(12) UK Patent Application (19) GB (11) 2 121 906 A

(21) Application No **8214590**
(22) Date of filing **19 May 1982**
(43) Application published **4 Jan 1984**
(51) **INT CL³ F16B 39/28**
(52) Domestic classification **F2H** 12B3 16A1 16E 16F1 16F2 16F3 16F4
(56) Documents cited
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(58) Field of search **F2H**
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(54) **Adjustable locking screw and nut**

(57) An adjustable locking screw and nut combination, in which the nut 11 is divided into a plurality of similar segments 16, 17, 18, 19 which are joined together by flexible webs 20 so as to be normally spaced angularly from one another but which are radially deformable to reduce the inner and outer diameters of the nut 11, the screw 10 having an externally threaded portion 13, the crest diameter *a* of which is less than the internal diameter of the nut when the nut is in its normal unstressed condition, the screw 10 being insertable into the nut 11 and the nut 11 thereafter being compressible to grip the screw 10 when the combination is pushed into an aperture in a workpiece.

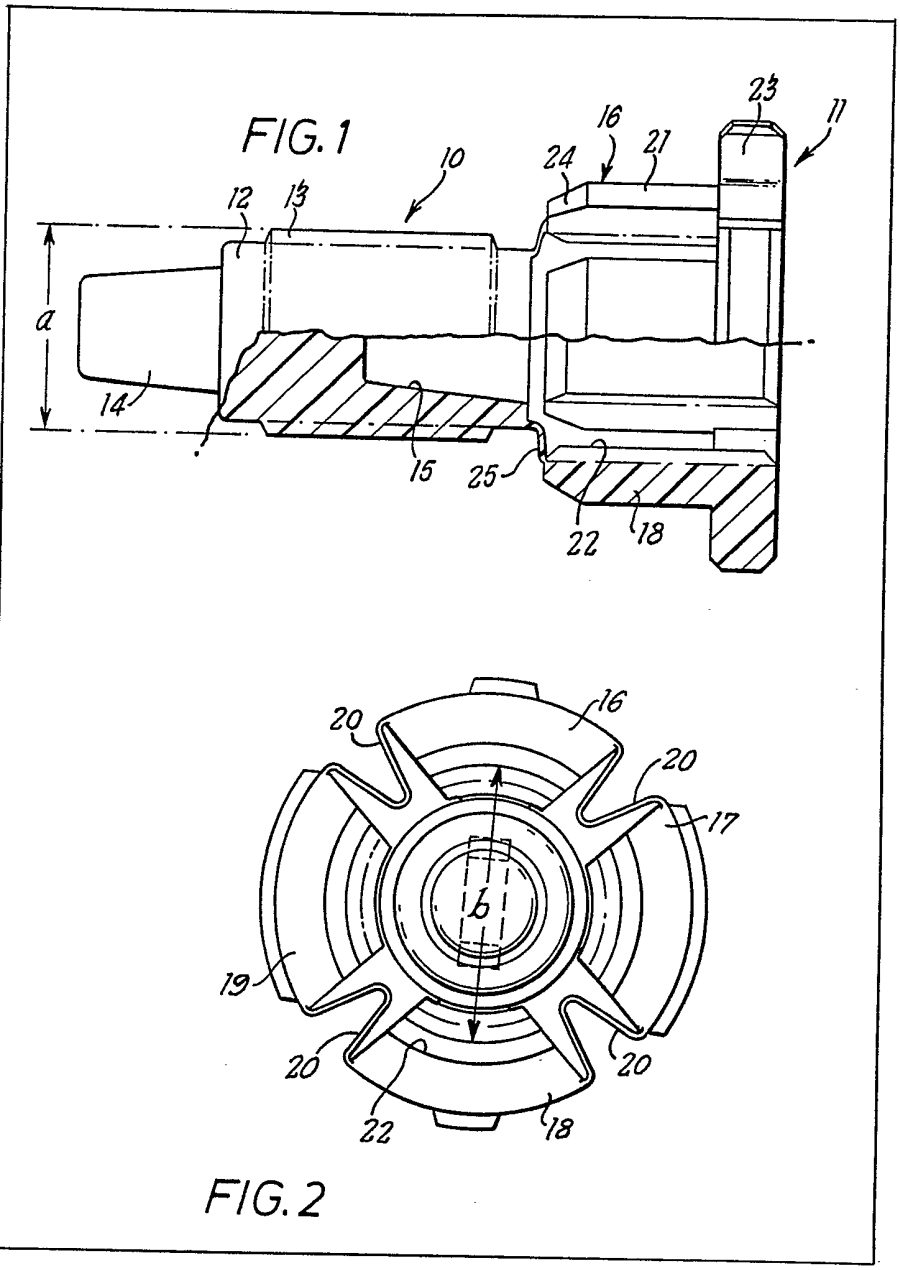

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FIG. 1

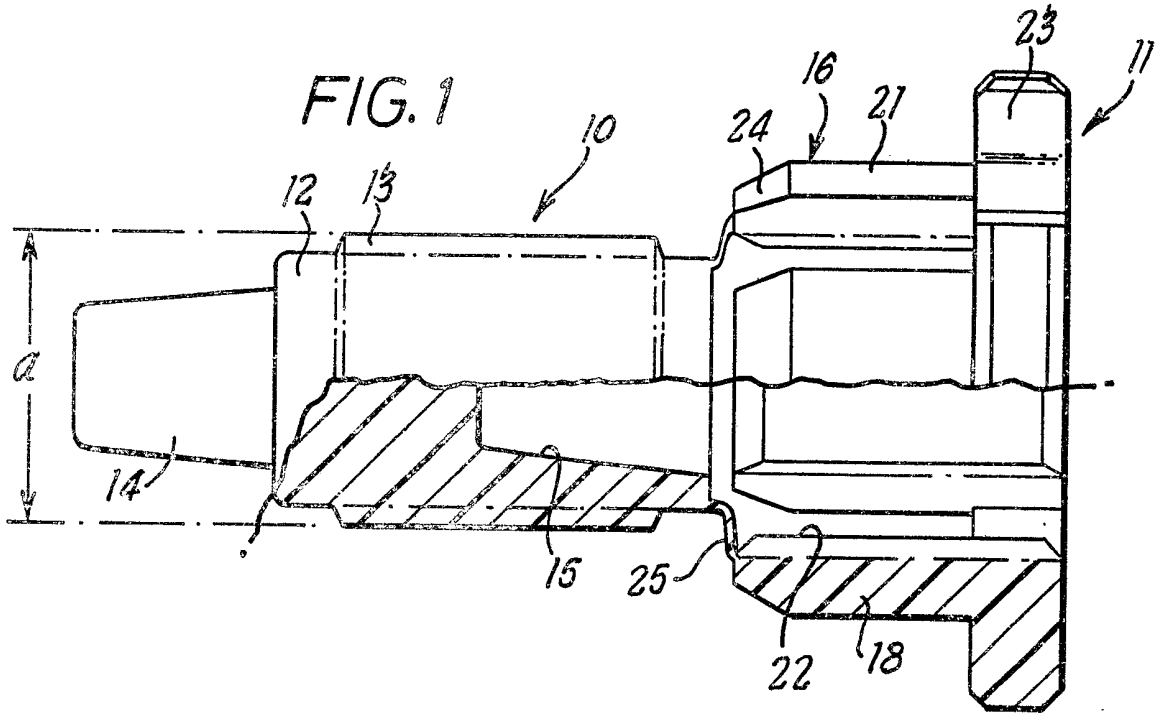

FIG. 2

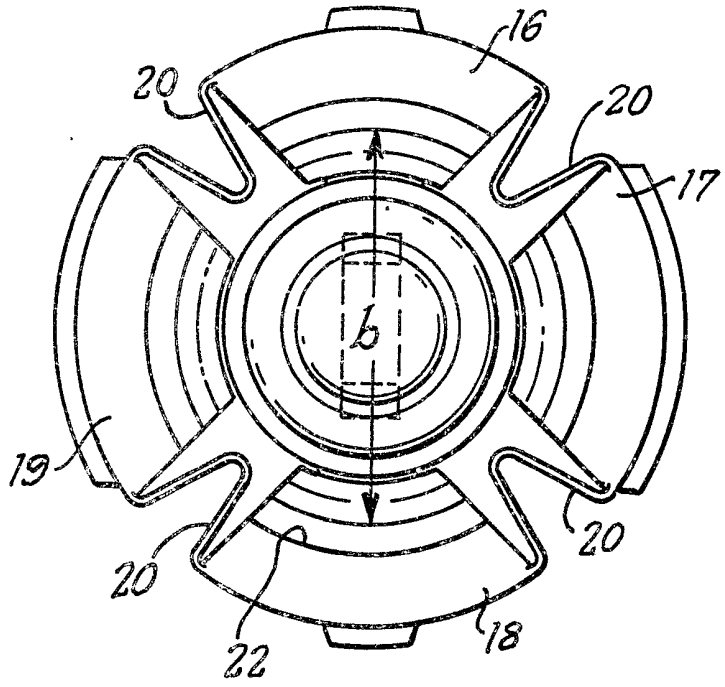

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FIG. 3

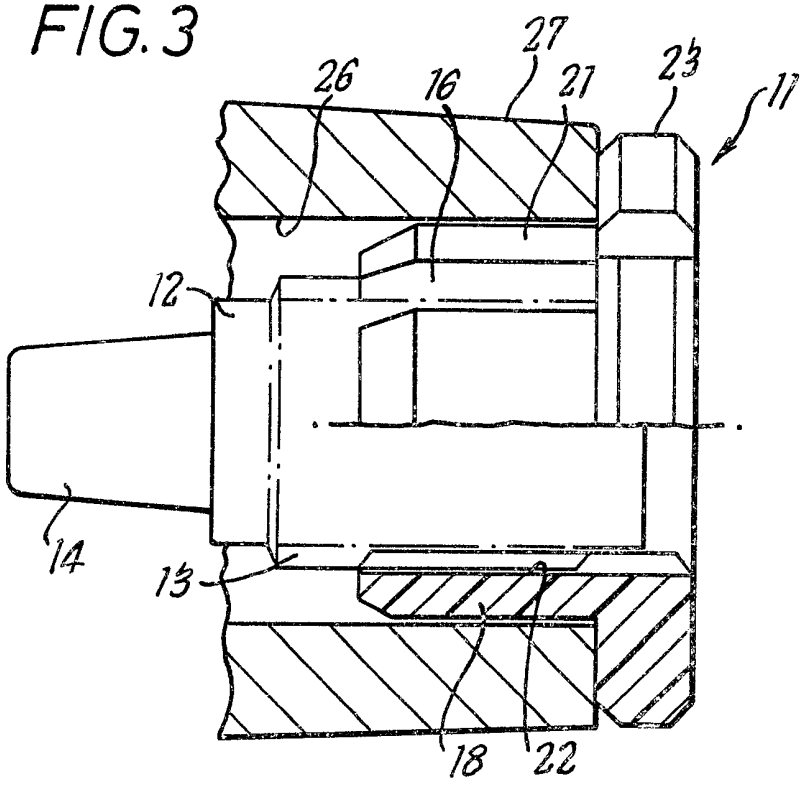

FIG. 4

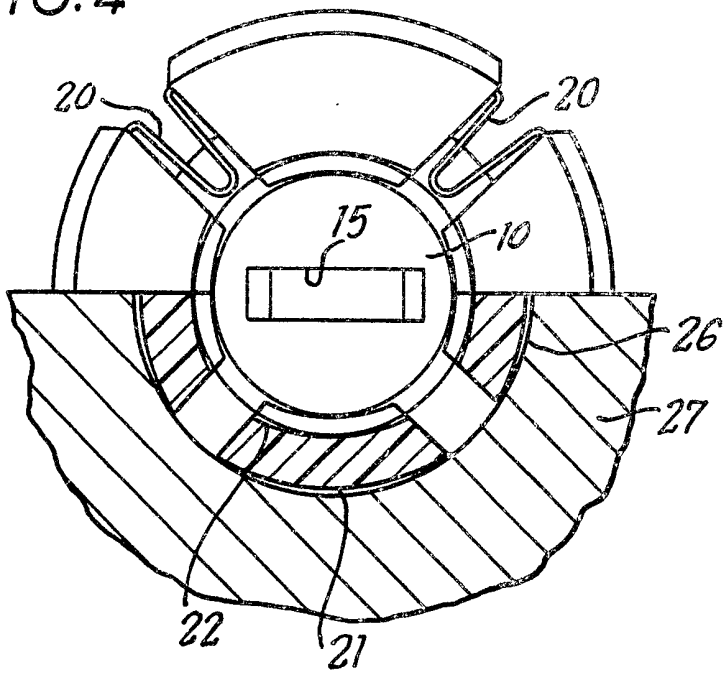

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FIG. 5

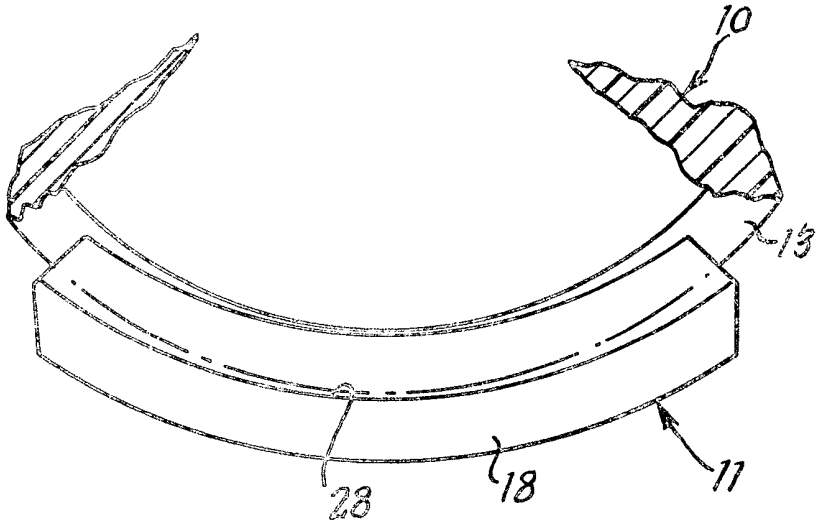
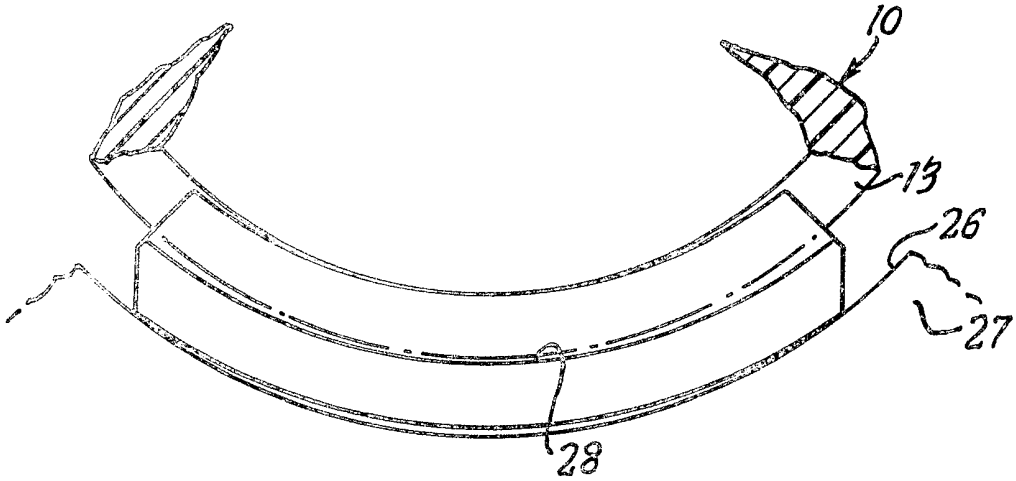


FIG. 6



SPECIFICATION

Adjustable locking screw and nut

The present invention is concerned with an adjustable locking screw and nut combination which is designed to enable the screw to be locked in a given position relative to the nut without the need for deforming the nut or screw or the application of a glue or adhesive.

There are many situations in which it is necessary to adjust a screw to a certain position within a threaded aperture and then lock the screw in that position. Hitherto the locking of the screw has been achieved in a number of ways, none of which are entirely satisfactory. For instance, it is known to adjust the screw to the required position and then deform the screw so that the thread of the screw is jammed. This involves a risk that the position of the screw will be shifted during the deforming operation and it also means that the screw cannot be subsequently adjusted or reused. Alternatively, it is known to apply a small quantity of glue or adhesive to the screw when it has been adjusted so as to lock the screw in position. This involves a further manual operation which can add substantially to assembly costs.

It is therefore an object of the present invention to provide an adjustable locking screw and nut for use in combination to enable the screw to be adjusted to the desired position within the nut and thereafter gripped by the nut so as to be securely locked in the predetermined position without any risk of movement when subjected to vibration.

According to the present invention we provide an adjustable locking screw and nut combination, in which the nut is divided into a plurality of similar segments which are joined together so as to be normally spaced angularly from one another but radially deformable to reduce the inner and outer diameters of the nut, the screw having an external thread, the crest diameter of which is less than the internal diameter of the nut when the nut is in its normal unstressed condition whereby the screw can be inserted into the nut and the nut thereafter compressed to grip the screw.

Preferably each segment of the nut has an outer part cylindrical surface and an inner part cylindrical surface, the outer and inner part cylindrical surfaces being concentric and the radius of curvature of the inner surfaces being greater than radius of curvature of the screw.

The adjacent segments of the nut may be joined by flexible webs of material which allow radial compression and radial expansion of the segments to facilitate removal of a core during the moulding operation.

Preferably, the nut has an internal thread on the inner surfaces of the segments which engage the thread on the screw.

In a further embodiment of the invention, in order to facilitate handling of the nut and screw, the screw may be initially be joined to the nut, the material joining the screw to the nut being easily broken to allow insertion of the screw into the nut.

The screw may also be provided with any convenient means for the transmission of torque such as a screwdriver slot in its head end.

In order to facilitate insertion of the nut into an aperture of smaller diameter than the external diameter of the nut in its normal unstressed condition the nut may be provided with an external taper at one end. It may also be provided with an external abutment at its other end to limit insertion of the nut into the aperture.

An embodiment of the present invention will now be described with reference to the accompanying drawings in which:—

Figure 1 is an elevation, partly in section of an adjustable locking screw and a nut combination;

Figure 2 is a side elevation of the screw and nut combination of Figure 1;

Figure 3 is an elevation similar to Figure 1, partly in section, but showing the nut located in an aperture in a support and the adjustable locking screw in position within the nut;

Figure 4 is a section taken on the line IV—IV of Figure 3;

Figure 5 shows a detail on an enlarged scale of the nut and screw engaged one within the other, and

Figure 6 is a detail similar to Figure 5 but showing the nut and screw in place in a workpiece.

In the drawings an adjustable locking screw is indicated generally at 10 and a complementary nut is indicated generally at 11. Both the screw and the nut are formed from a synthetic plastics material as an integral injection moulding. They are preferably formed from nylon but other synthetic plastics materials may be employed.

The screw 10 comprises a main body portion 12 formed with an external screw thread 13 and a tapered tip 14. The trailing or head end of the screw, which is opposite to the tip 14 is formed with a screwdriver slot 15 to enable the screw to be turned when it is in the nut.

The nut 11 is divided into four similar segments 16, 17, 18 and 19 which are joined by flexible webs of material 20. The webs 20 are designed to normally hold the segments in position, as shown in Figure 2, so that they are spaced angularly one from another but form a generally cylindrical nut body. The webs 20 allow the segments 16, 17, 18 and 19 to be radially compressed inwardly and towards one another and they also allow a limited amount of radially outward movement of the segments away from each other to facilitate removal of a core from the nut during the moulding operation.

Each segment has an outer cylindrical surface 21 and an inner cylindrical surface 22. The outer cylindrical surfaces 21 form part of the same interrupted cylinder and are concentric with the inner cylindrical surfaces 22 which also form part of a single interrupted cylinder. The inner cylindrical surfaces are threaded so as to form an interrupted thread which is adapted to engage the external thread on the screw 11.

Externally, the nut 11 is formed at one end with

an annular flange 23 and at the other end with a tapered portion 24 which is adapted to provide an easy lead in for the nut to an aperture in a support element or workpiece.

The screw 10 is initially joined to the tapered end of the nut 11 by two easily breakable ties 25. This enables the screw and nut to be handled as a single unit and the screw to be readily pushed down into the nut when required.

The crest diameter '*a*' of the thread on the screw is substantially less than the crest diameter '*b*' of the internal thread on the nut so that the screw is a clearance fit within the nut when the nut is in its normal unstressed position, as shown in Figures 1 and 2.

In order to use the screw 10 and nut 11, the screw is struck downwardly into the nut, breaking the ties 25 so that the screw enters the threaded bore of the nut. In this position, as shown in Figure 5, the segments of the nut sections engage the screw lightly, but without any distortion occurring. The nut 11, with the screw loosely located in the bore of the nut is then inserted into a receiving aperture 26 in a support structure or workpiece 27, as shown in Figures 3, 4 and 6. The diameter '*c*' of the aperture 26 is substantially less than the external diameter of the nut in its unstressed condition and the segments of the nut body are therefore deformed radially inwardly as the nut enters the aperture. This has the effect initially of bringing the segments into contact with the screw so that the thread at the centre portion 28 of the internal surface of each segment mates with the thread on the screw. As the nut is pushed further into the aperture 26, each segment is distorted and progressively wrapped around the screw, thereby progressively gripping the thread of the screw, as can be seen most clearly from Figure 6.

When the nut has been pushed fully home into the aperture as shown in Figures 4 and 6, the body portion of the nut is deformed and under permanent strain. In this condition, the screw can be rotated in the nut by applying torque through the screwdriver slot but is gripped sufficiently tightly by the resilience of the nut to ensure that it cannot shift under the anticipated vibration. The elasticity in the material of the nut ensures that regardless of the extent of vibration the nut will always grip the screw and prevent shifting of the screw relative to the nut.

The precise position of the tip 14 of the screw can thus be adjusted by rotation of the screw relative to the nut and once the correct position has been achieved no further operation is required in order to maintain the screw in position.

In the illustrated embodiment of the invention, the screw is initially joined to the nut. This is not essential although it facilitates handling. Two ties 25 are used to join the screw to the nut but this again is not essential and more ties may be employed if required.

In the illustrated embodiment, the nut is divided into four segments but the nut may be divided into three or more segments. The shape of the webs 20 which join the segments may also be varied and it is envisaged that the nut may also be provided with a plain bore, particularly if the screw is made of a harder material than the nut so that it can cut its own thread on the bore of the nut.

Other minor changes in the design of the screw and the nut shown and described herein may also be made without departing from the spirit and scope of the present invention which is properly defined in the following claims.

CLAIMS

1. An adjustable locking screw and nut combination, in which the nut is divided into a plurality of similar segments which are joined together so as to be normally spaced angularly from one another but which are radially deformable to reduce the inner and outer diameters of the nut, the screw having an externally threaded portion, the crest diameter of which is less than the internal diameter of the nut when the nut is in its normal unstressed condition, the screw being insertable into the nut and the nut thereafter being compressible to grip the screw.

2. A screw and nut combination as claimed in claim 1, wherein each segment of the nut has an outer part cylindrical surface and an inner part cylindrical surface, the outer and inner part cylindrical surfaces being concentric.

3. A screw and nut combination as claimed in claim 2 wherein the radius of curvature of the inner surfaces of the nut segments is greater than the radius of curvature of the threaded portion of the screw.

4. A screw and nut combination as claimed in any preceding claim wherein adjacent segments of the nut are formed by flexible webs of material which allow radial compression and radial expansion of the segments.

5. A screw and nut combination as claimed in any preceding claim wherein the nut has an internal thread on the inner surfaces of the segments which is complementary to the thread on the screw.

6. A screw and nut combination as claimed in any preceding claim, wherein the screw is joined to the nut.

7. A screw and nut combination as claimed in any preceding claim, wherein the screw and the nut are formed from a synthetic plastics material.

8. A screw and nut combination as claimed in any preceding claim, wherein the screw has torque transmission means at its head end.

9. A screw and nut combination as claimed in any preceding claim, wherein the nut has an external abutment at one end adapted to limit insertion of the nut into an aperture and an external taper at the other end adapted to facilitate insertion into an aperture having a smaller diameter than the external diameter of the nut in its normal unstressed condition.

10. A screw and nut combination as claimed in any preceding claim wherein the screw has a tip portion which is adapted to project from the nut

and which is positionally adjustable by rotation of the screw in the nut.

11. A screw and nut combination as claimed in any preceding claim substantially as described herein with reference to the accompanying drawings.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1984. Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.