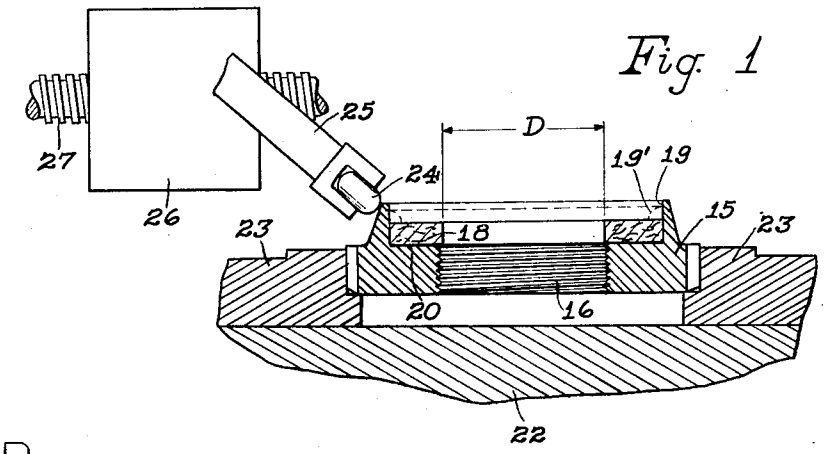
May 28, 1940. A. M. CHAMBERS, JR., ET AL 2,202,044

METHOD OF AND APPARATUS FOR MANUFACTURING LOCK NUTS

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Fig. 1



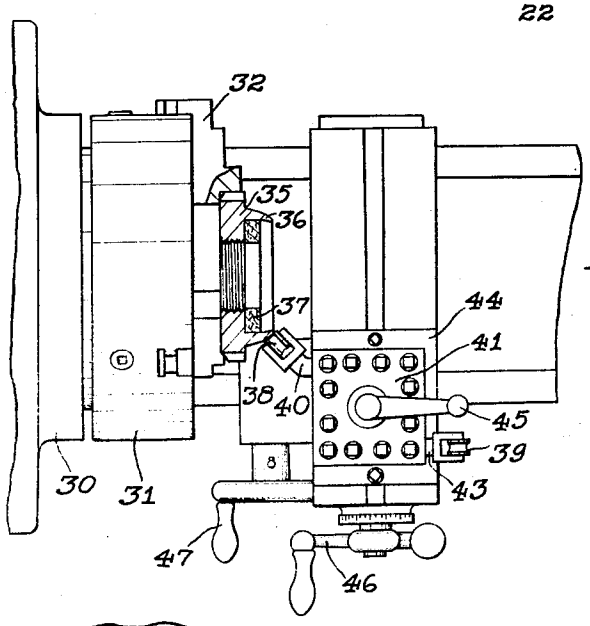


Fig. 2

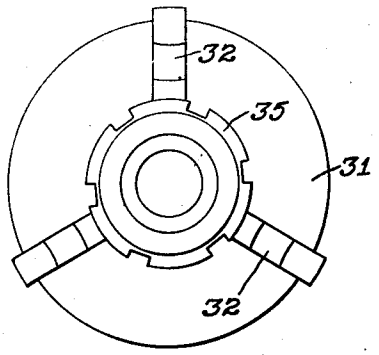


Fig. 4

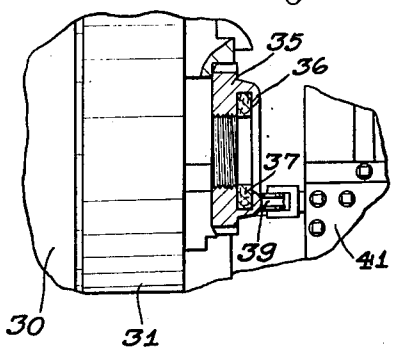


Fig. 3

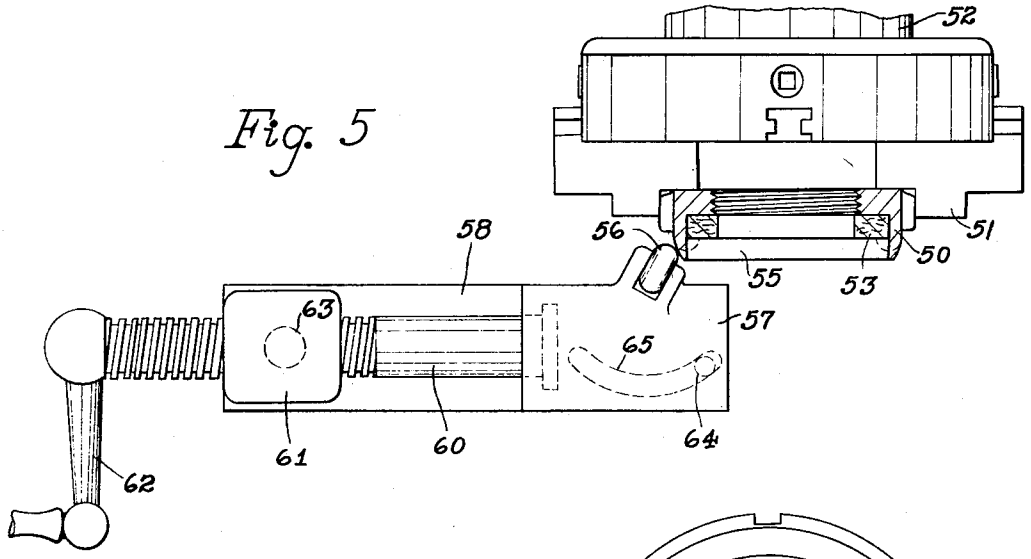
Albert M. Chambers Inventors
and Wm. Ralph Jenkinson
By
B. F. Schlesinger
Attorney

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METHOD OF AND APPARATUS FOR MANUFACTURING LOCK NUTS

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Fig. 5



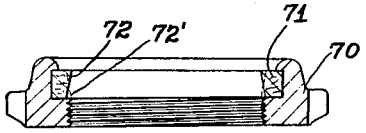


Fig. 6

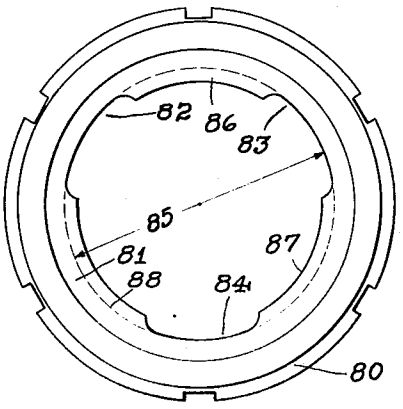


Fig. 8

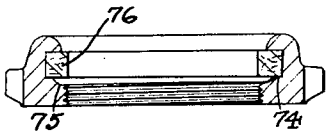


Fig. 7

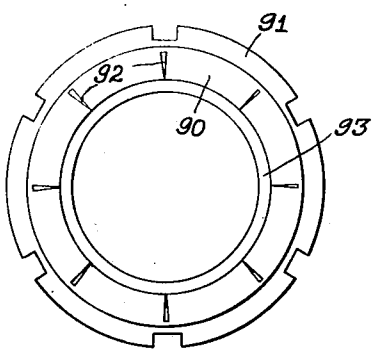


Fig. 10

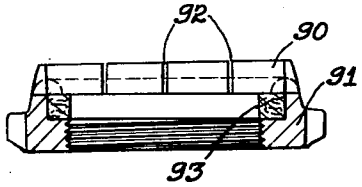


Fig. 9

Albert M. Chambers Inventors
and Wm. Ralph Jenkinson
By B. F. Schlesinger
Attorney

Patented May 28, 1940 2,202,044

UNITED STATES PATENT OFFICE

2,202,044

METHOD OF AND APPARATUS FOR MANUFACTURING LOCK NUTS

Albert M. Chambers, Jr., and William Ralph Jenkinson, Rochester, N. Y., assignors, by mesne assignments, to Elastic Stop Nut Corporation, Elizabeth, N. J., a corporation of New Jersey

Application June 15, 1937, Serial No. 148,342

11 Claims. (Cl. 10—72)

The present invention relates to lock nuts and particularly to lock nuts of the type wherein a fibre or similar elastic washer is secured in a metallic nut-body to provide the locking medium.

One object of the invention is to provide an improved but very practical and inexpensive method for securing an elastic washer in a nut-body.

Another object of the invention is to provide apparatus suitable for carrying out the method.

A further object of the invention is to provide improvements in the structure itself of lock nuts of the type described.

Heretofore, lock nuts of the type described have been made by turning a cavity in one end of a threaded metallic nut-body in such way as to leave an edge of metal standing around the periphery of the cavity, then placing an elastic washer in said cavity and bending the edge wall of the cavity over the washer by means of a die mounted in a power-press. When the nut-bodies are made of certain grades of steel, or when the nuts are of large size, it has been found impossible to press the metal edge over the washer without causing cracks in the metal. The result is that it has been necessary to use selected grades of steel for lock nuts of the described type or to confine their manufacture to nuts of the smaller sizes. With the present invention, it is possible to make lock nuts of the described type in all sizes and in practically any grade of steel without danger of cracking.

In the method of manufacture employed in the present invention, the metallic nut-body is threaded and provided with a cavity to receive the elastic washer, as usual, but, instead of forcing the edge of the cavity down over the washer in a die-press, the edge is spun down over the washer by rotating the nut blank at high speed while exerting a downward bending pressure on the edge of the cavity. Thus, the bending pressure on the edge of the cavity is applied gradually and uniformly around the edge of the cavity and cracking of the metal is avoided. The apparatus for performing the actual bending operation by the process of the present invention may take various forms, as will be described hereinafter.

For large sized nuts, the invention contemplates relieving the elastic washer at spaced points around its bore so that it will only bear at spaced points on the thread of the article on which the nut is being used, thereby reducing the force required to thread the nut into place or to take it off. The invention also contemplates other improvements in lock nuts of the type described. For instance, it is within the purview of the invention to taper the bore of the elastic washer so as to thread the nut on more easily. Under some conditions, also, the edge wall of the cavity in which the washer is mounted may be slotted so as to further relieve the metal of strains in the bending of this wall over into position for securing the washer in place.

Various embodiments of the invention are illustrated in the drawings, in which:

Fig. 1 is a more or less diagrammatic view illustrating the new method of securing an elastic washer in place in a lock nut of the type covered by the present invention;

Fig. 2 is a fragmentary view of a lathe, showing a special fixture mounted thereon in place of the ordinary tool head for employment in practicing the method of the present invention, the fixture being shown in position for performing the first step of a two-step operation of spinning over the metal of the nut-body to hold the elastic washer in place;

Fig. 3 is a fragmentary view similar to that of Fig. 2 but illustrating the second step in spinning the metal into holding position;

Fig. 4 is a view looking at the work spindle of the lathe and showing the nut and the chuck for holding the same during the spinning operation;

Fig. 5 is a view of a modified form of apparatus for performing the process of the present invention;

Fig. 6 is a sectional view of a lock-nut constructed according to one embodiment of this invention;

Fig. 7 is a sectional view of a lock nut constructed according to a different embodiment of this invention;

Fig. 8 is a plan view of a large size lock nut constructed according to one embodiment of this invention;

Fig. 9 is a sectional view of a nut-body with an elastic washer mounted therein, prior to bending of the metal down over the washer; and

Fig. 10 is a plan view of the nut shown in Fig. 9 after the edge metal has been bent down over the washer.

In the drawings, 15 denotes a metallic nut-body which is internally threaded as at 16 and provided with a cavity or recess at one end to receive the elastic washer 18. The inside wall 19 of this cavity or recess is preferably made cylindrical. The end face or seat 20 of the recess may be made

of any suitable shape, but is preferably made plane, as shown.

The purpose of the present invention is to provide a method for bending the edge wall 19 of the recess over the washer 18 so as to secure the washer in position in the nut-body. To this end, the nut-body, with the washer mounted therein, may be secured to the work spindle of a lathe or a similar machine and while the work spindle is rotated at high speed, pressure is applied to a suitable tool to bend the wall 19 down and over the washer 18.

In Fig. 1, 22 denotes the nose of the work spindle of a lathe and 23 are chuck jaws for securing the nut-body in position. 24 is a roller which is mounted in an arm 25. This arm 25 is secured to a head 26 which is substituted for the ordinary tool head of the lathe and which may be manipulated by a screw 27 corresponding to the screw ordinarily provided for traversing the tool head. The arm 25 is secured in any suitable manner to the head 26 to project at an angle of approximately 45° from one side of the head.

In setting up the machine for operation, the head 26 is adjusted relative to the work spindle so that the roller 24 will engage the outside periphery of the wall 19 of the recess in which the washer 18 is mounted. Then the work spindle 22 is rotated to revolve the nut-body at high speed and simultaneously the head 26 is traversed by the screw 27 to apply a pressure to the wall 19 and gradually spin that wall down over the washer 18 to the dotted line position indicated by the numeral 19' in Fig. 1. The traversing movement of the head 26 will be performed at a rate dependent upon the thickness of the wall 19 and its diameter and the rate of the traversing movement will be slow enough to avoid applying any excessive pressure to the wall 19 during the spinning over of the same and thereby avoid any possibility of setting up strains in the metal which may cause the same to crack.

In use, the fibre or other elastic washer 18 is ordinarily not threaded, but has the thread formed into the same only when the nut is threaded onto the shaft or bolt or spindle, etc., on which the nut may be used. The diameter D of the bore of the washer 18 can be varied from the major to the minor diameter of the thread 16 of the nut to provide different locking powers for different nominal thread diameters. By varying the height of the wall 19, more or less stock can be spun over the washer 18.

In some instances, instead of trying to spin over the retaining wall in one step, it is desirable to do this work in two steps, so as to minimize the possibility of setting up strains in the metal. Apparatus for doing this is illustrated in Figs. 2 to 4 inclusive. Here 30 denotes the work spindle of a lathe, 31 the chuck head and 32 the chuck-jaws. The nut-body 35 is secured in the chuck-jaws 32 so that the wall 36, which surrounds the recess for the fibre washer 37, extends outwardly.

For spinning the wall 36 over the washer 37, two rollers 38 and 39 are provided. The roller 38 is mounted in a bent arm 40 which is secured in any suitable manner at one corner of a rotatable tool head 41. The roller 39 is mounted in an arm 43 which is secured in the diagonally opposite corner of the tool head 41. The tool head 41 is rotatably mounted upon the cross slide 44 which in turn may be mounted upon the carriage of the lathe.

The mechanism for rotating the tool head 41 has not been shown, but may be of the type usually found on standard lathes and may be manipulated by a lever 45. The slide 44 can be traversed by a screw (not shown) which may be operated by a lever 46. The carriage can be manipulated in the usual manner by the hand wheel 47 to move the slide, together with the tool head, to and from operative position.

The arm 40 is so bent that the roller 38 extends at an angle of approximately 45° from the tool head 41 while the arm 43 extends at right angles to the tool head.

In use, the tool head 41 is first adjusted to bring the roller 38 into operative position and then this roller is engaged with the wall 36 of the nut by adjusting the slide 44 and the lathe carriage. Then the machine is started causing the spindle 30 to be rotated and simultaneously the slide 44 is traversed to spin the wall 36 partially over the washer 37. Then the hand wheel 47 is manipulated to withdraw the carriage and the crank 45 is turned to rotate the tool head 41 to bring the roller 39 into operative position and then the carriage is returned to bring this roller into operative engagement with the wall 36 of the nut-body. The roller 39 extends at right angles to the slide 41. Hence, when the spindle 30 is again rotated and the hand wheel 47 revolved to force this roller against the wall 36, the wall 36 is spun down flat over the washer 37 to securely hold it in position.

In Fig. 5, there is illustrated a slightly different piece of apparatus for spinning over the wall of the nut to retain the elastic washer in place. The nut-body 50 is secured as before in the jaws 51 of a chuck that is mounted on the head of the work spindle 52 of a lathe or other suitable machine, with the elastic washer 53 in position. For spinning over the wall 55 of the recess in which the washer 53 is mounted, a roller 56 is provided. This roller is rotatably mounted in a slidable head 57 so that it extends at an angle of substantially 45° to the head. The head 57 slides on a base 58 and may be moved by the screw shaft 60 which is journaled at one end in the head and which threads through a nut 61. The screw shaft is operated by the crank-handle 62.

The nut 61 is pivotally mounted by means of the pin 63 in the base 58. The slide 57 carries a pin 64 which engages in an arcuate slot 65. Thus, as the screw shaft 60 is rotated by means of the crank 62, the slide 57 is moved in a curvilinear path controlled by the slot 65 to bend over the wall 55 of the nut 50 down upon the washer 53.

Ordinarily, the elastic washers are provided with a cylindrical hole or bore, but the exertion of threading the nut onto a shaft, bolt or other part may be reduced by making the washer with a tapered bore as shown in Fig. 6. Here the nut is designated at 70 and the washer at 71. The washer has a tapered bore, the wall of which is denoted at 72. This form of washer allows the thread of the shaft or bolt to start easily into the washer and when the nut is forced against a shoulder, allows the tapered surface 72 to shift to the position indicated by the dotted line 72' to provide a wedging lock for the nut.

It is preferred to make nuts with a plane surfaced seat for the washer, as already described, but in some instances, it may be desirable to make the seat nothing more than a short shoulder and make the bottom of the washer-receiving recess spherical, as shown at 75 in Fig. 7 so that when the nut is forced "home," the fibre washer

76 can expand into the spherical part of the recess.

For large spanner nuts of above about 2" thread diameter, such as shown, for instance, at 80 in Fig. 8, it has been found that a very great pressure must be exerted to thread the nut on or off of a shaft or bolt, if the elastic washer is made in the usual manner. We have found, however, that by relieving the washer at spaced points around its bore so that it has really only segmental gripping portions and only engages the shaft or bolt with a part of its surface, the nut can much more readily be threaded "home" or removed and at the same time will have the desired gripping effect. Thus, as shown in Fig. 8, the washer 81 is cut out or relieved on three spaced parts, 82, 83 and 84 of its bore to a depth equal to or greater than the outside diameter 85 of the thread of the shaft or bolt so that the elastic washer will not engage the thread of the shaft or bolt at these points, 82, 83 and 84, but only engage and thread onto the shaft or bolt with the segmental portions 86, 87 and 88 left between the relieved parts. A lock nut constructed in this way is comparatively easy to get on and off, yet will have the necessary locking power.

To further eliminate possibility of straining the metal and avoid possibility of cracks or breakage, we have found it desirable in some instances to slot the wall of the washer receiving recess before bending the wall down over the washer. Thus, as shown in Fig. 9, the wall 90 of the washer receiving recess of the nut 91 is saw-slotted at spaced points, as indicated at 92, before bending the wall down over the elastic washer 93. Fig. 10 shows the completed nut, with the wall bent down into position. The saw-slots are closed or very nearly closed in the bending operation.

While a number of different embodiments of the invention have been illustrated, it will be understood that the invention is capable of various further modifications and the present application is intended to cover any variations, uses, or adaptations of the invention following, in general, the principles of the invention and including such departures from the present disclosure as come within known or customary practice in the art to which the invention pertains and as may be applied to the essential features hereinbefore set forth and as fall within the scope of the invention or the limits of the appended claims.

Having thus described our invention, what we claim is:

1. The method of manufacturing a nut which comprises threading a metallic body and forming a recess in one end of said body, mounting a non-metallic washer in said recess and rotating the nut while applying a bending pressure to the side wall of said recess in a direction inclined to the axis of the nut to bend the wall partially over the washer, and then completing the bending operation by rotating the nut while applying a bending pressure to said wall in the direction of the axis of the nut.

2. Apparatus for manufacturing a lock nut of the type in which a non-metallic locking washer is secured in a recess in a metallic nut-body comprising a rotary support for the nut, a member adapted to engage the side wall of said recess, means for rotating the nut, and means for exerting a pressure on said member during the rotation of the nut to bend the side wall of the recess over the washer to secure the washer in the recess.

3. Apparatus for manufacturing a lock nut of the type in which a non-metallic locking washer is secured in a recess in a metallic nut-body comprising a rotary support for the nut, an indexable tool head, a pair of tools mounted on said head, one of which projects at right angles to the head and the other of which extends diagonally therefrom, means for rotating the nut support, and means for exerting a pressure on either of said tools, when the same is in operative position and during the rotation of said support, to bend the side wall of the recess over the washer.

4. Apparatus for manufacturing a lock nut of the type in which a non-metallic locking member is secured in a recess in a metallic nut-body comprising a rotary support for the nut, an indexable tool head, a pair of tools mounted on said head, one of which projects at right angles to the head and the other of which extends diagonally therefrom, means for rotating the nut support, and means for simultaneously producing relative movement between the nut support and the tool head in a direction perpendicular to the axis of the nut.

5. Apparatus for manufacturing a lock nut of the type in which a non-metallic locking washer is secured in a recess in a metallic nut-body comprising a rotary support for the nut, an indexable tool head, a pair of tools mounted on said head, one of which projects at right angles to the head and the other of which extends diagonally therefrom, means for rotating the nut support and means for simultaneously producing relative movement between the nut support and the tool head in directions both perpendicular to and axial of the nut support.

6. The method of manufacturing a nut which comprises threading a metallic body and forming a recess in one end of said body, mounting a non-metallic washer in said recess, engaging a roller with the side wall of said recess, and rotating the nut on its axis while moving the roller in a direction inclined to the axis of the nut to bend the wall of the recess over the washer.

7. The method of manufacturing a nut which comprises threading a metallic body and forming a recess in one end of said body, mounting a non-metallic washer in said recess, engaging a roller with the wall of said recess, and rotating the nut on its axis while moving the roller in a direction perpendicular to the axis of the nut to bend the wall of the recess over the washer.

8. Apparatus for manufacturing a lock nut of the type in which a non-metallic locking washer is secured in a recess in a metallic nut-body comprising a rotary support for the nut and means for securing the nut with its axis coaxial of the axis of said support, a roller adapted to be engaged with the wall of said recess, means for rotating the nut-support and means for simultaneously producing a relative movement between the nut support and roller in a direction inclined to the axis of the nut support.

9. Apparatus for manufacturing a lock nut of the type in which a non-metallic locking washer is secured in a recess in a metallic nut-body comprising a rotary support for the nut and means for securing the nut with its axis coaxial of the axis of said support, a roller adapted to be engaged with the wall of said recess, means for rotating said support, and means for simultaneously producing a relative movement be-

tween the nut support and roller in a direction parallel to the axis of the nut support.

10. Apparatus for manufacturing a lock nut of the type in which a non-metallic locking member is secured in a recess in a metallic nut-body comprising a rotary support for the nut, and means for securing the nut on said support with its axis coaxial with the axis of said support, a roller adapted to be engaged with a side wall of said recess, means for rotating the nut support, and means for simultaneously rolling the roller around the end of said side wall to bend the side wall over the washer.

11. Apparatus for manufacturing a lock nut of the type in which a non-metallic locking member is secured in a recess in a metallic nut-body comprising a rotary support for the nut, and means for securing the nut on said support with its axis coaxial of the axis of said support, a roller adapted to be engaged with the side wall of said recess, means for rotating the nut support, and means for simultaneously imparting a curvilinear movement to said roller to bend said side wall over the washer.

ALBERT M. CHAMBERS, JR.
W. RALPH JENKINSON.