

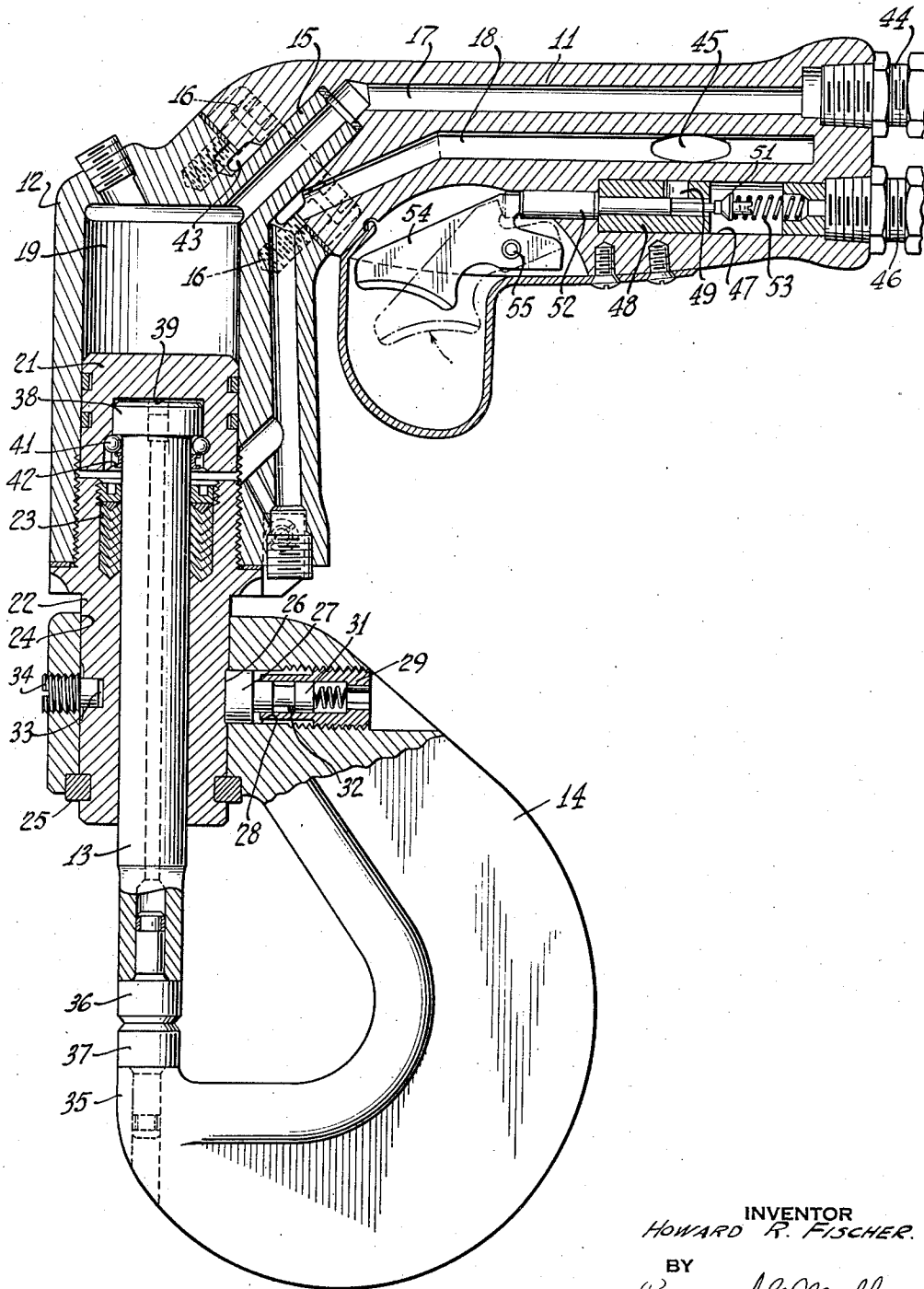
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RIVETING TOOL

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RIVETING TOOL

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7 Claims. (Cl. 78-48)

This invention relates to portable power tools and particularly to fluid pressure operated tools for riveting and the like.

This is a division of application Serial No. 305,204, filed November 18, 1939. The original application is in the names of Howard R. Fischer and Edward W. Stevens but the subject matter covered by the present case is the sole invention of said Fischer.

An object of the invention is to provide a fluid pressure operated tool which, although capable of applying a high pressure, is small, compact and well adapted for use in close quarters.

Another object of the invention is to construct the tool of a plurality of sub-units which are adjustable and interchangeable to permit modification of the tool in accordance with the requirements of a particular class of work.

A further object is to provide a tool which may be utilized advantageously in a system wherein the power generating means is located remotely from the tool which is held and applied to the work by one hand of the operator.

In carrying out these objects there has resulted a hand held power driven implement comprising a cylinder, a pressure fluid operated piston reciprocable therein, a handle for said implement, the cylinder and handle each having an abutting face disposed in a plane inclined about 45 degrees to the axes of the cylinder and handle respectively, whereby the handle and cylinder may be held in abutting engagement selectively in line with each other or at right angles to each other, a pilot portion on one of the elements providing a swivel connection, and fluid conducting passages extending between the handle and cylinder and arranged to be open in either position of the elements.

Other objects and structural details of the invention will be apparent from the description which follows when read in conjunction with the accompanying drawing which is a longitudinal section of a riveting tool constructed according to the present invention.

Referring to the drawing, the tool here disclosed as embodying the invention is one unit of an assembly further comprising a power generating unit which is connected to the tool by flexible fluid conducting hose lines and is relatively stationary or rolled along the floor while the gun is applied to working positions within the range of the hose lines. The tool is a gun adapted for the work of squeeze riveting and represents the terminus of a hydraulic system originating in the generator and controlled by

the operator holding the gun who manipulates means on the gun to effect by remote control variations in the flow of pressure fluid through the interconnecting hose lines.

The riveter is composed of several cooperating sections or sub-units each detachable from the other to facilitate assembly and replacement or servicing. These sections are, broadly, a handle 11, a cylinder 12, a piston assembly including a piston rod 13, and a yoke 14. The handle 11 is recessed to receive a pilot portion 15 integral with cylinder 12 and extending therefrom at an angle of 45 degrees relative to the axis of the main part of the cylinder. The handle 11 and cylinder 12 are secured together by means of screws 16 and are so connected that fluid conducting passages formed in each element are joined to define in effect two passageways 17 and 17 leading respectively into the upper and lower ends of a piston chamber 19 in the cylinder 12. Reciprocable within the chamber 19 is a piston head 21 movable from end to end of the chamber under the force of oil pressure supplied alternately through passageways 17 and 18. The piston rod 13 is secured to the piston head and extends downwardly through a bushing or cylinder extension 22 screwed into the lower end of the cylinder 12. The upper end of the extension 22 closes the lower end of the cylinder 12 to form the piston chamber 19. Packing 23 positioned within the extension 22, about the piston rod 13, acts to prevent the seepage of fluid downward between the rod and the extension. The extension 22 projects below the cylinder 12 and the projecting portion thereof passes through a bore 24 formed in the upper end of the yoke 14, thus establishing a swivel connection between the extension and the yoke. In order that the yoke may be held from slipping off the extension a split locking ring 25 is provided which fits in the complementary recesses or grooves cut in the extension and yoke. The yoke 14 is normally locked against axial movement relative to the extension by an annular groove 26 in the extension cooperating with a lock plunger 27 which fits a radial bore 28 in the yoke. A screw 29 secured in the bore 28 supports a spring pressed plunger 31 which acts against the lock plunger 27 to hold it in the annular groove 26. The screw 29 supports a transverse pin 32 which projects through an annular recess in plunger 31 to limit its movement in both directions. A plurality of circumferentially spaced bores 33 extend radially inward from the annular groove 26 and are arranged selectively

to receive a locking plug 34, if it is desired to inhibit swivel movement and hold the yoke 14 in a selected position of adjustment relative to cylinder 12 and handle 11.

The piston rod 13 extends through the lower end of the cylinder extension 22 and overlies an anvil head 35 formed on the yoke 14. In accordance with the usual construction of devices of this type a reciprocable contact head or die 36 is positioned in the lower end of the rod 13 and a similar die 37 is positioned in the anvil head 35. It will be further noted, in connection with the piston assembly construction that the piston rod 13 is detachably secured to the piston head 21 in order that it may be removed for individual servicing in any respect. The upper end of the piston rod 13 is formed with a head 38 which extends into a recess 39 in the piston head 21. A plurality of locking balls 41 are positioned below the head 38 in a groove cut in the inner wall of the piston head 21 and normally hold the piston rod 13 with its head locked within the recess 39. A removable retaining ring 42 is also positioned within the recess 39 below the locking balls 41 and serves to retain the balls in locking position.

An important feature of the riveter is the ease with which it may be adapted for use in operations of varying requirements. Each of the principal elements of the unit is interchangeable with other elements of different construction and a variety of combinations of these elements may be produced. The cylinders 12 vary chiefly in the diameter of their piston chambers and the selection of a particular cylinder is determined by the size of the rivets to be headed. The handle 11 also is replaceable and may be secured to the cylinder 12 in either of two positions: at right angles to the cylinder or substantially in line therewith. In the drawing the handle and cylinder are arranged at right angles, but to change the position to one of alignment it merely is necessary to remove the screws 16 and reinsert them after turning the handle through an arc of 180 degrees relatively to the cylinder about the axis of pilot portion 15. It will be noted that the separate passages in the cylinder 12 and handle 11 which comprise the passageway 18 are placed in communication with each other through an annular groove 43 surrounding pilot portion 15 and formed by the registering of individual recesses in the adjacent ends of the cylinder and handle. Thus, the handle may be turned to any extent relatively to the cylinder and communication between the passages comprising passageway 18 will also be maintained through the groove 43. Passageway 17 extends through pilot portion 15 and therefore also is always open.

Pressure fluid for actuation of the piston 21 is delivered to the base of the handle 11 by a pair of hose lines, one of which is attached to the riveter by a coupling 44 and communicates with the passageway 17. The other of the pair of lines is attached to the riveter by another coupling (not shown) and communicates through a port 45 with the passageway 18.

If it is desired to operate the gun as an independent machine the supply of pressure fluid to the passageways 17 and 18 may be placed under the control of any known valve means which is adjustable to connect the passages alternatively to the source of pressure and to exhaust. In the present instance, however, the riveter is adapted for use in conjunction with a power generator, the operation of which is controlled by com-

pressed air bleeding means preferably located on the gun. A compressed air hose line (not shown) connects the generator and riveter, being attached to the gun by a coupling 46 at the base of handle 11. Air passing from the generator through the hose line enters a bore 47 and, at the will of the operator, exhausts through a bushing 48 and port 49 therein communicating with the atmosphere. Such a flow operates (in a manner not essential to an understanding of the present invention) to initiate a cycle of machine operation during which the piston 21 and rod 13 descend to upset the rivet and then return upward in preparation for a new cycle. The escape of the air from bore 47 is controlled by a valve 51 at one end of a stem 52 reciprocable within the bushing 48. The valve 51 is pressed by a spring 53 to a seated position on the bushing 48 and, when so seated, cuts off the flow of air from bore 47 to exhaust port 49. Opening of the valve 51 is accomplished by applying pressure to the opposite end of stem 52, a trigger 54 being provided for this purpose. The trigger 54 is pivoted at 55 and when rocked in a clockwise direction (as viewed in the drawing) unseats the valve 51 and allows the air to pass to atmosphere. The valve 51 is illustrated as fully open but it preferably is moved to such position in step-by-step fashion in order that the rate of flow of the escaping fluid will vary. According to the construction of the power generator such a method of manipulating the trigger 54 causes the cycle of operation to be conducted in successive stages. First the trigger 54 is moved to an intermediate position and a relatively low pressure is applied to the rear of piston 21 to engage or "set" the rivet. When the operator observes that this step of the operation is satisfactorily completed he continues actuation of the trigger 54 until valve 51 is fully open whereupon the pressure in back of piston 21 is intensified and the rivet is "headed." Upon release of the trigger 54 or through the action of automatic means, independent of the trigger, the flow of hydraulic fluid through the passageways 17 and 18 is reversed and the piston 21 is returned upward in chamber 19 thereby separating the dies 36 and 37.

While the invention has been described with particular reference to a compression riveter it is susceptible of embodiment in riveting and like tools of the type which operate with a pulling action.

What is claimed is:

1. A portable compression riveter comprising a cylinder providing a piston chamber, a piston reciprocable therein, one end of the cylinder being adapted to support a yoke, the other end of the cylinder having a pilot portion projecting at an angle of about 45 degrees to the axis of the cylinder, said piston and yoke being adapted to carry complementary dies engageable with opposite ends of a rivet, a handle swivelly mounted on said pilot portion and extending in a direction about 45 degrees from the pilot portion whereby the handle may be swung into a position in line with or at right angles to the cylinder, and securing means for holding the handle relative to the cylinder in the selected positions of adjustment.

2. A portable compression riveter according to claim 1 in which one end of the piston chamber is connected to a pressure fluid passage in the handle and communication therebetween is maintained in the various positions of adjust-

ment by a passageway extending through the pilot portion.

3. A compression riveter comprising a cylinder providing a piston chamber, a piston reciprocable therein, a handle connected to the cylinder for adjustment about a swivel axis and having a pair of pressure fluid passages therein, means for establishing communication between the handle passages and the respective ends of the piston chamber to reciprocate the piston, said means comprising two passageways extending between the cylinder and handle and each having a portion arranged concentrically with respect to the swivel axis, said piston and cylinder being adapted to carry complementary riveting dies engageable with the work upon movement of the piston.

4. A fluid pressure operated tool comprising a cylinder having a yoke swivelly mounted on one end and a handle swivelly mounted on the other end, the swivel axis for the yoke being in line with the cylinder axis, the swivel axis for the handle being inclined to the cylinder axis, the handle extending in a direction inclined from the associated swivel axis, and means for securing the handle rigidly to the cylinder in its selected positions of adjustment.

5. A fluid pressure operated tool comprising a cylinder providing a piston chamber, a piston reciprocable therein, a handle for said tool, said cylinder and handle having abutting end faces, a pilot portion on the abutting end of one of said elements projecting at an angle of about 45 degrees to the axis of said element, the other of said elements being swivelly mounted on said pilot portion, pressure fluid passages in said handle for delivering pressure fluid to the piston chamber of said cylinder to effect relative movement between the piston and cylinder, complementary work engaging elements carried by the piston and cylinder, and an annular groove sur-

rounding said pilot portion and formed by a recess in the abutting face of one of said handle and cylinder elements connecting one of said passages to one end of said piston chamber and maintaining communication therebetween in any relative position of rotation of said handle and cylinder.

6. A Pressure fluid operated tool according to claim 5, characterized in that said pilot portion is provided with a longitudinal bore maintaining constant communication between another of the pressure fluid passages in said handle and the other end of said piston chamber.

7. A hydraulic fluid pressure operated tool comprising a cylinder and a supporting handle extending transverse to each other, the rear end of the cylinder and the adjacent end of the handle having abutting end faces in a plane oblique to the axes of the cylinder and handle, a pilot portion on the cylinder surrounded by said abutting end faces and projecting at right angles to the plane of the latter and fitting a complementary recess in the handle, the cylinder providing a piston chamber, a piston reciprocable in the piston chamber, said piston and cylinder being adapted to carry complementary dies engageable with opposite sides of the work upon relative movement between the piston and cylinder, a passageway connecting the rear end of the piston chamber with a hydraulic fluid passage in the handle, a second passageway connecting the front end of the piston chamber with a second hydraulic fluid passage in the handle, one of said passageways including a bore through the pilot portion of the cylinder and the other passageway including an annular chamber surrounding said pilot portion, the annular chamber consisting of a groove formed in one or both of said abutting end faces.

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