April 20, 1965 V. GEORGEFF 3,178,975

HIGH SPEED PRECISION BLANKING PRESS

Filed March 24, 1961 3 Sheets-Sheet 1

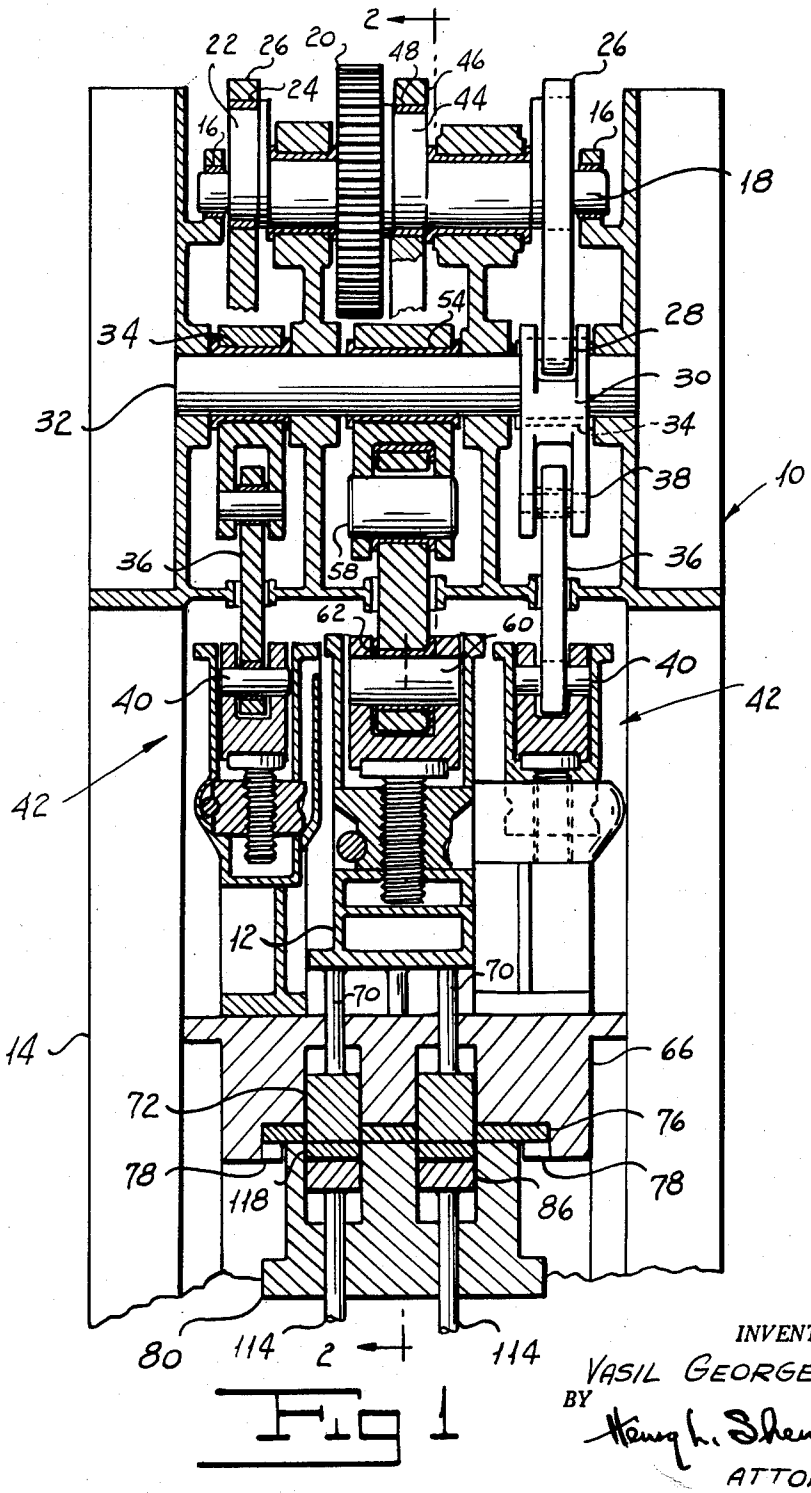


Fig 1

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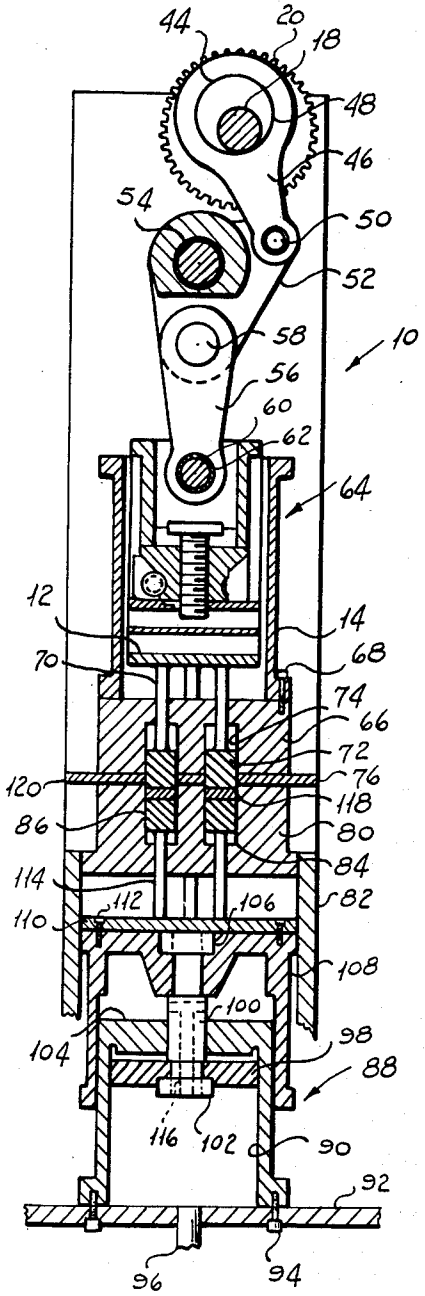


Fig 2

Fig 4

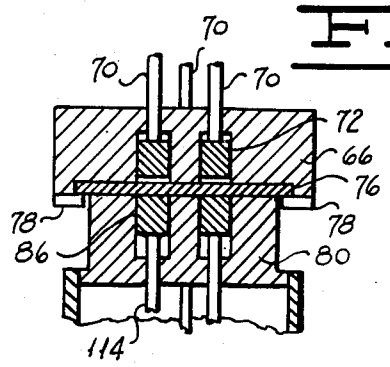


Fig 5

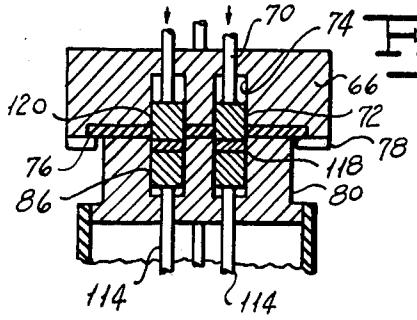


Fig 6

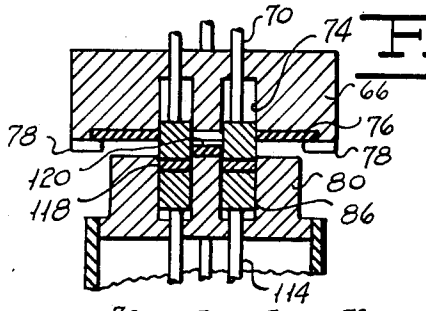
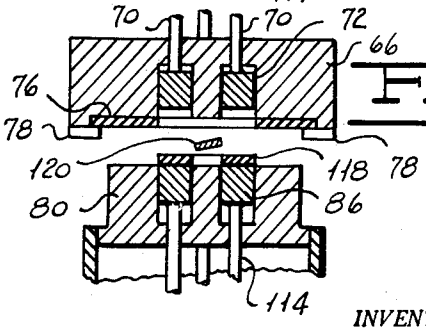


Fig 7



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Fig 3

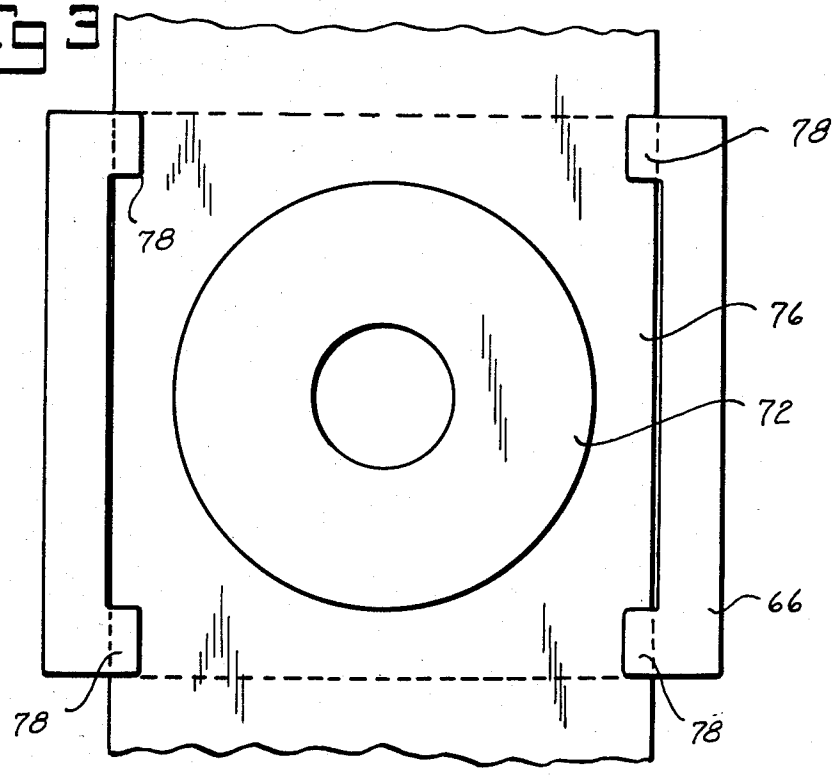
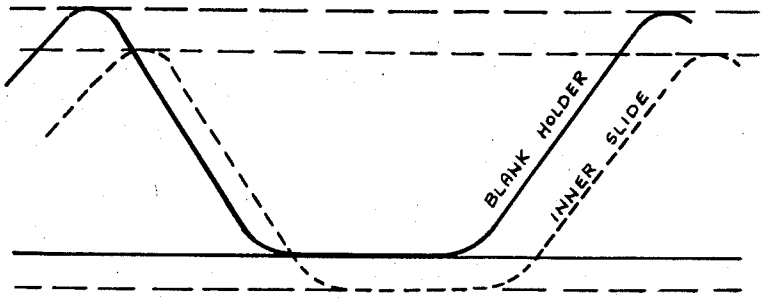


Fig 8



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HIGH SPEED PRECISION BLANKING PRESS

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Filed Mar. 24, 1961, Ser. No. 98,049
6 Claims. (Cl. 83—125)

My invention relates to a high speed precision blanking press and more particularly to a power press for performing precision blanking operations in a more rapid and expeditious manner than is accomplished in the prior art.

As is known in the art, in the normal blanking operations performed on a press, as the punch is driven through the material from which the blank is to be formed the punch penetrates into the work with a clean cut through only about one-third the thickness of the work. During the remainder of the blanking operation, there is an irregular breaking or tearing of the material around the periphery of the blank. In some instances the irregularity around the edge of the work is not objectionable. In many other instances, however, this roughness or irregularity is objectionable and the blank must be ground or shaved to provide the finished blank with a smooth edge.

It has been suggested in the prior art that "precision blanking" operations be performed to produce a blank having a very accurate edge with a smooth finish in a single operation on a press. The secret of precision blanking rests in securely clamping the stock between the punch and the die with pressures equal to or greater than that required to perform the blanking operation. When this is done, the punch cuts its way completely through the blank as contrasted with the partial penetration which occurs in the ordinary blanking operation.

In the prior art precision blanking operations have been accomplished using conventional single action presses provided with heavy cushions in both the slide and the bed to grip the work. Owing to the fact that such heavy cushions are used, the press must operate at a speed which is relatively slow as compared to that at which it normally operates. Further means must be provided for locking the die cushion to prevent the blanked part from being forced back into the stock during return stroke of the press. It has further been suggested in the prior art that precision blanking be performed on hydraulic presses provided with hydraulic rams. The operation of these presses, like that of a single action press provided with heavy cushions in the slide and in the bed, is relatively slow.

I have invented a high speed precision blanking press which is adapted to produce a blanked part having a very accurate edge with a smooth finish. My precision blanking press operates in a more rapid and expeditious manner than do presses of the prior art which are adapted to perform precision blanking operations. My high speed precision blanking press is relatively simple for the result achieved thereby.

One object of my invention is to provide a high speed precision blanking press which is adapted directly to produce a blank part, the cut edge of which is very accurate and has a smooth finish.

Another object of my invention is to provide a high speed precision blanking press which performs precision blanking operations in a more rapid and expeditious manner than do presses of the prior art adapted to perform such operations.

A further object of my invention is to provide a high speed precision blanking press which is relatively simple for the results achieved thereby.

A still further object of my invention is to provide a high speed precision blanking press which does not require a cushion locking device.

Other and further objects of my invention will appear from the following description.

In general my invention contemplates the provision of a high speed precision blanking press having means for driving a blankholder with a dwell to clamp stock between the blankholder and the press bed during a blanking operation. I reciprocate the inner slide of my press to carry a punch through the clamped stock against the action of a cushion pad to form a blank. I arrange the inner slide drive of my press so that the inner slide dwells at the bottom of its stroke to permit the blankholder to begin the upward portion of its stroke before the inner slide starts to return thereby to carry the stock up on the blankholder to prevent the formed blank from being driven back into the stock under the action of the die cushion and to permit scrap to be cleared from the die.

In the accompanying drawings which form part of the instant specification and which are to be read in conjunction therewith and in which like reference numerals are used to indicate like parts in the various views:

FIGURE 1 is a sectional view of my high speed precision blanking press.

FIGURE 2 is a sectional view of my high speed precision blanking press taken along the line **2—2** of FIGURE 1.

FIGURE 3 is a plan view of my high speed precision blanking press showing the construction of the blankholder slide as viewed from the underside thereof.

FIGURE 4 is a schematic view showing the relative disposition of the parts of my high speed precision blanking press after the blankholder slide has moved to clamp the stock and before the inner slide has performed the blanking operation.

FIGURE 5 is a schematic view of my high speed precision blanking press showing the relative disposition of parts immediately after a blanking operation has been performed.

FIGURE 6 is a schematic view showing the relative disposition of the parts of my high speed precision blanking press showing the relationship of parts after the blankholder slide begins to return.

FIGURE 7 is a schematic view showing the relative disposition of parts of my high speed precision blanking press as the inner slide begins its return stroke.

FIGURE 8 is a diagram illustrating the relative motions of the blankholder and the inner slide of my high speed precision blanking press.

Referring now to FIGURES 1 and 2 of the drawings, my high speed precision blanking press includes a frame, indicated generally by the reference character **10**, carrying an inner slide **12** and a blank-holder slide **14** for reciprocating movement with respect to the frame by any suitable means such as by gibs (not shown). Bushings **16** carried by the press frame rotatably support the press drive shaft **18**. A gear **20** carried by shaft **18** for rotation therewith is adapted to be driven in the course of a press operation from the flywheel (not shown) of the press through a clutch (not shown) in a manner known to the art. Shaft **18** carries for rotation therewith a pair of eccentrics **22** carrying bushings **24** which support respective pitmans **26**. Pins **28** pivotally connect the pitmans **26** to bell cranks **30** rotatably supported on bushings **34** carried by a rocker shaft **32** supported in the press frame. I pivotally connect links **36** to the other arms of bell cranks **30** by pins **38**. Pins **40** carried by the blank holder slide adjusting mechanisms, indicated generally by the reference characters **42**, connect the other ends of links **36** to the mechanisms **42**. Each of the slide adjusting mechanisms **42** is of a suitable type known to the

art adapted to be actuated to adjust the position of the blankholder 14 with respect to the press bed to be described hereinafter. From the structure just described it will be appreciated that when shaft 18 is driven, blankholder 14 is reciprocated on the press frame 10 with a dwell at the bottom of its stroke.

Shaft 18 carries for rotation therewith an eccentric 44 which supports a pitman 46 on a bushing 48 carried by the eccentric 44. A pin 50 connects the pitman 46 to one arm of a bell crank 52 rotatably supported on a bushing 54 carried by the rock shaft 32. I connect the other arm of the bell crank 52 to a link 56 by means of a pin 58. A stub shaft 60, forming part of the inner slide adjusting mechanism, indicated by the reference character 64, carries a bushing 62 which supports the end of link 56 remote from the pin 58. The mechanism 64 is of a type known in the art which is adapted to be actuated to adjust the position of the inner slide 12 with respect to the press bed. I connect a blankholding portion 66 of the die to the blankholder slide 14 by any suitable means such as bolts 68. A plurality of rods 70 welded or otherwise secured to the inner slide 12 support a punch 72 adapted to move up into a recess 74 in the blankholder 66. In the particular form of my invention shown in the drawings, punch 72 is adapted to punch a blank in the form of a washer out of the stock 76.

Referring more particularly to FIGURES 1 and 3, the blankholder 66 is formed with a plurality of strip carriers 78 adapted to receive the stock 76 in the manner shown in FIGURES 2 and 3. It will be appreciated that through the medium of the carriers 78 the blankholder 66 supports the stock 76 for movement therewith.

I secure a lower die 80 on the press bed 82 by any suitable means known to the art. Die 80 is formed with an annular recess 84 adapted to receive a cushion pad 86. In the press bed below the die 80, I mount a die cushion assembly, indicated generally by the reference character 88. One form of cushion assembly 88 which is suitable for use in my high speed precision blanking press includes a lower cylinder 90 secured to a support plate 92 by any suitable means such as by bolts 94 and adapted to be supplied with fluid under pressure from a suitable source (not shown) through a pipe 96 leading into the cylinder. Cylinder 90 receives a lower piston 98 secured to a rod 100 by means of a nut 102 or the like. The upper end of the cylinder 90 is closed by an upper piston 104 through which the rod 100 extends. A nut 106 or the like secures an upper cylinder 108 to the rod 100. If desired, I may secure a wear plate 110 to the cylinder 108 by means of bolts 112 or the like. A plurality of pressure pins 114 resting on the plate 110 extends into the recess 84 to support the die cushion pad 86. From the structure just described it will be appreciated that when fluid under pressure is supplied to the cylinder 90 through the pipe 96 plate 110 is urged upwardly as viewed in FIGURE 1 resiliently to support the cushion pad 86. A passage 116 formed in the rod 100 permits fluid under pressure to flow from the lower cylinder 90 into the upper cylinder 108.

Referring now to FIGURES 4 and 8, from the top of the stroke of my high speed precision blanking press the blankholder 66 first descends to clamp the stock 76 between the blankholder and the lower die 80. When the blankholder reaches the bottom of its stroke, the drive linkage permits it to dwell. As can be seen by reference to FIGURE 5, while the blankholder 66 dwells the inner slide 12 which drives the rods 70 causes the punch 72 to cut completely through the stock 76 to form a washer 118 and a slug 120. In the course of this operation of forming the blank 118, the upper die 72 acts against the cushion assembly 88 to push the die cushion 86 downwardly to the position shown in FIGURE 5.

I so arrange the drive of the inner slide 12 that this slide dwells at the bottom of its stroke for a period of time sufficient to permit the blankholder 66 to begin its

return stroke. This is readily seen from the motion diagram of my press shown in FIGURE 8. As can be seen by reference to FIGURE 6, while the inner slide dwells to hold the washer 118 down in the recess 84 of the die 80 the blankholder 66 begins its return stroke and in the course of this movement carries the stock 76 upwardly through the medium of the carriers 78 on the blankholder. In this manner I prevent the die cushion assembly 88 from forcing the washer 118 back up into the stock as would occur if the inner slide were permitted to begin its return stroke during the period of dwell of the blankholder. After the blankholder 66 has moved upwardly through a sufficient distance to permit the washer 118 to be removed from the die area then the inner slide starts the return to move the washer 118 out of the die recess 84. As is shown in FIGURE 7, this action permits the slug 120 and the formed part 118 to be removed. When this operation is complete, the press is ready to begin its next operation.

The operation of my high speed precision blanking press will be apparent from the description given hereinabove. The sequence of operations as shown in FIGURES 4 to 7 and the motion diagram of FIGURE 8 readily demonstrate the action of my press. First the blankholder 66 and the punch 72 begin their descent. The blankholder arrives at the bottom of its stroke to clamp the stock 76 between the blankholder and the die 80 with sufficient force to permit a precision blanking operation to take place. After the blankholder begins its dwell, then the punch 72 cuts completely through the stock 76 to form the washer 118 and the slug 120. After the blanking operation, the inner slide dwells and the blankholder begins its return stroke in the course of which it carries the stock 76 upwardly. When the stock has been moved some distance up away from the die 80, then the inner slide returns and in the course of this operation the cushion assembly 88 pushes the pad 84 upwardly to move the washer 118 out of the die recess 84 to permit the formed part 118 and the slug 120 to be removed from the die area. In this manner my high speed precision blanking press accomplishes a precision blanking operation without driving the work back into the stock from which it was formed.

It will be seen that I have accomplished the objects of my invention. I have provided a precision blanking press adapted to perform precision blanking operations directly to produce blanked parts having very accurate and smooth edges. My high speed precision blanking press accomplishes these operations in a more rapid and expeditious manner than do presses of the prior art adapted to perform such operations. My press is relatively simple in construction for the results achieved thereby.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of my claims. It is further obvious that various changes may be made in details within the scope of my claims without departing from the spirit of my invention. It is, therefore, to be understood that my invention is not to be limited to the specific details shown and described.

Having thus described my invention, what I claim is:

1. A precision blanking press for punching a blank from a workpiece including in combination a frame, a die, means supporting said die, a blankholder, means mounting said blankholder for reciprocating movement on the frame, means carried by said blankholder for supporting said workpiece for movement therewith, a working slide, a coacting die carried by said slide for movement therewith, means mounting said working slide for reciprocating movement on said frame, means for driving said blankholder with a predetermined dwell at the bottom of its stroke to clamp said workpiece between the blankholder and the first die, and means for

driving said working slide to cause said coacting die to move through said workpiece to punch a blank from the workpiece during the dwell of said blankholder, said working slide drive means including means for causing said working slide to dwell at the bottom of its stroke until after the dwell of said blankholder.

2. A precision blanking press for punching a blank from a workpiece including in combination a frame, a die, means for supporting said die, a blankholder, means on said blankholder for supporting said workpiece for movement therewith, means mounting said blankholder for reciprocating movement on said frame toward and away from said die, a working slide, a punch carried by said working slide for movement therewith, means mounting said working slide for reciprocating movement on said frame toward and away from said die, means for driving said blankholder slide with a predetermined dwell at the bottom of its stroke to clamp said workpiece between said blankholder and said die, and means for driving said working slide to drive said punch through said workpiece to punch a blank out of said workpiece during the dwell of said blankholder, said working slide drive comprising means for delaying the return of said working slide until after said blankholder slide begins its return.

3. A precision blanking press for punching a blank from a workpiece including in combination a frame, a die, means for supporting said die, a cushion pad disposed in said die, a cushion for resiliently supporting said pad, a blankholder, means mounting said blankholder for reciprocating movement on said frame toward and away from said die, means carried by said blankholder for supporting said workpiece for movement therewith, a working slide, a punch carried by said working slide for movement therewith, means mounting said working slide for reciprocating movement on said frame toward and away from said die, means for driving said blankholder with a predetermined dwell at the bottom of its stroke to clamp said workpiece between said blankholder and said die, and means for driving said working slide to drive said punch through said workpiece to form a blank in said die against the action of said cushion pad, said working slide moving said cushion pad downwardly in the course of forming said blank, said working slide drive means including means for causing said working slide to dwell at the bottom of its stroke until after said blankholder begins to move upwardly whereby to hold said cushion pad down for a predetermined time.

4. A precision blanking press for punching a blank from a workpiece including in combination a frame, a die, means for supporting said die, a pad disposed in said die, a cushion for resiliently supporting said pad, a blankholder, means for supporting said workpiece on said blankholder for movement therewith, means mounting said blankholder for reciprocating movement on said frame toward and away from said die, a working slide, a punch carried by said working slide, means mounting said working slide for reciprocating movement on said frame toward and away from said die, means for driving said blankholder with a predetermined dwell at the bottom of its stroke to clamp said workpiece between said blankholder and said die and means for driving said working slide to drive said punch through said workpiece to form a blank in said die against the action of said pad during the dwell of said inner slide, said working slide moving said pad downwardly against the action of said cushion, said working slide drive means including means for causing the working slide to dwell at the bottom of its stroke until after the blankholder begins to move upwardly whereby to prevent said cushion from forcing said blank out of said die until after the blankholder begins to move upwardly.

5. A precision blanking press including in combination a frame, a blankholder, means mounting said blankholder for reciprocating movement on the frame, means carried by said blankholder for supporting said workpiece for movement therewith, a working slide, means mounting said working slide for reciprocating movement on said frame, means for driving said blankholder with a predetermined dwell at the bottom of its stroke and means for driving said working slide, said working slide drive means including means for causing said working slide to dwell at the bottom of its stroke until after the dwell of said blankholder.

6. A precision blanking press for actuating a pair of coacting dies to punch a blank from a workpiece including in combination a frame adapted to support one of said dies, a blankholder, means mounting said blankholder for reciprocating movement on said frame, means carried by said blankholder for supporting said workpiece for movement therewith, a working slide adapted to carry the other of said dies, means mounting said working slide for reciprocating movement on said frame, means for driving said blankholder with a predetermined dwell at the bottom of its stroke to clamp said workpiece between the blankholder and the one die and means for driving said working slide to cause said other die to move through the workpiece to punch a blank from the workpiece during the dwell of the blankholder, said working slide drive means including means for causing said working slide to dwell at the bottom of its stroke until after the dwell of the blankholder.

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