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TOGGLE CLAMP

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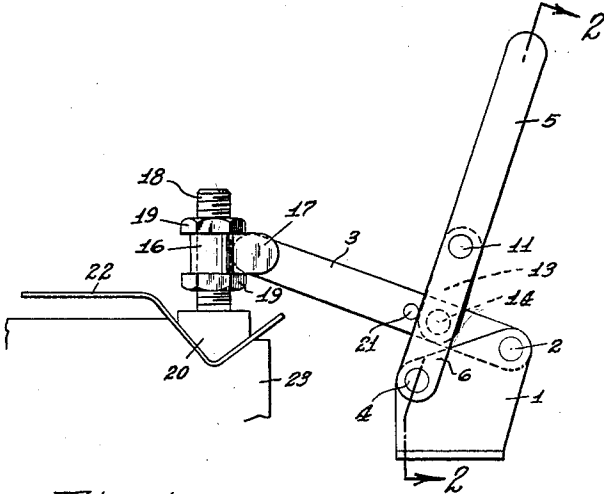


Fig. 1.

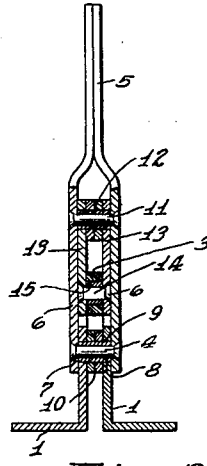


Fig. 2.

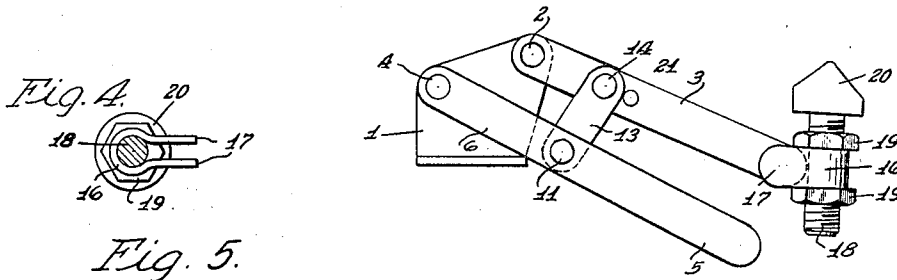


Fig. 3.

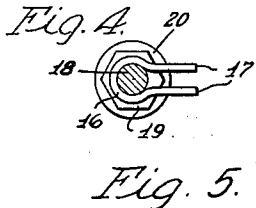
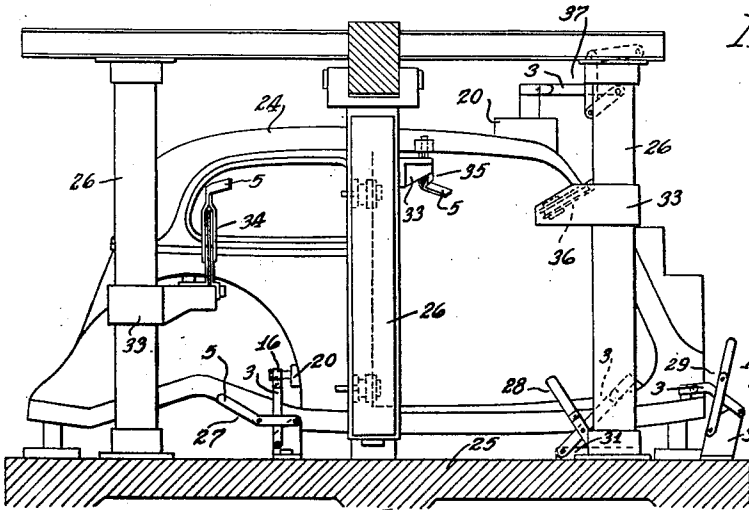


Fig. 4.



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TOGGLE CLAMP

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5 Claims. (Cl. 29—89)

The present invention pertains to toggle clamps of a type particularly adapted for use in connection with automobile body building and with checking fixtures.

5 The primary object of the present invention is to provide a clamp for holding stampings, castings, forgings, or other articles of high production in a jig or fixture during operations thereon. The clamp is designed to combine mechanical strength and durability with lightness and ease of operation.

Another object of the invention is to reduce friction and keep bearing play down to a minimum by the provision of hard bronze bushings at the pivot points.

15 Another object of the invention is to provide a clamp wherein the work holding bar travels a greater distance than the operating handle. By way of example, the movement of the clamping bar is approximately twice that of the handle but the rate of movement of the clamping bar relative to the rate of movement of the handle constantly varies. A desirable leverage action is thus attained by combining the toggle elements so that when the clamp is in its open position movement of the handle to close the clamp causes movement of the clamping bar at a rate approximately three times faster than the handle and during the final five degrees of movement before the locking point the handle has a speed approximately twelve times that of the clamping bar. Thus the clamping bar may be rapidly moved to and from its clamping position and the operating lever has an increased leverage advantage over the bar at the time the latter becomes operative as a holding means.

Still another object of the invention is to provide an adjustable bolt retainer constructed to hold itself in place on the clamping bar by frictional engagement therewith until all the parts have been properly adjusted, at which time it is permanently welded in position.

With the above and other ends in view the invention consists in matters hereinafter more particularly set forth with reference to the accompanying drawing, in which

Figure 1 is a side elevation of the clamp in an operative position;

50 Fig. 2 is a cross section taken on the line 2—2 of Fig. 1;

Fig. 3 is a side elevation of the clamp in an inoperative position;

Fig. 4 is a detail view of the bolt retainer, and

55 Fig. 5 is an elevation of a fixture for supporting

an automobile body, clamps being illustrated on the fixture for holding the body.

Like characters of reference are employed throughout to designate corresponding parts.

The base for the present clamp is formed of two angle brackets 1 united by a rivet 2 which also serves as a fulcrum and a means for attaching a clamping bar 3 to the base. Also serving to unite the two brackets 1 is a rivet 4 whose outer ends serve as a fulcrum for an operating handle 5. As more clearly shown in Fig. 2 the handle 5 has two spaced apart arms 6 straddling the brackets 1 and clamping bar 3 and having apertures 7 receiving the ends of the rivet 4. Sleeved on the rivet 4 is a bronze bushing 8 whose ends are received in apertures 9 in the brackets 1, the bushing thus serving as a spacer element between the arms 6. Sleeved on the bushing 8 are spacer elements 10 which function to hold the brackets 1 in spaced apart relation. The bushing 8 and the spacer elements 10 cooperate with the rivet 4 to hold the arms 6 relative to the brackets 1 without any play and yet without resulting in any frictional binding.

Extending between the arms 6 is a rivet 11 having a bronze bushing 12 sleeved thereon and spacing the arms apart. Links 13 have one of their ends pivotally attached to the arm by means of the rivet 11 and bushing 12 and their other ends attached to the clamping bar 3 by a rivet 14 journaled in a bronze bushing 15 in the clamping bar. A stop 21 is provided on the clamping bar 3.

On the outer end of the clamping bar 3 is provided a bolt retainer. The retainer comprises a substantially cylindrical part 16 having a pair of arms 17 formed integral therewith. In assembly the two arms 17 are forced over the end of the clamping bar, which they frictionally engage, and the retainer is adjusted to suit the particular work to be held. The arms 17 are then welded to the clamping bar.

Received in the retainer 16 is a screw threaded bolt 18 having nuts 19 thereon engaging opposite sides of the retainer to secure the bolt relative thereto. On the end of the bolt 28 is welded or formed a work engaging head 20.

In operation, the head 20 engages a piece of work, designated at 22 to hold it in a fixture 23, as shown more clearly in Fig. 1. As shown, in order to move the head 20 into engagement with the work the lever 5 has been moved pivotally relative to the brackets 1 until it strikes the stop 21. When the lever 5 engages the stop 21 the links 13 will have passed their dead center relative to the pivot points 4 and 11 and they will positively

hold the clamping bar 3 against movement in a direction away from the work as a result of pressure on the clamping bar tending to move the same.

5 To release the clamp to permit removal of the work 22 the lever 5 is moved, by manual pressure, from the position shown in Fig. 1 to that shown in Fig. 2. This movement pulls the clamping bar and causes it to move through an arc of
10 approximately one hundred and eighty degrees whereby it is moved completely away from the work piece, as shown in Fig. 3.

When the lever 5 is moved from the position shown in Fig. 3 to that shown in Fig. 1 the clamping bar is moved through approximately twice
15 the number of degrees that the lever 5 is moved, and obviously, the movement of the bar is at a rate faster than the rate of movement of lever. However, as the lever 5 approaches the stop 21 the arms 6 of the lever and the links 13, which
20 comprise a toggle linkage, are almost straightened and therefore movement of the clamping bar takes place at a rate lower than the lever. This provides a leverage advantage of approximately
25 twelve to one at the time the head 20 engages the work.

The advantage of the wide range of movement of the clamping bar becomes apparent upon reference to Fig. 5 wherein there is illustrated an
30 automobile body 24 held in a fixture including a base part 25 and vertically extending elements, this fixture serving as an example of a fixture such as is used in flash welding operations. On the base part 25 are provided several clamps, the
35 clamps being constructed as described above and being generally designated on this figure by the numerals 27, 28 and 29. In each instance, however, the base brackets take a different form. For example, the base 30 supporting the clamp
40 27 is constructed so that the clamping bar 3 is substantially vertical when it is in its clamping position. A limitation as to the extent of movement of the lever 5 is present in this particular mounting and for this reason it has been bent to
45 permit the desired amount of pivotal movement before it strikes the base 25.

Clamp 28 has a base 31 supporting the elements so that the clamping bar extends in a plane approximately forty-five degrees to the horizontal. Clamp 29 is supported upon a base 32 designed to
50 elevate the clamp relative to the base 25. In this form the clamping bar 3 is bent in order to adapt itself to the work.

On the vertical elements 26 are provided brackets 33 supporting clamps 34, 35 and 36, clamps 34 and 35 being provided with bent levers 5 in order to accommodate the clamps to the limitations as to space. At 37 there is illustrated a clamp having a clamping arm with an enlarged head 20
60 therein for engaging the top of the body 24. Accordingly it becomes apparent that both the clamp supporting bases and the work engaging heads take various forms in order that the clamp may be adapted to the work. However, in all these forms the wide range of movement of the clamping
65 bar is present and its advantage is apparent with the type of fixture and work shown because

of the difficulty experienced in removing the work from the fixture in the event that the clamping elements are only capable of being moved sufficiently to release the work and not sufficiently to entirely remove them from the work.

Although a specific embodiment of the invention has been shown and described it will be understood that various changes may be made within the scope of the appended claims without departing from the spirit of the invention, and
10 such changes are contemplated.

What I claim is:—

1. In combination with a clamping bar and means for moving the same to operative and in-operative positions, a retainer for supporting a
15 work engaging element, said retainer having means for frictionally engaging said clamping bar for holding itself in positions of adjustment with respect thereto.

2. In combination with a clamping bar and
20 means for moving the same to operative and in-operative positions, a retainer for supporting a work engaging element, said retainer having means for frictionally engaging said clamping bar for holding itself in positions of adjustment
25 with respect thereto, an adjustable element supported by said retainer, and means for holding said adjustable element in positions of adjustment.

3. In combination with a clamping bar and
30 means for moving the same to operative and in-operative positions, a retainer for supporting a work engaging element, said retainer having means for frictionally engaging said clamping bar for holding itself in positions of adjustment
35 with respect thereto, a bolt received in said retainer, and nuts on said bolt and engaging said retainer to secure said bolt relative thereto.

4. In a clamping device, spaced apart base brackets, a clamping bar having its ends disposed
40 between said brackets, a rivet uniting said brackets and extending through an aperture in the said end of said clamping bar, spaced apart elements, a rivet uniting said brackets and pivotally supporting the ends of said spaced apart elements
45 relative to said brackets, links, a rivet pivotally attaching said links to said clamping bar, a rivet pivotally attaching said links to said spaced apart elements, and an operating handle connected to said spaced apart elements.

5. In a clamping device, spaced apart base brackets, a clamping bar having its ends disposed
50 between said brackets, a rivet uniting said brackets, and extending through an aperture in the said end of said clamping bar, spaced apart elements, a rivet uniting said brackets and pivotally supporting the ends of said spaced apart elements relative to said brackets, links, a rivet pivotally attaching
55 said links to said clamping bar, a rivet pivotally attaching said links to said spaced apart elements, an operating handle connected to said spaced apart element, and a bushing surrounding said rivets and serving as a spacer element for the respectively united parts and as a wear surface.

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