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OR 2,100,357
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Nov. 30, 1937. W. McL. ROSBOROUGH 2,100,357

CASTELLATED NUT BLANK

Filed Dec. 24, 1931

FIG. 1

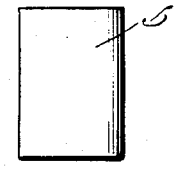
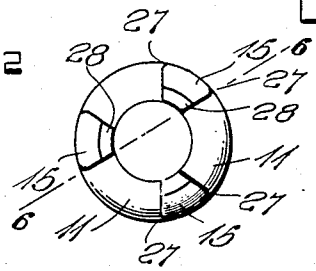


FIG. 2



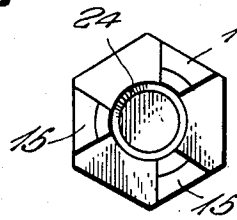
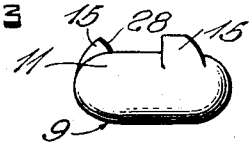


FIG. 4

FIG. 3



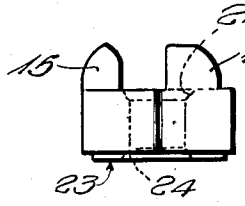


FIG. 5

FIG. 6

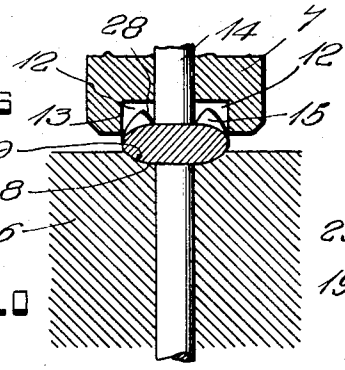


FIG. 7.

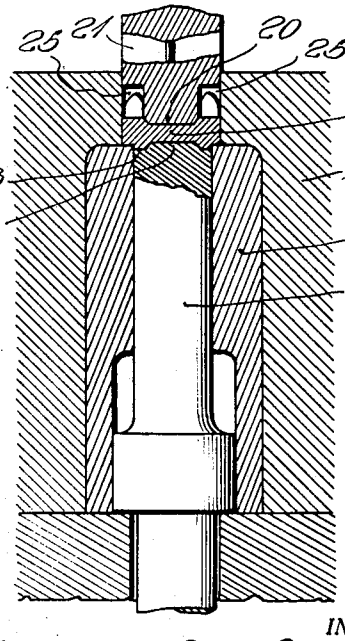
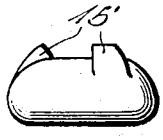


FIG. 10



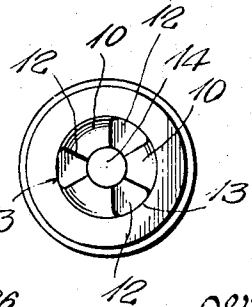


FIG. 8

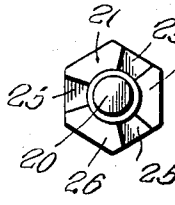


FIG. 9

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2,100,357

CASTELLATED NUT BLANK

William McLure Rosborough, Charlotte, N. C.

Application December 24, 1931, Serial No. 583,068

4 Claims. (Cl. 85—34)

My present invention relates to a method of forming castellated, slotted and similar nuts by a method in which the locking lugs or castles of the nut are formed by a compression and/or extrusion process; to the means for accomplishing the method and to the nut blank produced by the method.

Heretofore the manufacture of plain, i. e., uncastellated nuts having chamfered surfaces on the top of the nut and either chamfered surfaces or a washer face on the bottom of the nut, from a blank having one or both of its surfaces substantially dome-shaped, has been accomplished in the art; but the art does not teach the manufacture of castellated nuts from such blanks with the castles formed by compressing the metal around the portions which form the castles, and/or by extruding the metal from the blanks to form the castles, either with or without chamfered surfaces or with washer faces on the bottom of the nuts.

One of the objects of my invention is to provide a method whereby castles can be formed upon the nut blank simultaneously with the shaping of the blank into its dome formation, and simultaneously with the subsequent conversion of the dome-shaped blank into hexagonal form.

Other objects of my invention will appear as the description proceeds.

In the drawing, which illustrates one of the methods by which the invention can be carried out,—

Figure 1 represents a side elevational view of a blank substantially in the form it occupies before being converted into dome shape.

Figure 2 represents a plan view of the blank after it has been given its dome-shaped configuration, and the formation of the locking lugs has been started.

Figure 3 represents a side elevational view of the blank shown in Figure 2.

Figure 4 represents a plan view of the blank after it has been given its hexagonal shape and the locking lugs have been fully formed.

Figure 5 represents a side elevational view of the blank shown in Figure 4.

Figure 6 represents a fragmentary vertical sectional view taken through the die and punch for forming the blank into the condition illustrated in Figures 2 and 3, the blank being shown in position in the mechanism, and the section being taken along intersecting planes as indicated by the broken line 6—6 of Figure 2.

Figure 7 represents a similar view through the die and punch which transforms the blank into the condition shown in Figures 4 and 5, the blank being shown in position in the mechanism.

Figure 8 represents a view of the working face of the punch illustrated in Figure 6.

Figure 9 represents a view of the working face of the punch illustrated in Figure 7.

Figure 10 represents a side elevational view of a modified form of blank.

Referring more particularly to the drawing, the blank 5, which is preferably obtained by being severed by suitable mechanism, from a length of cylindrical stock, is placed between the die 6 and the punch 7, the latter being then moved toward the die, to bring the parts substantially in the relationship shown in Figure 6. The die 6 is provided with a concaved wall 8 which imparts a rounded or dome shape to the lower face of the blank, as indicated at 9, and the working face of the punch is similarly concaved as at 10 to provide the rounded or dome-shaped upper face 11 of the blank. Further, the die is provided with radial recesses 12, corresponding in number to the number (whatever that may be) of locking lugs to be formed on the nut blank, such recesses at their lower ends terminating at the working face of the punch, and having straight vertical walls as at 13, and being of sufficient depth to allow the portions of the metal coinciding with the recesses to enter the latter without engaging the bottoms of the recesses as the blank is compressed, thereby permitting the lugs to assume the natural shape illustrated in Figures 3 and 6, and without compression of the metal forming the lugs. The inner ends of the recesses in the punch are closed by the knockout pin 14 of the punch, and the recesses extend outwardly to the edge of the concave portion 10 of the punch. As the punch compresses the blank to bring it into the condition illustrated in Figures 3 and 6, the locking lugs 15 of the blank are started by compression of the metal of the blank except for the portions which underlie the recesses 12 in the die, with the result that the metal is compressed and/or extruded into the recesses in attempting to escape the pressure applied on the blank.

The blank having been shaped by the die 6 and punch 7, when released from this mechanism, is transferred by suitable means to the die 16. The recess in the latter is of hexagonal shape, to correspond with the shape of the blank shown in Figure 4, the diameter of the die measured at right angles to any pair of opposed walls being substantially equal to the diameter of the

blank in its circular form, as shown in Figure 3, so that the blank substantially fits the die 16. A knock out pin 17 is provided in the die and works in a block 18, the knockout pin being provided with an extension 19 to co-operate with the extension 20 of the punch 21 in compressing the central portion of the blank to form a web 22 which, in a subsequent operation may be removed by drilling, punching, or otherwise to form the opening in the nut blank and to condition the latter ready for tapping. The upper edge of the knockout pin 17 around the extension 19 may terminate, if desired, below the upper edge of the block 18 to thereby form a washer face 23 on the bottom face of the blank. The extensions 19 and 20 of the pin and punch, respectively, are preferably bevelled in order to form bevelled faces such as 24, on the blank at the ends of the opening therein formed when the web is removed.

The punch 21 is hexagonal in formation and fits the die so as to completely fill the latter over the blank when the latter is in place in the die, and the punch is provided with radially arranged lug-forming recesses 25, corresponding in number and location to the lugs which have been initially started by the operation previously described, and they are of such depth as to allow the locking lugs of the blank to be extruded into the recesses as the punch and die are brought to the relative position indicated in Figure 7, without the metal of the lugs engaging the bottoms of the recesses. The working face of the punch 21, except for the projection 20 and the recesses 25, is flat as at 26, and the side walls of the recesses which are plane and straight, open at the outside faces of the punch as well as at the working face thereof, to thereby bring the locking lugs from the inwardly sloping or inclined condition shown in Figures 2 and 3, in which they are slightly rounded at their bases as at 27, into the vertical condition shown in Figures 4 and 5, by wedging them out against the side walls of the die. Further, the radial width of the recesses 25 in the punch 21, is somewhat reduced over the radial width of the recesses 12 in the punch 7, due to the increase in diameter of the projection 20 over the diameter of the knockout pin 14 of punch 7. Hence, the upper bevelled surfaces 28 of the lugs are engaged by the projection as the punch 21 descends, and are forced outwardly, the lugs being thus straightened up and their inner walls finished off to bring the lugs into the condition shown in Figure 5. The lugs in this condition are also offset outwardly from the circumference of the opening which will be formed in the blank when the web is removed, thereby providing a clearance on the inner faces of the lugs so that when the blank is tapped, no threads will be formed on such faces. This is of advantage, because, where the lugs as well as the body of the blank are tapped, it often occurs that the tap chatters, due to the fact that the lugs strike the flutes, and consequently imperfect threads are formed. Further, the lugs would give slightly under the action of the tap, were they threaded, so that threads of less depth would be cut in them than in the body of the nut. Should the lugs of the nut spring back to normal position after the removal of the tap the threads of the lugs would grip the threads of a bolt or gauge with a binding action, and to a greater extent than the threads in the body portion of the nut, thus preventing the nut from falling within the tolerance limits, thereby making it necessary to discard it.

It will also be observed that the depth of the recesses 25 is such as to allow the lugs to be extruded from the metal of the blank as the die compresses the blank in approaching the position shown in Figure 7, without the formation of the lugs being hindered by engagement of the extruded metal with the bottom walls of the recesses. Thus the lugs will extend to the full height naturally assumed under the compression and/or extrusion of the metal of the blank, and will be raised from the initiatory height assumed in the blank of Figure 3 to their full height reached in the blank of Figure 5. By thus making the recesses of a depth greater than the height of the lugs, no obstruction is offered to the movement of the metal in attempting to escape from the pressure exerted upon it, and relief is thus provided to avoid likelihood of breaking the die.

It will be observed that though I may utilize a domed blank such as has been used in the prior art in making plain nuts it is modified in my process, by the formation of locking lugs thereon, and furthermore, my process departs from the prior art, by acting upon the blank in such manner that pressure is applied over the entire areas of the domed surfaces by a punch which coincides in diameter with the diameter of the die, to thus completely compress the entire areas of the dome surfaces in bringing the blank into a hexagonal form, and thereby extrude the metal from the blank sufficiently to fully form the locking lugs.

It will also be observed that the blank made in accordance with my process has the metal of its body portion in a compressed and dense condition as compared to the metal which forms the locking lugs, since the latter are at no time subjected to the pressure of the punch. Hence, the metal of the lugs has not been compressed or "punished", and the lugs will therefore absorb shocks and vibrations to a greater extent than they would had the metal which forms them been subjected to the compression strain, and they will therefore better resist the fatigue which is caused by the vibration of machinery on which the nuts may be used. Further, by thus leaving the metal of the lugs in an uncompressed condition as compared to the metal of the body of the blank, the lugs will be less likely to crystallize and break under shearing stresses than they would if their metal had been densified.

While I may form the blank 5 into the shape shown in Figures 3 and 6, in which it is dome-shaped on both surfaces, I may if desired, by utilizing a die and punch of the proper shape, form the lug into the condition illustrated in Figure 10 in which the lower surface is flat and the upper surface rounded, the formation of the locking lugs 15' being initiated on the upper surface of the blank as before.

It will be observed that I have illustrated the locking lugs 15 as being located at sides of the hexagonal blank rather than at the corners thereof, which latter is the usual practice. By so placing them, the metal forming the lugs is subjected to less distortion than would be the case were the lugs located at the corners of the blank, because in the latter event the outside faces of the lugs would have to assume angular forms corresponding to the intersecting side walls of the die, whereas by locating them at the sides the metal is free to flow substantially

straight along the side walls of the die without the necessity of being additionally forced into angular formations. Hence, the internal structure of the lugs when arranged at the sides of the blank will be of greater strength than would be the case if distortion, due to the angular formation of the lugs, had taken place. It is to be understood, however, that the lugs may be formed at angles of the blank if so desired.

While I have shown the blank as being provided with three locking lugs, it will be understood that I do not intend to limit the invention to such arrangement, but may form the blank with any desired number of lugs. It will also be understood that while I have described the formation of a hexagonal nut, my process may be used in making blanks of other shapes.

The foregoing description has been given for purposes of clearness of understanding of the invention, and no undue limitations should be deduced therefrom, but the claims should be construed as broadly as permissible, in view of the prior art.

Having thus described my invention what I claim as new, and desire to secure by Letters Patent is:—

1. A castellated nut blank having the metal of the body of the blank compressed and dense as compared to the metal of the locking lugs, and having extruded locking lugs, the metal of the locking lugs being uncompressed and not dense as compared to the metal of the body of the blank.

2. A castellated nut blank having its body portion compressed and dense and having extruded locking lugs the metal of which is uncompressed and not dense as compared to the metal of the body portions of the blank, such lugs being offset outwardly from the central portion of the blank sufficiently to clear the tap when the blank is tapped.

3. A castellated nut blank, formed from a section of stock, and having locking lugs, the material of the body of the blank being compressed and dense relatively to the section of stock from which the blank was formed, and the material of the lugs being relatively uncompressed.

4. A polygonal castellated nut blank, formed from a section of stock, and having locking lugs, the material of the body of the blank being compressed and dense relatively to the section of the stock from which the blank was formed, and the material of the locking lugs being relatively uncompressed, the locking lugs being arranged at side faces of the blank.

WILLIAM McLURE ROSBOROUGH.