United States Patent

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[54] **FLUID-OPERATED VISE**
5 Claims, 3 Drawing Figs.

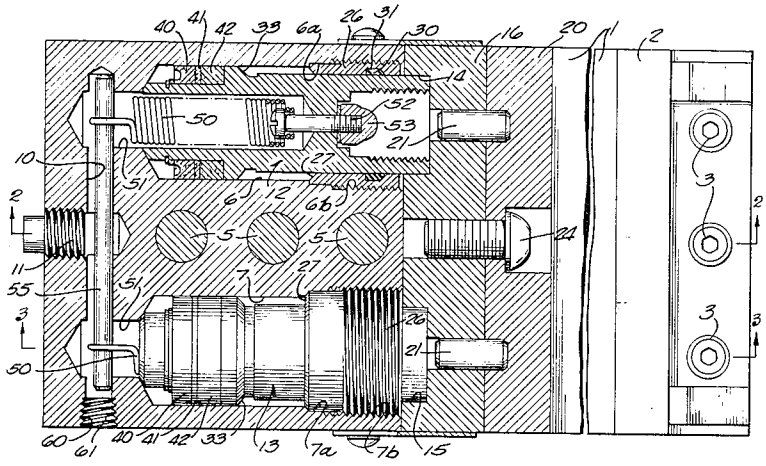
[52] **U.S. Cl.** **269/25,** 92/132, 100/257, 100/259, 269/157
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[50] **Field of Search** 269/25, 157, 23; 90/DIG. 26; 100/257, 259, 266; 92/13, 132

[56] **References Cited**
UNITED STATES PATENTS

3,338,573	8/1967	Lukas	269/25 X
3,396,637	8/1968	Sessody	92/132 X

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ABSTRACT: A fluid-operated vise having a pair of extendible pistons to which is attached a front plate and which forms a subassembly that can be easily and positively retracted by simple spring means, thus resulting in an axially compact vise. The two pistons need not be attached together at their rear ends and as a result, it is unnecessary to hold any critical tolerances between the parts or parallelism between the pistons.



FLUID-OPERATED VISE

BACKGROUND OF THE INVENTION

The invention pertains to fluid-operated vises of the type which find particular utility for mounting on the bed of a machine, such as a milling machine and for holding a workpiece for a cutting operation.

Vises of this character must be compact in size, and yet provide sufficient clamping force. Not only must the vise which holds the workpiece be secure and hold the workpiece firmly and accurately, but in addition, there must be no displacement of the jaw during machining operation. The present invention is an improvement over the device shown in the U.S. Pat. No. 3,338,573, which issued Aug. 29, 1967, and entitled "Fluid Operated Vise." The device shown in that patent was not only costly to manufacture and assemble because of its numerous parts, but it required exceptional critical tolerances between the two pistons and the actuator bar and particularly required exceptional close tolerances as to parallelism between the pistons, in order to be able to assemble the unit and insure its proper operation. Furthermore, that device utilized a rather complex arrangement for returning the pistons which contributed to a vise of longer dimensions.

SUMMARY OF THE PRESENT INVENTION

The present invention provides a particularly compact fluid-operated vise having a minimum number of parts when considering the functions which it is capable of performing and which requires no extremely close tolerances in its manufacturing, but at the same time, is rugged in construction and accurate in its holding functions. The vise includes a simple and yet positive means for withdrawing the pistons and their connecting front plate, and which means is readily assembled.

These and other objects and advantages of the present invention will appear hereinafter as this disclosure progresses, reference being had to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view partially in cross section and showing the vise made in accordance with the present invention;

FIG. 2 is a vertical sectional view taken generally along line 2—2 in FIG. 1, and

FIG. 3 is a cross-sectional view taken along the line 3—3 in FIG. 1.

DESCRIPTION OF A PREFERRED EMBODIMENT

The vise provided by the present invention includes a base member 1 having a jaw 2 fixed thereto by means of cap screws 3. The body 4 is rigidly secured by cap screws 5 to the base 1 and a pair of bores 6 and 7 are formed in the body so as to form parallel cylinders therein. These parallel cylinders have enlarged portions or counterbores 6*a* and 7*a*, respectively, and in addition, have threaded ends 6*b* and 7*b*, respectively for purposes that will appear.

The rear ends of the cylinders 6 and 7 are connected together by the cross passage 10 and the fluid inlet 11 is provided into the cross passage 10 so that fluid under pressure may be admitted to the cylinders to actuate the plungers to be described.

Plungers 12 and 13 are provided for sliding engagement, respectively in clyinders 6 and 7 and the forward end of these plungers are inserted in bores 14 and 15, respectively, of a front plate 16. It will be noted from FIG. 3 that a set screw 17 threadably extends through the front plate and engages each of the plungers 12 and 13 so as to hold the plungers in assembled relationship with the front plate. A jaw 20 is located relative to the front plate 16 by means of dowls 21 and is rigidly secured to the front plate by means of the button head socket screw 24.

In order to provide proper bearing and sealing for the front portion of the plungers, a bearing stop ring 26 is threadably engaged in each of the cylinders 6 and 7 and it will be noted

the rearward portion of this ring has a tapered end 27. The reduced diametrical portion of the plungers 12 and 13 are adapted to form a sliding and snug fit with the internal surface of the bearing stop rings and a wiper ring 30 is contained in a groove 31 in the stop ring so as to prevent leakage of fluid therebetween.

It will be noted that the plungers have a tapered surface 33 adjacent their rearward ends and which surface is adapted to abut against the corresponding surface 27 of the stop rings. Thus, when the cylinders are pressurized by fluid, the forward movement of the plungers is limited by the abutting of surface 33 of the plunger against surface 27 of the stop rings. This forms a simple and yet positive stop for each of the plungers.

Suitable means are provided on the rear ends of the plungers for sealing them in respect to the cylinders and this means comprises a U-cup 40, backup washer 41, and rod bearing 42.

In this manner, the plungers are accurately seated in the cylinders both at their rear ends and also at their front ends by means of the stop rings.

Means are provided for positively and easily withdrawing the plungers and front plate assembly and this means comprises a spring 50 located in the bore 51 of the plungers. One end of the spring is connected to the plungers by the screw 52 which extends through the central portion of the plunger and is held therein by being threadably engaged in the acorn nut 53. The rear, hook portion of the springs embrace a cross rod 55 which is located in the cross passage 10. In this manner, the springs bias both the plungers and also the front plate and jaw 20 to the retracted position.

In order to assemble the vise, it is only necessary to simply insert the plungers in their bores with the sealing members 40, 41, and 42 already assembled on the plunger, and also with the springs 50 located within the bores 51 and held in place by the screws 52. Then the bearing stop rings can be threadably adjusted into position and the front plate then inserted over the front ends of the plungers and held in place by the set screws 17. To connect the rear ends of the springs, the rod 55 is simply inserted through the opening 60, after which the pipe plug 61 is screwed into the opening 60.

In operation, pressure fluid is admitted via opening 11 and the fluid is evenly distributed to the rear end of the cylinders, thereby causing the plungers to extend, thus acting to close the vise. When the pressure fluid is released, the springs quickly and evenly return the plungers to the retracted position along with the jaw 20.

The present invention provides a particularly compact vise, having relatively few parts, and which is easy to assemble, disassemble, and repair. At the same time, the plungers are accurately and positively guided in their cylinders and act in unison to apply an even clamping force.

I claim:

1. A fluid-actuated vise comprising a base member having a fixed jaw, a body secured to said base member and having a pair of parallel cylinders formed therein, a plunger slideably mounted in each of said cylinders and having a front plate rigidly secured to and between one of their ends, fluid passage means extending into said cylinders whereby pressure fluid acts to extend said plungers and front plate toward said fixed jaw, a bearing stop ring threadably engaged in each of said cylinders and forming a bearing for said plungers, said plungers each having an integral stop formed around the outer periphery thereof for abutment with their respective stop rings when said plungers have been extended a predetermined amount, a tension spring connected to said plungers and having a hook at the other end extending into said passage means in said body, and a rod in said passage means extending through said hooks, whereby said spring on release of fluid pressure in said cylinders retracts said plungers and front plate.

2. A fluid-actuated vise comprising a base member having a fixed jaw, a body secured to said base member and having a pair of parallel cylinders formed therein, a plunger slideably mounted in each of said cylinders, a front plate rigidly secured

to one end of said plungers, a fluid passage in said body adjacent the cylinders and being connected to said cylinders whereby fluid under pressure in said passage acts to extend said plungers and front plate toward said fixed jaw, a bearing stop ring in each of said cylinders and forming a bearing for said plungers, said plungers having a reduced diametrical portion for sliding engagement with said stop rings and also an enlarged diametrical portion adjacent the rear end thereof for sliding engagement with the interior of said cylinders, a tension spring located in and connected to each of said plungers and having a hook at the other end extending into said passage, and a rod in said passage connected to the hook on each of said springs adjacent the rearward portion thereof, whereby said spring on release of pressure within said passage retracts said plungers and front plate.

3. A fluid-actuated vise comprising a base member having a fixed jaw, a body secured to said base member and having a pair of parallel cylinders formed therein, a plunger slideably mounted in each of said cylinders and having one end extending from one end of said cylinders and a bore in the other end of said plunger, bearing means mounted in the end of each cylinder for retaining said plunger in said cylinder, a front plate rigidly secured to and between the said one end of said plungers, the other ends of said plungers being unconnected with one another, a fluid passage in said body and in communication with said cylinders whereby pressure fluid acts to pressurize said cylinders and extend said plungers and front plate toward said fixed jaw, and spring means located in said the bore of each of said plungers and having a connection with each of said plungers adjacent the forward portion thereof, and a rod in said passage connected to the spring means in each of said plungers whereby said spring means is elongated on admission of fluid under pressure to said passage and retracts said plungers and front plate on release of pressure in said passage.

4. The vise described in claim 3 wherein said bearing means comprises a bearing stop ring threadably engaged in each of said cylinders and forming a bearing for said plungers, said plungers each having a stop formed around the periphery thereof for abutment with their respective stop rings when said plungers have been extended a predetermined amount.

5. The vise as claimed in claim 4 further characterized in that said plungers have a reduced diametrical portion for engagement with said stop rings and also an enlarged diametrical portion adjacent the rear end thereof for engagement with the interior of said cylinders.

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