

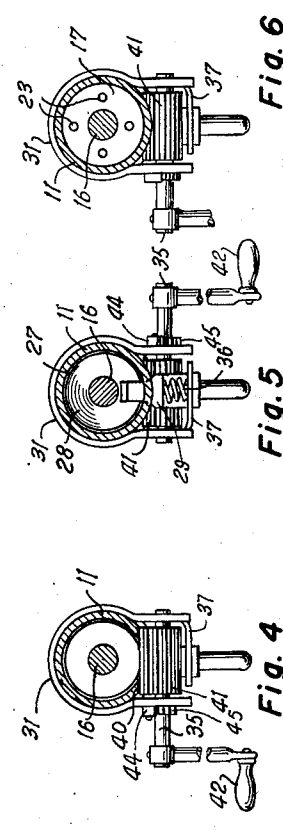
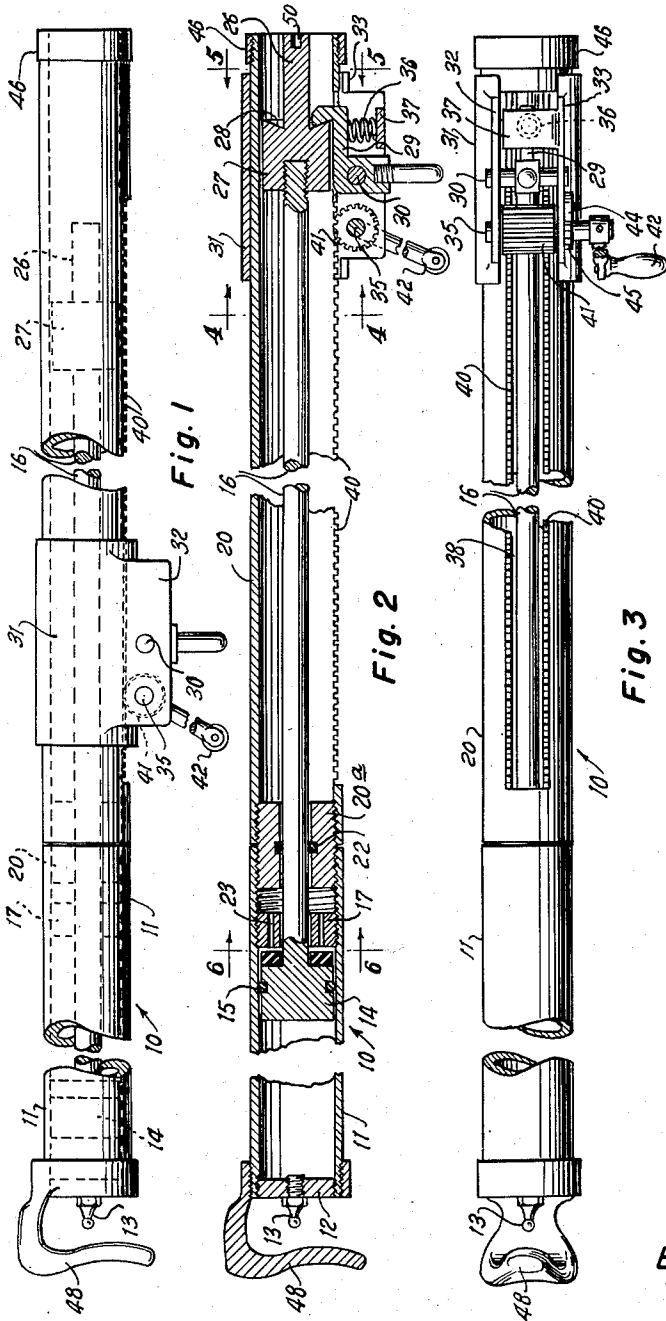
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POWER DEVICES

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POWER DEVICES

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This invention relates to a power device for hand tools. One object of the invention is to provide a power device for operating hand tools.

An important object is to provide a portable power device for operating hand tools which is self-contained in that when it is in operation it is not required that the same be connected to sources of power such as compressed air or electrical current.

Still another object is to provide a power device, of the type described, which is portable and easily operable by a single operator.

A further object of the invention is to provide a portable power device having a power reservoir in which a compressible fluid, such as air, is maintained under pressure and is employed to actuate a piston.

A still further object of the invention is to provide a portable power device, of the type described, in which the compressible fluid is further compressed to greater pressure by the piston as the latter is brought into operative position from which it may be released to perform the work desired.

Another object is to provide a portable power device, of the type described, wherein the piston may be moved into operative position by manually operable means.

A particular object is to provide a portable power device having a cylinder in which a piston is adapted to move, means for introducing compressed fluid under pressure into one end of the cylinder to pre-load the piston, and means for moving the piston into operative position whereby the compressible fluid is placed under still greater pressure causing the piston to move with great speed and force when released to perform its desired work.

Another object is to provide a new and improved hand tool having a self-contained power device.

Additional objects and advantages of the invention will be readily apparent from the reading of the following description of a device constructed in accordance with the invention, and reference to the accompanying drawings thereof, wherein:

Figure 1 is a side elevation of the power device;

Figure 2 is a longitudinal vertical sectional view of the power device shown in Figure 1;

Figure 3 is a bottom view of the power device shown in Figures 1, 2; and

Figures 4, 5 and 6 are sectional views taken on the lines 4—4, 5—5, and 6—6, respectively, of Figure 2.

Referring now to the drawing, the numeral 10 designates a power device which includes an elongate cylinder 11 having a cover 12 threaded in one end thereof, the cover being provided with a valve stem 13 through which a compressible fluid, such as air, may be introduced into the cylinder. The valve in said stem prevents escape of the air from the cylinder which is preferably highly compressed so as to exert a considerable force on the piston 14 which is slidable in the cylinder. The piston is provided with an O-ring 15 which seals between the piston and the cylinder to prevent passage of air therebetween.

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The piston 14 has a forwardly projecting stem or rod 16 which extends through a stop ring 17 threaded in the end of the cylinder remote from the cover 12. The stop ring limits movement of the piston 14, and a shock absorber ring 18 of rubber or other resilient structure is disposed about the piston rod and between the piston and the stop-ring to lessen the shock transmitted through the cylinder to the operator of the device when the movement of the piston and piston rod is stopped by the stop-ring.

An extension 20, which is substantially tubular in form, is secured to the outer end of the cylinder 11 remote from the cover 12 by means of a bushing or connector 20a which is threaded into adjacent ends of the extension and the cylinder. The connector is provided with a longitudinal aperture or bore through which the piston rod extends. An O-ring 22 disposed in an annular groove in the connector seals between the connector and the piston rod to prevent flow of air therebetween. The stop-ring 17 is provided with apertures 23 so that a sealed air space or chamber exists between the piston and the connector 20 which closes the forward or outer end of the cylinder. The pressure of the air within this air space is reduced as the piston is moved toward the left to its operative position so that the partial vacuum so created tends to aid the compressed air on the opposite side of the piston in moving the piston outwardly toward the right in Figure 2, from its operative position when the piston is released for movement.

A suitable tool, such as a nail driver 26, may be threaded on the outer or forward end of the piston rod, and has an enlarged guide portion 27 which engages the inner wall of the extension to guide the movement of the outer end of the piston rod in the extension 20. The outer surface of the enlarged guide portion of the nail driver is inclined slightly inwardly and rearwardly to provide an annular catch shoulder 28 which is engaged by a latch 29 pivotally secured by a pin 30 to a bracket 31 which is slidably mounted exteriorly of the extension 20. The slidable bracket has a pair of parallel spaced depending flanges 32 and 33. The latch pin 30 and a shaft 35 are mounted on and extend between the parallel flanges of the bracket.

The latch 29 is biased inwardly toward a position engaging the catch shoulder 28 by a spring 36 which is supported by a perpendicularly extending arm 37 of the flange 33 and bears against the latch. The latch catch member extends inwardly into the interior of the extension through a longitudinal slot 38 found in the under side of the extension.

The parallel edges defining the sides of the slot in the extension are provided with gear teeth 40 which are engaged by the teeth of a pinion gear 41 rigidly mounted on the shaft 35 carried by the flanges of the bracket 31 so that when the shaft 35 is rotated clockwise (Figure 2) by means of the handle 42, the bracket 31 is moved rearwardly on the extension and toward the cylinder 11.

A ratchet 44 pivotally mounted on the flange 33 of the bracket engages the gear teeth of a gear 45 rigidly mounted on the shaft to prevent counterclockwise rotation of the shaft until it is manually pivoted out of engagement with the gear teeth.

The outward movement of the bracket is limited by a stop-ring 46 threaded on the outer end of the extension.

A handle or shoulder rest 48 may be threaded on the end of the cylinder remote from the extension, and a similar handle may be provided adjacent the latch 29 on the slidable bracket to facilitate operation of the latch, if desired.

In use, with the piston 14 and bracket 31 in the positions shown in Figure 2, air under considerable pressure, say 400 pounds per square inch, is introduced from a

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suitable source into the cylinder 11 through the valve stem 13, thus "pre-loading" the piston so that it is urged toward the right by the pressure of the compressed air. The valve stem is then disconnected from the source of compressed air and the device may be carried to the site of use.

In operation, the piston is moved toward the rear of the cylinder, further compressing the air in the cylinder to an even higher pressure, say 800 pounds per square inch, by clockwise rotation of the handle 42 which causes the bracket to move rearwardly on the extension 20. Since the latch 29 engages the catch shoulder 28 of the nail driver 26, the piston is moved rearwardly with the bracket. The ratchet 44 prevents counterclockwise rotation of the shaft 35 when the operator has moved the piston to the desired operative position.

The outer end of the extension is then seated against the surface into which a nail is to be driven and the latch 29 is pivoted out of engagement with the catch shoulder 28 to release the piston for outward movement. The force of the compressed air in the cylinder then moves the piston with great force and velocity toward the right in Figure 2, causing a nail previously positioned in the recess 50 of the nail driver to be driven into the surface.

The ratchet or pawl 44 is then disengaged from the gear 45 and the bracket again moved outwardly on the extension by rotating the handle 42 and shaft 35 counterclockwise until the catch member of the latch 29 again engages the catch shoulder 28 of the nail driver. The above sequence of operations may then be repeated again to drive another nail into the surface.

It will be apparent that the cylinder is under great pressure at all times, pre-loading the piston so that the piston will be moved outwardly or forwardly with great force when the latch 28 is released from its engagement with the catch shoulder of the nail driver. It will also be seen that the piston has to be moved only a very short distance toward the left to cause the air pressure in the cylinder to rise to extreme values since the air is already under great pressure.

It will thus be seen that the power device is self-contained and can be carried from place to place without dragging compressed air lines or electrical power supply lines, since the compressed air in the cylinder pre-loads the piston and is held in the cylinder as long as desired. The sealing means between the piston and the cylinder prevents escape of the air from within the cylinder, but if nominal amounts of air do escape, the cylinder may be readily recharged or pre-loaded to the desired pressure.

The device may obviously be used with any other suitable type of hand tool than the nail driver illustrated; for example, shears, clamps, jacks or the like, requiring the application of a large force over a relatively short distance.

It will be also apparent that the gear arrangement for moving the piston into operative position is but one of many means by which this may be accomplished. For example, the piston could be moved into operative position by the use of a screw jack, or by any other gear arrangement.

The foregoing description of the invention is explanatory only, and changes in the details of the construction illustrated may be made by those skilled in the art, within the scope of the appended claims, without departing from the spirit of the invention.

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What I claim and desire to secure by Letters Patent is:

1. A power device for hand tools comprising: a cylinder closed at its rear end and having an apertured stop member at its other end, a piston movable in said cylinder and having an operating rod extending forwardly from said piston through said apertured stop member, said rod being adapted to have a suitable tool to be operated by said power device connected with its outer end; means for introducing a compressible fluid under pressure into said cylinder to urge the piston in one direction; means for moving said piston in the opposite direction toward operative position against the force exerted by the compressible fluid; and means for releasing said piston for movement in said one direction from said operative position, such movement of said piston moving the operating rod whereby said tool connected with said rod is actuated by movement of said rod.

2. A power device comprising: a cylinder having a piston movable therein; said cylinder being closed at its rear end and having an apertured stop member at its other end; said piston having an operating rod extending forwardly therefrom through said apertured stop member, said rod being adapted to have a tool to be operated by said power device connected with its outer end; means for introducing and holding a compressible fluid in said cylinder to bias said piston for movement in one direction; means for moving said piston in the opposite direction to an operative position against the force exerted by the compressible fluid; and means for releasably holding said piston in said operative position, said holding means being releasable to permit the compressible fluid to act on said piston to move the same and the operating rod carried thereby in said one direction, whereby such movement of said rod is adapted to actuate any tool connected with said rod.

3. A power device of the character set forth in claim 2, including: means limiting movement of said piston in said one direction comprising: a closure bushing surrounding said operating rod and closing the outer end of said cylinder beyond said stop member to provide a chamber in said cylinder therebetween; means sealing between said closure bushing and said operating rod; flow restrictive passageways through said stop member, whereby movement of said piston toward said stop member forces compressible fluid through said passageways into said chamber to cushion the engagement of the piston with said stop member.

4. A power device of the character set forth in claim 3, including: an extension carried by said closure bushing and projecting outwardly therefrom and disposed substantially concentrically with said operating rod; said means for moving said piston to an operative position comprising: means movably mounted on said extension and connectible with said operating rod.

5. A power device of the character set forth in claim 4 wherein the means for releasably holding the piston in operative position includes: latch means carried by said means for moving said piston to operative position and releasably engageable with cooperating latch means carried by said operating rod.

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