

May 1, 1945.

C. DESOUTTER

2,374,737

PORTABLE RIVETING PRESS

Filed Feb. 26, 1940

3 Sheets-Sheet 1

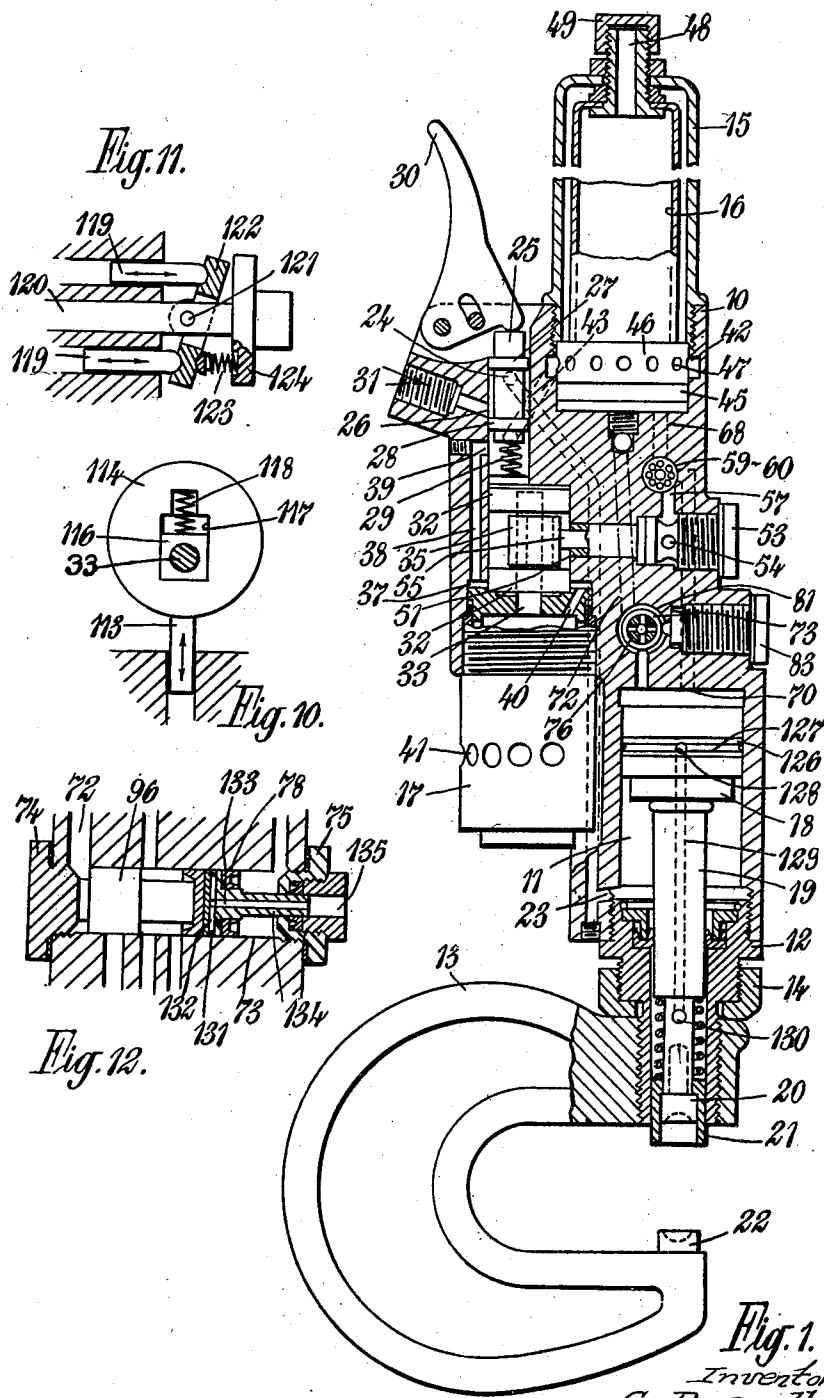


Fig. 1.
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3 Sheets-Sheet 2

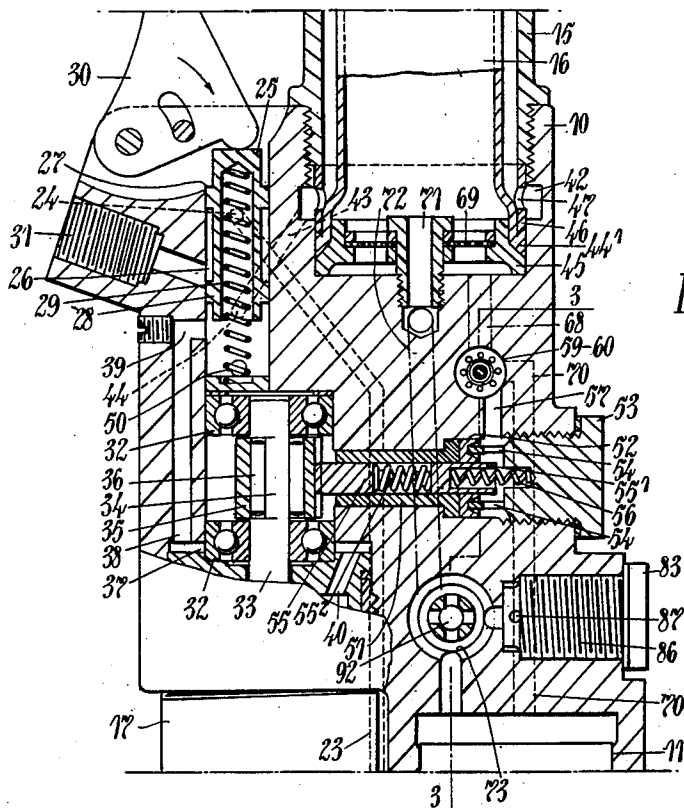


Fig. 2

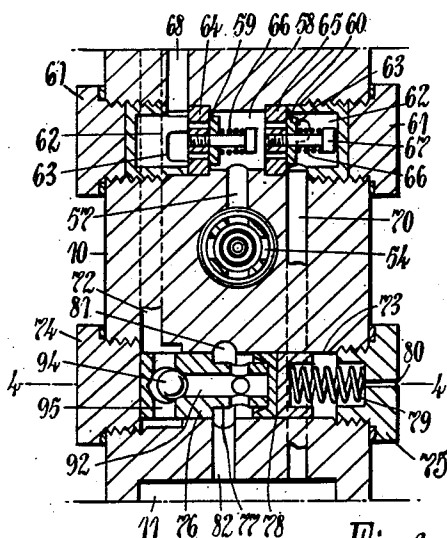


Fig. 3

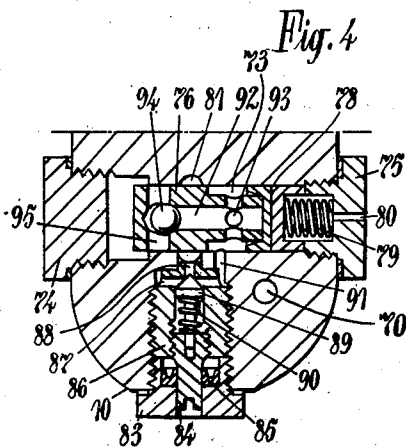


Fig. 4

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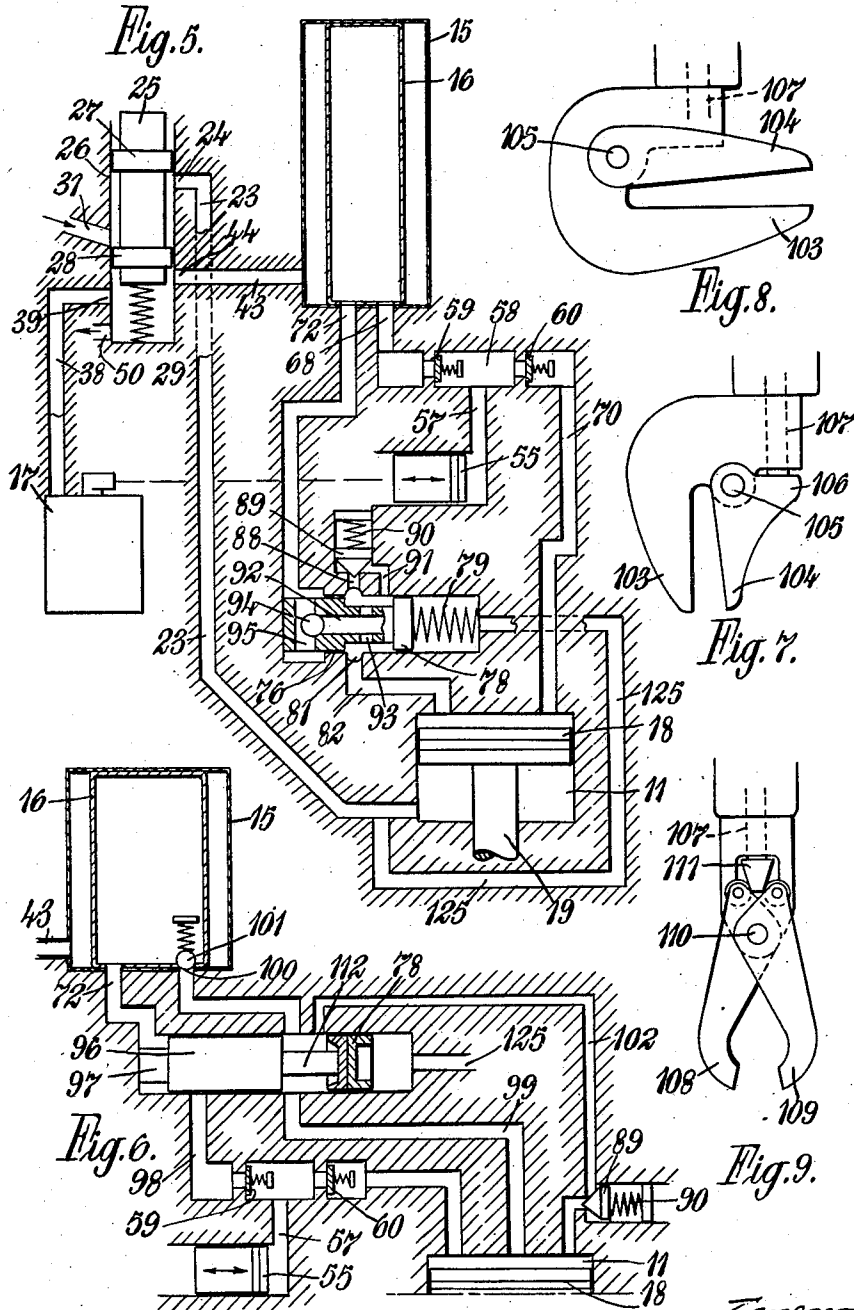
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3 Sheets-Sheet 3



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1945

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UNITED STATES PATENT OFFICE

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PORTABLE RIVETING PRESS

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Application February 26, 1940, Serial No. 320,944
In Great Britain March 1, 1939

2 Claims. (Cl. 60—51)

This invention relates to self-contained power-operated hydraulic riveting presses of the kind comprising a reservoir for the operating liquid (preferably oil), a pressure-applying piston within a cylinder, and a pump for transferring liquid under pressure from the reservoir to the pressure cylinder.

The object of the present invention is to devise improvements in the construction and arrangement of such apparatus which will result in high efficiency and the development of greater power in relation to the over-all weight and size of the device as compared with those hitherto proposed or adopted so that the device will be of a readily portable character, that is may be easily carried and applied by hand.

The invention consists in a portable self-contained riveting press comprising in combination a reservoir for the operating liquid such as oil, a pressure applying piston within a cylinder, a pump for transferring liquid from said reservoir to said cylinder and a motor for driving said pump such that it must make a plurality of revolutions or other units of movement in order to effect the power stroke.

The pump alone may supply the oil from the reservoir to the pressure cylinder but according to a further feature of the invention, another preliminary means of supply of the oil from the reservoir to the pressure cylinder is provided. This preliminary means, which independently comes into action at the commencement of the operation, causes a plentiful supply of oil to be present in the pressure cylinder under a medium pressure to effect the comparatively rapid approach, or what is herein termed the idle portion of the stroke, of the pressure piston.

Upon the completion of the said idle portion, which it should be noted may be any proportionate part of the total stroke, the arrangement is such that the pump takes over the supply, to effect what is herein termed the power portion of the stroke which completes the total stroke and effects the squeezing of the rivet or other operation.

In accordance with a still further feature of the invention, pressure-limiting means, which can be adjustably set, are provided so that when a predetermined pressure is obtained on the pressure piston increase in this pressure is prevented by the oil in the pressure cylinder being by-passed back to the reservoir.

According to another feature of the invention, and preferably operating in combination with such unloading means, hand- or automatically-controlled valve means are provided, preferably

having the form of a piston valve, associated with suitable supply and return conduits for the oil from the reservoir to the pressure cylinder and from the pressure cylinder to the reservoir. This piston control valve means may be such that it is held in a rest position by pneumatic pressure, alone or assisted by spring means, or even by spring means alone leaving open, through a one-way valve, the return conduit from the pressure cylinder to the reservoir. When, however, oil under pressure is first supplied from the reservoir, the said piston control valve immediately is moved (automatically or otherwise) to close the said return conduit; in some cases the piston control valve in its rest position closes the supply conduit and consequently when it is moved from the rest position it also opens the said supply conduit.

A still further feature of the invention consists in the main control means for the operation of the tool. This includes a manually-operated part such as a push-button, trigger or otherwise, which moves through a determined path, and by its movement controls a valve, and which may include electrical switching means if an electric motor is used. In this way, according to the degree of movement of the manually operable part, the operation can be effected by stages.

In the case where the motor driving the pump is a pneumatic motor, then advantage may be taken of the fluid (generally and hereinafter referred to as compressed air) supply connected to the tool to effect supplementary operations in the press, for example for the preliminary supply of the oil from the reservoir to the pressure cylinder, for the return action of the pressure piston, and if desired for the return of the piston control valve. In addition the air pressure may act to supply the oil from the reservoir to the pump when this latter is in operation, especially in the case of a high-speed reciprocating pump.

The invention also includes other features which will appear from the following description.

In order that the invention may be better understood, it will now be described with reference to the accompanying drawings which illustrate one example of a riveting press, having a reciprocating plunger pump driven by a pneumatic motor and constructed according to the invention.

In the drawings—

Figure 1 is an elevation partly in section showing the general co-relation of the parts.

Figure 2 is a portion of Figure 1 to a larger

scale and more fully in section insofar as details are concerned.

Figure 3 is a sectional view on the general line 3-3, Figure 2.

Figure 4 is a sectional view on the line 4-4, Figure 3, showing the parts in a different position.

Figure 5 is a diagrammatic lay-out of the conduits and connections of the press shown in the preceding figures.

Figure 6 is a view similar to a part of Figure 5 but showing a modification.

Figures 7, 8 and 9 are diagrammatic views of modifications of the arrangement of the actual riveting dies or the like.

Figures 10 and 11 show diagrammatic views illustrating modifications in the pump drive.

Figure 12 shows a section of a modified detail hereafter referred to.

In carrying my invention into effect in one convenient manner I provide the press with a body 10 formed from a drop forging or otherwise and bored at one end to constitute a pressure cylinder 11 having a cover 12 to an extension of which cover is attached a U frame 13, a lock-nut 14 securing the parts in position. At the other end the body 10 is bored to take one end of a casing 15 to accommodate a rubber sack 16 as shown, and in an intermediate position it is bored to have attached thereto by screwing one end of a pneumatic motor 17, the axis of which is parallel to or slightly inclined to that of the pressure cylinder 11. In addition, the body 10 is fabricated to accommodate the various parts hereafter referred to and has numerous conduits and passages for air and liquid (oil). These conduits and passages generally are shown in convenient positions to render clear the understanding of the drawings but it should be understood they comprise various bores and cross bores, many from the exterior, the ends of which in some cases are plugged. They however form the connections as shown in the drawings.

In the pressure cylinder 11 is an associated pressure piston 18 having a piston rod 19 the outer extremity of which carries a riveting die 20 and a spring-pressed clamping member 21. During the preliminary portion of the stroke of the piston 18 the clamping member 21 is brought into clamping position with respect to the rivet and resiliently held in position by the spring acting thereon. The hold-up or fixed die 22 is carried by the frame 13.

The cylinder 11 on the underside of the pressure piston 18 has opening therein to one end of a conduit 23 of the compressed air system, the other end of which terminates in a port 24 controlled by a valve 25 as hereafter explained. This valve which is of general hollow cylindrical form (Figures 1 and 2) works in a bore 26 in the body 10 and has two spaced flanges 27 and 28 between which is an annular space in said bore. The valve is kept pressed to its out-of-action position by a compression spring 29 and is operated by a trigger 30. 31 is a screwed bore for the connection of the supply of compressed air which bore is extended to open into the bore 26, so that in the position of rest of the valve 25, it communicates with the annular space around the valve between the flanges 27 and 28, as shown in Figures 1 and 2. In this position also it will be realized that the port 24 communicates with this annular space. Thus, in the position of rest of the valve 25, when the compressed air is supplied through the bore 31, it immediately passes through the port 24 along the conduit 23 to the cylinder 11

on the underside of the piston 18, and ensures the piston being fully returned to the position shown in Figure 1.

To prevent the possibility of the compressed air entering at the underside of the piston 18 passing to the upper part of the cylinder, where it would mix with the oil and affect the efficiency of the press, the central metal member 126 of the piston 18 has a circumferential groove 127 with one or more radial bores 128 passing to an axial bore 129 in the piston rod 19. The lower end of this axial bore 129 terminates in one or more radial apertures 130 in the lower part of the piston rod. Thus, any compressed air that may find its way past the lower part of the piston 18 is exhausted to atmosphere through the groove 127, bores 128, 129 and 130 and the socket in which the clamping member 21 is mounted without fluid tight fit.

The bore in the body 10 which receives the end of the pneumatic motor 17 is extended to take ball bearings 32 in which is mounted the shaft 33 of the pneumatic motor. Between the ball bearings 32 this shaft has an eccentrically formed portion 34 which is mounted in a strap 35 with the interposition of roller or needle bearings 36.

When the parts are so mounted, an annular space 37 is left at the end of the bore receiving the casing of the motor 17, which annular space 37 has opening therein to one end of an air conduit 38, the other end of which terminates in a port 39 opening into the bore 26. An inlet conduit 40 establishes communication between the space 37 and the inlet of the motor 17, while 41 (Figure 1) are the exhaust openings from the motor. As the port 39 does not communicate with the bore 31 in the rest position of the valve 25, it will be understood that the compressed air cannot operate the motor in this position. Actually it is not until some substantial movement is given to the valve 25 that the flange 28 passes over the port 39 to effect the necessary communication.

The bore in the body 10 for the end of the casing 15 includes, as will be seen from Figures 1 and 2, an annular space 42 which communicates by a conduit 43 with another port 44 in the bore 26. This port is also below the flange 28 in the rest position of the valve 25, but upon the initial opening movement of the valve, the flange 28 passes thereover so that air can pass to the conduit 43.

The rubber sack at its lower end has a dove-tailed flange 44' which is carried between two ring members 45 and 46. The upper end of the ring 46 abuts against the end of a screw spigot portion of the casing 15 to hold the parts in position, and the ring is provided with apertures 47 which, when the parts are mounted in position, are adjacent the annular space 42. As will be seen also the exterior of the sack 16 is spaced from the inner surface of the casing 15. Consequently, after the preliminary opening movement of the valve 25, the pressure air can enter the space around the sack 16. The upper end of the sack has an inlet nozzle 48 clamped thereto, which passes to the exterior of the casing 15 and is closed by a cap 49.

At the lower end of the bore 26 is an exhaust port 50.

Operation

The general operation of the pneumatic portion of the device thus far described is as follows.

In the position of rest, as already explained, when the compressed air is in communication with the press, the pressure thereof comes through port 31, bore 26 and ports 24 and 23 to the underside of the piston 18 to hold this in the fully returned position and, as will be appreciated, from Figure 5, the conduit 43 is closed to receipt of any compressed air and is open to exhaust through port 44, bore 26 and port 50. Initial or preliminary movement of the trigger 30 moves the valve 25 so that the flange 27 moves below the port 24 and thus the air under pressure in the cylinder 11 can be exhausted through the fully-open upper end of the bore 26. At the same time, by the movement of the trigger, the flange 28 has passed the port 44 so that through the conduit 43 the compressed air passes to the space around the sack 16 and it exercises a squeezing effect on the sack for the purpose hereafter explained.

Moreover, this supply of the compressed air to the space around the sack continues for the whole of the time the valve 25 is moved from its position of rest. By further movement of the trigger 30 the flange 28 passes by the port 39 and thus the compressed air passes to the pneumatic motor 17 and causes this to run, that is to say causes the eccentric strap 35 to be operated as and for the purpose hereafter explained. When the valve 25 returns to its position of rest both the ports 39 and 44 open to the exhaust 50, and as no supply of compressed air is passing to the motor, this stops and further the pressure is relieved from around the sack 16 and no further compressed air passes into the space around the sack.

In a bore in the body 10 having various diameters and at right angles to the axis of the shaft 33, there is arranged a flanged sleeve 51, the flanged end of which supports a bucket leather 52 which is kept pressed into position by a sleeve-like extension of a closing plug 53. This sleeve-like extension is apertured at 54 for the purpose hereafter explained, and in the flanged sleeve 51 and bucket leather 52 a pump plunger is mounted to reciprocate.

The plunger is formed from three connected parts, namely, two end parts 55 and 55', and an intermediate connecting part 55'', which in the construction shown is a helical compression spring which is mounted around pegs on the ends of the other parts. The part 55' has a bore extending partly therethrough to receive one end of a compression spring 56 the other end of which is located in a recess in the closing plug 53. The spring 56 is much weaker than the spring 55'' and serves to keep the plunger as a whole pressed into a groove on the surface of the strap 35.

The spring 55'' forming part of the plunger effects what may be termed a spring loading of the pump, so that when the reaction pressure in conduit 70, bore 58 and conduit 57 is slight, the pump plunger has its full stroke whilst when the reaction pressure is greater, the effective stroke of the plunger is lessened due to compression of spring 55''.

Modification

In place of locating a compression spring between the two parts of the plunger, equivalent constructions may be adopted, for example as shown in the diagram of Figures 10 and 11.

In Figure 10, 113 represents the plunger (corresponding to the part 55' of the foregoing modi-

fication) and 114 an eccentric mounted upon the driving shaft 33 of the motor. This shaft passes through a guide block 116 mounted to slide in a radial slot 117 in the eccentric 114. The eccentric is normally kept pressed to the maximum eccentricity by one or more compression springs 118 forming the spring loading. It will be appreciated, however, that when the reaction pressure on the plunger is sufficiently great, it wholly or partly overcomes the pressure in the spring or springs 118 effectively to reduce the eccentricity and therefore the stroke of the pump.

Figure 11 illustrates a multiple-plunger pump in which 119 are the plungers and 120 the driving shaft. This latter has mounted thereon by a pivotal connection 121 a swash plate 122 forming the driving means for the plungers. This swash plate normally is kept at the maximum angle by a compression spring 123 abutting a flange 124 but when the reaction pressure is sufficiently great, the spring is more or less compressed to vary the stroke of the plungers.

The space into which the outer part 55' of the plunger projects communicates through the apertures 54 and a conduit 57 with a chamber 58 having an inlet valve 59 opening thereinto and an outlet valve 60 opening therefrom. This chamber 58 forms a portion of a cross bore in the body 10 (see particularly Figure 3) of various diameters and for accommodating various parts.

At each end of the cross bore is a closing plug 61 and each closing plug bears on another hollow plug 62 forming a continuation thereof, each of these latter having an extension with apertures 63 therein. One extension holds an apertured valve seat 64, in position on a step in the bore to co-operate with the inlet valve while the other holds a similar apertured seat 65 in position on a step in the bore to co-operate with the outlet valve. Each valve 59 or 60 preferably is formed from a synthetic resin such, for example, as that known under the registered trade-mark "Bakelite" reinforced by fabric. In some cases other materials may be used for the valves, such for example as vulcanized fibre or cellulose compounds reinforced by fabric. Each valve is of circular disc-like form and is kept pressed on its seat by a compression spring 66 located on the stem of a headed screw 67, screwing into the seat 64 or 65 as the case may be.

On the one hand, the apertures 63 in association with the inlet valve communicate with a conduit or passage 68 in the body 10, which opens into the end of the bore in the body 10 which receives the casing 15 and ring member 45. This latter carries a filter 69 so that before the oil which is contained in the sack 16 passes to the conduit 68 it must pass through the filter. The aperture 63 in association with the delivery or outlet valve 60 communicate with a delivery passage 70 which communicates with the upper end of the cylinder 11.

The arrangement is such that when the motor 17 is running, oil from the sack 16 (subject to the squeezing action of the compressed air therearound), first of all passes the valve 59 because of the combined action of the said squeezing action on the sack and the suction of the plunger 55, 55', and then is forced past the valve 60 by the action of the plunger in its pressure stroke and into the conduit 70 and to the upper part of the cylinder 11.

The ring member 45 has a centrally disposed apertured plug 71 which communicates with a

conduit 72 leading to one end of another cross bore 73 in the body 10, the two ends of which are closed by plugs 74 and 75 (Figures 3 and 4). In this cross bore is mounted to move a cut-off valve 76. At the end remote from the conduit 72 this valve is reduced in diameter at 77 and abuts a piston 78 separate therefrom. This piston is comprised of two parts which normally in the position of rest (where the pressure piston 18 is held in the fully returned position by the compressed air from the conduit 23) are kept pressed against the reduced portion 77 by compressed air in the end of the bore 73 supplied by a conduit 125 in communication with the conduit 23 (Figure 5). If desired a compression spring 79 can also be used in addition to the compressed air for increasing the pressure on the piston 78, although this is not essential and in a further alternative a spring such as 79 alone is used. This last construction is indicated in Figures 3 and 4 and in this last case the cap 75 against which the spring abuts is open to the atmosphere by a vent 80. Just beyond the step of the piston valve 76 is an annular space 81 which communicates by a conduit 82 with the upper end of the cylinder 11. It should be noted that when the device is operated to effect riveting, the space at the end of the bore 73 behind the piston 78 (as it communicates by the conduit 125 with the conduit 23) is open to atmosphere through the port 24. Consequently the compressed air does not oppose the movement of the piston control valve.

The action of this cut-off valve is the following. When the oil from the sack 16 by the preliminary pressure of the compressed air coming on the exterior of the said sack passes through the apertured plug 71 to the conduit 72, it first of all causes the cut-off valve 76 to move to the right as shown in Figure 4 (against the action of the spring 79 if this latter is provided). When the valve 76 is so moved, the one-way valve 94 in the cut-off valve 76 is closed by the air pressure. The valve by its larger diametered portion shuts off the annulus 81 from the bore 73. At the same time, however, the pressure oil also passes through the conduit 68 and past the valves 59 and 69 (although the pump is not running) and then through the conduit 70 passes to the cylinder 11 to cause the preliminary portion of the stroke of the piston 18, that is to say until the clamp 21 comes into action and the movable die 20 comes against the end of the rivet to be "squeezed" over. When this position is attained, then upon the still further movement of the trigger 30, the pump is brought into operation so that the pressure built up thereby in the upper end of the pressure cylinder completes the stroke of the piston 18 and thus effects the squeezing over of the rivet head.

An adjustable pressure relief valve device is provided in another bore in the body 10 closed by a flanged plug 83 which is apertured for the stem of an adjustable screw 84 passing through a leather gasket 85 and abutting another plug 86, the inner end of which has a cross bore 87 with a passage 88 opening therein controlled by a conical valve 89 which is adjustably loaded through a compression spring 90 controlled by the variable position of the adjustable screw 84. The passage 88 communicates with the annular space 81, and the inner end of the bore carrying the plug 83 and associated parts communicates by a passage 91 with the space surrounding the reduced portion 77 of the piston valve. This piston valve is made hollow and provided with

a bore 92 therein having apertures 93 opening therein, in the reduced portion 77. Moreover, the bore 92 is controlled by a one-way valve 94 also located in cross bores 95 in the said piston valve.

In this manner when the pressure of the oil in the cylinder 11 exceeds a certain predetermined amount (after riveting) the oil pressure builds up in the conduit 82 and annular space 81 and the valve 89 is lifted permitting the oil from the pressure cylinder 11 to flow up the conduit 82, into the annular groove 81, through the passage 88 through the cross passage 87 and the conduit 91, into the bore 73 through the apertures 93 past the valve 94, into the cross bores 95. At this stage this high pressure oil presses against the shoulder formed between the large and small diameter portions of element 76 and moves element 76 to the left into the position shown in Figure 3 and thus uncovers conduit 82. This high pressure oil then flows up conduit 82, into annulus 81 and bore 73, through holes 93 and bores 92 and 95 and so to return through the conduit 72 and apertured plug 71 to the sack 16.

When the riveting operation is completed, the trigger 30 is released and the valve 25 is brought by the spring 29 to its rest position so that the motor 17 is stopped and the pressure around the sack 16 is relieved by exhaustion of the compressed air through conduit 43, port 44, bore 26, and exhaust port 50 and the compressed air is admitted to the conduit 23 and consequently to the space at the end of the bore 73. The compressed air supplied to the space therefore operates on the piston 78 and effects its return to the position shown in Figure 3.

It will of course be understood that prior to using the tool, the cap 49 is removed and the sack and passages in connection therewith right through to the upper portion of the pressure cylinder 11 are filled with a suitable oil, for example castor oil. Moreover, it should be remarked that with the disposition of the parts shown in the drawings (Figure 1), by holding the tool in this position with the cap removed, any trapped air will rise to the top thus permitting the whole liquid system to be adequately filled with the oil.

In the modified arrangement of cut-off valve (substituted for the cut-off valve 76 hereinbefore described) shown in Figure 6, the valve 96 has a reduced end 97 which abuts the end of its bore, and in the rest position closes the communication from the conduit 72 to a conduit 98 leading to the inlet valves 59 and 60. In this position also, a return passage 99 from the cylinder 11 communicates across the bore of the cut-off valve 96 with an inlet 100 to the sack 16, which is controlled by a one-way valve 101. Thus, in the position shown in the drawings, the oil returning from the cylinder 11 has passed through the conduit 99 to the inlet 100 past the valve 101 into the sack 16. The pressure relief valve 89 is located in another conduit 102. To the rear of the cut-off valve 96 is provided an extension of reduced diameter 112. This abuts the combined piston device 78 which is separate therefrom and is under the control of the compressed air, with or without a spring as described in reference to Figure 5.

As will be seen from Figure 6, the conduit 102 of the relief valve 89, in the position of rest of the cut-off valve 96, opens into the annular space around the extension 112 coming between

the rear of the piston control valve 96 and the piston device 78.

In operation, when the oil under pressure passes along the conduit 72, it moves the valve 96 to the right, the space behind the piston 78 being open to exhaust, and places the conduit 98 in communication with the conduit 72, allowing the oil under pressure to pass through the valves 59 and 60 to the cylinder 11. At the same time, however, it closes the communication of the return conduit 99 across its bore so that the only return conduit that communicates with the annular space behind the piston control valve 96 is the conduit 102 from the pressure relief valve 89.

Thus, in the operation of the tool with the cut-off valve in the right-hand position, upon the valve 89 rising from its seating, the oil under pressure is released from the cylinder 11 and passes through the conduit 102 back to the annular space between the piston device 78 and the rear of the piston control valve 96. The pressure of this oil moves the piston control valve 96 towards the rest position, which it attains, and opens up the return conduit 99 to the sack 16 through the one-way valve 101, the oil from the pressure cylinder returning to the sack 16 by the rise of the piston 18 under the action of compressed air supplied through the conduit 23.

As will be realised, the riveting dies may be arranged in any manner to suit the particular work to be performed. Figures 7, 8 and 9, somewhat diagrammatically, show some of these methods.

In Figure 7, the dies are carried by jaws 103 and 104, the former being attached to the body in any suitable manner and the latter being pivoted at 105 to the jaw 103. The jaw 104 has an arm 106 connected by pin and slot or other mechanism with the piston rod or the like 107 in connection with the pressure piston.

A somewhat similar arrangement is shown in Figure 8. In this case no additional arm 106 is necessary.

In Figure 9, the piston rod or the like 107 controls the closing of pivoted jaws 108 and 109, which are pivoted together at 110 on a part carried from the body, through cam and roller means 111.

Figure 12 shows a construction of piston control valve such as 96 and the piston member 78 indicated diagrammatically in Figure 6. This latter in preferred forms where compressed air is used in the bore 73 for effecting the return of the piston control valve 96, has a peripheral groove 131 with a radial bore or bores 132 communicating with an axial bore 133 in a rod-like extension 134 sliding in a guideway 135 carried by the end cap. In this manner any compressed air that tends to leak past the piston 78 to the liquid system is trapped by the groove 131 and passes by the bores 132 and 133 to the atmosphere.

As will be realised, the invention is not limited to the particular examples thereof illustrated in the drawings but can be carried into effect in a great variety of manners.

For example, where a motor other than a pneumatic motor is utilised, the copious preliminary supply may take place through the action of a pump which is either the pump connected to the motor, or a supplementary pump driven by the motor.

Insofar as details are concerned, in place of

utilising, as illustrated, a control valve, which in the example is a piston control valve, in connection with the supply and return passages and operating automatically, such control valve may be operated manually and suitably connected with the trigger, plunger or the like which operates the other parts of the apparatus. In some cases even, a special manipulatable control may be provided for setting this valve device in the required position according to the stage of the operation being performed.

Although in practice the sack device operated upon by compressed air gives good service, in some cases it may be replaced by another container. For example, such container may consist of a cylinder having a piston therein normally returned to one end thereof, preferably assisted by spring means. This piston is adapted to be operated to effect an ejection of the oil from the container by compressed air or other means. In a particular exemplification of such cylinder and piston means, the cylinder may be of transparent material (glass, synthetic resin or otherwise) enclosed within an outer casing having a window or windows (for example a longitudinal slot) so that from the exterior the operator can ascertain the amount of liquid (oil) in the said cylinder.

Although the invention has been particularly described and is particularly designed for effecting riveting operations, it is obvious that with but slight modifications the riveting dies may be replaced by other corresponding parts such as punches and cooperating dies or otherwise without any general changes of the other mechanism, and the invention must be regarded as embracing such mechanical variations.

In some cases the cylinder on the underside of the pressure piston may have the liquid therein and form part of the reservoir, or even the reservoir. In this case it is connected through suitable conduits or the like with the upper side of the pressure cylinder, with or without the inclusion in the said circuit of a supplementary reservoir. When such supplementary reservoir is provided, it may have spring or other means to compensate for the variation in the total enclosed volume due to the variable position of the piston rod. It is obvious that in such a circuit the pump and other supplying means readily can be combined to effect the operation of the tool.

In certain constructional forms the reservoir, or a part of the said reservoir, or a filling member for the said reservoir containing the liquid (for example castor or other oil), may be provided in the form of spares or cartridges. In this manner when, through leakage or the like, the oil in the system partially is used up, by the removal of the old container or the like and replacement by a fresh cartridge or the like, the oil system would be replenished.

The invention is not limited to the precise forms or details of construction described, as these may be varied to suit particular cases.

I claim:

1. A portable self-contained riveting press comprising a closed reservoir for operating liquid, a cylinder, a pressure applying piston in said cylinder, separate parallel conduits connecting said reservoir with one end of said cylinder, a pump connected with one of said conduits for transferring liquid from said reservoir to said cylinder to advance said piston, an inlet for a fluid pressure medium, control means op-

erable in one position to connect said inlet with said reservoir for rendering the fluid medium effective to transfer a preliminary supply of said liquid from said reservoir through said one conduit to said cylinder and operable in another position to conduct said fluid pressure medium from the inlet to the opposite end of said cylinder to retract said piston and return said liquid from said cylinder to said reservoir through the other conduit, a cut-off valve in the second conduit maintained in closed position by the pressure of the liquid while the control means is maintained in the first position, and means operable during the retraction of said piston to open said cut-off valve whereby the liquid may freely pass from the cylinder to the reservoir through the second conduit, said cut-off valve being in the form of a slide controlling communication through the second mentioned conduit and one end thereof being presented to the pressure of the fluid medium in the portion of the second mentioned conduit adjacent said reservoir.

2. A portable self-contained riveting press comprising a deformable reservoir for operating liquid, a cylinder, a pressure applying piston in said cylinder, separate parallel conduits

connecting said reservoir with one end of said cylinder, a pump connected with one of said conduits for transferring liquid from said reservoir to said cylinder to advance said piston, control means operable in one position to apply a fluid pressure medium to the exterior of said reservoir for transferring a preliminary supply of said liquid from said reservoir through said one conduit to said cylinder and operable in another position to supply fluid pressure medium to the opposite end of said cylinder to retract said piston and return said liquid from said cylinder to said reservoir through the other conduit, a cut-off valve in the second conduit maintained in closed position by the pressure of the liquid while the control means is maintained in the first position, means operable during the retraction of said piston to open said cut-off valve whereby the liquid may freely pass from the cylinder to the reservoir through the second conduit, and a pressure relief valve communicating with the second passage at a point between the cylinder and the cut-off valve and operable, when opened, to apply the pressure liquid from said cylinder to said cut-off valve in a direction to cause said cut-off valve to open.

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