United States Patent

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[73] Assignee **Threadline Fastener Corporation Barranca, Covina, Calif.**
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[54] **INTERNALLY THREADED SELF-LOCKING FASTENER**
10 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **151/7**
[51] **Int. Cl.** **F16b 39/24**
[50] **Field of Search** 151/7, 24, 25, 6

[56] **References Cited**

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Primary Examiner—Edward C. Allen
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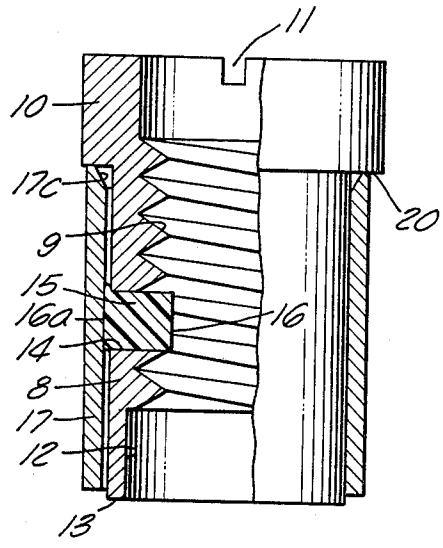
ABSTRACT: A self-locking internally threaded fastener having a resiliently deformable insert retained in a sidewall thereof by a rigid outer sleeve.



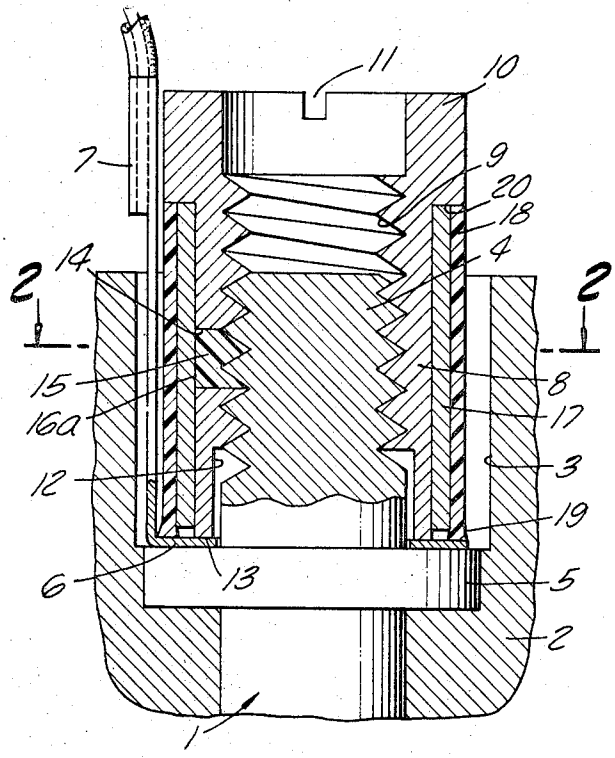


FIG. 1.

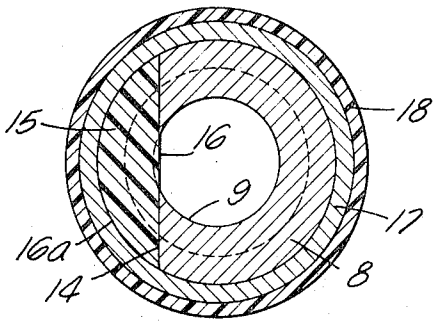


FIG. 2.

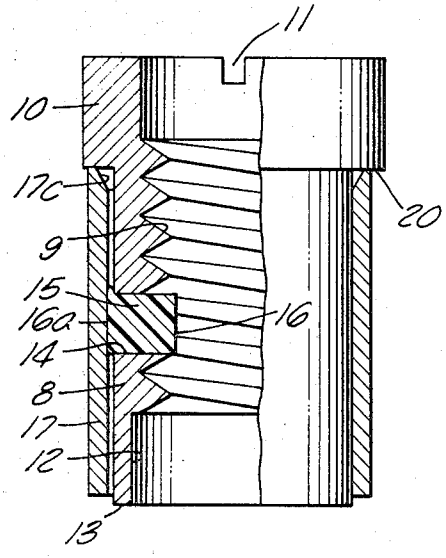


FIG. 4.

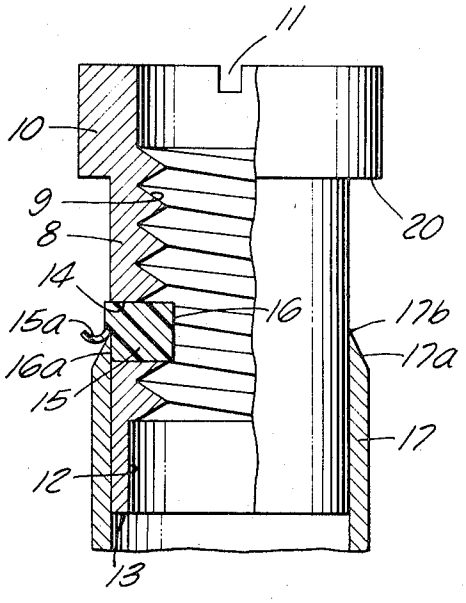


FIG. 3.

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INTERNALLY THREADED SELF-LOCKING FASTENER

This application is a continuation of my copending application Ser. No. 612,656, filed Jan. 30, 1967 and now abandoned.

The present invention relates to self-locking fasteners and more particularly to self-locking threaded fasteners of the internally threaded type provided with resilient means engageable with an externally threaded stem for holding the internally threaded member on the stem.

In certain respects the present invention is an improvement in the internally threaded self-locking fastener disclosed in the pending application of Jan R. Coyle, Ser. No. 585,537, filed Oct. 10, 1966 now U.S. Pat. No. 3,437,118.

The present invention is disclosed in relation to internally threaded self-locking fasteners of the type adapted to be employed in combination with a binding post in making electrical connections but the features of the invention have application to self-locking nuts or fasteners having other utility.

An object of the invention is to provide a self-locking internally threaded fastener which is ideally suited for use in combination with a binding post of a terminal block whereby electrical circuits may be completed by binding to the posts the usual conductor clips.

Frequently due to space limitations the binding posts are quite small, and, consequently, the fastening devices for binding the conductor clips on the postshave also been small, having comparatively thin wall sections rendering difficult the utilization of the ordinary resilient locking elements of the nylon or other plastic material insert type.

In the aforementioned pending application one form of the locking fastener disclosed comprises a resilient outer sleeve disposed about the exterior of the internally threaded chordally slotted fastener body so as to hold the insert in the slot, whereby the resiliency of the sleeve and/or the insert creates a lateral force tending to frictionally bind the threads at the opposite side of the fastener from the insert.

A further object of the present invention is to provide a locking fastener of the type wherein a thin walled internally threaded body may be provided with a recess or slot in one side and a resiliently deformable insert disposed in the slot so as to extend at least past the root of the internal threads and so as to be exposed at the outside of the body, the body also having thereon a rigid sleeve overlying the slot so as to confine the resilient insert therein. A fastener made in accordance with this objective will, of course, rely essentially upon the inherent resiliency of the insert itself as distinguished from the resiliency of the insert confining sleeve which may be placed about or shrunk onto the fastener body in accordance with the disclosure of the aforementioned application. The present invention results in a particular advantage in the case that the binding post is disposed within a bore of a terminal block affording only slight annular clearance about the fastener body for reception of the terminal clips in that the rigid sleeve may have a thin wall section which will not interfere with driving of the fastener in a small clearance bore in which may be disposed one or more terminal clips. Moreover, the rigid sleeve will not be deformed outwardly in the region of the insert when the latter is deformed.

Heretofore, self-locking internally threaded fasteners have been provided in which a circular insert of nylon or like material has been disposed in a drilled hole in the sidewall of the threaded body, and the sidewall has been staked over to retain the insert against outward displacement upon engagement with the complemental threads of the binding posts or other male threaded member. However, such fasteners are not practical in the event that the sidewall of the fastener is comparatively thin or in the event that the lock must be obtained within a few thread convolutions. This is to say that when the wall thickness of the fastener is on the order of, say, 0.020 inches difficulties are encountered in staking over the margin of the drilled hole without causing thread distortion or undesirable displacement of the insert itself on the one hand, or on the other hand, accomplishing the desired retention of the insert against outward displacement upon application of the

fastener. Moreover, in some installations of internally threaded fasteners of the type here involved, the necessary locking action must be accomplished within comparatively few fastener revolutions or convolutions of the internal thread and circular inserts afford only nominal locking effect in small diameter fasteners due to the inherent limitation on the size of the insert.

Accordingly, it is still another object of the invention to provide an internally threaded self-locking fastener in which a chordal insert is provided which affords substantial thread contact with the mating thread of a male member, and which can effect a complete and adequate lock within a minimum number of threads, and wherein a rigid retaining sleeve is disposed about the exterior of the fastener so as to confine the insert and resist outward deformation during application of the fastener, whereby there will be no obstruction to the driving of the fastener in small clearance sockets containing a binding post of a terminal block.

Specifically, an object of the invention is to provide a fastener according to the preceding objects wherein the rigid sleeve is constructed so as to facilitate assembly on the fastener body either by shearing off excess outwardly protruding portions of the insert or by piloting the sleeve onto the fastener body.

Other objects and advantages will be hereinafter described or will become apparent to those skilled in the art, and the novel features of the invention will be defined in the appended claims.

In the accompanying drawing:

FIG. 1 is a view partly in section and partly in elevation showing a self-locking internally threaded fastener made in accordance with the invention and applied to a binding post in the socket of a terminal block;

FIG. 2 is a transverse sectional view as taken on the plane of the line 2–2 of FIG. 1 but with the fastener of the invention removed from the binding post;

FIG. 3 is a view partly in section and partly in elevation illustrating an intermediate stage in the manufacture of a modification of the fastener of FIGS. 1 and 2; and

FIG. 4 is a view partly in section and partly in elevation illustrating a further modification of the fastener hereof.

Like reference characters in the several views of the drawing and in the following description designate corresponding parts.

Referring first to FIGS. 1 and 2, there is illustrated an internally threaded self-locking fastener more particularly in the form of a nut applicable to a binding post 1 incorporated in a terminal block 2, a portion of which is shown in section as containing a socket 3 into which extends an externally threaded post section 4, the binding post also including a flange 5 with which it is desired to make an electrical connection with the washerlike end 6 of a typical terminal clip 7.

The binding nut of the invention includes an axially extended body 8 provided with an internally threaded bore 9 in its lead end and in the illustrative embodiment a head end 10 provided at 11 with driving tool engageable slot means so that the fastener may be driven forcefully onto the post to effect good electrical connection between the terminal clip end 6 and the binding post flange 5. At the lead end of the body 8 is a counterbore 12 providing clearance whereby the lead end surface 13 of the body 8 is enabled to engage the washerlike end 6 of the terminal clip even though the male thread on the post section 4 may be discontinuous adjacent the lower end of such section 4.

In accordance with the present invention, resilient locking means are employed for imposing a lateral force on the threaded connection between the body 8 and the post section 4 to cause at the opposite side thereof a frictional thread lock. Thus, there is provided in the threaded section of the body 8 a chordal slot 14 which extends transversely of the fastener and which, as best seen in FIG. 2, is preferably of a depth slightly greater than a plane tangent to the crests of the threads in the threaded bore 9. Disposed in and filling the slot or recess 14 is

an insert 15 of resilient deformable plastic material having good memory or recovery characteristics, such as nylon, as is well known in the art. The insert has a base wall 16 which bottoms on the chordal bottom wall of the slot 14 and extends across the opening in the threaded bore provided by the slot 14. While in the illustrative embodiment the base wall of the slot and the bottom wall 16 of the insert extend inwardly slightly beyond the crests of the threads, it will be recognized that mating threads of the binding post section 4 will engage the insert so long as the insert extends at least inwardly past the root of the internal threads of the body 8. The insert 15 is exposed about its arcuate outer surface 16*a* at the outside of the body 8 and means are provided for retaining the insert in the slot. This retaining means is in the form of a sleeve 17 of rigid material which will resist deformation and therefore confine the insert 15 against outward displacement as it is engaged by the external thread of the post section 4.

Inasmuch as in numerous applications the clip 7 as well as the fastener of the present invention are plated with corrosion resistant material, and inasmuch as in many applications the cavity 3 affords very small annular clearance about the exterior of the fastener for reception of the clips, a means is provided for protecting the clip and fastener from contact with one another within the cavity as the fastener is being driven. Preferably such means also provides a seal about the washer-like clip section 6 for excluding air and moisture from the electrical connection particularly in the region at which the lead end face 13 of fastener body 8 engages the washerlike clip section 6 whereat the plating is likely to be disturbed. This means comprises in the illustrative embodiment an outer sleeve 18 of resilient plastic material such as nylon which may be placed over the rigid sleeve 17 or such as certain "Teflon" materials which may be heat shrunk onto the outer sleeve 18. At the lead end of the fastener the outer resilient sleeve 18 initially preferably projects axially beyond the lead end face 13 of the body 8 so that upon engagement with the washerlike clip section 6 the resilient sleeve end 19 will, as shown in FIG. 1, be axially deformed and will sealingly engage the clip section 6.

Preferably, the head section 10 of the fastener projects outwardly from the threaded body section 8 and provides a shoulder 20 facing the head end of the fastener and both the rigid retaining sleeve 17 and the outer resilient sleeve 18 abut with the shoulder 20.

In order that the resilient locking action will take effect after only slight revolution of the threaded body 8 onto the threaded post section 4, it will be noted that the axial distance between the commencement of the internal thread at the inner extremity of the counterbore 12 and the adjacent wall or side of the insert 15 is, in the illustrative embodiment, equivalent to one and one-half convolutions of the internal thread. So that the locking action will be fully effective after only a few revolutions of the fastener, the axial extent of the insert, in the illustrative embodiment, is also one and one-half convolutions of the thread so that the full locking effect will be realized after only about three revolutions. Due to the provision of a locking resilient insert of chordal form it will be appreciated that the locking action will be substantial as compared with the locking action provided by an insert in a drilled hole of comparable axial extent. It will be understood, moreover, that if desired the axial extent of the insert 15 may be greater than that shown, and if space limitations or other considerations require, the chordal type recess may be disposed in the first thread convolution.

Referring now to FIG. 3, there is shown a modification of the invention in a partial stage of completion, wherein the internally threaded fastener, as in the first described embodiment, includes the internally threaded body section 8, head section 10, threaded bore 9, chordal slot 14 and insert 15. As in the case of the embodiment of FIG. 1, the structure of FIG. 3, when complete, will also include the rigid retaining sleeve 17 which has been preassembled thereon and, if desired, the outer resilient sleeve 18 (not shown in FIG. 3). However, as shown in FIG. 3, when the insert 15 is placed in the slot 14 there may be a portion of the plastic material projecting outwardly past the outside of the body section 8. Thus, the inner end of the rigid sleeve 17 is beveled at 17*a* to provide a leading cutting edge 17*b* by which the outwardly projecting plastic material will be sheared off as indicated at 15*a*, so that the insert 15 will be cut to size during the assembly of the rigid sleeve on the fastener body.

In the embodiment of FIG. 4, the fastener again is essentially the same as that shown in FIGS. 1 and 2 and the same reference characters are therefore applied. However, in this modification the rigid outer sleeve 17 may be of slightly larger inside diameter than the outside diameter of the threaded body section 8, but in any event is provided at its inner end with an outwardly flared surface 17*c* forming pilot means for assisting in the insertion of the fastener body section 8 into the sleeve 17. To the extent that the sleeve 17 of FIG. 4 is larger than the body section 8, the beveled surface 17*c* will also encounter any plastic material projecting outwardly past the outside of the body, deforming the insert, and the insert will thus load the sleeve 17 laterally so that all clearance will be taken up on one side and the insert will serve also to retain the rigid sleeve 17 in place.

From the foregoing, it will be appreciated that the present invention provides an efficient self-locking nut or fastener construction which is particularly well suited for thin walled nuts or fasteners and while specific embodiments of the invention have been herein shown and described, changes and alterations may be resorted to without departing from the spirit of the invention.

I claim:

1. In a self-locking fastener, comprising: a thin walled fastener body having a bore adapted to receive a stem; and means in said bore engageable with said stem for retaining said body on said stem; said body having a chordal recess opening into the bore and at the outside of said body generally throughout the extent of the chord; an insert of resiliently deformable material filling said recess and extending inwardly into said bore; and a preassembled rigid sleeve member of uniform wall thickness slidably disposed about the outside of said body and being fixedly retained in a position over the exposed portion of said resiliently deformable means at the outside of said body for limiting outward movement of the deformable means, when the fastener body and rigid sleeve member are applied as a unit to the stem.

2. A self-locking fastener as defined in claim 1, wherein said resiliently deformable means is a deformable plastic material, and said rigid member is a sleeve which closely fits the outside of said body and conforms to the latter so as to be applicable thereto by an endwise linear movement along said body, and said rigid member is provided at its inner end with a cutting edge providing means for shearing plastic material projecting outwardly past the outside of said body upon application of said rigid member to said body.

3. A self-locking fastener as defined in claim 1, wherein said resiliently deformable means is a deformable plastic material, and said rigid member is a sleeve which loosely fits the outside of said body and conforms to the latter so as to be applicable thereto by an endwise linear sliding movement along said body, and said rigid member is provided at its inner end with a flared surface forming pilot means for piloting the rigid member onto said body and deforming plastic material projecting outwardly past the outside of said body during said preassembly of said rigid member on said body, whereby said deformed plastic material will retain the sleeve in assembled position.

4. A self-locking fastener, comprising: a fastener body having a threaded bore in at least one end thereof; a head at one end of said body and a lead end at the opposite end of said body; said body in its threaded section having a chordal recess opening into the threaded bore and at the outside of said body generally throughout the extent of the chord; an insert of resiliently deformable material filling said recess and extend-

ing inwardly at least past the root of the thread of said threaded bore; a sleeve of rigid material disposed about and conforming to said body, and confining said insert in said recess; and said head having tool engageable driving means thereon.

5. A self-locking fastener as defined in claim 4, wherein resiliently deformable material is disposed about said sleeve and has an end adjacent the lead end of said body provided with means for sealing engagement with a member engaged by the lead end of said body.

6. A self-locking fastener as defined in claim 4, wherein said body is provided with a counterbore at its lead end.

7. A self-locking fastener as defined in claim 4, wherein said body is provided with a counterbore at its lead end; and said insert has an axial extent at least as great as the axial distance between the inner extremity of said counterbore and the adjacent end of said insert.

8. A self-locking fastener as defined in claim 7, wherein said thread in said threaded bore comprises one and one-half convolutions from the inner end of said counterbore to said adjacent end of said insert.

9. In a self-locking fastener; a fastener body having a wall with a smooth outer surface and a bore adapted to receive a stem, and means in said bore engageable with said stem for retaining said body on said stem; an opening in said wall and resiliently deformable means in said opening extending into said bore and to the outside of said body; and a rigid sleeve having a smooth inner surface, said rigid sleeve being preassembled on said body and snugly engaged with said smooth outer surface and extending over the deformable means at the outside of said body, whereby said rigid sleeve provides a backup for said resiliently deformable means and limits outward movement thereof, all portions of said sleeve being larger than said stem whereby said sleeve is free of engagement with said stem when said stem is in said bore.

10. A self-locking fastener according to claim 9, wherein the fastener body has an end engageable by a driving tool for actuating the fastener body and said preassembled rigid sleeve as a unit.