April 14, 1959 E. Q. KRUCHTEN 2,881,645

WORK HOLDING DEVICE

Filed March 20, 1956

Fig. 1.

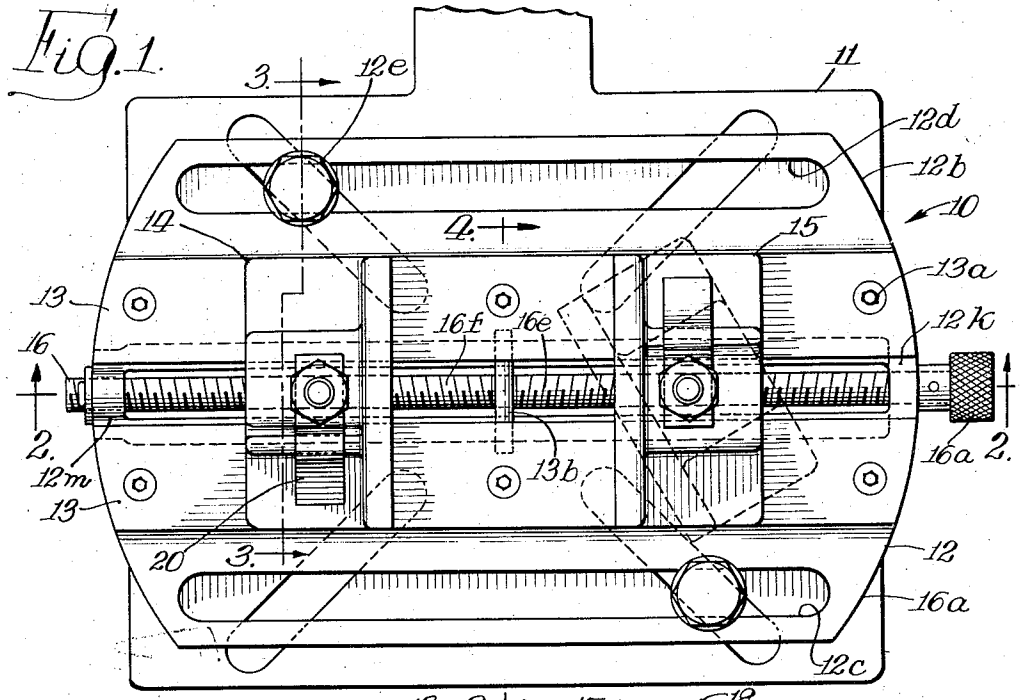


Fig. 2.

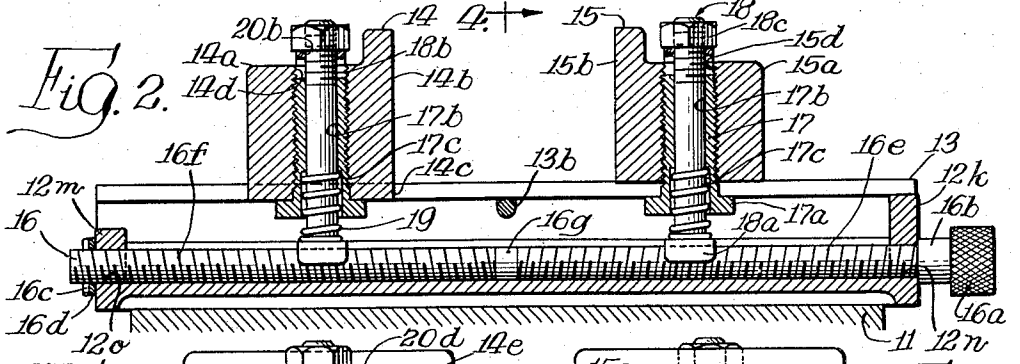


Fig. 3.

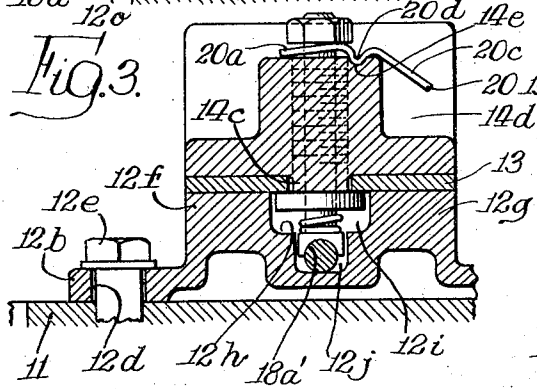
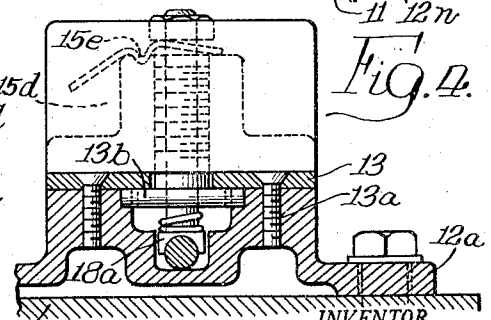


Fig. 4.



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United States Patent Office 2,881,645
Patented Apr. 14, 1959

2,881,645

WORK HOLDING DEVICE

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Application March 20, 1956, Serial No. 572,644

6 Claims. (Cl. 77—63)

This invention relates to a work holding device and, in particular, to a work holder having new and improved quick acting vise jaw means.

It is desirable in the operation of machine tools such as drill presses to secure the work to the bed of the machine quickly and immovably. Many work holding devices are known in the art for securing work to a machine bed, but such devices commonly do not afford completely satisfactory fast acting means for effecting the work holding.

The principal feature of applicant's invention is to provide a new and improved work holder which is adapted to secure the work firmly and quickly to a machine tool bed without the use of tools.

A further feature is that the work holding device may act to center the work automatically notwithstanding an irregularity therein.

Another feature is that the work holder comprises a pair of spaced jaws which are concurrently movable toward and from each other.

A still further feature of the invention is that the jaws are secured to a base by means of an undercut guideway defined by the base and a pair of spaced plates mounted on the base, each jaw having a bushing secured thereto and having an enlarged end received in the guideway, with the bushing being longitudinally movable relative to the jaw thereby effecting a variation of the space between the enlarged end and the jaw bottom to permit slidable movement of the jaw relative to the plates to compensate for a change in the thickness of the plates.

Yet another feature is the provision of a work holder as described above wherein a first plunger is longitudinally slidably carried in the bushing of one jaw member and provided with a threaded end adapted to engage releasably a right threaded portion of a rod rotatably carried by the base to effect movement of the jaw parallel to the axis of the rod, and a second plunger is provided in the bushing carried by the other jaw and provided with a threaded end adapted to engage releasably a left threaded portion of the rod to effect opposite movement of the jaw parallel to the axis of the rod.

A yet further feature is the provision of means for biasing the plunger into engagement with the rod, with further means being provided for overcoming the biasing means when desired, said further means comprising a lever pivotally carried by the jaw and having an end engaging the plunger.

Other features and advantages of this invention will be apparent from the following description taken in connection with the accompanying drawings wherein:

Figure 1 is a plan view of a work holder embodying the invention, secured to a portion of a drill press table and with one of the jaws thereof also shown in an alternate position in dotted lines;

Figure 2 is a sectional view thereof taken approximately along the line 2—2 of Figure 1;

Figure 3 is a sectional view thereof taken approximately along the line 3—3 of Figure 1; and

Figure 4 is a sectional view taken approximately along the line 4—4 of Figure 1.

In the exemplary embodiment of the invention as disclosed in the drawings a work holder generally designated 10 is shown to be secured to a portion of a machine tool bed such as table 11. Work holder 10 includes a base 12 provided with a pair of spaced ways or guide plates 13 on which is translatably carried a pair of work-clamping jaws 14 and 15. Means are provided to effect a forcible drawing together of said jaws to clamp the work therebetween, comprising a threaded rod 16 rotatably carried by the base and complementary threaded means on each of the jaws. The threaded means are further arranged to allow ready disconnection thereof from rod 16 when desired to allow a quick-acting movement of the jaws toward or away from each other.

Base 12 comprises a rigid, generally flat member having opposite side portions 12*a* and 12*b* provided with parallel elongated slots 12*c* and 12*d* respectively. The slot arrangement is preferably similar to that shown in my prior Patent No. 2,383,201. Clamp bolts 12*e* are provided to extend through slots 12*c* and 12*d* to be secured to suitable means (not shown) provided on tool table 11, for fixedly securing base 12 to the tool table as desired. A raised midportion extends between side portions 12*a* and 12*b* and forms a pair of spaced supporting platforms 12*f* and 12*g* defining between themselves a stepped channel 12*h* having an upper portion 12*i* and a smaller-width lower portion 12*j*. Fixedly secured against the upper surface of platforms 12*f* and 12*g* are guide plates 13 which extend laterally inwardly toward each other sufficiently to overlie channel 12*h* and thus form therewith an undercut slot structure. Any suitable means for securing guide plates 13 to platforms 12*f* and 12*g* may be used, screws 13*a* being illustratively shown for this purpose. At opposite ends of channel 12*h*, walls 12*k* and 12*m* extend between platforms 12*f* and 12*g*, said walls having openings 12*n* and 12*o* respectively forming journal means for rotatively carrying rod 16.

Clamping jaws 14 and 15 are generally similar and comprise rigid block members having a body portion 14*a* and 15*a* respectively and a face portion 14*b* and 15*b* respectively. In the preferred embodiment now being described, one of the jaw members, namely jaw 14, is provided with means for preventing rotational movement thereof about an axis perpendicular to the plane of plates 13. This means comprises a depending rib 14*c* extending from the bottom of jaw 14 and received between guide plates 13. Only a small clearance is had between rib 14*c* and the guide plates which, while allowing ready movement of the jaw longitudinally of channel 12*h*, prevents substantially any rotation of the jaw.

The means for securing jaws 14 and 15 to guide plates 13 is identical in each of the jaw assemblies and comprises a generally tubular bushing 17 exteriorly threaded over substantially its entire length to have threaded engagement in a complementary threaded bore 14*d* in jaw 14 and threaded bore 15*d* in jaw 15. The external diameter of bushing 17 is preferably comparable to the spacing between plates 13 and the lower end 17*a* of the bushing is received in channel 12*h* and enlarged radially outwardly so as to underlie the inner edges of plates 13. Thus it may be seen that longitudinal adjustment of bushings 17 may be had thereby positioning lower end 17 closer to or farther away from the bottom of the jaw, whereby a variable thickness in guide plates 13 may be accommodated.

Extending slidably completely through tubular bushing 17 is a plunger 18 having a radially enlarged shoe 18*a*

at its inner end received in lower portion 12*j* of channel 12*h*, and an exteriorly threaded portion 18*b* projecting upwardly from the top of the jaw. The width of shoe 18*a* is comparable to the width of channel portion 12*j* and the horizontal cross section thereof is non-circular thereby preventing rotation of the shoe and, thus, plunger 18. The bottom surface 18*a'* of shoe 18*a* is semi-cylindrical and is threaded complementarily to rod 16, shoe 18*a* thereby essentially constituting a half-nut.

A nut 18*c* threaded onto pin portion 18*b* secures the plunger in bushing 17. Means are provided to bias yieldingly plunger 18 to urge shoe 18*a* against rod 16. To this end, the inner end of the bore 17*b* through bushing 17 is radially enlarged to form a shoulder 17*c*, and a helical spring 19 is mounted around plunger 18 to extend between shoe 18*a* and bushing shoulder 17*b* under suitable compression. Further means are provided to overcome the spring bias and remove shoe 18*a* from contact with rod 16, which means comprises a lever 20 having a first end 20*a* provided with an opening 20*b* through which plunger outer portion 18*b* is passed. A second end 20*c* is connected to the first end by an indented or V-shaped midportion 20*d*, and extends downwardly behind the face portion of the jaw. To accommodate recessing of lever second end 20*c* the body portions of the jaws may be cut away at their upper lateral edges to form a suitable space 14*d*. The tops of body portions 14*a* and 15*a* are provided with suitable grooves 14*e* and 15*e* respectively for retaining the V-shaped midportion 20*d* of the lever and preventing inadverent swinging of the lever away from the juxtaposed relationship with the back of the jaw face portion. Nut 18*c* may be adjustably positioned to bear against lever end 20*a* and hold lever midportion 20*d* in grooves 14*e* and 15*e* under some tension. The adjustable positioning of nut 18*c* further permits adjustment of the force with which shoe 18*a* acts against rod 16.

Rod 16 is received in lower portion 12*j* of channel 12*h* and extends completely longitudinally therethrough to project outwardly through openings 12*n* and 12*o* from walls 12*k* and 12*m* respectively. At the end of the rod adjacent wall 12*k* a knurled knob 16*a* is provided which may be formed integrally with the rod or secured thereto as desired. A collar 16*b* may be provided on rod 16 between knob 16*a* and wall 12*k* to space the knob outwardly therefrom and allow ready manual grasping of the knob. At the end of the rod projecting from wall 12*m* means are provided to prevent longitudinal movement of the rod, which, as shown, may comprise a cotter pin 16*c* extending through the rod and a washer 16*d* on the rod between the cotter pin 16*c* and the wall 12*m*.

Rod 16 is exteriorly threaded, over a greater portion of its length, complementarily to threaded shoes 18*a*. Illustratively, rod 16 may be a ⅜" rod having a "standard" thread. However, to effect an approach and withdrawing of the jaws relative to each other by action of rod 16 on the shoes 18*a*, a first portion 16*e* of the rod is provided with a right-hand thread and a second portion 16*f* of the rod is provided with a left-hand thread. Shoe 18*a* carried by the jaw 15 coacts only with threaded portion 16*e* and the shoe carried by the jaw 14 coacts only with threaded portion 16*f*. Means for preventing the non-associated shoe from contacting the other threaded portion are provided comprising a non-threading midportion 16*g* of rod 16 and a stop pin 13*b* fixedly secured to the underside of guide plates 13 in channel 12*h* and between threaded portions 16*e* and 16*f*.

In using work holder 10, base 12 is secured as desired by means of clamp bolts 12*e* to the tool table 11. As slots 12*c* and 12*d* are elongated the clamp bolts may cooperate with means in either radial or parallel slots on the table.

The work is then placed on guide plates 13 in the desired position relative to the tool, jaws 14 and 15 being spaced apart sufficiently to allow this placement therebetween. The jaws are then moved toward each other so as to engage generally opposite sides of the work. To this end the lever 20 on each of the jaws is pivoted to withdrawn shoe 18*a* from engagement with threaded rod 16 thereby allowing unobstructed sliding movement of the jaws on plates 13. With the jaws in abutment with the sides of the work, levers 20 are released and plungers 18 are moved longitudinally through their respective bushings 17 by the action of springs 19 so that the shoe on jaw 14 engages threaded portion 16*f* and the shoe on jaw 15 engages threaded portion 16*e*. Suitable rotation of rod 16 by manipulation of knurled knob 16*a* now drives the jaws together by virtue of the opposite hand threads of the two portions. It should be noted at this point that a release of the jaws is effected merely by a rotation of the rod in the reverse direction.

As indicated above, at least one of the jaws may be allowed to pivot about its plunger. In the embodiment being described jaw 15 is so arranged and, as seen in Figure 1 in dotted lines, may be arranged substantially angularly relative to the other jaw 14. This allows face portion 15*b* of the jaw to accommodate itself properly to the surface of the work notwithstanding an irregularity therein. It is obvious that if the work has parallel opposite sides, face portions 14*b* and 15*b* of the jaws will be parallel, as shown in full lines in Figure 1.

As the clamping force developed between jaws 14 and 15 is transmitted only through the portion of rod 16 extending between shoes 18*a* on each of the jaws, there is no thrust force acting between the rod and the walls 12*k* and 12*m* of the base. Thus no thrust washers or similar means for accommodating such thrust forces need be provided. Further, because only the relatively small spring pressure of springs 19 acts downwardly on rod 16 only a negligible frictional retarding force is produced in the journals formed by openings 12*n* and 12*o*, and resultingly rod 16 is readily manually rotatable.

It should be further noted that, because of the unique operation of my work holder wherein both jaws are simultaneously moved away from each other, an automatic centering feature is obtained. Thus, if a plurality of work pieces is to be handled having a variation in the lateral dimensions of the individual pieces, it is only necessary to properly center the first workpiece and effect the release thereof upon completion of the desired tool operation by reverse rotation of the rod. This moves each of the jaws an equal distance from the center of the first workpiece. Thus when another workpiece is substituted between the jaws, whether it be larger or smaller in lateral dimension, the jaws when caused to abut the sides thereof by forward rotation of rod 16 must, of necessity, remain equidistant from the original center. Such functioning may be highly desirable where mass production techniques are employed.

While I have shown and described certain embodiments of my invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. A work holder of the character described, comprising: a base having an undercut guideway formed therein; a pair of jaws carried on said base, at least one of said jaws being translatable thereon; means on said translatable jaw extending into said guideway and provided with an enlarged portion in said guideway to retain the jaw on said base, said means being adjustable to vary the spacing between the enlarged portion and said jaw; and means urging the enlarged end against the base

for sliding engagement therewith and urging the jaw away from the base.

2. A work holder of the character described, comprising: a base; a pair of spaced, elongated plates mounted on the base to form an undercut guideway; a pair of jaws slidably carried on said plates, each jaw having a face portion adapted to engage work and a tubular member longitudinally adjustably secured thereto to extend into said guideway and with an enlargement on the portion of the tubular member in said guideway to retain the jaw on said plates; a force transmitting means carried by said base and adapted to produce oppositely directed forces; and a plunger longitudinally positionable through each tubular member with means at an end of said plunger for engaging said force transmitting means, means for biasing said engaging means into connected relationship with said force transmitting means, and means at the other end of said plunger adjacent said face portion of the jaw for overcoming said biasing means and disconnecting said plunger first named means from said force transmitting means.

3. A work holder of the character described, comprising: a base; a pair of jaws slidably carried on said base to move toward and from each other and having a face portion adapted to engage work; a rod rotatively carried by said base and having a right threaded portion and a left threaded portion; a plunger longitudinally slidable on one of said jaws and having threaded end engagable with the rod right threaded portion; a plunger longitudinally slidable on the other of said jaws and having a threaded end engagable with the rod left threaded portion; means on each of said jaws for biasing the plunger thereon whereby the plunger threaded end is in engagement with the rod threaded portion; and lever means pivotally carried by each of said jaws adjacent said face portion for overcoming the bias means and disconnecting the plunger threaded end from the rod portion when desired.

4. A work holder of the character described, comprising: a base; a pair of jaws translatably carried on said base; means mounting one of said jaws for pivotal movement relative to said base; readily disconnectable means for forcibly moving at least one of said jaws toward and from the other jaw; and unitary means for biasing the disconnectable means into the jaw moving disposition and biasing one of said jaws away from said base.

5. A work holder of the character described, comprising: a base; a pair of laterally spaced, elongated plates mounted on the base to form an undercut guideway; a pair of jaws slidably carried on said plates, each jaw having a face portion adapted to engage work and a tubular member longitudinally adjustably secured thereto to extend into said guideway and with an enlargement on the portion of the tubular member in said guideway to retain the jaw freely slidable on said plates and at least one of said jaws having means for preventing rotation thereof about an axis perpendicular to the plane of the plates; a rod rotatively carried by said base and having a right threaded portion and a left threaded portion; a plunger longitudinally positionable through the tubular member of one jaw with means at an end of said plunger for engaging said rod right threaded portion; a plunger longitudinally positionable through the tubular member of the other jaw with means at one end of the plunger for engaging said rod left threaded portion; means for biasing said plungers into connected relationship with said threaded portions; and means at the other end of each of said plungers adjacent said face portion of each jaw for overcoming said biasing means and disconnecting the plunger engaging means from said rod threaded portions.

6. A work holder of the character described, comprising: means defining an undercut guideway; a jaw provided with a work engaging portion and a tubular element longitudinally adjustably secured thereto to extend into said guideway; means on the portion of the tubular element in the guideway to retain the jaw on the guideway means; force transmitting means associated with the guideway means and arranged to produce alternatively oppositely directed forces; and a plunger longitudinally positionable in the tubular element with means at one end for engaging the force transmitting means, and means at the other end adjacent the work engaging portion of the jaw for manipulating the plunger to disassociate it from the force transmitting means when desired.

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