June 22, 1948. O. D. GRAY 2,443,614

LOCK NUT

Filed Sept. 23, 1944

Fig. 1

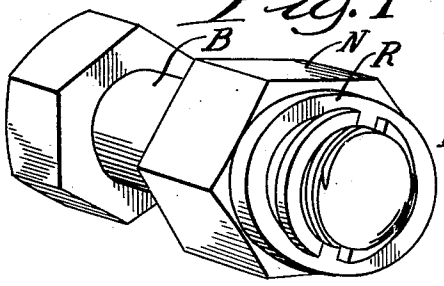


Fig. 2

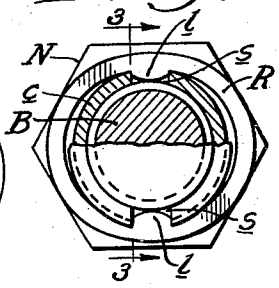


Fig. 3

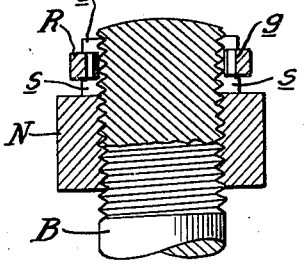


Fig. 4

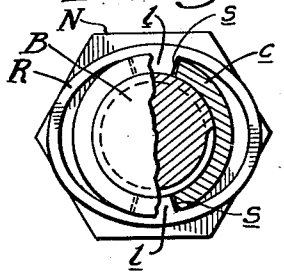


Fig. 5

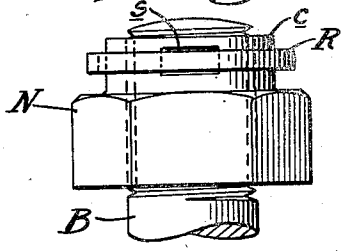


Fig. 6

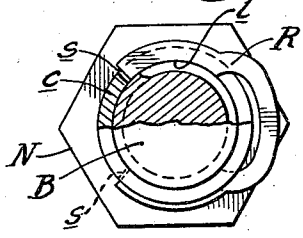


Fig. 7

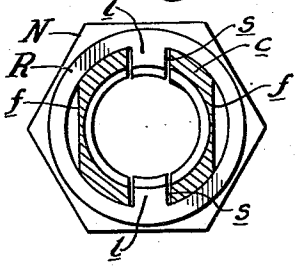


Fig. 8

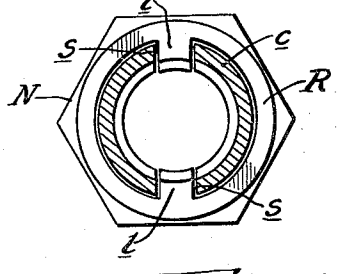


Fig. 9

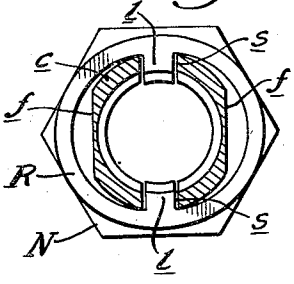


Fig. 10

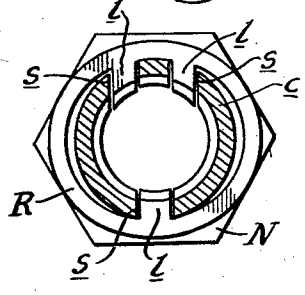
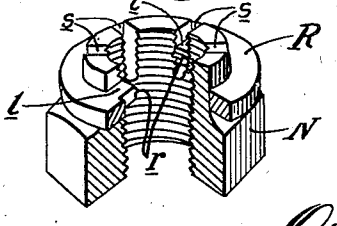


Fig. 11



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LOCK NUT

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Application September 23, 1944, Serial No. 555,493

10 Claims. (Cl. 151—24)

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This invention relates to a lock nut which is simple and dependable in operation, and inexpensive to produce. In essence, the lock is a spring, in non-rotatable relationship with a nut, exerting a force which proceeds toward the associated bolt to establish therewith an enhanced frictional resistance whereby to oppose rotation of the nut, either direction. The spring which may be in the form of a ring is carried either by the nut or by the bolt, and during rotary advance of the nut, either way, may be distorted by the operating tool sufficiently to relax its tension upon the bolt. A spring lock of this character may be associated with the nut either separably or non-separably. It is readily adaptable to quantity production, and in use may be advanced with the nut to or from its final position with a minimum of effort.

These and other objects of my invention will appear from the description to follow, taken in conjunction with the showings in the accompanying drawings, wherein:

Figure 1 is a view in perspective of one form of the present lock nut in operative position upon a coacting bolt; Fig. 2 is a transverse section through the bolt with the nut fitted thereon, taken through the collar extension in a plane just above the spring ring; Fig. 3 is a fragmentary longitudinal section taken on line 3—3 of Fig. 2; Fig. 4 is a partial end elevation of and transverse section through a bolt whereon is fitted a second form of lock nut a portion of which is shown in section; Fig. 5 is a fragmentary front elevation of the bolt and lock nut as per Fig. 4; Fig. 6 which is a view similar to Fig. 4 shows a third form of lock nut; Figs. 7–10, each of which is a transverse section, show four additional forms of lock nuts; and Fig. 11 is a perspective view, partly broken away, of a conventional castellated unit to which is applied the spring ring of my invention.

The principle underlying the present lock nut in all of its forms is the application of frictional pressure to a bolt at one or more circumferential points through the instrumentality of a spring ring, continuous or otherwise, that may be carried upon the bolt or upon the nut which is to be frictionally locked thereto, the ring being interlocked with the nut for rotation therewith and consequent movement lengthwise of the bolt; the ring is also distortable at spaced points, with the aid of a suitable wrench employed for operation of the nut, to relax at other points its pressure upon the bolt whereby the nut, during its operating movements, may advance (either way)

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substantially free of frictional resistance. It is of importance that the spring ring be interlocked with the nut in such a way as to advance therewith. While it is optional whether the ring be connected separably or inseparably to the nut, its position relative to the bolt is always such as to exert thereon a substantially radial pressure in all positions of the nut, this pressure being relaxable only at such moments as the nut undergoes adjusting manipulations with the aid of a proper tool. With these preliminary observations, I will now pass on to a detailed description of the lock nut in a number of its various forms several of which are suggested in the accompanying drawings.

The bolt B herein illustrated in all of the figures is of conventional construction in that it comprises a shank having a threaded end portion adapted to receive thereon a polygonally faced nut N provided with an axial bore wherein are formed cooperating threads. The nut may be provided at one end with a radially distortable collar extension *c* through which the threaded axial bore is continued. A nut of the kind with which I am here concerned may be produced economically in quantities, desirably from mild steel, and no special problem is involved in its manufacture.

The spring ring R is provided with inwardly extended lugs *l* usually two or more of them, each adapted to enter within the nut slot *s* that is appropriately formed for this purpose. The slot *s* shown in the nut of Fig. 5 is closed, i. e., it is bounded on all four sides, so that the presence of a circumferential groove is unnecessary for holding the ring in assembled relation with the nut; the same is true for the showing in Fig. 6. In the remaining figures, however, the slots *s* are shown as open at one end whereby special utility resides in the use of a circumferential groove for maintaining the spring ring in operative position, assuming that a normally inseparable relationship between the nut and ring be desired at all.

Figures 1–5 illustrate nut collars *c*, round in contour, surrounded by spring rings R that are normally of elliptical form, the two lugs *l* extending inwardly in line with the short axis of the ring. According to Fig. 6 the ring R is C-shaped. Its opposite arms carry inwardly extended lugs *l* which are projected through wide arcuate slots to reach the bolt B with which they engage.

The nut collar *c* of Fig. 7 is oppositely flattened at *f* and intermediately thereof is slotted to receive the lugs *l* of the surrounding spring ring

R. Since the nut N is here shown without an associated bolt, the ring R appears in its relaxed normal condition wherein its opposite lugs *l* are projected to a position slightly interiorly of the nut. Both the collar *c* and ring R may be of round contour, and the provision of opposite flats *f* makes it possible to distort the ring R inwardly at such points thereby spreading apart the two lugs *l*, with consequent relaxation of frictional pressure upon an associated bolt.

In Fig. 8 the ring R is loosely fitted upon the nut collar *c*. It may be sufficiently oversize to be potentially free of contact therewith at all points. Because of the clearance thus provided the ring may be distorted, as required, to spread apart its opposed lugs *l* for relaxation of pressure upon an associated bolt. In this construction the contour of the ring may be round or elliptical. In Fig. 9 the collar *c* is oppositely flattened at *f* and the ring is elliptical with two lugs *l* formed in line with its short axis. Opposed pressures upon the ring R in the direction of its long axis will produce a spreading movement of the lugs with consequent relaxation of frictional pressure upon the bolt. If more than two lugs are desired to enhance the area and points of engagement between the spring ring and the bolt, then the arrangement of Fig. 10 is suggested. Here the lugs *l* are not oppositely disposed, but nevertheless are movable toward and from the bolt, respectively, in response to (1) resilience of the spring ring R and (2) pressure applied externally to the ring at points remote from the lugs to effect a distortion of the ring which will produce a relaxation of its pressure engagement with the bolt.

In all the constructions thus far described the spring ring R is applied to a nut N which is formed more or less specially for its reception. It is not necessary, however, that this be always the case, since the lock nut of my invention may be used with full effectiveness with a nut of standard form—for example, a castellated nut N as shown in Fig. 11. Here the ring R is fitted around the nut collar *c*, loosely or otherwise, with its lugs disposed within two of the opposite slots *s*. Assembly of the ring with the nut need not take place until after the nut has been started in its rotative movement upon the associated bolt. The inner faces of the spring lugs *l* may, if desired, be formed with appropriate ribs *r* to coact with and track in the bolt threads so that the spring ring R is automatically advanced along the bolt as the nut itself is rotated thereupon. It is unimportant whether the ring be positioned upon the nut adjacent the shoulder at the base of its collar, since the purpose of the ring is to prevent its reverse rotation thereupon.

In each of the various forms of lock nut herein discussed, there is a spring ring exerting upon the bolt, directly or indirectly, a resilient pressure force which is relaxable in varying degrees by an appropriate tool whereby to free the nut for facile adjustment upon the bolt. The material of which the nut is formed possesses little or no resiliency, although it is yieldable or bendable to some extent. By itself the nut is incapable of locking resiliently with the bolt; the spring ring is relied upon for this purpose. When in locking relation with the bolt the spring serves effectively to oppose rotation of the nut, and continues indefinitely to do so. It is only when the spring ring is compressed properly, as with the use of a special tool, that relaxation of the ring's resilient pressure engagement with the bolt takes

place. When the ring exerts its pressure upon the collar, rather than upon the bolt, it should desirably be continuous and endless in order to develop the necessary force.

I claim:

1. For use with a bolt having a continuous thread, a coacting threaded nut through which is a lateral opening, a continuous spring ring surrounding the nut and shaped to bear with resilient pressure against the nut at the opening and spaced therefrom at points remote from the opening providing portions compressible radially inwardly by a tool, and means correlated with the ring in the opening for resilient pressure against the threads only of the bolt, the shape and elasticity of the ring causing relaxation of its correlated means with the bolt in response to distortion of the ring inwardly toward the nut.

2. For use with a threaded bolt, a coacting threaded nut through which are lateral openings on opposite sides, and a continuous unbroken spring ring surrounding the nut in non-rotatable engagement therewith formed with opposed lugs projecting inwardly through the lateral openings for resilient pressure engagement with the bolt, there being spaces between the ring and nut at points intermediately of the lugs and the ring being distortable inwardly into such spaces whereby to retract the lugs with consequent relaxation of their pressure engagement with the bolt.

3. For use with a threaded bolt, a coacting threaded nut through which is a lateral opening, and a continuous unbroken spring ring surrounding the nut in non-rotatable engagement therewith formed with a lug projecting inwardly through the lateral opening for resilient pressure engagement with the bolt, there being a space between the ring and nut at a point remote from the lug and the ring being distortable inwardly into such space whereby to retract the lug with consequent relaxation of its pressure engagement with the bolt.

4. For use with a threaded bolt, a coacting threaded nut through which are spaced lateral openings, and a continuous unbroken spring ring mounted on the nut in non-rotatable inseparable engagement therewith formed with spaced lugs projecting inwardly through the lateral openings for resilient pressure engagement with the bolt, there being spaces between the ring and nut at points intermediately of certain lugs and the ring being distortable inwardly into such spaces whereby to retract the lugs with consequent relaxation of their pressure engagement with the bolt.

5. For use with a threaded bolt, a coacting threaded nut from which is extended a collar having spaced lateral openings therethrough and a circumferential groove therearound, and a continuous unbroken spring ring mounted on the nut within the collar groove thereof in normally inseparable relation therewith, the ring being formed with spaced lugs projecting inwardly through the lateral openings of the collar for resilient pressure engagement with the bolt, there being spaces between the ring and groove bottom at points intermediately of certain lugs and the ring being distortable inwardly into such spaces whereby to retract the lugs with consequent relaxation of their pressure engagement with the bolt.

6. For use with a threaded bolt, a coacting threaded nut from which is extended a collar having spaced lateral openings therethrough, a

continuous unbroken spring ring surrounding the nut collar formed with spaced lugs projecting inwardly through the lateral openings for resilient pressure engagement with the bolt, there being spaces between the ring and the collar at points intermediately of certain lugs and the ring being distortable inwardly into such spaces whereby to retract the lugs with consequent relaxation of their pressure engagement with the bolt.

7. For use with a threaded bolt, a coacting threaded nut, a continuous unbroken spring ring having spaced means inwardly projected for resilient pressure engagement with the bolt and distortable toward the bolt at points intermediate of the spaced means whereby to narrow and widen the ring at spaced points, the spaced means in engagement with the bolt being at the widened points, and means interconnecting the nut and ring for unitary rotation upon the bolt.

8. For use with a threaded bolt, a coacting threaded nut through which are spaced lateral openings, and a continuous unbroken spring ring surrounding the nut in non-rotatable engagement therewith formed with spaced lugs projecting inwardly through the lateral openings for resilient pressure engagement with the bolt, a pair of lugs being provided at one side of the ring and a single lug at the opposite side thereof and there being spaces between the ring and nut at points intermediately of certain lugs, and the ring being distorted inwardly into such spaces in consequence of pressure engagement between the lugs and the bolt.

9. For use with the bolt having continuous threads, a coacting threaded nut through which are spaced lateral openings and a continuous spring ring surrounding the nut in non-rotatable engagement therewith formed with spaced lugs projecting inwardly through the lateral openings of the nut in normal pressure engagement with the bolt threads, the distance between the lug ends being initially less than the bolt diameter, and there being spaces between the ring and the nut at points remote from the lugs into which the ring may contract in response to a radial pressure directed inwardly at such points to produce elongation of the ring in the direction of the lugs so as to relax the resilient pressure engagement between the lugs and the bolt while distortion of the spring ring continues.

10. For use with a bolt having continuous threads, a coacting threaded nut through which is a lateral opening and a continuous spring ring surrounding the nut in non-rotatable engagement therewith formed with a lug projecting inwardly through the lateral opening of the nut in normal pressure engagement with the threads of the bolt, the distance between the lug end and the opposing internal nut wall being initially less than the bolt diameter, and there being space between the ring and the nut at points remote from the lug into which the ring may contract in response to a radial pressure directed inwardly at such points to produce elongation of the spring ring in the direction of the lug so as to relax the resilient pressure engagement between the lug and the bolt while distortion of the spring ring continues.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
258,497	Stevens	May 23, 1882
337,801	Vaughan	Mar. 9, 1886
774,418	Finley	Nov. 8, 1904
838,948	Bryar	Dec. 18, 1906
1,091,959	Pybus	Mar. 31, 1914
1,092,256	Glauber	Apr. 7, 1914
1,134,520	Dyba	Apr. 6, 1915
1,241,401	Kusy	Sept. 25, 1917
1,271,643	Winton	July 9, 1918
1,467,907	Miyagi	Sept. 11, 1923
2,007,293	Cayonette	July 9, 1935
2,108,643	Allen	Feb. 15, 1938
2,395,234	Schlueter	Feb. 19, 1946

FOREIGN PATENTS

Number	Country	Date
64,486	Sweden	Feb. 7, 1927
79,508	Sweden	May 2, 1931
165,585	Germany	Nov. 9, 1904
173,930	Great Britain	Jan. 19, 1922
237,809	Great Britain	Aug. 6, 1925
605,461	France	Feb. 19, 1926
764,544	France	Mar. 5, 1934