Oct. 18, 1938. W. A. PURTELL 2,133,467

METHOD AND APPARATUS FOR MAKING KNURLED SOCKETED SCREWS

Filed March 11, 1936

Fig. 1.

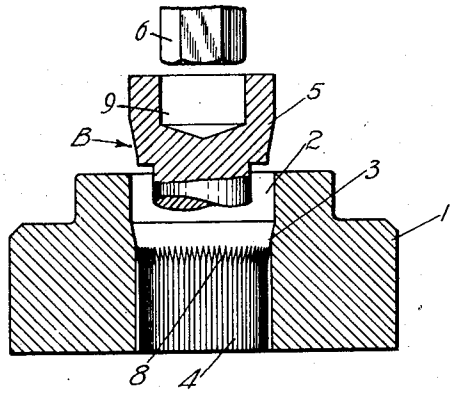


Fig. 2.

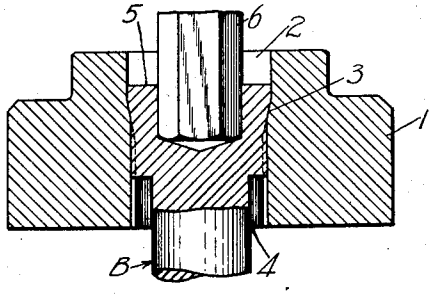


Fig. 3.

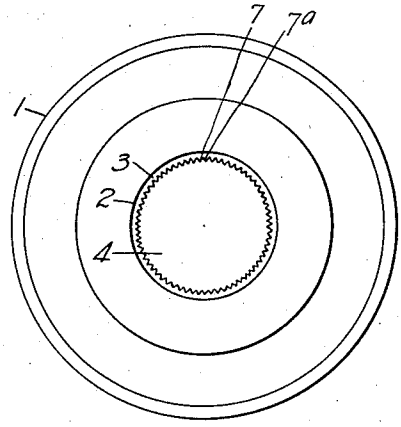


Fig. 5.

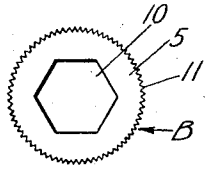
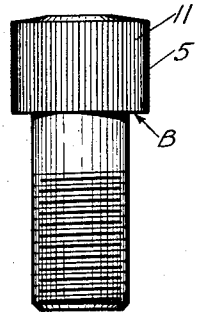


Fig. 4.



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METHOD AND APPARATUS FOR MAKING KNURLED SOCKETED SCREWS

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Application March 11, 1936, Serial No. 68,329

17 Claims. (Cl. 10—7)

My invention relates to knurled socketed screws and methods of and apparatus for making the same.

It has heretofore been proposed to make hexagonally socketed cap screws by drawing the cold blanks through a drawing die, the socket being formed by an hexagonal tool around which the metal is drawn by the so-called "Allen" method. In another so-called broaching method, the head is formed and bored and then the hexagonal socket is broached out. To provide knurling on the heads of screws made by either of these methods, it has heretofore been necessary to perform another and separate operation after the formation of the socket and while using an additional tool or tools. This has been expensive, and, in certain diameters, also results in the distortion of the hexagonal socket in such manner as to require the use of a fixture or mandrel, and thereby further increase the cost in such manner as to make the procedure impractical.

My invention has for its object to provide an improved method of knurling such cap screws which is adapted to be carried out as a part of the forming operation thereof. A further object of my invention is to provide such an improved method which eliminates altogether all necessity for a separate knurling operation or the use of any additional tools, fixtures or mandrels, while substantially reducing the cost of such knurled screws and being equally adapted to use on all diameters and producing a superior screw. A still further object is to provide an improved apparatus for making such knurled screws, which is adapted to be used in carrying out my improved method. These and other objects and advantages of my improvements will, however, hereinafter more fully appear.

In the accompanying drawing I have shown, for purposes of illustration, one embodiment of my invention, the same being illustrated as adapted to be applied to use in mechanism for drawing cap screws in accordance with the Allen method.

In the drawing:—

Fig. 1 is a vertical sectional view of a combined drawing and knurling die of my improved construction, the same being illustrated with a hexagonal tool associated therewith and about to operate on a blank, a portion of which is broken away to facilitate illustration;

Fig. 2 is a like sectional view showing the parts in one position occupied thereby in the course of my new combined knurling and drawing operation;

Fig. 3 is a top plan view of the combined drawing and knurling die;

Fig. 4 is a side elevation of a finished screw, and

Fig. 5 is a top plan view of the latter.

In carrying out my invention, I apply the knurling to the head of the blank in the course of the drawing operation so that as the socket is formed in the head of the blank during drawing, the head is also completely knurled, all as hereinafter more fully described.

Referring more particularly to Figure 1, it will be noted that I have shown therein a drawing die 1 of generally usual form and provided with a usual axial aperture 2 therein and having a usual tapered surface 3 leading from the aperture 2 to a reduced communicating aperture, generally indicated at 4, through which the head 5 of a blank B is forced in a usual manner by a hexagonal member 6 during socketing, and from which the socketed head is ejected by this member 6 at the completion of the socket forming operation. In carrying out my improvements, however, it will be noted that the aperture 4 is provided with a series of shallow serrations or flutes 7 of suitable form and extending longitudinally of the aperture 4 in such manner as to form longitudinally extending serrations or flutes on the head of the finished screw during the drawing and socketing thereof. More particularly, it will be noted that herein these serrations 7 in the drawing die are in the form of generally angular or V-shaped inwardly projecting portions spaced from like adjacent serrations by similarly shaped grooves 7a. Further, it will be observed that the upper ends of these serrations 7 merge into the sloping surface 3 of the die as shown at 8, while the grooves 7a run up beyond the extremities of the serrated portions, all as clearly shown in Figure 1.

In the use of my invention, a blank B having a head 5 and a usual axially bored aperture 9 of slightly larger cross section than the proposed hexagonal socket across the corners thereof, is disposed on the die 1 in a usual manner. When it is forced through the die apertures 2, 3 and 4 by the hexagonal tool 6, it will be evident that an hexagonal aperture or turning socket 10 adapted to be engaged by any suitable turning tool, will be formed in the head 5 in the usual manner, with the tool 6 entering the aperture 9 and the metal in the head drawn in such manner about the tool 6 as to transform the bored aperture 9 into an hexagonal socket. However, as this socket is formed, it will also be evident that, while the

metal in the head 5 of the blank is drawn inwardly and upwardly to cause the hexagonal tool 6 to be reproduced therein, the outer surface of the head will also be simultaneously drawn and longitudinally grooved by the serrations 7 and cooperating grooves 7a. More particularly, it will be noted that as the blank is forced into the die and over the tapered surface 3, the metal is also drawn over the surfaces 8 at the upper ends of the serrations 7, which merge into the tapered surface 3, in such manner that the serrations on the head are formed in the drawing operation and without providing objectionable peripheral resistance, or requiring cutting or tearing of the metal. Further, when the hexagonal socket 10 is completely formed and the head is ejected from the die 1, it will be evident that the outer side of the head will be completely knurled or serrated as shown at 11 in Figure 4.

As a result of my improvements, it will be evident that all need for any additional knurling operation or the use of any additional tools or fixtures is eliminated, the knurling operation being performed simultaneously with the drawing or socketing operation. Thus, it will be observed that it is possible as a result of my improvements, to reduce very substantially the cost of drawn knurled screws, the same, as a result of my improvements, being produced at substantially the same cost as unknurled screws. Further, distortion being impossible, my improvements are adapted to be used on all sizes of screws. Through the sloping surfaces 8 on the ends of the serration 7, merging into the tapered surface 3, and the resultant minimizing of resistance, a construction is also produced which lends itself to drawing, while any cutting or tearing or tendency to drive out the bottom of the head is also effectually prevented, as well as objectionable stresses in the latter below the socket bottom. Further in my improved construction, in making screws in all sizes, the additional knurling action of the serrations in the die results in a superior article due to the slight compacting of the metal while the latter is being shaped between the hexagonal member at the axis of the head and the tapered and serrated walls of the die aperture surrounding the axis. It will further be obvious that within limits the number and form of the serrations on the head may be varied as desired by suitably varying the number and cross section of the serrations in the drawing die without interfering with the formation of the desired roughened exterior or the drawing operation or the formation of the socket. Obviously the latter may also be of any desired cross section or polygonal shape other than hexagonal. These and other advantages of my improvements will, however, be clearly apparent to those skilled in the art.

While I have in this application specifically described the above illustrated embodiment of my improvements, it will be understood that this form of the same is used for purposes of illustration, and that my improvements may be embodied in other forms without departing from the spirit of my invention or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:—

1. The step in making a socketed screw which consists in, knurling the screw while reducing the diameter thereof and forming a turning socket in the screw.

2. The step in making socketed screws which consists in, knurling the screws while drawing the same and while forming a polygonal socket therein during drawing.

3. The step in making socketed cap screws which consists in, working the periphery of the head of the blank to form a roughened exterior while reducing the diameter of the head and forming a turning socket in the head.

4. The step in making socketed cap screws which consists in, working the periphery of the head of the blank to form a roughened exterior while both drawing the head and forming a polygonal socket therein during drawing.

5. The step in making drawn socketed cap screws which consists in, roughening the exterior of the head and compacting the metal in the latter while reducing the diameter of the head and forming a turning socket in the head.

6. The step in making drawn socketed cap screws which consists in, roughening the exterior of the head and compacting the metal in the latter while both drawing the head and forming a polygonal socket therein during drawing.

7. The method of making socketed screws from a blank having an axial aperture therein, which consists in, drawing the blank, and while the drawn portion is being reduced in diameter, both forming said aperture into a turning socket and knurling the exterior of the drawn portion.

8. The method of making socketed screws from a blank having an axial aperture therein, which consists in, drawing the blank and while the drawn portion is being reduced in diameter both forming said aperture into a polygonal socket and forming longitudinal grooves on the outer periphery of the drawn portion.

9. Apparatus for making socketed screws, comprising a tool for forcing a blank through a drawing die and forming a socket in said blank around said tool during drawing, and a drawing die having roughening means in the wall of the drawing aperture therein.

10. Apparatus for making socketed screws, comprising a tool for forcing a blank through a drawing die and forming a socket in said blank around said tool during drawing, and a drawing die having knurl forming means disposed longitudinally in the wall of the drawing aperture therein.

11. Apparatus for making drawn socketed screws comprising a tool for forcing a blank through a drawing die and forming a socket in said blank around said tool during drawing, and a drawing die having a drawing aperture therein and knurl forming flutes disposed longitudinally in the wall of said aperture and having means on their inner ends for preventing cutting of the blank.

12. Apparatus for making drawn socketed screws comprising a tool for forcing an axially apertured blank through a drawing die and forming a turning socket in said blank around said tool during drawing, and a drawing die having an aperture therethrough and a tapered portion leading to said aperture, and flutes in said aperture having tapered ends forming a continuation of said tapered portion.

13. Apparatus for making drawn socketed cap screws, comprising a tool for forcing a headed blank through a drawing die and forming a socket in said blank around said tool during drawing, and a drawing die having knurl forming means in the wall of the drawing aperture therein, said means comprising shallow flutes in the surface of said wall.

14. Apparatus for making drawn socketed cap

screws, comprising a tool for forcing a headed blank through a drawing die and forming a socket in said blank around said tool during drawing, and a drawing die having knurl forming means in the wall of the drawing aperture therein, said drawing aperture having a tapered portion leading thereto, and flutes in the drawing aperture opening into said tapered portion.

15. Apparatus for making drawn socketed cap screws, comprising a tool for forcing a headed blank through a drawing die and forming a socket in said blank around said tool during drawing, and a drawing die having knurl forming means in the wall of the drawing aperture therein, said tool comprising a polygonal member, and said knurl forming means being operative simultaneously during socketing by said polygonal member.

16. Apparatus for making drawn socketed screws, comprising a tool for forcing a blank through a drawing die and forming a socket in said blank around said tool during drawing, and a drawing die having a drawing aperture including a tapered intermediate portion and knurl forming means in the wall of said intermediate portion and extending throughout the remainder of the length of said aperture, said tool comprising a polygonal member, and said knurl forming means being operative simultaneously during socketing by said polygonal member.

17. Apparatus for making drawn socketed screws comprising a drawing die having a drawing aperture extending therethrough comprising spaced portions of different uniform cross-section and an intermediate tapered portion therebetween, and having flutes in the portion of smaller cross-section having tapered inner ends merging into said tapered portion.

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