

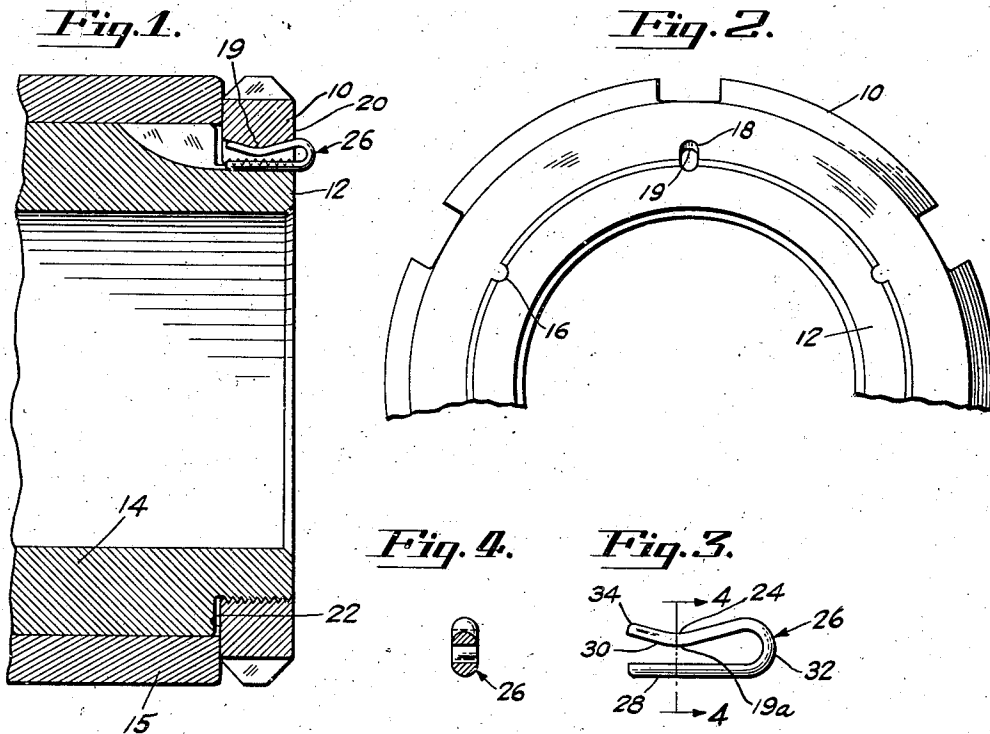
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LOCKING MEANS FOR THREADED MEMBERS

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LOCKING MEANS FOR THREADED MEMBERS

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This invention relates to means for locking male and female threaded members in adjusted position.

An object of the invention is to provide an improved cotter key and improved key receiving means for locking cooperating threaded members in any of a plurality of adjusted positions relative to each other.

Another object of the invention is to provide an improved cotter key of this type which is easily insertable by a simple longitudinal movement and which, as a result of this movement, is self-locking.

Further objects of this invention are to provide such an improved cotter key construction in which the key is readily inserted into and withdrawn from locking position from the face of the threaded members being secured; in which the threaded members are not materially weakened; in which the cotter key provides a straight spline portion which lies in the thread junction between the members throughout the inserted length of the key; and in which the key itself has no sharp bends which invite breakage, is safely re-usable, and has no exposed sharp projections when in locking position.

Other objects and advantages will be apparent from the specification and claims and from the drawing which illustrates what is now considered to be a preferred embodiment of the invention.

Fig. 1 is a longitudinal section through two threaded members showing the improved locking means.

Fig. 2 is a front view of the structure shown in Fig. 1 with parts broken away to facilitate illustration.

Fig. 3 is a side-elevation on a larger scale of the improved cotter key.

Fig. 4 is a section on lines 4—4 of Fig. 3.

As herein shown, an internally screw-threaded locking ring member, or nut, 10, is adapted to be threaded onto an externally screw-threaded reduced end portion 12 of a sleeve member 14 to secure an outer concentric sleeve 15 of a machine element in any of a plurality of longitudinally adjusted positions relative to the member 14.

In order to lock the threaded members 10 and 14 against relative rotation, a plurality of half-round grooves 16 are formed in the external threaded portion 12 of member 14 at a suitable number of spaced locations about the periphery thereof, the bottoms of these grooves extending somewhat below the roots of the threads. A single groove 18 is formed in the threaded inner surface of ring 10 which, when peripherally

aligned with any one of the grooves 16 forms a cotter key receiving recess. It will be obvious that a plurality of grooves 18 may be formed in ring 10 if a finer adjustment is desired.

The groove 18, which is deeper than the grooves 16, extends a substantial distance below the roots of the threads in the ring member 10, and while the bottom of the groove 18 is of half-round cross-section throughout its length, the bottom of this groove is not longitudinally straight. Instead the bottom profile of the groove 18 forms a shallow, very broad V having its apex 19 inwardly directed and located midway between the front face 20 and the rear face 22 of the ring. The apex 19 is preferably somewhat rounded so as to conform to the similarly rounded internal apex 24 of the outer leg of the cotter key 26, when the latter is in the recess formed by the complementary grooves 16 and 18.

The cotter key is constructed of the usual half-round wire bent back upon itself so as to present the half-round surface of the wire outermost, with the flat surface of the two legs 28 and 30 of the cotter in confronting relation. The legs contrary to the usual cotter construction are widely spaced and the bight 32 is formed about a much greater radius than in the usual cotter construction. The legs 28 and 30 are also counterminous, and the entire key instead of being formed of malleable wire is formed of material, as steel, which can be tempered so that the key is resilient.

The depth of the key receiving recess formed by grooves 16 and 18 is slightly greater adjacent the front and rear faces 20 and 22 than the spread of the free ends of legs 28 and 30, and the spread of these free ends, when the legs are fully compressed so that apex 19a of leg 30 engages leg 28, is slightly less than the depth of the key receiving recess midway of its length opposite apex 19.

The leg 28 constitutes a straight spline which lies in the thread junction of the threaded members 10 and 14 and provides a positive lock against relative rotation of members 10 and 14. The leg 30 constitutes a longitudinally concave latch which cooperates with the correspondingly convex bottom surface of groove 18 to hold the cotter key releasably in its inserted position. For ease of insertion of the cotter key, any sharp corner at the end of leg 30 should be broken to provide a cam follower surface 34 which will slide freely along the bottom of groove 18 during insertion and withdrawal of the key.

When the spanner ring 10 has been rotated

into the position desired on member 14, with the groove 18 aligned with one of the grooves 16, the cotter key is inserted longitudinally into the key receiving recess. During this movement the leg 28 slides along the key-way formed by grooves 16 and 18 at the thread junction of the members and the cam follower surface 34 slides over the inclined cam surface on the bottom of groove 18 leading toward apex 19. During this movement the legs 28 and 30 are urged toward each other until apex 19a engages or nearly engages leg 28, the engagement between the two constituting means for preventing over flexing of the cotter key in use. As the cam follower surface 34 passes apex 19, the key will snap into the latching position shown in Fig. 1. In this position the bight 32 of the cotter key projects beyond the face 20 a sufficient distance to provide an eye which can be utilized to advantage in withdrawing the cotter key.

It will be evident that as a result of the construction above described a perfect spline is provided for resisting relative rotation of the threaded members, and that this spline is held releasably in position by the improved latching means above described.

It will further be evident that as a result of this construction the improved cotter key is self-locking and self-releasing upon forcible longitudinal movement thereof from the front face of the threaded members. Further, the key is insertable split end first so that only the smooth rounded bight is exposed, thus eliminating the danger and annoyance of sharp protruding ends. Also as a result of this improved construction by which the key receiving recess is deep adjacent the outer face thereof and the bight is not inserted into the recess, the bend comprising the bight can be made about a sufficiently large radius to provide good resilience and prevent over stress of the key within the controlled limits of compressive movement afforded before the apex of the leg 30 bottoms on leg 28. As a result of these improvements a self-locking and self-releasing cotter key has been provided which can safely be re-used indefinitely.

It will also be evident that the improvements described are the result of simple machine operations and that the threaded members secured by the cotter key are not materially weakened. All sharp bends are avoided in the cotter key, and by reason of using a hardened key greater security against shear of the key is provided. It will also be obvious that the improved construction is especially valuable in locking machine elements together of the type shown in which the inserted end of the cotter key does not protrude.

While one embodiment of the invention has been described herein and illustrated in the accompanying drawing, it is to be understood that the invention is not limited to this particular construction, but that the invention covers such other constructions as fall within the scope of the following claims.

I claim:

1. In combination, male and female members having cooperating screw-threaded surfaces each provided with an axially extending groove therein, said grooves registering in a plurality of axially adjusted positions of said members to form a key receiving recess therebetween which is open at one end and having on one wall thereof an abutment projecting into said recess intermediate its ends, and a generally U-shaped cotter

key having its legs biased apart and insertable free ends first into said recess through the open end thereof, said key having latch means thereon intermediate its length cooperating with said abutment in said recess for holding said key releasably against withdrawal when the latter is fully inserted into member locking position in said recess and having means cooperating with said abutment in said recess for releasing said latch upon withdrawal of said key.

2. In combination, male and female members having cooperating screw-threaded surfaces each provided with an axially extended groove therein, said grooves registering in a plurality of axially adjusted positions of said members to form a key receiving recess therebetween which is open at one end, and a generally U-shaped resilient cotter key having its legs spaced apart and insertable free ends first into said recess through the open end thereof, said key having intermediate the ends of one of its legs a concave latch portion providing follower means and said recess having cam means intermediate its ends cooperating with said follower means during insertion of said key for initially urging the legs thereof together against their bias and subsequently releasing the same for latching engagement of said latch portion with said cam means.

3. In combination, relatively rotatable male and female members having cooperating threaded surfaces, each provided with an axially extending groove therein, said grooves registering in a plurality of adjusted positions of said members to form a recess between said members which is open at one end, a generally U-shaped cotter key for locking said members against relative rotation having generally parallel legs biased apart and disposed in said recess with its bight portion located external of the recess at the open end thereof, and cooperating abutment means on said key and one of said members for holding said key releasably against withdrawal from said recess when the key is in locking position including a latch portion on one of said legs intermediate the ends thereof and a cooperating latch engaging portion on an adjacent side wall of one of said grooves intermediate the ends of said recess.

4. In combination, two machine elements to be locked together against relative movement, confronting slots in confronting relatively movable surfaces of said elements forming an elongated recess when said slots are registered, one of said slots having a convex bottom wall, and a resilient cotter key of generally U-shaped form having its legs biased apart and having one leg provided with a concave surface to receive said convex wall when said cotter key is in locking position in said recess for holding said key against accidental longitudinal displacement from said recess.

5. In combination, two machine elements to be locked against relative movement, one having a slot and the other having a complementary slot movable into registry therewith to provide a cotter key receiving recess, one of said registering slots having a convex wall, and a cotter key having generally parallel legs biased apart during insertion into said recess and having one leg provided with a concave surface to receive said convex wall when said key is in locking position in said recess.

6. In combination, two machine elements to be locked against relative movement, one having a slot and the other having a complementary

slot movable into registry therewith to provide a cotter key receiving recess between said elements, one of said registering slots having a portion of its bottom wall projecting into said recess, and a resilient generally U-shaped cotter key having generally parallel legs which are biased apart by the resilience of the key, one of which is provided with a reentrant portion adapted to receive said projection when said key is fully inserted into element locking position in said recess.

7. A resilient cotter key of generally U-shape having substantially co-extensive legs which are normally spaced apart, one of said legs being straight and constituting a spline and the other leg having a portion intermediate its ends which is displaced inwardly toward said straight leg forming opposed oppositely inclined locking abutments between the connected end of said leg and the free end thereof.

8. A resilient cotter key of generally U-shape having legs of substantially equal length which are normally biased apart by the inherent resiliency of the material of the key, one of said legs being straight and constituting a spline and the other leg being bent into a shallow V with the apex extending inwardly toward said straight leg to form opposed oppositely inclined abutments substantially midway between the bent end of the key and the free ends of said legs, the V-shaped portion of said bent leg constituting oppositely inclined locking abutments located intermediate the ends of the key and said apex constituting an abutment engageable with said straight leg to limit the inward flexure of said legs.

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