

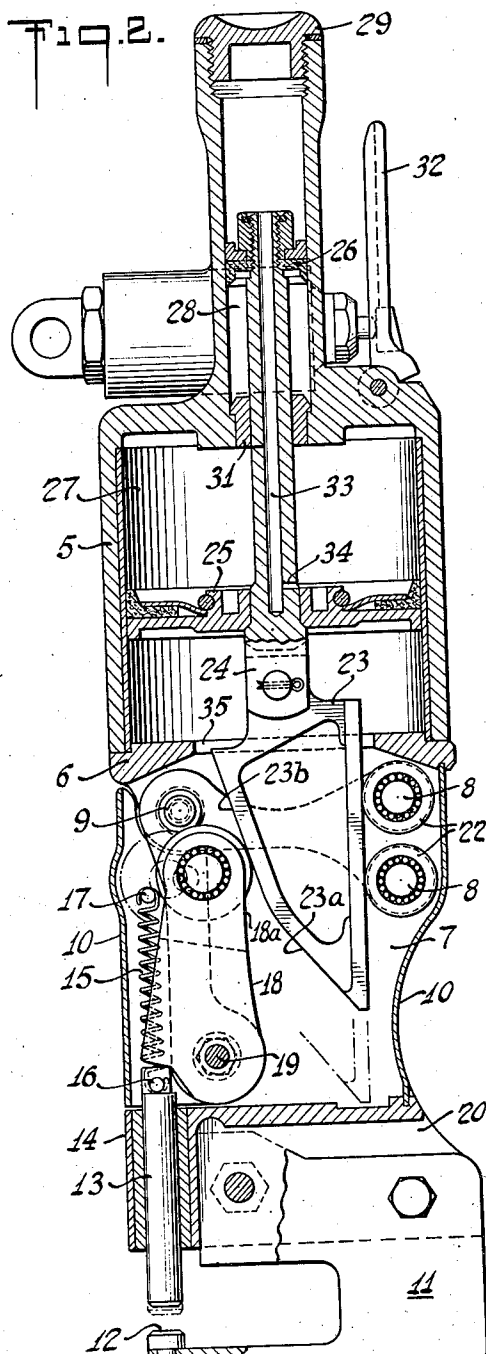
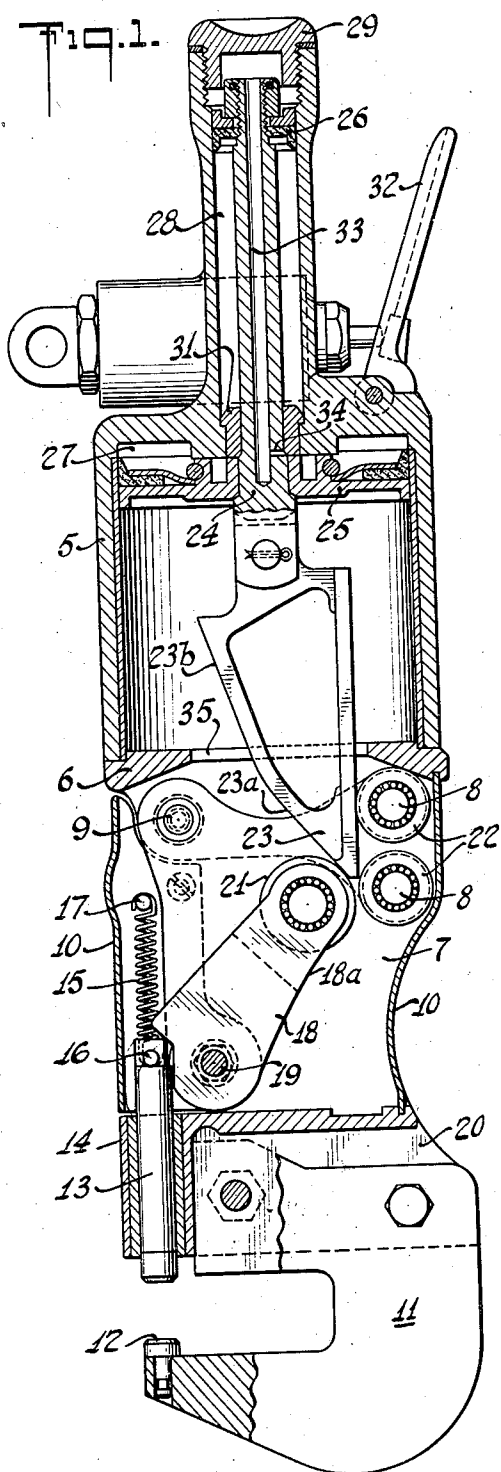
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COMPRESSION RIVETER

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COMPRESSION RIVETER

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This invention relates to squeeze riveting and like machines and more particularly to means for applying the rivet setting pressure. This is a division of application Serial No. 316,299, filed January 30, 1940, now Patent No. 2,310,625, dated February 9, 1943.

One object of the invention is to transmit the motion of a reciprocable power piston to a parallel rivet setting plunger through a wedge movable with the piston and through a pivoted lever having arms engaged respectively with the wedge and with the plunger, the wedge being doubly inclined in order to move the plunger at different speed and force ratios.

Another object of the invention is to cause the rivet set plunger to exert substantially the same ultimate pressure irrespective of the thickness of the work sheets.

The latter object is accomplished by making the second of the wedge inclines engaged by the pivoted lever of uniform slope so that the mechanical advantage varies but little during the rivet setting portion of the power stroke. In a comparable device of the prior art the mechanical advantage changes greatly during the power stroke, maximum pressure being not attained until near the end of the limit of movement of the wedge. As a result that device is suited for use only with sheets of uniform thickness. In riveting other, thicker, sheets the strokes of the rivet set plunger and of the wedge are shortened and the full rivet heading pressure cannot be applied.

Other objects and structural details of the invention will be apparent from the following description when read in conjunction with the accompanying drawings, wherein:

Fig. 1 is a view chiefly in longitudinal section, of a riveting unit embodying the mechanism of the invention, the parts being shown at the end of the return stroke which is their normal position; and

Fig. 2 is a view similar to Fig. 1 showing the parts at the end of a power stroke, and in full and dotted outline indicating respectively the positions assumed when the work sheets are thick and when they are thin.

The machine disclosed herein as embodying the mechanism of the present invention is a portable compression riveter which is light in weight and is adapted to be held or supported in the hands of the operator, when in use. Referring to the drawing, it will be seen that the principal supporting elements of the machine are a cylinder 5, an adapter 6, associated with the cylinder, and a U-shaped bracket 7 secured to the adapter.

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A pair of guard plates 10 enclose the open sides of the bracket 7. The adapter 6 fits into one end of the cylinder 5 and is held in place by screws (not shown) extending into the wall of the cylinder. The adapter extends a short distance beyond the end of the cylinder 5 and is secured to the side walls (one shown) of the bracket 7 by a pair of tie rods 8 and a bolt 9. The lower or closed end of the bracket 7 is formed with a downwardly extending rib 20 to which is detachably secured a yoke 11. A particular yoke 11 is shown here merely by way of illustration since any one of a plurality of differently formed yokes may be attached to the rib 20; the selection of a particular yoke being determined by the requirements of the work to be done. Each yoke, however, is formed with an anvil head in which is positioned a die 12 in line with a rivet set plunger 13 movable within a projecting portion 14 of the bracket 7. The die 12 and plunger 13 cooperate as riveting members between which work sheets of varying thickness may be placed and joined by a rivet headed by the pressure of said plunger. The rivet set plunger 13 is urged upward, or away from the die 12 by a pair of springs 15 (one shown) tensioned between a pin 16 passed through the rivet set and a stud 17 supported by one of the guide plates 10. The upper end of the rivet set plunger 13 contacts an arm or shoulder formed on a lever 18 of the bell crank type which is pivotably mounted on a stub shaft 19 rigidly mounted between the side walls of the bracket 7. The outer end of the lever 18 is bifurcated to form a pair of arms 18a which support a roller 21. The roller 21 is normally spaced slightly from the lower one of a pair of rollers 22 mounted on the tie rods 8, and a wedge 23 is arranged to enter between the rollers 21 and 22 and thereby force the lever 18 in a counter-clockwise direction to press the rivet set plunger 13 toward the die 12. The wedge 23 is pivotally connected to the bifurcated lower end of a piston rod 24 which forms part of a piston assembly movable within the cylinder 5.

The piston assembly comprises, in addition to the rod 24, a pair of pistons 25 and 26 secured to the rod 24 and movable through respective chambers 27 and 28 formed in the cylinder 5. The chamber 28 is of considerably less diameter than the chamber 27 and is formed in a reduced elongated portion of the cylinder, which portion may be used as a handle for the tool. The outer end of the chamber 28 is closed by a cap 29, and a piston rod bushing 31 positioned in the inner end of the chamber 28 acts as a seal between the

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chambers 27 and 28. To effect reciprocation of the piston assembly through power and return strokes, pressure fluid is supplied to the tool from a remote source and may be admitted alternately to the chamber 27 in back of piston 25 and to the chamber 28 in front of piston 26, the admission of fluid to one chamber being accompanied by a venting of the other chamber. In the former instance the assembly is driven downward (see Fig. 2) to force the wedge 23 between the rollers 21 and 22 and set the rivet, while in the latter instance the assembly is returned to the starting position of Fig. 1. Any suitable means may be provided for controlling the flow of pressure fluid, for example, a conventional four-way valve. According to another and preferred method, valve means operating under the control of a hand lever 32 acts to admit pressure fluid selectively to the back of piston 25 and constantly to the front of piston 26. Immediately upon the release of the pressure in chamber 27 therefore the piston assembly is retracted. In order that the continuously applied return pressure may be balanced during the power stroke, pressure fluid is directed to the rear of piston 26 by means of a passage 33 in the rod 24, this passage receiving fluid through a port 34 communicating with the area in back of piston 25.

The wedge 23 projects through an opening 35 formed in the adapter 6 and the lower end thereof normally engages the roller 21. The face of the wedge adjacent the roller 21 is formed with a cam surface made up of two inclined surfaces 23a and 23b adapted to be placed successively in cooperative relation with the roller 21. During the downward motion of the wedge 23 on the power stroke the roller 21 travels first on inclined portion 23a, which, having a steep slope, will move rivet set plunger 13 fast but without a high working pressure. As the wedge advances, the lever 18 rocks counterclockwise about the pivot 19 away from the position shown in Fig. 1, thereby increasing the effective length of the power arm of the lever which is represented by the distance between the pivot 19 and the line of applied force which passes through the center of roller 21. The slope of the cam surface on the wedge becomes more gradual as the roller 21 enters upon portion 23b and now the plunger 13 is moved slower and with greater pressure resulting from the increased mechanical advantage. With the elements in the Fig. 2 position, the effective length of the power arm of the lever 18 is approaching its maximum amount and is changing only in a relatively slight degree in relation to the further rocking movement. As long as the roller remains on portion 23b there is no substantial further change in the mechanical advantage because the surface 23b is uniform in slope and en-

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gages the roller 21 to move the lever 18 to a position in which its effective length approaches a maximum amount with a minimum rate of change. The stroke of the wedge permits the roller to travel a short or long distance on portion 23b according to the thickness of the work sheets. However, whether the sheets permit a travel of the roller only to the full line position of Fig. 2 or all the way to the dotted line position thereof, the slope, mechanical advantage and final rivet heading pressure will be substantially the same.

What is claimed is:

1. In a power operated machine, a mechanical movement comprising a piston having a camming surface thereon, a power plunger movable in a line parallel to the line of movement of the piston, a housing for the piston and plunger, a stationary pivot in the housing, a bell crank lever arranged between the foregoing lines and mounted on the pivot to transmit movement from the piston cam to the plunger, and a roller carried by the free end of the power arm of the lever, said camming surface coacting with said roller to move the lever about its pivot toward a position of said lever relative to said lines wherein the effective length of the power arm of the lever acted upon by the cam approximates its maximum and the rate of change of effective length of the power arm is substantially at its minimum, said lever having a shoulder integrally formed thereon to actuate the plunger.

2. A mechanical movement, as in claim 1, in which the camming surface is uniformly inclined toward the line of movement of the plunger thereby to rotate the lever to approach a position of parallelism with said line.

3. A mechanical movement, as in claim 2, in which the shoulder is formed on the side of the lever away from the piston.

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