May 9, 1933. J. C. HANNA 1,907,538

RIVETER

Filed April 11, 1929

Fig. 1

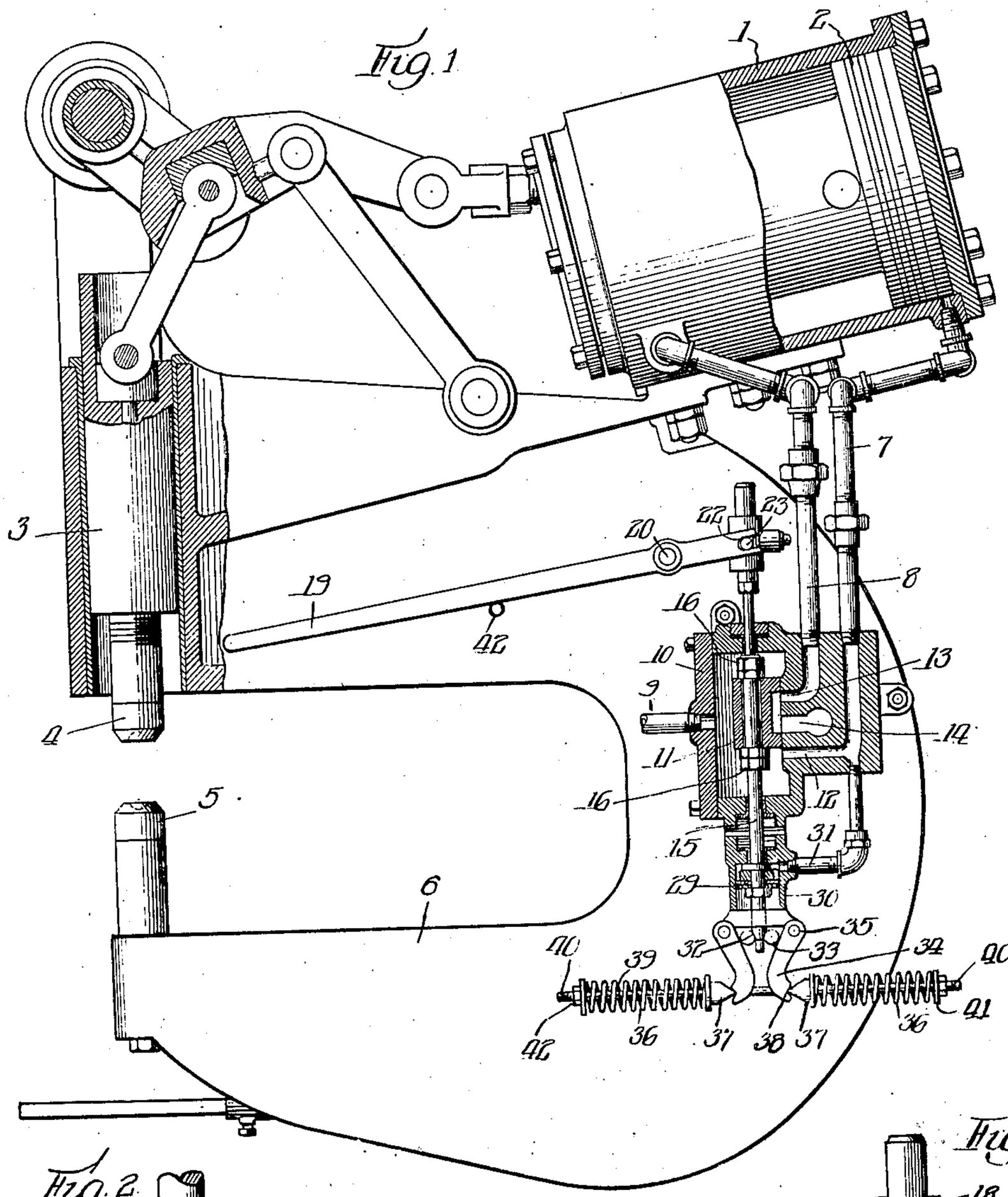


Fig. 2.

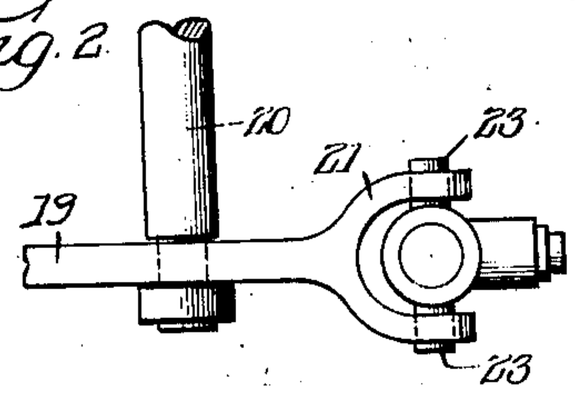


Fig. 3.

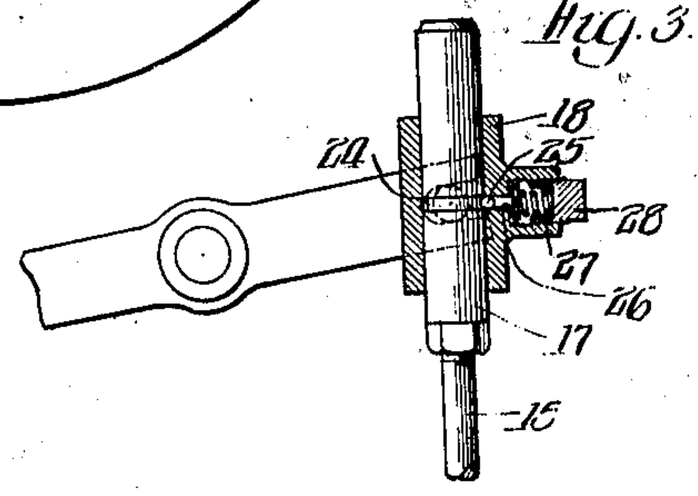
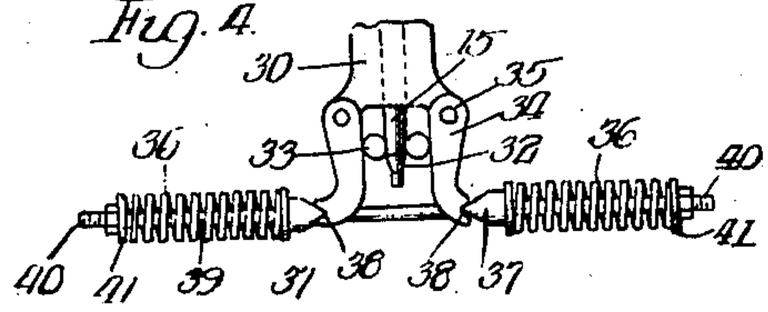


Fig. 4.



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UNITED STATES PATENT OFFICE

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RIVETER

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This invention relates to improvements in riveting machines or machines of like character in which fluid pressure is employed to obtain the necessary force for performing crushing, punching, embossing or similar effects, and in which the force is transmitted either directly from a piston to the die or through the intervention of toggles, levers or other means for multiplying the intensity of the initial force.

According to the customary practice an approximate uniform standard of fluid pressure is maintained for connection to riveters or presses, and, inasmuch as the force required for particular operations will vary in accordance with the dimensions of the material being fabricated, it would, therefore, be necessary to have a plurality of machines, each of which is so proportioned as to develop the desired pressure of the particular operation. Such an outlay of equipment would be necessarily expensive. It is, therefore, desired that some means be developed which may be readily adaptable to standard riveters and which will serve to limit the maximum pressure developed to a predetermined amount. It is, of course, desirable that the means be adjustable so the predetermined force may be varied.

It is a purpose of this invention to provide improved means which will efficiently limit the maximum pressure developed in a riveting or like machine and which will positively and efficiently operate by acting directly on a controlling member for the main valve of the riveter.

It is a further purpose of the present invention to so design the mechanism that upon the reaching of the maximum desired pressure in the riveter, the pressure is automatically cut off and the parts returned to the normal position.

Another purpose of my invention consists in the provision of an apparatus which will operate as above described independently of the control of an operator. That is, in a riveter in which there is a manual control lever, even though the operator holds the lever in working position, the pressure will be cut off and the dies separated when the desired maximum pressure is reached.

In particular, the present improvements include a piston which is connected directly to the main D valve of the machine and which is resisted in its movement by adjustable spring means which are so connected that there is a minimum of friction between the movable parts, and, further, the resisting means is so designed that once the movement of the piston to move the D valve to return position has started, the resistance will decrease and the movement will be quickly and fully completed.

Other objects and advantages of my improvements will be more readily apparent as the description proceeds in connection with the attached drawing in which a preferred embodiment of the improved mechanism is illustrated in connection with a standard type of riveting machine.

In the drawing:

Figure 1 is a general view, parts of which are in section and illustrates the position of the riveter just before the pressure stroke is started.

Figures 2 and 3 are detail views of the connection between the pivoted operating lever and the D valve rod.

Figure 4 is a detail view of the spring resisting means showing the position of the parts after the return movement of the main piston.

The invention as illustrated is mounted upon a pneumatic riveter of the compression toggle joint type but it will be readily apparent that the improvements are adaptable to any of the ordinary riveters or similar machines in which there is a fluid cylinder which receives pressure from a source having a uniform maximum pressure. There is shown a main cylinder 1 in which slides the main piston head 2 which is connected through simple levers and toggles to a vertically slidable ram 3 carrying an upper die 4 which cooperates with a fixed lower die 5 mounted in the other arm of a U-shaped riveting frame 6.

A pressure line 7 is shown extending to the working end of the cylinder, while a pressure line 8 extends to the return end of

the cylinder 1. Fluid pressure is supplied through the inlet pipe 9. The pipe lines 7, 8 and 9 are suitably connected to a valve chest and housing 10 in which is mounted the D valve 11 of the ordinary type for controlling port 12 to the working end of the main cylinder 1, port 13 to the return end of the main cylinder 1 and exhaust port 14. In the position shown, the D valve 11 is in position to admit fluid pressure from the pipe line 9 to the port 12 and to the head end of the cylinder 1 which will cause the movement of the piston 2 and the operation of the upper die 4. A valve operating rod 15 is shown connected to the D valve by the nuts 16 at both sides of the valve and extending through opposite ends of the valve chest 10. To the upper end of the valve rod 15 is secured an enlarged extension 17 which is designed to be releasably connected to a grip block 18.

The lever 19 is the usual control lever which extends adjacent the operating end of the machine whereby the operator may readily grasp the lever in order to initiate the riveting operation. The lever 19 is fulcrumed on shaft 20 and is formed at its end with a yoke 21 having slots 22 in the arms which engage transversely extending pins 23 from the grip block 18.

In the usual construction the lever 19 is directly connected to the rod holding the D valve, but in my construction the grip block 18 is releasably connected to the extension 17 of the valve rod 15 for a purpose which will be later apparent. The enlarged extension 17 is therefore provided with a circular groove 24 and a ball 25 is pressed in engagement with the groove 24 by a plunger 26 which is mounted to slide in the wall of the grip block 18. Plunger 26 is pressed to engage the ball 25 by spring 27, the resistance of which may be adjusted by the spring cap 28.

To the lower end of the valve rod 15 is secured a piston 29 which slides in a cylinder 30. The cylinder 30 in the present construction is attached directly to the lower end of the valve chest 10 and suitable packing is provided to prevent the escape of the pressure through the bearings for the slidable valve rod 15. To one end of the cylinder 30 is connected a pipe line 31 which is also connected to the housing 10 in communication with the port 12 to the head end of the main cylinder 1. The pressure upon the piston 29 tending to move the D valve downward from the position shown will therefore be the same as the pressure upon the main piston 2, and suitable means is provided to resist the movement of the piston 29 together with the D-valve 11 until a desired maximum pressure has been attained.

In the design shown, the lower end of the valve rod 15 which extends through the piston 29 is formed with oblique wedge surfaces 32 which engage rollers 33. The rollers 33 are held in engagement with the oblique wedge surfaces 32 by the arms 34 which are pivoted at 35 to the lower end of the cylinder 30. The levers 34 are normally moved towards each other by the springs 36 which are designed to exert their force against V-shaped wedges 37 which engage knife edge bearings 38 formed in the lower ends of the levers 34. The springs 36 surround rods 39 which are attached to the V-shaped wedges 37 and include screw-threaded ends 40 whereby spring washers 41 may be adjusted by the nuts 42.

In the position shown in Figure 1 it will be apparent that the adjusting nuts 42 may be so positioned as to balance the yielding resistance of the springs 36 and exert uniform pressure upon each of the levers 34 which will transmit the pressure diametrically through the rollers 33 to the oblique surfaces 32 of the valve rod 15, and therefore, produce vertical components of pressure which will tend to resist the movement of the piston 29 until the pressure on the piston 29 overcomes the pressure developed by the springs 36. When sufficient pressure has been developed on the piston 29, the valve rod 15 will be moved downward thus shifting the D-valve 11 and causing the admission of fluid pressure to the return end of the main cylinder 1 which effectuates a return of the piston 2 and an upward movement of the die 4. The final position of the lower end of the valve rod 15 is illustrated in Figure 4 from which it is apparent that the rollers 33 now act against the plane vertical sides of the valve rod 15 and therefore do not develop any vertical component of pressure. Thus it will be evident that when the piston 29 starts to move downward, the resistance developed by the springs 36 will produce diminishing vertical components of pressure and cause the piston 29 to quickly complete a full movement. It will be further noted that the inner faces of the pivoted levers 34 are initially disposed angular to the axis of movement of the rod 15 and substantially parallel to the inclined wedge surfaces 32. As the rod 15 moves downwardly from the position shown in Figure 1, the rollers will roll up the wedge surfaces, and down with respect to the levers. Due to the action of the wedge surfaces in forcing the rollers apart, the levers 34 are moved about their pivots 35 towards positions substantially parallel to the axis of movement of the rod 15. The diminishing relative angle between each of the levers and the axis of movement of the rod 15 tends to decrease the effective resistance produced by the springs 36 even before the rollers have reached the straight sides of the rod 15.

As stated before, the operating lever 19 is releasably connected to the valve rod 15 whereby, even if the operator is holding the

lever in the working position shown in Figure 1, the D valve will be moved downward and relative movement between the extension member 17 and the grip block 18 will occur due to the spring pressed ball 25 being forced out of the groove 24 into bearing engagement with the cylindrical surface of the extension 17. For the next operation the operator only needs to raise the lever 19 to reengage the grip block 18 and then, upon a downward movement of the lever 19, the D valve together with the valve rod 15, will be again moved to the position shown in Figure 1. The downward movement of lever 15 is limited by a stop member 42 shown in Figure 1.

The advantages of such design will be clearly apparent. The operator may adjust the resistance of the springs 35 in order to vary the resisting component of pressure upon the valve rod 15 in accordance with the particular materials which are being operated upon. By directly connecting the piston 29 to the means for moving the D-valve, there is no opportunity for leakage of the fluid pressure and the parts will more delicately respond to the pressure developed in the head end of the cylinder.

It is to be understood that various changes and modifications may be made in the particular embodiment of my invention without departing from the spirit of the invention as expressed in the appended claim.

I claim:

In combination with a machine for performing a riveting or like operation, a main cylinder, a main piston for operating a working member, fluid connections to the end of said main cylinder, a main valve for controlling said fluid connections, an auxiliary cylinder, an auxiliary piston in said auxiliary cylinder, a fluid connection to one end of said auxiliary cylinder adapted to receive the pressure developed in the working end of the main cylinder, means for moving said main valve by the movement of said auxiliary piston, means for resisting the movement of said auxiliary piston which will not yield and allow movement until the development of a predetermined working pressure in said main cylinder, said last-named means including a wedge shaped extension from said auxiliary piston, rollers adapted to be pressed into engagement with the wedge surfaces of said extension and adjustable springs for developing pressure upon said rollers.

Signed at Chicago, Illinois, this 5th day of April, 1929.

JOHN C. HANNA.