

Aug. 17, 1943.

R. O. ALLEN

2,326,735

FLUID ACTUATED TOOL

Filed Nov. 8, 1941

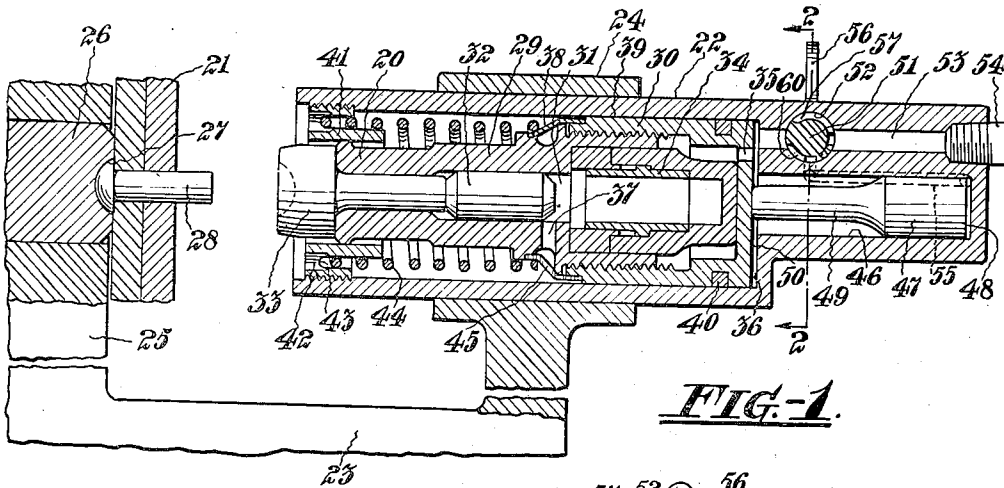


FIG. 1.

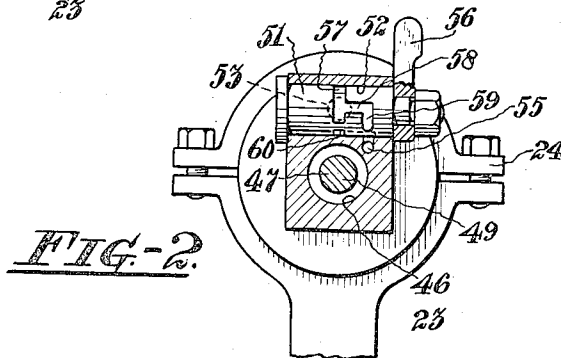


FIG. 2.

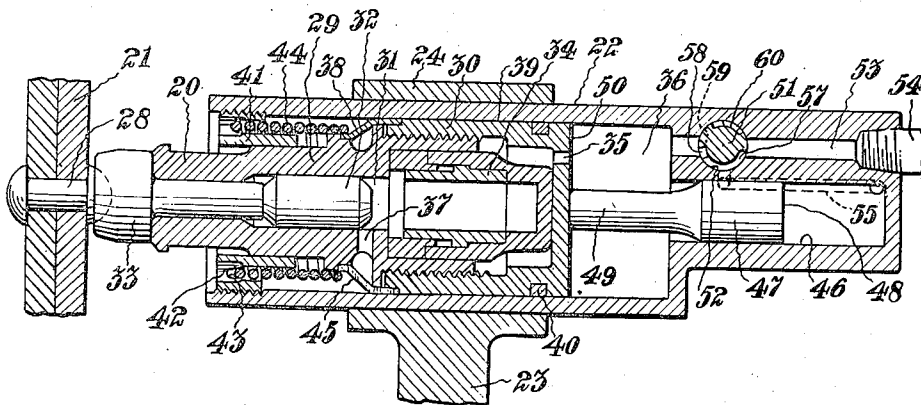


FIG. 3.

INVENTOR
Roy O. Allen
 BY *Coada*
 HIS ATTORNEY.

UNITED STATES PATENT OFFICE

2,326,735

FLUID ACTUATED TOOL

Roy O. Allen, Athens, Pa., assignor to Ingersoll-Rand Company, New York, N. Y., a corporation of New Jersey

Application November 8, 1941, Serial No. 418,315

3 Claims. (Cl. 121—9)

This invention relates to fluid actuated tools, and more particularly to a fluid actuated riveting machine of the percussive type having a mounting to slidably support the riveting machine with respect to the work.

One object of the invention is to enable the riveting machine to be conveniently shifted to different working positions with respect to its mounting in accordance with the variations in the dimensions of the work upon which the machine operates.

Another object is to enable the riveting machine to be moved to and held against the work under a comparatively light pressure so that the work may be conveniently adjusted to a correct position with respect to the riveting machine before a heavy holding pressure is applied to the riveting machine for retaining it firmly against the work during the upsetting of a rivet.

Other objects will be in part obvious and in part pointed out hereinafter.

In the drawing accompanying this specification and in which similar reference numerals refer to similar parts,

Figure 1 is a longitudinal elevation, partly in section, of a fluid actuated tool constructed in accordance with the practice of the invention and an example of work upon which the tool may operate,

Figure 2 is a transverse view taken through Figure 1 on the line 2—2, and

Figure 3 is a view similar to Figure 1 showing the percussive element of the tool in a working position.

Referring more particularly to the drawing, 20 designates a fluid actuated power unit shown as being in the form of a riveting machine and 21 an example of work upon which the riveting machine may operate. The riveting machine is arranged slidably in a casing 22 supported by a bracket 23 which also supports the work 21.

The casing 22 is adjustable with respect to the bracket 23 and the bracket is accordingly provided with a clamp element 24 of a well known form adapted to enable the casing 22, together with the riveting machine, to be shifted to or from the work. The bracket 23 has an arm 25 that lies in the path of the riveting machine and contains an anvil block 26 having a suitable recess 27 to accommodate the head of a rivet 28 extending through the work 21.

Briefly described, the riveting machine 20, which may be of a known type, comprises, as casing parts, a cylinder 29 and a head block 30 threadedly connected thereto. The cylinder has

a piston chamber 31 for the accommodation of a hammer piston 32 reciprocable in the piston chamber for actuating a rivet set 33 at the front end of the cylinder.

A suitable valve mechanism 34 is arranged in the cylinder and the head block for distributing pressure fluid to the piston chamber, such pressure fluid being conveyed to the valve mechanism by a passage, or passages, 35 in the head block 30 and communicating with the rearward end of the chamber or bore 36 in the casing 22 wherein the riveting machine is slidably arranged. The piston chamber has a free exhaust port 37 intermediate its ends to communicate the piston chamber with the bore 36 forwardly of the head block 30, and an exhaust deflector 38 encircling the front end of the head block 30 and the adjacent portion of the cylinder 29 overlies the exhaust port 37.

The peripheral surface 39 of the head block 30 has a nice sliding fit on the surface of the bore 36, and in the periphery of the head block, preferably near the rearward end thereof is a sealing ring 40 to prevent the leakage of fluid along the cooperating surfaces of the head block and the bore 36. The riveting machine is additionally guided in the casing 22 by a bushing 41 threaded into the front end of the casing and acting as a guide for the forward portion of the cylinder.

The port, or ports, 42 extends longitudinally through the wall of the bushing 41 to communicate the space of the bore forwardly of the exhaust deflector with the atmosphere. The wall of the bushing is, moreover, grooved to provide a seating surface 43 for an end of a spring 44 which encircles the cylinder and seats with its other end against an inclined shoulder 45 of the exhaust deflector 38.

The riveting machine, when idle, is held in its rearmost limiting position in the bore 36 by the spring 44 but is actuated to the different working positions which it may occupy by pressure fluid. To this end the casing is provided with a bore 46 of considerably smaller diameter than the bore 36, into which it opens with its front end, and in the bore 46 is a free plunger 47 having a pressure surface 48 on its rearward end to which pressure fluid is applied for moving the riveting machine forwardly in the casing 22. On the opposite end of the plunger 47 is a reduced stem 49 that seats against the rearward end of the head block 30 constituting, in the construction shown, a pressure surface 50.

The pressure fluid applied to the pressure sur-

faces 48 and 50 is controlled by a valve 51 of the rotary type arranged in a valve chamber 52 that bisects a passage 53 leading from a supply conduit 54, at the rearward end of the casing 22, to the bore 36. A passage 55 also leads from the valve chamber 52 to the rearward end of the bore 46.

The throttle valve, which is provided with a lever 56 for its manipulation, has a partly annular peripheral groove 57 of such length as to afford communication between the several branches of the passage 53 in what may be termed the open position of the valve 51. A branch passage 53 leads from an intermediate portion of the groove 57 longitudinally along the valve 51 to a partly annular passage 59 also in the periphery of the valve. The passage 59 lies in the same longitudinal plane as the point of communication of the passage 55 with the valve chamber 52 wherewith it is intended to register.

The passage 59 is so arranged that its leading end lies in a different radial plane than the corresponding end of the groove 57 in order that pressure fluid may be introduced into the passage 55 before the valve reaches a position in which the groove communicates the branches of the passage 53 with each other.

The valve 51 also controls the exhaust of fluid from the bore 46 and to this end the valve is provided in its periphery with an annular passage 60 to afford communication between the passage 55 and the branch of the passage 53 lying between the valve chamber 52 and the bore 36.

In the operation of the device, the valve 51 is rotated to bring the leading end of the passage 59 into registry with the passage 55. Pressure fluid will then flow into the bore 46 against the pressure surface 48 and move the riveting machine 20 forwardly in the casing 22 until the rivet set 33 seats against the rivet 28. The machine 20 will move readily in the direction without creating a sub-atmospheric pressure in the chamber 36 since the said chamber will be in communication with the atmosphere through the exhaust port 37, the piston chamber 31 and the passages in the riveting machine that control the actions of the valve 34 and the piston 32. After the work has been correctly positioned with respect to the riveting mechanism the valve 51 is rotated further in the same direction until the groove 57 communicates the several branches of the passage 53 with each other. Pressure fluid then flows into the rearward end of the bore 36 against the pressure surface 50 to hold the rivet set 33 firmly against the work and to set the riveting machine 20 in operation.

In the new position of the valve 51 and simultaneously with the admission of pressure fluid into the bore 36 pressure fluid will also flow from the bore 36 through the port 35 to the distributing valve mechanism whereby it will be distributed to the ends of the piston chamber 31 for actuating the piston 32. Such pressure fluid exhausts from the piston chamber 31 through the port 37 and the exhaust deflector into the forward portion of the bore 36, thence through the ports 42 to the atmosphere.

The riveting machine and the plunger 47 will remain in the positions described and the percussive and the pressure fluid distributing element of the riveting machine will continue op-

erating as long as the valve 51 remains in the open position. After the rivet 28 has been upset the valve 51 is returned to its initial position wherein the passage 60 communicates the passage 55 with the branch of the passage 53 leading from the valve chamber 52 to the bore 36. The pressure fluid supply will then be cut-off from the bores 46, and 36 and the pressure fluid in the bore 46 will exhaust through the passages 55, 60 and 53 into the bore 36, whence it may pass through the valve mechanism 34 and the piston chamber 31 to the atmosphere together with the pressure fluid existing in the chamber 36 after the valve 51 has been moved to its closed position. The spring 44 will then return the riveting machine and the plunger 47 rearwardly to their starting positions.

I claim:

1. A fluid actuated tool, comprising a stationary casing, a fluid actuated percussive power unit slidable in the casing, means to yieldingly resist forward movement of the power unit in the casing and to move the power unit rearwardly in the casing, a free plunger in the casing seating against the power unit and having a pressure surface, a pressure surface on the power unit of different area than the first mentioned pressure surface, pressure chambers for the accommodation of the pressure surfaces and one of said pressure chambers serving as a supply chamber for the power unit, and means for subjecting the pressure surface of smaller area to pressure fluid to move the power unit forwardly through the casing to a working position and to subsequently subject the other pressure surface to pressure fluid for holding the power unit in such working position.

2. A fluid actuated tool, comprising a stationary casing, a fluid actuated percussive power unit slidable in the casing, a free plunger in the casing to seat against the rearward end of the power unit and having a pressure surface, a pressure surface on the power unit, pressure chambers for the accommodation of the pressure surfaces and one of said pressure chambers serving as a supply chamber for the power unit, and means for first subjecting the pressure surface on the plunger to pressure fluid for moving the power unit forwardly in the casing to a working position and subsequently subjecting the pressure surface on the power unit to pressure fluid for holding the power unit in such working position.

3. A fluid actuated tool, comprising a stationary casing, a fluid actuated percussive power unit slidable in the casing, a pressure surface on the power unit, a free plunger in the casing seating against the power unit and having a pressure surface of smaller area than the first-mentioned pressure surface, pressure chambers for the accommodation of the pressure surfaces and one of said pressure chambers serving as a supply chamber for the power unit, and a valve movable to one position to first valve pressure fluid to the pressure surface on the plunger to move the power unit forwardly in the casing to a working position and being movable to another position to valve pressure fluid to the pressure surface on the power unit to hold the power unit in such working position.

ROY O. ALLEN