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GB 1473822 A GB 0432901 A GB 0405674 A
GB 0377076 A GB 0350192 A GB 0328167 A

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(71) Applicant(s)
Kai Corporation

(Incorporated in Japan)

9-3 Iwamoto-Cho, Chiyoda-Ku, Tokyo 101, Japan

Shigeru Industrial Co Ltd

(Incorporated in Japan)

5397 Ohaza-Kotaka, Tsubame-Shi, Niigata-Ken 959-12, Japan

(72) Inventor(s)
Shigeru Fujita

(74) Agent and/or Address for Service
Urquhart-Dykes & Lord
8th Floor, Tower House, Merrion Way, LEEDS, LS2 8PA, United Kingdom

(54) Preventing loosening of screwthreaded fasteners

(57) Loosening of a nut and bolt assembly is prevented by providing a spring clip(s) 15 projecting beyond the screwthread of a bolt 12 (Figure 1) or nut 21 (Figure 8) so as to engage in a groove(s) 23 in the screwthread of nut 21 or bolt 12, the spring clip 15 being retractable. The spring clip 15 may comprise an axial part secured in an axial bore in the bolt 12 and a portion projecting from one or both sides of the bolt 12.

Fig.1

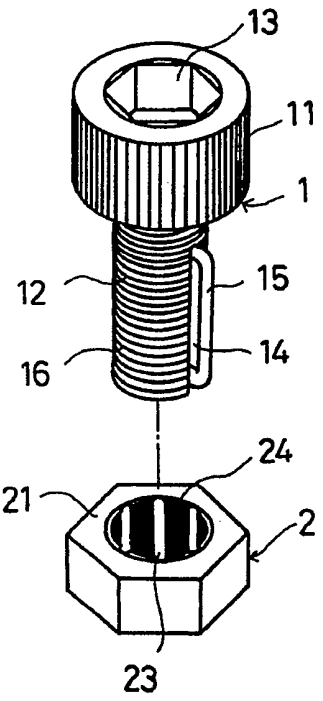

Fig.8

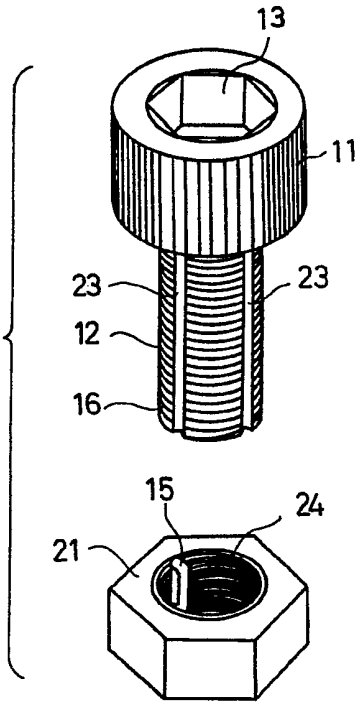

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Fig.1

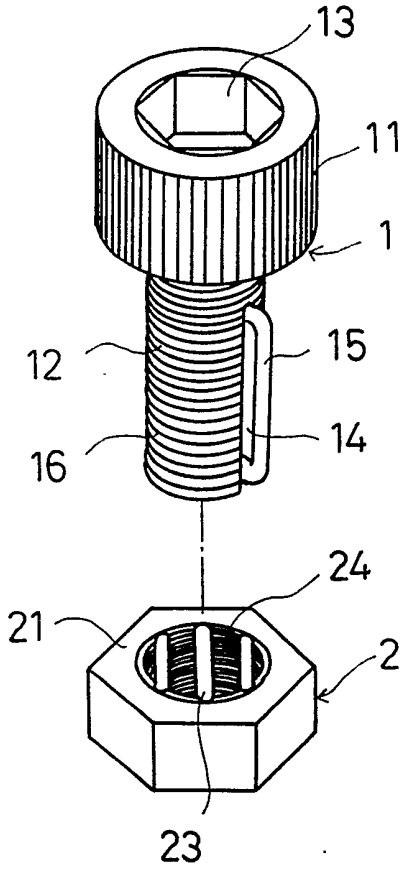


Fig. 2

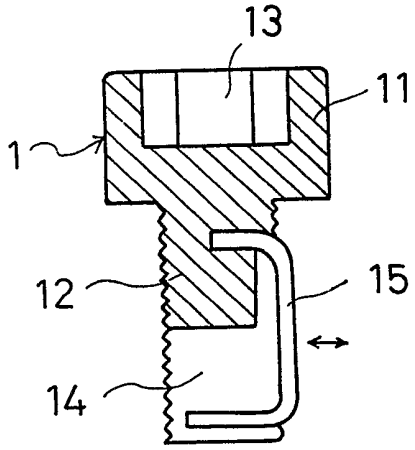


Fig.3

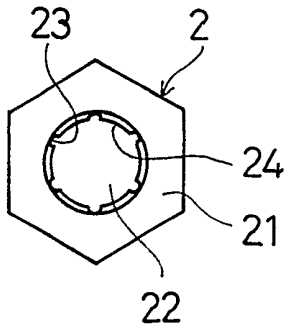


Fig. 4

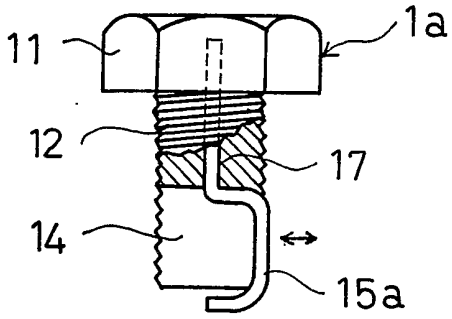


Fig.5

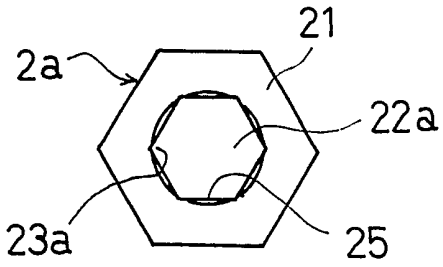


Fig. 6

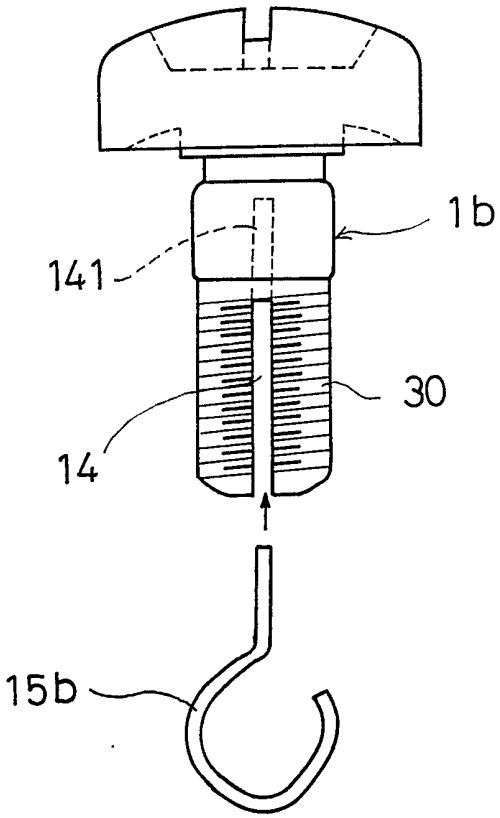


Fig. 7

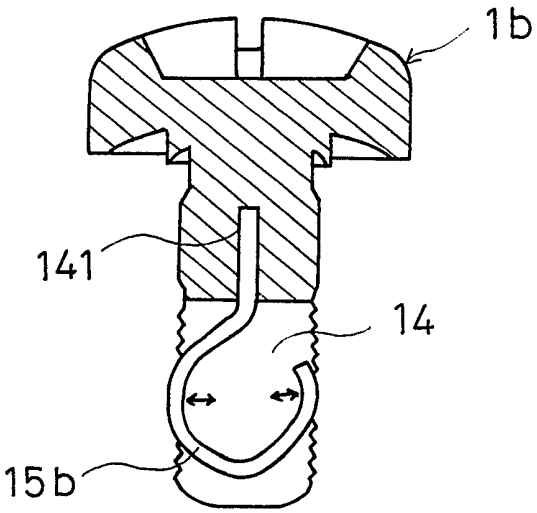
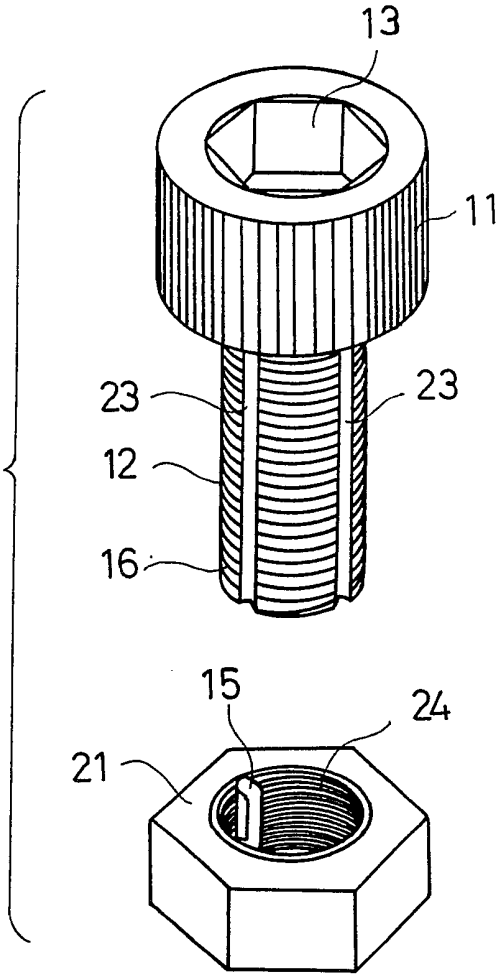


Fig.8



STRUCTURE FOR PREVENTING THE LOOSENING OF A TIGHTENED SCREW ASSEMBLY

The present invention relates generally to a structure for preventing the loosening of a tightened screw assembly, even when the assembly is only loosely tightened.

There are many types of threaded screw assemblies for fastening two memberes to each other, such as a threaded male screw and associated female member. Equally well known are assemblies for clamping a third member therebetween based on the tight engagement between a male screw member and an associated female member.

To prevent the loosening of such fastened screw assemblies, one or more of the following techniques are commonly employed: securing two nut members to a single bolt member in a so-called double screw engagement, disposing a spring washer between the nut and bolt members,
placing a tack or wire hook through the bolt member to prevent the nut member from rotating, or using a split pin type bolt having a tapered shank portion longitudinally split into two parts to generate a resilient force opposing a compressive force created, when the male member engages the female member. In general, for such type of fasteners, securely tightening the male to the female member produces sufficient friction to prevent the disengagement of the nut from the bolt.

Some applications of threaded fasners, however, require a bolt or screw member that is loosely rather than securely

tightened to the female member. An example of this is a screw assembly adapted to a joint pivot or hinge rod assembly of, for example, a pair of scissors. A loosely tightened screw assembly allows the scissors to be easily manipulated while at the same time preventing the scissors from becoming too loose for efficient cutting.

Unfortunately, some applications requiring loosely threaded screw assemblies such as scissors can not utilize the above memtioned common techniques for preventing the loosening of the screw assembly. For example, double screw engagement as well as spring washers are impractical for scissors or other similar type applications. Similarly, tacks and wire hooks placed through a bolt member are poorly suited to prevent the disengagement of scissors halves. Of the above memtioned widely used techniques used to prevent the disengagement of screw assemblies, the only applicable technique is the split pin type bolt having a tapered shank portion longitudinally split into two parts.

The disadvantage of using bolts having tapered shank portions for applications requiring loosely tightened screw assemblies is that, until the tapered screw is fully or securely tightened, the screw's threads will not fully engage the threads of the associated female member. Given conditions where a minimal tensional force is applied to the male and female members, the screw assembly tends to become disengaged. Consequently, tapered shank type screw assemblies, as well as the other above mentioned techniques used to prevent the

loosening of screw assemblies, are poorly suited to loosely tightened screw assemblies.

Accordingly, it is a primary objective of the present invention to provide a structure for preventing the loosening of a threaded screw assembly that has a wide range of applications and which is not limited by the disadvantages associated with conventional techniques.

To achieve the foregoing and other objects and in accordance with the propose of the present invention, an improved structure is provided, for preventing threaded screw type fasteners from becoming loose. The screw assembly of the present invention includes a first member having a recess defined by a first threaded peripheral surface, and a second member including a projection having a second threaded peripheral surface, whereby the second member can engage the first member.

The improved structure comprises at least one engaging recess formed on either the first or second peripheral surfaces, and at least one spring clip provided in the remainder of the first and second members. A portion of the spring clip projects from the peripheral surface of the member in which the clip is provided, and couples with the engaging recess provided on the associated member's peripheral surface. The projecting portion of the spring clip is retractable into the clip providing member to allow its member to disengage from the engaging recess.

It is preferable that the engaging recess comprises a groove extending substantially along a direction axial to the first and second periferal surfaces. Accordingly, the contact area for the engagement between the engaging recess and the spring clip increases, and produces a tight engagement therebetween.

The features of the present invention that are believed to be novel are set forth with particularity in the appended claims. The invention, together objects and advantages thereof, may best be understood by reference to the following description of the presently preferred embodiments together with the accompanying drawings.

Figs. 1 through 3 show a first embodiment according to the present invention:

Fig. 1 is a perspective view showing a bolt and a nut;

Fig. 2 is a cross-sectional view of the bolt which is longitudinally cutaway; and

Fig. 3 is a plan view of the nut.

Figs. 4 and 5 show a second embodiment according to the present invention:

Fig. 4 is a partly cross-sectional view of the bolt; and

Fig. 5 is a plan view of the nut.

Figs. 6 and 7 show a third embodiment according to the present invention:

Fig. 6 is a front view of the bolt; and

Fig. 7 is a cross-sectional view of the bolt.

Fig. 8 is a perspective view showing an another modification according to the present invention.

The first through third embodiments according to the present invention will now be described referring to the accompanying drawings.

The first embodiment as shown in Figs. 1 through 3 employs a combination of a bolt 1 and nut 2. The bolt 1 includes a head 11 and a shank portion 12, similar to a conventional bolt. The head 11 includes an engaging portion for turning the bolt, e.g., a hexangular recess 13 for engaging with an Allen Wrench. The shank portion 12 includes threads 16 which are formed around the peripheral surface thereof, and a recess 14 which is longitudinally formed along the shank portion 12 in such a manner that it splits the shank portion 12 into two parts.

Further, a spring clip 15 is fixed to the shank portion 12 at the upper portion of the recess 14. Although a trunk portion of the clip 15 projects outward beyond the peripheral surface of the shank portion 12, the trunk portion can be depressed into the recess 14. When the spring clip 15 is depressed within the recess 14, the clip 15 exerts an urging force outward due to its own spring action.

The nut 2 comprises a main body 21 having a through hole 22 formed therein. Threads 24 as well as londitudinal grooves 23 (six grooves in this embodiment) are formed around inner

peripheral wall of the through hole 22. Each of the grooves 23 extends along a central axis of the nut. When the bolt 1 and nut 2 are engaged with each other, the spring clip 15 fits into one of the grooves 23.

The just fitting of the clip 15 into one of the grooves 23 allows an operator to sense the favorable engagement through the click of the bolt 1. As the bolt 1 turns, the spring clip 15 is pushed into the longitudinal recess 14. The resiliency of the pushed spring clip 15 results in resistance when the bolt 1 is turned. The resistance contributes to prevent the loosening or disengagement of the bolt from the nut.

The second embodiment of the present invention as shown in Figs. 4 and 5 illustrates a different securing arrangement of spring clip and bolt than described in the first embodiment. As shown in Fig. 4, an insertion pit 17 is formed at the center of a shank portion 12 of a bolt 1a. The shank portion 12 includes a longitudinal recess 14 formed at the lower half portion thereof while the spring clip 15a is formed from wire having an elastic or resilient property. The proximal end of the clip 15a is securely fitted into the insertion pit 17, and the remaining portion of the clip 15a projects beyond the peripheral surface of the shank portion 12. According to this design, the spring clip 15a in the second embodiment has superior and stronger resiliency than that of the spring clip 15 described in the first embodiment.

As shown in Fig. 5, a nut 2a includes a polygonal through hole 22a, here shown as a hexagon, which is simply threaded by means of a tap. According to this embodiment, it is easy to form a male threaded portion 25 including engaging groove portions 23a which corresponds to the longitudinal grooves 23 in the first embodiment.

Figs. 6 and 7 illustrate a third embodiment according to the present invention wherein a bolt 1b having a shank portion 30 incorporates a longitudinal slit along the shank portion of the bolt 1b and an insertion cavity 141. A spring clip 15b is formed from resilient wire and bent in a hooked shaped fasion as shown in Fig. 6. The clip 15b is inserted into the insertion cavity 141 so that the side portions of the clip 15b project beyond respective peripheral edges of the bolt shank 30, as shown in Fig. 7.

When the bolt 1b engages with the nut shown in Figs. 3 or 5, the projected portions of the clip 15b couple with the engaging grooves 23 or 23a. Thye progressive clicking of clip 15b into grooves 23 or 23a, during the threading engagement or disengagement of bolt 1b and associated nut, allows for tachle confirmation that the bolt and nut assembly is prevented from disengagement.

Although only three embodiments of the present invention have been described in detail herein, it should be apparent to those skilled in the art that the present invention may be

embodied in many other specific forms.

Particularly, it should be understood that the following modifications are applied to the present invention. Engaging grooves may be made in a male screw member, and a spring clip may be provided in a female member, as shown in Fig. 8. Additionaly, a plurality of spring clips may be provided on one of a male screw and an associated female member. Therefore, the present examples and embodiments are to be considered as illustrative and not restrictive.

CLAIMS:

1. A structure for preventing the loosening of a tightened screw assembly, the screw assembly including a first member having a recess defined by a first threaded peripheral surface; and a second member including a projection having a second threaded peripheral surface, whereby the second member can threadingly engage the first member, the structure comprising:

at least one engaging recess formed on one of said first and second threaded peripheral surfaces; and

at least one spring clip provided in the other of said first and second member, a portion of said spring clip projecting from the threaded peripheral surface of the member in which the clip is provided to couple said engaging recess, said projecting portion of the spring clip being retractable into the clip selecting member to allow said clip providing member to disengage from said engaging recess.

2. The structure according to claim 1, wherein said engaging recess includes a groove extending substantially along a direction axial to said first and second peripheral surfaces.

3. The structure according to claim 1, wherein said engaging recess is formed on said first member; and wherein said spring clip is provided in said second member.

4. The structure according to claim 3, wherein said second member has a recess for accommodating said spring clip.

5. The structure according to claim 3, wherein the projection of said second member further comprises a shank portion having a longitudinal recess for splitting said shank portion into two parts; and

wherein said spring clip is a bent wire disposed in said longitudinal recess and attached to said second member such that said spring clip extends beyond the peripheral surface of said second member.

6. The structure according to claim 1, wherein said engaging recess is formed on said second member; and wherein said spring clip is provided in said first member.

7. A threaded screw assembly comprising:

a female member comprising a recess defined by a threaded inner peripheral wall, said inner wall being further provided with at least one engaging groove formed thereon and extending along the depth of said recess;

a male screw member comprising a projection having a threaded outer peripheral wall to engage with said female member; and

a spring clip provided in said male screw member, such that a portion of the spring clip projects from the surface of said outer wall to engage with one of said engaging

grooves, the projected portion of the spring clip being retractable into said male screw member to allow said male member to disengage from the engaging groove.

8. The screw assembly according to claim 7, wherein said male screw member has a recess for accommodating said spring clip.

9. The screw assembly according to claim 7, wherein said projection of the male screw member has a longitudinal recess for splitting the projection into two parts; and

wherein said spring clip is a bent wire disposed in said longitudinal recess and attached to said male member such that said spring clip extends beyond the peripheral wall of said male member.

10. The screw assembly according to claim 7, wherein said female member is a nut, and wherein said male screw member is a bolt.

11. A structure for preventing the loosening of a tightened screw assembly, substantially as hereinbefore described with reference to the accompanying drawings.

12. A threaded screw assembly substantially as hereinbefore described with reference to the accompanying drawings.

Patents Act 1977 Examiner's report to the Comptroller under Section 17 The Search report)	Application number GB 9323957.2
Relevant Technical Fields (i) UK Cl (Ed.M) F2H (HCN) (ii) Int Cl (Ed.5) F16B 39/32	Search Examiner P M Weller Date of completion of Search 14 February 1994
Databases (see below) (i) UK Patent Office collections of GB, EP, WO and US patent specifications. (ii)	Documents considered relevant following a search in respect of Claims :- 1-12

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A:	Document indicating technological background and/or state of the art.	&:	Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
X	GB 1473822 A	(TOWMOTOR) all figures	1-4,6,7
X	GB 0432901 A	(BOITEL) all figures	1-4,6,7
X	GB 0405674 A	(BOITEL) all figures	1-4,6,7
X	GB 0377076 A	(KENNEDY) all figures	1-4,6,7
X	GB 0350192 A	(HARRINGTON) all figures	1-4,6,7
X	GB 0328167 A	(BRUNELLI) all figures	1-4,6,7

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