Oct. 18, 1938. W. A. PURTELL 2,133,466

METHOD OF AND APPARATUS FOR MAKING KNURLED SOCKETED SCREWS

Original Filed June 15, 1935

FIG 1.

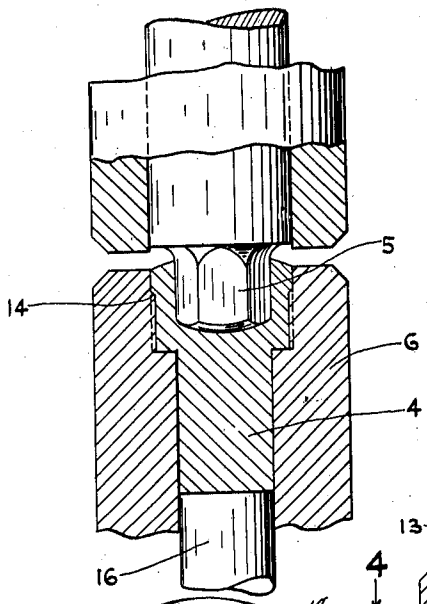
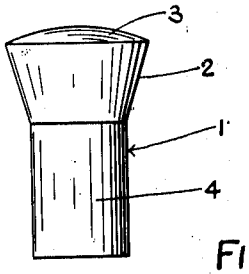


FIG 2.



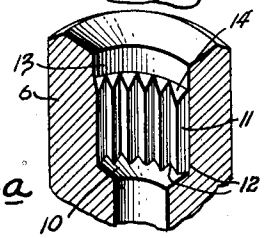


FIG. 3a

FIG 3.

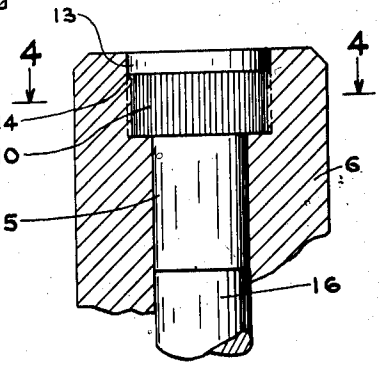


FIG 6.

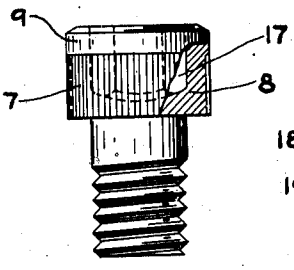


FIG 4.

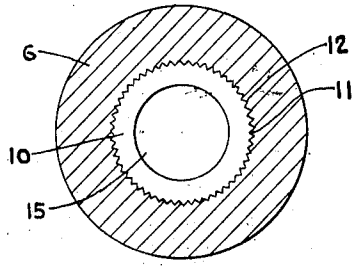
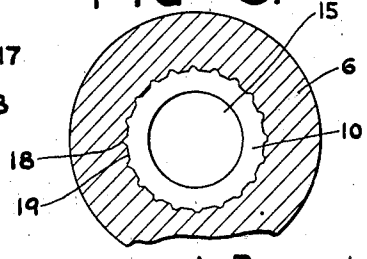


FIG 5.



WILLIAM A. PURTELL
INVENTOR

BY

ATTORNEY.

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METHOD OF AND APPARATUS FOR MAKING KNURLED SOCKETED SCREWS

William A. Purtell, West Hartford, Conn., assignor to The Holo-Krome Screw Corporation, a corporation of Connecticut

Original application June 15, 1935, Serial No. 26,861. Divided and this application April 7, 1937, Serial No. 135,506

25 Claims. (Cl. 10—10)

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

It has among its objects to provide an improved method of, and improved apparatus for, making such knurled socketed screws. A further object is to provide such an improved method of and apparatus for making such improved screws as described and claimed in my copending application Serial No. 26,861, filed June 15, 1935, of which this application is a division. Other objects of my invention are to enable knurled screws to be made in an improved quick and inexpensive manner bringing the cost of making the same down substantially to the cost of making ordinary unknurled screws and, more particularly, to enable the screws to be knurled while the screw is being socketed, in such manner as to eliminate all necessity for additional knurling or handling operations following socketing, and also to enable these screws to be produced with existing equipment with only slight changes and without appreciable additional expense. 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 certain forms in which my improved method may be practiced and of the apparatus used in connection therewith.

In the drawing:—

Figure 1 is a vertical sectional view of a socketing die and punch simultaneously knurling and socketing a blank in accordance with my improvements;

Fig. 2 is a side elevation of a blank used;

Fig. 3 is a vertical section through the socketing die;

Fig. 3ª is an enlarged detail of the tops of the flute forming means;

Fig. 4 is a transverse sectional view of the die on line 4—4 of Figure 3;

Fig. 5 is a sectional view similar to Figure 4, showing a modified form of die; and

Fig. 6 is a side elevation partially in section, showing the knurled cap screw produced.

In carrying out my improvements, I preferably utilize the preferred method of and apparatus for making cap screws taught in my previous Patent No. 1,978,372, and certain improvements in connection with both, whereby the same are adapted to the production of knurled cap screws of the socketed type.

The blank, generally indicated at 1 in Figure 2, is first prepared, preferably by upsetting in two operations as taught in my patent mentioned, to produce a tapered head 2, a crowned top 3 and an elongated shank 4. This blank is then socketed by a punch 5, while the blank is disposed in a socketing die 6 of an improved construction, all in such manner as to form my improved knurling on the finished product as shown in Figure 6, including the knurled or fluted portion 7 on the cap screw head 8 disposed below the outer smooth closing-off band 9 on the head 8.

Referring more particularly to Figures 1 and 3, it will be noted that the socketing die 6 is provided with a fluted knurl forming socketing aperture 10. This corresponds in conformation to the knurled portion 7 on the head 8 of the screw heretofore described, and has radially located flute forming rib and groove portions 11 and 12 thereon, corresponding to and forming like but oppositely disposed portions of the flutes on the knurled or fluted portion 7 of the finished screw. Further, it will be noted that the rib portions 11 each have sloping sides converging into a vertical edge and that they extend inwardly from the wall of the aperture 10 below an annular smooth portion 13 and are provided at their upper ends with downwardly sloping portions 14 which lead from the wall of the portion 13 over the upper ends of the flutes to the inner edges thereof. Further, it will be noted that the bottoms of the grooves between the ribs 11, herein indicated at 12, are of the same diameter as the portion 13 above the same. Also, it will be observed that the socketing die aperture 10 is herein provided with a blank supporting portion on its bottom and with a reduced extension 15 thereon adapted to receive the shanks 4 of the blanks, and that a knock-out pin 16 is provided in this extension 15 in order to support the shanks and push up the finished screws to eject the same.

Thus, with the blank 1 suitably positioned in the socketing die 6, when the punch 5 enters the upper end of the blank to socket the same, i. e., form the socket 17 of the finished screw, I am able simultaneously to form on the screw the smooth upper closing-off rim portion 9 and the lower knurled portion 7, previously described. This is done all in one operation, and as the metal displaced by the punch 5 flows laterally from in advance of the punch and is distributed thereby to fill out the die aperture 10 in the manner described and claimed in my previous patent mentioned. More particularly, it will be noted that as the socket 17 is formed in the

screw, the metal in the blank is caused to enter the grooves 12 in the socketing die and to be so shaped by the portions 11, 12, 13 and 14 of the latter die, as to produce the desired knurled portion 7 and upper sealing off band 9, by the time the punch 5 has completed the formation of the socket 17, whereupon obviously the completed screw may be removed in the usual manner by pushing up the knock-out pin 16.

In Figure 5, it will be noted that the shape of the rib and groove portions on the die 6 is somewhat modified. Here, the ribs, corresponding to the ribs 11, are indicated at 18 and have wider tops, while the grooves, corresponding to the grooves 12, are indicated at 19, and substantially wider than the ribs 18. It will, of course, be evident that, with the socketing die aperture changed to conform to the new ribs and grooves, screws will be made by the same general method and apparatus heretofore described; the principal difference being that, in this construction, a modified form of knurl is produced which presents to the fingers a more smooth rib surface than that previously described and one with greater spaces between the ribs.

It will be understood that while I have shown only a blank and a socketing die and the socketing punch, I contemplate the formation of the blank by upsetting, as previously described in my patent mentioned, and further that I contemplate the use of my improved socketing die and punch in connection with either a separate socketing machine or a mechanism adapted to perform both the upsetting and the socketing operations successively and automatically in the same machine.

As a result of my improvements, it is made possible to form the knurling on the screw in such manner as, not only to produce an improved knurled screw, but very substantially to reduce the cost of producing such screws. Further, it is made possible to eliminate altogether the separate knurl forming operation heretofore necessary, including the resultant additional handling of the screws, while also eliminating the need for providing additional apparatus. Also, it will be evident that it is possible to carry out my invention while practising my previous method and using my previous apparatus with only minimum changes and without requiring material increase in expense. 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 certain forms of my invention, it will be understood that these have been used for purposes of illustration, and that the same may be modified and embodied in other forms without departing from its spirit 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 knurled socketed screws which consists in, knurling the screw while forming a socket in the same.

2. 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 forming a turning socket in the head.

3. The step in making knurled socketed screws which consists in, knurling the blank while expanding the external diameter thereof and forming a turning socket in the blank.

4. The step in making knurled socketed screws which consists in, forming superimposed knurled and smooth bands on the screws as the latter are socketed.

5. The step in making knurled socketed screws which consists in, forming superimposed knurled and smooth bands on the screw as the same is socketed, with the smooth band disposed above the knurled band.

6. The step in making knurled socketed screws which consists in, forming a lower fluted portion on the head beneath an upper smooth band portion as the screws are socketed.

7. The method of making knurled socketed screws which consist in, socketing the blanks, and knurling the exterior thereof while forming the inner and outer walls of the socketed portion.

8. The method of making knurled socketed screws which consists in, forcing a blank into a die while socketing the blank, and forming longitudinally extending knurls on the periphery of the socketed portion as the socket is being formed.

9. The method of making knurled socketed screws which consists in, forcing a blank into a die while socketing the blank, and forming longitudinally extending knurls on the periphery of the socketed portion as the socket is being formed and while simultaneously forming a smooth upper sealing off band above the knurled portion.

10. The method of making knurled socketed screws which consists in, forcing a blank into a die while socketing the blank, forming longitudinally extending knurls on the periphery of the socketed portion as the socket is being formed, and moving the socketed screw reversely in the die to eject it therefrom.

11. The method of making knurled socketed screws which consists in, forming a wide knurled lower portion and a relatively narrow upper smooth band portion thereon as the screw is socketed in a socketing die aperture having a fluted lower portion and a smooth upper portion, and ejecting the screw upward therefrom following knurling.

12. The method of making knurled socketed cap screws which consists in, partially forming the head on the blank, and knurling the head while forming the inner and outer walls of the socketed head.

13. The method of making knurled socketed screws which consists in, upsetting the blank to form the head, and knurling the upset portion thereof while forming the internal and external walls of the socketed portion.

14. Apparatus for knurling screws including a die having a screw socketing aperture and knurl forming means on the wall of a portion of said aperture and connected to an end smooth portion of said aperture by an intermediate longitudinally grooved tapered portion.

15. Apparatus for knurling screws including a die having a screw socketing aperture and knurl forming means on the walls of said aperture comprising vertically disposed flutes having sloping ends leading to the inner edges of said flutes.

16. Apparatus for knurling screws including a die having a screw socketing aperture comprising spaced portions of uniform cross section, one smooth and the other serrated, and an intermediate tapered portion opening into said serrated portion, and a punch cooperating with said die and a blank therein to form a socket in said blank in said aperture while said serrated portion knurls the exterior of said blank.

17. Apparatus for knurling screws including a die having a screw socketing aperture comprising spaced portions of uniform cross section, one

smooth and the other serrated, an intermediate tapered portion opening into one end of said serrated portion, and a blank supporting portion at the opposite end of said serrated portion.

18. Apparatus for knurling screws including a die having a screw socketing aperture and knurl forming means on the walls of said aperture comprising vertically disposed flutes toward the bottom of said walls and a smooth portion at the top of the latter.

19. Apparatus for knurling screws including a die having a screw socketing aperture and knurl forming means on the walls of said aperture comprising vertically disposed flutes toward the bottom of said walls and a smooth portion at the top of the latter, said smooth portion being of substantially the same diameter as the grooves between said flutes.

20. Apparatus for knurling screws including a die having a screw socketing aperture and knurl forming means on the walls of said aperture comprising vertically disposed flutes toward the bottom of said walls and a smooth portion at the top of the latter, said fluted portion being substantially wider than said smooth portion.

21. Apparatus for knurling screws including a die having a screw socketing aperture and knurl forming means on the walls of said aperture comprising vertically disposed flutes toward the bottom of said walls and a smooth portion at the top of the latter, said flutes having inclined portions on their upper ends leading from said smooth portion and the inner edges of the flutes.

22. Apparatus for knurling screws including a die having a socketing aperture and knurl forming means in the walls of said aperture, and a cooperating punch cooperating with said die and a blank therein to form a socket in a blank in said aperture as said knurl forming means knurl the periphery of the blank.

23. Apparatus for knurling screws including a die having a socketing aperture, a punch cooperating with said die and a blank therein to form a socket in said blank in said aperture, and knurl forming means for knurling the periphery of a blank as said punch acts on a blank in said aperture.

24. Apparatus for knurling screws including a die having a socketing aperture, a punch cooperating with said die and a blank therein to form a socket in said blank in said aperture, and knurl forming means for knurling the periphery of a blank as said punch acts on a blank in said aperture, said last mentioned means comprising flutes in said aperture having tapered extremities on their receiving ends and spaced between the opposite ends of said aperture.

25. Apparatus for making fluted cap screws comprising a socketing die having the lower portion of the walls of its socketing aperture longitudinally fluted and also having a smooth portion above said fluted portion, and a punch for simultaneously socketing a tapered blank in said socketing aperture and forcing the metal in said blank into said fluted and smooth portions of the walls during socketing.

WILLIAM A. PURTELL.