

Nov. 24, 1959

R. E. POWERS ET AL

2,914,033

AIR OPERATED TOOL AND VALVE THEREFOR

Filed July 23, 1956

2 Sheets-Sheet 1

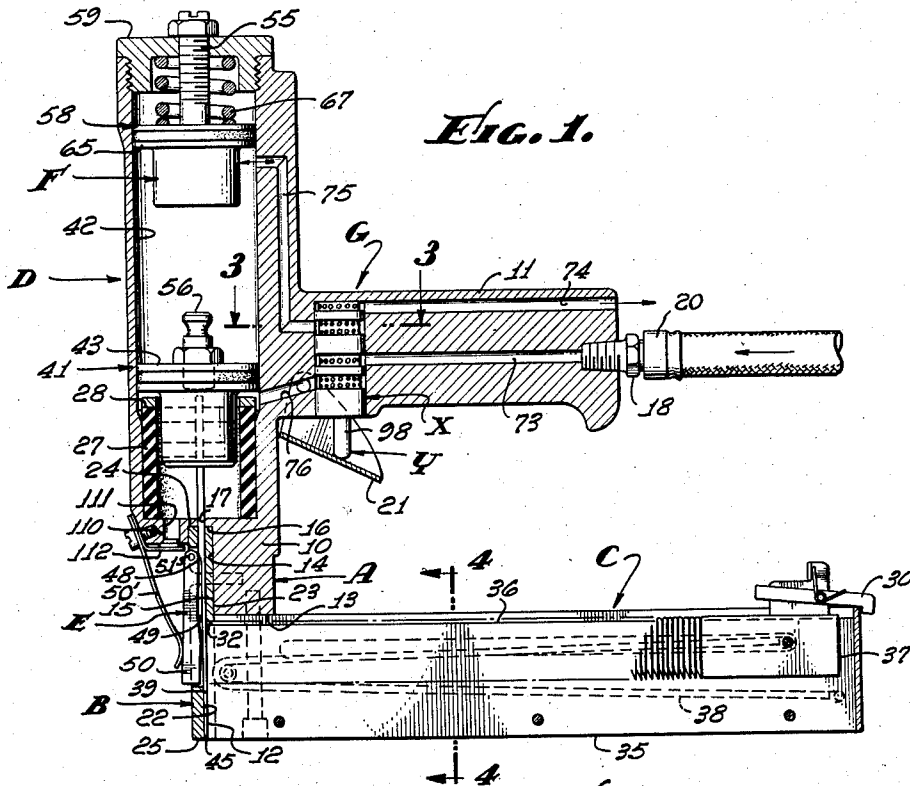


Fig. 1.

Fig. 2.

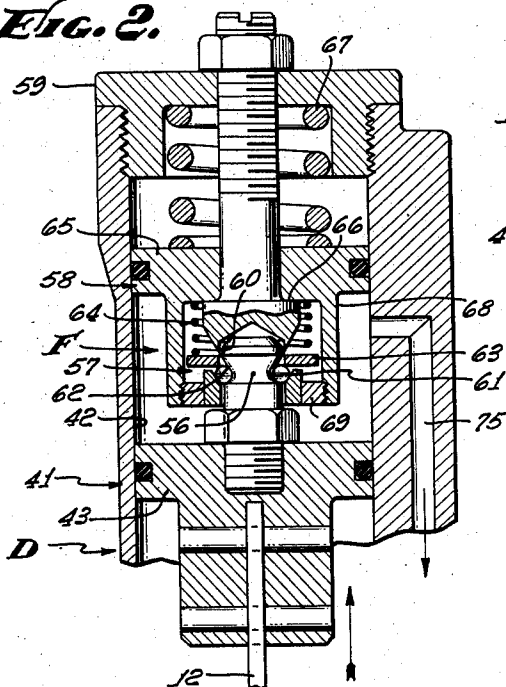


Fig. 3.

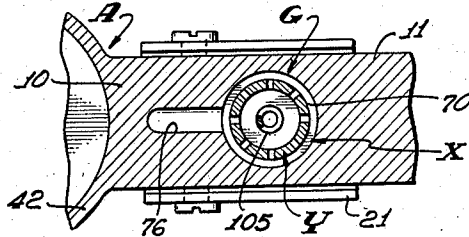
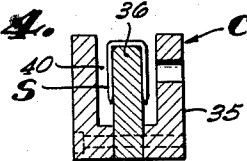


Fig. 4.



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2 Sheets-Sheet 2

Fig. 5.

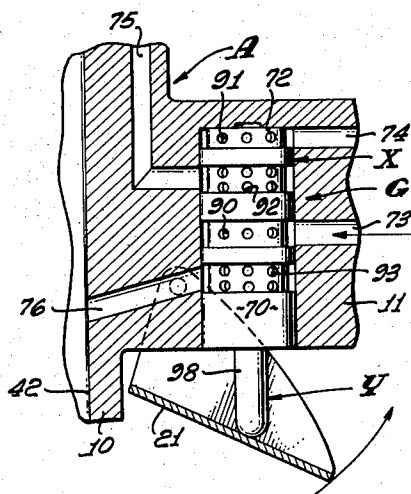


Fig. 6.

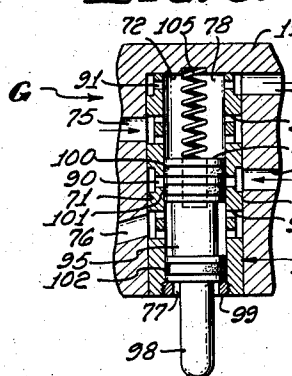


Fig. 7.

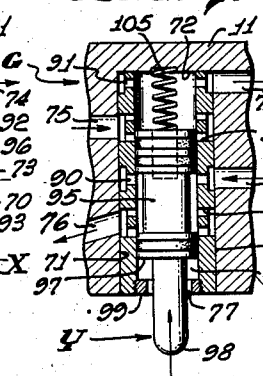


Fig. 8.

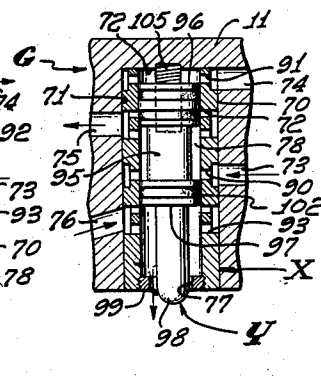


Fig. 9.

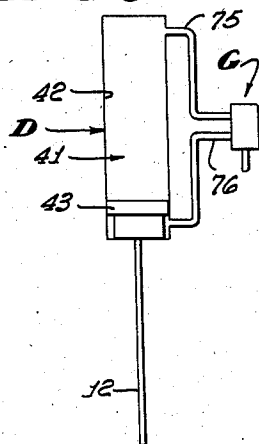


Fig. 10.

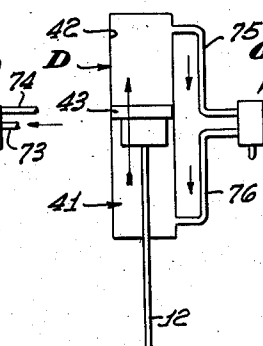
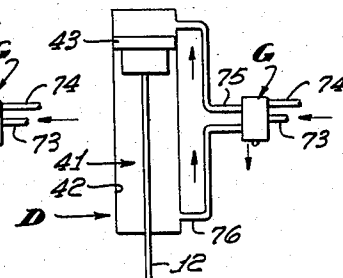


Fig. 11.



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AIR OPERATED TOOL AND VALVE THEREFOR

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Application July 23, 1956, Serial No. 599,450

10 Claims. (Cl. 121—21)

This invention relates to a tool for driving fasteners, for example staples and the like, and is more particularly concerned with the drive or operating means and a control valve therefor for such a device, it being a general object of the invention to eliminate the spring that is ordinarily employed in such tool to return or retract the piston that is used to drive the staples.

This application is co-pending with our application Serial No. 599,577, entitled Air Operated Tool and Control Therefor, filed on even date herewith.

Tools that employ a reciprocating action are commonly driven or operated by a fluid actuated cylinder and piston means. Compound or double acting cylinder and piston means have long been available, however, in the particular type of tool under consideration, features of construction have made it advisable to avoid the use of double-acting cylinder and piston means. That is, the piston of this type of tool operates a driver or blade that is rectangular in cross section which makes it difficult to provide an adequate fluid seal surrounding said blade. Therefore, it has been the practice, heretofore, to employ a single acting cylinder and piston means and to provide a return spring.

The use of return springs is a source of trouble in the operation and maintenance of tools of the type under consideration, since the return springs weaken and often break. A weakened spring will not return the piston the entire length of the stroke resulting in malfunctioning of the tool, and a broken spring will damage the mechanism by galling the piston and the cylinder walls. It is obvious that a spring has many disadvantages in tools of the type under consideration.

An object of this invention is to provide a completely pneumatic or fluid actuated tool of the type under consideration eliminating springs that are ordinarily employed to effect the return stroke of the moving part or parts.

It is an object of this invention to provide a tool of the type under consideration wherein the moving part or parts are actuated by fluid under pressure, and in which said part or parts are freely movable and unimpeded. By eliminating the return spring that is ordinarily employed, we have materially increased the driving power and effectiveness of the tool.

Another object of this invention is to provide a pneumatic or fluid driven tool having a double acting cylinder and piston operating means that is adequately vented so that the working stroke of the machine is effective and not retarded. In the tools of the type under consideration, the working stroke must be rapid and not impeded by the entrapment of fluid in the cylinder below the piston. We provide a valve that adequately exhausts fluid from both the upper and the lower end of the cylinder.

It is also an object of this invention to provide a valve for controlling operation of a double acting cylinder and piston means in a tool of the type under consideration that governs reciprocation of said piston and its related elements.

It is still another object of this invention to provide a

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valve controlling a double acting cylinder and piston means that actuates said means and then isolates the tool from the fluid pressure when in the normal unactuated position. That is, a single manual movement of the valve that we provide actuates the moving parts of the tool so that they are first retracted and then advanced with driving force after which the valve is manually released and cuts off the air supply to the cylinder and piston means, to the end that neither end of the cylinder is under pressure.

It is also another object of this invention to provide a valve that is operable manually, and which by a single movement acts to direct fluid to cause reciprocation of the piston in one direction and then in the other direction. In practice, the normal unactuated position of the piston is at the lower end of the cylinder in which case the piston is first raised and then lowered. Both raising and lowering of the piston is done rapidly and under fluid pressure that is handled by the valve.

It is an object of this invention to provide a completely pneumatic or fluid operated tool of the type referred to, that is simple, practical, dependable, and effective, and which is adapted to handle and drive fasteners, such as nails, pins, tacks and staples or the like.

The various objects and features of our invention will be fully understood from the following detailed description of a typical preferred form and application of our invention, throughout which description reference is made to the accompanying drawings in which:

Fig. 1 is a side sectional view of a fastener driving tool that incorporates the features of the present invention. Fig. 2 is an enlarged detailed sectional view of a portion of the structure shown in Fig. 1. Fig. 3 is an enlarged sectional view of a portion of the structure taken as indicated by line 3—3 on Fig. 1. Fig. 4 is a sectional view taken as indicated by line 4—4 on Fig. 1. Fig. 5 is an enlarged detailed sectional view of a portion of the structure shown in Fig. 1. Figs. 6, 7, and 8 are detailed sectional views illustrating the valve that we have provided and showing the operative positions thereof, and Figs. 9, 10, and 11 are diagrammatic views illustrating the operation of the tool as controlled by the valve.

The fastener delivering tool of the present invention is adapted to be handled manually and involves, generally, a frame A having a body portion 10 and a handle or grip portion 11, a head B carried by the frame A and adapted to direct fasteners into a piece of work, a magazine C for handling a supply of fasteners such as staples and cooperating with the head B so that the staples are received and handled by the head, operating means D having a blade or driving element 12, a guide means E for handling the staples and for accommodating the driving element of the means D so that it is continuously guided by the head B, latching means F adapted to cooperate with and control operation of the means D, and a valve means G adapted to control the supply of fluid under pressure to actuate the means D.

The frame A is a substantially rugged but light-weight part that carries the elements of the tool, and which is shaped to be conveniently handled by a person. The frame A involves, generally, the body portion 10 and the handle or grip portion 11 above referred to. The body portion 10 is a simple elongate part having an opening or passage 17 extending longitudinally through the lower head end thereof and is characterized by a flat front face 13 and a recess 14. The front face 13 is at the forward end of the body and is normal to the longitudinal axis of the body, while the recess 14 has a flat seat 15 spaced laterally of the axis of the body and parallel therewith. The seat 15 extends rearwardly from the face 13 to a shoulder 16 where the passage 17, that is rectangular in cross sectional configuration, opens to

the exterior of the body. The shoulder 16 is normal to the longitudinal axis of the body.

The handle or grip portion 11 is provided to give the person handling the tool a convenient means to hold the tool and is a simple grip of ordinary construction that projects from the body 10. In practice, the grip 11 may be substantially normal to the axis of the body and may project therefrom as clearly shown in Fig. 1 of the drawings. In structures of the type under consideration, it is common practice to provide a fluid pressure supply connection 18 at the grip 11, such as a pneumatic hose or the like, and also to include a control means at the grip 11. It is to be understood that any suitable fluid pressure supply means can be provided without affecting the present invention. When compressed air is employed, as in the case illustrated, the hose of the power connection 18 is attached to the grip 11 through a quick disconnect 20 and the valve means G is under control of a finger operated trigger 21.

The head B is, in effect, an extension of the body 10 of the frame A and is provided to receive and deliver fasteners such as staples to the work being acted upon by the tool. The head B is carried by the body 10 in the recess 14 and is provided with a longitudinal guideway 22 that extends through and opens at the ends of the head B. The head B has a bottom face 23 engaged with the seat 15, it has a rear end face 24 normal to the axis thereof and engaged with the shoulder 16, and it has a front end face 25 engageable with the work.

In the particular form of the invention shown, the guideway 22 is adapted to handle fasteners or staples S that are U-shaped and formed of wire, or the like, having a pair of sharpened ends (Fig. 4). The staples referred to are substantially elongate with straight parallel shanks joined by a curved back.

It will be apparent how the guideway 22 can be proportioned so that it will readily pass the staples with clearance and will act upon the staples to guide them as they are delivered through the head B and from the tool. The guideway 22 is a continuation of the passage 17 above described and guides the driving blade of the tool as well as the staples S that are handled thereby.

A fastener or staple receiving opening 32 extends laterally through the head B, which opening enters the bottom face 23 of the head and opens into the passage 22 so that the staples S fed to the head B are properly guided and aligned with the passage 22 before they are engaged by the driving blade 12 of the mechanism. The passage 22 has a staple guiding portion at the front of the head B of sufficient width to freely pass a fastener or staple handled by the head B, and the passage 22 has a blade guiding portion rearward of the first mentioned portion that is of increased width in order to accommodate the relatively large plunger or driving blade 12.

The magazine C is adapted to handle a supply or stack of fasteners or U-shaped staples S and involves, generally, a case 35 carried by the frame A, a guide 36 within the case 35, a follower 37 adapted to advance the fasteners or staples, and a feed spring 38 yieldingly urging the follower toward the head B. The case 35 is carried by the front face 13 of the body 10 and is an elongate part that projects laterally from the frame A. The case 35 is shell-like in form and the guide 36 is core-like part that is coextensive with the case 35 and is carried between the side walls thereof. As shown in Fig. 4 of the drawings, the case 35 and guide 36 are shaped so that a longitudinal passage 40 is formed, which passage conforms in general configuration to the U-shaped staples S which are handled by the head B.

The guide 36 enters the fastener or staple receiving opening 32 and terminates in a flat end 39 that occurs in the plane of the bottom wall of the guideway 22. The follower 37 conforms with the configuration of and is slidably carried in the passage 40 and is yieldingly

urged toward the head B by the feed spring 38. Means is provided to prevent the follower 37 from entering the guideway 22. The fasteners or staples S are inserted into the magazine C through the open top thereof by simply engaging them over the guide 36 ahead of the follower 37 tensioning the spring 38. As clearly shown in Fig. 1, a spring biased latch 30 secures the follower 37 in a retracted position when desired, thus facilitating insertion of the fasteners.

The operating means D is provided to drive the fasteners or staples handled by the structure and in addition to the blade or driving element 12, includes a cylinder and piston mechanism 41. The cylinder and piston mechanism 41 is carried by the body 10 of the frame A on the longitudinal axis thereof, and is under control of the valve means G hereinafter described. The mechanism 41 involves a cylinder 42 and a piston 43 slidably operable in the cylinder. The piston 43 is actuated to retract and advance in the cylinder 42 in a manner common to tools of the type under consideration. However, the usual compression return spring is eliminated, which ordinarily is provided within the cylinder 42 ahead of the piston 43 to return the piston 43 to a retracted position.

The blade or driver element 12 of the operating means D is essentially an elongate part rectangular in cross-sectional configuration and terminates at its forward end in a flat fastener or staple driving face 45. The blade 12 has a driving head at the forward end thereof which occupies the staple guiding portion of the guideway 22 when the driver is in the extreme advanced position and also has a stem that is guided by the blade guiding portion of the guideway 22. When the blade 12 is in the forward staple driving position as indicated in Fig. 1 of the drawings, the blade substantially occupies the passage 22. As shown, the blade 12 is provided with an inclined cam or face 48 that is pitched upwardly and rearwardly and which is provided to shift the guide means E hereinafter described.

In addition to the foregoing, the operating means D involves a snubber 27 that is provided to damp the piston 43 at the end of the work stroke. The snubber 27 is shown as a body of resilient material, such as rubber or the like, that is carried within the cylinder 42 and supported by the lowermost head thereof. In accordance with the invention, the snubber 27 is a circular ring shaped part or body that is held in working position by the walls of the cylinder 42 and which surrounds the driving blade 12 with substantial clearance. In practice, the piston 43 has a depending part that couples with the blade 12, the said depending part being smaller than the interior of the ring shaped snubber 27. Thus, the depending part of the piston 43 enters the snubber ring after which the piston engages the top 28 of the snubber to compress it. The top 28 of the snubber 27 is reinforced by a ring of metal, or the like, that is engageable with the piston. It will be apparent how the snubber 27 slows and stops advance of the piston 43 at the end of the work stroke.

The guide means E is in the form of a closure or gate 50 that is pivotally carried by the head B so that it normally substantially occupies the top of the head B. As shown, the gate 50 is elongate and is shiftable engaged with the head B by means of a pivot pin 51. The gate 50 normally occurs in a position where it forms a continuation of the guideway 22. As shown, the gate 50 is provided with a cam face 49 that cooperates with the face 48 above referred to provided on the driver 12. By providing the cooperating cam faces 48 and 49, the gate 50 is shifted or moved to the position shown in order to allow the driver 12 to advance. A spring 50' is provided to yieldingly hold the gate 50 in a down or normal position where it forms a continuation of the guideway 22 and thereby guides the staples handled by the gun and also guides the driver 12 of the gun. A head

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construction for a fastener driver of the type referred to is particularly set forth and claimed in the Richard E. Powers Letters Patent No. 2,784,406, issued March 12, 1957.

The latching means F that we employ is adapted to cooperate with and control operation of the operating means D above described. The means F is provided to couple with and to hold the piston 43 at the end of the return stroke and to release the piston 43 when sufficient fluid pressure has been established in the cylinder 42 to effect the desired work stroke. The latching means F involves, generally, an anchor 55 carried by the cylinder 42, a latching head 56 carried by the piston 43, a latching means 57 adapted to releasably couple the head 56 to the anchor 55, and a pressure responsive release means 58 adapted to actuate the means 57 to release the head 56 from the anchor 55.

The end of the cylinder 42 remote from the head B is closed by a cap 59, the anchor 55 being in the form of a screw threadedly engaged through an opening in the cap. The anchor 55 is an elongate part that projects axially into the cylinder 42 from the end thereof and is provided with a bore 60 to receive the head 56. The head 56 projects from the top of the piston 43 and is adapted to enter the bore 60 where it is engaged by the latching means 57. The head 56 is a tapered part with a widened top and the latching means 57 involves a pair of latching pins 61 that are releasably engageable beneath the widened top of the head. As shown, the pins 61 are carried in outwardly divergent angularly related slots 62 that open upwardly and outwardly from the end portion of the anchor 55. The slots 62 open into the bore 60 so that the pins are engageable with the head 56 when it is in the bore 60. A pressure plate 63 is provided to normally yieldingly urge the pins 61 into engagement with the head 56 under the influence of a spring 64.

The pressure responsive release means 58 actuates the latching means 57 to move the pins 61 in the slots 62 to release the head 56 from the anchor 55. The means 58 is responsive to the pressure of fluid in the cylinder 42 acting upon the piston 43 and involves a piston 65 adapted to lift the pressure plate 63 to allow outward shifting of the pins 61. In practice, the piston 65 surrounds the anchor 55, there being a shoulder 66 on the anchor limiting movement of the piston 65 toward the piston 43. A spring 67 normally yieldingly urges the piston 65 toward the piston 43 and against the shoulder 66. The piston 65 has a skirt 68 that carries a retainer 69 that has lifting engagement with the pressure plate 63 when fluid pressure in the cylinder 42 shifts the piston 65. Adjustment of the latching means F is obtained by rotation of the anchor 55 to vary the compression of the spring 67, the anchor 55 being locked in the adjusted position by a suitable lock nut. It will be apparent how the latching means F couples to the piston 43 until sufficient fluid pressure is built up in the cylinder 42 to operate the release means 58.

In accordance with the present invention, we have provided the valve means G which is a three position valve means that controls the supply of fluid under pressure from the connection 18. In Figs. 6, 7, and 8 of the drawings, and in Figs. 9, 10, and 11 we have illustrated the particular valve that we provide and the manner in which the piston 43 is controlled. As shown in Figs. 1 and 9, the normal unactuated position of the piston 43 is at the lower or head end of the cylinder 42, and when the tool is in this condition, the valve means G is released and positioned as shown in Figs. 1, 5, and 6.

As shown in Fig. 10 of the drawings, the piston 43 is moved from the lower end of the cylinder 42 toward the upper end thereof, and when the tool is in this condition, the valve means G has been manually engaged and actuated to the position shown in Fig. 7.

As shown in Fig. 11 of the drawings, the piston 43 has

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been fully moved to the upper end of the cylinder 42 (see Fig. 2), and when the tool is in this condition the valve means G has been manually actuated to the position shown in Fig. 8.

When the piston has been moved to the position shown in Fig. 11 and is latched to the anchor 55 (see Fig. 2), and when the valve means G remains in the position shown in Fig. 8, pressure is built up in the cylinder 42 between the pistons 43 and 65 until the head 56 is released whereupon the work stroke of the tool is initiated. In order to accomplish the foregoing operation of the tool, we have provided the valve means G which involves generally, a valve body X, a valve slide Y and a means normally yieldingly urging the slide Y to an unactuated position.

The valve means G is shown as a manually actuated valving means under control of the trigger 21 that is pivotally carried by the handle 11 and which is engageable with the slide Y to effect operation of said means. The valve means G may vary in form as circumstances require and is constructed so as to exhaust fluid from the upper end of the cylinder 42 and to isolate the operating means D from the fluid pressure supply when the valve is in a normal unactuated position (see Figs. 1, 5, and 6).

The valve means G is also constructed so as to have an intermediate position that the slide Y passes through as it is manually actuated in which position the valve continues to exhaust fluid from the upper end of the cylinder 42 and in which position the fluid pressure supply is connected to the lower end of the cylinder 42 to operate the piston 43 toward the upper end of the cylinder (see Fig. 7).

Further, the means G is constructed so as to have a fully actuated position that the slide Y reaches, in which position the valve closes the exhaust from the upper end of the cylinder, opens an exhaust at the lower end of the cylinder, and in which position the fluid pressure supply is connected to the upper end of the cylinder to effect the work stroke of the tool (see Fig. 8).

The valve means G is preferably formed in and carried by the frame A of the tool and, as shown, is housed within the grip 11. In the case illustrated, the body X is a separately formed element that may be machined and then set in place in the grip 11. The body X is best illustrated in Figs. 5 to 8 of the drawings and involves a valve sleeve 70 that is carried in a recess or bore 71 provided in the grip 11. As shown, the bore 71 opens at the forward side of the grip 11 and is a straight cylindrical bore terminating in a bottom 72.

Fluid handling passages connect the bore 71 with the fluid pressure connection 18, with the outside atmosphere, and with the upper and lower end portions of the cylinder 42. The connection 18 is connected to the bore 71 by a passage 73 that opens into the bore intermediate the ends thereof, preferably about midway therebetween. The outside atmosphere is connected to the bore 71 by a passage 74 that opens into the bore at the upper end portion thereof and opens to the atmosphere at the butt end of the grip 11. The upper end of the cylinder 42 is connected to the bore 71 by a passage 75 that opens into the bore intermediate passages 73 and 74 where they enter the bore, the passage 75 entering the cylinder 42 just below the piston 65. The lower end of the cylinder 42 is connected to the bore 71 by a passage 76 that opens into the bore intermediate the passage 73 and the lower end of the sleeve 70. In addition to the foregoing connections, an exhaust port 77 is formed by the open lower end of the sleeve 70 that surrounds the slide Y.

The sleeve 70 is a cylindrically shaped element that is press fitted into the bore 71 and has an elongate cylindrically shaped chamber 78 that slideably receives the slide Y. A fluid pressure supply port or ports 90 are provided intermediate the ends of the sleeve 70, preferably midway between the ends thereof and are in communication with the passage 73. A fluid exhaust port or ports 91 are pro-

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vided at the upper end portion of the sleeve 70 and are in communication with the passage 74. A fluid handling port or ports 92 are provided in the sleeve 70 intermediate the ports 90 and 91 and are in communication with passage 75, and a fluid handling port or ports 93 are provided at the lower end of the sleeve 70 below the port or ports 90 and are in communication with the passage 76. The ports 90, 91, 92 and 93 open into the chamber 78 and are in communication with the said passages through annular channels turned in the exterior of the sleeve 70, as shown.

The valve slide Y is freely shiftable in the sleeve 70 of the body X and as illustrated in Figs. 6 to 8 of the drawings, involves a valve stem 95, and upper and lower valve heads 96 and 97. The stem 95 is carried centrally of the chamber 78 and has a lower forwardly projecting extension 98 that is actuated by the trigger 21. A stop ring 99 is threadedly carried at the lower end of the sleeve 70 and is engageable with the head 97 limiting downward movement of the slide Y. As shown substantial clearance occurs between the extension 98 and ring 99 for establishing the port 77 above referred to.

The valve head 96 occurs adjacent the fluid pressure supply ports 90 when the slide Y is in the normal unactuated position (see Fig. 6), and in accordance with the invention the head 96 has sealing engagement with the sleeve 70 both above and below the ports 90. The seal may be effected by upper and lower O rings 100 and 101, as shown in Fig. 6, to the end that the operating means D is isolated from the supply of fluid under pressure. When in the unactuated position the head 96 allows exhaust of fluid from ports 92 through the chamber 78 to ports 91, and the head 97 closes the lower end of the chamber 78.

When the valve head 96 is in the intermediate position (see Fig. 7), the supply ports 90 are open to the chamber 78 and are in communication with the lower ports 93, to the end that fluid under pressure effects raising or return of the piston 43 to the upper end of the cylinder 42. When in the intermediate position the head 96 continues to allow exhaust of fluid from the ports 92 to ports 91, and the head 97 continues to close the lower end of the chamber 78 below the ports 93.

When the valve head 96 is in the fully actuated position (see Fig. 8) the supply ports 90 remain open to the chamber 78 and are opened to the ports 92, to the end that fluid under pressure will effect the work stroke of the tool through operation of the operating means D and the latching means F, as above described. When in the fully actuated position the head 96 closes the ports 91 from communication with the ports 92, and the head 97 opens the lower ports 93 to the outside atmosphere through port 77, thereby freeing the piston for downward movement in the cylinder 42. The head 97 seals with the sleeve 70 employing, for example, an O ring 102, as shown in Figs. 6 to 8.

The means that normally yieldingly urges the slide Y to the unactuated position is preferably a simple compression spring 105 that is seated on the bottom 72 of the bore 70 and engages the inner end of the slide Y at the head 96. It will be apparent how the slide Y is biased to return to the position shown in Figs. 5 and 6 of the drawing.

The ports 93 normally handle a sufficient quantity or volume of fluid to allow for effective and efficient operation of the piston 43 during the work stroke of the tool. However, under some circumstances, it may be desired to increase the rapidity of the work stroke by further elimination of back pressure beneath the piston 43. As illustrated in Fig. 1 of the drawings, we provide a pressure relief valve 110 that is spring biased to withstand the fluid pressure required to raise or return the piston 43 to the latching means F, and which allows free exhausting of fluid from the head end of the tool. A port 111 is formed at the end of the cylinder 42 and is normally

closed by the valve 110. A spring 112 yieldingly urges the valve toward a normal closed position.

From the foregoing, it will be apparent that we have provided a highly developed and improved tool of the type under consideration. There is no spring to impede actuation of the moving parts that drive the staples S, the tool being operated entirely by fluid pressure, preferably pneumatically. When the tool is idle, the fluid under pressure is withheld from the operating means D to the end that there is no fluid loss which is ordinarily caused by leakages in tools of this type since there is no seal at the end of the cylinder 42 surrounding the blade 12. When the trigger 21 is initially or partially actuated through the said intermediate position, the piston 43 is actuated into engagement with the latching means F. When the trigger 21 is fully actuated, the pressure is built up and the piston is released to effect the work stroke. It is to be observed that when the trigger 21 is released, the valve operates through the said intermediate position. In practice, this latter return movement is too rapid to effect return operation of the piston 43. However, if it is so desired, the person operating the tool may momentarily hold the trigger 21 in the said intermediate position before releasing it completely in which case the piston is actuated into engagement with the latching means. Upon complete release of the trigger 21, the fluid pressure is released from and is isolated from the working mechanism of the tool.

Having described only a typical preferred form and application of our invention, we do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to ourselves any variations or modifications that may appear to those skilled in the art and fall within the scope of the following claims.

Having described our invention, we claim:

1. A valve for admitting and exhausting fluid from the opposite ends of double-acting cylinder and piston units and the like, including, an elongate body with a fluid pressure supply port intermediate its ends, with exhaust ports at the ends and having fluid handling ports between the supply port and exhaust ports, and a valve slide shiftable in the body and normally closing the supply port and operable through an intermediate position where the supply port is in communication with one of said fluid handling ports and to a fully actuated position where the supply port is in communication with the other of said fluid handling ports.

2. A valve for admitting and exhausting fluid from opposite ends of double-acting cylinder and piston units and the like, including, an elongate body with a fluid pressure supply port intermediate its ends, with exhaust ports at the ends and having fluid handling ports between the supply port and exhaust ports, a valve slide shiftable in body and normally closing the supply port and operable through an intermediate position where the supply port is in communication with one of said fluid handling ports and to a fully actuated position where the supply port is in communication with the other of said fluid handling ports, and means yieldingly urging the slide to the normally closed position.

3. A valve for admitting and exhausting fluid from the opposite ends of double-acting cylinder and piston units and the like, including, an elongate body having a bore extending therethrough, a supply port intermediate the ends of the body, exhaust ports at the ends of the body, fluid handling ports between the supply port and exhaust ports, and a valve slide shiftable in the bore and having a head normally closing the supply port and operable through an intermediate position where the supply port is in communication with one of said fluid handling ports and to a fully actuated position where the supply port is in communication with the other of said fluid handling ports.

4. A valve for admitting and exhausting fluid from the opposite ends of double-acting cylinder and piston

units and the like, including, an elongate body having a bore extending therethrough, a supply port intermediate the ends of the body, exhaust ports at the ends of the body, fluid handling ports between the supply port and exhaust ports, and a valve slide shiftably carried in the bore and having a head normally closing the supply port and a head normally closing one of said exhaust ports, the slide being operable through an intermediate position where the first mentioned head opens the supply port so that it is in communication with one of said fluid handling ports and to a fully actuated position where the supply port is in communication with the other of said fluid handling ports and where the second mentioned head opens said exhaust port.

5. A valve for admitting and exhausting fluid from the opposite ends of double-acting cylinder and piston units and the like, including, an elongate body having a bore extending therethrough, a supply port intermediate the ends of the body, exhaust ports at the ends of the body, fluid handling ports between the supply port and exhaust ports, and a valve slide shiftably carried in the bore and having a head normally closing the supply port and a head normally closing one of said exhaust ports, the slide being operable through an intermediate position where the first mentioned head opens the supply port so that it is in communication with one of said fluid handling ports and to a fully actuated position where the supply port is in communication with the other of said fluid handling ports and opens the other exhaust port and where the second mentioned head opens said exhaust port.

6. A valve for admitting and exhausting fluid from the opposite ends of double-acting cylinder and piston units and the like, including, an elongate body having a bore extending therethrough, a supply port intermediate the ends of the body, exhaust ports at the ends of the body, fluid handling ports between the supply port and exhaust ports, and a valve slide shiftably carried in the bore and having a head normally closing the supply port and normally opening one of said exhaust ports, and a head normally closing the other exhaust port, the slide being operable through an intermediate position where the first mentioned head opens the supply port so that it is in communication with one of said fluid handling ports and to a fully actuated position where the supply port is in communication with the other of said fluid handling ports and where the first mentioned head closes the said exhaust port and the second mentioned head opens the other exhaust port.

7. A valve for admitting and exhausting fluid from the opposite ends of double-acting cylinder and piston units and the like, including, an elongate body having a bore extending therethrough, a supply port intermediate the ends of the body, exhaust ports at the ends of the body, fluid handling ports between the supply port and exhaust ports, and a valve slide shiftably carried in the bore and having a head normally sealing above and below and closing the supply port and operable through an intermediate position where the supply port is in communication with one of said fluid handling ports and to a fully actuated position where the supply port is in communication with the other of said fluid handling ports.

8. A fastener driving tool of the character described and having a return stroke and a work stroke and including, a frame, a driver element shiftably carried by the frame, operating means for said element comprising a cylinder and a piston shiftable therein and operatively joined to the driver element, a latching means for releasably coupling to the piston and driver element and including a pressure responsive means and operable to release the piston when a predetermined fluid pressure is

built up in the cylinder, and a normally closed valve means operable to alternately admit and exhaust fluid from opposite ends of the cylinder and comprising, an elongate body with a fluid pressure supply port intermediate its ends, with exhaust ports at the ends and having fluid handling ports between the supply port and exhaust ports, and a valve slide shiftable in the body and normally closing the supply port and operable through an intermediate position where the supply port is in communication with one of said fluid handling ports to effect a return stroke and to a fully actuated position where the supply port is in communication with the other of said fluid handling ports to effect a work stroke.

9. A fastener driving tool of the character described and having a return stroke and a work stroke and including, a frame, a driver element shiftably carried by the frame, operating means for said element comprising a cylinder and a piston shiftable therein and operatively joined to the driver element, a latching means for releasably coupling to the piston and driver element and including a pressure responsive means and operable to release the piston when a predetermined fluid pressure is built up in the cylinder, and a normally closed valve means operable to alternately admit and exhaust fluid from opposite ends of the cylinder and comprising, an elongate body having a bore extending therethrough, a supply port intermediate the ends of the body, exhaust ports at the ends of the body, fluid handling ports between the supply port and exhaust ports, and a valve slide shiftably carried in the bore and having a head normally closing the supply port and operable through an intermediate position where the supply port is in communication with one of said fluid handling ports to effect a return stroke and to a fully actuated position where the supply port is in communication with the other of said fluid handling ports to effect a work stroke.

10. A fastener driving tool of the character described and having a return stroke and a work stroke and including, a frame, a driver element shiftably carried by the frame, operating means for said element comprising a cylinder and a piston shiftable therein and operatively joined to the driver element, a latching means for releasably coupling to the piston and driver element and including, a pressure responsive piston in the cylinder and operable to release the piston when a predetermined fluid pressure is built up in the cylinder, and a normally closed valve means operable to alternately admit and exhaust fluid from opposite ends of the cylinder and comprising, an elongate body having a bore extending therethrough, a supply port intermediate the ends of the body, exhaust ports at the ends of the body, fluid handling ports between the supply port and exhaust ports, and a valve slide shiftably carried in the bore and having a head normally closing the supply port and a head normally closing one of said exhaust ports, the slide being operable through an intermediate position where the first mentioned head opens the supply port so that it is in communication with one of said fluid handling ports to effect a return stroke and to a fully actuated position where the supply port is in communication with the other of said fluid handling ports and where the second mentioned head opens said exhaust port to effect a work stroke.

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