

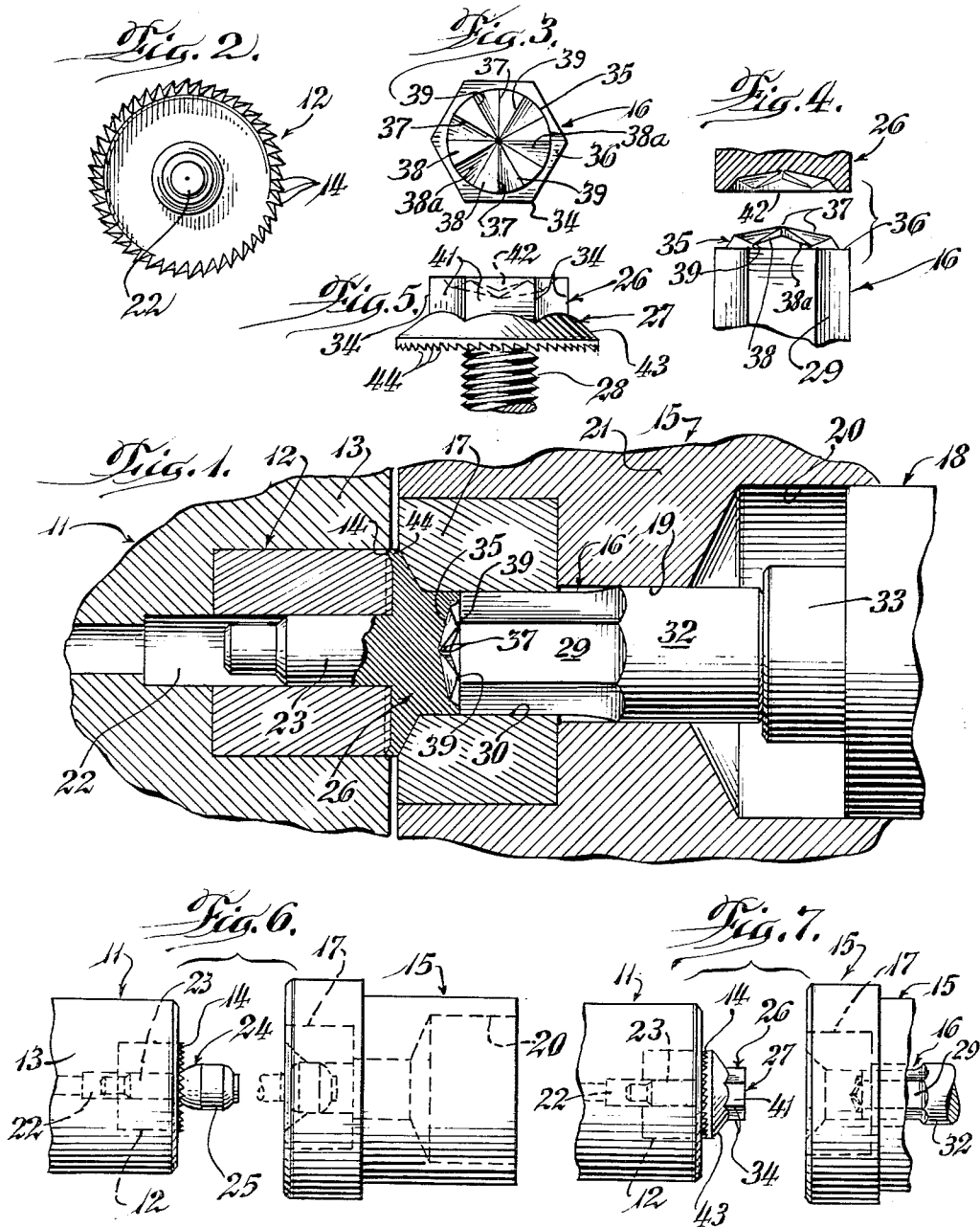
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POLYGONAL BOLT HEAD FORMING PUNCH

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POLYGONAL BOLT HEAD FORMING PUNCH

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The present invention relates to the manufacture of headed fasteners, such as bolts and screws, and more particularly to a novel method and manner of producing the head thereof.

With conventional tools for cold heading apparatus, difficulty is encountered in filling out the corners of the polygonal heads of threaded fasteners. Rather than adding more material to the end of the blank forming the head and relying upon greater impact to force the material toward the corners as contemplated with such conventional tools, in the present invention there is provided a novel heading punch having means in the forming cavity for most effectively filling out the corners of the head. This novel heading punch not only results in increased tool life but also requires less metal to form the head and eliminates trimming of excess metal.

It is, therefore, an important object of the present invention to provide a novel heading punch for cold heading machines employed in the production of headed fasteners.

A further object of the present invention is the provision in a cold heading machine of a novel heading punch positioned in the bottom of a polygonal cavity for forming the head of a threaded fastener, the end of such punch being so contoured as to displace and force the displaced metal of the head or enlargement of the blank into and fill the corners of the cavity.

Another important object of the present invention is the provision of a novel heading punch unit provided with a polygonal cavity shaping the sides of the head and a heading punch the end of which forms the bottom of the cavity and is so contoured as to provide a plurality of uniformly arranged and radially extending ridges conforming to the number of sides of the polygonal head to be formed, the sides of said ridges sloping rearwardly and radially outwardly and merging to form substantially V-shaped, radially extending and outwardly and rearwardly sloping grooves, the resulting combination of angles and/or radii of the ridges, sides and grooves of the punch splitting or displacing the metal at the center of each of the polygonal sides of the head and forcing and directing this metal toward and into the corners of the cavity, thus assuring filling and sharply defining the exterior upper corners of the head.

A further object of the present invention is the provision of a novel method and manner of forming the polygonal head of threaded fasteners, such as screws and bolts, and although the drawing discloses forming the head of hexagonal shape, the method is equally applicable to the formation of heads of square and octagonal shape with the heading punch altered to divide the combination of angles and radii into four or eight equally spaced graduations in place of the six employed in the formation of a hexagonal head.

Further objects are to provide a construction of maximum simplicity, efficiency, economy and ease of assembly and operation, and such further objects, advantages

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and capabilities as will later more fully appear and are inherently possessed thereby.

In the drawing:

Figure 1 is a fragmentary enlarged view, part in vertical cross section and part in side elevation, of the novel cold heading mechanism shown in the process of forming the polygonal head of a threaded fastener, such mechanism including a die for holding the headed blank and for forming the teeth or serrations on the underside of the washer or flanged enlargement of the head, and a heading punch provided with a cavity and a novel insert forming the bottom of the cavity, the formed polygonal head being broken away to show the position of the punch insert.

Fig. 2 is an enlarged view in end or front elevation of the die for holding the headed blank and for forming the teeth on the underside of the washer of the formed head.

Fig. 3 is an enlarged view in front elevation of the end of the punch insert forming the bottom of the cavity of the heading punch.

Fig. 4 is a fragmentary enlarged view in side elevation of the projected end of the punch insert and also showing in vertical cross section the indented head of the fastener after the heading operation has been completed and the punch insert withdrawn from the head.

Fig. 5 is a fragmentary enlarged view of one form of threaded fastener with the polygonal head thereof formed in accordance with the present invention.

Fig. 6 is a view in side elevation of the novel punch and die assembly separated, the headed blank for forming the threaded fastener shown inserted into the die and ready for upsetting the head or enlargement of the blank by the punch to form it into polygonal shape.

Fig. 7 is a view similar to Fig. 6 but with the die and punch separated after forming of the polygonal head.

Referring to the disclosure in the drawing in which is disclosed an illustrative embodiment of the present invention, the novel apparatus comprises a die unit 11 including a die in the form of an insert 12 mounted in an encompassing die holder or support 13 and provided on its exterior with relatively shallow serrations or teeth 14, and a cold heading punch unit 15 including a punch insert 16 slidably mounted in the forming cavity of a punch member 17, and a plunger 18 conformably received in aligned bores 19 and 20 in a holder or support 21.

The die insert 12 is provided with a central opening 22 for receiving the shank 23 of a blank 24 having an enlargement or headed part 25 (Fig. 6) to form the polygonal head 26 (Fig. 7) of a threaded fastener 27, the shank being subsequently threaded at 28, as shown in Fig. 5.

The cold heading punch insert 16 is provided with an elongated polygonal reduction 29 conformably and slidably received in a complementary polygonal bore or forming cavity 30 in the encompassing punch member 17 mounted in the holder 21, with the cylindrical end or enlargement 32 of the punch insert conformably and slidably received in the complementary bore 19 of the holder. The plunger 18 is slidably mounted in the bore 20 and is provided with a reduced end 33 adapted to engage the adjacent, aligned end 32 of the punch insert 16 whereby a blow struck the plunger 18 is transmitted to the heading punch insert to deform the enlargement 25 on the blank 24 and form the polygonal head 26 of the fastener 27.

The cold heading punch or insert 16 is so constructed that each of the corners 34 of the polygonal head 26 is filled out to a substantially greater degree than is effected by prior apparatus and methods. To accomplish

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this, the heading punch 16 is so designed that the bottom of the polygonal cavity formed by the projected end 35 of this punch provides a flat peripheral surface or base 36 and radially projecting edges or ridges 37 extending from the center to this encompassing flat base and also sloping radially and outwardly with the triangular sides 38 and 38^a at the opposite sides of each ridge or edge sloping or inclining away therefrom to form between adjacent ridges 37 a radially and outwardly extending and inclined trough or depression 39 which substantially merges into the encompassing base 36.

To form an indented hexagonal head 26 as disclosed in the illustrative embodiment of the drawing, the projected end 35 forming the bottom of the punch cavity is provided with six uniformly spaced, radially extending ridges 37 and six uniformly spaced, radially extending and outwardly inclined troughs or depressions 39 formed between adjacent ridges at the juncture of the inclined triangular sides 38 and 38^a. In the event the head 26 of the threaded fastener 27 is to be formed with four or eight sides, there is provided a corresponding number of said ridges and troughs on the projected end 35 of the heading punch or punch insert 16, and the polygonal portion 29 of the latter and the complementary bore 30 in the sleeve 31 are formed with a corresponding number of sides.

This combination of angles and radii of the ridges 37, depressions 39 and the sloping and angularly arranged sides 38 and 38^a, splits and displaces the material being headed in the center of each of the flat sides 41 of the polygonal head 26 and forces the metal outwardly toward and guides it into the corners of the cavity of the punch and thereat fills out the corners 34 of the head 26.

The end of the polygonal head 26 when forced is recessed at 42 with the recess complementing or conforming to that of the projected end 35 of the heading punch 16 as shown in detail in Figs. 1, 4 and 5, the projected end 35 having displaced or transferred the metal outwardly from the center of the head and directed it into the outer or upper corners 34 thereof, whereby these exterior upper corners are completely filled and sharply defined in the forming operation by the novel punch and its cavity, as will be clearly evident from Fig. 1.

In the disclosed embodiment the threaded fastener 27 is formed with a hexagonal head 26 and an integral spin lock washer 43, the underside of the washer being formed with multiple teeth or serrations 44 by the teeth 14 on the die. Other types of threaded fasteners with polygonal heads and with or without integral washers may be formed in the present novel method and manner, the only change required being in the contour of the punch cavity and the punch insert forming the bottom of this cavity, which would conform to the shape of the head to be formed. If the threaded fastener is to be devoid of an integral lock washer, the cavity in the punch member 17 would make no provision therefor and the teeth 14 on the die 12 would be omitted.

After the heading operation has been completed as above disclosed, the shank of the fastener may be threaded in any suitable manner.

Having thus disclosed the invention, I claim:

1. In cold heading apparatus for forming the polygonal head of a headed fastener, a cold heading punch

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for effectively filling and sharply defining the corners of the polygonal head comprising a punch having a cavity provided with encompassing walls contoured to conform to the polygonal shape of the head and an insert having a part of polygonal shape slidably mounted in the cavity of the punch and provided with a part forming the bottom of the cavity, said last mentioned part having radially extending and uniformly spaced projections comprising sharply defined edges with the sides of said edges inclined downwardly into intermediate troughs, said edges and troughs emanating from the center and inclined radially outward, with their number conforming to the number of the sides on the head, said edges extending in radial alignment with the sides of the polygonal part of the insert and the intermediate troughs extending in radial alignment with the corners of the polygonal part, an annular planar surface surrounding and spaced below the projecting edges and into which the intermediate troughs merge, said surface confining the metal flow to within the forming cavity, each of said edges when forced into the metal of the head splitting the metal at one side of the polygonal head and displacing and forcing the displaced metal outwardly from the center to the corners of the head and into the corners of the cavity of the punch to form sharply defined and longitudinally extending corners on said head.

2. In cold heading apparatus for forming a polygonal head on a fastener, a cold heading punch for effectively filling and sharply defining the longitudinally extending corners of the polygonal head comprising a punch member having a cavity with plural sides conforming to the periphery of the polygonal head of the fastener and an insert having a polygonal part received in and conforming to the contour of said cavity, said insert provided with a projecting part adapted to form the bottom of the cavity with said projecting part having uniformly spaced, radially extending and sharply defined ridges and intermediate troughs emanating from the center and extending radially outward toward the polygonal part and adjacent the periphery of said insert with each ridge sloping radially outward and downward at each side thereof to form between adjacent ridges a radially and outwardly extending trough merging into an encompassing base, said ridges extending in radial alignment with the sides of the polygonal part of the insert and the intermediate troughs extending in radial alignment with the corners of the polygonal part, an annular planar base surrounding and spaced below the projecting ridges and into which the intermediate troughs merge, said base confining the metal flow to within the forming cavity, whereby when said punch is actuated the end of said insert engages and forms a recess in the head of the fastener with each of said ridges splitting the metal at one side of the head and forcing this metal outwardly into the corners of the cavity of the punch member to form sharply defined corners.

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