

Aug. 16, 1949.

D. R. FRANCIS

2,479,336

BLANKHOLDER PRESS FOR FORMING WORKPIECES

Filed March 27, 1947

2 Sheets-Sheet 1

FIG. 1

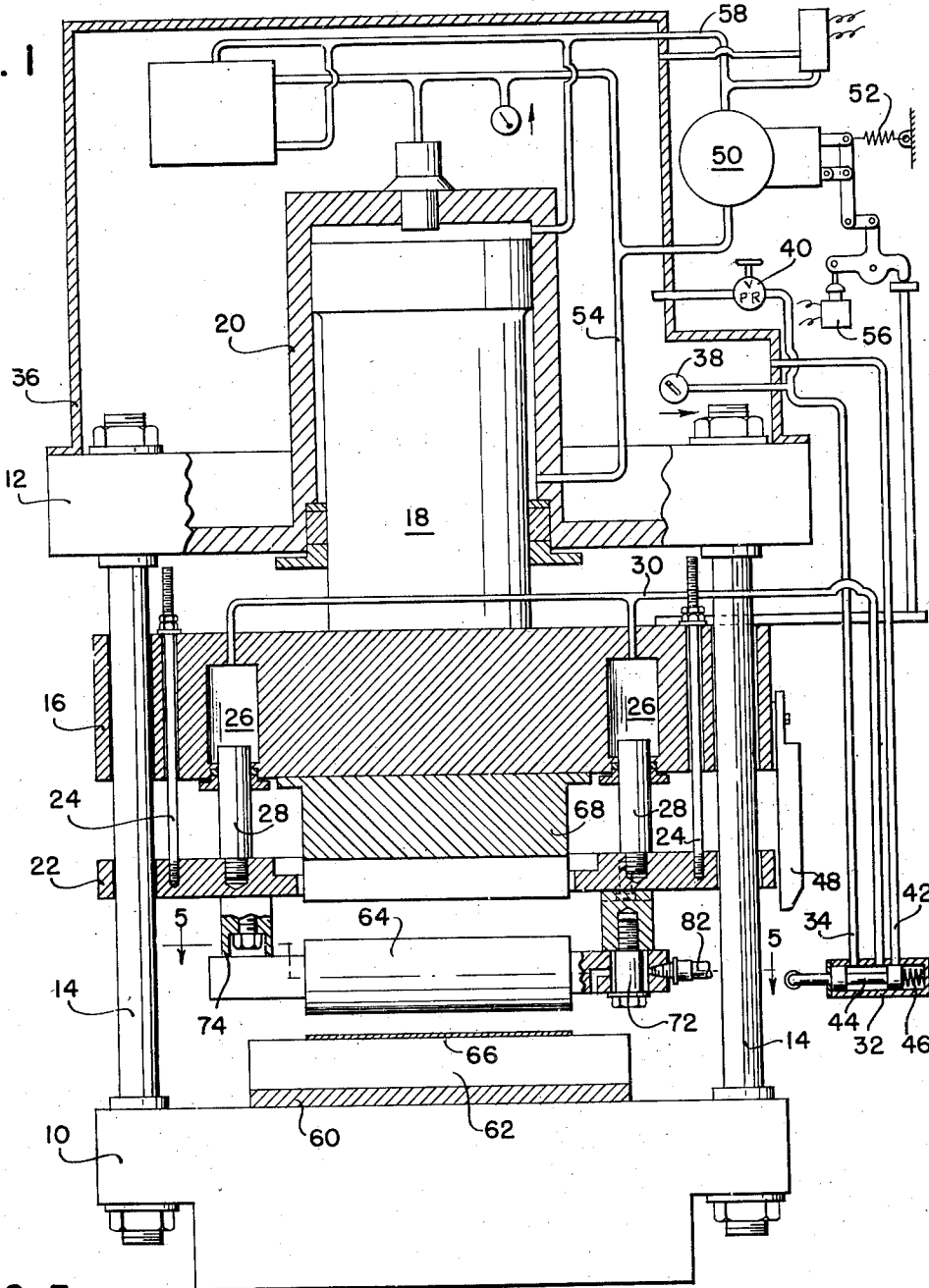
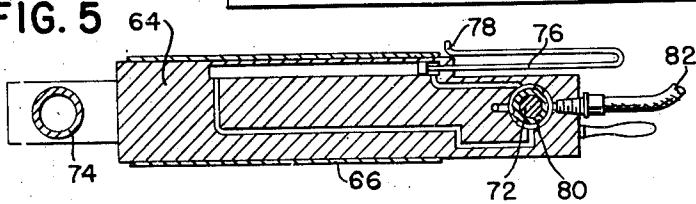


FIG. 5



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2 Sheets-Sheet 2

FIG. 2

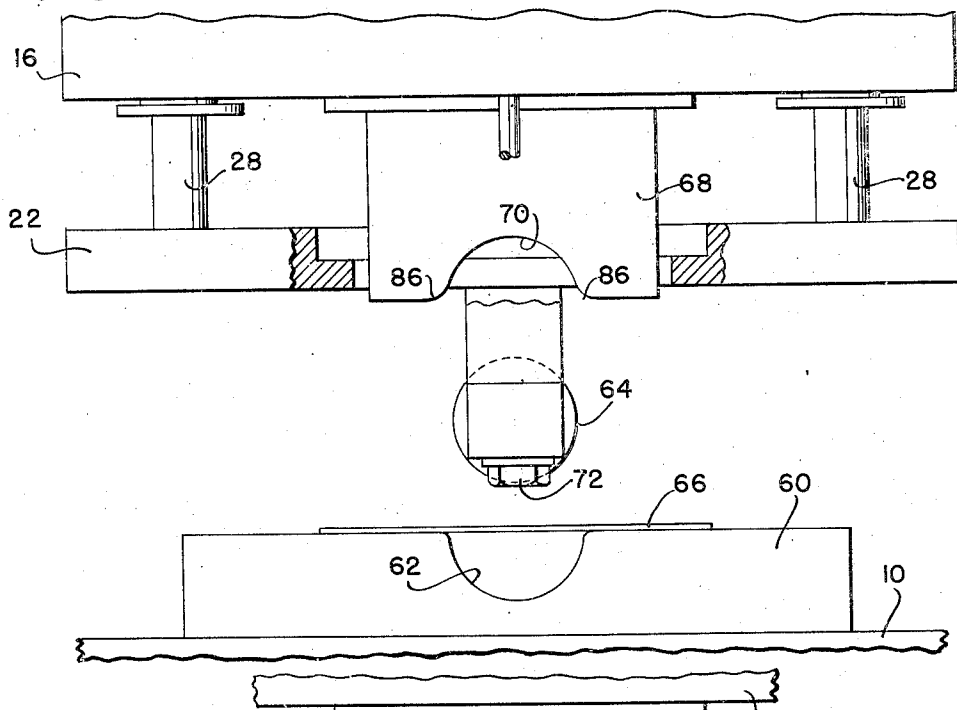


FIG. 3

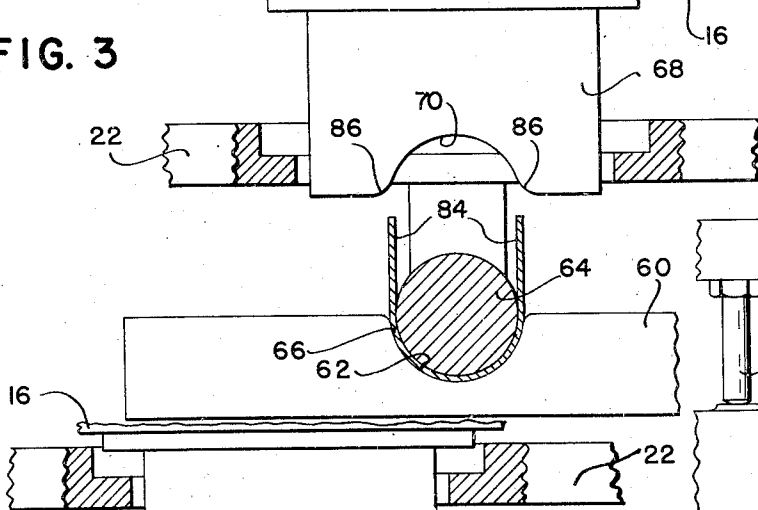


FIG. 6

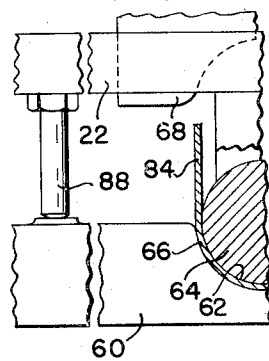
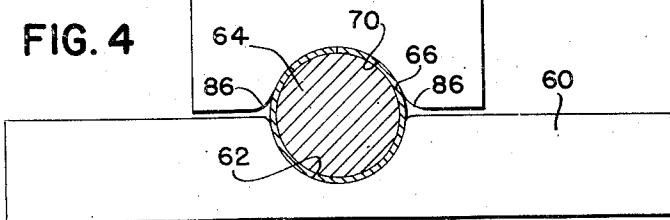


FIG. 4



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BLANKHOLDER PRESS FOR FORMING WORKPIECES

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1 Claim. (Cl. 153—49)

1

This invention relates to an improved apparatus for forming cylindrical work members from plates.

The particular object of this invention is to provide an apparatus for forming a plate of material into a cylindrical work member with a single stroke of a press.

A further object is to provide an apparatus for forming cylindrical members from plates which first bends the plate into a U-shape and thereafter forms the leg portions thereof over to form a completed cylinder, and accomplishes this by a single stroke of a press member.

It is also an object of this invention to adapt a blankholder type press to the operation of forming a cylinder from flat plate material without greatly modifying the structure thereof.

A still further object is to provide, in combination with a blankholder type press, an improved die arrangement whereby the workpieces may readily be removed from the press following the forming operation.

These and other objects and advantages will become more apparent upon reference to the following description and the accompanying drawings in which:

Figure 1 is a vertical section through a press constructed according to this invention;

Figures 2, 3, and 4 are fragmentary views showing the press and workpiece being formed thereby in various stages of a work cycle;

Figure 5 is a plan section indicated by the line 5—5 on Figure 1; and

Figure 6 is a view showing the use of a positive stop to halt the blankholder in a predetermined position.

Referring to Figure 1, a press according to this invention comprises a bed 10 and a head 12 which are interconnected by strain rods 14. A platen 16 is reciprocable to and from the bed 10 and may be guided on the strain rods 14, if desired.

Connected with the platen 16 is a double acting ram 18 which reciprocates in a cylinder 20 carried by the head 12.

Suspended beneath the platen 16 is a blankholder platen 22, the spacing of which relative to the platen 16 is limited by the rods 24. Secured to the blankholder platen 22 and extending into the cylinders 26 in the platen 16 are the blankholder plungers 28. When the platens 16 and 22 move toward each other the plungers 28 displace fluid from the cylinders 26 through the conduit 30. The conduit 30 is connected with a valve 32 that normally places the said conduit in communication with a second conduit 34 leading

2

to the reservoir 36 mounted on the press head. Free flow of fluid from the reservoir 36 into the conduit 34 is provided for by the check valve 38 while fluid flow from the conduit 34 into the tank 36 is controlled by the adjustable pressure relief valve 40. It will be apparent that separating movements of the platens 16 and 22 may be had freely at any time whereas movements thereof together are resisted by the pressure developed in the cylinders 26 by the relief valve 40.

A third conduit 42 is connected with the valve 32 and opens directly into the reservoir 36. The conduit 42 is adapted for being connected with the conduit 30 when the valve member 44 of the said valve is moved rightwardly against the thrust of the spring 46 by engagement with the valve member of the cam 48 secured to the platen 16. The purpose of this will become more apparent hereinafter.

The double acting ram 18 has connected therewith a fluid source 50 adapted for selectively supplying fluid to the advancing and retracting sides of the said ram for reciprocating the same together with the platens 16 and 22. The source 50 is normally urged by a spring 52 to deliver through the conduit 54 to the retracting side of the ram, and when the solenoid 56 is actuated, the fluid source is shifted to deliver through the conduit 58 to the advancing side of the ram 18.

As best seen in Figures 2, 3 and 4, there is mounted on the press bed a die 60 comprising the substantially semi-cylindrical groove 62. Suspended from the blankholder platen is a substantially cylindrical arbor 64 which is adapted for entering the groove 62 with sufficient space therearound to receive the thickness of the work member 66. Extending downwardly from the main platen 16 there is a die member 68 having a substantially semi-cylindrical groove 70 therein which is complementary to the groove 62 in the die member 60.

The arbor 64 is carried on the blankholder platen 22 as shown in Figure 1 wherein it will be seen that the right hand support for the said arbor comprises a pivot 72 while the left-hand end comprises the abutment 74. The pivot 72 permits the arbor 64 to be turned in order to permit the formed workpieces to be removed therefrom.

As shown in Figure 5, the arbor 64 may carry a fluid operable plunger 76 which has an end portion 78 thereon adapted for engaging and stripping the workpiece from the arbor. Conveniently, the valve mechanism for actuating the plunger 76 in its stripping and return move-

3

ments may be located, as indicated at 80, about the pivot 72 whereby movement of the arbor to its unloading position will effect fluid communication between the pressure conduit 82 and the side of the plunger 76 on the right side as viewed in Figure 5.

Operation

In operation, the workpiece 66, which is a flat plate of metal, is placed on the die 60, as shown in Figures 1 and 2. Thereafter, the solenoid 56 is energized to commence the delivery of fluid from the source 50 to the advancing side of the ram 12. This moves the ram and platens 16 and 22 downwardly and brings the arbor 64 in engagement with the workpiece 66 as shown in Figure 3. At this time the workpiece is formed substantially to a U-shape with the edge portions thereof extending vertically as indicated at 84.

It will be noted that the edges of the groove 70 in the die member 68 are somewhat relieved as at 86 so that further movement of the said die member will move the portions 84 of the work member inwardly.

Proceeding from Figure 3 to Figure 4, wherein the die member 68 has been advanced to the limit of its travel, it will be seen that the workpiece 66 has been completely formed into a cylindrical member. It will be observed that between their Figures 3 and 4 positions, the platens 16 and 22 have moved relatively. If, during this relative movement, the valve 32 is inoperative due to its position relative to the cam 48, the relative movement of the blank-holder platen, relative to the main platen, will be accompanied by a discharge of fluid through the relief valve 40 which will develop a continuous pressure downwardly on the blankholder platen and mandrel 64. If the workpiece being formed is of a material having a substantial amount of spring-back, the press will preferably be operated in this manner in order to insure the proper engagement of the edges of the work member by the upper die.

However, if the material being formed is relatively ductile and the bending thereof is not accompanied by an appreciable amount of spring-back, then the valve 32 may be made operative and will connect the blankholder cylinders 26 to exhaust at or shortly after the time the press reaches its Figure 3 position. In this manner, the remainder of the working stroke of the platen 16 may be accomplished without any loss of pressing force to the blankholder platen.

After the workpiece is fully formed and the press platens have been retracted, the mandrel 64 is rotated about its pivot 72. The rotating movement of the mandrel on its pivot making connection between the conduit 82 and plunger 76 actuates the plunger to move the stripper 78 to

4

dislodge the formed workpiece from the mandrel. After the workpiece has been dislodged, the mandrel is returned to its working position and the plunger 76 and stripper 78 automatically return to their Figure 5 position.

From the foregoing it will be seen that this invention provides an apparatus for very rapidly forming cylinders from flat plates or sheets. Furthermore, this is accomplished by a single stroke of the press platen so that only one press and one set of dies are required for the complete operation.

As shown in Figure 6, the blank-holder platen 22 may have a stop member 88 thereon which abuts the die member 60 and prevents the thrust of the blank-holder plungers from being exerted on the thin metal of the workpiece.

It will be understood that this invention is susceptible to modification in order to adopt it to different usages and conditions and, accordingly, it is desired to comprehend such modifications within this invention as may fall within the scope of the appended claim.

I claim:

In a press; a pressing platen having a grooved die thereon; a similarly grooved die stationarily mounted; a blank-holder platen suspended from said pressing platen; piston-cylinder means extending between said platens and adapted for exerting a thrust on said blank-holder platen in response to movement of said pressing platen there-toward; a mandrel carried by said blank-holder platen between said dies; and pivot means supporting said mandrel on said blank-holder platen to permit movement thereof for loading and unloading, said mandrel having stripper means to remove workpieces formed thereon and automatically operable by the movement of said mandrel about its pivot.

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