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EJECTOR FOR HEADER PUNCHES

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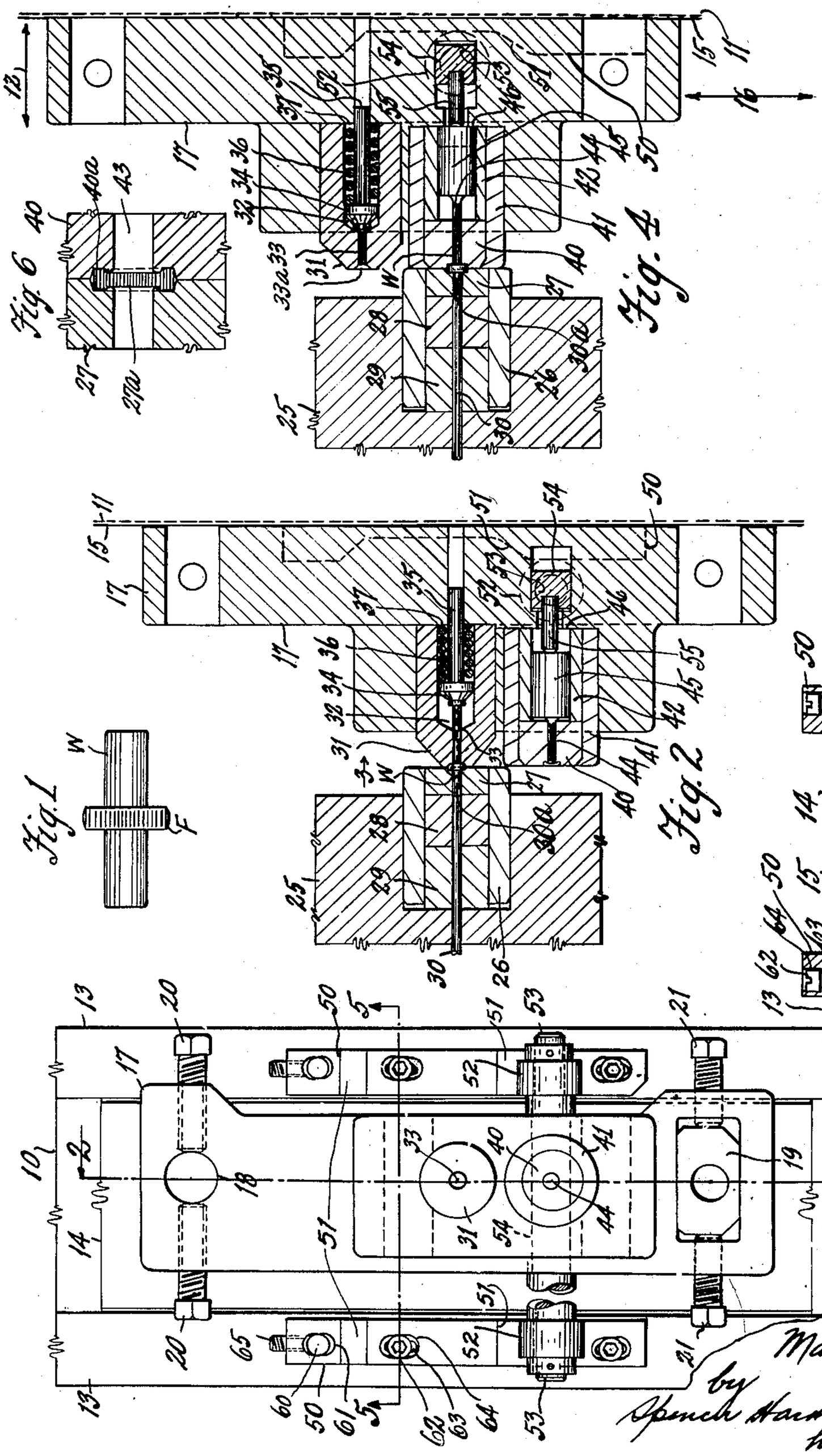

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

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EJECTOR FOR HEADER PUNCHES

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1 Claim. (Cl. 78—17)

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This invention relates to heading machines by which a length of wire is cut from a wire supply and is shaped between dies. More particularly the invention relates to a heading machine equipped with dies for forming a flange between the ends of the length of wire.

An object of the invention is to provide for the ejection of the workpiece from the header punch.

Further objects and advantages of the present invention will be apparent from the following description, reference being made to the drawings, wherein preferred embodiments of the present invention are clearly shown.

In the drawings:

Fig. 1 is a side view on an enlarged scale of the part or work piece formed by the header.

Fig. 2 is a sectional view on line 2—2 of Fig. 3 showing the fixed die and the coning punch in position for the coning operation.

Fig. 3 is a view in the direction of arrow 3 of Fig. 2, showing the movable punches.

Fig. 4 is a view similar to Fig. 2 showing the header movable punch in alignment with the fixed die for the heading operation.

Fig. 5 is a sectional view on line 5—5 of Fig. 3.

Fig. 6 is a fragmentary sectional view of the fixed die and the header punch in closed relation and is drawn to the same scale as Fig. 1.

The header to which the present invention is applied has a ram 10 (Figs. 3 and 5) having a front face 11 which is represented by the dotted line 11 in Figs. 2 and 4. The ram 10 reciprocates horizontally this motion being represented by the arrowheaded line 12 (Fig. 4). To the ram 10 there are attached rails 13 which guide a vertically movable slide 14 having a front face 15 (Fig. 5) represented by the line 15 in Figs. 2 and 4. The vertical movement of the slide 14 is represented by the arrowheaded line 16 (Fig. 4). The horizontal movements of the ram and the vertical movements of the slide are effected by a mechanism provided by the machine. The slide carries a frame 17 having apertures for receiving posts 18 and 19 provided by the slide. Screws 20 threaded through the frame and bear against the post 18. Screws 21 threaded through the frame bear against the post 19. By means of these screws the frame is clamped to the posts in the desired position of adjustment.

A fixed part 25 of the header supports a die holder 26 which surrounds a fixed die 27 and blocks 28 and 29, said die and blocks being bored to receive a knock out pin 30, the right end which is shown at 30*a* in Figs. 2 and 4. When the slide 15 and frame 17 carried thereby are down as shown in Fig. 2, a die 31 supported by the frame

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17 is in alignment with the die 27. The die 31 is commonly known as the upsetting or coning punch. Before the punch 31 approaches the die 27, a mechanism provided by the header has sheared off a length of wire and has transferred it to a position in alignment with the die 27 and punch 31. As shown in Fig. 2, the piece of wire W has been received by the punch and die and has been compressed between the right end 30*a* of the knockout pin 30 and a pin 32 which is guided by the aperture 33 in the punch 31. The right movement of the pin 32 as the work piece W is compressed is limited by the engagement of the head of the pin 32 with the head 34 of a rod 35 guided for horizontal movement by the frame 17. Right movement of the pin 35 is stopped by the complete compression of a spring 36 surrounding the pin 35 and located between the head 34 of the pin 35 and a shoulder 37 of the frame 17. This causes the workpiece W to be compressed and the material of its central portion to bulge out and fill the outwardly flaring cavity 33*a* at the left end of the aperture 33 and to partly fill the cavity 27*a* of the die 27 (Fig. 6). This operation is called "coning."

After the coning operation, the frame 17 is moved right by the ram and during this movement the spring 36 expands to urge the pin 32 toward the left in order to strip the workpiece W from the punch 31 whereby the workpiece remains in the die 27. While the punch 31 is retracted from the die 27, an upward movement of the slide takes place in order to position a second die known as the header punch 40 in alignment with the die 27. Punch 40 is supported by a holder 41 carried by the frame 17, said punch 40 being backed up by a tube 42 within the holder. The punch 40 provides a cavity 40*a* (Fig. 6) which cooperates with the cavity 27*a* of the die 27 for forming the knurled flange F of the workpiece W (Fig. 1). The right stem of the workpiece is received by the central aperture 43 in the punch 40 which also receives a knockout pin 44 integral with a cylinder 45 which slides within the tube 42. When the workpiece W is located as shown in Fig. 4, left movement thereof is stopped by engagement of the piece with the end 30*a* of the knockout pin 30 and right movement is stopped by engagement with the pin 44 which can move no further right since it is stopped by the shoulder 46 of the frame 17. Therefore the bulging part of the workpiece formed by the coning operation is caused to be shaped by the surfaces of the cavities 27*a* and 40*a* to form the flange F of the workpiece.

Following the heading or flange forming op-

eration shown in Fig. 4, the ram moves right to separate the punch 40 from the die 27. As the die 40 moves right the knockout pin 30 is caused to move right to eject the workpiece from the die 27. However, because the friction between the workpiece and the punch 40 might be such that the workpiece would remain in the punch 40, means are provided for ejecting the workpiece from the punch 40 after separation of the punch 40 from the die 27 has taken place. This is effected by the downward movement of the slide 14 and frame 17 preparatory to the next coning operation. As the slide 14 moves down the pin 44 is caused to move left. This movement is effected by the action of cam bars 50 fastened to the rails 13 and having inclined surfaces 51 which are engaged by rollers 52 rotatably supported by rods 53 (Fig. 3) integral with a block 54 which is guided for horizontal movement by the frame 17. Therefore as the frame 17 moves down while the punch 40 is separated from the die 27 the block 54 moves left and causes a pin 55 attached to the block to push against the cylinder 45 and to push the knockout pin 44 to the leftmost position, which position the pin 44 occupies while the punch 31 is engaging the die 27 as shown in Fig. 2. In this way, the workpiece W is ejected from the die 40 in case it should stick in it when the die 40 moves right from the position shown in Fig. 4. At the beginning of the next heading operation the pin 44 will still be close to the face or left end of the punch 40 when the latter is in alignment with the die 27 and starts to approach it. As the punch 40 approaches the die 27 while the workpiece W is located between them, left movement of the workpiece is stopped by engagement with the right end of the knockout pin 30 said end being then at 30*a*. Therefore as the punch 40 continues to move, the pin 44 is engaged by the workpiece thereby arresting its movement 44 toward the left, while the punch 40 moves up to engage the die 27. Therefore there is relative movement of the pin 44 to the right thereby causing the cylinder 45, the pin 55 and the bar 54 to move to the right as shown in Fig. 4, the cylinder 45 being stopped by the shoulder 46.

The cam bars 50 are adjusted vertically upon the rails 13. Each rail 13 carries a stud 60 received by an elongated slot 61 located near the top end of the cam bar. Each bar is secured to a rail by a pair of screws 62 which pass through elongated slots 63 in the bars and the heads of the screws engage shoulders formed by elongated counterbores 64. The screws are adapted to thread in corresponding tapped holes in rail 13. A screw 65 is threaded through the top end of each cam bar and extends into the slot 61 to engage stud 60. When it is desired to adjust each

cam bar 50 vertically the operator loosens the screws 62 and then turns the screw 65 while pushing it against the studs 60. When the proper adjustment is made the screws 62 are tightened to secure the cam in desired position of adjustment. In this way the left movement of the knock-out pin 44 can be timed in relation to a vertical movement of the frame 17.

The present invention therefore provides for positively ejecting a workpiece from the heading punch 40. The positive ejector is one which can be reliably used especially when the work is of such character that it is unsafe to rely upon a spring operated knockout pin such as provided in the coning punch. If the character of the work were such that the coning operation might result in the work sticking to the coning punch after it had moved away from the die 27, the coning punch as well as the heading punch could be provided with a positively operated ejecting pin similar to that disclosed in the heading punch.

While the embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claim which follows.

What is claimed is as follows:

In a double stroke header having a fixed die, a coning punch and a header punch movable alternately into cooperative relation with the die to form a work piece, a ram for moving the punches axially toward the die, a slide supported by the ram for movement transversely of the die, a frame attached to the slide and supporting the punches, means for operating the ram and slide, the combination including an ejector, comprising a knockout pin movable axially of the header punch, a movable bar extending through the frame and guided thereby axially of the header punch, rollers mounted upon the ends of the bar, cams attached to the ram and engaged by the rollers and so shaped as to effect a movement of the bar axially of said punch in response to a movement of the slide transversely of said die, and operating means for transmitting movement of the bar to the knockout pin.

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