

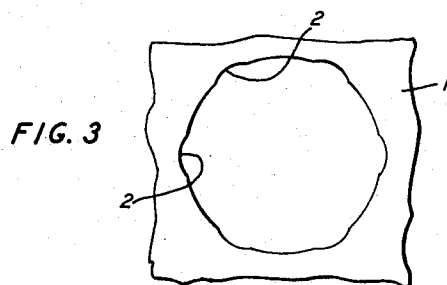
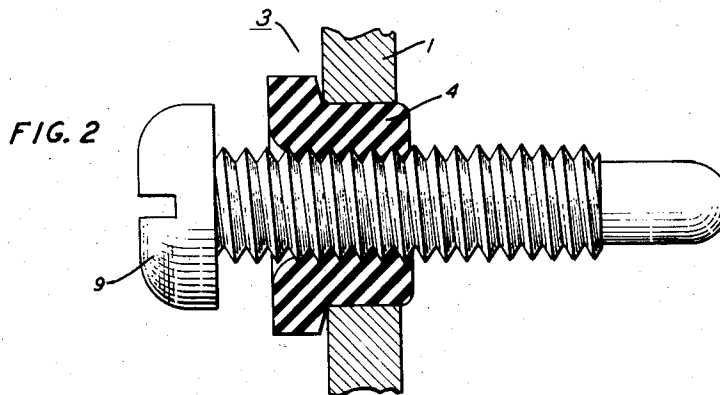
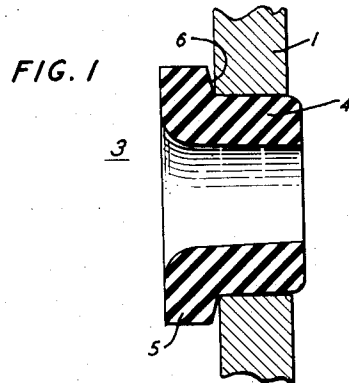
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SCREW MOUNTING HAVING INSULATING AND LOCKING PROPERTIES

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SCREW MOUNTING HAVING INSULATING AND LOCKING PROPERTIES

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2 Claims. (Cl. 151—41.7)

This invention relates to adjusting screws.

The object of this invention is to improve the stability of adjustment of threaded devices.

A feature of this invention is a means for insulatedly mounting a threaded member.

Another feature of this invention is a means for imparting high axial stability to a threaded member.

A further feature of this invention is a means for mounting a threaded member so that the torque required to turn the member remains constant within predetermined limits.

Threaded elements such as set screws and machine screws are widely used adjustably to control the physical relationship between two members. In many such applications, it is imperative that the threaded member have high axial stability so that the adjusting element will remain in a preset position despite shifts in the position of the adjusted member.

A further requirement frequently imposed is that the adjusting element so intimately engage its threads that a relatively high and exceedingly uniform torque is required to change the position of the adjusting element. With customary techniques, this requirement is difficult of economical attainment in that precision tapping is required in a hole that normally must be reamed as well as bored.

It is additionally required, in many electrical applications, that the adjusting element be electrically insulated from the adjusted element. This has normally been accomplished either by mounting the threaded female element in a plate of insulating material or by providing the male threaded element with an insulated portion engaging the adjusted member. The former method required the replacement of a simple punched metal part with an expensive substitute of normally inferior physical properties; the latter method has proved costly of execution and not adequate from a stability standpoint because insulating materials normally cannot withstand as high unit pressures as metals.

The aforesaid object has been attained and the noted deficiencies in the prior art methods have been overcome by means of an insulated member which is firmly clamped in a metal plate and which is designed to accept a threaded male member, assuming, in so doing, a resilient permanent set such that the engagement between the male and female threaded members is precise and continuous.

The exact nature of the invention may be more clearly understood from the following detailed description of one embodiment thereof, when read with reference to the accompanying drawings in which:

Fig. 1 is a sectional view of an insulating support member constructed in accordance with the principles of the invention and engaging an aperture in a metal plate;

Fig. 2 is a sectional view of the assembled adjusting means; and

Fig. 3 is a view of the metal adjusting plate and of the aperture therein.

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In many types of sensitive electromagnetic relays, critical adjustment of the relationship between the operating elements is performed by means of threaded adjusting members. Thus, in one type of extensively used sensitive relay disclosed in Patent 1,121,897, granted December 22, 1914, to E. B. Craft, the static unoperated relationship between the fixed contact elements, carried on the fixed contact springs, and the moving contact elements, carried by the armature, is controlled by means of threaded members which engage tapped slots in a metal adjusting plate and which have insulating tips inserted in their ends and to engage the fixed contact springs. It has been found that relays embodying this type of adjusting means require periodic readjustment. Analysis disclosed that the failure of the adjusting screws to retain their adjusted position resulted both from insufficient axial stability of the adjusting screw and from the fact that a relatively low and non-constant torque was required to turn those adjusting screws. It was further recognized that the initial cost of manufacturing adjusting screws of this type was inordinately high due to the necessity of providing the insulating detail and that the stability of the insulating material under high unit pressures was not as satisfactory as metal.

The manner in which these deficiencies have been overcome is the subject of this invention, and a relay of the type disclosed in the above-identified Craft patent and embodying the present invention is disclosed in my co-pending application, Serial No. 394,818, filed on November 27, 1953. It is to be understood, however, that while the invention is ideally suited for use in conjunction with sensitive relays, it is applicable to a diversity of fields wherever precise adjustment is required.

Referring now to the drawings, Fig. 1 shows an adjusting plate 1 which is preferably metallic and which may serve any additional structural purpose required in the particular item to which the invention is being applied. Plate 1 is provided with an aperture which is preferably of the form disclosed in Fig. 3 of the drawings. For a purpose which will be perceived from the ensuing description, the edges of the aperture in the adjusting plate 1 are preferably provided with discontinuities such as a plurality of grooves 2 running through the depth of the material of the adjusting plate 1.

Insertable in the aperture in the adjusting plate 1 is a bushing 3 (Fig. 1) of insulating material. This material should be resilient, strong, tappable, have a high dielectric constant, and maintain its physical properties over an extended life. One material well suited to the application has been found to be a high molecular weight polyhexamethylene adipamide, sold as commercial nylon.

Bushing 3 is in the form of a circular member with an enlarged head. The main circular body portion 4 is slightly tapered so as to be readily insertable in the aperture in the adjusting plate 1, with clearance existing between the lower circumference of the body portion 4 and the edges of the plate 1 defining that aperture, as is shown in Fig. 1 of the drawings. The enlarged head portion 5 overlies the face of the plate 1 and the surface of that head 5 which is adjacent the plate 1 is preferably also tapered as is shown at 6 in Fig. 1 of the drawings.

The bushing 3 is also provided with an aperture which is gradually tapered throughout a major portion of its length and abruptly tapered in the head portion 5. The abrupt taper insures the easy insertion of a threaded screw in the aperture, and the gradual taper insures that the engagement between the threads on the screw and the bushing will be progressively more intimate. It has been found that a gradual taper of 1° 45' is satisfactory when a No. 4-48 machine screw is used.

As is shown in Fig. 2 of the drawings, a threaded screw 9 is self-tapped in the aperture of the bushing 3. The

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size of the aperture in the bushing 3 should be so selected that an exceedingly intimate engagement exists between the threads of the screw 9 and the newly tapped threads in the bushing 3. It has been found that the requisite relationship exists, with the noted material; if the diameter of the aperture in the bushing 3 at the beginning of the gradual taper near the head of the bushing be approximately equal to the major diameter of the screw 9 and if the smallest diameter of the aperture in the bushing 3 be between the pitch diameter and the minor diameter of the screw. The ultimate test, however, is functional, with the relative dimensions being selected so that constant, reasonably high torque is required to turn the screw after it has been threaded into the bushing 3. For example, in applying the invention to the aforesaid sensitive relay, it was found that the dimensions should preferably be selected such that a nominal torque of 12 ounce-inches is required to turn the screw after the threads are fully tapped. It will be seen in Fig. 2 of the drawings that when the screw 9 is inserted in the aperture in the bushing 3, the outer circumference of the bushing 3 expands so as more tightly to engage the aperture in the adjusting plate 1.

It will be noted that due to the exceedingly intimate relationship between the threads on the screw 9 and the threads on the bushing 3 not only is a high constant torque required to turn the screw, but also a high degree of axial stability is imparted to the screw. Further, since the bushing 3 is a material having a relatively high dielectric constant, no additional insulating means is required so that the screw 9 may be entirely metallic and hence cheaper than its earlier counterpart, and its tip spherical surface more stable under pressure of the adjusted member.

It is to be understood that the above-described arrangements are but illustrative of the application of the principles of the invention. Numerous other arrangements may be devised by those skilled in the art without departing from the spirit and scope of the invention.

What is claimed is:

1. In combination a plate having surfaces defining a cir-

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cular aperture therethrough, said surfaces of said plate having a plurality of grooves formed thereon, an open-ended bushing of a high molecular weight polyamide having a flanged portion integral with one end, said bushing having outer and inner uninterrupted surfaces each of which is continuously tapered from said flange end to the other end of said bushing, and a screw threaded through said bushing, said tapered outer surface intimately engaging the plate surface forming said aperture and said grooves and said flange portion abutting one flat surface of said plate, and said inner surface tapered from a diameter approximating the major diameter of said screw threads at one end of said bushing to a substantially smaller diameter at said other end.

2. In combination a plate having surfaces defining a circular aperture therethrough, said surfaces of said plate having a plurality of grooves formed thereon, an open-ended bushing of a high molecular weight polyamide having a flanged portion integral with one end, said bushing having outer and inner uninterrupted surfaces each of which is continuously tapered from said flange end to the other end of said bushing, and a screw threaded through said bushing, said tapered outer surface intimately engaging the plate surface forming said aperture and said grooves and said flange portion abutting one flat surface of said plate, and said inner surface tapered from a diameter approximating the major diameter of said screw threads at said flange end to a diameter intermediate the pitch and minor diameters at said other end.

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