May 8, 1951 C. K. ARTER, JR 2,552,304

FLUID POWER ACTUATED HAND CLAMP

Filed Jan. 9, 1946

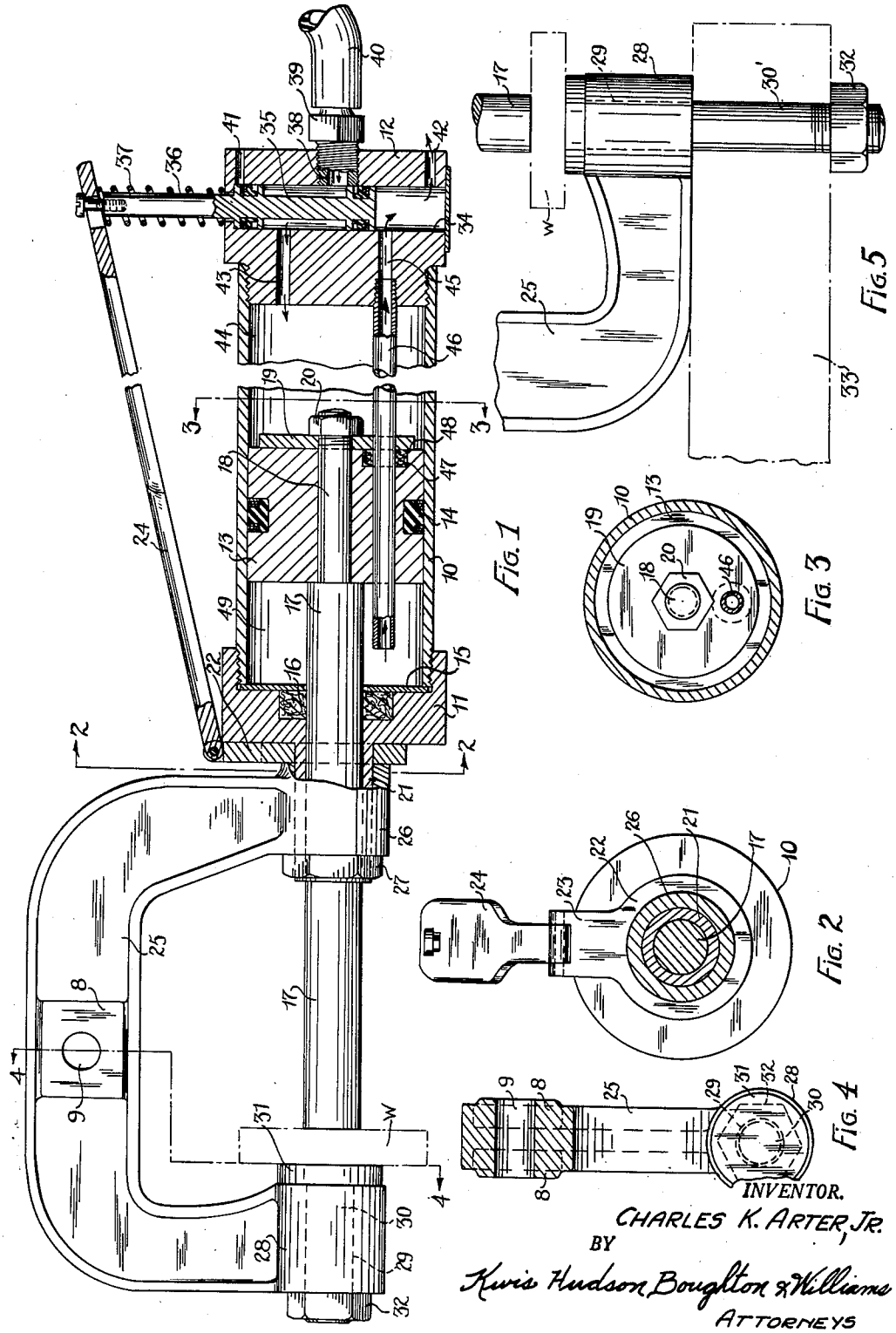


Fig. 1

Fig. 5

Fig. 3

Fig. 2

Fig. 4

INVENTOR.
CHARLES K. ARTER, JR.
BY
Kuris Hudson Boughton & Williams
ATTORNEYS

Patented May 8, 1951

2,552,304

UNITED STATES PATENT OFFICE

2,552,304

FLUID POWER ACTUATED HAND CLAMP

Charles K. Arter, Jr., Shaker Heights, Ohio

Application January 9, 1946, Serial No. 639,966

2 Claims. (Cl. 144—305)

1

This invention relates to improvements in power clamps, particularly C-clamps operated by pressure fluid such as compressed air.

One of the objects of the invention is the provision of a clamp which may be operated much more rapidly than the conventional screw clamp, and yet grip the work firmly.

Another object is the provision of control means which will function automatically to hold the clamp closed except when the control is manually operated. Hence it is unnecessary for the operator to use one hand to keep the clamp in closed condition, and both hands are then free when needed to perform operations upon the work held by the clamp.

Another object is the provision of means disposed entirely within the power cylinder and its end walls for causing live and exhaust fluid to flow into and out of the spaces within the cylinder on opposite sides of the piston therein.

A further object is the provision of a C-clamp, the capacity of which may be varied by substituting C-members of different lengths, and in which the angular relation of the C-member may be changed to suit conditions.

Still another object is the provision in a power cylinder having end walls threadably connected thereto of a manually operable control bar extending the full length of the cylinder connected with a control valve at one end wall and with a rotatably adjustable plate engaging the other end wall, whereby the control bar may be assembled and maintained in proper position parallel to the axis of the cylinder.

Another object is the provision of removable and replaceable anvil elements which may be interchangeably employed, including such an element for mounting the clamp in an upright position upon a bench or the like.

Other objects and features of novelty will appear as I proceed with the description of that embodiment of the invention, which, for the purposes of the present application, I have illustrated in the accompanying drawing, in which

Fig. 1 is an elevational view, partly in central longitudinal section, of a C-clamp embodying the invention,

Figs. 2 and 3 are cross-sectional views taken substantially on the lines 2—2 and 3—3 of Fig. 1,

2

Fig. 4 is a cross-sectional view taken substantially on the ilne 4—4 of Fig. 1, and

Fig. 5 is a fragmental elevational view showing the clamp mounted in an upright position on a bench or the like.

In the drawing a power cylinder shown at 10 is provided with end walls 11 and 12 threadably connected thereto. Piston 13 is mounted to slide within the cylinder and is sealed against the flow of pressure fluid in either direction by means of packing 14.

On the inner side of end wall 11 there is a metal washer 15 held at its periphery by the threaded joint between the cylinder 10 and end wall 11, and serving to retain packing 16 of any suitable character, which seals the sliding joint around a plunger 17 having a reduced diameter portion 18 that extends through the piston and through a large washer 19, a nut 20 being threaded onto the extremity of the reduced portion 18 to form a rigid connection between the piston and the plunger.

Plunger 17 extends through a central opening in end wall 11 and through a tubular extension 21 formed integral with that wall. A flat plate 22 having a circular opening therethrough of a size to receive extension 21 is mounted on that extension. This plate is provided with a projecting portion 23 which extends slightly beyond the periphery of end wall 11, where it has hinged thereto a control bar 24 that extends substantially the fulll ength of the cylinder.

The C-member 25 of the clamp is formed at the extremity of its inner arm with a cylindrical enlargement 26 which is bored to receive cylindrical extension 21. The hub of this enlargement bears against plate 22. A nut 27 is threaded onto the end of extension 21, and when turned down tightly serves to hold plate 22 and C-member 25 firmly in any selected angular position relative to the assembled cylinder 10 and end walls 11 and 12.

The extremity of the outer arm of C-member 25 may be finished in the conventional manner of clamps of this sort, but I prefer to form this extremity as a cylindrical enlargement 28 more or less similar to the enlargement 26. This enlargement 28 has a hole 29 therethrough which takes the shank of a bolt 30 with a hard steel

head or anvil 31 which is held in place by a nut 32 threaded onto the outer end of the bolt. Anvil 31 is of course centered with respect to plunger 17. In case the clamp is to be used upon work of irregular configuration, a bolt with a special head conforming to the contour of the work may be substituted for the one shown.

This removable bolt feature of my invention has another important advantage illustrated in Fig. 5 of the drawing, where a bolt 30' having a longer shank is employed for fastening the clamp in an upright position to a bench top 33 or the like.

Since hard metal is employed in the parts 17 and 31 the C-member 25 may be formed of lighter and less wear resistant material if desired.

At an intermediate point in its length C-member 25 may have an integral boss with opposed flat surfaces 8 through which a hole 9 is bored. When it is desired to mount the clamp in a horizontal position on a bench this boss may be gripped in the jaws of a vise, or it may be fastened to a bench by a bolt passed through the hole 9 and through a hole in the bench.

The capacity of the work which may be handled by the clamp depends upon the distance between the extremity of cylindrical extension 21 and the anvil 31 of bolt 30 in the outer arm of the C-member. This capacity may be increased by substituting for the C-member shown one that is longer. Similarly, work of a smaller nature can be handled by the same tool with a shorter C-member inserted in place of the member illustrated. The C-member 25 and the plate 22 are adjustable angularly independently of each other.

Although the piston 13 may be caused to move in one direction by means of a spring, not shown, the disclosure herein contemplates moving the piston in both directions by means of pressure fluid. To this end a cylindrical valve chamber 34 is formed in end wall 12 to receive a spool valve 35 which has an axially disposed stem 36 that has a loose connection with the rear end of control bar 24, permitting movement of the bar without binding from the position illustrated to a position closely approaching the end wall 12. A coil spring 37 surrounding stem 36 tends to hold stem 36 and valve 35, as well as control member 24, in their outermost positions.

The operation of valve stem 36 by a bar 24 which extends along the cylinder 10 substantially throughout its length facilitates the use of the tool, since the operator may grasp the cylinder as a handle at any point along its length, his fingers extending over the control bar 24. The size of the operator's hand will determine the point at which it will be most comfortable for him to grasp the tool. The two threaded connections between the cylinder 10 and the end walls 11 and 12, when the latter are tightened down in the assembly of the device will cause some variation in the angular relation of these parts in different tools. On this account the bar 24 instead of being hinged to end wall 11 is hinged to the separate plate 22, the angular position of which is adjustable to bring the hinge into proper relation with the stem 36, after which the plate is locked by nut 27 as previously explained.

Valve chamber 34 has a central connection at 38 with a fitting 39 for a flexible tube 40 through which compressed air or other pressure fluid may be delivered to the power cylinder. 41 and 42 are exhaust passages. A passage 43 connects the valve chamber 34 with a cylinder space 44 to the rear of piston 13. A passage 45 in end wall 12 establishes communication between chamber 34 and a tube 46 which is mounted in the end wall and is disposed parallel to the axis of cylinder 10 and extends through washer 19 and piston 13 with sufficient clearance to minimize friction. A cavity 47 in piston 13 receives packing 48 which surrounds tube 46 and is held in place by washer 19. The sliding joint is therefore sealed. The forward end of tube 46 extends well into the cylinder space 49 in front of the piston.

Operation.—With the parts in the position illustrated in Fig. 1, any piece of work W will be tightly gripped since pressure fluid will flow from the supply line through tube 40 into valve chamber 34 and thence through passage 43 into cylinder space 44, causing the piston 13 to move to the left until plunger 17 is stopped by its engagement with the work. This gripping of the work will continue as long as may be required and without any control being exercised by the operator. Now when the operator desires to release the work W he pulls the control bar 24 inwardly toward the cylinder 10 by means of the fingers of the hand which holds the cylinder, thereby shifting the valve piece 35 downward, as viewed in the drawing until the upper end of the spool moves downward beyond passage 43 and the lower end moves downward beyond the passage 45. Passage 43 will then communicate with exhaust connection 41, relieving the pressure in cylinder space 44, and live fluid will flow from the supply through the reduced diameter part of the valve into passage 45 and through tube 46 to the cylinder space 49. This will cause the piston 13 to move rearwardly, pulling the plunger away from the work. As soon as the operator releases his hold upon the control bar 24, spring 37 will again return the parts to the illustrated position or to whatever position the thickness of the work being gripped will permit.

Having thus described my invention, I claim:

1. In combination, a power cylinder having end walls one of which is threaded on the cylinder, one of said end walls having an opening therethrough surrounded by a cylindrical extension, a laterally extending valve element on the other end wall, a piston within said cylinder, a plunger attached to said piston projecting through said opening and cylindrical extension, a clamp C-member rotatably mounted on said cylindrical extension, a plate rotatably mounted on said extension between said C-member and the adjacent end wall of the cylinder, control means articulated with said plate adapted to engage said valve element when said plate is in proper angular position, and means for locking said C-member and plate against angular movement on said extension.

2. In a power operated clamp, a power cylinder having end walls threadably connected therewith, a fluid valve carried by one of said end walls, a laterally extending valve operating element on said end wall, the other end wall having a hollow central projection of circular cross-section, a plate rotatably mounted on said projection, a clamp member also mounted on said circular extension, said power cylinder having a piston and a plunger extending through said hollow extension for cooperation with said clamp member, a control member articulated with said plate and having an operative connection with said laterally extending valve operating element, and means for locking said plate in a selected

angular position relative to the assembled cylinder and end walls.

CHARLES K. ARTER, JR.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
298,224	Morgan	May 6, 1884
624,435	Fielding	May 2, 1899
898,413	Merralls	Sept. 8, 1908
1,136,796	Hammar	Apr. 20, 1915
1,498,638	Periolat	June 24, 1924
1,635,696	Upham	July 12, 1927
1,827,258	Payzant	Oct. 13, 1931
1,849,805	Raymond	Mar. 15, 1932
1,888,834	Puleo	Nov. 22, 1932
2,052,976	Harcourt	Sept. 1, 1936
2,073,510	Bishman	Mar. 9, 1937
2,096,574	Denny	Oct. 19, 1937
2,281,476	Casey	Apr. 28, 1942
2,400,140	Sargeson	May 14, 1946

FOREIGN PATENTS

Number	Country	Date
807,567	France	Jan. 15, 1937