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J. A. FARMWALD ET AL

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PRESSURE FLUID OPERATED TOOL ACTUATOR

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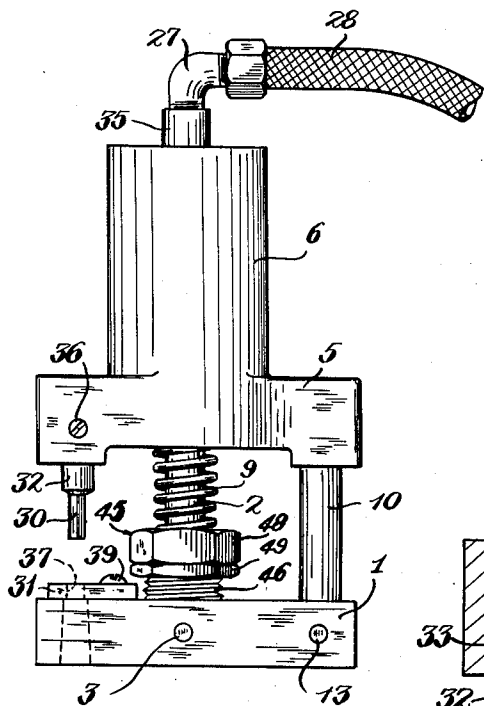


FIG. 1

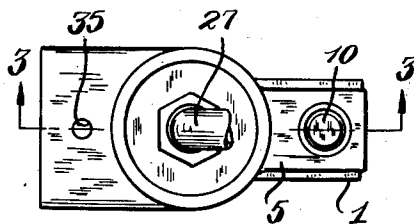


FIG. 2

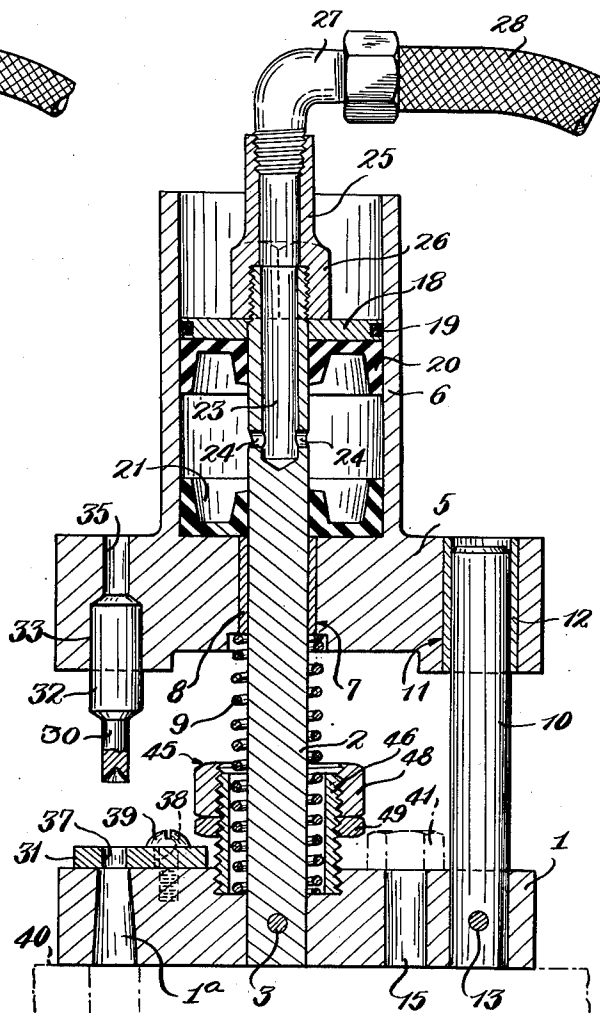


FIG. 3

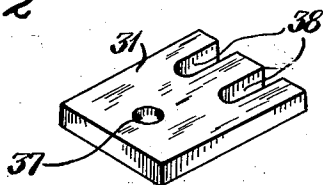


FIG. 4

INVENTOR.S
JOHN A. FARMWALD
BY SMITH M. JOHNSON
Brennan & B. West
ATTORNEY

2,816,608

PRESSURE FLUID OPERATED TOOL ACTUATOR

John A. Farmwald, Middlefield, Ohio, and Smith M. Johnson, Pawling, N. Y., assignors to The Johnson Rubber Company, Middlefield, Ohio, a corporation of Ohio

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8 Claims. (Cl. 164—95)

This invention relates to a tool actuating device of the class operated by pressure fluid, such as compressed air, and more particularly to an improved device of this class that is suitable for use singly or in multiple.

Objects of the invention are to provide a thoroughly reliable and highly efficient pressure fluid tool actuating device that is very simple of construction; that is substantial and durable; that is inexpensive to manufacture and maintain; and that lends itself readily to use in multiple.

When used in multiple, two or more of the devices are attached to a support in the required relationship to simultaneously perform several operations on a piece of work that is presented to the tools incorporated in and operated by the devices. The devices, under this arrangement, are communicatively connected to a source of pressure fluid supply, and the delivery and exhaust of the pressure fluid to and from the several devices is controlled by a single valve. Accordingly, when a piece of work is presented to the "gang" of tools, so to speak, and the valve is actuated, the several devices will operate substantially simultaneously, as a single apparatus. The tools of the several devices may be the same, or they may differ one from another, according to the nature of the work to be performed. The tools may consist of punches, notching dies, shears, or the like.

The present preferred embodiment of our invention is illustrated in the accompanying drawing, and while we shall proceed to describe the same in detail by means of reference characters, it is understood that the invention is not limited to the structural details shown further than is required by the terms of the claims appended hereto.

In the drawing:

Figure 1 is a side elevational view of our improved pressure fluid device, showing it equipped with a punch and die;

Figure 2 is a plan view of the device;

Figure 3 is a central vertical section through the device on a scale considerably larger than that of the preceding views; and

Figure 4 is a perspective view of the die.

Hereinafter, terms are employed from which it might be inferred that the device is confined to an upright position, as shown in the drawing. Obviously, the device may occupy any desired position best suited to the work to be performed, whether used singly or in multiple.

The base of the device is designated 1; and secured at its lower end to the base and rising therefrom is a rod 2. The lower end of the rod fits into a hole in the base and is secured in place by a pin 3. Guided for vertical movement along the rod is a head structure 5, and a cylinder 6 rises from the head structure in concentric relation to the rod 2 and is shown as formed integral with said structure. The head structure has a vertical bore 7 that is fitted with a bushing 8 that slides upon the rod, and a helical spring 9 surrounds the rod and is interposed between the base and head structure and yieldingly retains the latter in ele-

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vated position. To prevent the head structure from turning about the rod 2, and to insure against binding of said structure upon said rod, a guide post 10 rises from one end of the base and operates within a bore 11 of the head structure that is fitted with a bushing 12. The lower end of the guide post fits into a hole in the base 1 and is secured therein by a pin 13. A hole 15 is shown as extending vertically through the base between the lower ends of the rod 2 and post 10 for a purpose which will presently appear.

Mounted on the rod 2 adjacent the upper end thereof is a piston 18, shown as circumferentially grooved and fitted with an O-ring 19 that engages the inner surface of the cylinder; and applied to the rod below the piston are reversely arranged dished packing washers 20 and 21. These washers are desirably molded from a suitable pliable plastic and are very effective in closing the joints between the cylinder, piston, and rod. The rod 2 is provided with an axial bore 23 that opens through the upper end of the rod and extends downwardly a distance below the piston where it communicates with the working portion of the cylinder through ports 24.

The end of the rod 2 above the piston 18 is shown as externally threaded for the application of the internally threaded lower end of a tubular fitting 25. Said lower end is enlarged and shaped to provide a wrench receiving portion 26, and to serve as an abutment for holding the piston 18 against upward movement. The upper end of the fitting 25 has communicative connection, through an elbow 27, with a pressure fluid conduit 28.

The device is equipped with a tool comprising cooperating parts 30 and 31. In the present instance, the part 30 consists of a punch having a shank 32 that is inserted upwardly into a socket 33 of the head structure 5, the shank being secured within said socket by a set screw 36 (Fig. 1). In accordance with common practice, a bore 35 leads from the socket 33 through the top of the head structure for the reception of a suitable implement that may be used for dislodging the shank from the socket, in the event it sticks. The part 31 consist of a die having an aperture 37 for the reception of the punch when the head structure is depressed. As shown in Fig. 4, the rear end of the die is provided with notches 38 for the accommodation of screws 39 by which the die is adapted to be secured to the base in properly adjusted position with respect to the punch. The base is provided with a passage 1^a beneath the aperture 37 of the die.

The device is adapted to be attached to a support 40, shown in broken lines in Fig. 3, by means of a screw or bolt 41, similarly illustrated. The working portion of the cylinder is adapted to be placed in communication with a source of pressure fluid, such as compressed air, through the ports 24, bore 23, elbow 27, and conduit 28. The flow of the pressure fluid to and from the cylinder is controlled by suitable valve means, preferably a three-way valve (not shown), that should be located in convenient reach of the operator. When two or more of the devices are set up for simultaneous use, all are desirably connected to a source of pressure fluid by means of a manifold, as will be readily understood, and a single three-way valve used to control the supply and exhaust of the pressure fluid to and from the several devices simultaneously.

When the beforementioned valve is positioned to admit pressure fluid to the cylinder 6, the head structure 5 will be depressed so as to operate the tool comprised of the parts 30 and 31; and when the valve is actuated to permit escape of the fluid from the cylinder, the spring 9 will return the head structure 5 to its elevated position, thereby to separate the parts of the tool.

To limit the downward movement of the head 5, a stop designated generally by the reference numeral 45 may be

included. Preferably, it is capable of adjustment to vary the distance to which the punch, for example, may be projected through the aperture of the die, or to compensate for wear of the former.

The stop 45 comprises an externally threaded sleeve 46 that is screwed into a counterbore of the base 1 about the rod 2. The sleeve is of an internal diameter sufficient to loosely receive the spring 9, and it is of a height that will accommodate said spring when the latter is compressed. Adjustable along the upper end of the sleeve is a relatively thick nut 48 that constitutes the stop, proper, and it is shown as backed up by a lock nut 49, the latter serving to securely hold the nut in any position to which it is adjusted.

Having thus described our invention, what we claim is:

1. A device of the class described comprising a base including means adapting it to be fixedly attached to a support, guide means immovably fastened to the base and extending therefrom at substantially right angles to the plane of the base, a head structure reciprocable along said guide means toward and from the base and including a cylinder integral with said structure and arranged with its axis substantially parallel to the direction of movement of said structure, the end of the cylinder remote from the base being open and unobstructed, a piston in the cylinder separating the open end of the latter from the working portion of the cylinder, the piston being in fixed relation to and supported by said guide means, fluid conducting means of considerably less cross sectional area than the cylinder adapted to have connection with a source of pressure fluid and extending through the open end of the cylinder in spaced relation to and therefore out of frictional engagement with any surrounding part on the cylinder, said conducting means continuing on through the piston and opening into the working portion of the cylinder whereby the aforesaid structure is moved toward the base when pressure fluid is admitted to the cylinder, biasing means disposed between the base and structure for moving said structure away from the base, and a tool comprising cooperating parts, one of which parts is operatively connected to the structure and the other part carried by the base.

2. The combination and arrangement of parts defined by claim 1, and, in addition thereto, two unattached identical cupped washers of pliable material arranged in reverse relation to each other within the working portion of the cylinder, each washer including an inner and an outer cylindrical flange that frictionally engages the rod and the surrounding surface of the cylinder, respectively, said washers being held in place, one against the piston and the other against the end of the cylinder, solely by fluid pressure and friction.

3. In a device of the class described, a base including means adapting it to be fixedly attached to a support, a rod immovably secured to and extending from the base at substantially right angles to the plane thereof, a head structure having a guide aperture through which said rod extends, a cylinder integral with the head structure and extending from the side thereof remote from the base with its axis coincident with that of the rod, the end of the cylinder opposite the head structure being open, a piston mounted on the rod within the cylinder, biasing means disposed between the base and head structure and tending to move the head structure away from the base, a tool comprising cooperating parts, one of which parts is operatively connected to the head structure and the other part carried by the base, the rod having an axial bore opening through its end remote from the base and a port through which said bore communicates with the working part of the cylinder inwardly of the piston, pressure fluid conducting means extending into the cylinder through the open end thereof and communicating with said bore, the open end of the cylinder being unobstructed and said conducting means being considerably less in cross sectional area than the cylinder and disposed in spaced rela-

tion to and therefore out of frictional engagement with any surrounding part on the cylinder, and means for restraining the head structure against turning on the rod.

4. In a device of the class described, a base including means adapting it to be fixedly attached to a support, a rod immovably secured to and rising from the base, a head structure having a guide aperture through which said rod extends, a cylinder integral with and rising from the head structure about the rod, the cylinder being open and unobstructed at its upper end, a piston on the rod within the cylinder, a guide post rising from the base, the head structure having a second guide aperture wherein the guide post is slidable relative to the head structure, a tool part carried by the head structure, a second tool part attached to the base for cooperation with the former tool part, spring means interposed between the base and head structure and tending to sustain the latter in elevated position, the aforesaid rod having an axial bore that opens through the top of the rod and being provided with a port through which said bore communicates with the working portion of the cylinder below the piston, and pressure fluid conducting means applied to the top of the rod for communication with said bore, said conducting means being considerably less in cross sectional area than the cylinder and being spaced inwardly from and out of frictional engagement with any surrounding part on the cylinder.

5. In a device of the class described, a base including means adapting it to be fixedly attached to a support, a rod immovably secured to and extending from the base at substantially right angles to the plane thereof, a head structure having a guide aperture through which said rod extends, a cylinder incorporated in the head structure and extending from the side thereof remote from the base with its axis coincident with that of the rod, the end of the cylinder opposite the head structure being open, a piston mounted on the rod within the cylinder, a helical spring surrounding the rod and confined between the head structure and base and tending to retain the head structure in elevated position, a stop for limiting the movement of the head structure toward the base, the same comprising a sleeve surrounding the spring and considerably less in length than the distance between the head structure and base when the head structure is in elevated position, a tool comprising cooperating parts, one of which parts is operatively connected to the head structure and the other part carried by the base, fluid conducting means adapted to have connection with a source of pressure fluid and extending into the open end of the cylinder and through the piston and opening into the cylinder between the piston and the opposed end of the cylinder, and means for restraining the head structure against turning on the rod.

6. In a device of the class described, a base including means adapting it to be fixedly attached to a support, a rod immovably secured to and extending from the base at substantially right angles to the plane thereof, a head structure having a guide aperture through which said rod extends, a cylinder incorporated in the head structure and extending from the side thereof remote from the base with its axis coincident with that of the rod, the end of the cylinder opposite the head structure being open, a piston mounted on the rod within the cylinder, a helical spring surrounding the rod and confined between the head structure and base and tending to retain the head structure in elevated position, a stop for limiting the movement of the head structure toward the base, the same comprising a threaded sleeve surrounding the spring and considerably less in length than the distance between the head structure and base when the head structure is in elevated position, a threaded element having screw connection with the sleeve for longitudinal adjustment with respect thereto and adapted to project beyond an end of the sleeve, a tool comprising cooperating parts, one of which parts is operatively connected to the

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head structure and the other part carried by the base, fluid conducting means adapted to have connection with a source of pressure fluid and extending into the open end of the cylinder and through the piston and opening into the cylinder between the piston and the opposed end of the cylinder, and means for restraining the head structure against turning on the rod.

7. The combination and arrangement of parts defined by claim 5, wherein the base has an internally threaded counterbore substantially concentric with the rod, and said sleeve is externally threaded and screwed into said counterbore.

8. The combination and arrangement of parts defined by claim 7, and, in addition thereto, an internally threaded element screwed onto and adjustable along the sleeve for engagement by the head structure.

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