Nov. 26, 1957 J. P. LEHNING 2,814,059

METHOD FOR MAKING SERRATED-HEAD BOLTS

Filed June 22, 1955

Fig. 1.

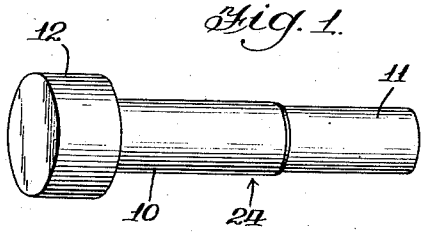
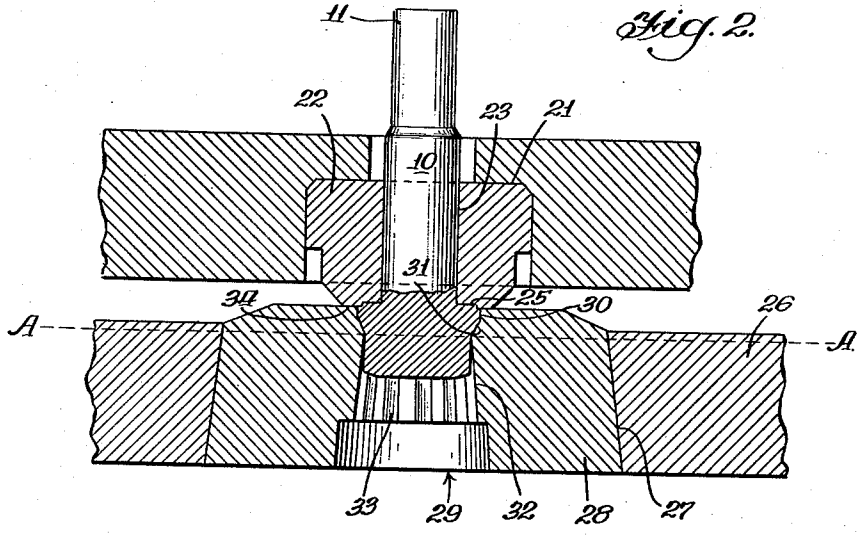


Fig. 2.



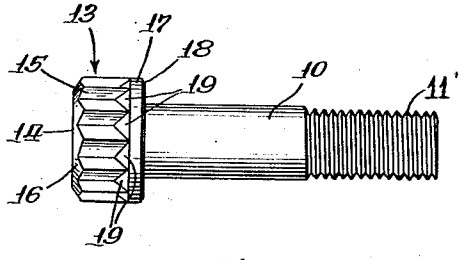


Fig. 3.

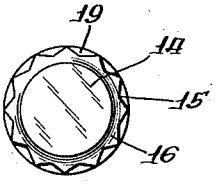


Fig. 4.

INVENTOR.
J. Philip Lehning
BY Paul O. Pippel
Atty.

United States Patent Office 2,814,059
Patented Nov. 26, 1957

2,814,059

METHOD FOR MAKING SERRATED-HEAD BOLTS

J. Philip Lehning, Chicago, Ill., assignor to International Harvester Company, a corporation of New Jersey

Application June 22, 1955, Serial No. 517,114

1 Claim. (Cl. 10—27)

This invention relates to a greatly simplified method for making a bolt head having an integrally formed washer on the under side thereof and a peripherally serrated upper portion adapted to fit a box type or socket type wrench. More in particular this invention relates to a method of forming such a bolt head as a flash-free finished product from a blank in a single punch and die operation.

Most all of the commonly known types of bolts are provided with square cut or hexagonally cut longitudinally disposed flat faces adapted to engage a wrench for application of torsional stress thereto. Where the head portions of such bolts are not provided with an integrally formed washer on the shank or underside thereof, the head may be satisfactorily formed by the shearing action of a single punch and die operation. However when such bolts are provided with integrally formed washers on the underside of the head portion, the deformation or displacement of material during a punch and die operation is excessive which leaves an outwardly flared flash portion usually at the lower extremities of the flat faces and the upper extremity of the integrally formed washer. The resulting flash portion is not only waste metal but also at least one subsequent and expensive operation is required to remove the flash to complete the finished product.

Particularly for use with larger type bolt heads box type and socket type wrenches are provided with as many as twelve V-shaped engaging grooves or notches disposed on the inner periphery thereof to expand the versatility thereof. Thus wrenches of this type may be used where as little as a 30 degree rotational movement of the engaged bolt head is permissible before re-engagement of the wrench may be required.

With the above described problem in mind it is therefore an object of this invention to provide a new and useful bolt with a head having a plurality of V-shaped serrations or notches disposed on the outer periphery thereof adapted for engagement with a box type or socket type wrench.

Another object of the invention is to provide a bolt having a head according to the preceding object wherein an integrally formed washer is disposed on the under side of the head.

A further object of the invention is to provide a bolt with an improved head having a plurality of V-shaped longitudinally extending serrations wherein the serrations terminate in a V-shaped facet formation adjacent the upper edge of an integrally formed washer disposed on the underside of said bolt head.

A still further object of the invention is to provide a method of making bolt heads according to the preceding objects whereby the finished bolt head including an integral washer on the underside thereof may be completed in a single punch and die operation.

A still further object of the invention is to provide a method of making bolt heads from blanks according to the preceding objects whereby the head is formed without loss of material and with minimum displacement of material.

Further objects and advantages of the invention will be apparent from the following description, the appended claims with the accompanying drawings wherein:

Figure 1 illustrates a bolt blank having a head blank and a shank without threads.

Figure 2 is a vertical cross-sectional view, partly broken, illustrating a punch and die positioned in a press including a bolt formed from a bolt head blank.

Figure 3 illustrates a bolt with a finished head after ejection from the punch and die operation of Figure 2.

Figure 4 is a plan view of a finished bolt head showing the profile of the serrations or notches.

Referring to Figure 1 the numeral **10** illustrates a bolt shank having a reduced end portion **11** adapted for cutting threads thereon. At this point it should be understood that the shank portion **11** may be threaded or unthreaded prior to the formation of the bolt head according to this invention. A solid cylindrically shaped bolt head blank **12** is integrally connected to the other end of the shank **10** as shown in Figure 1. The construction material used in this bolt may be of metal or non-metal material as may be appropriate.

Figure 3 illustrates a finished bolt with the portion **11'** of the shank **10** threaded. The finished bolt head generally indicated at **13** is provided with a top surface **14** and a plurality of peripherally disposed serrations or notches **15** in a V-shaped cross-sectional formation as shown in Figure 4. The number of notches **15** uniformly disposed about the periphery of the head may number three or more but generally speaking standard type box wrenches or socket wrenches are adapted to engage bolt leads having four, six or twelve faces depending usually upon the size of the head.

In order to facilitate engaging a wrench to the bolt head a circular chamfered portion **16** which intersects the upper end portions of the notches **15** with the top surface **14** is provided.

On the underside of the head **14** there is provided an integrally connected washer **17** with the head **13** and shank **10**. The washer **17** may be annularly shaped as shown in Figure 3 but of course it may also be serrated on the outer periphery as well as being serrated on the underside thereof. The washer **17** may optionally be provided with an annular shoulder portion **18** as shown in Figure 3.

In order to form the notches **15** with minimum displacement of material as well as improving the structural strength of the bolt head **13**, facets **19** are provided. The facets **19** are mostly comprised of displaced material during the forming thereof as described later. Each of the facets **19** is disposed in a plane at an angle with reference to the longitudinal axis of the bolt. Two edges of each facet are formed by the juncture of the lower respective ends of the corresponding notch **15**. The third edge of each facet **19** is formed by the juncture of the facet with the upper edge of the outer periphery of the washer **17** as best shown in Figure 3.

From the foregoing it may be readily seen that a new and novel type of bolt head having an integrally connected washer on the underside thereof which is adapted for use with commercial type wrenches has been described. Further, this particular type of bolt head lends itself to a unique method of manufacture whereby the bolt head **13** may conveniently be formed by forcible displacement of material in a single punch and die operation which method will now be described.

Referring to Figure 2 the numeral **20** shows a portion of a ram of a press (not shown) having a recessed portion **21** adapted to support for vertical movement a punch

or forming member **22**. The punch **22** is provided with a vertically disposed bore **23** adapted to receive the shank **10** of the blank bolt or work piece generally indicated at **24**. The lower portion of the punch **22** is adapted to form the underside of the washer **17**. For convenience Figure 2 illustrates a shallow annular recess **25** in the punch **22** for forming the optional annular shoulder portion **18** of the washer **17**.

The numeral **26** illustrates a portion of the bed plate of the press (not shown) provided with a recess **27** adapted to position a die **28**. The die **28** comprises a cavity or hollow portion generally indicated at **29**. It can be seen from Figure 2 that the upper periphery **30** of the cavity **29** is adapted to form the washer **17** of the finished bolt head **13**. The portion **31** of the cavity **29** below the upper periphery **30** is adapted to form the lower end portions of the notches **15** and the facets **19** of the bolt head **13**. The intermediate portion **32** of the cavity **29** is provided with serrations **33** which are adapted to form the notches **15** of the bolt head **13**. It will be noted that the intermediate portion **32** of the cavity **29** flares outwardly in a downward direction to facilitate ejection of the finished bolt head **13** from the die **28**.

Referring to Figure 2 it will be seen that the punch **22** and die **28** are in closed relation just after the formation of a bolt head **13** from the blank **12**. The force exerted in a downward direction by the ram **20** with the punch **22** causes sufficient pressure on the head blank **12** in the zone above the line A—A of Figure 2 in the cavity **29** of the die **28** resulting in deformation or displacement of the material adjacent the curved surface of the head blank **12** to first form the chamfered portion **16** followed by the formation of the notches **15**. The excess material resulting from the formation of the chamfered portion **16** and notches **15** is crowded or flowed to form the facets **19** and washer **17**.

From the above it can be seen that a bolt head blank **12** with its associated shank **10** may be inserted in the punch **22** and the punch **22** driven downwardly by the ram **20**, the pressure exerted against the head blank **12** will in but a single strike convert the head blank **12** by deformation of the material into a bolt head **13**. It may also be seen that if the head blank **12** is of a correct predetermined volume or diameter in relation to longitudinal length, no flash of excess material will occur on the annular surface **34** where the lower extremity of the punch **22** approaches the upper surface of the die **28**. Thus if the volume of the head blank **12** is properly controlled with respect to its cross-sectional diameter and length the finished bolt head **13** will be substantially of the same volume as the blank **12**. Further if the volume of the blank **12** is properly controlled the bolt head **13** will be in finished product form upon its removal from the punch and die thus eliminating the expensive necessity of adding a separate operation to remove flash formation.

From the foregoing it can readily be seen that a unique bolt head construction has been described as well as a convenient and economical method of producing the same.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the specific foregoing description, and all changes which come within the meaning and range of equivalency of the claim appended are therefore intended to be embraced therein.

What is claimed is:

The method of making in a single stroke punch and die operation a finished flash-free metal bolt head of the kind described consisting of the steps of taking a bolt shank provided with an integrally connected solid metal cylindrically shaped head blank of predetermined height and diameter, applying pressure downwardly in an axial direction to the upper end of the peripheral portion of said blank, continuing the application of said pressure to said blank in an axial direction downwardly in sufficient magnitude to displace a portion of said metal in an axial direction without displacing metal adjacent the lower end of said blank to form a plurality of uniformly spaced peripherally disposed notches extending longitudinally from said upper end and terminating at a distance substantially above said lower end, said displaced metal substantially being formed into facets positioned at the bottom end of each of said formed notches and integrally connected to a remaining annular shaped portion of said blank whereby a finished flash-free bolt head is formed having a mean diameter and height substantially equal to the height and diameter of said blank.

References Cited in the file of this patent

UNITED STATES PATENTS

662,134	Rodd	Nov. 20, 1900
721,659	Blakeslee	Mar. 3, 1903
1,933,737	Kaufman	Nov. 7, 1933
2,102,941	Cadwallader	Dec. 21, 1937
2,133,466	Purtell	Oct. 18, 1938
2,333,388	Poupitch	Nov. 2, 1943
2,353,531	Whitney	July 11, 1944
2,689,359	Friedman	Sept. 21, 1954

FOREIGN PATENTS

436,706	Great Britain	Oct. 16, 1935
747,937	Germany	Oct. 20, 1944
1,001,909	France	Feb. 2, 1952