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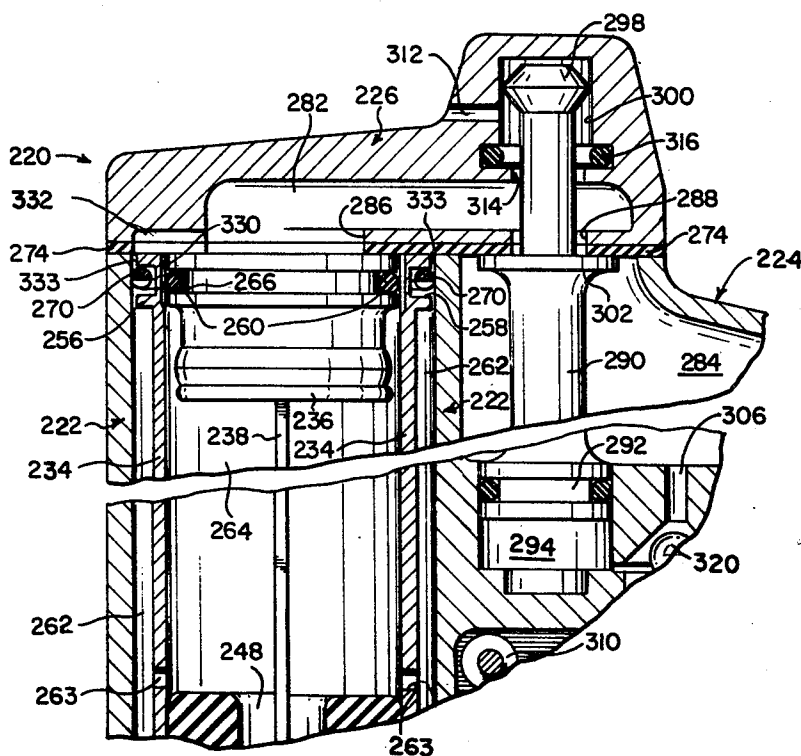
- [72] Inventors Paul W. Bojan;
Robert L. Wolfberg, Chicago, Ill.**
- [21] Appl. No. 732,441**
- [22] Filed May 27, 1968**
- [45] Patented Jan. 5, 1971**
- [73] Assignee Signode Corporation
Chicago, Ill.
a corporation of Delaware**

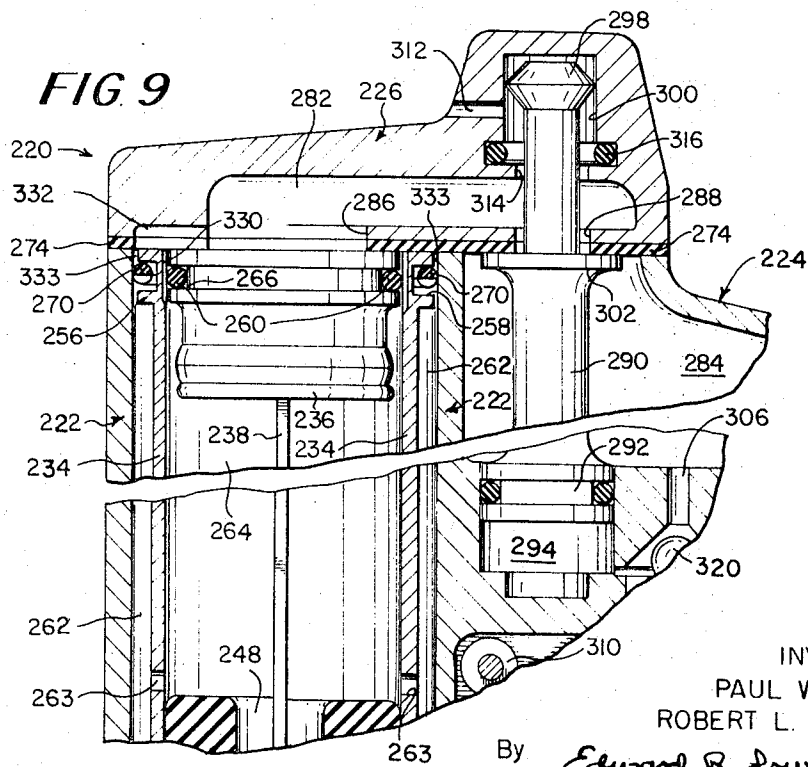
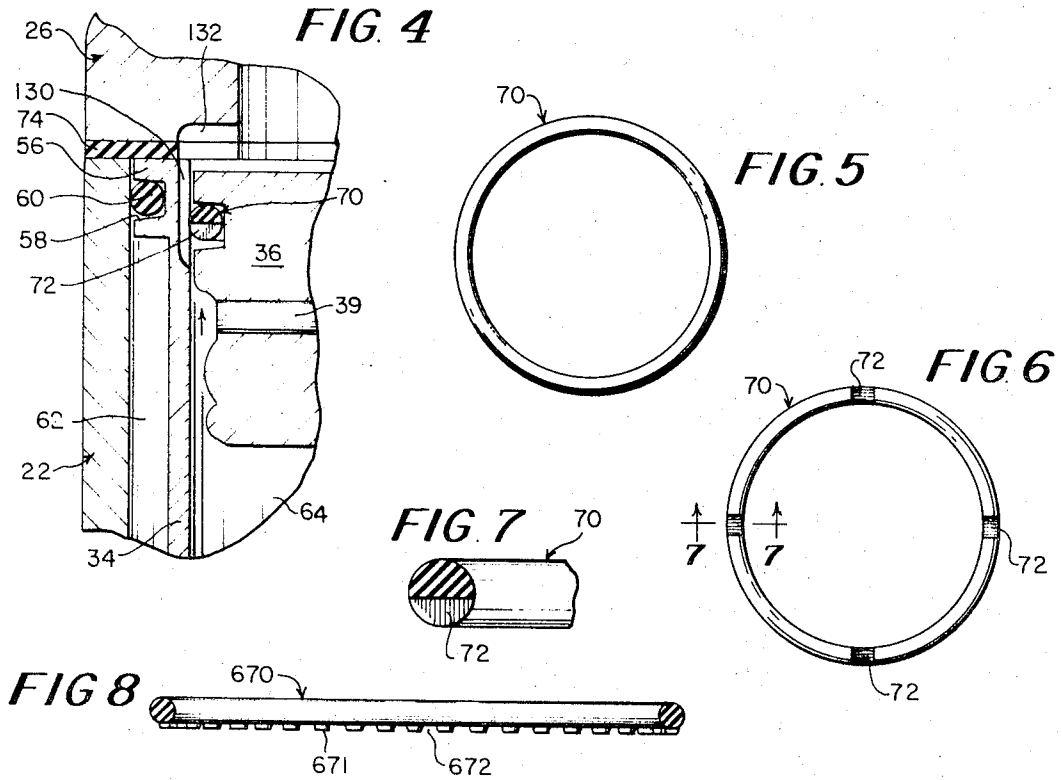
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Primary Examiner—Paul E. Maslousky
Attorney—Edward R. Lowndes

- [54] PNEUMATIC PISTON RETURN SYSTEM FOR IMPACT TOOLS**
4 Claims, 12 Drawing Figs.
- [52] U.S. Cl.**..... **91/416,**
91/399, 91/422, 91/461
- [51] Int. Cl.**..... **F15b 15/17,**
F15b 13/042
- [50] Field of Search**..... 91/416,
399(Cursory), 461(Cursory), 422(Cursory)

ABSTRACT: A piston return system for air cylinders wherein live air, when introduced into the cylinder on the pressure side of the piston initiates the power stroke. During the power stroke and for a short time thereafter, a special deformable sealing ring which operates in the manner of a check valve introduces live air into an annulus which surrounds the cylinder and communicates with the other side of the piston, such air serving to return the piston when air pressure is relieved on the pressure side thereof.





INVENTORS:
PAUL W. BOJAN
ROBERT L. WOLFBERG

By *Edward R. Doudes*

FIG 10

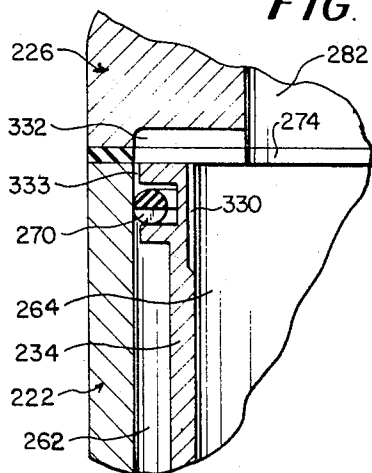


FIG 11

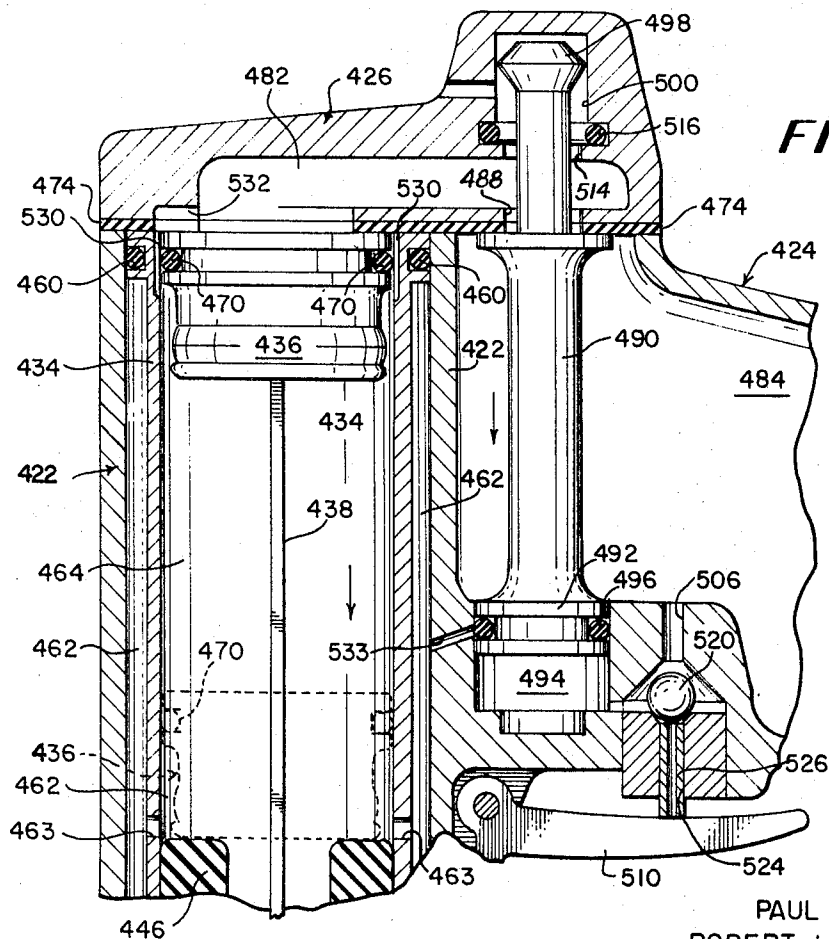
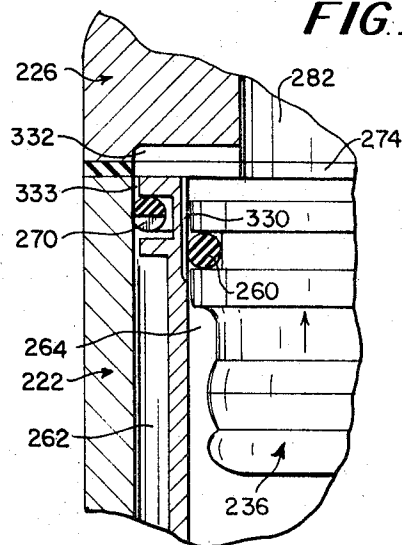


FIG 12

INVENTOR:
PAUL W. BOJAN
ROBERT L. WOLFBERG

By

Edward A. Lowndes

PNEUMATIC PISTON RETURN SYSTEM FOR IMPACT TOOLS

The present invention relates to impact tools of the type employing a pneumatically operable piston and cylinder assembly for powering the driver ordinarily associated with such tools. The invention has particular reference to a novel means for returning the piston of such an assembly to its retracted position after the piston has delivered its power stroke.

Insofar as piston return means are concerned, pneumatically operable piston and cylinder assemblies may, broadly, be divided into two groups. In one group the piston is returned by spring pressure and in the other group the piston is returned by air pressure. It is to this latter class of piston and cylinder assemblies that the present invention pertains.

Numerous air return systems are currently employed for returning a piston to its retracted position within a cylinder. Certain of these systems rely upon the use of live air for driving the piston in both directions. Such systems possess the obvious disadvantage that a large volume of air must be expended during each operating cycle. To obviate this limitation, certain other air return systems have been devised in which all, or at least a limited portion of the air which is expelled from the cylinder during the power stroke of the piston is collected in a fixed pressure chamber and compressed therein by the compressive action of the piston during the power stroke. After the piston has completed its power stroke, this stored and compressed air is returned to the cylinder and caused, by expansion thereof, to return the piston to its retracted position. While such systems conserve an appreciable amount of compressed air, the placement of the pressure chamber entails difficulty in cylinder design. Placement of the pressure chamber at the end of the cylinder on the driver side of the piston requires a cylinder of undue length, while placement of the pressure chamber at one side of the cylinder increases the overall bulk of the system. In either event, the use of offset pressure chambers, regardless of their location with respect to the cylinder, consumes a space which must be sufficiently large as to enclose a volume of air under pressure which, when released into the cylinder on the driver side of the piston, will maintain an effective expansion force sufficient to completely return the piston and hold it in its retracted position until the next succeeding power stroke thereof. Small porting areas for large air displacements, as well as unreliable valve mechanism also present difficulties that have not been overcome by such air expansion piston return systems.

The present invention is designed to overcome the above-noted limitations that are attendant upon the construction and operation of conventional piston return systems of the air return type and, accordingly, the invention, in its broadest aspect, contemplates the provision of a novel air return system wherein that portion of the cylinder chamber which is disposed on the driver side of the piston at the time the latter is at the end of its power stroke is utilized as an expansion chamber into which live air is injected momentarily for piston return purposes. The live air is obtained by the simple expedient of bypassing air from the pressure side of the cylinder around the edge of the piston and past the piston sealing ring which is of special construction and functions as a check valve for the unidirectional passage of live air into the expansion chamber at such time as the piston completes its power stroke. Thus, when the application of live air is terminated and the pressure side of the cylinder is bled to atmosphere, the entrapped air within the expansion chamber, which is unable to bypass the piston in the opposite direction, expands and returns the piston to its initial position due to the pressure differential on opposite sides of the piston. In one illustrated commercial embodiment of the invention, the volume of the expansion chamber on the driver side of the piston is effectively increased by surrounding the cylinder with a narrow cylindrical annulus which communicates with the expansion chamber on the driver side of the piston. This annulus appreciably increases the amount of air which may be stored for

expansion purposes without adding to the overall length of the cylinder while at the same time it does not appreciably increase the overall width of the cylinder wall.

In a modified form of the invention, the same piston and cylinder construction is preserved but a conventional piston sealing ring is employed while a special check valve type of sealing ring is employed for sealing the annulus, the ring allowing live air to enter the annulus when the piston has completed its power stroke and preventing escape of such air during expansion thereof for piston return purposes.

In another modified form of the invention, substantially the same piston and cylinder construction is preserved but conventional sealing rings are employed both for sealing the piston to the cylinder wall and for sealing the annulus, live air being admitted to the annulus when the piston has completed its power stroke by way of a passage leading to the annulus and which is caused to communicate with the source of live air under the control of the main actuating valve which supplies air to the cylinder for performance of the power stroke of the piston.

In all of the forms of the invention briefly outlined above, tool size is kept to a minimum and tool operation under the control of a single 'valve' lever such as a conventional valve operating trigger element is made possible so that, insofar as tool operation is concerned, conventional operating procedure is employed.

The improved piston return system of the present invention as briefly outlined above has been designed for use primarily in connection with portable impact tools such as magazine fed stapling and nailing machines, and other devices which rely for their action upon the pressure stroke of a driver. It is to be distinctly understood however that the invention is not necessarily limited to such use and piston and cylinder assemblies constructed in accordance with the principles of the invention may, with or without suitable modification, as required, be employed for other purposes too numerous to mention. Irrespective however of the particular use to which the invention may be put, the essential features thereof are at all times preserved.

The provision of an impact tool which is extremely simple in its construction and which therefore may be manufactured at a low cost; one which is comprised of a minimum number of parts, especially moving parts, and which therefore is unlikely to get out of order; one which is rugged and durable and which therefore will withstand rough usage; one which is capable of ease of assembly and disassembly for purposes of inspection of parts, replacement or repair thereof; and one which, otherwise, is well adapted to perform the services required of it, are further desirable features which have been borne in mind in the production and development of the present invention.

In the accompanying three sheets of drawings forming a part of this specification, three illustrative embodiments of the invention have been shown as being operatively applied to a commercial stapling tool or machine.

In these drawings:

FIG. 1 is a sectional view taken substantially centrally and longitudinally through a portable stapling tool constructed according to the present invention and embodying the novel piston return system thereof;

FIG. 2 is a sectional view taken on the line 2-2 of FIG. 1;

FIG. 3 is an enlarged fragmentary detail view taken radially through the cylinder wall of the tool and in the vicinity of the piston when the latter is at the bottom of its power stroke;

FIG. 4 is a fragmentary sectional view similar to FIG. 3 but taken in the vicinity of the piston when the latter is near the end of its return stroke;

FIG. 5 is a top plan view of a check valve element employed in connection with the invention, the element being in the form of an annular elastomeric sealing ring;

FIG. 6 is a bottom plan view of the sealing ring shown in FIG. 4;

FIG. 7 is an enlarged sectional view taken radially through the sealing ring of FIG. 6 and along the line 7-7 thereof;

FIG. 8 is a sectional view taken diametrically through a modified form of sealing ring capable of use in connection with the invention;

FIG. 9 is an enlarged fragmentary sectional view taken substantially centrally and longitudinally through the upper cylinder and valve regions of a modified form of stapling tool, the undisclosed portions of the tool being substantially identical to the corresponding parts of the tool shown in FIG. 1;

FIG. 10 is a fragmentary sectional view similar to FIG. 4 but embodying the modified form of tool shown in FIG. 9 and showing the position of the sealing ring at the time the piston has completed its power stroke;

FIG. 11 is a fragmentary sectional view similar to FIG. 10, showing the position of the sealing ring during the return stroke of the piston; and

FIG. 12 is an enlarged fragmentary sectional view similar to FIG. 9, illustrating a further modified form of the invention.

Referring now to the drawings in detail and in particular to FIG. 1, the piston return system of the present invention has, for exemplary purposes, been illustrated as being operatively embodied in a portable gun-type percussion or impact tool in the form of an air-operated, magazine-fed stapling tool which has been designated in its entirety at 20. The impact tool involves in its general organization a composite tool casing which is comprised of four principal parts, namely a cylinder enclosing body portion 22 from which there projects rearwardly an integral lateral extension or handle portion 24, a closure head 26, a nosepiece 28, and a staple magazine 30.

The body portion 22 is of tubular construction, the upper end thereof being open while the lower end is closed by means of a relatively thick bottom wall 32. The tubular body portion 22 surrounds and encloses a thin-walled sleeve-like cylinder 34 within which there is mounted for vertical reciprocation a piston 36 which carries a driver 38 for staples S disposed in the staple magazine 30. The upper end of the driver is secured by means of a taper pin 39 in a slot 40 formed in the piston and the lower end thereof is guided in a slot 42 formed in the bottom wall 32. The bottom wall 32 is provided with a stepped recess 44 within which the lower rim portion of the cylinder 34 is pressed with a tight fit and also within which there is piloted an annular elastomeric bumper pad 46 designed for engagement with the piston 36 when the latter completes its downward power stroke. An elastomeric seal 48 for the driver 38 is centered within the annular bumper pad to prevent egress of air from the lower regions of the cylinder in a manner and for a purpose that will be made clear presently.

The magazine 30 may be of any conventional type and no claim is made herein to any novelty associated with the same. In the illustrated form of magazine, the staples S are supported in straddling relation on a guide bar 50 disposed within a magazine chamber 52 and are urged forwardly in the magazine toward a driver slot 54 which is formed in the nosepiece in alignment with the driver 38 by means of the usual spring-pressed follower (not shown). The forward upper edge of the guide bar 50 constitutes a shearing edge by means of which the leading staple S in the staple cartridge may be sheared from the cartridge each time it is engaged by the driver 38.

As best seen in FIGS. 1 and 4, the upper circular rim of the cylinder 34 terminates flush with the upper rim of the tubular body portion 22 and is provided with a thickened flange 56 which is formed with a continuous annular groove 58 therein for reception of an O-ring 60 by means of which the cylinder 34 is sealed to the inner wall surface of the body portion 22. The wall of the cylinder 34 is spaced a slight distance from the wall of the body portion 22, the two walls being coaxial so that they define therebetween an annulus 62 which is of full cylinder height. A series of ports 63, preferably four in number are formed in the cylinder wall and establish communication between the interior of the cylinder 34 and the annulus 62. These ports 63 are disposed near the bottom wall 32 and, as clearly shown in FIG. 3, are equally and circumferentially spaced around the cylinder wall below the lower-

most effective level of the piston 36. The portion of the cylinder chamber below the piston constitutes a variable volume expansion chamber 64 while the annulus 62 constitutes an auxiliary fixed volume expansion chamber the function of which is to increase the capacity of the chamber 64 so that a greater amount of compressed air will be available for expansion purposes in order to effect the return stroke of the piston 36, all in a manner that will be described in greater detail presently.

As best seen in FIGS. 3 and 4, the piston 36 is generally of cylindrical design and the side wall thereof is provided with an annular groove 66 in the upper region of the piston and within which there is disposed a sealing ring 70 (see also FIGS. 5, 6 and 7) which functions in the manner of a check valve during reciprocation of the piston to allow live air to flow around the piston from the pressure side thereof to the expansion chamber during the pressure stroke of the piston and especially at such time as the piston remains bottomed against the elastomeric bumper pad 46 and to prevent reverse flow of air around the piston during the return stroke of the latter under the influence of expanding air within the expansion chambers 62 and 64. The sealing ring 70 is formed of a suitable elastomeric material such as rubber, either natural or synthetic, or a rubber substitute and it is in the form of a modified O-ring in which the underneath side thereof is relieved by the provision of a series of circumferentially spaced transverse grooves 72 which constitute air passages for the downward flow of air around the piston 36 in the manner shown by the arrows in FIG. 3 at such time as the piston is bottomed against the bumper pad 46. The specific operation of the sealing ring 70 will be described in greater detail subsequently and at such time as the operation of the stapling tool 20 is set forth.

Referring again to FIG. 1, the closure head 26 is secured in any suitable manner as for example by fastening bolts (not shown) to the upper open end of the body portion 22. A gasket 74 is interposed between the closure head and the upper rim of the body portion in sealing relationship. The outer end of the integral hollow handle portion 24 is adapted to be connected by a suitable nipple fitting 76 to a flexible conduit 78 leading to a source of air under pressure.

The closure head 26 overhangs the upper rim of the body portion 22 and has an enlarged lower end 92 guided in a socket 94 provided internally in the handle portion 24 and sealed to the wall of the socket by an O-ring 96. The upper end of the valve spool 90 is provided with an enlargement 98 which is guided in a socket 100 formed internally of the closure head 26. The medial region of the valve spool 90 is formed with a third enlargement 102 which constitutes a closure valve for the port 88 which establishes communication between the chambers 82 and 84.

An elongated valve spool 90 projects through the port 88 and has an enlarged lower end 92 guided in a socket 94 provided internally in the handle portion 24 and sealed to the wall of the socket by an O-ring 96. The upper end of the valve spool 90 is provided with an enlargement 98 which is guided in a socket 100 formed internally of the closure head 26. The medial region of the valve spool 90 is formed with a third enlargement 102 which constitutes a closure valve for the port 88 which establishes communication between the chambers 82 and 84.

The socket 94 normally communicates through an air passage 106 with the chamber 84 and a ball check valve assembly 108 is adapted upon actuation of a pivoted trigger element 110 to become closed and prevent such communication between the socket 94 and 84. The socket 100 communicates through a passage 112 with the atmosphere and through a port 114 with the chamber 82. An O-ring 116 encompasses the port 114 and is designed for sealing engagement with the enlargement 98 when the valve spool 90 is in its lower position. When the valve spool is in its uppermost position, the chamber 82 is bled to the atmosphere through the port 114 and passage 112.

The check valve assembly 108 includes a ball valve element 120 disposed in a valve chamber 122 and normally closes a passage 124 leading to the atmosphere and opposes the

passage 106. A hollow thrust pin 126 is slidable in the passage 124 and operates to displace the valve element 120 when the trigger element 110 is depressed.

In the operation of the above-described impact tool 20, the spool valve 90 will normally be maintained in its uppermost position since air pressure within the chamber 84 will be effective through the passage 106 to maintain full working pressure upon the underneath side of the enlargement 92, as well as to maintain pressure upon the closure valve 102. Such closure valve will therefore close the port 88 and pressure within the upper end of the cylinder 34 will be bled to the atmosphere through the port 114 and passage 112.

Upon depression of the trigger element 110, the ball valve element 120 will become dislodged from the passage 124, thus bleeding the valve chamber 122 to the atmosphere. The valve element 120 will close the passage 106 so that air at working pressure within the chamber 84 will act upon the enlargement 92 and cause the spool valve 90 to move downwardly, thus opening the port 88 and at the same time causing the enlargement 98 to make sealing engagement with the O-ring 116, thus closing the port 114. At this time, working pressure within the chamber 84 will be transmitted through the port 88 to the chamber 82 where it will be applied through the port 86 to the upper end of the cylinder 34, thus forcing the piston 36 downwardly. The amount of air which bypasses the sealing ring 70 during the downward stroke of the piston is very slight and has little, if any effect upon the power which is applied to the piston 36 and its driver 38. However, when the piston reaches the end of its power stroke as shown in dotted lines in FIGS. 1 and in full lines in FIG. 3, full line pressure remains effective upon the upper end face of the piston and the sealing ring 70 is forced downwardly against the lower side wall of the groove 66 and live air then passes around this sealing ring as indicated by the arrows in FIG. 3 so as to enter the expansion chamber 64 beneath the piston and fill the latter. As soon as the air pressure in the expansion chamber 64 exceeds the air pressure in the annulus 62, this live air flows radially outwardly through the ports 63 and fills such annulus. This flow of live air continues until the pressure of air in the chambers 62 and 64 substantially balances the pressure of air above the piston (i.e. equals line pressure) and then, as soon as the trigger element 110 is released, the ball valve element 120 will again close the passage 124 so that the spool valve 90 will return to its uppermost position and bleed the upper end of the cylinder 34 to the atmosphere through the port 114 and passage 112, whereupon the piston 36 will perform its return stroke under the influence of the expansion of air in the expansion chamber 64 and annulus 62. The full expansion pressure of such air is applicable to the piston inasmuch as the sealing ring 70 now becomes wedged between the upper side wall of the groove 66 and the side wall of the cylinder 34 as shown in FIG. 4 so that air may not bypass the sealing ring or piston.

In order that after the return stroke of the piston has been completed no entrapped air will remain in the expansion chamber to thus dampen the next succeeding power stroke of the piston, a series of small splinelike grooves 130 (FIG. 4) are formed in the wall of the cylinder 34 at the extreme upper end thereof, four such grooves being adequate to afford the desired bleeding effect. These grooves communicate at their upper ends with relief areas or passages 132 which are provided in the underneath side of the closure head 26 so that the residual air may be bled to the chamber 82 for discharge through the port 114 and passage 112. The gasket 74, also is relieved to accommodate such bleeding of residual air. Obviously, a very small amount of air will pass through the grooves 130 at the commencement of the power stroke, but as the piston moves out of the range of the grooves 130, no further bypassing of air around the piston will take place during the power stroke and no appreciable decrease in the effectiveness of such power stroke will be encountered.

From the above description, it will be apparent that upon release of the trigger element 110 and subsequent return of

the piston to its uppermost position, the various pneumatic tool instrumentalities will be restored to their normal or initial positions preparatory to a subsequent staple driving operation.

In the modified form of stapling tool 220 disclosed in FIGS. 9, 10 and 11, the composite tool casing including the body portion 222 with its handle extension 224, the cylinder 234, closure head 226 and nosepiece 228 remain substantially the same as the corresponding parts of the tool 20 previously described. However, in the tool 220 the disposition of the two sealing rings 60 and 70 (FIGS. 1, 3 and 4) have been reversed while minor porting arrangements have been effected to accommodate such reversal. Due to the similarity of construction between the two forms of the invention, similar reference numerals but of a higher order have been applied to the corresponding parts as between the disclosures of FIGS. 1, 3 and 4 and of FIGS. 9, 10 and 11 thus avoiding needless repetition of description.

In the form of the invention disclosed in FIGS. 9, 10 and 11, the piston 236 is sealed to the wall of the surrounding cylinder 234 by a conventional O-ring 260 so that no leakage or bypassing of air around the piston takes place except when the piston 236 is near the top of its stroke, either during the power or the return stroke thereof. However, in order to provide live air for expansion in the expansion chamber 264 and annulus 262, a sealing ring 270 of the unidirectional check valve type, and which may be identical with the sealing ring 70 of FIG. 1, is installed in the annular groove 258 provided in the thickened flange 256 at the upper end of the cylinder 234, while the relief areas 332 provided in the underneath side of the closure head 226 are of greater radial extent than are the relief areas 132 and communicate with the small annulus 333 which surrounds the upper side wall flange of the groove 258. Otherwise, the porting arrangement of the tool 220 remains precisely the same as that of the tool 20.

The operation of the tool 220 is similar to that of the tool 20 and, upon depression of the trigger element 310 and consequent downward movement of the spool valve 290, air under line pressure will be admitted to the chamber 282 above the piston 236, thus causing the latter to deliver its downward power stroke. As soon as the piston 236 has cleared the grooves 330, air will be bypassed around the piston and, at such time as it reaches the bottom of its power stroke, live air within the chamber 282 will pass through the relief areas 332 and vertical passages 333 and enter the annular groove 258 where it will bypass the O-ring 270 and enter the annulus 262, such air also passing radially inwardly through the ports 263 and entering the expansion chamber 264. Upon release of the trigger element 310, the air which has filled both the annulus 262 and expansion chamber 264 will utilize its expansive force in returning the piston 236 to its initial position while the O-ring 270 will prevent escape of air from the annulus upwardly through the passage 333. As is the case in connection with the previously described form of the invention, the splinelike grooves 330 which are similar in function to the grooves 130 in the form of the invention shown in FIG. 1 will insure complete collapse of air pressure in the cylinder 234 after the piston 236 has been fully returned. These grooves 330, being small and few in number, do not diminish the effect of the power stroke of the piston. They merely evacuate the cylinder after the piston has been returned.

In a further modified form of the invention which has been illustrated fragmentarily in FIG. 12, the same principle of piston return under the influence of expanding air in the expansion chamber 464 beneath the piston 436 and in the annulus 462 has been preserved. Again, in order to avoid repetition of description, similar reference numerals but of a still higher order have been applied to the corresponding parts as between the disclosures of FIGS. 9 and 12. In this latter form of the invention, the relief areas 332 and vertical passages 333 have been eliminated so that no live air may enter the expansion chamber 464 or annulus 462 by either bypassing it around the piston 436 as in the first form of the invention, or by utilizing a check valve type of sealing ring as in the second

form of the invention. However, relief areas 532 communicate with the splinelike grooves 530. Conventional O-ring seals 460 and 470 are employed both in the groove 466 of the piston and the groove 458 of the cylinder 434. In order to admit live air into the annulus 462 and expansion chamber 464 at the time the piston 436 completes its power stroke, a passage 533 is provided in the wall of the body portion 432, this passage establishing communication between the annulus 462 and the socket 494 within which the enlargement 492 of the valve spool 490 is disposed. Thus, at such time as the trigger element 510 is depressed so as to shift the valve spool 490 downwardly, the passage 533 is uncovered by the enlargement 492 and the annulus 462 and expansion chamber 464 receive a supply of live air directly from the chamber 484 for subsequent expansion and consequent piston return purposes in the manner previously described in connection with both the tool 20 and the tool 220.

In FIG. 8 a modified form of check valve type sealing ring 670 which is capable of substitution for either of the sealing rings 70 or 270 has been shown. The ring 670, which is formed of elastomeric material is generally circular in cross section and, in order to prevent seating of the ring against one side of the groove in which it may be positioned, a multiplicity of spacer lugs 671 are formed on one side of the ring. These lugs establish intervening voids or passageways 672 for unidirectional air flow therethrough.

The invention is not to be limited to the exact arrangement of parts shown in the accompanying drawings or described in this specification as various changes in the details of construction may be resorted to without departing from the spirit of the invention.

We claim:

1. In a pneumatically operable device for repeatedly exerting a work force in one direction, a casing having a tubular body portion, a sleeve-like cylinder in said body portion and, in combination with the wall thereof, defining a narrow fixed volume annulus, a piston slidable in said cylinder between retracted and advanced positions, a wall closing the forward end of the cylinder and annulus and defining a variable volume expansion chamber forwardly of the piston, a closure head for the rear end of the cylinder and defining a pressure chamber rearwardly of the piston, the upper end of said annulus opening into and being in communication with said pressure chamber, said cylinder having a port in the wall thereof establishing communication between said expansion chamber and annulus in all positions of the piston, valve means selectively operable to admit live air at working pressure to said pressure chamber to drive the piston forwardly to its advanced position and to relieve such pressure to allow the piston to return to its retracted position under the influence of expansion of air in said expansion chamber and annulus, an annular elastomeric sealing ring interposed between the extreme

upper end region of the cylinder and said wall of the body portion of said casing, said sealing ring being automatically effective during forward movement of the piston as well as after the piston has assumed its full forward position to bypass live air therearound and thus admit such live air at working pressure directly into said annulus from said pressure chamber for flow through said port and into said expansion chamber for storage thereof, said annular sealing ring being effective when air pressure in the pressure chamber is relieved to seal said annulus against the escape of the stored air therein whereby the stored air is effective through said port and in the expansion chamber to initiate and complete the return stroke of the piston.

2. In a pneumatically operable device, a tubular casing defining a relatively deep socket having a cylindrical rim region, a sleeve-like cylinder disposed in said socket and, in combination with the wall of the latter, defining a narrow fixed volume annulus having an upper rim, a piston slidable in said cylinder between a retracted and an advanced position, a wall closing the forward end of the cylinder and defining a variable volume expansion chamber below the piston, a closure head for the rear end of the cylinder and defining a pressure chamber rearwardly of the piston and in open communication with the upper rim of said annulus, said cylinder having a port in the wall thereof establishing communication between said expansion chamber and annulus in all positions of the piston, valve means selectively operable to admit live air at working pressure to said pressure chamber to drive the piston forwardly to its advanced position and to relieve such pressure to allow the piston to return to its retracted position under the influence of expansion of air in said expansion chamber and annulus, and unidirectional valve means automatically effective when live air is admitted to said pressure chamber and the pressure therein exceeds that in the annulus to allow such air to enter the upper rim of the annulus, said latter valve means being effective when pressure is relieved in said pressure chamber to seal the annulus against escape of the entrapped air.

3. In a pneumatically operable device, the combination set forth in claim 2, wherein said unidirectional valve means comprises a resilient sealing ring surrounding the upper rim region of the cylinder and interposed between the cylinder wall and the wall of said socket, one of said walls being provided with a groove floatingly receiving the sealing ring therein, the forward side of said sealing ring being formed with a series of recesses therein which bypass air around the sealing ring when the latter is in engagement with the forward side surface of the groove.

4. In a pneumatically operable device, the combination set forth in claim 2, wherein said groove is an external groove which is formed exteriorly in the upper rim region of the cylinder wall.

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