

[54] MOUNTING ASSEMBLY FOR MACHINIST VISE

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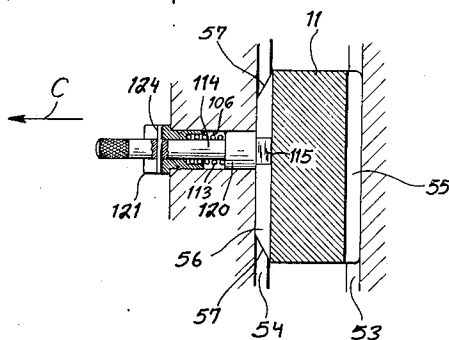
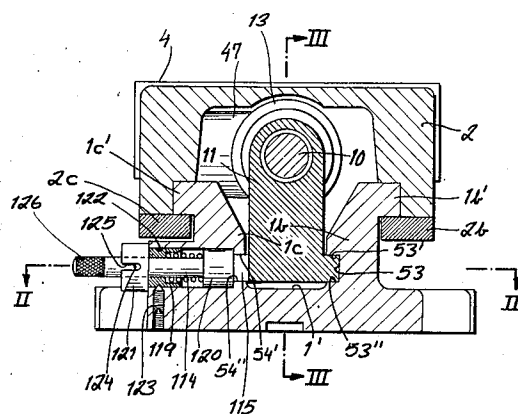
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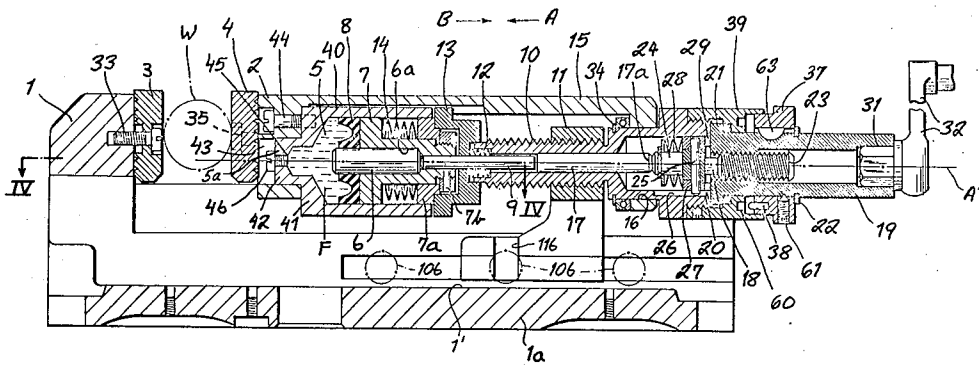
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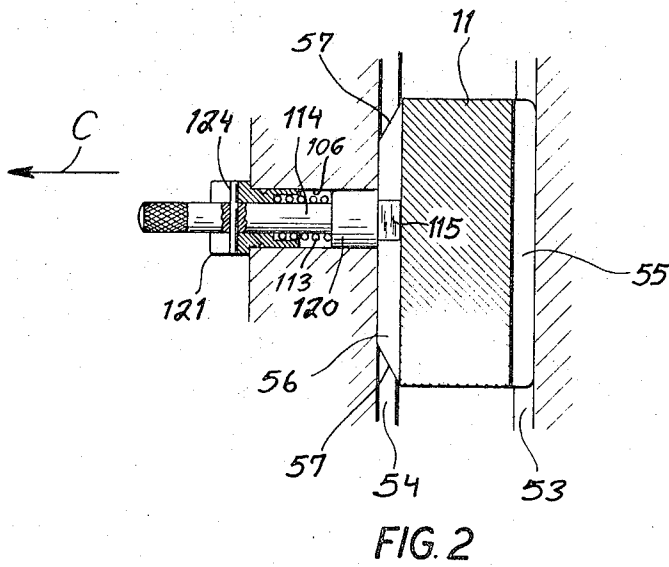
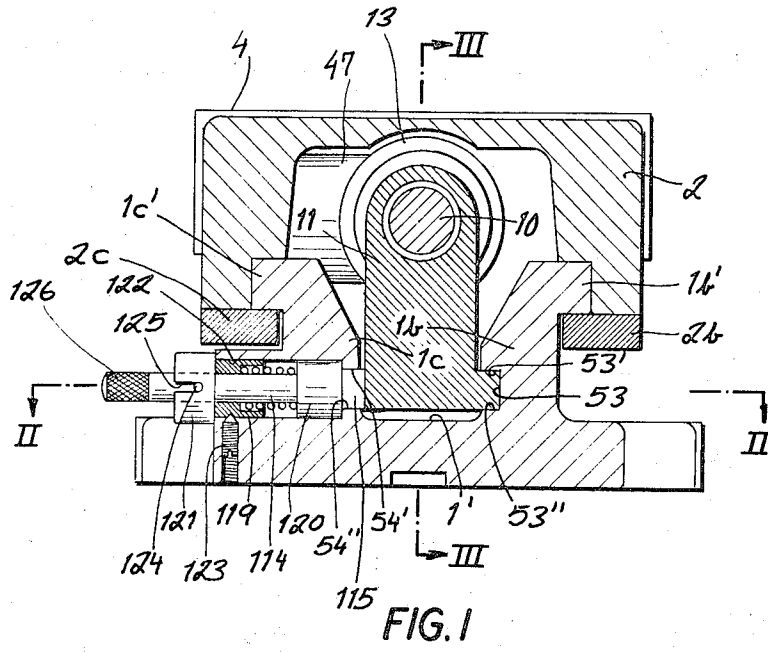
[57] ABSTRACT

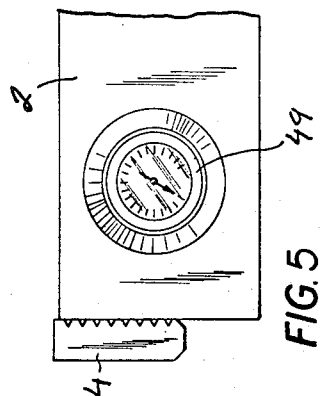
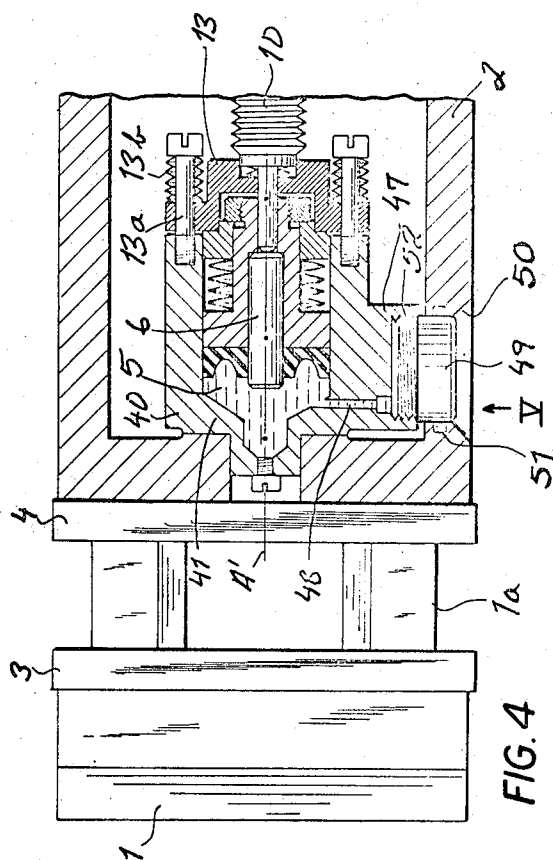
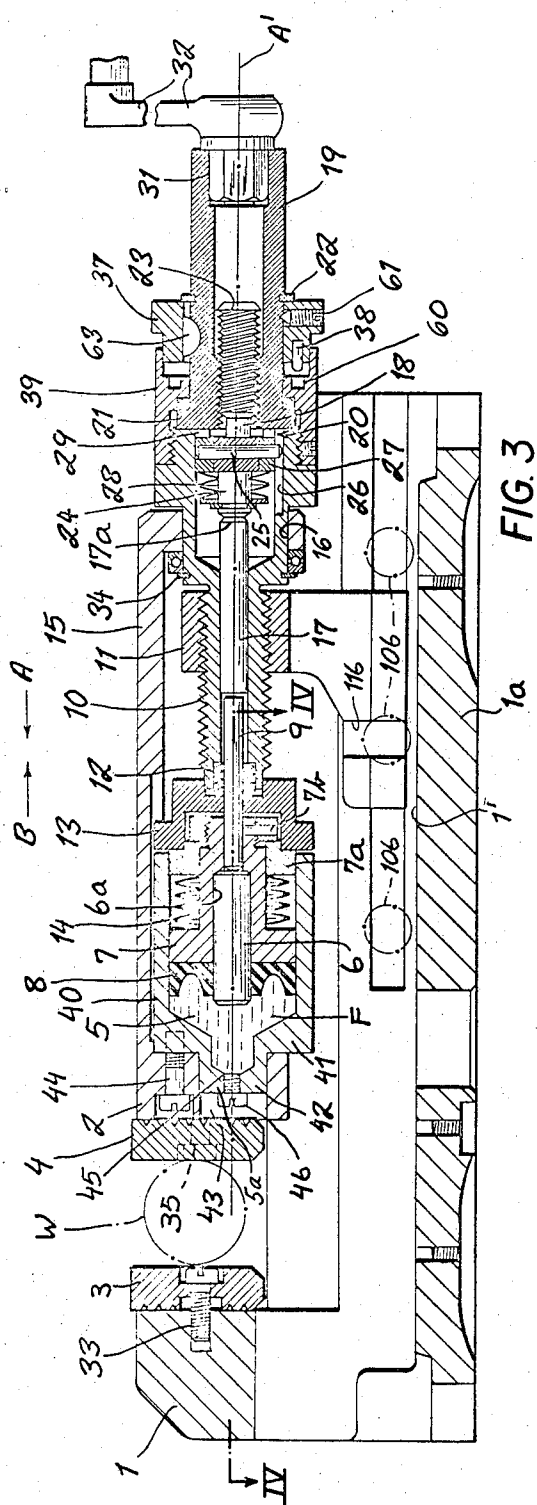
A machinist vise has a support carrying a stationary jaw engageable by a jaw movable by a spindle threaded into a longitudinally displaceable slide. The support is formed as a channel with a pair of inwardly opening longitudinally extending grooves which receive ribs on the side of the slide. A spring-loaded bolt is received in a transverse bore opening into one of the grooves and has a square rectangular head engageable in a complementary notch formed on the corresponding rib of the slide. A plurality of such bolts are provided along the channel to arrest the slide in a selected one of several longitudinally spaced locations. Each bolt is surrounded in its bore by a longitudinally nondisplaceable sleeve, between one end of which and a large-diameter portion of the bolt there is provided a compression spring, and on whose outwardly projection portion there are formed two diametrically opposed grooves. A transverse pin passing through the bolt is receivable in these grooves or can lie on the end of the sleeve to hold the square end of the bolt out of the path of the respective slide rib.

7 Claims, 5 Drawing Figures









MOUNTING ASSEMBLY FOR MACHINIST VISE

FIELD OF THE INVENTION

The present invention relates to a mounting assembly for a clamping device. More particularly this invention concerns a mounting assembly for a machinist vise wherein a spindle is threadedly received in a slide displaceable along a guide.

BACKGROUND OF THE INVENTION

A clamping device such as a machinist vise often comprises a base on which is mounted a stationary jaw and which is formed with a guide. A slide is received in the guide and in turn carries a displaceable jaw on the end of a spindle which is threaded into the slide so that the latter forms or is provided with a nut for the spindle. A hydraulic cylinder having a pair of pistons can be received between the spindle and the displaceable jaw to allow the jaw to be advanced at two different rates with different mechanical advantages.

The guide can be formed as a channel with the slide riding in the channel and another slide carrying the displaceable jaw and connected to the first slide by the spindle riding astride the channel. The spindle slide is often provided below the spindle with a throughgoing transverse bore alignable with transverse bores extending through both cheeks of the channel. A pin is passed through these bores to longitudinally arrest the spindle slide in the channel prior to clamping of a workpiece between the vise jaws. Since the displaceable jaw is only movable through about ten centimeters relative to the spindle slide, this adjustment allows the jaws to be spaced apart by a larger distance for a particular workpiece to be clamped. In such an arrangement the vise may easily be disassembled, and just as easily some of its component parts may be mislaid. In addition any metal chips or shavings that fall into the channel must be removed carefully each time to allow a snug fit of the spindle slide in the channel prior to insertion of the locking pin.

Another arrangement is known wherein the guide channel is formed on each cheek with an inwardly directed ridge that fits into a groove on the corresponding side of the spindle slide. It has been found necessary to provide two locking pins on such a vise, with the front of the slide being braced by one pin and the rear by the other pin.

OBJECTS OF THE INVENTION

It is therefore an object of the present invention to provide an improved mounting assembly for a clamping device.

Another object is the provision of a mounting for a machinist vise wherein the spindle slide can be quickly and easily locked in a plurality of positions relative to its support.

Yet another object is to provide such a vise wherein the chances of misplacing any of the component parts of the vise are reduced to a minimum, moderate fouling of the channel with chips and the like resulting from metalworking operations is not detrimental, and locking of the spindle nut at various positions relative to the stationary jaw is facilitated.

SUMMARY OF THE INVENTION

The above objects are attained according to the present invention by a mounting assembly wherein each

cheek of the channel-shaped (U-section) guide is formed with an inwardly open groove having parallel upper and lower surfaces, with these grooves extending longitudinally and parallel to each other. The edges of the inverted T-section spindle nut or spindle-carrying slide are received in the grooves and one slide edge is formed with a notch engageable by a spring-loaded bolt received in a bore formed in one of the cheeks of the guide and capable of projecting into the respective groove. The guide is provided with a plurality of such spring-loaded bolts spaced apart longitudinally on the guide by a distance equal to slightly less than the displacement distance of the movable jaw relative to the slide.

According to another feature of this invention the bolts each have a square head and the notch is correspondingly formed to insure a tight hold between the two.

In accordance with yet another feature of the present invention means is provided to hold the bolt against the force of the spring with its end out of the path of the slide. Thus all of the bolts save one can be held in this out position and the slide is pushed along the channel until the bolt corresponding to the desired setting automatically drops into the notch.

Another feature of the invention lies in the provision of a space between the bottom of the inverted T-section slide and the base or root of the channel at the right of the U so that any chips or the like falling into the channel will not interfere with longitudinal displacement of the slide. Thus the slide is basically T-shaped in section with the longitudinal edge of each T-arm engaged in one of the grooves which are spaced slightly above the base of the channel.

DESCRIPTION OF THE DRAWING

The above and other objects, features, and advantages will become apparent from the following, reference being made to the accompanying drawing in which:

FIG. 1 is a transverse section through the vise according to the present invention;

FIGS. 2 and 3 are sections taken along lines II—II and III—III of FIG. 1, respectively;

FIG. 4 is a section taken along line IV—IV of FIG. 3; and

FIG. 5 is a view taken in the direction of arrow V of FIG. 4.

SPECIFIC DESCRIPTION

The machinist vise according to this invention has a channel or housing 1 formed on a mounting plate 1a. A slide 2 is displaceable parallel to the plate 1a in the direction indicated by inline arrows A and B to clamp a workpiece W between a fixed jaw 3 held by bolts 33 on the housing 1 and a movable jaw 4 held by bolts 35 on the end of the slide 2.

The guide channel 1 as best shown in FIG. 1 is provided with a pair of cheeks 1b and 1c formed at their upper longitudinal edges with outwardly projecting ribs 1b' and 1c' which are overreached by respective lips 2b and 2c formed on the slide 2. The cheeks 1b and 1c are formed additionally with respective grooves 53 and 54 having parallel upper surfaces 53' and 54' and lower surfaces 53'' and 54''.

The position of the slide 2 is determined by a piston-and-cylinder arrangement having a cylinder chamber 5

formed in a cylinder member 40 fastened to the slide 2 by bolts 44. A piston 7 is slidable axially in the member 40 and surrounds a piston 6 while having an effective surface area equal to about twelve times that of the piston 6 to pressurize hydraulic fluid F (here oil) in the chamber 5. A gland 8 is provided to prevent leakage around and between the coaxial pistons 6 and 7. The piston 6 is received in the wide-diameter portion of a stepped bore 6a in the piston 7 so that movement of piston 7 in direction A inherently moves piston 6 in this direction.

The cylinder 40 has an end wall 41 formed with an extension 42 coaxial with the axis A' of the vise. This projection 42 is received snugly in a correspondingly shaped bore 43 being open behind the jaw 4. In addition the projection 42 is formed with an axial threaded bore 45 that is normally plugged by a removable screw 46. The bore 45 is open into the chamber 5, or the extension 5a thereof which can receive the piston 6 when it is displaced as far as possible in the direction A.

A sleeve 10 is threaded through an arm or slide 11 longitudinally displaceable in the upwardly open U-section channel 1. This slide 11 is basically T-shaped, having a pair of laterally projecting elongated ribs 55 and 56 which fit with slight clearance in the grooves 53 and 54. Each rib is approximately twice as long as the channel 1 is wide to prevent canting of the slide 11 in this channel 1. It should also be noted, as best seen in FIG. 1, that the base 1' of the channel 1 is spaced from the base of the slide 11, the grooves 53 and 54 lying slightly above this base 1'.

The sleeve 10 bears via springs 12, axially abutting caps 13 and 7a, and springs 14 on the piston 7. These springs 12 and 14 are stacks of belleville washers. The slide 2 has an axial extension 15 formed with a bore 16 snugly receiving a cylindrical portion of the sleeve 10 between a shoulder and a snap ring 34, leaving a small amount of play. Thus a rotation of the sleeve 10 in one direction relative to the support, channel or housing 1 will move the jaw 4 in direction A towards the jaw 3, and an opposite rotation will separate these jaws 3 and 4 by retraction of jaw 4 in direction B. As the sleeve 10 is advanced toward the jaw 3 it bears via the springs 12, caps 13 and 7a, and springs 14 on the piston 7 which in turn bears on the slide 2 to move the jaw 4. The piston 6 is moved in direction A with the piston 7. The fluid F in chamber 5 is kept under pressure by springs 13b surrounding screws 13a received in member 40. The springs 14 are maintained in a prestressed condition by a nut 7b on the piston 7.

A rod 9 passes axially through the cap 13 and extends into the interior of the hollow sleeve 10, with its front end bearing on the piston 6 and its back end bearing on an end of a rod 17 axially slidable in the sleeve 10. Another pin 18 engages the upper end 17a of the pin 17 and is axially couplable with another sleeve or nut 19 carried on the upper end of the sleeve 10. The sleeve 10 and nut 19 are rotationally couplable through a torque coupling shown at 20. At the same time the nut 19 is axially fixed relative to the sleeve 10 by a snap ring 22 on one side and a flange 21 on the other side.

The nut 19 threadedly engages a threaded region 23 of the pin 18 which is prevented from rotating relative to the sleeve 10 by means of a transverse pin 25 passing through an axially elongated bore in the lower end 24 of the pin 18 and engaging in axial grooves 26 formed in the interior of the sleeve 10. These grooves 26 have

an axial length at least equal to the axial travel of the piston 6.

The torque coupling 20 is formed by axially inter-engaging V-shaped teeth 29 formed on one end of the sleeve 19 and on the confronting surface of a ring or bushing 27 urged into contact with this sleeve 19 by a spring 28. The bushing 27 is formed with a transverse bore snugly receiving the pin 25 and coupling the pin 18 rotationally to the sleeve 10. Thus, unless there is undue resistance to rotation, the teeth 29 will couple the sleeves 19 and 10 together through the intermediary of the pin 25 passing through the ring 27. To rotate the sleeve 19 a crank handle 32 is fitted into a hexagonal socket 31 in the upper end of this sleeve 19.

Axially displaceable relative to the upper part 39 of the sleeve 10 is a ring 37 provided with a pin 38 engageable in axial bores 60 formed in this upper section 39. A key 63 engageable in an axial slot in the ring 37 rotationally couples this ring 37 and the sleeve 19 while a spring-loaded pin 61 is engageable in a pair of axially spaced recesses to retain the ring in an up or down position as described below.

With reference to FIGS. 1 and 2, it can be seen that the edge or rib 56 of the slide arm 11 is formed at its end with inclined camming surfaces 57 and towards its center with a transversely open square notch 116 (See FIG. 3.). The cheek 1c is formed with three longitudinally spaced bores 106 each receiving a locking bolt 114 which is urged by a spring 113 toward the channel 1. Each such bore 106 opens into the groove 54.

The bolt has a cylindrical portion 120 slidably received in the bore 106 and a square end 115 of substantially the same width as the notch 116 and of the same height as the groove 54. Each bore 106 is round but does not extend through the groove 54 so that the end 115 is guided by the surface 54' and 54''. A sleeve 119 is received in the outer portion of the bore 106. This sleeve 119 is formed with a circumferential groove 122 into which a screw 123 threaded into the base plate 1a engages to prevent the spring 113 from driving the sleeve 119 out of the bore 106. The bolt 114 is provided with a milled head or knob 126 and a transverse pin 124 which is received in a pair of axially extending notches 125 formed in the external portion of the sleeve 119 which bears with a shoulder 121 on the guide channel 1. Thus retraction of the bolt 114 in direction C and rotation through enough of an angle to misalign the pin 124 and notches 125 will lock the bolt 114 in the "out" or retracted position, with its end 115 not extending into the path of the rib 56 in groove 54.

As shown in FIGS. 4 and 5 the cylinder member 40 is formed with a lateral projection 47 which is in line with a round port 50 formed in the wall of the slide 2. A radial passage or conduit 48 leads from the base of a threaded cylindrical socket 52 formed in the projection 47 to the chamber 5. A pressure gauge 49 is screwed into this socket 52 through the port 50. A seal 51 is provided between the inner edge of the port 50 and the gauge 49 to prevent workpiece shavings and the like from entering the works of the slide 2.

The vise described above is assembled in the usual manner, except that the entire assembly of piston 7 and 6, cylinder 40, cap 7a, prestressing nut 7b, and springs 14 are fitted into the slide 2 as a single unit and secured by bolts 44. Thereafter the cap 13 and various rods 9 and 17 are mounted along with the structure in the vise handle, and finally the snap ring 34 is mounted. The

gauge 49 is screwed into place after the screws 44 are tightened. Only the jaw 4 is left off to permit access to the filling hole 45. Hydraulic fluid F is injected into the chamber 5 through this hole 45, the screw 46 with its washer-seal is driven home, and jaw 4 is secured with screws 35. The original filling of the chamber 5 is executed with the pistons 6 and 7 fully withdrawn in direction B. It has been found advantageous to fill the chamber 5 completely and close the bore 45 before screwing the screws 13a completely home. This method insures that the fluid F in chamber 5 is always somewhat pressurized to prevent leakage.

The vise described above is operated as follows:

A workpiece W is set between the open jaws 3 and 4. If this workpiece W is too wide to fit between these jaws, that pin 114 which is engaged in the notch 116 is pulled out and the slide arm 11 is pushed back until the next pin 114 engages in the notch 116. On pushing back, the beveled end 57 will cam the next pin against the force of its spring, this pin subsequently snapping into the notch 116. Of course, the slide arm 11 can be displaced in either direction in this manner, should for example the jaws 3 and 4 be set so far apart that they cannot be advanced sufficiently to grip the workpiece, and more than one bolt 114 can be passed by the notch 115 if the vise must be displaced by a greater distance. Any chips that might have fallen into the channel 1 will cause no difficulty since they will merely lie in the base 1' of this channel 1 and will not be in the way of the slide arm 11.

The crank 32 is then rotated in the clockwise direction and this rotation is transmitted by the teeth 29 to the ring 27 and therethrough to the pin 25 which rotates the sleeve 10 relative to its support arm 11, thereby advancing this sleeve 10 in the direction A. Since the sleeve 10 bears through springs 12 and 14 and members 13 and 7a on the piston 7, this piston will build up pressure in the cylinder chamber 5 to displace the jaw 4 in direction A also.

As soon as the jaws 3 and 4 close on the workpiece W the sleeve 10 will offer resistance to rotation over and above the normal frictional resistance of advance. At this time the springs 28 will compress to allow the teeth 29 to slip relative to each other, causing the nut 19 to rotate relative to the sleeve 10. This rotation will screw the pin 18 in the nut 19, forcing it forwardly. This motion is transmitted by rods 17 and 9 to the piston 6 to advance this smaller-diameter piston into the chamber 5. Since the effective surface area of piston 6 is only a fraction of that of the piston 7 and since the pitch of the threads on section 23 is much smaller than that of the threads between the sleeve 10 and the arm 11, the crank 32 is thereby effective with a greatly increased mechanical advantage to clamp the workpiece W between the jaws 3 and 4. Of course the teeth 29 only slip for a very brief time since after only one or two turns of the crank 32 the pin 18 pulls the ring 27 completely out of engagement with the teeth 29 on the sleeve 19.

The workpiece is released by counterclockwise rotation of the crank 32 which first pulls back the pin 18 in direction B and, when the teeth 29 reengage, rotates the sleeve 10. Thus, the piston 6 will always be fully withdrawn when the fast-advance operation is commenced. The springs 12 and 14 insure that any minor leaks of fluid F are taken up without releasing the workpiece.

Should for some reason the workpiece get wedged between the jaws so tightly that on retraction of the jaw 4 the teeth 29 disengage, the ring 37 can be pushed down so that its pin 38 engages in one of the bores 40 to couple the sleeves 19 and 10 rotationally, thereby making forcible withdrawal of the jaw 4 possible. This auxiliary rotational coupling is also useful on excessively resilient objects which must be tightly clamped.

The clamping pressure can be read directly off the liquid-pressure gauge 49 to permit the operator of the vise to know just how tightly he is clamping the workpiece W. This gauge 49 permits him to apply the greatest possible amount of force to a workpiece without crushing it, since he need merely experiment with one workpiece to find its limits, note the pressure at which it deforms, and then stay below that pressure level with subsequent similar workpieces. Setup and use is extremely easy with such a vise.

I claim:

1. A mounting assembly for a clamping device, said assembly comprising:

a guide formed with a channel having a pair of elongated parallel cheeks each provided with an inwardly open longitudinal groove, said grooves being mutually parallel and each having parallel upper and lower surfaces, one of said cheeks being formed with at least one transverse throughgoing bore opening into the respective one of said grooves;

a slide having a pair of oppositely extending longitudinal ribs respectively received in said grooves, the rib received in said one groove being formed with a laterally open notch having a pair of flanks perpendicular to said surfaces and spaced apart therealong;

a bolt received in said bore and having an end of rectangular parallelepipedal configuration snugly receivable between said surfaces and said flanks and transversely displaceable into and out of said one groove and into and out of said notch upon alignment of said notch with said bore, whereby engagement of said end in said notch longitudinally arrests said slide;

a stationary jaw mounted on said guide, said slide having a movable jaw mounted thereon for displacement toward and away from said stationary jaw, and means on said slide for advancing said movable jaw to clamp an object between said jaws while exerting a reverse force upon said slide, said bolt constituting the sole means for resisting the component of said force along said grooves; and spring means engaging said bolt for urging said end toward said notch.

2. The assembly defined in claim 1 wherein said end of said bolt is substantially square in section.

3. The assembly defined in claim 1 wherein the rib corresponding to said one groove has beveled ends.

4. The assembly defined in claim 1, further comprising a sleeve in said bore surrounding said bolt, said spring means including a compression spring braced between said sleeve and said blot.

5. The assembly defined in claim 4 wherein said sleeve is formed with a shoulder bearing on said one cheek and a circumferential groove, said device further comprising a locking screw threaded into said guide and engaging in said groove to fix said sleeve in said bore.

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6. The assembly defined in claim 4 wherein said sleeve projects from said guide and is formed with at least one notch, said bolt having a pin engageable in said notch on projection of its end into said one groove.

7. The assembly defined in claim 6 wherein said bolt projects from said guide and has on its projecting end a knob.

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