Dec. 1, 1959 E. MOONEY 2,915,096

HAND CLAMP

Filed April 8, 1957

Fig. 1

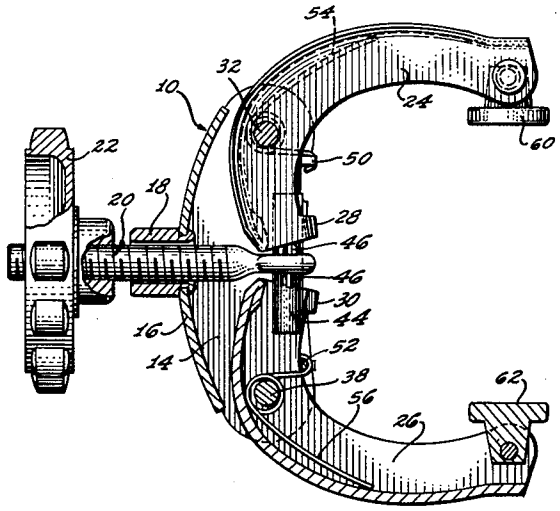


Fig. 2

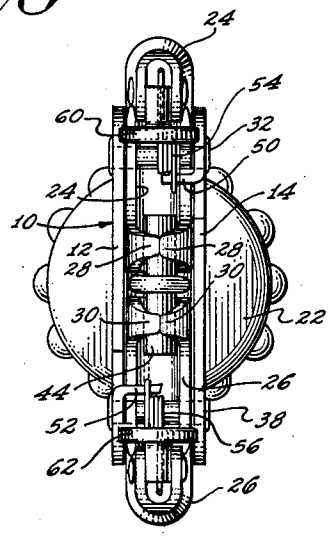


Fig. 3

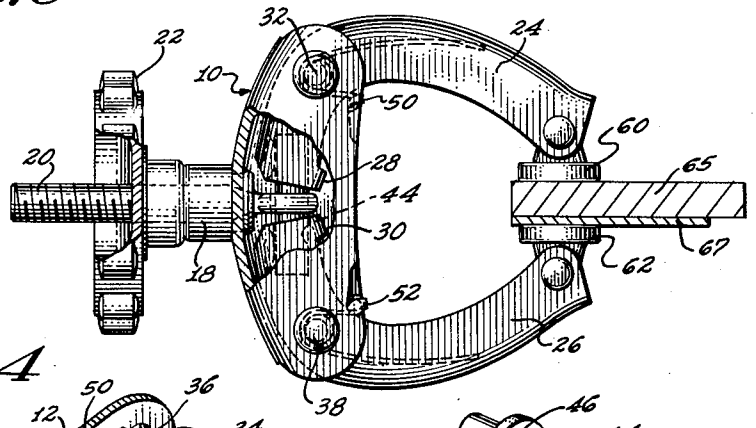


Fig. 4

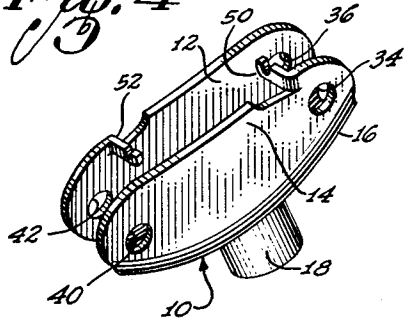
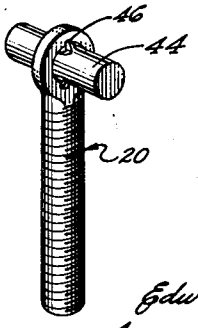


Fig. 5



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HAND CLAMP

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2 Claims. (Cl. 144—297)

The present invention relates to general service hand clamps or vises for use in workshops, machine shops and the like; and which are utilized to hold a plurality of work pieces together while operations are being performed on them.

There has been a growing need in recent years for suitable hand clamps which are appropriate for holding smaller pieces of work together. That is, there is at present a need for a hand clamp which is simple and rapid to operate, and which is constructed with such a configuration that it will not be in the way of the operations being performed on the clamped work.

The need for such hand clamps is demonstrated by the growing accident rate in home workshops in particular, and also in industry in general. As more and more home workshops are being equipped with power tools of increasing complexity, it is becoming more and more necessary to reduced the likelihood of accidents resulting from the use of such tools. A large proportion of the accidents that do occur are a direct result of the use of these tools with work that is not properly clamped or which is not clamped at all.

It is believed that the reason in the past why even seasoned mechanics often did not bother to properly clamp work being operated on was due to the lack of appropriate hand clamps. The prior art clamps were for the most part awkward to operate, and they were cumbersome and continually got in the way of the operations being performed on the work. This led even experienced workmen to be often tempted to hold the work in their hands while it was being processed. This, of course, provided a very prevalent source of accidents.

As noted above, most prior art hand clamps for the small work pieces were clumsy to handle, and their inadequate design and configuration was such that their body portions impaired drilling or other operations which were attempted to be performed on the clamped work. This condition prevailed because it was usual in such prior art clamps for the body portion of the clamp to extend essentially perpendicular to the plane of the clamped work. This not only created an obstruction for the operations being performed on the work, but it also impaired the convenient leveling and setup of the work.

A feature of the present invention is the provision of a hand clamp of improved construction in which the body portion of the clamp extends essentially in the plane of the clamped work pieces away from an end free of these pieces. This allows tools to run in an unobstructed manner right up to the side of the clamping jaws of the clamp. A degree of freedom is therefore provided that is unobtainable with most prior art clamps. This configuration of the clamp of the invention also provides a minimum obstruction under the clamped work pieces, and they can be moved freely over the surface of the supporting table for the particular power tool being used at that particular time.

Another feature of the improved hand clamp of the

invention is that the clamped work does not tend to cock or twist as the clamp is being tightened against the work. This is because the center line of the clamp of the invention, as noted above, extends in essentially uni-planar relation with the plane of the clamped work. This means that all the torque produced by the clamp is about an axis at which it is impossible for the various clamped work pieces to turn with respect to one another.

The clamp of the invention is constructed in one embodiment so that both its jaws are movable in unison from zero to maximum opening. Moreover, the clamp is constructed to exert its greatest clamping pressure as its jaws approach maximum opening. The former feature provides for a wide adjustment of the clamp, and the latter feature provides for a strong clamping action for large jaw openings where it is most needed. This, in effect, doubles the capacity and range of the clamp as compared with prior art hand clamps in general. An important result flowing from this particular feature is that for any range of operations, only half the number of clamps constructed in accordance with the present invention need be used as compared with the usual type of prior art hand clamps.

Another important feature of the present invention is the fact that there is no turning exerted on the clamping pads of the hand clamp as it is being clamped into position. This eliminates any galling or damage to finished work with which the clamp may be used, and the pads lend themselves to quick slip for rapid removal of the clamp.

The improved clamp of the invention also utilizes operating jaws of channel-like cross section. This provides for an extremely rigid and strong construction without an accompanying excessively large weight. Moreover, the pressure exerted by the jaws on the clamp pads is so exerted at diametrically opposite points near the outer rims of the pads. This insures against pivoting of the pads on the clamped work pieces and thereby precludes the likelihood of damage to the clamped work.

Also, the operating jaws of the illustrated embodiment of the present clamp are pivotally supported on respective pivot pins in a rigid frame. This frame is such that it embraces the jaws and serves to eliminate torsion or twist of these members as the unit is clamped about the supported work pieces. Respective retainer springs extend along the inner portions of the jaw member, and these springs serve to bias the jaws in an open direction.

The improved clamp of the invention is also constructed to include a threaded eye-bolt. This eye-bolt extends along the center line of the clamp through the frame referred to in the preceding paragraph. This eye-bolt is coupled to the jaws of the clamp in a manner to be described, and it is slidably movable reciprocally within the frame to open and close the jaws. A balanced, rim-weighted, rapid-spin control knob is threaded to the eye-bolt externally of the frame, and this knob serves to provide the desired clamping action of the assembly.

Rapid action of the clamp may be achieved by manually closing its jaws over the work pieces that are to be clamped, and then by spinning the knob into position and tightening it to complete the clamping operation. Quick removal of the clamp is possible merely by spinning the knob to its outer position. In a constructed embodiment of the hand clamp, the rapid spin action described above was found to afford a rapid adjustment of the clamp from zero to full opening in less than two seconds.

Because of the constructional features described in the preceding paragraph, the hand clamp of the invention is eminently suited for accomplishing its intended purpose. In the manner described, the clamp may be clamped into position by an exceedingly rapid and sim-

ple operation. While it is in position, it provides a minimum obstruction for the operations being performed on the clamped work pieces. These and the other described features of the invention are such that mechanics and hobbyists are encouraged properly to clamp the work they are using and thereby prevent accidents.

The clamp of the invention is simple and economical to construct because it lends itself to simple prefabrication techniques. The channel shape of the jaws permits light weight materials to be used without impairing the strength of the assembly. All the necessary components may be conveniently assembled by means of blanking dies and forming dies, and the need for welding or other less efficient or satisfactory fabricating methods is obviated.

Other features and advantages of the present invention will become apparent from the following description, particularly when taken in connection with the accompanying drawing, in which:

Figure 1 is a side view partly in section, showing in full scale the constructional details of one embodiment of the improved hand clamp or vise of the present invention, this view showing the jaws of the clamp in an open position;

Figure 2 is an end view of the clamp of Figure 1 with the jaws, likewise, in an open position;

Figure 3 is a side view, partly in section, of the improved clamp of the invention, and this view is similar to the view of Figure 1 but with the jaws of the clamp closed and clamped down on a pair of supported work pieces;

Figure 4 is a perspective view of a frame which forms an important component of the illustrated embodiment of the invention; and

Figure 5 is a perspective view of an eye-bolt assembly which also forms an important component of the invention.

With reference to the drawings, the improved hand clamp of the present invention includes a frame **10** which is shown, for example, in Figure 4. The frame **10** includes a pair of parallel side walls **12** and **14**, and it also includes a central section **16**. The section **16** has an aperture extending through it which is coaxial with the center line of the clamp. A bushing **18** is swedged into the aperture of the section **16**. This bushing may be integral with the frame **10** if so desired.

An eye-bolt **20** (Figure 5) extends through the bushing **18**, and the eye-bolt is slidable in the bushing for rectilinear reciprocal motion with respect to the frame **10** along the center line of the clamp. The eye-bolt **20** has a threaded portion protruding from the bushing **18** and out from the frame **10**. A control knob **22** is threaded to this protruding portion of the eye-bolt **20**. The knob **22** is preferably a balanced rim-weighted knob, as noted previously, for rapid spin on the eye-bolt.

The clamp includes a pair of jaw members **24** and **26**, each having a channel-shaped cross section. Each of the jaw members has an actuating end and a clamping end. The respective actuating ends of the jaw members are turned over as at **28** and **30** so as to form a complete enclosure for these ends.

The jaw member **24** is pivotally mounted to the frame **10** on one side of the center line of the clamp by means of a pin **32**. The pin **32** extends through a pair of aligned holes in the jaw **24** at a point intermediate the ends of the jaw, and this pin also extends through a pair of aligned apertures **34** and **36** in the side walls **12** and **14** of the frame **10** (Figure 4).

Likewise, the jaw **26** is pivotally mounted to the frame **10** on the opposite side of the center line of the clamp from the jaw **24**. The jaw member **26** is so mounted by a pivot pin **38**. This pin extends through aligned openings in the jaw member **26** and through a pair of aligned apertures **40** and **42** (Figure 4) in the side walls

12 and **14** of the frame **10**. It will be observed that the jaw members extend into the frame **10** between the side walls **12** and **14** and are rigidly held by the side walls so as to prevent torsion or twist of the jaw members as they are clamped down on the supported work.

A rod-like transverse member **44** extends through the end portion of the eye-bolt **20** (Figure 5). This member **44** is held in place in the eye-bolt by a series of turned-up ears **46** in its periphery, which ears engage opposite sides of the eye-bolt. The opposite ends of the transverse rod **44** extend into the enclosures formed by the portions **28** and **30** at the respective actuating ends of the jaw members **24** and **26**. The transverse rod is in loose fit with these actuating ends of jaw members to provide an essentially toggle engagement. This permits the transverse member **44** to pivot the jaw members **24** and **26** in a direction to close them as the eye-bolt **20** is moved to the left in Figure 1, and it enables the jaws **24** and **26** to be opened when the eye-bolt is moved to the right in Figure 1.

The frame **10** has a bent-over portion **50** at the end of its side wall **14**, and the side wall **12** has a bent-over portion **52** in its edge. These portions are best shown in Figure 4. A first resilient coil spring **54** is wound about the pivot pin **32** within the jaw **24**. One end of this spring is turned over the portion **50**, and the other end of the spring bears against the inner surface of the jaw **24**. The spring **54** tends to bias the jaw **24** in a counter clockwise direction in Figure 1 with respect to the frame **10**.

A second spring **56** is coiled about the pin **38**. One end of this second spring is turned over the portion **52** of the frame **10**, and the other end of this second spring bears against the inner surface of the jaw **26**. The spring **56** tends to rotate the jaw **26** in a clockwise direction with respect to the frame **10** about the pin **38**. The portions **50** and **52** additionally serve to limit the opening of the jaws **24** and **26** of the clamp. In their maximum open position, the inner edges of the jaws bear against these portions, as shown most clearly in Figure 1.

The frame **10** and the jaws **24** and **26** may be composed of a suitable material such as steel, as may the other components of the clamp as described above. A clamp pad **60** is pivoted to the clamped end of the jaw member **24**, and a clamp pad **62** is pivoted to the clamping end of the jaw member **26**. These clamp pads, for example, may be composed of semi-soft steel.

The edge of the jaw member **24** engages the top surface of the pad **60** at two diametrically opposite positions so that the pad **60** is firmly brought into engagement with the clamped work. Likewise, the jaw member **26** engages the clamp pad **62** at diametrically opposite positions on its upper surface so that this latter pad is firmly and positively brought into a clamping position. As noted above, this insures against pivoting of the pads on the clamped work with resulting damage to the work.

The clamp is shown in Figure 3 as clamping a work piece **65** against a work piece **67**. It will be seen that the center line of the clamp extends in uni-planar relation with the plane of the clamped work piece. That is, the center line extends away from the work piece in essentially the same plane as the work, rather than upwardly from the work pieces in perpendicular relation as is the case with most prior art clamps. This provides for the body portion of the clamp to extend free of the work and out of the way of any drilling or other operations to be performed on the work. Moreover, with this configuration, there is no tendency to turn the work piece **65** with respect to the work piece **67** when the clamp is clamped into position.

An examination of the illustrated embodiment of the invention will reveal that both the jaws **24** and **26** are moved as the clamp is adjusted, rather than having but one movable jaw. This provides for a rapid adjustment

through a wide range of clamping positions. Moreover, it will be observed that the leverage of the transverse member **44** with respect to the jaw members **24** and **26** is such that maximum leverage is exerted as the jaws reach their maximum positions. This provides the greatest clamping action for the wider jaw positions, as is desired.

Moreover, neither of the clamp pads **60** or **62** turn as the clamp is clamped into position so that the likelihood of galling or other damage to the support work is minimized. Also, as is evident from Figure 3, the jaws **24** and **26** of the clamp may be closed over the work pieces, and then the handle **22** may be spun into position for rapid action.

The invention provides, therefore, an improved hand clamp or vise that is relatively simple and economical to produce. The hand clamp of the invention is advantageous in that it is light and convenient to use, and it is capable of the most rapid and powerful clamping action. In addition the clamp is constructed so that it does not obstruct operations to be performed on the clamped work, or tend to damage the work.

I claim:

1. A clamping assembly including: a frame having a pair of essenially parallel side walls and having an apertured central section, an eye-bolt extending through said apertured central section in sliding relation with said frame for reciprocal rectilinear sliding motion with respect to said frame, said eye-bolt having a threaded portion protruding from said frame, a pair of channel-shaped jaw members, means for pivoting said jaw members between said parallel side walls of said frame on opposite sides of the line of motion of said eye-bolt, said jaw members being each so pivoted at a point intermediate the respective extremities thereof and each having an actuating end with a turned over portion and a clamping end, a rigid rod-like transverse member affixed to and extending through the end of said eye-bolt perpendicularly to the longitudinal axis of the eye-bolt and into said turned over portion of the actuating end of each of said jaw members in toggle relation therewith, and a control knob threaded to said protruding threaded portion of said eye-bolt.

2. A clamping assembly including: a frame having a pair of essentially parallel side walls and having an apertured central section, an eye-bolt extending through said apertured central section in sliding relation with said frame for reciprocal rectilinear sliding motion with respect to said frame, said eye-bolt having a threaded portion protruding from said frame, a pair of channel-shaped jaw members, means including a pair of pivot pins extending through said side walls of said frame for pivotally mounting said jaw members between said parallel side walls on opposite sides of the line of motion of said eye-bolt, said jaw members being each so pivoted at a point intermediate the respective extremities thereof and each having an actuating end with a turned over portion and a clamping end, a pair of biasing springs respectively coiled around respective ones of said pivot pins and each of said springs engaging said frame and a corresponding one of said jaw members for biasing said jaw members to an open position, a rigid rod-like transfer member affixed to and extending through the end of said eye-bolt at right angles to the longitudinal axis of the eye-bolt and into said turned over portion of the actuating end of each of said jaw members in toggle relation therewith, a control knob threaded to said protruding threaded portion of said eye-bolt, and a pair of clamp pads respectively pivoted to the clamping ends of said jaw members.

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