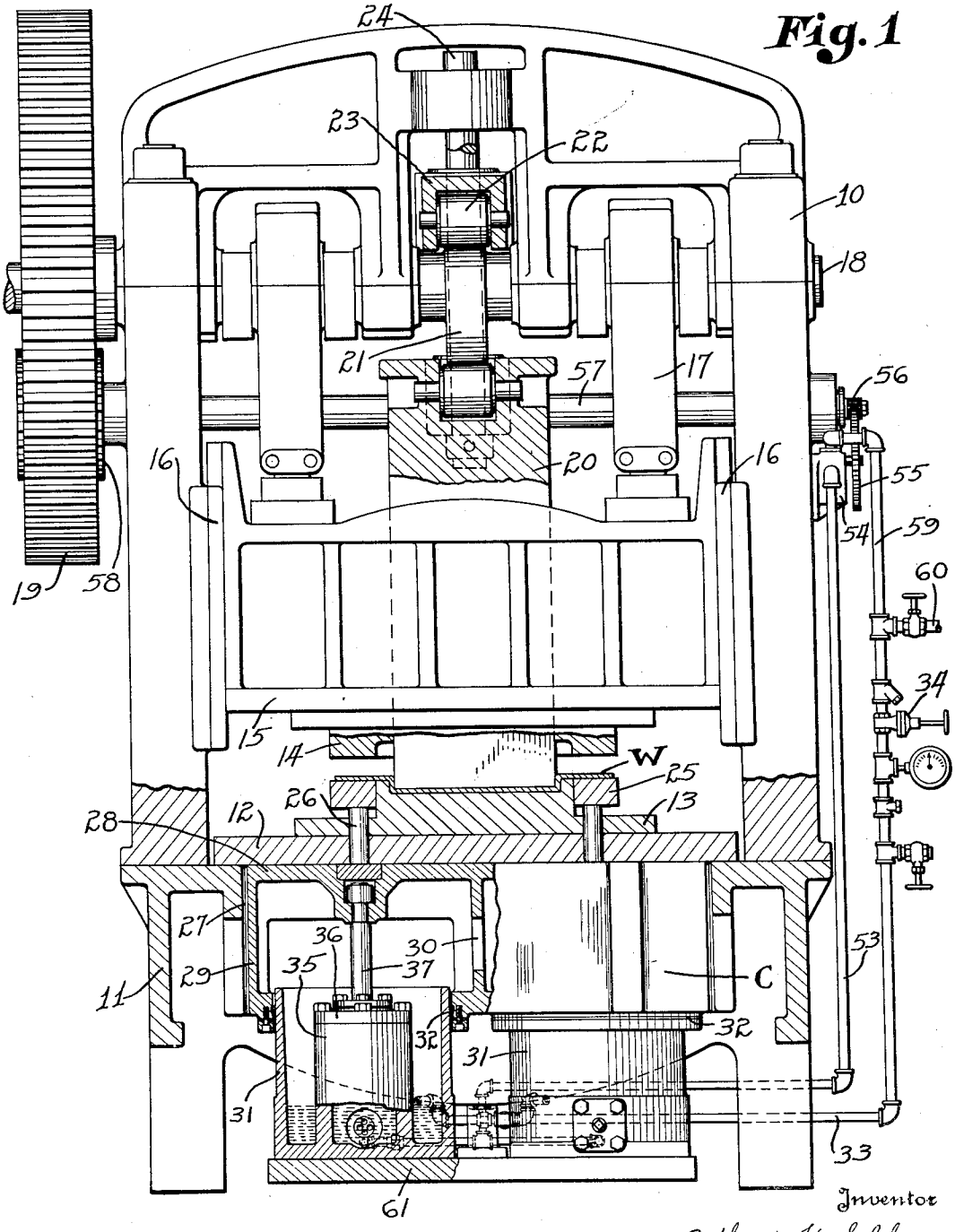
Nov. 21, 1933. A. H. SCHLOZ 1,936,410

METAL DRAWING PRESS

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Fig. 1



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Fig. 2

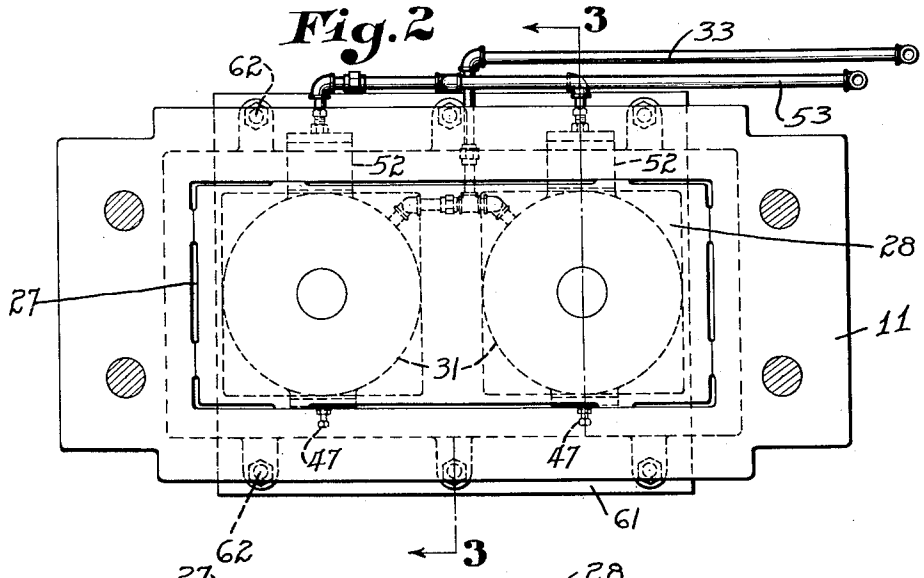
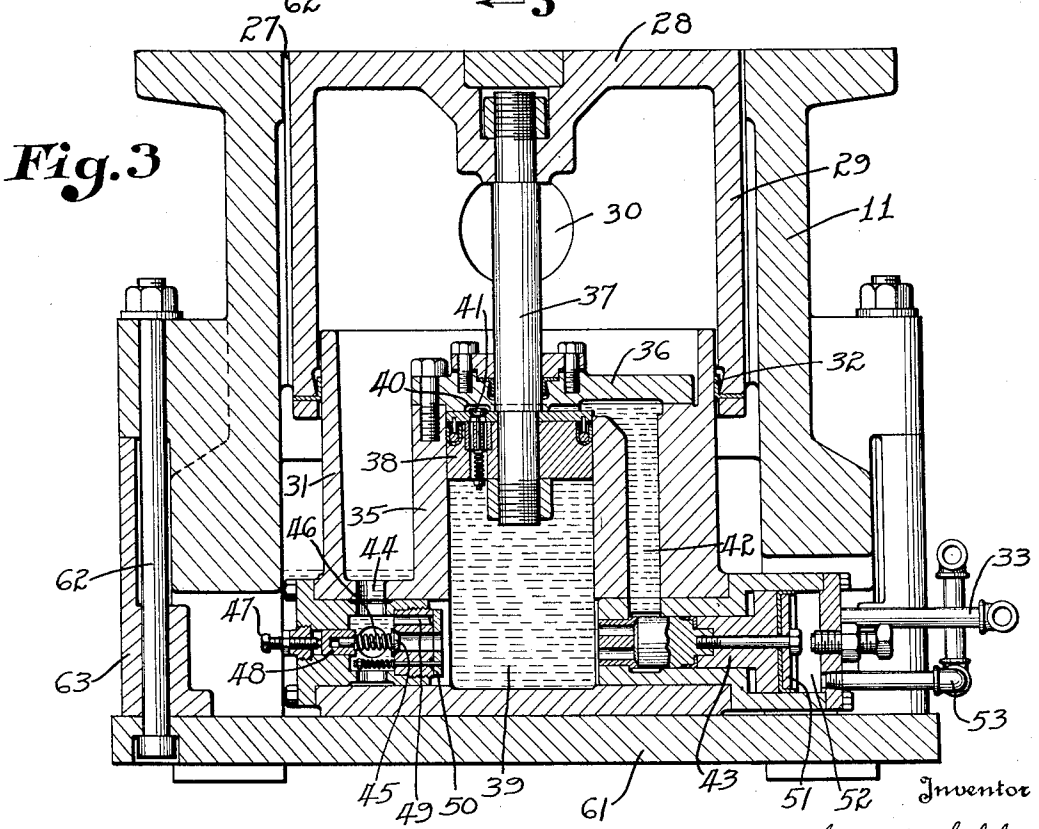


Fig. 3



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METAL DRAWING PRESS

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Application November 13, 1931
Serial No. 574,710

8 Claims. (Cl. 113—46)

This invention relates to metal stamping and drawing presses, but particularly to that type of press having a blank-holder for retaining the work in place while a ram or piston stamps or draws the metal into the desired shape.

Ordinarily, the working stroke of the piston is cushioned through a pressure pad on which is mounted one of the complemental dies. A cushioning device of this character is illustrated in the patent to F. J. Rode, No. 1,773,438, issued August 19th, 1930, but one difficulty inherent in that cushioning device is that a specially constructed bed is necessary. It is not adapted to be applied to presses now in operation, so that to obtain the benefits of that device, a new press must be secured. Another objection to cushioning devices of this type heretofore contemplated or in use, is that they take up considerable space, particularly since they require that the bed of the machine be raised above normal height.

Objects of this invention are to overcome the above difficulties and objections; to produce a simple and efficient cushioning device which may be mounted on existing presses without alteration in the bed structure; and to provide a press with a combined pneumatic and hydraulic cushioning device which is compact in arrangement, efficient and reliable in construction and operation, and has the new and improved features of construction, arrangement and operation hereinafter described.

For purposes of illustration, but not of limitation, an embodiment of the invention is shown in the accompanying drawings, in which:

Figure 1 is a side elevation partly in section of a metal drawing press embodying the present invention;

Figure 2 is a top plan view of the work-supporting bed of the press; and

Figure 3 is an enlarged transverse sectional elevation on the line 3—3 of Fig. 2.

The illustrated embodiment of the invention comprises a metal drawing press comprising a frame 10 having a bed 11 for supporting the pressure pad 12, on which a stationary die 13 is supported. A movable complemental die 14 is carried by a piston or ram 15, which reciprocates in guides 16 mounted on the frame 10. The die-carrying piston is connected by arms 17 to cranks on a crank shaft 18, which is driven by a gear 19 from any suitable source of power.

Reciprocating in a guideway formed in the piston 15 is a blank-holder 20 which in this instance also operates as a shaping plunger. The blank-holder 20 is reciprocated by means of a cam 21 on the shaft 18 engaging rollers 22 carried by a yoke 23, the vertical movements of which are guided by a pair of vertically disposed rods 24. As will be readily understood in the art the blank-holder 20 holds the work W on the die 13 until the piston 15 has moved away from the work. Since double acting presses of this general character are well known in the art, further description thereof is not deemed necessary.

In accordance with this invention a cushioning device C is provided for cushioning the working stroke of the piston or ram 15. As shown, a plate 25 is adapted to receive the force of the piston 15 through the work W. This shock thus imparted by the piston is transmitted from the plate 25 through pins 26, which extend through the die 13 and pressure pad 12 to the cushioning device C, which is disposed in an opening or chamber 27 formed in the bed 11. As will hereinafter appear, the cushioning device C is adapted to be mounted on old presses, or those which are presently in use, it merely being necessary to insert the cushioning device into the chamber 27 provided in the beds of most presses. Thus, it will be seen that in a simple and convenient manner a cushioning device may be installed on presses which are already built at a comparatively low cost.

As shown, the cushioning device C comprises a plate 28 having in this instance a pair of integral depending cylinders 29, which communicate with each other through an opening 30. Extending into each cylinder 29 is a stationary piston 31, packing 32 in the cylinder 29 providing a substantially air tight connection therewith. Air under pressure is supplied to the piston 31 through a conduit 33 having branches leading to the individual piston. It is thus manifest that a pneumatic cushion is provided for the die-carrying piston 15, and this cushion may be controlled by a valve 34 on the line 33 in order to increase or diminish the fluid pressure within the cylinder 29.

An hydraulic device is also provided to control the return of the plate 28 to normal position. This is desirable to prevent injury to the work W after the same has been drawn to the desired shape, since, manifestly, if the plate 28 were allowed to return abruptly to normal position before the blank-holder 20 has released the work W, the latter would be deformed or the shape thereof otherwise injured.

Formed integrally with each piston 31 and extending inside thereof is a cylinder 35 which is

closed at its upper end by a plate 36 except for an opening to receive a rod 37 secured at one end to the plate 28 and having a plunger 38 at its opposite end. Disposed within the cylinder 35 is liquid 39, such as oil, which may flow from the underside of the plunger 38 to the upper side thereof through a valve controlled passage 40, a spring controlled valve 41 thereof being adapted to prevent flow of the liquid in the opposite direction.

Opposite ends of the cylinder 35 are connected by a by-pass 42 to enable the liquid to pass from the upper side of the plunger 38 to the underside thereof when the plunger is moved upwardly in the cylinder. The flow of liquid through the by-pass 42 is controlled by a slide valve 43, and when this valve is either closed or open, downward movement of the plunger 38 is permitted, but since the area above the plunger 38 is restricted by the rod 37 a portion of the liquid may be forced from the cylinder 35 into the piston 31 through a passage 44.

Controlling the passage of liquid from the cylinder to the piston 31 is a valve 45, which is normally held in closed position by a coil spring 46. The tension of the spring 46 may be controlled by a set screw 47, which bears against a guide 48 in which the stem of the valve 45 is slidable.

On the upward movement of the plunger 38 the air pressure within the cylinder 39 and piston 31 forces the oil through a return duct 49, which is controlled by a spring controlled check valve 50. This arrangement is of importance to militate against air being trapped in the space above the plunger 38, it being desirable to have only a non-compressible fluid in this space. The pneumatic pressure within the piston 31 forces any oil which may pass therein back into the cylinder 35, and the augmented pressure within the cylinder positively pumps the liquid from the underside of the plunger 38 to the upper side thereof.

The control valve 43 for the above described hydraulic device is provided with a head 51 reciprocable in a cylinder 52, to which fluid, such as air under pressure, may be delivered through a conduit 53. The conduit 53 communicates at its opposite end with a valve chest 54 having a suitable valve actuated by a gear 55 meshing with a pinion 56. The pinion 56 is mounted on a shaft 57 driven from a pinion 58 meshing with a drive gear 19. Air under pressure is delivered to the valve chest 54 through a line 59, which is connected to an air line 60, the latter also being connected to the conduit 33 leading to the pneumatic cushioning device. The form of valve within the valve chest 54, which is driven by the gear 55, may be of any suitable or desired construction. Suffice it to say that air is admitted to the conduit 53 from the conduit 59 in order to create pressure in the cylinder 52 for driving the valve 43 to the left (Fig. 3) when the die-carrying piston 15 has completed its working stroke so that the return of the plate 28 to normal position is prevented until the blank-holder 20 has released the work W. Substantially when the blank-holder 20 has moved away from or released the work W the pressure in rear of the head 51 of the valve 43 is released or reduced to enable the valve to move to the right (Fig. 3), thereby to permit the plate 28 to return to normal position by means of the air under pressure within the cylinder 29 and piston 31.

It will be noted that the hydraulic and pneumatic cushioning devices above described are mounted on the foundation plate 61 of the bed 11, which is secured thereto by tie rods 62 and spacers 63. It is to be understood that the bed 11, foundation plate 61, tie rods 62 and spacers 63 provide the usual base construction for presses of this character, and the cushioning device C may be inserted into the chamber or opening 27 in a simple and convenient manner without disturbing the press proper. The device is constructed and arranged with the view of compactness to conserve space as much as possible, and is adapted for ready installation.

Numerous changes in details of construction, arrangement and operation may be effected without departing from the spirit of the invention, especially as defined in the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In a press having a die-carrying plunger, a blank-holder, and a bed, a unit within said bed for cushioning the working stroke of said plunger, means for detachably securing said unit within said bed, said unit comprising a resilient cushioning device including hydraulic and pneumatic devices disposed one within the other, and means for resisting return movement of said device substantially until the work is released by said blank holder.

2. In a press having a die-carrying plunger, a blank-holder and a bed, a detachable unit within said bed for cushioning the working stroke of said plunger, said unit comprising a pneumatic cushioning device, and liquid-controlled means for resisting the return movement of said device substantially until the work is released by said blank holder.

3. In a press of the class described, a bed having an opening, a cushioning unit within said opening comprising a movable work-supporting cylinder, a stationary piston within said cylinder, means to establish an air cushion within said cylinder, a dash pot within said piston including a plunger connected to said cylinder, and means for regulating the action of said dash pot.

4. In a press of the class described, a bed having an opening, a cushioning unit within said opening comprising a movable work-supporting cylinder, a stationary piston within said cylinder, means for establishing a pneumatic cushion within said cylinder, and a hydraulic cushioning device within said piston including a part connected to and movable with said cylinder, and adjustable means for regulating the operation of said hydraulic cushioning devices.

5. In a press of the class described, a bed having an opening, a cushioning device within said opening comprising relatively movable piston and cylinder parts, one of said parts being adapted to support the work, means for establishing a pneumatic cushion between the said parts, a hydraulic device for cooperating with said cylinder and piston parts in cushioning the relative movement thereof, said hydraulic device including a plunger connected for movement with the work-supporting part, and means for retaining a quantity of liquid on one side of said plunger after it has completed its cushioning movement for retaining the work-supporting part in its lowered position a predetermined period of time.

6. In a press of the class described, a bed having an opening, a cushioning device in said opening comprising a movable work-supporting cylinder, a stationary piston within said cylinder, means for establishing a pneumatic cushion within said cylinder, a cylinder within said piston, a plunger connected for movement to said

first cylinder, and operating in said second cylinder, liquid in said second cylinder, a by-pass connecting opposite ends of said second cylinder, a valve-controlled passage in said plunger, a valve controlling the passage of liquid through said by-pass, means for actuating said valve, a passage connecting the inside of said piston and said second cylinder, and valve means in said last passage controlling the flow of liquid therethrough.

7. In a press of the class described, a bed having an opening, a cushioning device in said opening comprising a movable work-supporting cylinder, a stationary piston within said cylinder, means for establishing a pneumatic cushion within said cylinder, a cylinder within said piston, a plunger connected for movement to said first cylinder, and operating in said second cylinder, liquid in said second cylinder, a by-pass connecting opposite ends of said second cylinder, a valve-controlled passage in said plunger, a valve controlling the passage of liquid through said by-pass, means for actuating said valve, a passage connecting the inside of said piston and said second cylinder, a valve in said last passage controlling the flow of liquid from said second cylinder to said piston, a spring controlling said valve, and means to adjust the tension of said spring.

8. In a press of the class described, a bed having an opening, a cushioning device within said opening comprising relatively movable piston and cylinder parts, one of said parts being adapted to support the work, means for establishing a pneumatic cushion between said parts, a hydraulic device for cooperating with said cylinder and piston parts in cushioning the relative movement thereof, said hydraulic device including a plunger connected for movement with the work-supporting part, means for retaining a quantity of liquid on the upper side of said plunger after it has completed its cushioning movement for retaining the work-supporting part in its lowered position a predetermined period of time, and means to augment the pressure of liquid on the underside of said plunger for militating against trapping of air above the plunger.

ARTHUR H. SCHLOZ.