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LOCK NUT

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9 Claims. (Cl. 151-19)

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This invention pertains to lock nuts for use on bolts and the like, and has as its general object the provision of such an article which can be made economically, which can be applied with facility to bolts of standard or conventional form, which will be highly effective to retain its connection and position on the bolt, which may be detached with facility when desired and re-applied and removed repeatedly, and which involves no mutilation, distortion or injury to the bolt to which it is applied or to the nut itself incident to attachment or detachment.

Other objects and advantages of the invention will be pointed out or indicated hereinafter or will be apparent to one skilled in the art upon an understanding of the present disclosure or upon actual use of embodiments of the invention.

To aid in explanation of the invention, I show in the accompanying drawing forming a part of this specification, and hereinafter describe, certain forms representing embodiments of it. It is to be understood, however, that these are presented for purpose of illustration merely, and hence are not to be construed in any fashion for the purpose of limiting the appended claims short of the true and most comprehensive scope of the invention in the art.

In such drawing,

Fig. 1 is a transverse sectional elevation of a lock nut embodying the invention, showing the parts in normal position preliminary to attachment of it to a bolt;

Fig. 2 is a top view of the nut illustrated in Fig. 1, with a portion broken away;

Fig. 3 is a side elevation of the same embodiment;

Fig. 4 is a sectional elevation of a modified form; and

Fig. 5 is a diagram serving to illustrate, on an enlarged scale, certain features and particulars in the action or operation of the device.

The nature of the invention will be most quickly ascertained from a detailed description of these illustrative embodiments, which is as follows.

The lock nut illustrated in Figs. 1, 2 and 3 comprises a leading or holding member 10, a following or clamping member 11, and a positioning member 12. The positioning member 12, although of value and utility, is not essential to the operativeness and full utility of the lock nut, and may be omitted if desired. The leading and following members are shown as of conventional hexagonal contour, but it is obvious that they may be of other forms, and while it is of advan-

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tage in certain particulars to have them of the same cross-sectional size and form, such is not essential.

The leading or holding member 10 is formed with a body portion 14 and a concentric neck or collar portion 15 of considerably less width than the body portion 14. The neck or collar portion 15 is formed with an upwardly tapering peripheral wedging surface 16 which terminates at an outwardly jutting shoulder or flange portion 17 which, in turn, has an upwardly tapering peripheral surface. The leading member 10 is tapped and threaded centrally, completely through the body and neck portions, with a screw thread of uniform pitch and diameter. The neck portion is severed by a plurality of radial slots 18 and thereby subdivided into a plurality of segments or flanges 15a. Each of these flanges bears on its inner surface a portion of the thread of the member 14, and said flanges are inherently resilient, the width of the slots 18 being sufficient to permit them an appreciable extent of inward deflection from their normal positions.

The following or clamping member 11 has a body portion 19 which is centrally tapped and threaded on the same pitch and radius as the leading member 10 and it is counterbored to provide a circular recess 20 concentric with and of greater diameter than its threaded bore. Thus the member 11 is formed with a clamping flange 21 which presents toward its center an inwardly tapering or converging circular wedging surface 22. This wedging surface is shaped to conform to the taper and size of the exterior wedging surface 16 of the neck portion 15 but the axial length of the wedging surface 22 is only a minor fraction of the axial length of wedging surface 16. Outwardly beyond the wedging surface 22, the flange 21 flares outwardly more rapidly as a circular constricting surface 24.

The leading and following members being formed as above described, they are assembled and connected to each other by placing them in concentric relationship with the flange 17 of the member 10 within the constricting taper 24 of the member 11, and then pressing them together with force sufficient to spring the segments 15a inward far enough to permit the flange 17 of the leading member to pass through the circular orifice defined by the converging surface 22 of the member 11. When the flange 17 has passed through that orifice, the segments 15a spring back to their normal position by their inherent resilience, thus positioning flange 17 in overlapping relationship to the flange 21 within the

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recess 20 and with the wedging surface 22 in bearing contact with the upper fraction of the peripheral wedging surface 16.

The wedging surfaces 22 and 16 should be smooth, circular in cross section, and of such circumferential size that they fit closely when the upwardly presented surface of the flange 21 is in abutment with the overhanging lower surface of the flange 17. Moreover, the inclination or angle of the wedging surfaces 16 and 22 relative to the common axis of the threaded bores of the members 10 and 11 is well within the limiting angle of the coacting parts.

In order to render immediately and clearly perceptible the rotational relationship of the members 10 and 11 whereat their threads are in phase, they may be provided on their external surfaces with suitable indices 25, and in order to retain the members against being jostled out of phase relationship, as when the nuts are loose in packages or bins, the retentive action of the coacting surfaces 16 and 22 may be supplemented by use of a positioning member 12. This preferably is in the nature of a resilient annular member interposed between facing surfaces of the members 10 and 11 before they are joined, and of thickness such as to be placed under resilient tension by being compressed between them when they are pressed to their connected position. When so positioned, the resilient reaction of the member 12 serves to resist frictionally the relative rotation of the members 10 and 11, and hence when they have been placed in phase relationship, serves to resist their displacement by forces incidental to handling and the like. In the embodiment illustrated, the member 12 may be a ring of elastic rubber composition which, in its compressed association with the members 10 and 11, serves to close the joint between them.

In the application of the nut to a bolt or the like, the members 10 and 11 being in their phase relationship and the flange 21 in abutment with the flange 17, the nut is turned onto the bolt in conventional fashion and to the desired extent, which may be to the extent of setting up the member 10 against an abutting surface. Having been turned onto the bolt to the desired extent, the wrench is then withdrawn from engagement with the member 14 but kept in engagement with member 11, and said member is screwed onto the bolt somewhat farther. What takes place is illustrated diagrammatically in Fig. 5, in which B designates the bolt and M designates an abutting member, such as a washer or element against which the body portion 14 of the leading or holding member 10 is set up. Inasmuch as bolts and nuts are made to certain standard specifications which provide for certain tolerances or allowances in pitch diameter of threads and other dimensions of nuts and bolts designed for use together, and inasmuch as the tolerances from basic pitch diameter are necessarily plus for nut threads and minus for bolt threads, there almost invariably results, as between any nut and any bolt taken from normal production lots, a certain amount of radial play, at least as regards individual turns of the threads. This play may not be ordinarily perceptible to the touch or to observation, but is ascertainable or detectable by use of proper instruments.

Consequently, when a nut such as the holding member 10 is set up on a bolt, particularly if tightened against an abutting surface, there will be more or less clearance between the leading surface of the nut thread and the opposed sur-

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face of the bolt thread, as indicated at c. Likewise, there will be clearance between the top of the respective threads and the bottom of the opposed thread, as indicated at d. Because of the play afforded by these clearances, when the following or clamping member 11 is turned onto the bolt, while the leading member 10 is stationary, thereby advancing the wedging surface 22 longitudinally of the wedging surface 16, the free end portions of the segments or flanges 15a are swung inwardly into gripping engagement with the bolt, as to the contacting relationship illustrated by the thread portion at the upper end of Fig. 5. Inasmuch as this contact is first established at the upper ends of the flanges 15a, the farther setting up of the clamping member 11 serves to set up in the portions of the flanges 15a which are within the recess 20 a condition of tension which causes them to exert a continuous resilient pressure inwardly against the bolt by virtue of their own resiliency.

Consequently, in the event of subsequent change of the relative diameters of the nut and bolt, such as might occur, for example, from thermal expansion of the nut or reduction of the bolt's diameter by longitudinal stretching of it, the frictional gripping action of the flanges 15a upon the bolt is still maintained, because of their tensioned condition. Moreover, in event of shrinkage of the nut or swelling of the bolt, portions of the flanges 15a within the recess 20 are capable of elastic flexion outwardly to accommodate the change in relationship. Consequently, it will be seen, the construction affords a lock nut having characteristics which enable it to remain firmly fixed and clamped in position on the bolt under conditions which tend to change the relative diameters of the two. It may be readily removed, when desired, simply by backing off the clamping member 11 until its flange 21 comes into abutment with the flange 17 of the holding member 10, and then unscrewing the latter with the member 11.

The modified construction illustrated in Fig. 4 contains the characterizing features of the construction described above, the same reference characters being applied to corresponding parts. It differs from the other embodiment in the form of the upper portions of the threaded flanges of the holding member, and the form of the recess of the clamping member. Flanges of the holding member are here designated by the reference character 15'. They have the converging peripheral wedging surfaces 16, as above described, but their upper portions are formed with peripheral wedging surfaces 16a which diverge from the terminations of the converging surfaces 16. The clamping member 19 has the peripheral wedging surface 22 for wedging cooperation with the surfaces 16 and it is also formed with a wedging surface 23 which flares from the terminus of the surface 22, and is adapted for bearing and wedging cooperation with the peripheral surface 16a of the flanges. The two members are connected in the manner above described, viz., by pressing them together sufficiently to spring the flanges 15' inwardly enough to enter the recess 20'. The wedging surfaces 22 and 16 cooperate as above described to clamp the holding member on the bolt. The cooperation of the wedging surfaces 23 and 16a has a similar effect in wedging the upper portions of the flanges 15' inwardly against the bolt when the member 11' is backed off on the bolt relative to the member 10' beyond the phase relationship illustrated in Fig. 4. Thus this con-

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struction is adapted to clamp the nut to the bolt when the holding and clamping members are relatively displaced in either longitudinal direction from their normal phase relationship.

With an understanding of the device and its operation, it will be appreciated that, in addition to the various advantages mentioned above, it has additional advantages from the manufacturing standpoint in that it is not necessary to hold it so closely to standard tolerance limitations.

What I claim is:

1. A lock nut comprising a leading member having a body portion with an integral coaxially extending collar portion which has a peripheral wedging surface tapering from the body portion, said body and collar portions being axially tapped to provide a threaded bore for screw threaded engagement with the threaded surface of a bolt and the collar portion being slotted lengthwise to provide a plurality of resilient segmental flanges bounding the bore, and a separate following member having a body portion which is axially tapped to provide a threaded bore for screw threaded engagement with the threaded surface of the bolt and is recessed concentrically therewith to form an inwardly jutting annular flange having an inwardly presented wedging surface spaced axially a substantial distance from the tapped portion, the axial length of the wedging surface being only a fraction of that of the peripheral wedging surface of the collar portion; said leading and following members being rotatably connected in coaxial relationship and with the annular wedging surface of the latter cooperating with the peripheral wedging surface of the former a substantial distance from the free end thereof, so that the two members may be turned onto a bolt coincidentally and the following member subsequently set up farther to swing the segmental flanges inwardly into clamping engagement with the bolt.

2. A lock nut as specified in claim 1 and wherein the peripheral wedging surface is circular and the inwardly presented wedging surface is tapered to fit it.

3. A lock nut as specified in claim 1 and wherein the collar member has an outwardly jutting shoulder at the narrower end of its peripheral wedging surface, said shoulder being disposed within the recess of the following member and in overlapping relationship to the inwardly presented flange thereof.

4. A lock nut as specified in claim 1 and wherein the collar member is provided at its narrower

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end with a peripheral flange jutting outwardly from its peripheral wedging surface and the annular flange of the following member is provided with a constricting surface converging toward its wedging surface.

5. A lock nut as specified in claim 1 and wherein the collar member is provided with an outwardly jutting shoulder at its narrower end in overlapping relationship with the annular flange of the following member, and tapering peripheral wedging surface portions of the collar segments have frictional bearing upon the inwardly presented wedging surface of said flange when said flange is in abutment with said shoulder.

6. A lock nut as specified in claim 1 and including also an elastically compressible positioning member interposed between and having frictional bearing upon opposed surfaces of the leading and following members.

7. A lock nut as specified in claim 1 and wherein the collar portion has a second peripheral wedging surface flaring from the smaller end of its tapering wedging surface, and the annular flange of the following member has an interior wedging surface flaring from the inner terminus of its circular wedging surface and adapted for wedging cooperation with said second wedging surface of the collar member.

8. A lock nut for use on a male threaded member, comprising a holding member having an apertured body portion tapped to screw onto the male member and having also resilient flanges extending axially from the body portion, and a clamping member adjustably connected with the holding member and operable to deflect the ends of the flanges inwardly toward the male member and tension intermediate portions of the flanges to spring inwardly toward it, said clamping member having wedging engagement with the flanges at locations spaced from their ends.

9. A lock nut for use on a male threaded member, comprising a holding member having an apertured body portion tapped to screw onto the male member and having also resilient flanges extending axially from the body portion, and a clamping member adjustably connected with the holding member and operable to deflect the ends of the flanges inwardly toward the male member and tension intermediate portions of the flanges to spring inwardly toward it, said clamping member and flanges having cooperating wedging surfaces, and those of the clamping member being of less axial extent than those of the flanges.

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