Feb. 14, 1956 J. L. SMITH 2,734,408

FLUID-PRESSURE-ACTUATED VISE

Filed Feb. 28, 1955 2 Sheets-Sheet 1

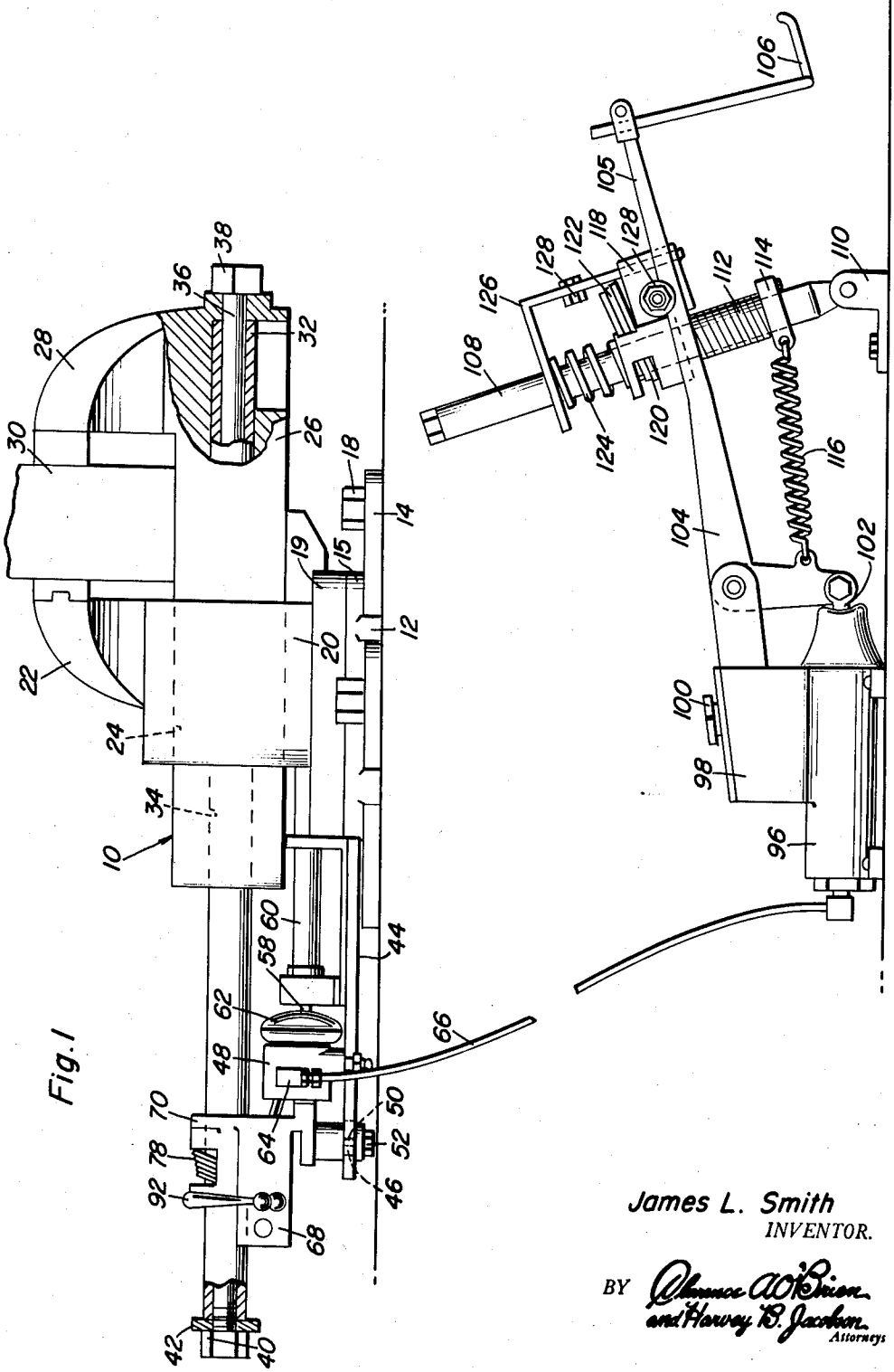


Fig. 1

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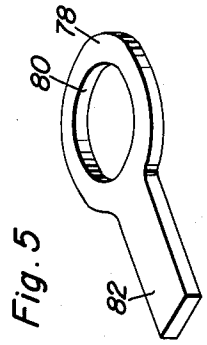


Fig. 5

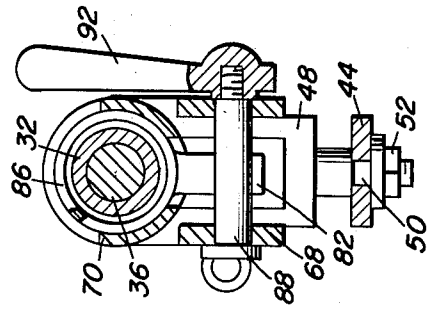


Fig. 4

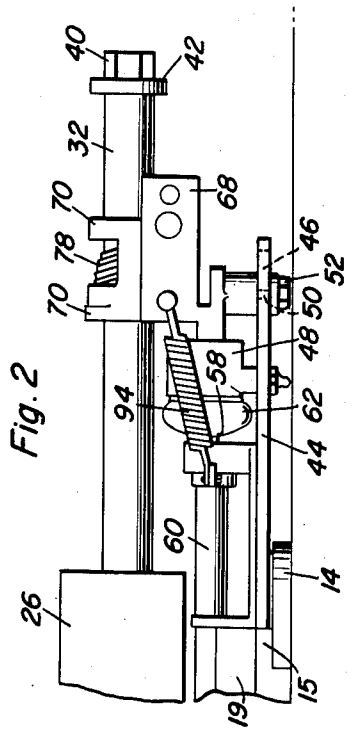


Fig. 2

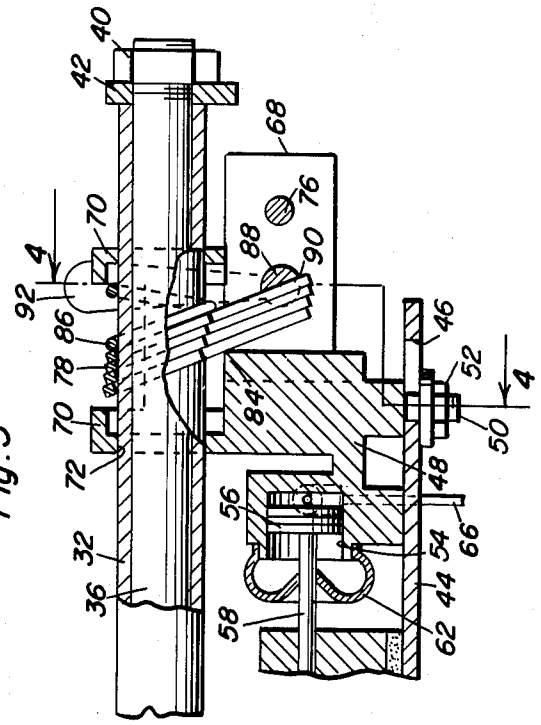


Fig. 3

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FLUID-PRESSURE-ACTUATED VISE

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Application February 28, 1955, Serial No. 491,047

5 Claims. (Cl. 81—17.2)

This invention generally relates to improved and novel construction in vises and more specifically relates to that type of vise that is actuated by fluid pressure for moving the movable jaw toward a stationary jaw for clamping an article therebetween.

In a large majority of cases, vise jaws are operated by means of a hand screw but for certain work this is not feasible such as in modern production work where time is extremely important. For such usage hydraulically or pneumatically operated vises of various types have been devised so that the operator may close the vise hydraulically. Obviously, such hydraulic actuation saves time and relatively powerful gripping forces are available by supplying fluid under the necessary pressure. However, such hydraulic vises generally have certain disadvantages such as a relatively large size and cost. Accordingly, it is the primary object of the present invention to provide a fluid-pressure-actuated vise that is simple in construction, substantially the same size as the screw-type vise, foot manipulated for easy operation and automatically locked and released for repeatedly clamping work between the jaw such as would occur in mass production.

Another object of the present invention is to provide a fluid-pressure-actuated vise in which the movable jaw may be pushed initially to a rough adjustment and then a foot treadle actuated for firmly gripping objects between the jaws of the vise.

A further object of the present invention is to provide a fluid-pressure-actuated vise which may be clamped and retained in clamped position automatically until foot-operated means is actuated for releasing the clamping grip.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

Figure 1 is a front elevation, portions being in section, of the fluid-pressure-actuated vise of the present invention;

Figure 2 is a rear elevation of a portion of the construction of the vise and shows the parts in workpiece-released position;

Figure 3 is an enlarged scale sectional view of the construction of Figure 2 showing the details of construction thereof;

Figure 4 is a transverse, vertical sectional view taken substantially upon parallel planes indicated by section line 4—4 of Figure 3 and shows the relationship of certain elements of the invention; and

Figure 5 is a perspective view showing one of the locking rings with the finger positioned thereon.

Referring now specifically to the drawings, it will be seen that the numeral 10 generally designates the fluid-pressure-actuated vise of the present invention which includes a stationary base 12 having mounting lugs 14 projecting therefrom for receiving fastening bolts 18 for securing the base 12 to a supporting surface. Pivotally mounted on a circular boss 15 on the base is a corresponding circular base plate 19 which carries an upstanding member 20 having a stationary jaw 22 mounted thereon. The upstanding member 20 is provided with a bore 24 for slidably receiving the polygonal mounting arm 26 of a movable jaw 28 which is moved toward the stationary jaw 22 for clamping a workpiece 30 between the jaws 22 and 28. A tubular actuating arm 32 is positioned in a bore 34 in the mounting arm 26 and extends coaxially and rearwardly therefrom. An elongated rod 36 is positioned in the tubular arm 32 and is provided with a headed portion 38 exteriorly of the movable jaw 28 and with a fastening nut 40 together with a washer 42 on the other end for releasably retaining the movable jaw 28 and the actuating arm 32 in assembled relation.

Projecting rearwardly from the base plate 19 and in parallel relation to the arm 32 is an elongated bracket 44 having a closed slot 46 adjacent the outer end thereof. Mounted on the bracket 44 is a supporting member 48 having a depending fastener member 50 thereon slidably received in the slot 46 and including a fastening nut 52 for guiding and limiting the sliding movement of the supporting member 48 on the upper surface of the bracket 44.

The supporting member 48 is provided with a horizontally disposed and forwardly facing cylinder 54 axially movable over a stationary piston 56. The piston 56 is provided with a rigid piston rod 58 that is rigidly attached to a mounting member 60 fixed on the bracket 44, whereby the piston 56 and the piston rod 58 always remain stationary with respect to the bracket 44. A flexible seal member 62 is provided for keeping dirt from entering the cylinder 54 when the piston 56 is in its innermost position. The cylinder is provided with a fitting 64 connected to a fluid line 66 for admitting fluid under pressure between the piston 56 and the head of the cylinder 54 for urging the cylinder 54 rearwardly and thereby sliding the supporting member 48 rearwardly on the bracket 44.

The supporting member 48 is provided with a pair of rearwardly projecting lugs 68 which are generally parallel to the arm 32 and underlie the same. Integrally formed with the supporting member 48 and the lugs 68 is a pair of collar members 70 having apertures 72 therein for slidably receiving the arm 32. A fastening member 76 extends between the lugs 68 for rigidifying the lugs.

A plurality of clutch plates 78 each having an elliptical opening 80 are positioned in surrounding relation to the arm 32 between the collars 70 and each of the clutch plates 78 is provided with a downwardly projecting finger 82, the clutch plates normally being tilted, and the forwardmost finger 82 engaging an upper rear corner 84 of the supporting member 48. A V-shaped double coil spring 86 is disposed between the rearmost clutch plate 78 and the rearmost collar 70 for retaining the clutch plates 78 in tilted position for causing longitudinal movement of the arm 32 to the left, as illustrated in Figure 1, whenever fluid under pressure is introduced into cylinder 54, and for preventing movement of the movable jaw 28 away from its workpiece-gripping position. It will be understood that the movable jaw 28 may be manually moved at any time toward the stationary jaw from a retracted position, since movement in such a direction will rock the clutch plates 78 toward their vertical or non-clutching positions. The V-shaped spring 86, after completion of such jaw-closing movement, will then rock the clutch plates back to their tilted positions so as to lock the arm 32 to the supporting member 48 so that when fluid is forced into the cylinder 54, the supporting member 48, the rod 32, and the movable jaw 28 will move as a unit to exert final clamping pressure on a workpiece.

In order to release the clutch plates 78 to permit either

manual retraction of the movable jaw 28 or spring retraction of the supporting member 48, a pivotal transverse cam member 88 is provided with a flat surface 90 for engagement with the rear surface of the rearmost finger 82 on the rearmost clutch plate 78. A laterally extending handle 92 is provided for manipulation of the cam member 88 wherein the clutch plates 78 may be rocked to their non-clutching positions and thus released from the arm 32 to permit such aforesaid retraction of the jaw 28.

A tension coil spring 94 interconnects the supporting member 48 and the member 60 and moves the supporting member 48 and the head of the cylinder 54 toward the piston 56 upon release of fluid pressure in the cylinder 54 so that the supporting member 48 will again assume its forwardmost position (see Figures 2 and 3), in readiness to transmit workpiece-clamping movement and pressure to the jaw 28 through the arm 32.

For supplying fluid pressure through the flexible conduit 66, a piston-type pump 96 is provided with a reservoir 98 having a removable filler cap 100. A piston rod 102 is connected to a bell crank 104 having a foot-operated treadle 106 at its outer end for pivotal movement thereof for pumping pressure into the line 66. The bell crank 104 has a forked extension 105 that straddles a pivotal upstanding rod 108 mounted on a suitable bracket 110. A coil spring 112 is mounted under compression on the rod 108 between a fixed abutment 114 and an undersurface of the forked extension 105 of the bell crank 104 for normally urging the bell crank 104 to a position that produces no fluid pressure in the cylinder 54. A tension spring 116 is provided for retaining the upstanding rod 108 within the forked extension 105. A slidable bracket 118 is mounted on the rod 108 and includes a plurality of locking plates 120 having projecting fingers 122 thereon. A coil spring 124 is provided for normally urging the bracket 118 upwardly thereby assuring that the locking plates 120 will bind upon the rod 108 and hold the forked extension 105 of the bell crank 104 in depressed position. When it is desired to release the locking plates 120 to permit the spring 112 to raise the extension 105 of bell crank 104, foot pressure may be exerted on an upper end of an angle plate 126 having one leg apertured and slidably mounted on the rod 108 and having another leg slidable through the bracket 118, whereby an abutment 128 on the angle plate 126 will engage the fingers 122 and rock the locking plates 120 to a perpendicular relation to the rod 108 thereby permitting the bracket 118 together with the bell crank 104 to move upwardly. An anti-friction roller 128 provided on the bracket 118 engages an upper surface of the extension 105 of the bell crank 104 whereby said extension may be easily returned by the spring 112 to its uppermost position.

In operation, the jaw 28 is manually moved against a workpiece after which the treadle 106 is depressed to exert pressure on the head of the cylinder 54 thereby moving as a unit the supporting member 48, the arm 32 and the jaw 28 for tightly clamping the workpiece 30 between the jaws 22 and 28. When it is desired to release the workpiece-clamping pressure the angle plate 126 is depressed to release the locking plates 120 to permit the spring 112 to rock the bell crank 104 in a direction to retract the piston rod 102 to release the pressure in the cylinder 54 thereby permitting the spring 94 to retract the supporting member 48 to the forward end of the slot 46 (see Figures 2 and 3), after which the cam 88 can be manipulated so as to permit the jaw 28 to be retracted by hand to any desired distance from the fixed jaw 22.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the appended claims.

What is claimed as new is as follows:

1. A fluid-pressure-actuated vise comprising a base having a jaw fixed thereon, a movable jaw mounted on said fixed jaw for movement in relation to said fixed jaw for selectively clamping and releasing a workpiece between said jaws, and means for moving said movable jaw, said means comprising an elongated cylindrical arm attached to said movable jaw, a pair of spaced collars surrounding said arm, a supporting member for said collars, means on said base for guiding said supporting member said supporting member having a cylinder formed therein, a piston in said cylinder, means on said base for supporting said piston against relative movement with respect to said fixed jaw, means to force fluid under pressure into said cylinder for moving said supporting member, spaced collars, arm and movable jaw as a unit in workpiece-clamping direction, and means for selectively locking said arm to said collars and unlocking said arm from said collars whereby the arm and movable jaw may be manually moved toward the stationary jaw and into contact with a workpiece, and then moved by fluid pressure for tightly clamping a workpiece between the jaws.

2. A fluid-pressure-actuated vise comprising a base having a jaw fixed thereon, a movable jaw mounted on said fixed jaw for movement in relation to said fixed jaw for selectively clamping and releasing a workpiece between said jaws, and means for moving said movable jaw, said means comprising an elongated cylindrical arm attached to said movable jaw, a pair of spaced collars surrounding said arm, a supporting member for said collars, said supporting member having a cylinder formed therein, a piston in said cylinder, means on said base for supporting said piston against relative movement with respect to said fixed jaw, means to force fluid under pressure into said cylinder for moving said supporting member, spaced collars, arm and movable jaw as a unit in workpiece-clamping direction, and means for selectively locking said arm to said collars and unlocking said arm from said collars whereby the arm and movable jaw may be manually moved toward the stationary jaw and into contact with a workpiece, and then moved by fluid pressure for tightly clamping a workpiece between the jaws, said piston-supporting means including a rod rigidly secured to said base; and guide means for the supporting member including an elongated bracket secured to said base and underlying the supporting member, and a depending fastening member on said supporting member, said bracket having a slot slidably receiving said fastening member for guiding and limiting the movement of said supporting member.

3. A fluid-pressure-actuated vise comprising a base having a jaw fixed thereon, a movable jaw mounted on said fixed jaw for movement in relation to said fixed jaw for selectively clamping and releasing a workpiece between said jaws, and means for moving said movable jaw, said means comprising an elongated cylindrical arm attached to said movable jaw, a pair of spaced collars surrounding said arm, a supporting member for said collars, said supporting member having a cylinder formed therein, a piston in said cylinder, means on said base for supporting said piston against relative movement with respect to said fixed jaw, means to force fluid under pressure into said cylinder for moving said supporting member, spaced collars, arm and movable jaw as a unit in workpiece-clamping direction, and means for selectively locking said arm to said collars and unlocking said arm from said collars whereby the arm and movable jaw may be manually moved toward the stationary jaw and into contact with a workpiece, and then moved by fluid pressure for tightly clamping a workpiece between the

jaws, said means for selectively locking and unlocking said arm including a plurality of elliptically apertured clutch plates slidably and tiltably mounted on said arm, said clutch plates having downwardly extending fingers thereon, spring means normally urging said clutch plates to tilted position for locking the arm to the collars against relative axial movement of the arm in a workpiece releasing direction, and means engageable with one of said fingers for moving said clutch plates to a vertical position thereby permitting free axial movement of said arm with respect to said base, supporting member and collars.

4. The structure of claim 3 wherein said finger-engaging means includes a pivotal cam member, and a handle for manipulating said cam member.

5. A fluid-pressure-actuated vise comprising a base having a jaw fixed thereon, a movable jaw mounted on said fixed jaw for movement in relation to said fixed jaw for selectively clamping and releasing a workpiece between said jaws, and means for moving said movable jaw, said means comprising an elongated cylindrical arm attached to said movable jaw, a pair of spaced collars surrounding said arm, a supporting member for said collars, said supporting member having a cylinder formed therein, a piston in said cylinder, means on said base for supporting said piston against relative movement with respect to said fixed jaw, means to force fluid under pressure into said cylinder for moving said supporting member, spaced collars, arm and movable jaw as a unit in workpiece-clamping direction, and means for selectively locking said arm to said collars and unlocking said arm from said collars whereby the arm and movable jaw may

be manually moved toward the stationary jaw and into contact with a workpiece, and then moved by fluid pressure for tightly clamping a workpiece between the jaws, said piston-supporting means including a rod rigidly secured to said base; and guide means for the supporting member including an elongated bracket secured to said base and underlying the supporting member, and a depending fastening member on said supporting member, said bracket having a slot slidably receiving said fastening member for guiding and limiting the movement of said supporting member; said means for selectively locking and unlocking said arm including a plurality of elliptically apertured clutch plates slidably and tiltably mounted on said arm, said clutch plates having downwardly extending fingers thereon, spring means normally urging said clutch plates to tilted position for locking the arm to the collars against relative axial movement of the arm in a workpiece-releasing direction, and means engageable with one of said fingers for moving said clutch plates to a vertical position thereby permitting free axial movement of said arm with respect to said base, supporting member and collars.

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