July 19, 1927. 1,636,110

F. J. RODE

PRESSURE CUSHION

Filed May 27, 1925 3 Sheets-Sheet 1

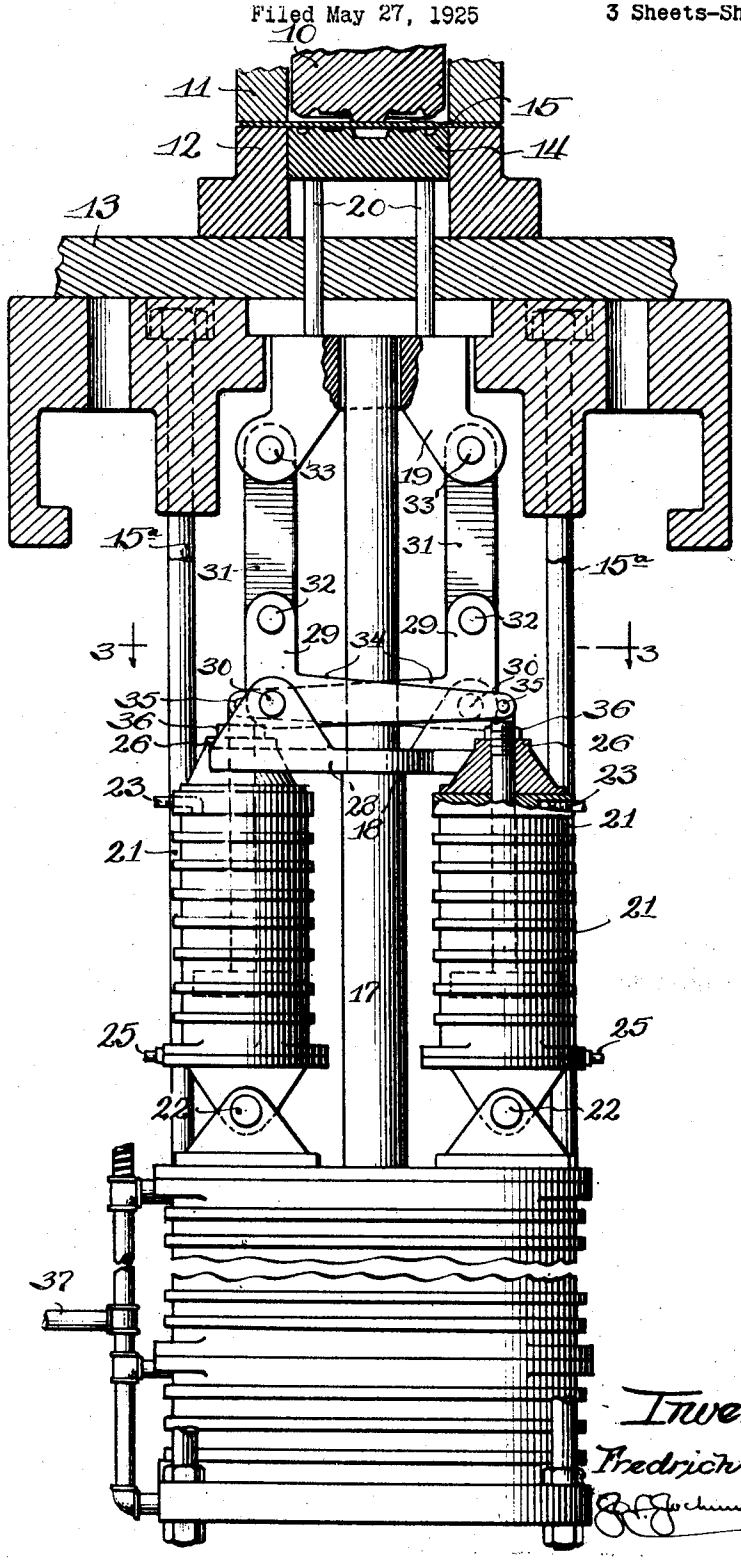


Fig. 1

Inventor,
Fredrich J. Rode

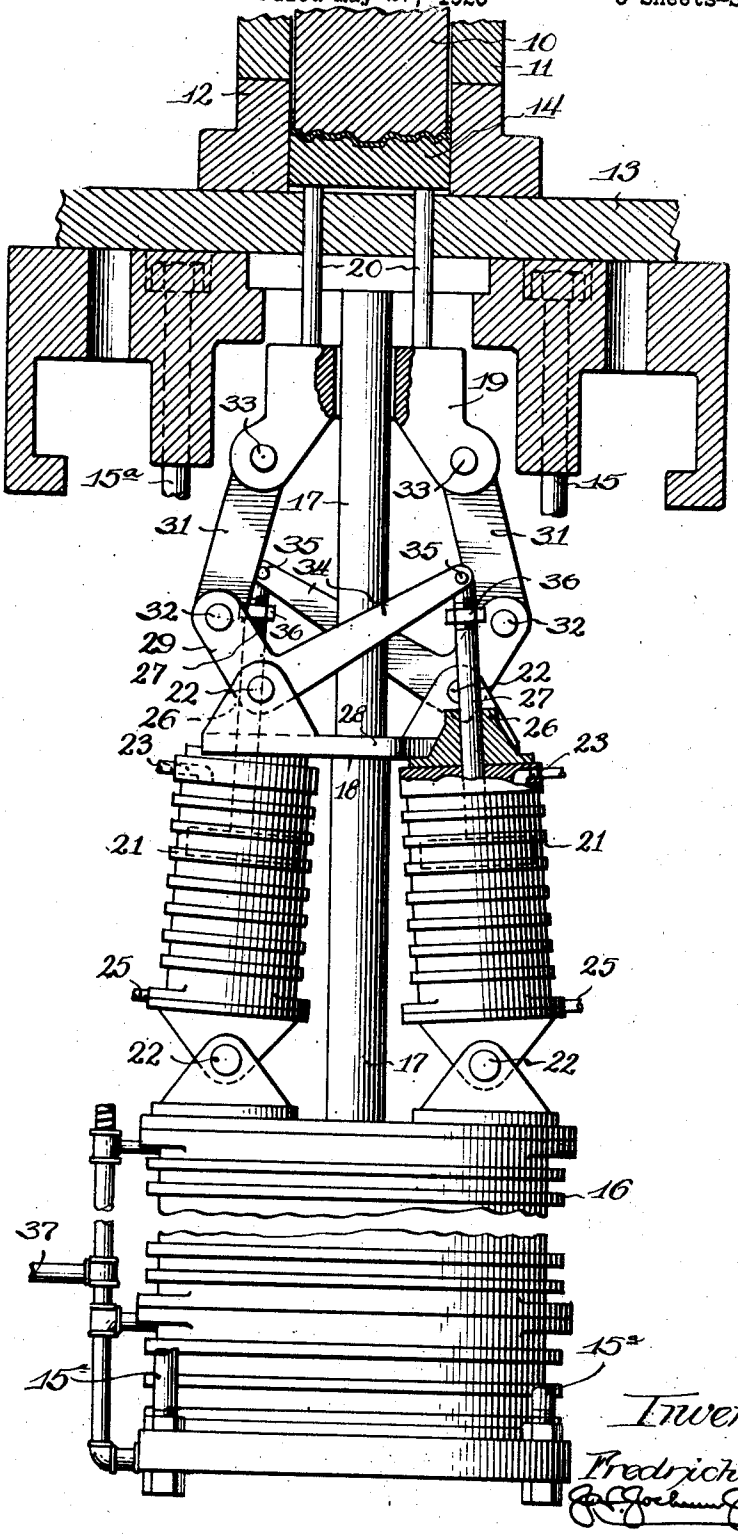
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F. J. RODE

PRESSURE CUSHION

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Fig. 2



Inventor,
Fredrich J. Rode,
by Jackson & Ritby.

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F. J. RODE

PRESSURE CUSHION

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Fig. 3

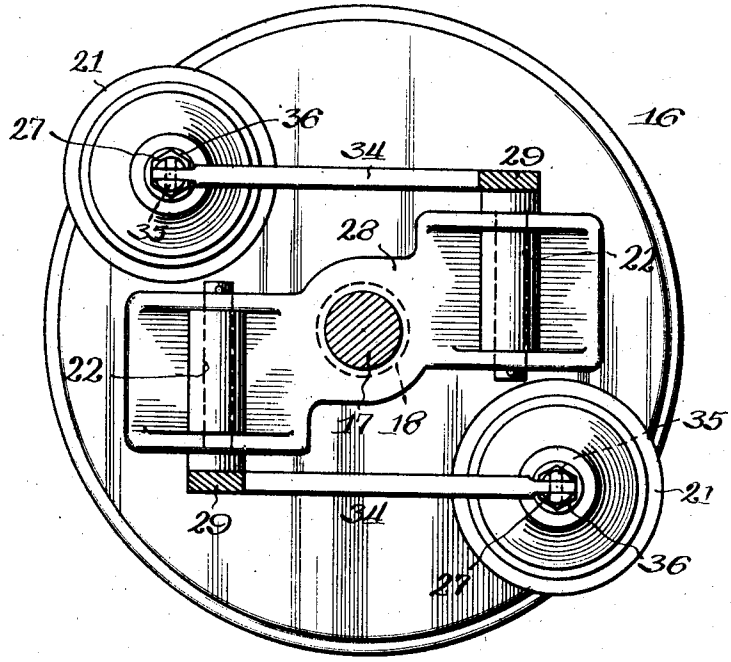
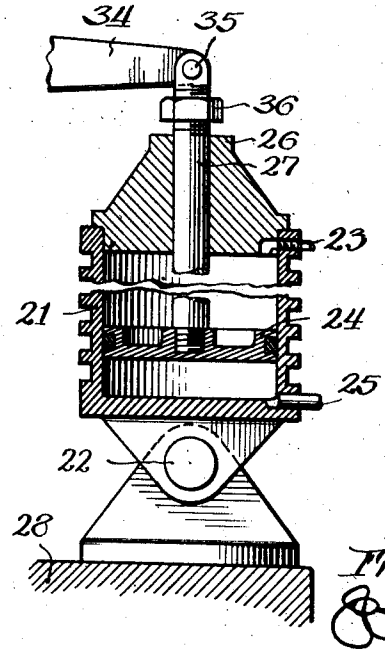


Fig. 4



Inventor,
Fredrich J. Rode,
by Jackson & Jackson
Attys.

Patented July 19, 1927. 1,636,110

UNITED STATES PATENT OFFICE.

FREDRICH J. RODE, OF CHICAGO, ILLINOIS, ASSIGNOR TO MARQUETTE TOOL & MANUFACTURING CO., OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

PRESSURE CUSHION.

Application filed May 27, 1925. Serial No. 33,295.

This invention relates to improvements in pressure cushion particularly adapted though not necessarily limited in its use with metal drawing or shaping machines, and one of the objects of the invention is to provide improved means whereby the desirable pressure may be obtained at the beginning of the stroke so that an embossing or forming operation can be done previous to the drawing or shaping operation, all during the same stroke of the press, and which has previously required two separate and distinct operations.

To the attainment of these ends and the accomplishment of other new and useful objects as will appear, the invention consists in the features of novelty in substantially the construction, combination and arrangement of the several parts hereinafter more fully described and claimed and shown in the accompanying drawings illustrating this invention, and in which

Figure 1 is a view partly broken away, partly in side elevation and partly in section of a cushion of this character constructed in accordance with the principles of this invention and showing the parts in one position.

Figure 2 is a view similar to Figure 1 showing the parts in another position.

Figure 3 is a view taken on line 3—3, Figure 1.

Figure 4 is an enlarged detail view partly in section and partly broken away of one of the fluid pressure cushioning devices.

Referring more particularly to the drawing the numeral 10 designates a punch or plunger which is reciprocable in any well known manner. Co-operating with the punch is a blank holder 11 which in turn co-operates with a die 12, the latter being supported upon the bed plate 13 of the machine.

Within the die 12 is another die member 14 which co-operates with the punch 10 to shape the metal 15 therebetween.

Supported beneath the bed plate 13 from a suitable portion of the machine, preferably by means of hanger rods 15ª, is a cushioning device designated generally by the reference numeral 16 and embodies a cylinder in which a piston (not shown) is reciprocable. Connected with the piston is a piston rod 17 which extends beyond the cylinder 16 and is provided at a suitable point in the length, with a shoulder 18.

A pin plate 19 is arranged beneath the bed plate 13 and pins 20 project through the bed plate 13 to engage and rest upon the pin plate 19 and these pins 20 support the die member 14.

Pivotally supported, preferably by the cylinder 16 are a plurality of supplemental cylinders 21 of any desired diameter and construction. These cylinders are pivotally supported as at 22 for rocking movement and each of which is provided with an inlet opening 23 to admit fluid on one side of a piston 24, which is reciprocable in the cylinder. The cylinder is provided with an outlet opening 25 on the other side of the piston so as to permit outside air to enter and to be discharged from the cylinder as the piston reciprocates and thereby not interfere with the reciprocation of the piston.

A stop 26 is formed on one end of the cylinder 21 and a piston rod 27 passes through and beyond the stop 26.

Any number of these cylinders may be provided, but in the present exemplification of the invention, two are shown and are independent of each other.

A supporting plate 28 is provided with an aperture therethrough through which the piston 17 loosely passes, and the plate engages and rests upon the shoulder 18 on the piston rod. This plate forms a support for bell crank levers 29. The levers are respectively fulcrumed as at 30 upon the plate 28 and a link 31 is pivotally connected at one end as at 32 to one of the arms of the bell crank lever and is pivotally connected by the other end as at 33, to the pin plate 19.

The fulcrums 30 of the bell crank levers 29 are arranged on opposite sides of the piston rod 17. The arm 34 of each of the bell cranks 29 extends to the other side of the piston rod, and in opposite directions to each other, and is pivotally connected as at 35 with the piston rod 27 connected with the pistons in the respective cylinders 21.

A collar or nut 36 is threaded upon the piston rod 27 and co-operates with the stop 26 to limit the movement of the piston 24 in the cylinder 21.

Fluid is supplied to the cylinder 16 from any suitable source through a pipe 37.

In operation, and assuming the die 10 and blank holder 11 to be elevated and the die 14 to be also elevated so that its upper face

will be substantially flush with the upper face of the die 12, the work 15 is placed in position upon the dies 12 and 14.

At this time the pin plate 19 will be at the limit of its upward movement and the pivots 33, 32 and 30 of the bell crank levers and links 31 will be in alinement so as to constitute and form a restraining means between the pin plate 19 and the supporting plate 28 to temporarily restrain these plates against relative movement. The pistons 24 in the cylinders 21 will then be at the limit of their lowermost movements, the collars 36 engaging the stops 26.

When the blank holder 11 descends it will co-operate with the die 12 to grip the work therebetween. The plunger 10 will then descend and while the work is being held between the blank holder 11 and the die 12 pressure exerted upon the plunger or die 10 will cause the work to be shaped between the die 10 and die 14. The downward movement of the plunger 10 and die 14 will then be against the fluid pressure in the cylinder 16 by reason of the fact that the pressure upon the die 14 will, through the medium of the pins 20 cause the pin plate 19 to descend, the togglelike devices formed by the links 31 and bell crank levers 29 operate to temporarily restrain the pin plate 19 and the supporting plate 28 against relative movement. By reason of this fact, the pressure which is then applied to the pin plate 19 will be directed upon the supporting plate 28 and as this plate engages the shoulder 18 on the piston rod 17 the piston rod 17 will be lowered against the fluid pressure in the cylinder 16.

This pressure is sufficient to permit the dies 10 and 14 to shape or emboss the plate or work 15.

At a predetermined point in the descent of the pin plate 19, the bell crank levers 29 will begin to rock about their fulcrums 30 by reason of the fact that the cylinders 21 are held in a fixed position but are adapted to rock about the pivots 22. As the supporting plate 28 then descends, the bell crank levers 29 will continue to rock about the fulcrums 30 to knuckle the toggle like device from the position shown in Figure 1 to the position shown in Figure 2, thereby causing the pressure exerted upon the work through the medium of the die 14 and die or plunger 10 from the cylinder 16, to be transferred or shifted from the cylinder 16 to the cushioning devices 21 and under which latter pressure the material will then be shaped and as the dies 10 and 14 descend the material will be drawn from between the blank holder 11 and the die 12 so as to assume the shape shown in Figure 2.

Thus it will be seen that all of the operations in the shaping and forming of the article, which have heretofore necessitated two separate operations, may be completed during one stroke or cycle of operation of the press.

When the die 10 and blank holding member 11 start to ascend, the piston rod 17 will be retarded in its upward movement by reason of the fact the shoulder 18 on the piston rod 17 contacts with the supporting plate 28 and this plate will be, at that time of the operation of the press, under the influence of the cushions 21, the piston in the cylinder 16 and piston rod 17 will be prevented from "slamming" back and will return at the same rate of speed as the supporting plate 28.

When the pin plate 19 reaches the limit of its upward movement the pivots 33, 32 and 30 of the togglelike device will again be in alinement and will constitute a restraining means to the relative movement between the pin plate 19 and the supporting plate 28.

The pivots 22 of the cylinders 21 permit the cylinders to assume a proper position during the rocking movement of the bell crank levers 29 so as not to retard the operation of the cushion and to prevent injury to the parts.

After the embossing or forming operation between the dies 10 and 14 has been completed the pressure will then be shifted from one of the cushioning devices to the other so as to permit the completion in the forming or shaping of the article.

Obviously any degree of fluid pressure may be maintained in the cylinders 16 and 21, and by adjusting the collars 36 upon the piston rods 27 the time in the cycle of operation of the mechanism at which the toggle mechanism will be knuckled, may be varied at will.

It will be manifest that the cushioning device is of such a construction that it will not only be of a compact arrangement but may be readily applied to any machine and may as readily be detached therefrom.

While the preferred form of the invention has been herein shown and described it is to be understood that various changes may be made in the details of construction and in the combination and arrangement of the several parts, within the scope of the claims, without departing from the spirit of this invention.

What is claimed as new is:—

1. In combination, a plunger, a work holding element co-operating therewith, a plurality of separate cushioning means for the work holding element, means for restraining one of the said cushioning means against operation during a portion of the operation of the other of the said cushioning means, and means for releasing the said restrained cushioning means to render the latter active.

2. In combination, a plunger, a work holding element co-operating therewith, a plurality of separate fluid controlled cushioning means for the work holding element, means for restraining one of the said cushioning means against operation during a portion of the operation of the other of the said cushioning means, and means for releasing the said restrained cushioning means to render the latter active.

3. In combination, a plunger, a work holding element co-operating therewith, a plurality of separate cushioning means for the work holding element, each of said cushioning means being responsive in its operation to the operation of the said element, means for restraining one of the said cushioning means against operation during a portion of the operation of the other of the said cushioning means, and means for releasing the said restrained cushioning means to render the latter active.

4. In combination, a plunger, a work holding element co-operating therewith, a plurality of separate cushioning means for the work holding element, each of said cushioning means being responsive in its operation to the operation of the said element and operable separately upon the said work holding means, means for restraining one of the said cushioning means against operation during a portion of the operation of the other of the said cushioning means, and means for releasing the said restrained cushioning means to render the latter active.

5. In combination, a plunger, a work holding element co-operating therewith, a plurality of separate cushioning means for the work holding element, means for restraining one of the cushioning means against operation, and means for automatically releasing the said locked cushioning means at a predetermined point in the cycle of operation of the work holding means.

6. In combination, a plunger, a work holding element co-operating therewith, a plurality of separate cushioning means for the work holding means, and means for automatically shifting the pressure against which the work holding means operates, from one of the said cushioning means to the other cushioning means.

7. In combination, a plunger, a work holding element co-operating therewith, a plurality of separate fluid pressure cushions for the work holding element, and means for automatically shifting the pressure against which the work holding means operates, from one of the said cushions to the other cushion.

8. In combination, a plunger, a work holding element co-operating therewith, a plurality of separate cushioning means for the work holding means, means for automatically shifting the pressure against which the work holding means operates, from one of the said cushioning means to the other cushioning means, and means adapted to be set to vary the time in the cycle of operation of the work holding means at which the pressure will be shifted.

9. In combination, a plunger, a work holding element co-operating therewith, a plurality of separate fluid pressure cushions for the work holding element, means for automatically shifting the pressure against which the work holding means operates, from one of the said cushions to the other cushion, and means adapted to be set to vary the time in the cycle of operation of the work holding means at which the pressure will be shifted.

10. In combination, a plunger, a work holding element co-operating therewith, a plurality of separate cushioning means for the work holding element, and means responsive in its operation to the operation of the work holding means for automatically shifting the pressure against which the work holding element operates, from one of the said cushioning means to the other cushioning means.

11. In combination, a plunger, a work holding element co-operating therewith, a plurality of separate cushioning means for the work holding means, and means for automatically shifting the pressure against which the work holding means operates, from one of the said cushioning means to the other cushioning means, the last recited means including a toggle like device intermediate the work holding element and one of the said cushioning means and means for knuckling said toggle like device.

12. In combination, a plunger, a work holding element co-operating therewith, a plurality of separate cushioning means for the work holding means, means for automatically shifting the pressure against which the work holding means operates, from one of the said cushioning means to the other cushioning means, the last recited means including toggle mechanism intermediate the work holding element and one of the said cushioning means, and means for knuckling the toggle like device, the last recited means including means adapted to be set to vary the time in the cycle of operation of said mechanism at which the said toggle like device will be knuckled.

13. In combination, a plunger, a work holding element co-operating therewith, cushioning means for said element, an additional and fluid pressure cushion for the work holding element, means for restraining the work holding element against operation with respect to the said fluid pressure cushion and during a predetermined portion of the operation of the said element against the stress of the first recited cushioning

means, and means for automatically rendering the said restraining means inactive to render the said fluid pressure cushion active.

14. In combination, a plunger, a work holding element co-operating therewith, cushioning means for said element, a fluid pressure cushion for the said element and embodying a pivotally mounted cylinder and piston movable therein, a togglelike device between the said work holding element and the said piston for locking the work holding element against operation with respect to the fluid pressure cushion, and bodily movable means to which one of the elements of the togglelike device is connected, the last said means being responsive in its bodily movement to the operation of the work holding element for causing the said togglelike device to be knuckled to render the fluid pressure cushion active with respect to the said work holding element.

15. In combination, a plunger, a work holding element co-operating therewith, cushioning means for the work holder and including a longitudinally movable member, a support co-operating with said member for thus moving it, a fluid pressure cushion for the work holding element and embodying a relatively movable cylinder and piston one of which is pivotally anchored, a bell crank lever pivotally mounted upon said support, said lever being pivotally connected with the other of the said relatively movable cylinder and piston elements, and a link interposed between the bell crank lever and the said work holding element for locking the said element against operation with respect to the said fluid cushion, the bodily movement of said support operating to cause the said lever to be shifted to unlock the work holding element with respect to the said fluid pressure cushion.

16. In combination, a plunger, a work holding element co-operating therewith, cushioning means for the work holder and including a longitudinally movable member, a support co-operating with said member for thus moving it, a fluid pressure cushion for the work holding element and embodying a relatively movable cylinder and piston one of which is pivotally anchored, a bell crank lever pivotally mounted upon said support, said lever being pivotally connected with the other of the said relatively movable cylinder and piston elements, a link interposed between the bell crank lever and the said work holding element for locking the said element against operation with respect to the said fluid cushion, the bodily movement of said support operating to cause the said lever to be shifted to unlock the work holding element with respect to the said fluid pressure cushion, and means adapted to be set to vary the point in the bodily movement of the said support at which the bell crank lever will be rocked with respect to the support.

In testimony whereof I have signed my name to this specification, on this 18th day of May, A. D. 1925.

FREDRICH J. RODE.