March 5, 1946. L. LOEWY 2,396,108

METALWORKING PRESS

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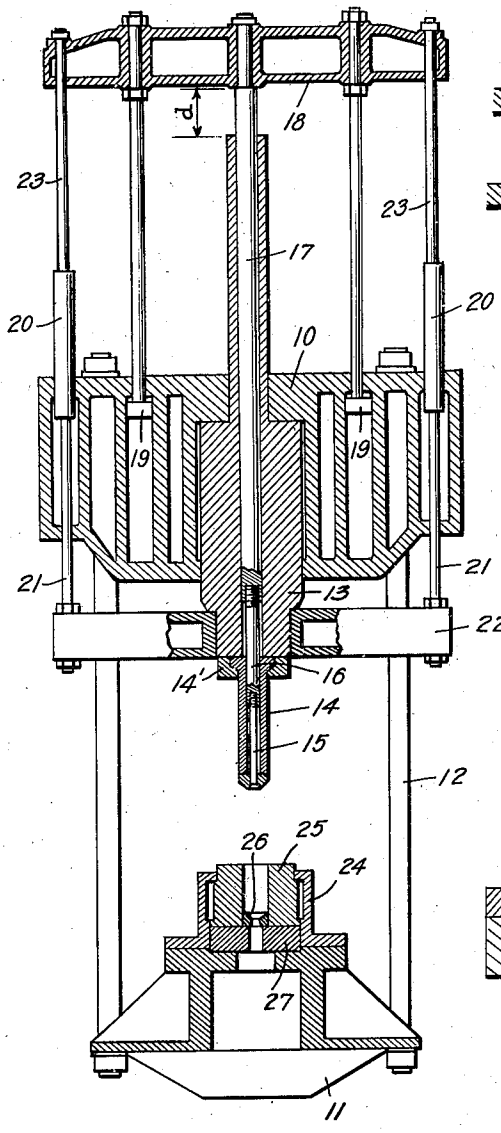


Fig. 1.

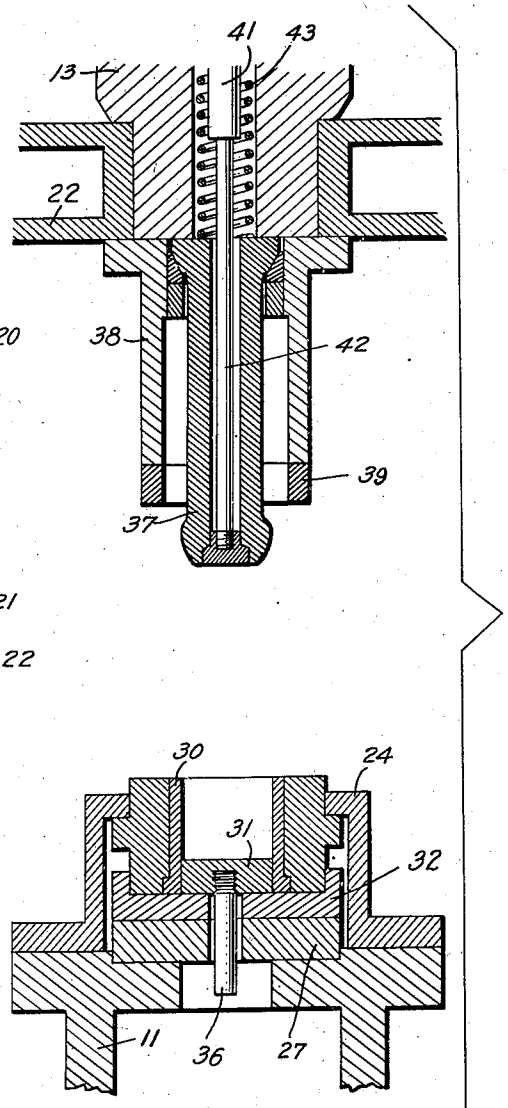


Fig. 3.

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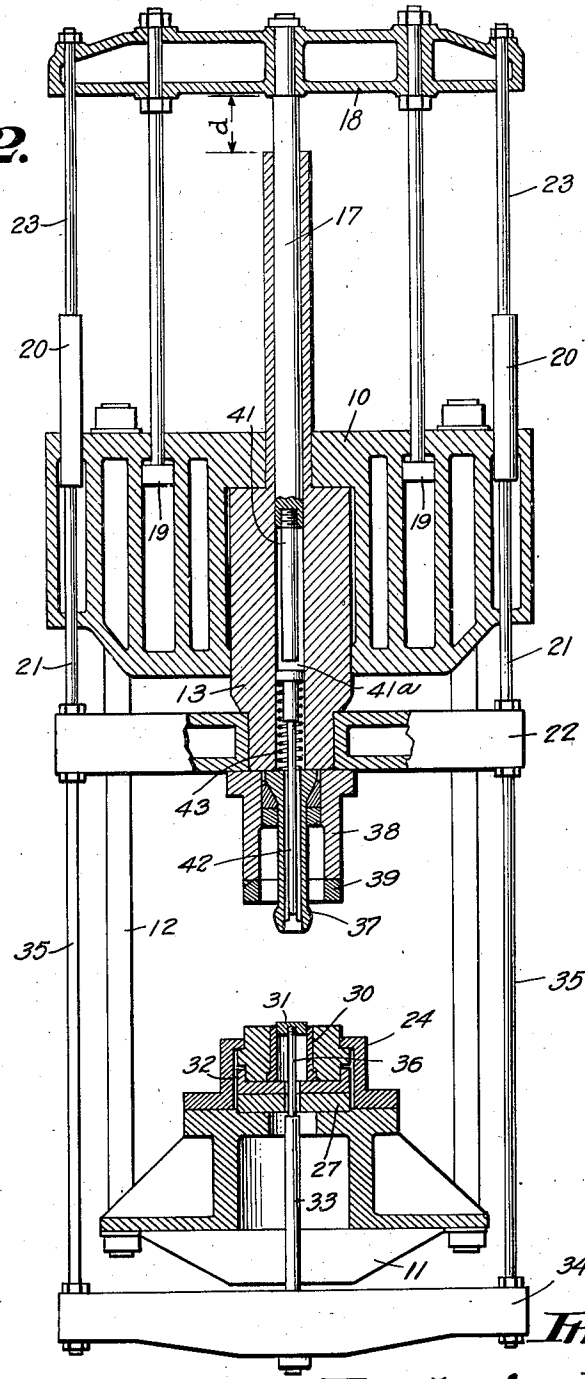
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Fig. 2.



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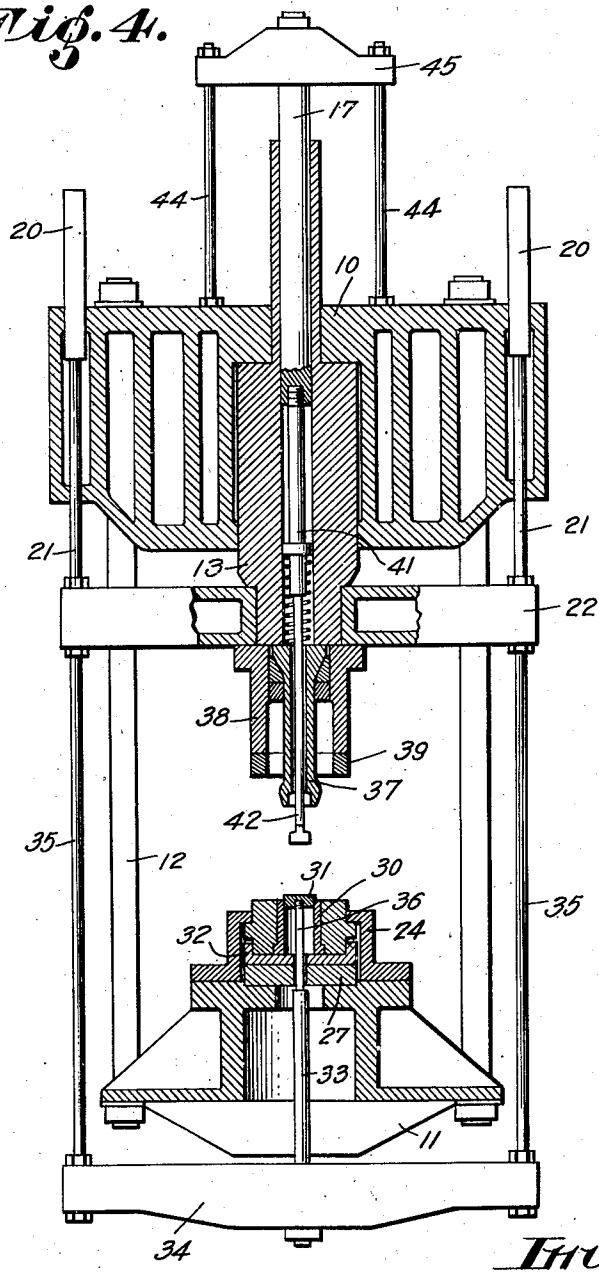
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Fig. 4.



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UNITED STATES PATENT OFFICE

2,396,108

METALWORKING PRESS

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Application July 9, 1941, Serial No. 401,578
In Great Britain May 9, 1941

4 Claims. (Cl. 78—42)

This invention relates to metal working presses and, in particular, to metal extrusion presses of the vertical type, in which rods, shapes and tubes are produced by extruding a billet placed within a container through a die which is inserted at one end of this container.

Presses of this type usually comprise a double-acting main power drive, preferably fluid-operated, for effecting both the working and the return strokes of the press stem which performs the extrusion of the billet through the die. In addition to this, in those presses which are adapted also for the extrusion of tubes, a second power drive is provided for actuating the mandrel which pierces the billet previous to its extrusion, and serves also to define, together with the die, an annular passage for the extruded product.

Presses are further known in which cup-shaped hollow bodies, such as cases for ammunition shells, are produced by piercing or punching a slug placed within a closed-bottom matrix and by forcing a certain portion of the slug material at the same time backwards through the space between the bore of the matrix and the descending punch. The pierced workpiece is either ejected from the matrix after the punch is withdrawn, or, in those cases in which the workpiece adheres to the punch, it will be stripped from the latter, special means being provided in the press for the ejecting or stripping operation.

Heretofore, different machinery had to be used for the extrusion of metal rods, shapes and tubes on one hand and for the manufacture of cup-shaped hollow bodies on the other, and it was not possible to use either a normal extrusion press or a normal piercing press for both purposes.

It is an object of this invention to provide a press which can be alternatively used for the extrusion of metal rods, shapes or tubes, and also for the manufacture of cup-shaped hollow bodies, such as cases for ammunition shells, thus widening the range of products which can be obtained from such a press and increasing its usefulness to a very considerable extent.

It is another object of this invention to provide a vertical extrusion press which can be transformed into a piercing press in a very simple manner, so that the change-over from one mode of operation to the other can be accomplished in a comparatively short time and with little labour.

This object is achieved by suitably adapting those elements which have to be added to the press for the manufacture of cup-shaped hollow bodies to the specific structural features of a vertical extrusion press, in such a way that the heavier and the more complicated parts, such as the frame of the press, its power drives, their controls, etc. can be retained without any alterations, the work necessary for the transformation of the press being substantially limited to an exchange of the respective tools and their accessories.

It is, therefore, a further object of this invention to provide means for adapting temporarily a vertical extrusion press of normal design to a piercing press in which cup-shaped hollow bodies and, in particular, semi-finished cases for ammunition shells can be produced.

In carrying out the invention, the punch for piercing the slugs will become associated with the main power drive, which in the extrusion press is provided for the actuation of the press stem. Thus, this punch will take the place of the press stem and can be coupled to the main ram so as to be actuated by the latter and its return rams respectively. The matrix will take the place of the container.

The ejecting means of the piercing press will be coupled with the return rams, preferably through downwardly extending tie-rods and a crosshead arranged below the press, so that the ejector will enter the matrix from below when the punch is being withdrawn from the matrix.

It is another feature of the invention to utilise the second power drive for operating the stripping means, this power drive being particularly suitable for that purpose since it is capable of being moved independently of the main ram. The place of the mandrel will be taken by a stripper pin, which to be effective is pushed downwards, while the punch with an adhering workpiece remains stationary.

It is to be noted here that the stripping pin when pushing off a workpiece from the punch will only engage the bottom wall of the workpiece and not, as in the case of known piercing presses, the side walls. This is of particular importance since the side walls are comparatively thin and therefore more liable to deformation than the thicker bottom walls.

For controlling the thickness of the bottom wall of the cup-shaped hollow bodies, a distance piece is associated with the punch which is adapted to limit the working stroke of the latter.

In a modification of the invention, the separate actuating means for the stripping means are dispensed with and a stop is provided instead which is arranged in the path of the upward stroke of the stripper pin. This stop brings the stripper pin to rest while the punch, with an adhering workpiece, will continue its upward movement so that the stripper pin will strike against the bottom wall of the adhering workpiece and push it off in the same way as described before.

In this case, the second power drive which is provided for the mandrel of an extrusion press will be dismantled and the parts connecting the mandrel to this power drive, such as a mandrel shaft, will be immobilised by anchoring the same to the press frame. This arrangement has the

advantage that the moving masses are considerably reduced when the press is used for piercing purposes only; furthermore, less pressure water is required for the operation of the press and the control will be simplified.

In order to make the invention more clearly understood and to show in which way it may be carried out, a press embodying the characteristic features of the invention will be described in the following specification with reference to the accompanying drawings in which:

Fig. 1 is a sectional elevation of a vertical metal extrusion press adapted for the extrusion of rods, shapes and tubes.

Fig. 2 is a sectional elevation of the press according to Fig. 1 adapted for the manufacture of cup-shaped hollow bodies.

Fig. 3 is a more detailed view of the tool assembly of the press according to Fig. 2.

Fig. 4 shows a modified way of adapting a press according to Fig. 1 to the manufacture of cup-shaped hollow bodies.

In the drawings, **10** denotes the main or upper platen for a vertical metal extrusion press in which the various hydraulic power drives are arranged and which is supported on the baseplate **11** by means of columns **12**. Located in the centre of platen **10** is the main ram **13** which carries at its lower end a press stem **14** by means of the tool holder **14'**.

Passing through an axial bore in ram **13** and press stem **14** respectively, are piercing mandrel **15** and mandrel holder **16**, the latter being detachably mounted on a shaft **17** which extends axially through the ram **13** and projects beyond platen **10**.

Shaft **17** carries at its upper end an upper cross-head **18** with which two laterally arranged piercing rams are associated. These rams are shown in the drawings as being of the double-acting type, so that the crosshead **18**, and with it the piercing apparatus consisting of the parts **15** to **17**, can be lowered and raised in accordance with the movement of the rams **19**.

For effecting the return movement of stem **14**, rams **20** are provided near the ends of platen **10**, which rams are connected to main ram **13** by means of tie-rods **21** and a lower crosshead **22**. The rams **20** are connected with upper crosshead **18** by means of extension rods **23** so that movement of the main ram **13** will be transmitted to the piercing apparatus through the intermediary of the lower crosshead **22**, tie-rods **21**, return rams **20**, extension rods **23** and upper crosshead **18**. Upper crosshead **18** is capable of sliding a certain distance "*d*" along rods **23** so as to render the piercing apparatus independently moveable from main ram **13** to some extent.

Arranged on baseplate **11** is a container holder **24** which is adapted to receive a billet container **25**. A die **26** is removeably inserted at the end of the container bore and supported in the container holder, together with the container, by means of a bolster **27**.

The metal extrusion press described so far is of normal design and operated in a well known manner, so that a detailed description of the operation is not considered necessary. For transforming this press into a piercing press, the following changes have to be made:

The container **25** and the die **26** will be exchanged for a matrix **30** having a bore of suitable size to take up slugs for the manufacture of cup-shaped hollow bodies. A bottom plate **31** is loosely inserted into the end of the matrix bore so as to close the same. As matrix **30** is of less height than the container, an intermediate backing piece **32** will be placed between the matrix and the die on one side and the bolster **27** at the other side. Means will be further attached to the press for ejecting workpieces from matrix **30**, these means comprising an ejector pin **33** mounted on a crosshead **34** which is connected by means of tie-rods **35** to the lower crosshead **22** and thereby also to the return rams **20**. The bottom plate **31** has a finger **36** which depends into the opening of baseplate **11** provided therein for the passage of the extruded products.

A further exchange to be made is that of the piercing stem **14**, the mandrel **15** and the mandrel holder **16**, for a punch and stripper assembly which is shown more in detail in Fig. 3. This assembly comprises a punch **37** fixed to the main ram by means of a tool holder **38**, a distance piece **39** being attached to tool holder **38**. Screwed into shaft **17** in place of mandrel holder **16** is an extension **41**. Loosely arranged in an axial bore of punch **37** is a stripper pin **42**, this pin being normally held back by means of a spring **43** in a position in which its tip is flush with the tip of the punch and forms a continuous surface with the same, so as to co-operate with the punch in the piercing of the billets. The stripper pin **42** is, however, adapted to be pushed downwards against the action of the spring, for stripping purposes, by means of the rams **19** belonging to the second power drive of the extrusion press which is provided therein for the actuation of the mandrel. As set out in the foregoing, this second power drive is to some extent moveable independently of the main ram and this feature is utilised for moving the stripping pin relatively to the punch **37**.

Movement is transmitted to stripper pin **42** by means of shaft **17** and shaft extension **41**. As shown in Fig. 2, a small clearance **41***a* is normally maintained between the bottom end of extension **41** and the top end of stripper pin **42**; furthermore, the pin **42** is flanged at its lower end and fits there snugly into a correspondingly shaped bore of the punch; thus it is ensured that during the piercing operation pin **42** will neither be pushed out too far by an accidental movement of shaft **17**, nor trail behind the punch **37**.

It will be noted here that all the main parts of the press, such as the main ram and all other components of the various hydraulic power drives, will remain unaffected by the above modifications. Neither are alterations necessary to the frame parts, such as the platen **10** and the baseplate **11**, or to the control apparatus of the power drives which are not shown here.

The work necessary for transforming the extrusion press to a piercing press is limited to an exchange of the tools and their accessories and to the incorporation of the ejecting and of the stripping means into the press. These modifications can be carried out in a few hours, so that the interruption in the operation of the press will be only of short duration.

In the following, the mode of operation of a piercing press according to Fig. 2 will be shortly described:

A slug of suitable size is first placed into the matrix **30**; punch **37** is then actuated by means of main ram **13** to pierce the slug and, at the same time, to force a part of the slug material backwards through the space between the matrix and the punch. In this way, a cup-shaped hollow body is obtained. The thickness of the bottom wall of the pierced work-piece will be determined

by the length of the stroke of the punch and this again is determined by means of the distance piece 39 which, at the end of the stroke, will abut against the top surface of the matrix.

After the punch has completed its working stroke, it is withdrawn from the matrix by means of the return rams 20. At the same time, the ejector crosshead 34 is moved upwards and ejector pin 33 will strike against finger 36 whereby the bottom plate 36 with the pierced workpiece will be pushed out of the matrix. In those cases in which a workpiece adheres to the punch on its withdrawal, the stripper pin 42 will be made effective for pushing off the workpiece from the punch in the manner described above by means of rams 19 and shaft 17. After the stripping has been completed, shaft 17 will be returned into its original position and the pin 42 drawn back by means of spring 43.

In the modification shown in Fig. 4, the hydraulic power drive which, in the extrusion press, was provided for the mandrel and which consisted of the double-acting rams 19, is dispensed with, and the shaft 17 is anchored to the platen 10 by means of tie-rods 44 attached to a crossbeam 45 which is mounted on shaft 17 in exchange for upper crosshead 18.

The operation of this press is the same as that according to Fig. 2 as far as the piercing of the slugs and the ejecting of the workpiece from the matrix are concerned. The stripping of any workpieces adhering to the punch is obtained by continuing the upward stroke of the punch while the stripper pin 42 has been arrested by abutting against the end of shaft 17, thereby pushing off the workpiece from the punch, so that no additional operation of any press parts is required for effecting the stripping.

In this case, shaft extension 41 will be shorter so as to allow the pin 42 to be retracted sufficiently to clear the matrix when being withdrawn together with the punch.

It is to be understood that the invention is not limited to that particular form of an extrusion press which is shown and described here. The invention is equally applicable also to other designs of extrusion presses, for instance, to an extrusion press having a closed frame in the upper part of which are arranged the power drives, whereas the bottom part of the frame takes up the container-holding elements and their accessories.

Cup-shaped hollow bodies which are produced with presses according to the invention in the manner described here are then subjected to a further treatment consisting of a number of drawing operations until the final dimensions are obtained. Experience has shown that on a press according to the invention a product can be obtained, the dimensions of which are much nearer to the final ones than was previously possible, with a corresponding reduction in the necessary number of drawing operations. This in itself is another important advantage of the invention as it results in a considerable saving of time and of production costs.

I claim:

1. In a metal working press the combination with a double-acting power drive for actuation of a punching tool, said power drive including a main ram, a second double-acting power drive for actuation of a stripping means independently of said first power drive, said second power drive comprising a mandrel shaft extending through said main ram, and holding and supporting means for a billet container, of a punching tool adapted to pierce blanks, said tool being associated with said first power drive for actuation thereby, a blank-receiving matrix associated with said supporting and holding means, means for ejecting a pierced blank from said matrix, said ejecting means being coupled to said first power drive so as to enter said matrix on the return stroke of said punching tool, means for stripping a pierced blank from said punching tool, said stripping means being located in said punching tool and associated with said second power drive, and means for moving said mandrel shaft so as to cause said stripping means to project from said punching tool to strip a pierced blank from said punching tool.

2. A press for making cup-shaped hollow bodies, having a double-acting power drive, an axially bored shaping tool, actuated by said power drive, a blank receiving matrix, means for removing the shaped blanks from said matrix, said removing means being operatively connected to said power drive, a stripping pin, arranged in the axial bore of and adapted to be lowered together with said shaping tool, and means for moving said stripping pin out of said shaping tool in a direction opposite to the return stroke of said shaping tool, said means constituting a second double acting power drive operative separate from said first mentioned power drive.

3. A press for making cup-shaped hollow bodies, having two independently operated power drives of the double acting type, a hollow blank piercing tool, a crosshead, adapted to be moved in a vertical direction by the first of said power drives and carrying said tool, a blank receiving matrix, means for removing the pierced blanks from said matrix, said removing means being operatively connected to said first power drive, means located in said hollow blank piercing tool for stripping a pierced blank from said tool, and means operatively connecting said stripping means to said second power drive for moving said stripping means in a direction opposite to the movement of said piercing tool on its return stroke to move the stripping means out of the hollow blank piercing tool to strip the cup-shaped article therefrom.

4. A press for making cup-shaped hollow bodies comprising a support, a blank receiving matrix connected to said support, a cross-head movable on said support toward and from said matrix, a hollow punch carried by said cross-head and adapted to enter said matrix, a stripper member movable longitudinally within the punch and having an enlarged head fitting a recess in the end of the punch, an ejector movable longitudinally within the matrix to eject work therefrom, a ram carried by said support and operable to move the cross-head and punch toward said matrix, a ram carried by said support operable to move the cross-head away from the matrix and to operate the ejector, and a ram operable to actuate the stripper to remove a hollow body from the punch.

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