Jan. 30, 1951 C. W. DELANEY 2,539,899

METHOD OF FORMING LOCK NUTS

Filed July 18, 1945

Fig. 1.

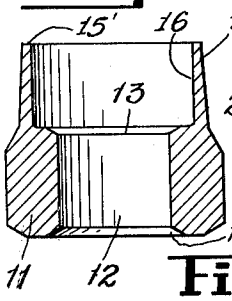


Fig. 2.

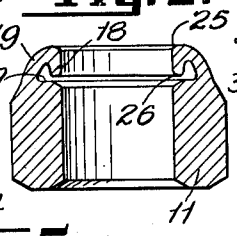


Fig. 3.

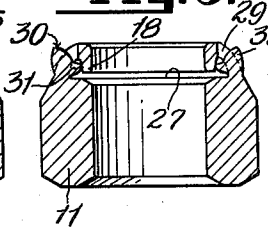


Fig. 4.

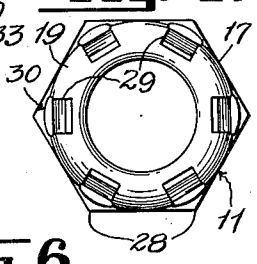


Fig. 5.

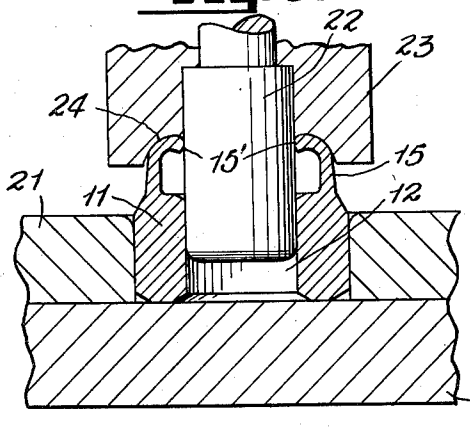


Fig. 6.

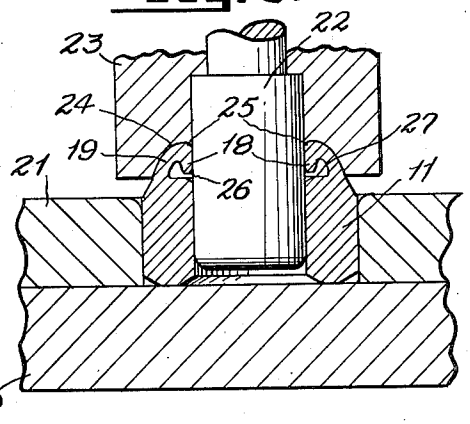


Fig. 7.

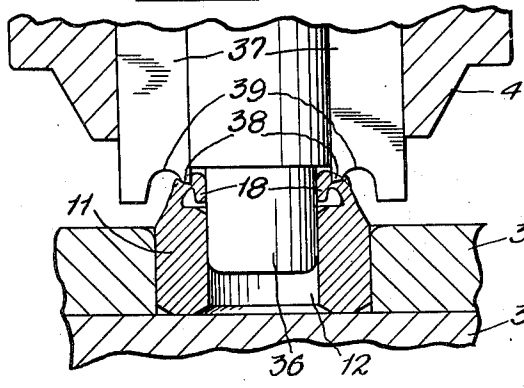


Fig 8.

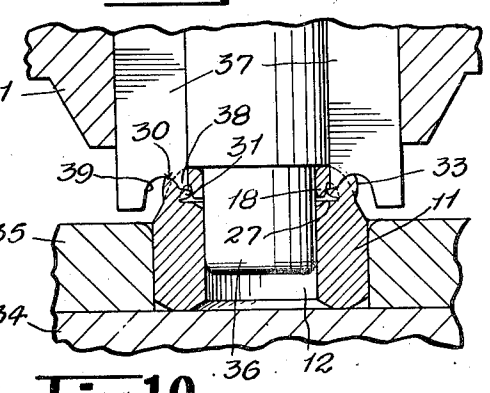


Fig. 9.

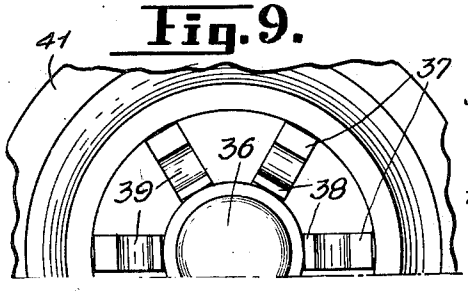
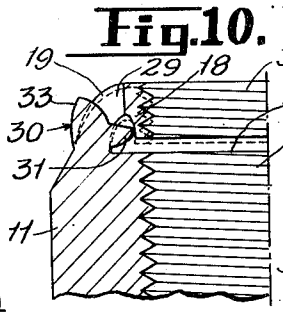


Fig. 10.



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METHOD OF FORMING LOCK NUTS

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Application July 18, 1945, Serial No. 605,714

6 Claims. (Cl. 10—86)

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This invention relates to lock nuts employing two threaded sections integrally joined and movable relatively to each other, with one threaded section set out of phase with respect to the other to retain a nut upon a threaded member regardless of the amount of vibration or shock to which it might be subjected. More particularly, the invention deals with a novel method of producing lock nuts of this type and kind, as more fully hereinafter set forth. The novel features of the invention will be best understood from the following description when taken together with the accompanying drawing, in which certain embodiments of the invention are disclosed, and in which the separate parts are designated by suitable reference characters in each of the views, and in which:

Fig. 1 is a sectional view of a nut blank or slug which I employ.

Fig. 2 is a view similar to Fig. 1, showing the completion of the first step in the method of producing the nut.

Fig. 3 is a view similar to Fig. 4 showing the next step in the operation.

Fig. 4 is a plan view of the structure as seen in Fig. 3.

Figs. 5 and 6 are diagrammatic sectional views showing the method of shaping the nut from the blank of Fig. 1 to the point of producing the result in Fig. 2.

Figs. 7 and 8 are diagrammatic sectional views showing the steps of stabbing or shearing the nut in producing the result shown in Figs. 3 and 4.

Fig. 9 is a bottom plan view of the shearing tool shown in Figs. 7 and 8; and

Fig. 10 is an enlarged sectional view of part of a nut showing the final steps in the operation of forming the lock nut, and indicating the setting out phase in dotted lines.

The present application deals with the method of producing lock nuts of the type and kind disclosed in a companion application filed of equal date herewith and later to be identified as Serial Number 605,713, filed July 18, 1945.

In carrying my invention into effect, a nut blank or slug of the general cross section shown in Fig. 1 of the drawing is first formed in any desired manner. This slug comprises an enlarged tubular body 11 of hexagon peripheral contour, having a bore 12 therein, the bore having bevelled countersunk upper and lower ends, as seen at 13 and 14. Extending upwardly from the body 11 is a tapered sleeve portion 15, the bore 16 of which is of greater diameter than the bore 12. The outer diameter of the sleeve is also disposed within the flat sides 17 of the body 11, as will

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appear from a consideration of Fig. 4 of the drawing.

The first step in producing the nut consists in inwardly turning the sleeve 15 to form, as seen in Fig. 2, the skirt 18 forming the resulting nut section, which joins the upper end of the nut in the curved wall portion 19. This result is accomplished by the dies and tools diagrammatically illustrated in Figs. 5 and 6. In these figures, 20 represents a bed plate having thereon a support 21 for the reception of the nut body 11. Movable toward and from the bed plate 20 is a forming pin 22, around which is disposed a forming or curling tool 23 having a curved recess 24, so shaped as to engage the upper edge 15' of the sleeve 15 and turn this edge inwardly and then downwardly along the forming pin 22. An early stage of this operation is shown in Fig. 5 of the drawing, where the sleeve is partially turned inwardly in a manner to initially direct the end 15' against the pin 22 in a substantially downwardly glancing manner. As the tool 23 continues in its downward movement, the result shown in Fig. 6, and also illustrated in Fig. 2 is accomplished. In other words, the skirt 18 and wall portion 19 are formed. In this connection, it will be noted that the skirt 18 terminates at its upper or outer end in a relatively sharp corner 25, which produces a relatively long skirt portion 18 to receive the greatest possible number of threads. It will also be apparent that the inner end 26 of the skirt 18 terminates short of the upper or outer surface 27 of the body 11.

The next step in the operation of forming the nut consists in stabbing or shearing the wall 19 at the six corner portions 28 of the hexagon nut body 11 to form apertures 29 in the wall 19, and also to form back up and reinforcing members 30 at said corner portions. Forming the apertures 29 in the wall 19 will give greater resiliency to said wall, whereas the members 30 are so formed as to produce inwardly extending parts 31 arranged adjacent and in close proximity to the skirt or thread section 18, to back up this section to resist radial stresses or strains thereon, and particularly in backing up the skirt 18 in forming the threads 32 therein, as later described.

In forming the members 30 outwardly extending parts 33 are also formed, as clearly seen in Fig. 10 of the drawing. That is to say, parts which are disposed outwardly of the contour of the wall 19. However, these parts 33 are disposed within peripheral boundaries of the nut body 11, as will appear from a consideration of Fig. 4 of the drawing.

The stabbing or shearing operation above re-

ferred to is produced from tools substantially of the type and kind diagrammatically illustrated in Figs. 7, 8 and 9. In Figs. 7 and 8 I have shown at 34 a bed plate having thereon a workpiece support 35 in which the nut, formed as shown in Fig. 2, is adapted to be placed. At 36 is shown a pin or mandrel adapted to support the wall of the skirt 18 and the wall of the body 11 in the stabbing or shearing operation. Spaced circumferentially around the pin or mandrel 35 are six similar shearing tools 37, each having at its lower surface a shearing portion 38 adapted to pass through the wall 19 adjacent but outwardly of the skirt 18, the tools 37 also having a curved portion 39 adapted to expand or extend part of the metal of the wall 19 outwardly in forming the members 33.

Comparing Figs. 7 and 8, Fig. 7 showing the beginning of the shearing operation and Fig. 8 the completion thereof, it will appear that the structure of the shears 38 is such as to force some of the material of the wall 19 downwardly and inwardly to a point substantially engaging the skirt 18 in forming the members 31. The tools 37 actually lance, shear and form to displace the wall 19 in forming the inwardly extending parts 31 and the outwardly extending parts 33, while at the same time forming the apertures 29 in the wall 19. Considering Fig. 10 of the drawing, it will also appear that the members 31 terminate short of the surface 27 of the nut body 11 and engage the inner end portion of the skirt 18.

After having completed the shearing operation by the tools disclosed in Figs. 7 and 8, the nut thus produced is now ready for the next or threading operation. It will be apparent that in forming the skirt 18, the bore of this skirt is common to the bore 12 of the nut body, as will clearly appear from a consideration of Figs. 2 and 3 of the drawing. Threads are now formed in the body 11 and the skirt 18, these threads being simultaneously formed. The threads of the skirt 18 have been previously identified by the reference character 32 and the threads of the body 11 are shown at 40 in Fig. 10 of the drawing. After these have been formed, the next and final step in the production of the lock nut consists in setting the nut section comprising the skirt 18 out of phase, and this is shown in dotted lines in Fig. 10 of the drawing.

It will be apparent that the shearing tools 37, as well as the pin 36 are supported in a suitable tool body 41 and movable therewith in the feed of said tools and pin toward and from the nut. In performing the operation of cutting the threads 32 and 40, the skirt 18 is backed up by the inwardly extending parts or back up members 31, these parts or members also support and reinforce the skirt 18 when the nut is in use.

From the foregoing, it will be apparent that after having produced the nut blank substantially as illustrated in Fig. 1 of the drawing, the steps of producing the lock nut comprise first turning the sleeve 15 inwardly in the manner shown in Figs. 5 and 6, producing the result substantially similar to that shown in Fig. 2, after which the turned sleeve portion is sheared adjacent but outwardly of the skirt 18 at the corner portions 28 to form the parts or members 30, including the parts 31—33 and the resulting recesses or openings 29 in the wall portion 19. The result of this shearing operation is illustrated in Fig. 3 of the drawing.

The next step consists in forming the threads

32 and 40 from a single threading operation, after which the now threaded skirt 18 is set axially inwardly out of phase, in the manner indicated in dotted lines in Fig. 10 of the drawing.

A lock nut produced in accordance with the method herein defined will fully meet the requirements of what is known as the "Preece test," in minimizing abrasive action upon the threaded member to which the nut is applied, thus obviating the removal of platings or coatings which may be applied to such threaded member. Furthermore, by reason of the structure of the wall 19 and the skirt at the inner end thereof, a combined axial and radial movement is produced, the axial movement taking place from a point adjacent the body of the nut, that is to say, where the wall portion 19 joins the nut body. At the same time a nut is produced which incorporates the required locking engagement with the threaded member upon which the nut is arranged.

From a descriptive sense, the stabbing or shearing operation above referred to may be described as a combined piercing and re-shaping operation, bearing in mind that the wall portion is re-shaped to the extent of forming the parts 31 and 33.

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

1. The method of forming lock nuts, which comprises first forming a nut blank comprising a nut body having a hexagon peripheral contour and a bore and a sleeve portion extending integrally from one end of said body within the peripheral boundaries thereof, then turning said sleeve portion inwardly to form an annular skirt joining the nut body in an annular curved wall portion, the skirt having a bore in alinement with the bore of said nut body and with the inner end of the skirt terminating in spaced relation to said end of the nut body, then stabbing said curved wall at circumferentially spaced intervals and in alinement with corner portions of the hexagon nut body to form openings and backing and reinforcing members comprising inwardly extending parts substantially abutting said skirt and outwardly extending parts arranged within peripheral boundaries of the nut body, then forming a thread in the bore of said nut body and skirt, and then setting the skirt out of phase with the nut body.

2. The method of forming lock nuts, which comprises first forming a nut blank comprising a nut body having a hexagon peripheral contour and a bore and a sleeve portion extending integrally from one end of said body within peripheral boundaries thereof, then turning said sleeve portion inwardly to form an annular skirt joining the nut body in an annular curved wall portion, the skirt having a continuous inward curvature from the end of the nut body to the outer end of said skirt, the skirt having a bore in alinement with the bore of said nut body and with the inner end of the skirt terminating in spaced relation to said end of the nut body, then stabbing said curved wall at circumferentially spaced intervals and in alinement with corner portions of the hexagon nut body to form openings and backing and reinforcing members comprising inwardly extending parts substantially abutting said skirt and outwardly extending parts arranged within peripheral boundaries of the nut body, then forming a thread in the bore of said

nut body and skirt, and then setting the skirt out of phase with the nut body.

3. The method of forming lock nuts, which comprises first forming a nut blank comprising a nut body having a hexagon peripheral contour and a bore and a sleeve portion extending integrally from one end of said body within the peripheral boundaries thereof, then turning said sleeve portion inwardly to form an annular skirt joining the nut body in an annular curved wall portion, the skirt having a bore in alinement with the bore of said nut body and with the inner end of the skirt terminating in spaced relation to said end of the nut body, then forming circumferentially spaced openings in the curved wall in alinement with corner portions of said hexagon body and simultaneously forming skirt reinforcing and backing members, then simultaneously forming threads in the bores of the nut body and said skirt, and then setting the threaded skirt out of phase with respect to the threaded nut body.

4. The method of producing lock nuts of the class described, which comprises forming a nut blank comprising a nut body with a thin wall sleeve extending from one end thereof within peripheral boundaries of said body, then turning the sleeve inwardly upon a forming pin to form a relatively long skirt portion with the inner end thereof spaced from said end of the nut body and with the outer end thereof joining a curved annular wall in a small radius to provide a relatively long bore in the skirt and in alinement with the bore of the nut body, forming circumferentially spaced openings in said curved wall to provide greater resiliency in the support of the skirt portion by said wall, utilizing material removed from the wall in forming said openings to form reinforcing members substantially abutting the outer surface of the inner end portion of said skirt, simultaneously threading the bore of the nut body and said skirt, and then setting the threaded skirt inwardly out of phase with respect to the threaded nut body.

5. The method af forming lock nuts of the class described, which comprises first producing a nut having a polygonal body portion with a circumferentially continuous skirt adjacent but spaced from one end of the body portion and integrally joining the body portion in an annular wall, then simultaneously stabbing outer portions only of said annular wall outwardly of the skirt at circumferentially spaced intervals to form a plurality of openings in said wall disposed in alinement with corner portions of the nut body and simultaneously forming backing members of the stabbed material of said wall abutting said skirt, then forming threads in the nut body and skirt, and then setting the threaded skirt out of phase with respect to the threaded nut body.

6. The method of forming lock nuts, which comprises first producing a nut blank comprising a nut body of predetermined peripheral contour and a bore therein with a sleeve extending from one end of the nut body within peripheral bounds thereof, then turning the sleeve inwardly upon a forming pin supported in the bore of said nut body and projecting from said end thereof to form a long skirt portion having a bore common to the bore of said nut body with the skirt portion spaced from said end of the nut body and joining the nut body in a curved circumferential wall, then stabbing the circumferential wall at a predetermined number of circumferential sections, while supporting the nut body in supports including a mandrel fitting the bore of said body and said skirt, to form openings in said wall and backing members engaging the inner end portion of the skirt, then cutting a thread in the bore of said body and skirt, and then setting the threaded skirt out of phase with respect to said threaded body.

CHARLES W. DELANEY.

REFERENCES CITED

The following references are of record in the file of this patent:

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