

June 3, 1969

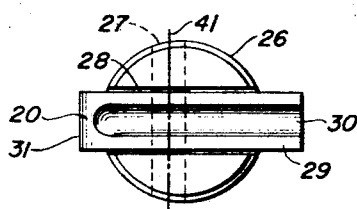
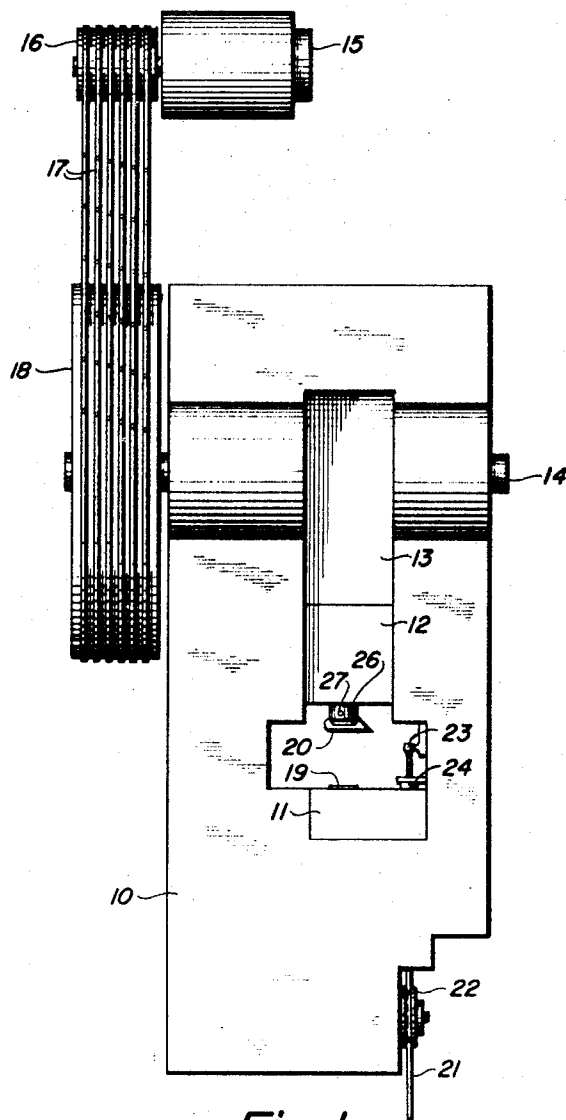
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HOOK BOLT BENDING HEADER TOOL

Filed Sept. 13, 1966

Sheet 1 of 2



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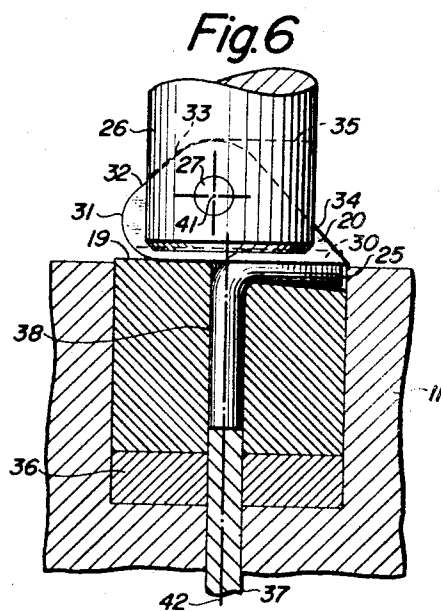
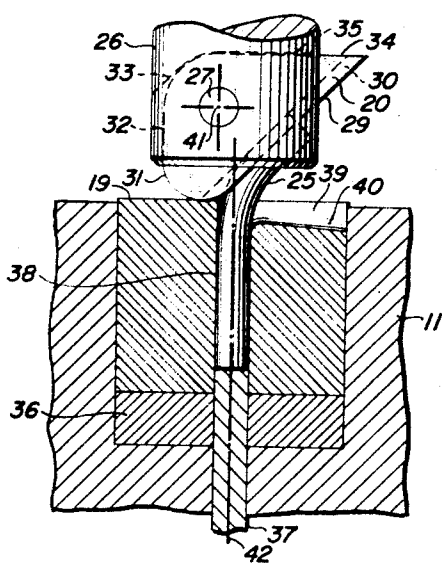
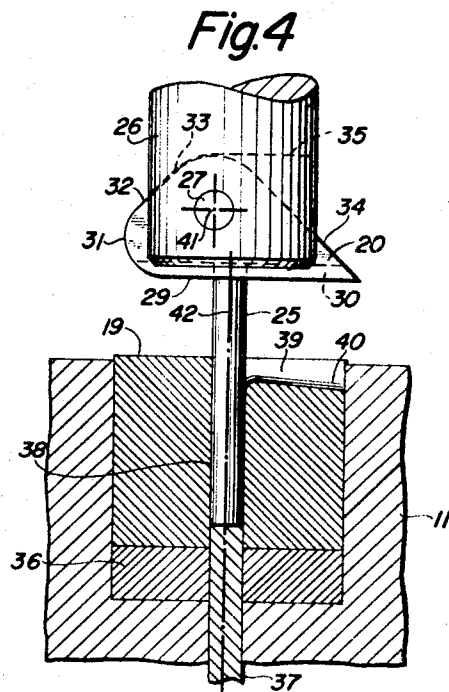
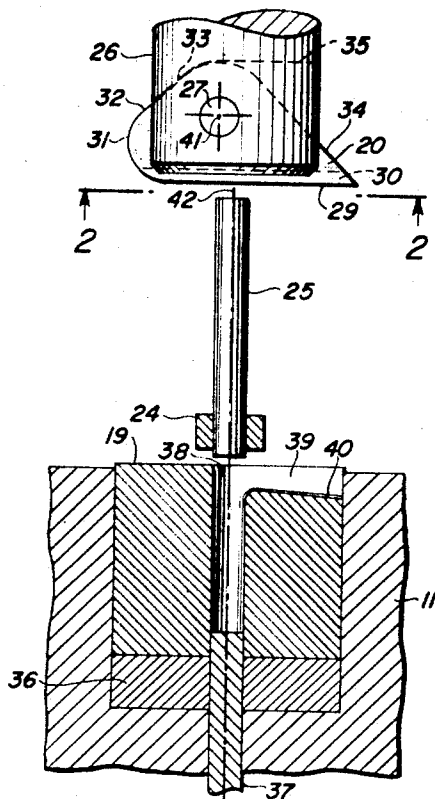
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Sheet 2 of 2



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HOOK BOLT BENDING HEADER TOOL

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3 Claims

ABSTRACT OF THE DISCLOSURE

An apparatus for bending a rod has a die for supporting the rod and another die pivotally attached to a die holder on an axis displaced to one side of and at right angles to the longitudinal axis of the rod. On movement of the pivotally mounted die towards the supporting die, the end of the rod contacts the pivotally mounted die and causes it to rotate on its axis solely by the reaction between the rod and the pivotally mounted die, and bend the rod.

This invention relates to a die for bending a rod, and more particularly to a rotatable die for bending a rod in a heading machine.

A heading machine generally comprises means to feed rod of substantial length to a cutoff station, means to cut the rod into a shorter length, and means to transfer the shorter length rod to a heading station which includes a fixed die and a movable die. The fixed die secures a portion of the length of the rod, and the movable die forms the rod into the desired shape. The movable die is usually secured to a reciprocating crosshead which moves in a direction parallel to the longitudinal axis of the rod. Heading machines may also include other stations where further changes may be made in the shape of the rod.

Heretofore, the die arrangement of a heading machine was not capable of producing an appreciable bending, as opposed to upsetting, of the rod. Thus, the shape of a product which could be made on a heading machine was limited.

An object of this invention is to increase the range of products which can be made on a heading machine.

Another object of this invention is to provide in a heading machine a die which produces a product having an appreciable bend thereon.

The foregoing objects can be attained by providing a rotatable die and controlling the degree to which said die rotates.

Referring to the drawings:

FIG. 1 is a plan view of a heading machine.

FIG. 2 is an enlarged sectional view taken on the line 2—2 of FIG. 3.

FIGS. 3, 4, 5 and 6 are enlarged fragmental sectional views showing the die and rod positions during selected times in the bending operation.

It should be understood that the term "rod" includes a wire and a bar of any cross sectional shape.

With reference to FIG. 1, the heading machine includes a frame 10 having a die block 11 and a crosshead 12. Crosshead 12 is driven reciprocally by pitman 13 suitably attached to crank shaft 14. Crank shaft 14 is driven by motor 15 through drive pulley 16, belts 17, and crank shaft pulley 18. Fixed die 19 is secured to die block 11, and movable die 20 is secured to crosshead 12. Rod 21 is fed into the machine by roller 22. Stop gage 23 aids in controlling the length of rod that is fed into the cutoff station of the machine. A cutter 24 cuts off a short length of rod and transfers it to the heading station which includes dies 19 and 20. The foregoing

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heading machine structure and operation are well known in the art and a further description thereof does not appear necessary to an understanding of this invention.

With reference to FIGS. 2-6, die 20 is pivotally attached in a transverse slot 28 in holder 26 by a cylindrical pin 27 which passes through die 20 and is secured to holder 26 in any suitable manner. Die 20 is triangular in shape with one side of the triangle forming the working surface 29. Working surface 29 includes a groove 30 which is shaped to conform to the longitudinal surface of rod 25. Arcuate portion 31 joins working surface 29 with side 32 of die 20. Die 20 may rotate in a clockwise direction until side 32 of die 20 contacts surface 33 of holder 26 at the bottom of the transverse slot 28 in holder 26, and in a counterclockwise direction until side 34 contacts surface 35.

Die 19 is secured in die block 11 by any suitable means with a backup plate 36 positioned between the inner end of die 19 and die block 11. A knockout pin 37 is slidably mounted within an opening in die block 11, die 19 and backup plate 36. Die 19 has a longitudinal opening 38 and a transverse cavity 39. Longitudinal opening 38 has a cross sectional area slightly larger than rod 25 and knockout pin 37. Transverse cavity 39 is shaped to accept the longitudinal surface of rod 25 and is deeper at its outer end 40 to allow the rod 25 to be bent to a greater degree than ultimately desired to compensate for spring back of the rod after bending. The location and movement of knockout pin 37 within longitudinal opening 38 is controlled by means not shown. Knockout pin 37 provides a support for rod 25 within opening 38 and a means to eject rod 25 from die 19.

As shown in FIGS. 3-6, the rotational axis 41 of die 20, i.e. the longitudinal axis of pin 27 (also shown in FIG. 2), is spaced from and perpendicular to the longitudinal axis 42 of rod 25 which is coincident with the longitudinal axis of longitudinal opening 38.

FIG. 3 shows the rod 25 after it has been cut, transferred to the heading station by cutter 24 and aligned with longitudinal opening 38 in die 19. Die 20 has its working surface 29 perpendicular to the longitudinal axis 42 of rod 25.

In FIG. 4, cutter 24 has returned to the cutoff station (not shown), and rod 25 has been forced into longitudinal opening 38 of die 19 by die 20 which has been moved toward die 19 by the mechanism shown in FIG. 1. One end of rod 25 is in contact with working surface 29 of die 20, and the other end is in contact with knockout pin 37 which will resist any further longitudinal movement of rod 25 within die 19. Thus, any further movement of die 20 towards die 19 will result in a force being exerted by rod 25 on die 20. This force will cause die 20 to rotate in a counterclockwise direction since the axis 42 of rod 25 is spaced from and perpendicular to the rotational axis 41 of die 20.

In FIG. 5, die 20 has moved towards die 19 until arcuate portion 31 is in contact with the face of die 19. The force mentioned above has caused die 20 to rotate in a counterclockwise direction until side 34 of die 20 is in contact with surface 35 of holder 26. The resultant force produced by the movement of die 20 towards die 19 and the rotation of die 20 has bent rod 25 as shown. Since arcuate portion 31 is in contact with die 19 on the side of the axis of rotation 41 of die 20 opposite the longitudinal axis 42 of rod 25, a further movement of die 20 towards die 19 will cause die 20 to rotate to a clockwise direction.

In FIG. 6, die 20 has moved towards die 19 from its position in FIG. 5. This movement has rotated die 20 in a clockwise direction and side 32 of die 20 is in contact with surface 33 at the bottom of transverse slot 28 in

holder 26. Also, working surface 29 is substantially perpendicular to the longitudinal axis 42 of rod 25. The resultant force produced by the movement and rotation of die 20 has bent rod 25 to substantially ninety degrees. A portion of rod 25 occupies transverse cavity 39. In practice, rod 25 would be bent slightly in excess of ninety degrees in order to allow for spring back.

Rod 25 is now bent to the desired shape, and die 20 moves away from the die 19 to a position as shown in FIG. 3. Knockout pin 37 ejects bent rod 25 from die 19, and another rod can be bent.

While FIGS. 3-6 show bending a rod ninety degrees, other degree bends can be made within the scope of this invention by varying the movement of die 20 towards die 19 to an extent greater or less than that indicated in FIG. 6, and varying the contour of cavity 39.

In operation, a rod 25 is cut from rod 21 by cutter 24 and transferred to a position adjacent the longitudinal opening 38 of die 19. The longitudinal axis 42 of rod 25 is coincident with the longitudinal axis of longitudinal opening 38 of die 19, perpendicular to the working surface 29 of die 20, and perpendicular to and spaced from the rotational axis 41 of die 20. Die 20 is moved towards die 19 to force rod 25 into longitudinal opening 38 of die 19. Cutter 24 returns to the cutoff station.

When rod 25 contacts knockout pin 37, a force is exerted by rod 25 on die 20 causing die 20 to rotate in a counterclockwise direction until side 34 contacts surface 35 of holder 26. As die 20 rotates and moves toward die 19, rod 25 is bent through an angle less than ninety degrees.

After the arcuate portion 31 of die 20 contacts the face of die 19 a force is exerted on die 20 to rotate it in a clockwise direction. Die 20 continues to move toward die 19 and rotate in a clockwise direction until side 32 of die 20 contacts the surface 33 of die holder 26 and the rod 25 is bent to the desired degree. Thereafter, die 20 moves away from die 19 to a position shown in FIG. 1 and the bending operation is repeated after knockout rod 37 ejects bent rod 25 from die 19.

We claim:

1. Apparatus for bending a rod, comprising:

- (a) a first die for supporting the rod with the portion to be bent extending outwardly therefrom,
- (b) a die holder disposed adjacent the end of the rod,
- (c) a second die pivotally mounted in said die holder

on an axis displaced to one side of and at right angles to the longitudinal axis of the rod,

(d) said second die having a working face extending on both sides of said longitudinal axis,

(e) means for moving the die holder toward and away from the first die,

(f) the location of the axis of said second die and the distance between the axis of said second die and the working face being such that on movement of the die holder toward the first die the end of the rod contacts the working face and further movement of the die holder toward the first die causes said second die to rotate on its axis solely by reaction between said rod and said working face and to bend said portion of the rod in a direction away from the axis of said second die.

2. Apparatus of claim 1 in which

(g) the second die includes a portion extending on said one side of said longitudinal axis and so disposed that on still further movement of the die holder toward the first die said portion of said second die contacts the first die and rotates said second die in the opposite direction, to further bend said portion of said rod in a direction away from the axis of said second die.

3. Apparatus of claim 2 including

(h) stop means on said die holder to contact said second die upon rotation of said second die in the directions of subparagraphs (f) and (g).

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U.S. Cl. X.R.

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