April 28, 1964 G. G. F. SMEETS 3,130,620

PUNCH AND GUIDE ASSEMBLY

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Fig. 1

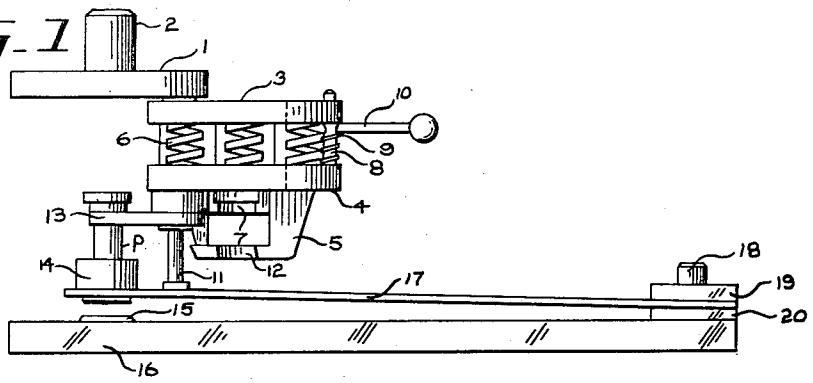


Fig. 4

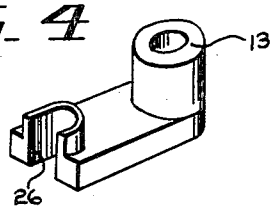


Fig. 2

Fig. 5

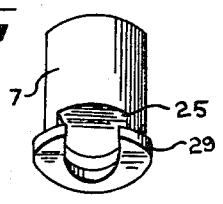


Fig. 3

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Fig. 6

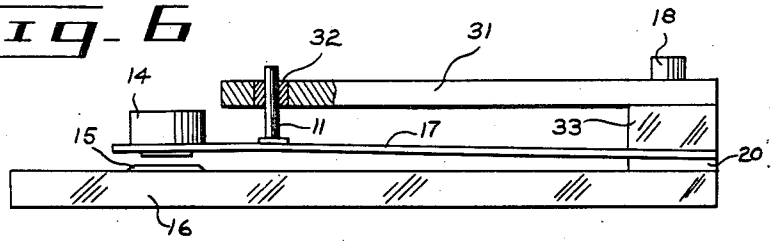


Fig. 7

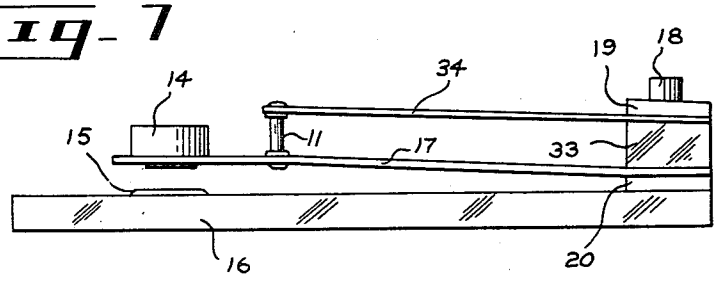
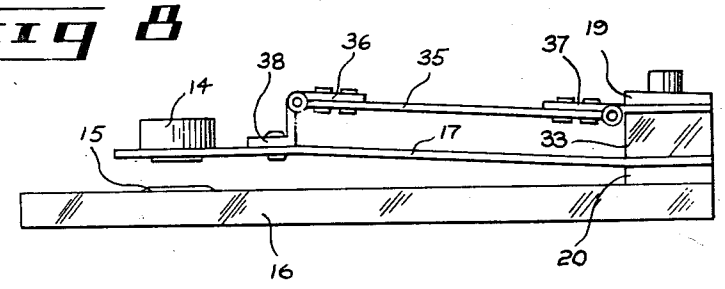


Fig 8



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3,130,620

PUNCH AND GUIDE ASSEMBLY

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11 Claims. (Cl. 83—140)

My invention relates to punch presses and more particularly to a novel punch holder and a stripping mechanism therefor. The invention further relates to the manner of securing the punch and stripper mechanism to the metal working press.

In known metal working, the punch of a metal working press for perforating sheet metal is secured in a relatively rigid manner to the machine and considerable time and labour is required to remove one punch and insert another. In addition, the punch guide which ensures that the punch, when pushed through the work piece by the press enters the die, is secured in a very secure manner to the main body of the machine so that the alignment of the punch and die will be maintained. A very heavily constructed holding member is required to hold the punch in proper alignment above the die. The greater the throat depth, i.e. the larger the workpiece which may be handled, the heavier and more rigid must be the punch guide holding member.

When a punch is installed in a machine it is secured to the ram plate the purpose of which is to press the punch through the workpiece. In order that the punch be in proper alignment with the die, the die is secured to the bed of the press as by means of so-called die shoes.

It is an object of my invention to provide a punch guide which is secured in a flexible manner to the press frame but which nevertheless provides for accurate guiding of the punch into the female die secured to the press bed.

It is a further object of my invention to provide a punch and guide holding mechanism which is economical to manufacture and at the same time reliable and durable.

It is a further object of my invention to provide a punch holder which for a larger throat is more accurate, i.e. the accuracy of punch alignment increases with throat depth.

It is a further object of my invention to provide a punch and stripping mechanism which is simple in construction and provides for rapid and easy insertion and removal of a punch and its cooperating guide.

In carrying out my invention, the punch guide is mounted on a flexible elongated sheet member which in turn is secured to the metal-working press table. A punch holding and stripping mechanism is secured to the ram plate of the press by means of a pivot allowing movement of the mechanism in one plane only and a further locating pin which locates the mechanism in proper position. The punch is provided with a flanged head by means of which it is supported in a slotted punch support while resting with its working end in the punch guide. The punch holder is provided with a pulling member having a T-shaped groove into which the flanged head of the punch is fitted to provide for pulling the punch from the perforated workpiece. This grooved member also provides the rigid coupling for the transfer of force between the ram plate and the punch. Movement of the punch holding and stripping mechanism from its located position is effective to remove the flanged head of the punch from the grooved member and also leave the punch held only by the slotted punch support member from which it is readily removed. In this position the punch guide may also be readily removed by just lifting it out of a recess provided in the flexible member.

In the operation of my invention the punch and guide are moved as a unit until the guide contacts the workpiece whereat further movement of the guide is obstructed and the punch proceeds through the workpiece into the female die. Movement of the punch with respect to the guide is resisted by a plurality of helical springs spaced about the punch. These springs act to hold the guide against the workpiece as the punch is removed and this provides the required stripping action.

For a better understanding of my invention, reference will now be made to the figures of the drawings in which

FIGURE 1 is a view of the punch guide holder and stripper mechanism in opened position providing for ready insertion or removal of the punch and guide set;

FIGURE 2 is a cross-sectional view of the mechanism in operative or closed position;

FIGURE 3 is a further cross-sectional view of the mechanism showing the relative movement of parts thereof during a punching operation;

FIGURE 4 is a perspective view of the slotted punch support; and

FIGURE 5 is a perspective view of the punch pulling member;

FIGURES 6, 7 and 8 show three additional embodiments of the invention for ensuring that the punch guide maintains a parallel relationship with the press bed.

Referring now to the drawing, the mechanism is shown as comprising a flat plate 1, which may be circular in plan view, which is secured by means of a round projection 2 in an opening provided therefor in the ram or force-applying section of a machine press. Plate 1 may be termed the ram plate.

A tubular bearing member 21 is secured in ram plate 1 by means of a set screw 26. A circular plate 3 is journalled in member 21 to be free to rotate thereabout at least from the position shown in FIGURE 1 to that shown in FIGURES 2 and 3. FIGURE 1 shows the open position of the mechanism while FIGURES 2 and 3 show the working or operative position.

Secured centrally to plate 3 by means of a screw 28 is a punch pulling member 7 best shown in FIGURE 5. Member 7 is provided with a flange 29 and a T-slot 25 as shown in FIGURE 5. A second circular plate 4 is slidably journalled on member 7 and is prevented from falling off by flanges 29 as shown in FIGURES 2 and 3. Plates 3 and 4 are held in spaced parallel relation by means of springs 6 of which there are, for instance, four symmetrically spaced about member 7. Plates 3 and 4 are preferably counter sunk to hold the springs in position and the springs are in a compressed state.

Fixedly secured to the end of tubular member 21 is a slotted punch support 13. Support 13 is illustrated clearly in FIGURE 4 and has an end journalled to fit on member 21 and a set screw 27, FIGURE 2, for securing it in fixed position with respect to member 21 and ram plate 1. One end of support 13 is slotted at 26 so that a punch P may be readily inserted to the position shown best in FIGURE 1. Secured below plate 4, by means of screw 30, is a further member 5 which is provided with a slot which, when in the closed position, partially encompasses punch P at a point located below support 13. A locating pin 8 with a protruding handle 10 is journalled in plates 3 and 4 and biased in an upward direction by a spring 9 compressed between plate 4 and handle 10. Pin 8 is used to secure plates 3 and 4 and other parts attached thereto in the position shown in FIGURES 2 and 3. By pushing downward on handle 10, pin 8 is removed from ram plate 1 and the mechanism can be readily moved to the position shown in FIGURE 1.

A punch guide 14 is accommodated in an opening provided therefor in one end of a flexible member 17, the

other end of which is secured to the table 16 of the machine press. The guide 14 is positioned over a female die 15 located in the press bed 16 as shown and when the guide is pushed downward to the bed, the guide 14 and the die 15 are in alignment. A pin 11 rigidly secured to flexible member 17 at 24 is slidably journalled in tubular member 21 so that the guide-holding end of member 17 is maintained substantially parallel to support member 13 so that a punch can be installed or removed without binding. Pin 11 for the most part is smaller in diameter than is the opening in shaft 21 so that binding will not occur therebetween. An enlarged end on pin 11 and a cooperating enlarged internal dimension of shaft 21 ensures that the movement of flexible member 17 is limited with respect to the shaft 21. Female die 15 may be held in a conventional manner in press bed 16.

To install a punch and guide in the mechanism it is first opened to the position shown in FIGURE 1. The punch can be first inserted in the guide and the composite unit moved into position so that the flanged head of the punch rests on support 13 and the guide drops into the opening in flexible member 17. The mechanism comprising plates 3 and 4 is swung around and in doing so the slot in member 7 moves over the flange of the punch P to the position shown in FIGURES 2 and 3 and the punch is held securely by members 7 and 13.

In the punching operation, as the press ram moves downward the punch and guide as a unit are moved downward to contact the workpiece 23 shown in FIGURE 3. Further movement of the guide is prevented and the workpiece 23 is pressed flat and held securely between the guide 14 and die 15, the pressure being supplied by springs 6 which are now compressed further by the continued downward movement of the ram. Punch P passes through the sheet and the perforation has been made.

As the ram moves upward the compressed springs maintain the pressure of the guide against the workpiece until circular plate 4, which has been moved upward on punch puller 7 again rests against flange 29. At this time the punch will be pulled clear of the workpiece and the stripping action will have been accomplished.

Referring now to FIGURE 6, an elongated rigid member 31 is secured to the press bed along with the flexible member 17 by bolt 18. A thick spacer member 33 is inserted between members 17 and 31. A bearing 32 is secured in member 31 as shown and acts as the guide for maintaining the punch guide 14 parallel with the press bed 16 during the vertical movement of the guide. Bearing 32 replaces tubular bearing 21 and performs the same function with respect to pin or shaft 11.

In FIGURE 7 two flexible members 17 and 34 are spaced as shown by spacer 33. Pin 11 is rigidly secured to each of these members as by riveting. Parallel relationship between guide 14 and press bed 16 is ensured when the flexible members 17 and 34 are of substantially equal resilience. This may be ensured by using equal dimensions for the portions of these members which are flexed during vertical movement of guide 14.

In FIGURE 8 a rigid member 35 is hingedly secured at one end to spacer 33 and at the other end to member 17 as shown. The mechanisms of FIGURES 7 and 8 are based on parallelogram principle.

It will be noted that in the mechanism according to my invention no effort has been made to hold the punch guide stationary. If flexible support member 17 is sufficiently long, the positional error of guide 14 with respect to die 15 will be negligible over the range of relative movement between these members.

It should be realized that a varied range of punches may be provided with a standard size flanged head which can be accommodated by a single size of puller 7. In the same manner the opening in flexible support 17 may accommodate the associated range of guides.

Due to the simplicity of the mechanism and the fact that the stripper mechanism is located above the punch and movable away with the other parts of the mechanism, changing of tools becomes of minor importance in the use of a machine using my invention.

Due to the self-aligning feature of the mechanism when in operation the securement between ram plate 1 and the mechanism 3, 4 etc. does not have to be rigid and can accommodate the hinged and locked mechanism as shown.

Although a preferred embodiment of my invention has been shown and described it will be realized that various modifications may be made which do not depart from the spirit and scope of this invention as defined by the appended claims.

What is claimed is:

1. For use in a machine press, a ram plate adapted to be secured to the ram thereof, first and second resiliently spaced plates secured to said ram plate for rotation about an axis at right angles and in a plane parallel to the press surface of said ram plate, means to lock the first and second plates with respect to said ram plate, a punch holding member secured to the first plate which is adjacent said ram plate, an aperture in the second plate in alignment with said punch-holding member, an elongated, flat, flexible punch guide holder adapted to be secured at one end to the bed of a machine press and having a punch-guide holding aperture in the other end thereof axially aligned with said first-mentioned aperture, a rigid pin rigidly secured at one end to the flexible member adjacent said aperture and between the aperture and the secured end of said flexible member and having its axis parallel to the axis of said guide-holding aperture, and journalled means secured to said ram plate providing sliding movement of the free end of said pin therein to maintain the orientation of the axis of said pin during movement of said flexible punch holder.

2. The apparatus as claimed in claim 1 wherein a stripping member, having an aperture aligned with that of said second plate and said punch guide aperture, is secured to the said second plate and between it and said flexible holder.

3. The device as claimed in claim 1 wherein said punch holding member extends through the aperture in said second plate and is provided with a T-shaped slot extending part way through the punch holding end thereof and adapted to hold a flanged head punch therein and further slotted means, secured to a said second plate to prevent removal of a punch from said slotted holder when said first and second plates are in their locked position.

4. The apparatus as claimed in claim 1, wherein said journalled means comprises a tubular guide transversely extending through apertures in said first and second ram plates and having its axis spaced from the axis of said guide-holding aperture and coaxial with said axis of rotation of said plates.

5. An elongated, flexible, flat punch guide holder member adapted to be secured at one end to the frame of a machine press to allow flexing movement of the other end of the member at right angles to the flat surface of said member and having a punch guide accommodating aperture located in said other end, and means for maintaining parallel orientation of the axis of said aperture during flexing movement of said flexible member comprising a second like elongated, flat, flexible member spaced vertically from and in parallel overlying relationship with said punch guide holder member and fixed thereto by its ends.

6. In a machine press, a punch guide holder comprising an elongated, flat, flexible member secured at one of its ends to the frame of said press and having a punch guide holding aperture located in the flat surface of said flexible member adjacent to the other end thereof, a rigid shaft member having one end secured to the flat surface of said flexible member adjacent said aperture and projecting therefrom substantially orthoganally with respect to said flat surface, a further member provided with an

opening accommodating said shaft member for a sliding fit therein, means securing said further member to said frame with the projecting end of said shaft member, in said opening, to provide substantially straight line movement, parallel to the desired orientation of the axis of a punch guide, during punching operation, of the projecting portion of said rigid member during flexing movement of said flexible member.

7. A punch guide holder comprising an elongated flat, flexible member adapted to be secured at one end to the frame of a machine press, the other end of said flexible member being free to flex in a direction corresponding to guided punch movement and having a punch guide accommodating aperture located in the flat surface thereof, a rigid member, having a projecting portion, secured to said flat surface adjacent said aperture and between said aperture and said one end, and means, secured with respect to said one end, providing substantially straight line movement of the projecting portion of said rigid member parallel to the proper orientation of the axis of the guide during flexing of said elongated member corresponding to a punching operation.

8. An elongated, flexible, flat punch guide holder adapted to be secured at one end to the frame of a machine press to allow flexing movement of the other end of the holder at right angles to the flat surface of said guide holder and having a punch guide accommodating aperture located in said other end, an elongated rigid member having one end rigidly secured to said flat surface and projecting therefrom adjacent said accommodating aperture and between said aperture and said one end of said holder, and means providing substantially straight line movement, parallel to the required orientation of the axis of said guide during a punching operation, of the other end of said rigid member during movement of said flexible punch guide holder.

9. The punch guide holder as claimed in claim 8 wherein said last-mentioned means is constituted by a journalled member, rigidly secured with respect to the secured end of said guide holder and in which the other end of said rigid member slides, said rigid member being substantially perpendicular to the surface of said holder.

10. The punch guide holder as claimed in claim 8 wherein said last-mentioned means is constituted by an elongated, flat, flexible member located in spaced parallel overlying relationship with said first-mentioned flexible member and having one end secured to the guided end of said rigid member and the other end rigidly secured adjacent and with respect to the secured end of said flexible punch guide holder.

11. The punch guide holder as claimed in claim 8 wherein said last-mentioned means is constituted by an elongated, flat, rigid member located in spaced parallel overlying relationship with said flexible member having one end hingedly secured to the guided end of said rigid member and the other end hingedly secured adjacent and with respect to the secured end of said flexible punch guide holder.

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