positioned between the anvil **13** and the spindle **15**. Further movement of the spindle **15** toward the anvil **13** is resisted by the interposed work-pieces so that it then becomes necessary to squeeze the handles **21** and **23** together with greater force which causes their common pivot connection **25** to move into dead center condition with respect to the pair of pivot connections **27** and **29**, i.e. with the center of the pivot connection **25** in line with the centers of the pivot connections **27** and **29**. In final movement of the common pivot connection **25** into dead center condition the pivoted ends of the pair of jaws separate but their free ends are held immobile by the pair of work-pieces that are to be clamped so that the jaws **7** and **9** are flexed under load and a certain amount of force, depending upon the setting of the spindle **15**, is stored in the jaws when they are thus clamped under load. In this position since the common pivot connection **25** is in dead center condition with relation to the pair of pivot connections **27** and **29**, no amount of outward force applied to the pair of jaws **7** and **9** short of breakage of parts will cause them to separate. The handles however may be separated to

actuate the pair of jaws out of closed lock position and without any lever unlocking means it may require two hands to pull the pair of handles **21** and **23** apart. The construction and operation of the toggle action pliers per se as thus described is entirely conventional.

When the lever unlocking means of the present invention is positioned between the pair of handles, the jaws may be separated by an operator using only one hand and in so doing he may grasp the lever and either one of the handles (the unlocking action differing depending upon which handle is grasped) and squeeze the two together whereupon the handles will separate and release the jaws from closed lock position. The term closed lock position as used throughout the specification and in the appended claims is intended to refer to that position described above for the jaws and when they are under load so that there is always an amount of flexure in the jaws resisting initial opening. In one way in which the handles may be separated there is provided by virtue of the unlocking means to be described in detail, a unique and novel control over the swinging movement of the handles in opening. While such control is provided in only one way of opening the pliers this is very desirable and all that is necessary because the pliers are normally used in only one way which is the position shown in Fig. 1. Therein it will be noted that the anvil jaw **7**, i.e. the one provided with the anvil **13** is the lower jaw and the spindle jaw **9** is the upper jaw. By far the greatest majority of the occasions of use of the pliers is with the anvil jaw positioned below the work and with the spindle jaw being brought to bear thereon from above.

Referring now in detail to the applicant's unlocking means, the same comprises a lever, generally designated **35**, which is pivotally connected to the pliers so that it extends in the same general direction as the handles and is disposed therebetween. The lever is permanently associated with the pliers due to the pivotal connecting means therefor and is thus prevented from moving away from the handles in the direction in which it extends from any reaction to its lever action. The means for connecting the lever **35** to the pliers pivotally mounts the former on one of the handles which is the handle **21** in the instance shown and includes an integral abutment **37** which protrudes laterally from the inside surface of the handle **21** toward the handle **23**. The abutment **37** is provided with a suitable aperture through which a rivet or pivot pin as at **39** may extend. The pivot pin **39** also extends through aligned apertures **41** provided each in one of a pair of spaced side plates **43** formed on the upper end of the lever **35** as best shown in the perspective view of Fig. 2. The ends of the pin **39** may be peened over or otherwise enlarged relative to the apertures **41** to provide a pivot connection for the lever hereinafter designated point A. The particular construction shown for the lever **35** includes besides the side plates **43** an integral back plate **45** which joins the side plates along their top edges as viewed in Fig. 1 and, as will be noted, these taper upwardly with respect to the handle **21** and outwardly as viewed in this figure. Thus the rear plate **45** is positioned to conform to the inside surface of the handle **23** which it bears against in the closed lock position of the pliers. At the lower right hand end of the side plates as viewed in Fig. 1, they are joined together into a handle extension **47** which projects outwardly nearly as far as the handles of the pliers. The handle extension **47** is the point of action for the lever to which force is applied and is constructed to provide a smooth surface for gripping on both of its sides. It should also be noted from Fig. 1 that the apertures **41** being part of the lever pivot connection are located in the side plates **43** adjacent their lower edges just to the right of the junction of the latter with the left hand or inner edges of the side plates. The said inner edges of the side plates **43** taper upwardly and inwardly as viewed in Fig. 1 to where they meet the inner edge of the back plate **45**. The back plate **45** is thus spaced at all times from the handle **21** and in the closed lock position of the pliers the outer end of the back plate is located above and to the right of point A while the inner end of the back plate is located to the left of point A and above the same but vertically between the outer end of the back plate and point A.

The outer end of the plate **45** is hereinafter designated point B and acts as a fulcrum for the lever against the handle **23** in the preferred way of opening the pliers as will later appear more fully. The lever pivot connection or point A applies the reaction of the lever to the handle **21** in the said preferred way of opening and in the other way of opening the handles acts as a fulcrum against the handle **21** as also will apear hereinafter. The inner end of the plate **45** in the said other way of opening applies the reaction of the lever against the handle **23** and will be hereinafter designated point C. The spacing of this point from the inside surface of the handle **21** permits the handle extension **47** of the lever to be moved toward the handle **23** to position the back plate **45** at a decided angle to the horizontal such as shown in Fig. 3, to which reference will be made shortly, so that the point B may be moved closer to the handle **23** and the point C closer to the handle **21** than that shown for these points in Fig. 1.

In operation of the lever unlocking means in the usual way of opening the pliers, the handle **23** and the lever **35** by way of its handle extension **47** are gripped and squeezed together in the hand of the operator. The point B acts as a fulcrum for the lever against the handle **23** in this way of opening the pliers and the lever pivot connection or point A applies the reaction of the lever to the handle **21**. Upon squeezing the lever and the handle **23** together the lever pivots on its fulcrum point B and snaps into an intermediate open position as shown in Fig. 3, the lever pivot connection or point A having forced the handle **21** away from the handle **23** to break the dead center condition for the common pivot connection **25**. In this respect it will be noted from Fig. 3 that the pivot connection **25** has moved from the rearward portion of the jaw **7** and this should be compared to the relative position for these parts shown in Fig. 1. A small but certain amount of force is required to retain the lever in the position shown in Fig. 3, this force counteracting the tendency of the jaws which are still closed in this position to throw the handles apart due to the flexure within the jaws. Upon release of the force holding the lever and the handle **23** in intermediate open position, but while they are still retained together within the grip of the operator, the handles move apart to a further open position as shown in Fig. 4 due to the energy stored in the jaws under load. In this position the jaws are separated an amount corresponding to the separation of the handles but the handle **23** and the lever **35** are still retained within the grip of the user as mentioned and as shown in Fig. 4 and it will be noted that the handle **21** always remains connected to the lever **35** so that the distance which it moves away from the handle **23** can be controlled as desired by the user.

Thus in the swinging movement of the handles into open position they are always under the control of the user and since the handle **21** remains connected to the lever **35**, the jaws may be closed as desired by pulling the lever **35** toward the handle **23**. Similarly the jaws may be opened wider by the operator with the back of his fingers which are retained about the lever **35** between the latter and the handle **21**. Thus with only one hand by means of the handle **23** and the lever **35** an operator is able to adjust the separation of the jaws similarly as he could do with the actual handles of the pliers if they did not swing open beyond his hand span.

By this manner of opening the plier jaws, the pliers have even a greater range of use in industrial applications because the pliers can be quickly removed with one hand and can just as quickly be reapplied, also with one hand. By means of the lever unlocking means of the present

invention the handle **21** can be drawn inwardly toward the handle **23** so that in the final application of the clamping force, the pair of handles **21** and **23** are within the hand span of the user who can then squeeze them together to apply the pliers to the objects to be clamped. It is oftentimes required such as in molding operations to alternately clamp and remove the pliers on a production basis as, for example, in clamping flanges of mating die parts wherein a plurality of such pliers are employed around the periphery of the die. To speed production each operator may remove a pair of pliers simultaneously one with each hand and a plurality of such pairs in succession and later reapply them in the same manner.

Not only are the above advantages provided in opening the pliers in the preferred way as described but also the lever unlocking means of the present invention is double acting in that the pliers can also be opened by squeezing together the lever and the handle **21** in the event that, through inadvertence, the pliers are applied in an inverted position from that shown in Fig. 1 as in Fig. 5. In such instance the lever pivot connection or point A functions as a fulcrum for the lever against the handle **21** and the point C applies the reaction of the lever against the handle **23**. In this other way of opening the pliers the handle **21** and the handle extension **47** of the lever are grasped by an operator and the two are squeezed together as shown in Fig. 5. The lever rocks on its pivot connection or point A and urges the point C against the handle **23** to move the latter away from the handle **21** and to cause the common pivot connection **25** to move from its dead center position and immediately the handles are swung open to the position shown in Fig. 5 by the flexure imparted to the jaws **7** and **9** when they are under load. The jaws though not shown are separated an amount corresponding to the separation of the handles. There is no intermediate position for this way of opening the pliers and there is no control over the handle **23** in its swinging movement relative to the handle **21**.

It will thus be seen that there has been provided by the present invention lever unlocking means in toggle action clamping devices in which the objects hereinabove set forth together with many thoroughly practical advantages are successfully achieved. It will be apparent that the invention is susceptible to variation, modification and

change without departing from the spirit thereof or from the scope of the appended claims.

What is claimed is:

1. In a manually operated toggle action clamping device having a pair of clamping jaws, toggle linkage means connecting the jaws together, and a pair of handles connected to said linkage means for movement toward and away from each other to move said jaws toward and away from each other, respectively; an unlocking lever pivotally mounted intermediate the ends thereof on one of said handles so that said lever is between said handles, said lever having a first portion engageable with the other one of said handles for moving said handles apart in response to swinging movement of the lever in one direction, said lever having a second portion engageable with said linkage means in an open position of said jaws for moving said jaws toward closed positions on swinging of said lever in said one direction.

2. In a manually operated toggle action clamping device having a pair of clamping jaws, toggle linkage means connecting the jaws together, and a pair of handles connected to said linkage means for movement toward and away from each other to move said jaws toward and away from each other, respectively; an unlocking lever pivotally mounted intermediate the ends thereof on one of said handles so that said lever is between said handles, said lever having a first portion engageable with the other one of said handles for moving said handles apart in response to swinging movement of the lever in one direction, said lever having a second portion engageable with the other one of said handles for moving said handles apart in response to swinging movement of the lever in an opposite direction, said second portion being engageable with said linkage means in an open position of said jaws so as to move said jaws toward closed positions on swinging of said lever in said one direction.

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