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FLUID PRESSURE OPERATED PORTABLE COMPRESSING TOOL

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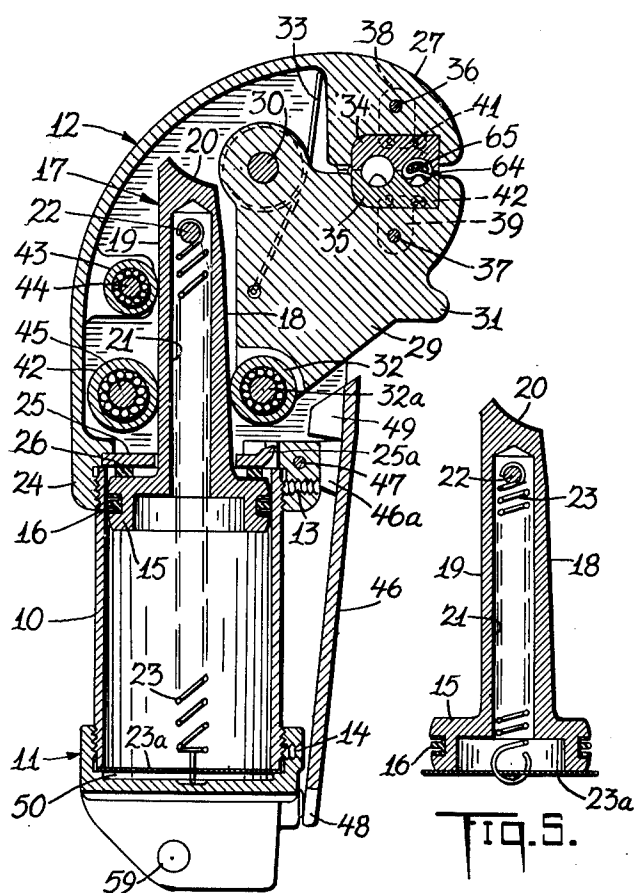


FIG. 2.

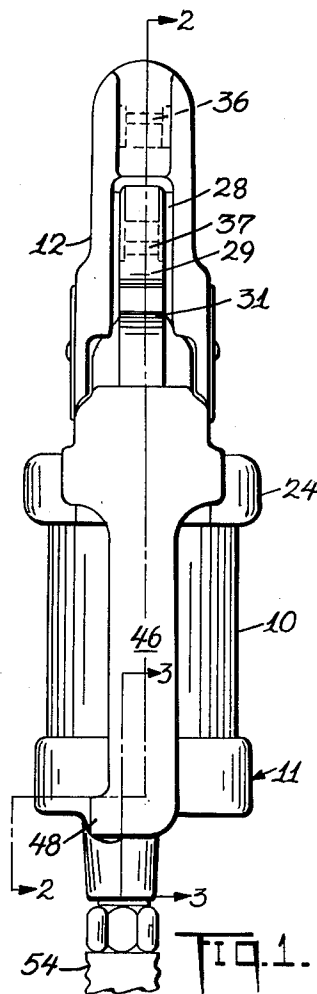


FIG. 1.

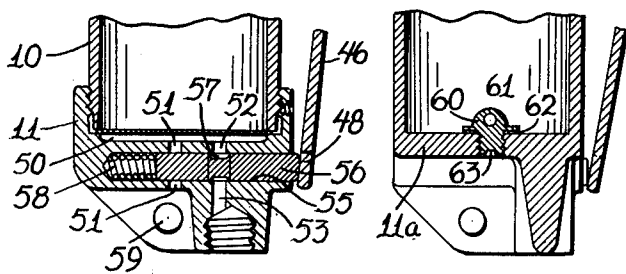


FIG. 3.

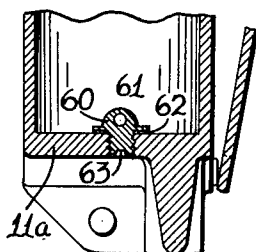


FIG. 6.

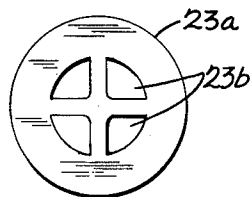


FIG. 4.

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FLUID PRESSURE OPERATED PORTABLE
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4 Claims. (Cl. 81—15)

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My invention broadly relates to a portable pneumatically operated compressing tool, and more particularly to such a tool for use in crimping and indenting operations. This application is a continuation-in-part, of my application Serial No. 63,068, filed December 2, 1948.

Heretofore, portable crimping tools have consisted primarily of hand operated mechanical fulcrum type tools requiring sufficient manual exertion from the operator to cause the indentation, which became laborious and strenuous where a large number of indentations were required for a particular installation. For large size indentations hydraulic tools have been devised to provide the necessary pressure to make the indentation, but these tools had long operating handles and because of their weight and size were not suitable for use in restricted areas. In such installations it is necessary that the tool be small and compact to be easily handled by the operator and operable in confined spaces and awkward positions, and at the same time be power operated to enable a plurality of indentations to be made without fatigue.

It is therefore the principal object of my invention to provide a small portable compressing tool that is compact and which can be easily operated.

Further objects consist in providing a compressing tool which may be readily operated no matter where on the handle the tool is grasped; in providing a compressing tool, wherein the object to be compressed may be clamped in position prior to the operation of the tool to insure maximum safety and ease of operation; to provide manual means whereby the object compressed may be readily unclamped after the compressing operation; to provide means whereby the return mechanism may be located so as not to increase the bulk of the tool and thus prevent its use in restricted areas; to provide a tool wherein the various elements may be organized into sub-assemblies to facilitate the production of the tools in quantity and to provide means for controlling the open and close position of the tool from the supporting position on the handle.

I accomplish these and other objects and obtain my new results as will be apparent from the device described in the following specification, particularly pointed out in the claims, and illustrated in the accompanying drawing, in which—

Fig. 1 is a side elevation view of my device equipped for indenting electrical connectors to conductors.

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Fig. 2 is a longitudinal cross sectional view of the tool taken along line 2—2 of Figure 1.

Fig. 3 is a sectional view of the valve shown in the cylinder—charging position and taken along line 3—3 of Figure 1.

Fig. 4 is an elevation view of the anchor plate for the piston return spring.

Fig. 5 is a partial cross section view of the piston return spring assembly.

Fig. 6 is a sectional view of a modified form of a return spring attaching means.

Referring to the drawing, the tool comprises a tube 10 or cylinder constituting a handle portion having a valve unit 11 threadedly attached to one end forming the base, and a fixed jaw body 12 threadedly attached to the opposite end, each end being locked in position by set screws 13 and 14. Within the tube is reciprocally mounted a fluid operated piston 15 provided with a peripheral groove to house a conventional packing ring 16, and an integrally formed extension 17 substantially square in cross section, having a lateral cam surface 18, a bearing surface 19, and a clearance surface 20 at the end thereof for a purpose later to be described. A longitudinal drilled aperture 21 is provided in the extension in which is secured by pin 22 one end of a return tension spring 23, the other end of the spring being anchored to plate 23a, shown in Figure 4, which abuts the end of the cylinder and has apertures 23b to permit the admission of the compressed air into the cylinder. The anchor plate, return spring and piston form a sub-assembly and are readily removable as a unit as shown in Figure 5. The fixed jaw body 12 is recessed at the circular base portion 24 to receive plate 25, having a struck-up lip 25a to engage the base 24, and forms a guide for the piston extension. A buffer ring 26 prevents a metal-to-metal contact with the piston.

At the other end of the body there is provided a head portion 27 to receive a crimping die. The central portion of the body is slotted at 28 to receive the movable jaw 29 pivotally mounted at fulcrum pin 30 and provided with thumb portion 31 and roller 32 pinned at 32a, which rides along the cam surface 18. Closing spring 33 has one end mounted in the movable jaw and the other end bearing against the head portion 27 to spring bias the movable jaw to a closed position with the fixed jaw. Nest die 34 and indenter die 35 are detachably secured to the fixed jaw and the movable jaw, respectively, by bolts 36 and 37 which extend through each jaw member to contact end plates 38 and 39 which are

attached to the dies by screws 40 and 41. The dies are interchangeable depending on the size of the conductor to be crimped.

Thrust roller bearings 42 and 43 are mounted within the slotted body by cross pins 44 and 45 respectively, and contact bearing surface 19 of the piston extension to maintain the piston extension in proper alignment when fully extended for the crimping operation. The cam surface 18 is designed to give the movable jaw its greatest movement at the start of the indenting operation and transmit the greatest force toward the end of the indenting operation.

The lever handle 46, controlling the power operation of the tool, is pivotally mounted through normally extending ears 46a, at one end to the circular base portion 24 by pivot pin 47. The lever handle extends substantially the length of the tube 10 to the end of the valve unit 11 and is provided with an offset portion 48 at the free end. A projection 49 on the lever handle adjacent the pivot pin abuts the circular base portion to limit the outward movement of the lever handle.

The valve unit 11 acts as a cap for the lower end of the tube, and is provided with a recess 50 forming an air passage between the cylinder and anchor plate 23a. The cap has two longitudinally drilled fluid passages 51 and 52 as shown in Figure 3, leading to the cylinder and offset from the center thereof to avoid interference by the anchoring end of the return spring; exhaust passage 51 extends to the atmosphere, while inlet passage 52 extends to the inlet port 53 to which is threadedly attached the flexible air inlet hose 54. The valve cylinder 55 is transversely positioned in the valve unit to intersect the passages 51 and 52 and receives the valve piston 56 having an annular undercut port 57. The piston is spring loaded by return spring 58 to an extended position to block the inlet passage 52, at which time the exhaust port 51 is open to vent the cylinder around the spring end of the piston. The piston is moved inwardly by the offset portion 48 of lever handle 46, compressing the return spring and aligning the undercut port 57 with the passage 52 to permit charging the cylinder, and simultaneously blocking the exhaust passage 51, as shown in Figure 3. Supporting aperture 59 located at the end of the valve unit permits the unit to be conveniently suspended when not in use.

In Figure 6 is shown a modified form of means for securing the return spring 23 within the tube by providing a stud 60 having an attaching aperture 61 to receive the lower end of the return spring and a gasket 62. The stud is threadedly secured within the valve unit 11a and extends therethrough providing adjustability at slot 63 from a point outside of the tool. In this modification the valve unit is formed integral with the lower end of the tube.

To crimp a connector the following procedure is followed; the tool being in a non-actuated position, with the valve extended under spring pressure to exhaust the cylinder and the piston extension retracted within the cylinder. The operator depresses the thumb portion 31 on the movable jaw against the action of the spring 33, allowing the cam roller 32 to clear the piston extension through the clearance surface 20 at the end of the piston extension to permit the movable jaw to open fully. The electrical connector 64 is positioned between the dies and the thumb portion is released, the movable jaw

clamping the connector to the fixed jaw through spring 33 permitting the tool to be held in any position without the connector falling out until the operator is ready for the next step. The conductor 65 is then inserted into the connector and the handle is grasped by the operator depressing the lever. It is to be noted that regardless of what position the handle of the tool is grasped by the operator, as may be required by the particular location of the conductor, the hand lever can always be easily actuated. When actuated, the hand lever depresses the valve piston 56 against the spring 57 to align the inlet port with the cylinder through undercut port 56. Fluid pressure admitted to the cylinder forces the piston upward against the action of return spring 23, while roller 32 riding along the cam 18 applies the necessary force at the jaws to properly crimp the connector to the conductor. Roller bearings 43 and 44 prevent any lateral movement of the piston extension.

Upon release of the hand lever the valve is spring actuated to an extended position to block the inlet port, and exhaust the cylinder, the piston being retracted by the return spring, permitting the movable jaw to be depressed by the thumb portion and the indented connector removed.

By positioning the movable jaws of my device to open in a direction of the longitudinal axis I am able to perform my compressing operation in any recess in which I can longitudinally position my tool. The compactness of my tool has been further obtained by locating the return spring within the piston thus avoiding increased lateral and longitudinal bulk. By providing a handle which extends longitudinally throughout the gripping and supporting area, I am able to operate my tool without moving the hand once the tool is grasped. I have furthermore located the thumb portion of the movable jaw to make it readily accessible to the hand when the tool is grasped. By spring biasing one of the jaws, I am able to hold the tool in one hand while positioning a connector therebetween, permitting the same hand that inserted the connector to position a conductor therein. Additionally, the sub-assembly of the piston and return spring greatly facilitate the repair and assembly of the main portion of the tool.

I have thus described my invention, but I desire it understood that it is not confined to the particular forms or uses shown and described, the same being merely illustrative, and that the invention may be carried out in other ways without departing from the spirit of my invention, and, therefore, I claim broadly the right to employ all equivalent instrumentalities coming within the scope of the appended claims, and by means of which, objects of my invention are attained and new results accomplished, as it is obvious that the particular embodiments herein shown and described are only some of the many that can be employed to attain these objects and accomplish these results.

I claim:

1. A fluid operated compressing tool comprising a body member having a tube with two end walls and a jaw member fixedly mounted thereto, a jaw member movably mounted to the body member, a piston operable within said tube having a hollow camming section projecting outside and beyond one end wall of the tube to actuate the movable jaw toward said fixed jaw member when fluid pressure is admitted to the

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tube and hollow camming section, and resilient means under tension, one end of which is secured within the tube to the other end wall thereof and attached to the outermost end of the hollow camming section of the piston to return the piston to a retracted position when the fluid pressure is vented from the tube, said piston being hollow along its longitudinal axis into which the resilient means is positioned.

2. A fluid operated compressing tool comprising a body member having a tube and a jaw member fixedly mounted thereto, a jaw member movably mounted to the body member, a piston operable within said tube and provided with a cam to actuate the movable jaw toward said fixed jaw member when fluid pressure is admitted to the tube, means for returning said piston to a retracted position, said movable jaw member spring biased to a closed position with respect to the fixed jaw, said cam applying pressure very gradually in the closed position of the movable jaw, and a thumb portion on the movable jaw adapted to be engaged by the operator to open the jaw against the spring bias.

3. A fluid operated compressing tool comprising a body member having a tube and a jaw member fixedly mounted thereto, a jaw member movably mounted to the body member, a piston operable within said tube to actuate the movable jaw toward said fixed jaw member when fluid pressure is admitted to the tube, means for returning said piston to a retracted position, said tube forming a handle, a valve mounted on the handle to control the operation of the piston,

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and a hand lever movably mounted to the body to actuate the valve and extending substantially the length of the tube, a spring secured to said movable jaw for biasing said jaw to a closing position and a thumb portion projecting from said movable jaw adjacent the hand lever for enabling said jaw to be opened against the action of the spring by the same hand that is supporting the tool.

4. In a fluid operated compression tool having a piston provided with return spring operated in tension, an anchoring plate for said spring, having a diameter slightly larger than the piston, and fluid openings to permit the piston to be actuated by the fluid passing through the openings.

HENRY P. DUPRE.

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