Jan. 27, 1942. J. H. FRIEDMAN 2,271,257

EJECTING MECHANISM FOR HEADERS

Filed Dec. 30, 1939

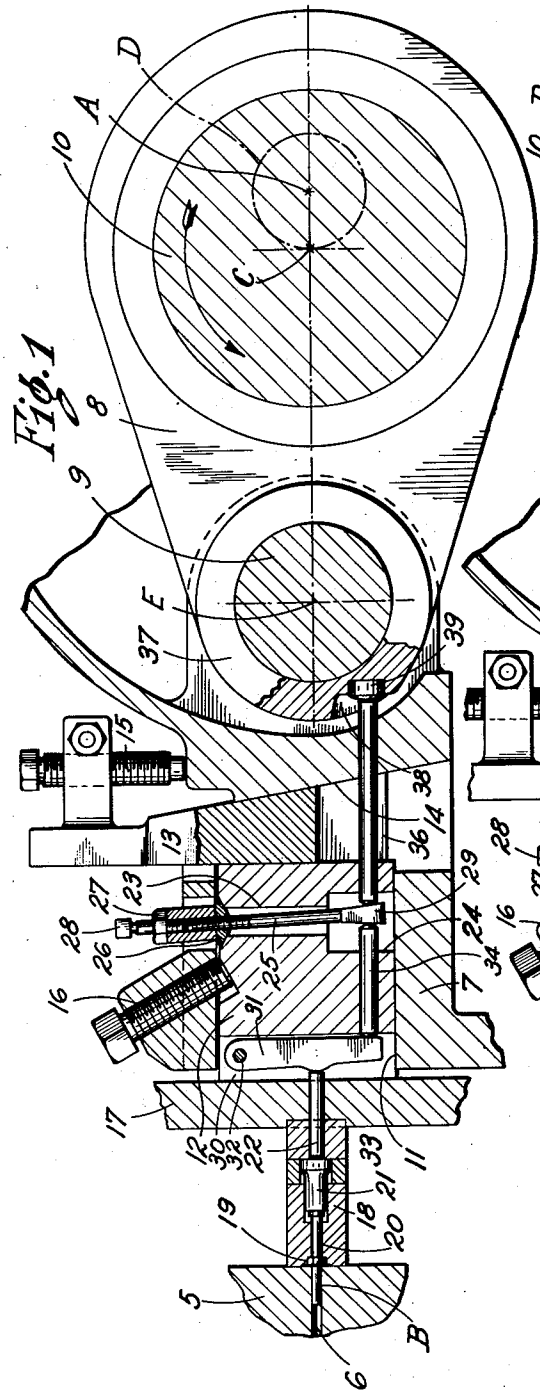


Fig. 1

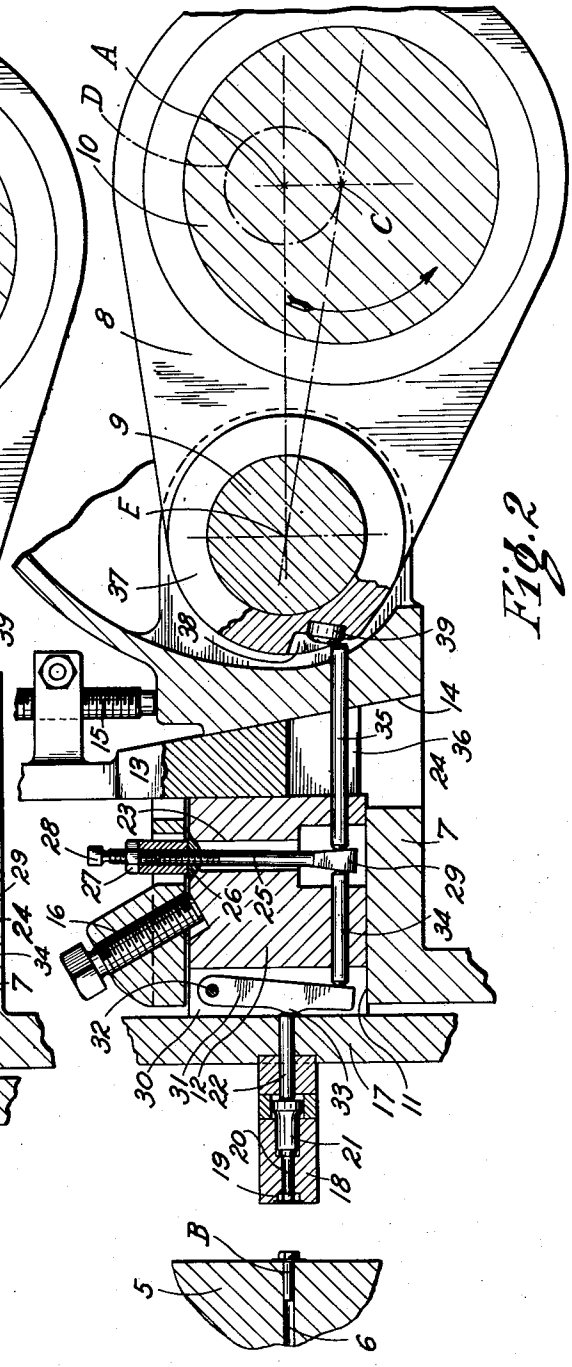


Fig. 2

INVENTOR.
JOHN H. FRIEDMAN
BY Richey & Watts
ATTORNEYS

Patented Jan. 27, 1942 2,271,257

UNITED STATES PATENT OFFICE

2,271,257

EJECTING MECHANISM FOR HEADERS

John Henry Friedman, Tiffin, Ohio, assignor to The National Machinery Company, Tiffin, Ohio, a corporation of Ohio

Application December 30, 1939, Serial No. 311,748

12 Claims. (Cl. 10—11)

This invention relates to heading or upsetting machines for making bolts, nuts, rivets and like articles, and more particularly to means to free the article from a punch or tool carried by a reciprocating member.

Machines of this type, such as cold headers, normally embody bed frames carrying dies in which the work is held, and reciprocating slides driven by cranks and carrying punches or heading tools for upsetting and shaping the blanks supported in the bed frame dies. In some instances it becomes desirable or necessary to provide means to free or eject the blanks from the tools carried by the reciprocating slide to prevent the blanks sticking in these tools. This situation becomes particularly acute in case the punch or tool carried by the header slide is arranged to shape the upset portion into hexagonal or other special shape, because of the frictional grip set up by the forcing of the metal into the corners of the recess in the heading punch. Likewise, in other forms of heading punches it may be desirable to provide means to free the blank from the punch to insure against the blank being carried out of the die.

The principal objects of the present invention are to prevent blanks from sticking in a tool or heading punch carried by a reciprocating slide; to improve and simplify an ejector or knockout mechanism applicable to such a tool or punch; to operate the knockout by motion derived from the driving mechanism which reciprocates the slide; to provide a knockout suitable for use on either single or double blow headers; and to provide a simple adjustment by which the stroke and position of the knockout member may be varied to fit any particular die set-up or adjustment. Other objects will appear in the following detailed description of one embodiment of the invention.

In the accompanying drawing:

Figure 1 is a longitudinal section through the center of a heading slide and punch embodying a knockout constructed in accordance with this invention and showing the crank at its forward dead center.

Figure 2 is a view corresponding to Figure 1 after the crankshaft has rotated 90° on the return stroke from the position shown in Figure 1.

The invention is shown applied to a double stroke header of the type illustrated in my Patent No. 1,955,061, although it is to be understood that it may be applied equally well to various other types of heading machines such as single blow or multiple station machines. The die 5 is fixed in the bed frame of the machine in the usual manner and is provided with an opening 6 to receive the shank of a blank to be headed or otherwise operated upon by the tools carried by the reciprocating slide. A reciprocating header slide 7 is mounted to slide in suitable ways in the bed frame toward and away from the die 5 and is driven by a pitman 8 journalled at one end to a wrist pin 9 carried in the slide and at the other end to a crank pin 10 formed in a crankshaft journalled in the bed frame and rotated by suitable power means in the usual manner.

In the illustrated embodiment the slide 7 is formed with an opening 11 slidably receiving a block 12 which may be adjusted toward and away from the die 5. On its rearward side the block 12 bears against a vertically adjustable wedge 13 which bears in a wedge shaped opening 14 in the slide 7. An adjusting screw 15 is provided to vertically adjust the wedge 13. A locking screw 16 is mounted in the upper portion of the slide 7 and engages the upper portion of the block 12 at an angle to tightly secure the block 12 against the lower side of the opening 11 in the slide 7 and against the wedge 13 in the adjusted position determined by the setting of the wedge 13.

The forward edge of the block 12 supports a punch rocker 17 which, in the type of header disclosed in my aforesaid Patent No. 1,955,061, is provided with a rearwardly extending shaft journalled in an opening in the slide 7 offset from the center line thereof, and carries a pair of heading punches which may be alternately aligned with the center of the slide 7 and with the die 5 by oscillation of the punch rocker 17.

One of the heading punches carried by the punch rocker 17 is shown at 18. As illustrated this punch 18 is the final or heading punch for a two-blow machine and is formed with a hexagonal recess 19 to upset and shape into hexagonal form the projecting end of a blank B carried in the bore 6 of the die 5. The punch 18 is also illustrated as being formed of three sections suitably secured together, each having an axially extending bore formed therein to receive and guide a knockout pin 20 which extends into the recess 19, a tappet 21 which engages the end of the pin 20 and a pin 22 which extends through the punch rocker 17 and engages the tappet 21.

The block 12 is formed with a vertical bore 23 terminating near the lower part of the block in an enlarged bore 24. A rod 25 extends loosely

through the bore 23 into the bore 24 and is supported at the upper face of the block 12 by a washer 26 having a spherical lower face bearing in a correspondingly formed recess in the upper surface of the block 12. A suitable adjusting nut 27 is threaded on to the upper end of the rod 25 and engages the washer 26 to adjust the rod 25 vertically in the block 12. A locking screw 28 is also threaded into the upper end of the adjusting nut 27 to secure the parts in a desired adjusted position. The lower end of the rod 25 is formed with a wedge 29 positioned in the enlarged bore 24.

The block 12 is also formed with a vertically extending slot 30 located in alignment with the punch 18 in which a lever 31 is pivotally supported by a pin 32. The lever 31 is shown as provided with a cam surface 33 for engagement with the end of the pin 22.

A pin 34 is slidably supported in the lower portion of the block 12 with its forward end projecting into the slot 30 in engagement with the lower end of the lever 31 and its rearward end projecting into the enlarged bore 24 in position to engage one side of the wedge 29. Another pin 35 in alignment with the pin 34 is also slidably supported in the block 12 and in the slide 7 with its forward end projecting into the enlarged bore 24 in position to engage the rearward side of the wedge 29 and its rearward end projecting through the slide 7 and into the space in which the pitman 8 operates. The wedge 13 may be provided with a slot 36 so that the portions of the wedge on opposite sides of the slot straddle the pin 35.

The forward end of the pitman 8 is provided with a bearing boss or the like 37 which is journalled on the wrist pin 9. A recess 38 is cut in this boss and a hardened button or similar engaging member 39 is supported in the recess in alignment with the rearward end of the pin 35. The forward face of the button 39 is preferably rounded off as shown to insure proper contact with the end of the pin 35.

In each of Figures 1 and 2 the point A represents the axis of the crankshaft and the point C represents the center line of the crank pin 10. The dot-and-dash circle D represents the path of movement of the center of the crank pin C about the center of the crankshaft A, and the point E represents the center of the wrist pin 9.

When the crank pin 10 is on its forward dead center, as illustrated in Figure 1, the punch 18 is advanced into its most forward position and the wedge 13 is adjusted so that in this position the punch 18 will complete the heading operation desired to be performed by it. As the crankshaft rotates in the direction indicated by the arrows, the slide 7 is drawn rearwardly away from the die 5 and at the same time the pitman 8 rocks about the wrist pin 9 so that the center line C—E of the pitman turns through an angle with respect to the line A—E connecting the centers of the wrist pin and crankshaft, and the button 39 is thereby swung upwardly about the center of the wrist pin E through a corresponding angular movement. The limit of this relative oscillation of the pitman about the center of the wrist pin E in one direction is represented in Figure 2 after the crank has moved through 90° from the forward dead center position illustrated in Figure 1. This movement of the button 39 about the center E caused by the oscillation of the pitman moves the pin 35 forwardly through its guiding apertures in the slide 7 and the block 12, swinging the rod 25 forwardly and pushing the pin 34 forward through the engagement of the pins 34 and 35 with the wedge 29. This movement of the pin 34 swings the lower end of the lever 31 forward causing the cam surface 33 thereof to push the pin 22, which in turn pushes the tappet 21 and the knockout pin 20 forwardly so that the end of the knock-out pin 20 enters the recess 19 in the punch 18 and ejects the head or upset which was formed in the recess 19.

In use the block 12 is fixed in a desired adjusted position by means of the adjusting wedge 13 and the locking screw 16 so that the punch 18 projects forwardly the desired amount. It is preferred to then place the parts in the forward dead center position and adjust the rod 25 vertically by means of the adjusting nut 27 so that all of the parts in the knockout train from the button 39 to the knockout pin 20 are in contact, and the pin 20 is in its retracted position in the bottom of the recess 19. The adjusting nut 27 on the rod 25 is then locked in position and it will be apparent that as soon as the rearward stroke of the slide begins, the knockout train begins to move relative to the slide 7. For most purposes it is desired to select a position for the button 39, and lengths for the respective lever arms from the point of contact of the pin 34 with the lever 31 to the pivot 32, and from the cam surface 33 to the pivot 32, so that the forward end of the knockout pin 20 remains stationary with respect to the die 5 as the slide 7 begins to recede. In this way the head or upset formed in the recess 19 is ejected from the recess simultaneously with the rearward movement of the punch and the blank is held in its proper position in the bore 6 of the die 5. It will be apparent than when, for any reason, it is necessary to change the position of the block 12, as to accommodate a punch of slightly different length, by manipulation of the main adjusting wedge 13, the length of the knockout train may be changed by vertical adjustment of the rod 25 so that the wedge 29 increases or decreases the spacing between the ends of the pins 34 and 35. Likewise if, for any reason, it is desired to delay the time of ejecting the blank from the punch until the punch has receded a short distance from the die 5, lost motion may be provided in the knockout train by lowering the rod 25 and wedge 29 so that the pin 35 must move into contact with the wedge 29 before the knockout action begins.

It will be apparent that as the crankshaft continues to rotate from the position shown in Figure 2 the slide continues to recede until the crankshaft reaches its rearward dead center position. During the 90° of rotation of the crankshaft from the position shown in Figure 2 the button 39 is moved until it again occupies the position shown in Figure 1. During the next 180° of rotation constituting the forward stroke of the slide 7 the button 39 is moved away from the end of the pin 35. Thus when the punch 18 approaches the die 5 to perform the next heading operation the knockout pin 20 and tappet 21 are free to be moved rearwardly until the tappet 21 seats in the rearward side of its enlarged bore in the punch, at which time the forward end of the knockout pin 20 is flush with the bottom of the recess 19, and the next heading operation is performed.

As previously explained, the invention may be

applied as illustrated to a double stroke header, such as shown in my prior Patent No. 1,955,061. In this event the punch 18 is aligned with the cam surface 33 on the lever 31 only during every other forward stroke of the header and during the alternate strokes a different punch is aligned with the die. This different punch may be constructed in the usual manner without knockout pins so that the knockout actuating mechanism simply operates idly during the strokes when the punch 18 is not aligned with the die 5. Obviously, both punches could be provided with knockout pins if desired. Similarly the same arrangement that is illustrated may be applied to a single stroke heading punch in which event the punch 18, as illustrated, would remain fixed in the position shown at all times. Obviously, the invention could also be applied to other types of double stroke headers in which the punches are mounted upon reciprocating slides carried on the forward face of the header slide 7.

Although I have disclosed a specific embodiment of the invention, it is to be understood that the invention is not limited to the various specific details and that many modifications and variations of the details and arrangements of parts may be resorted to without departing from the scope of the various features of my invention, as defined in the following claims.

I claim:

1. In a header having a reciprocating slide driven by a crank and pitman and carrying a punch, said slide being reciprocable between advanced and retracted dead center positions, ejector means arranged to eject or free a blank from said punch, and means arranged to be moved by relative oscillation of said slide and pitman at the beginning of the retracting movement of said slide to actuate said ejector means.

2. In a header, a stationary die, a slide reciprocable toward and away from said die carrying a punch co-acting with said die, a link pivoted to said slide and arranged to be moved to reciprocate said slide and to oscillate about its pivot during such movement, and ejector means arranged to be operated by oscillation of said link about its pivot at the beginning of the movement of said slide away from said die to eject or free blanks from said punch.

3. In a header, a die, a slide reciprocable with respect to said die and carrying a punch to co-act therewith, a link pivoted to said slide and arranged to be moved to reciprocate said slide and to oscillate about its pivot during such movement, an ejector means arranged to eject or free blanks from said die, and means operated by relative oscillation of said link and said slide during movement of said slide away from said die to move said ejector means.

4. In a header, a stationary die, a reciprocable slide carrying a punch co-acting with said die, a link pivoted to said slide and arranged to be moved to reciprocate the same and to oscillate about its pivot during such movement, ejector means axially slidable in said punch to eject or free a blank therefrom, an actuating member for said ejector means slidably mounted in said slide and having one end projecting therefrom adjacent said link on one side of the line connecting the center of said punch and the center of the pivotal connection of said link with said slide, and means on said link arranged to engage and reciprocate said actuating member during relative oscillation of said link and said slide during the movement of said slide away from said die.

5. In a header embodying a die and a reciprocating slide driven by a pitman and carrying a punch, mechanism for ejecting a blank from said punch comprising a pin slidable in the punch, a lever pivotally mounted in the slide for engaging said pin, an actuating member engaging said lever slidably mounted in said slide, and means on said pitman co-acting with said member to slide said pin to eject a blank from the punch during the movement of said slide away from said die.

6. In a header, a die, a reciprocating slide driven by a pitman and carrying a punch, mechanism for ejecting a blank from said punch including a reciprocatory pin mounted in said punch, an actuating member slidably mounted in said slide, a lever pivotally mounted in said slide for engagement with said actuating member and said pin, and a button on said pitman engaging said actuating member during the movement of said slide away from said die.

7. In a header, a stationary die, a reciprocable slide carrying a punch co-acting with said die, a knockout pin slidable in said punch and means to actuate said knockout pin including a pair of aligned rods slidably mounted in said slide, a wedge positioned between the ends of said rods and means accessible from a free face of said slide for adjusting said wedge.

8. In a header, a stationary die, a reciprocable slide carrying a punch co-acting with said die, a link pivoted to said slide arranged to be moved to reciprocate the same and to oscillate about its pivot during such movement, a knockout pin slidably mounted in said punch, an actuating member slidably mounted in said slide and arranged to be moved by relative oscillation of said link with respect to said slide, a wedge positioned in said slide and positioned to engage said actuating member and to transmit the motion thereof to said pin, said wedge being adjustable to vary the length of the knockout train.

9. In a header, a stationary die, a reciprocable slide carrying a punch co-acting with said die, a knockout pin slidable in said punch and means to actuate said knockout pin including a pair of aligned rods slidably mounted in said slide and extending longitudinally, a wedge positioned between the ends of said rods, said wedge being carried by a rod extending transversely of said slide and adjustably and pivotally supported from a face of said slide.

10. In a header, a stationary die, a reciprocable slide carrying a punch arranged to co-act with said die, a link pivoted to said slide arranged to be moved to reciprocate the same and to oscillate about its pivot during such movement, an ejector pin in said punch, means for actuating said pin including a pair of aligned rods slidably disposed longitudinally in said slide, means on said link arranged to engage the end of one of said rods and move the same during oscillation of said link, a wedge positioned between the ends of said pair of rods, said wedge being carried by a rod extending transversely through said slide and pivotally and adjustably supported thereon.

11. In a header having a stationary die and a reciprocating slide driven by a crank and pitman and carrying a punch cooperating with said die, an ejector rod slidably mounted in the punch, means for limiting the sliding movement of said ejector rod in a direction away from said die, an actuating member for said ejector rod, and

an abutment on said pitman arranged to engage said actuating member and slide said ejector rod away from said limiting means during the relative oscillation of said pitman and slide on the retracting stroke of said slide, said abutment permitting said ejector rod to be seated against said limiting means throughout the advancing stroke of said slide.

12. In a header, a stationary die, a reciprocating slide carrying a punch arranged to coact with said die, a pitman pivoted to said slide and journalled on a crank for reciprocating the slide toward and away from said die, an ejector rod slidably mounted in said punch, means to limit the sliding movement of said ejector rod in a direction away from said die so that the end of the ejecting rod forms an operating surface of said punch, an actuating rod slidably mounted in said slide arranged to move said ejector rod in said punch to eject or free blanks therefrom, an abutment on said pitman arranged to engage said actuating rod and move said ejecting rod in a direction toward said die during the relative oscillation of said pitman and said slide on the stroke of said slide away from said die, said abutment being spaced from said actuating rod throughout the stroke of said slide toward said die.

JOHN HENRY FRIEDMAN.