Dec. 10, 1940. P. VAN SITTERT 2,224,708

PORTABLE TOOL

Filed Aug. 22, 1938

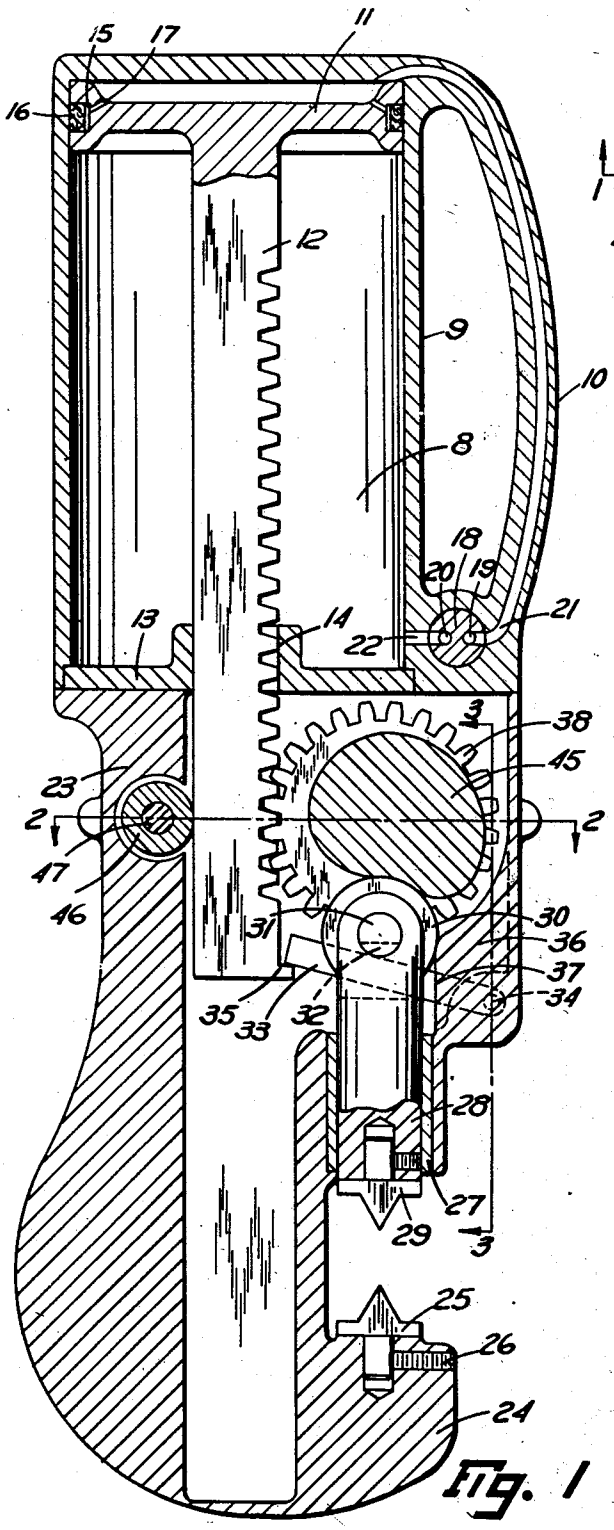

Fig. 1

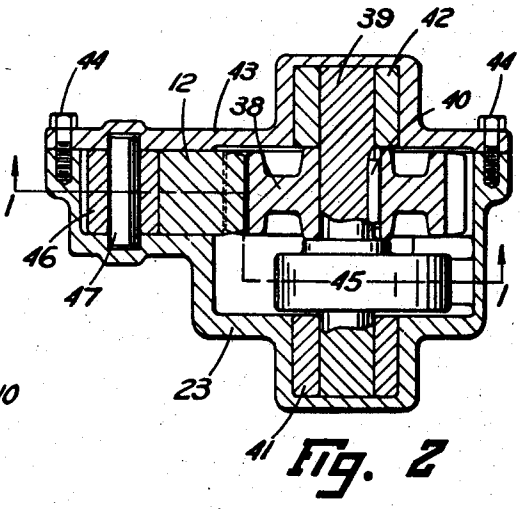

Fig. 2

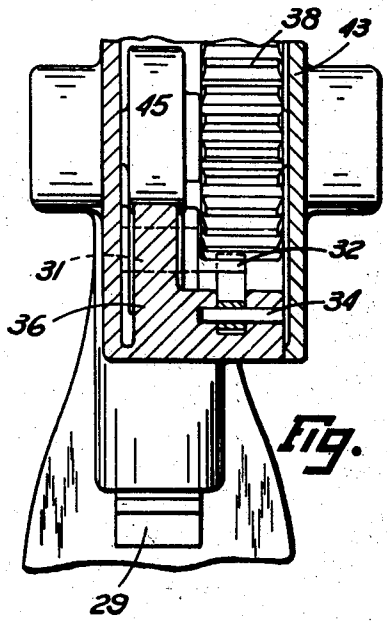

Fig. 3

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Patented Dec. 10, 1940 2,224,708

UNITED STATES PATENT OFFICE

2,224,708

PORTABLE TOOL

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Application August 22, 1938, Serial No. 226,071

8 Claims. (Cl. 74—110)

This invention relates broadly to machines for performing work such as riveting, stamping, punching, shearing or pressing, but more particularly to improvements in such machines wherein variable pressure rather than impacts is applied on the work.

One object of the invention is to produce a portable machine wherein initial pressure applied on the work is effected by a relatively rapid movement of the tool, which movement is gradually made slower to increase the pressure applied on the work as the pressure required to perform the work increases.

Another object of this invention is to provide such machines with a power actuated mechanism capable of perforating the work as well as withdrawing the tool from the work.

Another object of this invention is to produce such machines in a manner forming a simple and compact assembly which is strong and durable, and wherein the movable parts are constructed and arranged to reduce the frictional resistance between the engaging movable parts of the machine.

Other objects and features of this invention will appear more clearly from the following description and drawing, of which:

Fig. 1 is a longitudinal sectional view of a shearing machine embodying the invention, the section being taken in a plane indicated by line 1—1 in Fig. 2.

Fig. 2 is a cross sectional view taken in a plane indicated by line 2—2 in Fig. 1.

Fig. 3 is a longitudinal sectional view taken in a plane indicated by line 3—3 in Fig. 1.

Referring to the drawing, there is shown a fluid actuated reciprocatory motor generally designated by 8 and including a cylinder 9 having a handle 10 forming an integral part thereof. Reciprocable within the cylinder 10, there is a piston 11 having an integral rack 12 depending therefrom. The lower end of the cylinder is closed by a plate 13 formed with a central opening 14 within which the rack 12 is closely fitted for free slidable movement therethrough. The piston 11 is provided with an annular groove 15 accommodating an annular packing ring 16, the inner wall of which is in communication with the upper side of the piston 11 through small ports 17.

Rotatable within the lower portion of the cylinder 9, there is a throttle valve 18 formed with an inlet port 19 and an outlet port 20, the former having motive fluid admitted therein from any suitable source of supply, and the latter being in constant communication with the atmosphere. This throttle valve is in communication with the upper end of the cylinder 10, through a passageway 21, while the lower end of the cylinder is in communication with the throttle valve through a short passageway 22.

To the cylinder 9 is secured, by any suitable means, a housing 23 extending downwardly to form a yoke 24, which yoke detachably carries a tool 25 held rigidly in position by a screw 26. Secured within the housing 23, there is a bushing 27 having a work performing plunger 28 reciprocable therein parallelly to the rack 12, the lower end of which plunger is shaped to detachably receive a tool 29. The upper end of the plunger 28 is shaped as a clevis to receive a roller 30 rotatable on a cross shaft 31 carried by the plunger, which shaft has an end 32 laterally protruding beyond the plunger for engagement with a lever 33 having one end pivotally secured to the housing 23 by a pin 34, while the other end of the lever is capable of engagement with a step 35 formed on the end of the rack 12. Within the housing 23, there is a rib 36 forming a vertical guiding wall 37 engageable by the roller 30.

Mounted within the housing 23 in toothed engagement with the rack 12, there is a gear 38, secured on a shaft 39 by a key 40, which shaft has one end journaled within a bushing 41 carried by the housing 23, while the other end of the shaft is journaled within a similar bushing 42 fitted in a cover plate 43 detachably secured to the housing by cap screws 44. The shaft 39 is formed with an integral cam 45 capable of operative engagement with the roller 30.

Adjacent the gear 38, there is a roller 46 rotatable on a shaft 47 carried by the housing 23, which roller is in operative engagement with the rack 12 for preventing lateral movement thereof.

In the operation of the device, if the throttle valve 18 is positioned as shown in Fig. 1, motive fluid from the inlet port 19 will flow into the upper end of the cylinder through the passageway 21, while the lower end of the cylinder is vented to the atmosphere through the passageway 22 and the throttle valve outlet port 20. From the upper end of the cylinder, the motive fluid will be admitted into the groove 15 via the ports 17, thereby exerting radial pressure on the packing ring 16 for assuming a fluid tight joint between the piston and the cylinder. The piston subjected to the action of the motive fluid admitted into the upper end of the cylinder, will be driven downwardly for affecting the working

stroke of the rack 12 and the consequential rotation of the gear 38 and the cam 45 in a counterclockwise direction in Fig. 1. Due to the action of the cam 45 on the roller 30, it will be understood that rotation of the cam in the above mentioned direction will cause the working stroke of the plunger 28 and tool 29 relative the tool 25 for performing punching, shearing, riveting or like operations on the work placed therebetween.

In practice the cam 45 may be of any suitable shape calculated to impart slidable movement to the plunger 28 at any desired rate of speed. Preferably, the cam 45 is shaped substantially as shown in Fig. 1, whereby rotation of the cam resulting from the complete working stroke of the rack 12 will effect a materially shorter complete working stroke of the working plunger 28. In other words the cam 45 is preferably shaped to constitute with the gear 38 a speed reducing mechanism through which reciprocatory motion of the rack 12 is transmitted to the plunger 28 at a reduced rate of speed and consequently at an increased rate of power. For instance where the device is used as riveting machine, the shape of the cam will be such that at the initial part of its stroke the plunger 28 will move at a relatively high rate of speed, which rate will gradually decrease as the riveting operation proceeds so as to perform the work with a gradually increasing power.

Due to the engagement of the roller 30 with the vertical guide 46, the lateral thrust normally resulting from the rotative engagement of the cam 42 with the roller 30 is exerted on the guide 46, thereby enabling free slidable movement of the plunger 28.

When the working operation is terminated, the throttle valve 18 may be rotated 180° for admitting motive fluid into the lower end of the cylinder through passageway 22, while the upper end of the cylinder is vented to the atmosphere via the passageway 21 and throttle valve outlet port 20. In this instance motive fluid acting under the piston 11 will cause its return stroke for effecting the rotation of the gear 38 and consequently of the cam 45 in a clockwise direction in Fig. 1. During the return stroke of the piston 11, while the cam 45 rotates in a counterclockwise direction, the plunger 28 and the tool 29 will momentarily remain stationary. As the cam reaches the end of its rotation in the last mentioned direction, the step 35 formed on the rack 12 will engage the free end of the lever 33 for effecting pivotal movement thereof in a clockwise direction, resulting in the return stroke of the plunger 28 due to operative engagement of the cross shaft 31 with the lever 33.

While in the accompanying drawings and the foregoing specification there has been illustrated and described a somewhat specific form of the invention, such disclosure is for illustrative purposes only and is not intended to limit the invention in any way.

I claim:

1. In a device of the character described, a housing, a work performing plunger reciprocable in said housing, a motor driven cam effecting the working strokes of said plunger at a rate of speed slower toward the ends of said strokes than at the beginning thereof, and intermittently motor driven means effecting the return strokes of said plunger at a substantially uniform rate of speed.

2. In a device of the character described, a motor driven oscillating cam, a reciprocable work performing plunger acted upon by said cam for effecting its working stroke during rotation of the cam in one direction, and motor driven means acting on said plunger for effecting the return stroke thereof during rotation of the cam in the other direction.

3. In a machine of the type described, a housing, a reciprocable work performing plunger, a power actuated cam, a roller between said cam and plunger acted upon by said cam for effecting the working strokes of said plunger, and guiding means engaged by said roller resisting lateral thrust of said plunger resulting from the action of said cam on said roller.

4. In a device of the character described, a housing, a plunger reciprocable relative to said housing, motor driven rotary means effecting the working strokes of said plunger, and swingable means motor driven in at least one direction for effecting the return strokes of said plunger.

5. In a device of the character described, a cam rotatable in two direction, a reciprocable work performing plunger, a roller between said cam and plunger acted upon by said cam during its rotation in one direction for effecting the working stroke of said plunger, guiding means for said roller resisting lateral thrust of said plunger resulting from the action of said cam on the roller, and motor driven means effecting rotation of said cam in said one direction and effecting the return stroke of said plunger while rotating said cam in the other direction.

6. In a device of the character described, a power actuated reciprocatory member, a work performing plunger reciprocable parallely of said member, reciprocation transmitting means between said member and plunger including a cam active on said plunger for effecting the working stroke of said plunger at a gradually reducing rate of speed relative to that of said member, and means between said member and plunger acted upon by said member for effecting the return stroke of said plunger.

7. In a device of the character described, a power actuated reciprocatory member, a work performing plunger reciprocable parallelly of said member, a duality of longitudinal movement transmitting connections between said member and plunger one active during movement of said member in one direction for effecting the working stroke of said plunger at a gradually reducing rate of speed relative to said member and the other during movement of said member in the other direction for effecting return movement of said plunger.

8. In a device of the character described, a power actuated reciprocatory member, a reciprocable work performing plunger, means on said member operatively associated with means engaging said plunger for transmitting movement of said member in one direction to said plunger at a gradually reducing rate of speed relative to that of said member, and other means on said member operatively associated with means engageable with said plunger for transmitting movement of said member in the other direction to said plunger.

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