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CLAMP

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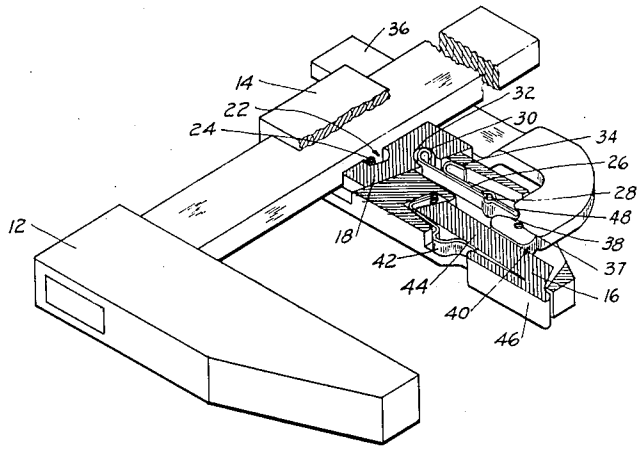


FIG 1

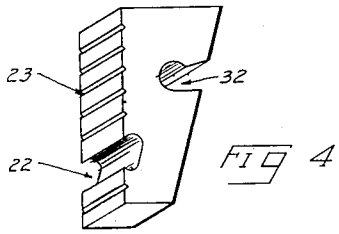


FIG 4

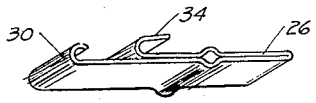


FIG 5

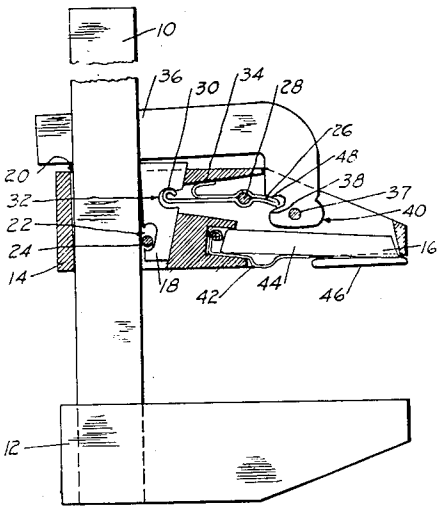


FIG 2

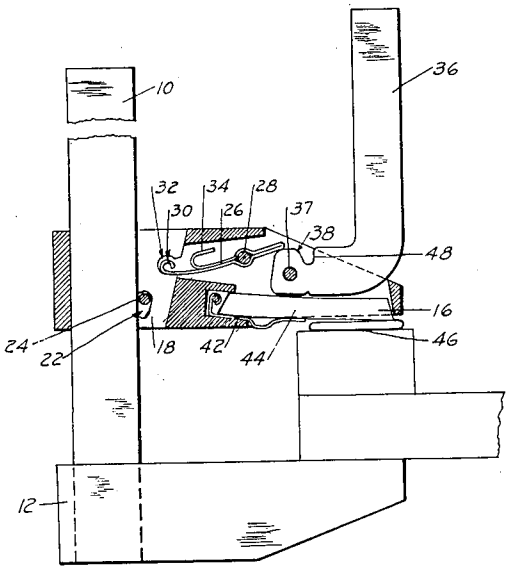


FIG 3

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CLAMP

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12 Claims. (Cl. 144—303)

This invention relates to clamps, and particularly to adjustable clamps. By suitable choice of materials and proportioning of parts, the clamp may be used for almost any conceivable purpose. The form chosen for the purpose of illustration is of the type known as the C-clamp, such as might be used, for example, in clamping together metal members which are to be welded.

In the form of clamp illustrated, the operation is controlled entirely by a single handle which may release the sliding jaw, may lock the jaw, and may actuate the pressure member. These various functions are performed with the aid of cam surfaces on the handle member, one of which presses a wedge into locking engagement with a slide bar, and the other of which subsequently actuates the pressure member. When the handle is turned in the opposite direction, the pressure from the cams is of course released, and in fact, a further turning of the handle may positively withdraw the wedge.

Numerous objects are accomplished by this invention. A clamp is provided which may be completely controlled by a single handle, and which is nevertheless thoroughly reliable. Before any pressure is exerted on the pressure member which would tend to slide the sliding jaw, it is rigidly locked in place. At the same time if it is desired to slide this jaw into closer relation with the work, this may be done instantaneously whenever the pressure member is released, without the operation of any special securing mechanism. At the same time the jaws are maintained parallel and a large pressure area is insured. Also a certain amount of resilience is provided to permit a complete operation of the handle without excessive pressure on the work, regardless of the position of the sliding jaw with respect to the work.

With these and various other objects in view, the invention may consist of certain novel features of construction and operation, as will be more fully described and particularly pointed out in the specification, drawing and claims appended hereto.

In the drawing, which illustrates an embodiment of the device, and wherein like reference characters are used to designate like parts.

Figure 1 is a perspective view of the clamp with certain parts broken away;

Figure 2 is a view illustrating the clamp in its fully released position;

Figure 3 is a view illustrating the clamp in its fully operative position;

Figure 4 is a perspective view of the wedge; and

Figure 5 is an enlarged detail view of the wedge-operating spring.

Although this invention may take many forms, only one has been chosen for illustration. This form includes the slide bar 10, the fixed jaw 12, the sliding jaw 14, the pressure jaw 16 and the mechanism for operating the same. The sliding jaw 14 is preferably formed of an integral casting having openings therethrough as shown best in Figure 2. In one of these openings may be inserted the slide bar 10 and also a suitable wedge 18. The wedge 18 and the associated walls of the sliding jaw 14 are so shaped that movement of the wedge 18 toward the fixed jaw 12 will thrust the wedge against the slide bar 10 and thrust the slide bar against the back wall 20 of the opening in the sliding jaw 14. This wall 20 is formed at an angle slightly greater than ninety degrees from the active face of the pressure jaw 16 in its operated position, so that when the wedge 18 presses the slide bar 10 against this face 20, the active face of the fixed jaw 12 will tend to be pointed slightly toward the active face of the jaw 14. This is done in order that a spreading pressure between the jaws will flex them into parallelism rather than out of parallelism. The wedge 18 is provided with a slot 22 through which is inserted a pin 24 which is secured in the sliding jaw 14. This pin retains the wedge in place under all circumstances and also limits the play of the sliding jaw 14 when the wedge 18 is released. The wedge 18 is shown in detail in Figure 4, in which may be seen the transverse grooves 23 which are indented in the active face of the wedge in order to increase its grip on the slide bar 10. It should be noted, however, that the slide bar 10 is smooth faced so that the sliding jaw 14 may be positioned with the utmost delicacy, though without any loss of rigidity. To prevent marring of the surface of the slide bar the grooves 23 are spaced quite far apart and the areas between them are made substantially flat.

The wedge 18 is operated by the spring lever 26 which is pivoted on the pin 28 riveted to the sliding jaw 14. This spring lever is shown in detail in Figure 5, from which it is seen that it is preferably made of one piece of spring steel. It is formed with the head 30 which fits into a socket 32 in the wedge 18. The spring 26 is also provided with a pressure spring 34 which presses against the upper wall of the sliding jaw 14 to press the wedge 18 to its gripping position. If desired, this pressure spring 34 may be made sufficiently strong to cause the wedge 18 to grip the slide bar 10 sufficiently tightly in all posi-

tions of the wedge to cause locking. For many purposes, however, it is preferred that this pressure be merely enough to take up the play at 20 and hold the sliding jaw 14 in position until the handle 36 is operated. One advantage of this is that the sliding jaw may then be released with only a light pressure on the handle. Under such conditions, however, it is important that the pressure on the wedge 18 be increased to the locking state before the clamping operation of the jaws begins. For this purpose, the handle 36 is pivoted on a suitable pin 37 and is provided with a cam surface 38 which contacts the end of the spring lever 26 to press the wedge 18 more firmly into locking position, and also tend to provide for any wear on the wedge. It is of course not necessary that the wedge be thus forced into position tightly enough to hold the sliding jaw 14 against all spreading forces, but merely that the pressure on the wedge 18 be sufficient to cause it to grip the sliding bar 10 and be moved by it into a completely locking position. In other words, it is only necessary that the pressure on the spring lever 26 exert enough force on the wedge 18 to make this wedge self-locking in its co-action with the slide bar 10.

When the spring lever 26 has thus been pressed to the locking position by cam surface 38, the cam surface 40 comes into play against the pressure jaw 16. This pressure jaw is now only held in position by the spring 42 which may be screwed or otherwise secured to the sliding jaw 14. The effective radius of the cam surface 38 increases so rapidly as the cam is rotated from the position shown in Figure 1 nearly to the position shown in Figure 3, that the handle and cam are quick acting in this portion of the stroke. Less than a quarter turn of the handle accomplishes a full and sufficient stroke of the pressure jaw 16. At the position shown in Figure 3 however, the cam is self-locking, i. e., so nearly circular that friction will hold it in place no matter how much pressure may be exerted on the jaws. As a matter of fact it is preferred that the slope of the cam be reversed so as to furnish even more positive locking. The complete operation of the handle 36 is illustrated in Figure 3, in which it is seen that the pressure jaw 16 has been pressed outwardly to clamp the article being worked upon against the fixed jaw 12. It will be noted that the shank 44 of the pressure jaw 16 is made of heavy spring steel which has separate points of support at its two ends and may be sprung in order that the pressure face 46 may be actuated with sufficient force without binding the handle 36. This permits the full operation of the handle 36 to the position shown in Figure 3, for even though the pressure face 46 may reach its utmost movement with only half the movement of the handle 36, the spring shank 44 will yield to permit the completion of the handle movement. When the handle is in the position shown in Figure 3, it is self-locking and will remain in that position until externally actuated. Of course the stiffness of the spring shank 44 which is chosen in any case will depend on the work to be performed. For welding, it is desirable that the clamp hold the pieces being welded firmly, but not too tightly to permit adjustment by tapping with a hammer. For other work, another pressure jaw may easily be substituted. The pressure face 46 is preferably resilient, and resiliently attached to the shank 44 as shown, but of course the ordinary swivel button or any other pressure applying device may be used if desired.

The handle 36 is swung to the normal position shown in Figure 1, to release the work. In this position it releases the pressure on the pressure jaw 16. However, the wedge 18 will usually have become wedged so tightly that positive means will be required to release it. For this purpose a shoulder 48 is provided on the handle in a position to contact the spring lever 26, and when the handle is moved to the position shown in Figure 2 to actuate the spring lever 26 in a clockwise direction, it thereby releases the wedge 18, as shown in Figure 2, so that the sliding jaw 14 may be slid outwardly on the slide bar 10. Upon release of the handle 36 the pressure spring 34 presses the wedge back into engagement with the slide bar 10 so that when the slide jaw 14 is again slid up into proximity with the work, it will stay in this position.

One of the outstanding advantages of this clamp is its simplicity of construction and ease of assembly. The fixed jaw 12 may of course be shrunk onto the slide bar 10, which may then be inserted through the sliding jaw 14. The wedge 18 may then be inserted into this same opening and if desired the pin 24 may then be secured in place. Thereafter the spring lever 26 may be inserted, the pin 28 passed therethrough, and secured into place, and the handle 36 may be pivoted in place by a pin 37. It is then only necessary to attach the spring 42, if this has not already been done, and to press the pressure jaw 16 into place.

For the sake of clarity, the operation of the clamp may be briefly summarized at this point: The work to be clamped is inserted between the jaws, in contact with the fixed jaw 12, and the sliding jaw 14 is slid into proximity with this work. Wedge 18 under the influence of spring 34 holds the parts in this position until the handle 36 is operated to increase the pressure on the wedge 18 and thereafter to exert the pressure on the pressure jaw 16 and securely clamp the work. To release the work it is merely necessary to operate the handle back to its normal position, at which time the work may ordinarily be removed, and if it is desired to open the jaws further, it is only necessary to squeeze the handle to the position shown in Figure 2, in which position the wedge 18 is pressed upwardly by the spring lever 26 to release the slide bar 10 so that the sliding jaw 14 may be moved at will with respect thereto.

It is to be understood that many other embodiments of the invention, including some in improved form, will be apparent, and in the course of time more will be devised by those skilled in the art. It is not desired that this invention be limited to the details described, for its scope includes all such forms or improvements as come within the spirit of the following claims, construed as broadly as the prior art will permit.

What is claimed is:

1. A clamp including: a substantially smooth surfaced slide bar, a first jaw carried thereby, a second jaw slidably mounted thereon, means initially effective independently of clamping action to anchor said sliding jaw at any position on said slide bar, a pressure jaw movable with respect to said slidable jaw, and a lever for operating said pressure jaw and for releasing said anchoring means.

2. A clamp including: a slide bar, a first jaw carried thereby, a second jaw slidably mounted thereon, means for initially anchoring said slidable jaw to said slide bar, a pressure jaw movable

with relation to said sliding jaw, and a lever carried by said slidable jaw for operating said pressure jaw to firmly clamp work against said first jaw and operable only after said sliding jaw has been anchored.

3. A clamp including: a slide bar, a first jaw carried thereby, a second jaw slidably mounted thereon, means for initially anchoring said slidable jaw to said slide bar, a pressure jaw movable with relation to said sliding jaw, and a lever carried by said slidable jaw for operating said pressure jaw only after said sliding jaw has been anchored and for alternatively releasing said anchoring means.

4. A clamp including: a slide bar, a first jaw carried thereby, a second jaw slidably mounted thereon, means normally operated resiliently for anchoring said slidable jaw to said slide bar at any position thereon, a pressure jaw movable with respect to said slidable jaw, and a handle for operating said pressure jaw and for releasing said anchoring means.

5. A clamp including: a substantially smooth surfaced slide bar, a first jaw carried thereby, a second jaw member slidably mounted thereon, resiliently operated means normally partially effective for anchoring said slidable jaw to said slide bar at any position thereon, a pressure jaw movable with respect to said slidable jaw member, and a handle for first and continually during clamping action, insuring the operation of said anchoring means; for secondly operating said pressure jaw, and for alternatively releasing said anchoring means.

6. A clamp including: a substantially smooth surfaced slide bar, a first jaw carried thereby, a second jaw member slidably mounted thereon, means for anchoring said slidable jaw to said slide bar at any position thereon, a pressure jaw movable with respect to said slidable jaw member, and a handle for first and continually during clamping action insuring the operation of said anchoring means; for secondly operating said pressure jaw, and for alternatively releasing said anchoring means.

7. A clamp including: a substantially smooth surfaced slide bar, a first jaw carried thereby, a second jaw member slidably mounted thereon, means for anchoring said slidable jaw to said slide bar at any position thereon, a pressure jaw movable with respect to said slidable jaw member, and a handle for first and continually during clamping action insuring the operation of said anchoring means; and for secondly operating said pressure jaw.

8. A clamp including: a pressure jaw movable with respect to the remainder of said clamp, means for operating said pressure jaw, and resilient means so arranged in the line of force between said operating means and said pressure jaw that its resiliency will permit a full movement of said operating means and at the same time limit the pressure exerted on said pressure jaw.

9. A clamp including: a pressure jaw movable with respect to the remainder of said clamp, means for operating said pressure jaw, and resilient means so arranged in the line of force between said operating means and said pressure jaw as to permit a free movement of said operating means and at the same time limit the pressure exerted on said pressure jaw; said operating means being quick acting through part of its stroke, but self-locking at the end of its stroke.

10. A clamp including: a pressure jaw movable with respect to the remainder of said clamp, means for operating said pressure jaw, and resilient means in the line of force between said operating means and said pressure jaw for permitting a free movement of said operating means and at the same time limiting the pressure exerted on said pressure jaw; said operating means including a cam which is quick acting through part of its stroke, but self-locking at the end of its stroke.

11. A clamp including: a smooth surfaced slide bar, a first jaw carried thereby; a second jaw slidably mounted thereon; a wedge for anchoring said slidable jaw at any position on said slide bar, said wedge being arranged to be tightened by the clamping action of said jaws and to be released by the sliding movement of said sliding jaw toward said other jaw; resilient means for pressing said wedge into operative position, said resilient means being sufficiently weak to permit easy displacement of said wedge during adjustment of said sliding bar; and means for producing a clamping operation of said clamp, said last named means being effective preliminary to and continually during said operation for applying an increased and positive locking pressure on said wedge.

12. A clamp including: a slide bar, a first jaw carried thereby; a second jaw slidably mounted thereon; a wedge arranged to anchor said slidable jaw at any position on said slide bar; means for operating said wedge; and a lug for limiting the lateral movement of said slide bar in said slidable jaw when said wedge is released, and for aiding in the retention of said wedge in place.

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