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SCREW-NUT

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Fig.1

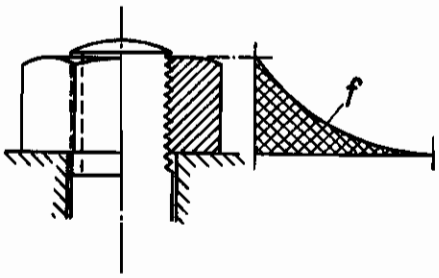


Fig.2

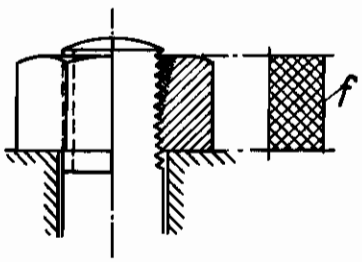


Fig.3

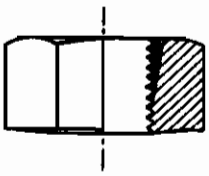


Fig.4

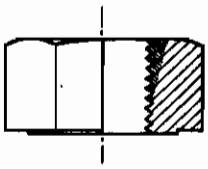


Fig.5

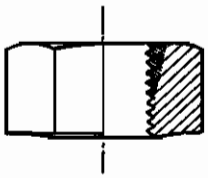
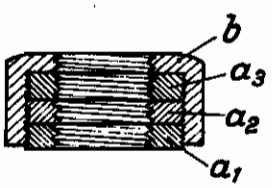


Fig.6

Fig.7



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ALIEN PROPERTY CUSTODIAN

SCREW-NUT

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vested in the Alien Property Custodian

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Recent experiments concerning the increasing of the lastingness of screw connections have shown, that the distribution of tension upon the individual carrying screw threads of a nut is not uniform. Whereas on the bearing portion of the nut, owing to the flux of lines of force pressed together a very high tension head is produced in the first screw threads, the flux of lines of force extraordnarily decreases in the screw threads farther distant from the bearing face and attains the tension zero already before the end of the nut. In a normal nut about 60% of all lines of force flux pass already through the first third of the screw threads, measured from the bearing face of the nut, whereas the remaining 40% of the lines of tension are distributed on the remaining two thirds of the screw threads in strongly decreasing towards the end of the nut.

In the accompanying drawing illustrates Fig. 1 the flux of lines of force in a normal nut by the curve *f* of the diagram.

The screw threads located near the bearing face therefore deform most. The better these screw threads at the tensile loading acting upon the screw bolt can adapt themselves to the deformation of the screw bolt, the better the screw threads farther distant from the bearing face will engage. The more completely the whole height of the nut is therefore utilized for the carrying, the more uniform will be the tension distribution upon the individual carrying screw threads of the nut.

Recently balancing notches have been proposed for already known measures for the reduction of the tension head on the screw threads near the bearing face and for the reduction of the danger of continuous breakage, for which the tension head is decisive, these notches being made in the face of the nut which has to become the bearing face and serving to conduct the flux of lines of force so that the tension is distributed more uniformly than in normal nuts over the totality of the carrying screw threads. It has also been proposed to turn out slightly conically those screw threads which are near the bearing face, so that the carrying depth of the screw threads is gradually reduced towards the bearing face and their participation in the force transmission is reduced thereby. It is further known, to alter the screw thread diameter and the screw thread pitch of the nut or to employ nuts composed of several discs or a combined upper and lower nut consisting each of one part. It has further been proposed in order to solve the same problem to construct the nut as collar nut with supporting ring. These measures same as all other measures which have been proposed up to the present in order to deflect the flux of lines of force partly from the screw threads with high tension head which are near the bearing face and to lead this flux of lines of force to the screw threads farther distant from the bearing face, resulted in a spatial alteration in the buiding up of the nut, which usually required additional working methods which mostly required much time and were expensive.

The invention proposes an absolutely new and simple way for attaining a better distribution of tension on to the individual screw threads of the nut, this way making it possible to maintain the spatial shape of the nut, so that it does not differ in appearance from the commonly used nuts.

The invention consists in that the material in the core portion of the nut carrying the screw threads shows an increasing strength beginning from the bearing face of the nut towards the nut end and a corresponding increasing modulus of elasticity.

The desired alteration of the strength and of the modulus of elasticity can be ensured, for instance, in iron and steel, by mechanical condensation, hardening, suitable treatment of the core of the nut or of the screw threads by heat-, case- or nitrating-treatment or by a similar method. If for instance light metal is used as material, the required influencing of the modulus of elasticity of the nut core may be effected either by mechanical condensation of a portion of the nut core or by partly hardening of the same by thermic method. Chemical methods altering the alloy of the material at the desired point may also be employed.

Fig. 2 shows the flux of lines of force in a nut constructed according to the invention with a nut core increasingly solidified towards the end of the nut.

It has been found that with the invention a measure known as such may be combined in an especially simple manner in order to attain besides the tension distribution at the same time a securing of the nut against unintentional loosening. With this object in view the bearing face of the nut is not made plane but projects, in a manner known per se, near the screw threads for instance conically, cylindrically or in ball-shape, as shown in Figs. 3, 4 and 5. If at the solidification of the nut increasing towards the nut end one has started from a sufficiently soft material or if, starting from a hard material, a reduction

of the strength and of the modulus of elasticity from the nut end towards the bearing face has been carried through, the bearing face of the nut, when said nut is being tightened, will be pressed plane to a greater or lesser measure and thereby cause a reduction of the screw thread clearance in the screw threads near the bearing face of the nut, whereby the nut is secured against accidental loosening. If further the elasticity of the material has been so selected that at the shaping of the same the elasticity limit is not exceeded, the nut may be used several times.

By selecting the height of the portion projecting from the bearing face of the nut thicker or thinner or higher or less high, the efficiency of the self-braking of the nut may be stronger or less strong. It may be mentioned that, for instance, when a ring-shaped portion of the bearing face surrounding the screw threads projects at a height of $\frac{1}{100}$ of the bolt diameter the screw thread clearance in the lower screw threads is suppressed and thereby a practically sufficient automatic braking of the nut is produced which excludes loosening of the nut even at strong shaking.

As shown in Fig. 6, the portion of the nut core possessing less strength and lower modulus of elasticity, in which the reduction of the screw thread clearance at the tightening of the nut takes place, may be inserted in known manner into the main portion of the nut which, according to the invention, possesses increasing strength and increasing modulus of elasticity towards the nut end. The two parts are connected the one with the other as shown in Fig. 6 by fine screw threads with which the portion *a* of the nut core possessing low modulus of elasticity is screwed into the main portion of the nut *b* having increasing modulus of elasticity.

According to the invention several parts of the nut core possessing different strength and different modulus of elasticity may be fitted into the main part of the nut so that the strength and the modulus of elasticity of the nut stepwise increase from the bearing face towards the end of the nut. Such a form of construction is shown in Fig. 7, according to which the parts a_1, a_2, a_3 possessing modulus of elasticity and strength increasing in the same succession and inserted into the main part *b* of the nut.

Instead of the connection of the inserted parts with the main part of the nut by screwing by means of fine screw thread, as shown in Figs. 6 and 7, other suitable measures, such as welding, pressing, injecting, may be employed, for instance in nuts which are made completely or partly of light metal.

Metallic, or also non-metallic parts may be employed for building up the nut, especially for building up the core parts of the same which effect the self-braking of the nut by suppression of the thread clearance owing to the alteration of shape of the nut.

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