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3,118,331

PORTABLE TOGGLE CLAMP WITH TRIGGER RELEASE

Filed June 26, 1961

2 Sheets-Sheet 1

FIG. 1

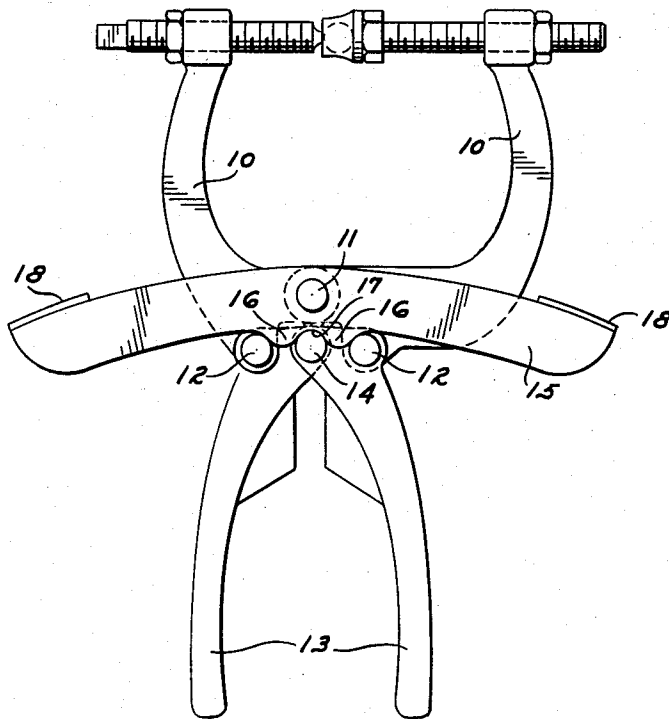


FIG. 2

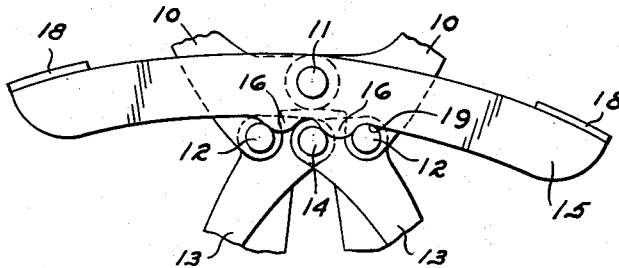
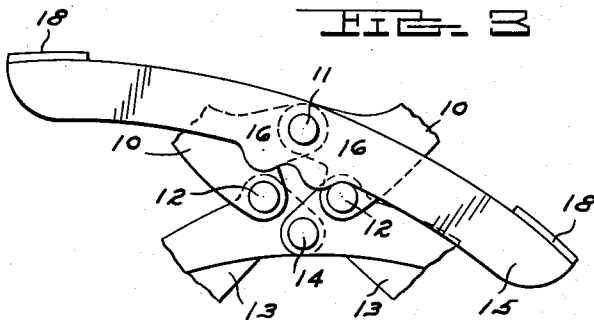


FIG. 3



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FIG. 4

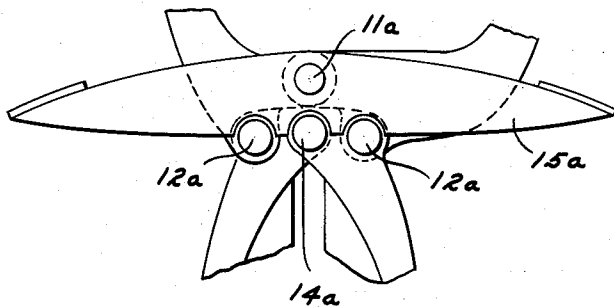


FIG. 5

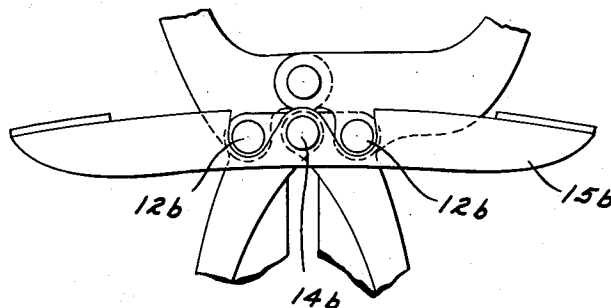
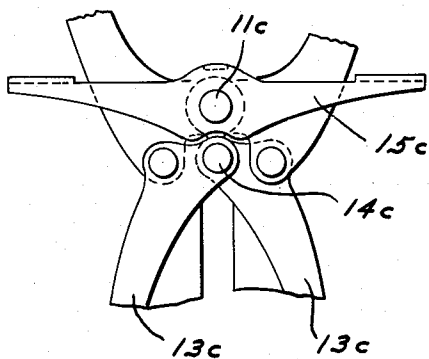


FIG. 6



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PORTABLE TOGGLE CLAMP WITH TRIGGER RELEASE

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13 Claims. (Cl. 81-351)

This invention relates to improvements in a double acting trigger release for a portable toggle clamp of the type generally disclosed in prior Patent 2,937,677 and pending application Serial No. 813,127, now Patent No. 3,051,028, wherein a pair of actuating handles are adapted for grasping and application of closing pressure by the single hand of an operator together with a trigger release lever accessible to the same hand.

In a toggle clamp of this type, it is necessary that the handle elements at the beginning of clamping action be sufficiently close together that they may be readily grasped in one hand and actuated to a locking position with the locking stroke consuming a limited travel corresponding to that portion of finger movement wherein squeeze pressure may be most readily applied. The aforementioned prior patent, as well as the pending application, are directed to the provision of an effective trigger release lever disposed between the handles. While such approach is feasible and practical in clamps larger than a certain minimum size, the handle elements of smaller clamps may be too close together to accommodate the inner position of a trigger release lever while leaving adequate room for finger insertion and release stroke travel.

The present invention is directed to provide an effective trigger release for this class of small clamps, and comprises a toggle release lever pivotally mounted exterior of the handle elements which is readily accessible by the thumb of an operator while grasping either one of the handle elements with the fingers of the same hand.

This and other objects of the invention may be more readily understood by reference to the drawings disclosing a preferred embodiment of the invention wherein:

FIGURE 1 is a side elevation of a portable toggle clamp incorporating the present toggle release lever shown with the clamp in locked position:

FIGURE 2 is a similar fragmentary view with the toggle release action initiated; and

FIGURE 3 is a similar fragmentary view with the toggle release and opening action completed.

FIGURES 4, 5 and 6 each show modified constructions varying somewhat from the preferred embodiment of FIGURES 1, 2 and 3.

With reference to FIGURE 1, it will be seen that the toggle clamp is of generally symmetrical design including two jaw elements 10 pivotally connected to each other by a rivet 11 and each being pivotally connected by a rivet 12 to one of a pair of identical handle elements 13 which are in turn pivotally connected together at a central pivot by a rivet 14 which passes through a position in alignment with and to a slightly over-center position relative to the rivets 12 when the clamp is fully closed into a self-locking position. Toggle release requires a spreading of the handle elements 13 or, in terms of the substantially aligned pivots, a relative downward movement of the central rivet 14 past a position in alignment with the outer pivots to an over-center position, substantially as shown in FIGURE 2, where the toggle becomes unlocked and resistance to the opening of the handle elements substantially disappears.

The release lever 15 of the present invention consists of a generally symmetrical rigid curved lever pivotally connected by rivet 11 to the common pivot of jaw elements 10. A pair of cam projections 16 formed as an

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integral part of the release lever extend on either side of the head of the central rivet 14, and an intermediate arcuate recess 17 formed between the projections 16 in the lever serves as an over-center positive stop for the central rivet 14. The cam surface of either of the projections 16 is adapted to engage and exert a downward pressure on the head of the central rivet 14 upon exerting thumb pressure on either end 18 of the release lever while grasping the adjacent handle element 13 with the fingers of the same hand until an unlocked position is reached, such as shown in FIGURE 2.

At this stage, a recess 19 on the other side of the projection with the active cam face engages one of the rivet heads 12 providing a new rapid opening fulcrum point for interaction between the release lever and toggle pivots. As will be seen from FIGURE 3, continuing movement of the active handle and release lever elements toward each other will produce a rapid wide open movement of the handle elements as well as the jaw elements connected thereto. Upon returning the handle to closed position, the release lever is automatically re-oriented to its original position as shown in FIGURE 1 where the recess 17 is operative as a positive stop for the central pivot.

It will be understood from the above description that the cam form of the projection 16 may be suitably adapted to provide a high initial mechanical advantage suitable to facilitate opening of the clamp with moderate hand pressure while the second stage engagement of one of the outer pivots is adapted to provide a reduced mechanical advantage rapid travel actuation suitable for fast opening of the handle and jaw elements when the high pivot frictional resistance from the heavy clamping pressures has disappeared upon unlocking the toggle elements.

With reference to FIGURE 4, the initial unlocking action as well as the rapid travel opening action results from the engagement of release lever 15a pivoted at rivet 11a with one of the rivets 12a, there being no preliminary toggle braking contact with the central rivet 14a as in the preferred embodiment. Accordingly, the mechanical advantage is determined and limited by the length of the lever arm extension beyond the pivot 12a.

Referring to the modification of FIGURE 5, the lever arm is in this case pivoted on the central rivet 14b and adapted to engage the lower side of either the rivets 12b as a fulcrum point for exerting toggle opening pressure. Here again the initial leverage is more limited than in the preferred embodiment.

In the modification of FIGURE 6, the release lever 15c is pivotally mounted on the upper central rivet 11c and adapted to engage the end of one of the handle elements 13c near the central rivet 14c rather than to engage such rivet directly as in FIGURES 1-3.

It will be understood that while a preferred embodiment of the invention and several modifications thereof have been illustrated and described in detail, other modifications might be resorted to without departing from the scope of the invention as defined in the following claims.

I claim:

1. A portable toggle clamp of the type having two jaw elements, two handle elements, a first pivotal connection common to the jaw elements, a second pivotal connection common to the handle elements, and a pair of pivotal connections each common to one jaw and one handle element, said last three mentioned pivotal connections being in substantial alignment in the closed position of said toggle clamp, characterized by a toggle release lever pivotally connected at said first pivotal connection adapted for thumb engagement by an operator while simultaneously applying squeeze pressure to an adjacent handle element, and a cam surface on said release lever adapted to engage and exert disaligning opening pressure on another of said

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pivotal connections upon the application of said thumb and finger squeeze pressure.

2. A portable toggle clamp as set forth in claim 1 wherein said first pivotal connection is symmetrically disposed relative to said last three pivotal connections and wherein said toggle lever is in the form of a symmetrical lever extending to either side of its pivotal connection for alternate application of thumb pressure in association with either handle element.

3. A portable toggle clamp as set forth in claim 1 wherein said first pivotal connection is symmetrically disposed relative to said last three pivotal connections and wherein said toggle lever is in the form of a symmetrical lever extending to either side of its pivotal connection for alternate application of thumb pressure in association with either handle element, said release lever being provided with a pair of cam surfaces, one of which is active in applying opening pressure depending upon which handle element and release lever extension is used.

4. A portable toggle clamp as set forth in claim 1 wherein said cam surface is adapted to apply opening pressure against said second pivotal connection.

5. A portable toggle clamp as set forth in claim 1 wherein said cam surface is adapted to apply opening pressure against said second pivotal connection and a secondary cam surface is provided on said release lever adapted to engage during a secondary portion of the toggle release movement the pivotal connection common to one of the jaw and handle elements in order to effect a rapid further opening movement upon the continued application of said squeeze pressure.

6. A portable toggle clamp as set forth in claim 3 wherein said cam surfaces comprise a pair of projections extending on either side of said second pivotal connection either of which is adapted to provide opening pressure thereto depending on which lever extension is used.

7. A portable toggle clamp as set forth in claim 3 wherein said cam surfaces comprise a pair of projections extending on either side of said second pivotal connection either of which is adapted to provide opening pressure thereto depending on which lever extension is used, and wherein a secondary cam surface is provided on each of said projections adapted to engage one of said pair of pivotal connections.

8. A portable toggle clamp as set forth in claim 3 wherein said cam surfaces comprise a pair of projections extending on either side of said second pivotal connection

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either of which is adapted to provide opening pressure thereto depending on which lever extension is used, and wherein a secondary cam surface is provided on each of said projections adapted to engage one of said pair of pivotal connections, and a recess being provided in said toggle release lever between said projections adapted to serve as a positive stop for said second pivotal connection upon closing said toggle clamp.

9. A portable toggle clamp of the type having two jaw elements, two handle elements, a first pivotal connection common to the jaw elements, a second pivotal connection common to the handle element, and a pair of pivotal connections each common to one jaw and one handle element, said last three mentioned pivotal connections being in substantial alignment in the closed position of said toggle clamp, characterized by a toggle release lever pivotally connected directly at one of said first two pivotal connections adapted for thumb engagement by an operator while simultaneously applying squeeze pressure to an adjacent handle element, said release lever projecting laterally to a position intermediate associated jaw and handle elements on either side of the clamp, and an integral reaction surface on said release lever adapted to exert dis-aligning opening pressure on said aligned pivotal connections upon the application of said thumb and finger squeeze pressure.

10. A portable toggle clamp as set forth in claim 9 wherein said reaction surfaces are adapted to engage one of said pair of pivotal connections.

11. A portable toggle clamp as set forth in claim 10 wherein said release lever is mounted on the first of said pivotal connections.

12. A portable toggle clamp as set forth in claim 10 wherein said release lever is mounted on the second of said pivotal connections.

13. A portable toggle clamp as set forth in claim 9 wherein said reaction surface is adapted to engage the end of one of said handle elements at a position closely adjacent a common pivotal connection.

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