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WISE

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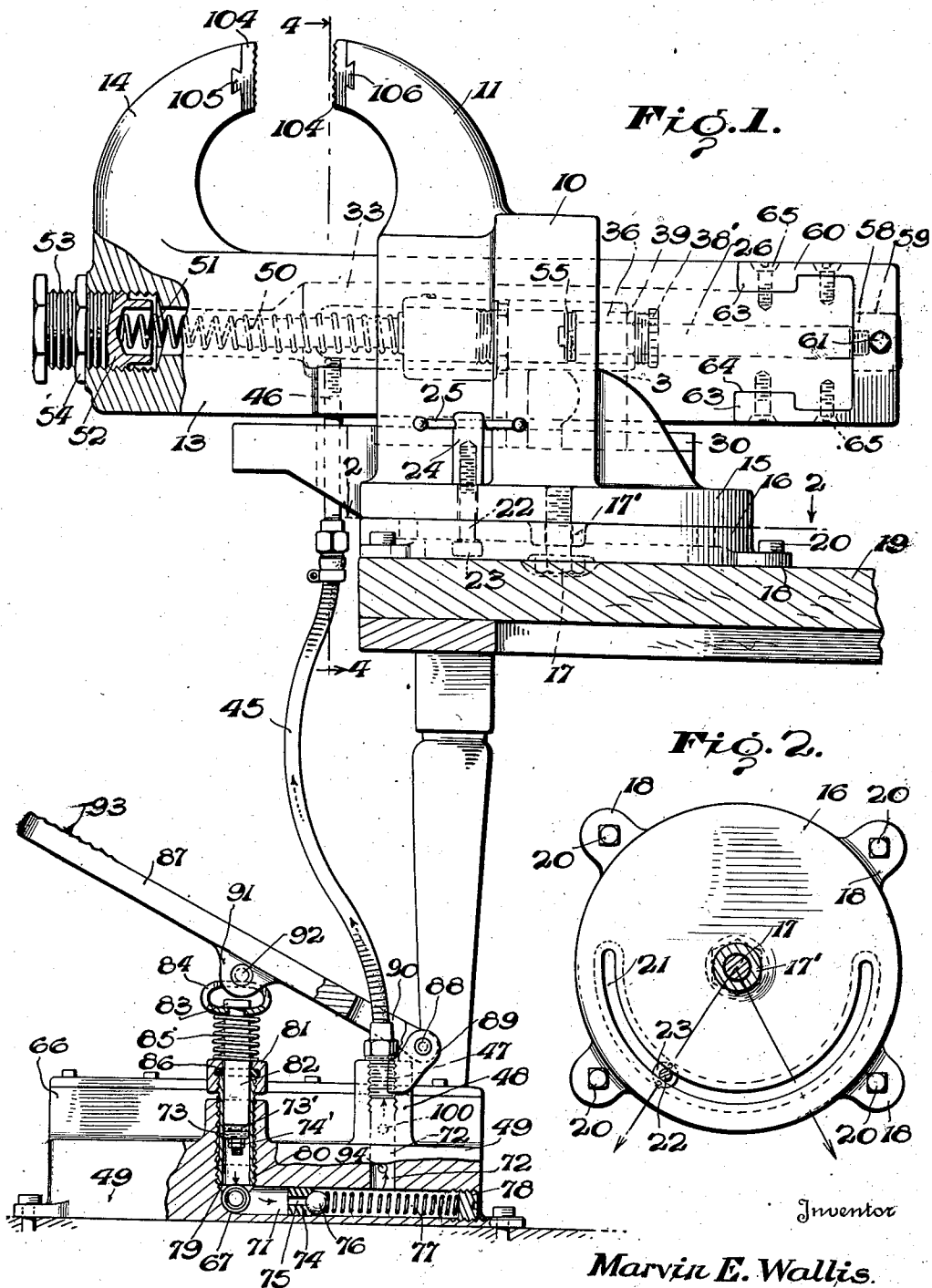


Fig. 2.

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VISE

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6 Claims. (Cl. 81-17)

The present invention relates to improvements in the construction of fluid operated vises.

An important feature of the invention is to provide a simple, efficient and compact fluid pressure operated vise assembly including means for quickly transmitting the clamping force to the movable jaw in a steady and uniform manner in order to insure a positive and tight holding of the work between the jaws.

A further object consists in providing the movable jaw with a horizontal arm or member which extends through the fixed jaw so as to be slidably mounted therein, said arm having a passage or opening in which is housed the operating instrumentalities for causing the movable jaw to approach the fixed jaw. The hollow movable arm substantially encloses or covers the operating instrumentalities in the different positions of the jaws so as to prevent filings, dirt, and other foreign matter from access thereto.

Other objects and advantages of the invention will become apparent from the following description when taken in conjunction with the accompanying claims and drawings.

Referring to the drawings in which is disclosed a preferred embodiment of the invention:

Figure 1 is a side elevation of the improved vise assembly with parts in section;

Figure 2 is a plan view taken substantially along the line 2-2 of Figure 1;

Figure 3 is a detail disassembled longitudinal sectional view of the cylinder mounting;

Figure 4 is a sectional view taken substantially along the line 4-4 of Figure 1;

Figure 5 is a detailed side view of the stationary jaw;

Figure 6 is a detailed perspective view of the pump mechanism;

Figure 7 is a detailed longitudinal sectional view on a small scale of the movable jaw;

Figure 8 is a detailed sectional view of the retaining nut associated with the movable jaw;

Figure 9 is an end view of Figure 8, and

Figure 10 is a right hand end view of Figure 7.

Referring to the drawings in which like numerals indicate like parts in the several figures, 10 designates a vise having a stationary jaw 11 provided with an opening 12 (Figure 4) which slidably receives an elongated horizontally disposed arm or member 13 of the movable coacting jaw 14. The vise 10 has its base 15 preferably rotatably mounted on a fixed plate or turntable 16 by the centrally disposed bolt 17, which extends through a depending threaded boss 17' 55

in the swivel base 15 that acts to center the vise on its support. The plate 16 may be provided with spaced outwardly extending lugs 18 which are clamped to a suitable support such as a bench, table or the like 19 by the bolts 20. An arcuate slot 21 (Figure 2) in the plate 16 has a threaded bolt 22 extending therethrough which has its head 23 bearing against the underside of the plate. The outer or upper end of the bolt 22 is arranged to receive a complementary threaded clamping sleeve or member 24 having a handle 25 for locking the vise in any predetermined or desired horizontal position relative to the table 19.

15 The arm 13 of the movable jaw 14 is slidably mounted in the wall of the opening 12 so as to be guided and supported by the stationary jaw, and has an axially disposed through passage 26 (Figure 7) having a portion thereof formed with a depending slot 27 that extends outwardly to one end of the jaw so as to provide a keyhole slot (Figure 10). The opposite end of the passage 26 is enlarged and threaded as at 28 and communicates with the keyhole slot 27 through a circular reduced conduit or port 29.

The swivel base 15 of the stationary jaw 11 is provided with a medially disposed dove-tailed groove 30 (Figure 5) which extends from one end a limited distance inwardly and is of such a length as to receive the spaced depending arms 31 and 32 of the tubular housing 33. The lower end of each of the arms 31 and 32 is flared outwardly as at 34 (Figure 4) so as to slide with a wedging or binding action into the groove 30 in order to be maintained firmly in a fixed position when the arm 31 abuts the shoulder 35 of the groove 30. Manifestly other suitable means may be provided for connecting the cylinder 36 and its associated parts to the base 15 in order to permit independent longitudinal movement of the jaw 14 and the arm 13 relative to the housing 31 and the cylinder 36. Extending axially through the housing 33 so as to be supported thereby is a fluid pressure cylinder 36 which has its opposite ends externally threaded as at 37 and 38 (Figure 3) so as to receive the clamping collars 39 which when tightened up about the adjacent ends of the housing 33 in order to firmly maintain the cylinder 36 and its associated parts in a fixed position within the housing 33. To the threaded end portion 37 of the cylinder 36 is threaded as at 40 a fitting or member 41 which is provided with a fluid pressure chamber 42. A packing 43 may be positioned between the end 37 of the cylinder and the fitting 41 to insure a tight sealing con-

nection of the parts. Chamber 42 has a threaded opening 44 to which is connected one end of a flexible hose 45 as at 46. (Figure 4). The hose 45 extends through the base 15 and has its lower end connected as at 47 to a fluid outlet boss 48 of the pump assembly 49. The fitting 41 also has a reduced outwardly projecting lug 50 arranged to receive one end of a coil spring 51 which is positioned within the port 29 of the passage 26 and has its outer end extending within a recess 52 in an externally threaded plug 53 which extends into the opening 28 of the jaw 14. The plug 53 is arranged to control the tension of the spring 51 and is maintained in a fixed position by the locking nut 54. A fluid pressure operated piston 55 is reciprocable in the cylinder 36 and has a rod or shaft 56 extending therefrom. The outer end of the rod 56 is threaded as at 57 to a block 58 which extends centrally into an opening 59 in a locking plate 60 and is secured thereto by the transverse bolt 61. The plate 60 is preferably formed as shown in Figure 8 and has rearwardly extending spaced portions 62 each provided with an inwardly extending arm 63 arranged to fit within a complementary recess 64 in the outer end portion of the arm or shank 13 and to be detachably secured thereto by the threaded bolts 65 (Figure 1) in order to provide an operative connection of the jaw 14 with the piston 55. The end 38 of the cylinder 36 is closed by a threaded packing nut 38' through which extends the rod 56. The hollow arm 13 of the movable jaw 14 is of such length that the wall of the passage 26 overlaps or covers the top and sides of the housing 33, cylinder 36, spring 51, piston 55, and rod 56 at all times and irrespective of the position of the jaws, so as to substantially enclose these parts and thus prevent filings, dirt, and other foreign matter from having access thereto.

Fluid pressures such as oil, air, gas or the like may be pumped into the cylinder 36 to actuate the piston 55 in any suitable manner, and as shown, this may be effected by providing the pump assembly 49 with an oil reservoir 66 that communicates with a passage 67 (Figure 6) in which is mounted a check valve 68' normally maintained against the seat 68 by the tension of a spring 69. The outer end of the passage 67 is closed by a plug 70 which abuts the adjacent end of the spring 69 to adjustably control the tension of the latter. The passage 67 communicates with a passage 71 disposed substantially at right angles thereto which, in turn, communicates with a vertical passage 72 in the fluid outlet boss or member 48 that communicates with the lower end of the hose 45 as at 47. The hose 45 is so constructed as to be capable of withstanding the pressure of the fluid and is of such a length as to permit the turning of the vise to its different adjustable positions without interfering with the communication of the pump with the cylinder. In the passage 71 is a valve seat member 74 (Figure 1) having a reduced opening 75 through which the fluid is conducted from the passage 67 to the passage 72. A reservoir check valve 76 is arranged to control the flow of the liquid through the passage 71 and is normally maintained against the valve seat 74 by a coil spring 77, the outer end of which abuts a screw plug 78 so as to control the tension of the spring in accordance with the pressure of the fluid. The passage 67 also communicates with a vertical passage 79 located in front of the check valve 68. The wall of the passage 79 is

threaded to receive a threaded sleeve 80 that has its upper end portion extending from the pump and connected to a clamping collar 81. Slidably mounted in the sleeve 80 is a reciprocating fluid pressure plunger 82 which has a reduced head 83 to which is connected a strap or cam 84. A coil spring 85 confined between the collar 81 and the cam 84 tends to maintain the plunger 82 in its raised position. A packing 86 is preferably located within the collar and against the adjacent end of the sleeve 80 so as to engage the plunger 82 and form a tight seal therewith. The lower end of the plunger 82 has a reduced threaded stem 73 to which is suitably secured the packing washers 73' by the locking nuts 74', for the purpose of providing a tight seal between the plunger and the wall of the sleeve 80.

A pedal 87 is pivoted as at 88 to the arms 89 that extend outwardly from the boss 48 and has an elongated opening 90 through which extends the hose 45. The pedal 87 may also be provided with depending spaced lugs 91 to which is connected a transverse pin 92 arranged to bear against the cam or member 84 on the plunger 82 to actuate the plunger 82 upon the depressing of the foot portion 93 of the pedal. When the foot is released from the pedal, the spring 95 acts to return or raise the plunger and the pedal to their normal inoperative positions.

The fluid outlet passage 72 is provided with a transverse branch passage 94 (Figure 6) which communicates with a release chamber 95, through a restricted port 96 controlled by a ball check valve 97 normally maintained against its seat by a spring 98. A release pin 99 mounted in the chamber 95 is arranged to engage the check valve 97 to move the same away from the opening 96 in order to allow the fluid to escape into the chamber 95 from where it is returned to the reservoir 66 through the passage 100. The pin 99 has a head 101 arranged to be engaged by the foot of the operator so as to depress the same. A packing nut 102 is threaded to the outer end of the chamber 95 and a coil spring 103 is confined between the head 101 and the nut 102 so as to normally move and maintain the pin 99 away from the check valve 97. The clamping jaws are preferably provided with detachable facing members 104 having flared or tapered ribs 105 arranged to be slidably mounted and maintained in complementary grooves 106 in the opposed sides of the jaws. The engaging surfaces of the members 104 may be of different shapes so as to be capable of receiving and clamping the particular work in a fixed position. The fitting 41 is provided with a threaded opening 107 which communicates the chamber 42 with the atmosphere so as to allow the air in the chamber 42 and the passages communicating therewith to escape. The opening 107 is closed by a removable threaded plug 108 positioned to be easily removed by the operator when it is desired to let out the air from the chamber 42.

In operating the device, the pressure supply is cut off so that the check valve 68' is moved against its seat by the spring 69, to close the flow of the oil to the passage 71. The screw 53 has been previously adjusted and is held in a fixed position by the locking nut 54 so that the spring 51 will act to move the jaw 14 to its open position when the fluid pressure is reduced in the cylinder 36 and chamber 42. The plunger 82 and the pedal 87 are maintained in their raised posi-

tion by the spring 85. Assuming it is desired to clamp the work between the jaws, the foot pedal 87 is depressed, thus causing the plunger 82 to be lowered, and upon the release of the foot from the pedal, the tension of the spring 85 returns the plunger 82 to its initial position and, at the same time, creates a suction in the passage 67 in front of the check valve 68' which unseats the latter and draws a charge of oil from the reservoir 66 into the passage 71. When the pedal 87 is again pressed down, the check valve 68' is closed and the pressure developed in the chamber 71 causes the check valve 76 to be opened, thus allowing the oil to flow through the port 75 into the passage 72 where it is conducted by the hose 45 to the cylinder 36 in front of the piston 55 so as to move the rod 56 outwardly from the piston and, at the same time, cause the jaw 14 through its connection at 61 with the block 58, to be moved towards the fixed jaw 11 to maintain the work firmly and securely in position. The slidable connection of the arm 13 with the fixed housing 33 through the slot 27, allows the jaw 14 to be moved relative to the jaw 11 without interfering with the efficient operation of the vise or the compactness of the cylinder assembly.

When it is desired to release the jaws from the work, the operator presses down on the head 101 of the pin 99 which unseats the check valve 97 so as to allow the oil in the passages 71 and 72 to flow into the chamber 95 from where it is returned to the reservoir 66 through the pipe 100. The release of the oil pressure in the passage 71 causes the spring 77 to move the check valve 76 against its seat 74 and, at the same time, the tension of the spring 69 moves the valve 68 against its seat, thus cutting off the flow of the oil from the reservoir to the pump assembly. Due to the pressure being released in the cylinder 36 in front of the piston 55, the tension of the spring 51 causes the jaw 14 to be moved away from the stationary jaw 11 so that the work may be withdrawn from the vise.

It will be seen that the actuation of the pin 99 will control the outward movement of the jaw 14 depending upon how long the pin is depressed to hold the valve 97 away from its seat. In other words, if the foot is quickly released from the head 101, the jaw 14 will be opened only a limited distance while if the pressure is maintained by the foot on the head 101, it will allow the jaw to move to its maximum open position. The adjustable connection of the vise to the plate 16 by the clamping sleeve 24 provides means for turning and maintaining the vise in any desired horizontal position so as to clamp the work thereto. The pin or bolt 61 is so constructed and designed as to constitute a shear pin in order that if excessive pressure should accidentally be applied to the cylinder 36 by the operator, the pin 66 will shear and thus prevent the other parts of the vise from being damaged.

Thus means are provided for moving and maintaining the jaws in firm and tight engagement with the work and which allows the vise to be moved to different adjusted positions without in any way affecting the fluid or hydraulic connection of the pump assembly with the cylinder 36 and its associated parts, and which does not disturb or interfere with the compactness of the parts mounted in the movable jaw. Preferably the vise is actuated by the foot of the operator so that his hands may be free to place the work in the device. However, the vise may, if desired, be operated by hand and requires very little ef-

fort to handle or control. The piston 55 is operatively connected to the arm 13 so that the power is applied to the movable jaw by a pulling force rather than a pushing one, thus insuring a better and more direct gripping of the work by the vise, than would otherwise be obtained.

It will be understood that the form of the invention shown and described is merely illustrative of a preferred embodiment and that such changes may be made as fall within the scope of the claims.

I claim:

1. A vise of the class described including a stationary jaw having an opening, a movable jaw provided with an arm extending through said opening, said arm having a longitudinal passage, a tubular housing in said passage, means connecting the housing to said stationary jaw, a cylinder within said housing, means for securing the cylinder to the housing, a fluid pressure operated piston slidably mounted in said cylinder and having a rod extending outwardly therefrom, means connecting the free end of the rod to the movable jaw, said arm overlapping said rod and said connecting means to prevent access of foreign matter thereto, spring means in said passage and confined between said housing and the movable jaw for normally maintaining the jaws apart, means for adjusting the tension of said spring, and means for controlling the flow of fluid into said cylinder to actuate the piston to cause the movable jaw to approach the stationary jaw.

2. A vise of the class described including a stationary jaw having an opening, a movable jaw having a longitudinal arm extending through said opening, said arm having a longitudinal passage and provided with a slot communicating with said passage, said slot extending inwardly from one end of the arm a limited distance, a tubular housing in said passage and having a depending portion extending through said slot, means connecting the depending portion of the housing to the stationary jaw, operating means movably mounted in said housing and connected to said movable jaw, yielding means in said passage and confined between said housing and the movable jaw for normally maintaining the jaws apart, and means for actuating said operating means to cause the movable jaw to approach the stationary jaw.

3. A vise of the class described including a stationary jaw having an opening, a movable jaw having a longitudinal arm extending through said opening, said arm having a longitudinal through passage and provided with a slot communicating with said passage, said slot extending inwardly from one end of the arm a limited distance, a tubular housing in said passage and having a depending portion extending through said slot, means connecting the depending portion of the housing to the stationary jaw, operating means movably mounted in said housing and connected to said movable jaw, the wall of said passage extending over the operating means to prevent access of foreign matter thereto spring means in said passage and confined between said housing and the movable jaw for normally maintaining the jaws apart, means for adjusting the tension of said spring, and means for actuating said operating means to cause the movable jaw to approach the stationary jaw.

4. A vise of the class described including a stationary jaw having an opening, a movable jaw having a longitudinal arm extending through said opening, said arm having a longitudinal

through passage and provided with a slot communicating with said passage, said slot extending inwardly from one end of the arm a limited distance, a tubular housing in said passage and having a depending portion extending through said slot, means connecting the depending portion of the housing to the stationary jaw, a cylinder within said housing, means for maintaining the cylinder in a fixed position relative to the housing, a fluid pressure operated piston slidably mounted in said cylinder and having a rod extending outwardly therefrom, means connecting the free end of the rod to the movable jaw, spring means in said passage between the inner end of said cylinder and the outer end of the movable jaw for normally maintaining the jaws apart, a pump assembly, flexible means communicating the pump assembly with said cylinder on one side of the piston, and means for controlling the flow of the fluid from the pump to the cylinder to actuate the piston.

5. A vise of the class described including a stationary jaw having an opening, a movable jaw provided with a horizontal arm extending through said opening, said arm having an axially disposed keyhole slot projecting inwardly from one end thereof and a port extending inwardly from the opposite end, a housing mounted in said slot, means connecting the housing to said stationary jaw, a cylinder within said housing, means for maintaining the cylinder in a fixed position relative to the housing, a fluid pressure operated piston slidably mounted in said cylinder

and having a rod extending outwardly therefrom, means connecting the free end of the rod to the movable jaw, spring means mounted in said port between the inner end of said cylinder and the outer end of said movable jaw, means for conducting fluid to one end of the cylinder, and means for controlling the flow of the fluid to said cylinder.

6. A vise of the class described including a stationary jaw having an opening, a movable jaw provided with a horizontal arm extending through said opening, said arm having an axially disposed key-hole slot projecting inwardly from one end thereof and a port extending inwardly from its opposite end, a housing mounted in said slot, means connecting the housing to said stationary jaw, a cylinder within said housing, means for maintaining the cylinder in a fixed position relative to the housing, a fluid pressure operated piston slidably mounted in said cylinder and having a rod extending outwardly therefrom, means connecting the free end of the rod to the movable jaw, said rod and said connecting means being wholly disposed within said arm, spring means mounted in said port between the inner end of said cylinder and the outer end of said movable jaw, adjustable means in said port for controlling the tension of the spring means, means for conducting fluid to one end of the cylinder, and means for controlling the flow of the fluid to said cylinder.

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