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COMBINATION OF SCREW OF SOFT MATERIAL AND FEMALE
THREADED BODY OF HARD MATERIAL
Filed Feb. 1, 1968

3,446,262

FIG. 1

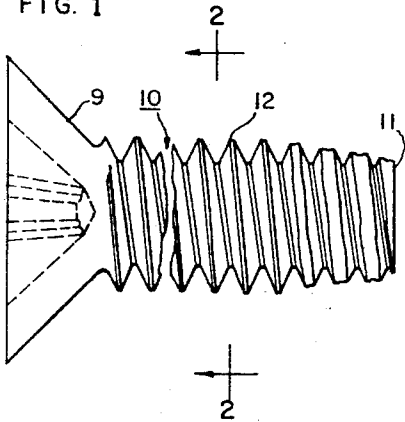


FIG. 2

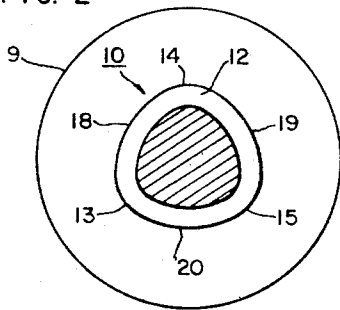


FIG. 3

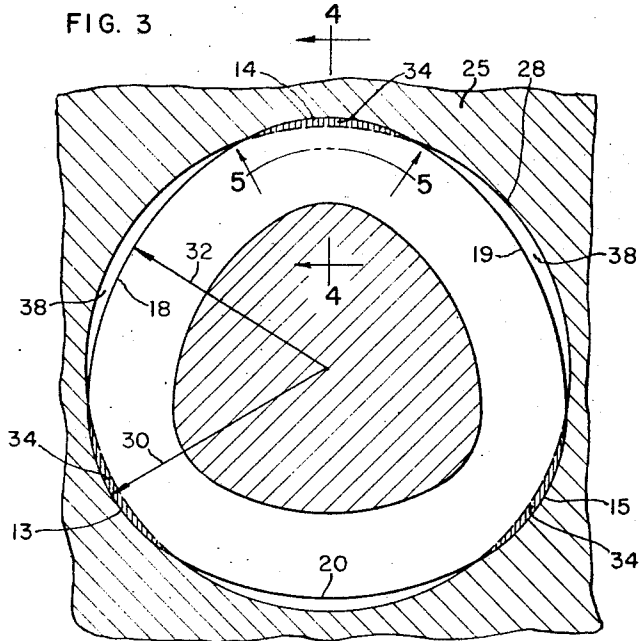


FIG. 4

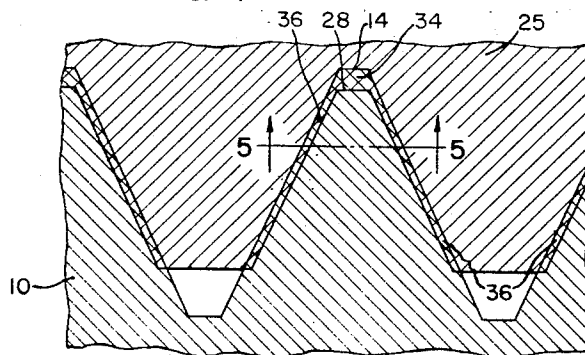
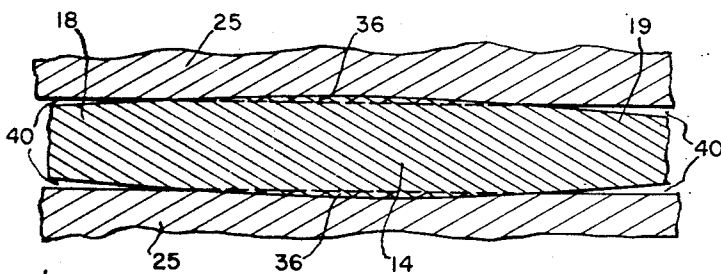


FIG. 5



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COMBINATION OF SCREW OF SOFT MATERIAL AND FEMALE THREADED BODY OF HARD MATERIAL

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1 Claim

ABSTRACT OF THE DISCLOSURE

The screw of the present combination is of polygonal cross section and is provided with a plurality of circumferentially spaced apart lobes. The lobes of the screw thread have a greater maximum radial dimension than the corresponding radial dimension of the thread of the female member into which the screw is adapted to be driven so that an interference condition exists between the lobes of the screw and the female thread. That part of the screw thread between the lobes has a lesser radial dimension than the corresponding points of the female thread. At least the surface portion of the screw thread is of a material which is softer than the material of the female thread so that the female member will reform the lobular portions of the male thread as it is driven relatively into the female member. The material displaced from the lobes of the screw thread will be forced into the area of the screw thread intermediate the lobes thereof.

Background of the invention

Frequently, plated screws are desired by a customer. Usually plated screws are ordered in only small quantities and it is a common practice for the screw manufacturer to take stock screws and provide a plating thereupon. It is customary, therefore, for such stock screws to be manufactured to the standard minimum tolerance dimensions specified for unplated screws, or even slightly less, so that when plating is desired, it can be added. It is usually attempted to hold the dimensions of the plated screws within the maximum tolerance limitation. Depending upon the class of fit desired and the size of the screw, the thickness of plating desired by the user frequently cannot be accommodated by the difference in size between the stock screw and the size of the female thread of the part to be used therewith. The result is that the unplated screws fit loosely when used with a standard female thread and when the screws are plated, they fit so tightly that the plating tends to gall, or create, a binding condition, thus causing assembly problems.

To circumvent such problems, special screws rather than standard screws from stock must be made with the added expense of special tooling, setting up, and handling smaller size lots. It is desirable, therefore, to provide a new and improved fastener combination whereby screws of a given size can be manufactured in quantity and stocked, and which may be supplied to the user in either plain finish or plated while at the same time providing a smooth, tight fit in either condition.

Description of the prior art

In my own prior Patent 3,195,156 entitled "Method of Producing Thread-Swaging Devices," I disclose a self-thread-forming screw of arcuate triangular cross section. The screw is primarily adapted for forming threads in the side walls of a previously drilled hole and is thus heat-treated and made harder than the material into which it is to be driven. While it is not necessary to use screws of the type disclosed in my prior patent, I prefer such screws

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as a matter of convenience. The screws of the present combination, moreover, function in a manner different from the screws of my prior patent and for a different purpose.

Summary of the invention

The present invention resides in the combination of a fastener of a noncircular, or lobular cross section and a second cooperating member including a female thread, the female thread being of a material harder than at least the surface portion of the fastener. The fastener has a maximum radial dimension which is slightly greater than the radial dimension of the circular female thread so that an interference condition will exist between the lobes of the fastener thread and the female thread. As the fastener is driven home, and because of the softer condition of at least the surface portion of the fastener over a depth at least as great as the interference zones, the thread on the lobes of the fastener will be reformed by the female thread. As a result, a smooth, tight fit is thus provided between the male and female threads without the occurrence of galling or excessive driving torques. The entire fastener device may be of relatively soft material as compared with the material of the female thread so that such device can be manufactured in large quantities of standard dimensions and stocked. Such stock screws may then be used as is or may be plated, as desired by the customer, irrespective of the variations in thickness of the plating, and if an oversize screw results, it can still be driven home without difficulty.

It is an object of the present invention, therefore, to provide a new and improved combination of a male fastener device together with a prethreaded female member, the fastener device being of polygonal cross section having circumferentially spaced apart lobes providing a predetermined interference with the female thread, at least the surface portions of the male member being softer than the female threads whereby the thread on the male member may be reduced in size by the female thread as may be necessary to provide a secure fastening.

Brief description of the drawings

FIG. 1 is a side elevation illustrating one form of a fastener device which may be used as part of the present invention combination;

FIG. 2 is a schematic, sectional view through the fastener device taken generally along the line 2—2 of FIG. 1 and for the purpose of illustrating the polygonal cross-sectional shape thereof;

FIG. 3 is a schematic, sectional view drawn to an enlarged scale illustrating the combination of a fastener device of the type shown in FIGS. 1 and 2 and a cooperating female threaded part;

FIG. 4 is a cross-sectional view taken along the lines 4—4 of FIG. 3; and

FIG. 5 is a sectional view taken along the line 5—5 of FIGS. 3 and 4.

Description of the preferred embodiment

Referring now to the drawings, in FIGS. 1 and 2 is illustrated a threaded male fastener device 10, which in this instance is a machine screw of a well-known, arcuate, triangular cross-sectional shape, such screws being manufactured and sold under the trademark "Taptite." Screws of this type are more fully disclosed and described in my prior Patent 3,195,156 referred to above. As will become evident as this description proceeds, it is not necessary to the present invention that screws of this particular type be utilized, but such screws are preferred merely for purposes of convenience on account of their ready availability.

The screw 10 is provided with a driving head 9 and a tapered work-entering end 11. The screw is provided with a thread 12 and which thread is defined by a plurality of circumferentially spaced apart lobes 13, 14 and 15 and intermediate arcuate sides 18, 19 and 20, the last mentioned sides merging smoothly and gradually with the lobes therebetween.

Referring now to the schematic presentation of FIG. 3, a screw of the type shown in FIGS. 1 and 2 is illustrated in a superimposed relationship with a female thread provided in a cooperating male part 25. While both the crest and root outlines of the male thread are shown, the female thread is represented only by the circle 28 defined by the root of the thread. It will be observed that the maximum radial dimension 30 of the lobes 13, 14 and 15 is greater than the maximum radial dimension 32 of the sides 18, 19 and 20 thereof. The radius of the root 28 of the female thread is less than the radial dimension 20 but greater than the radial dimension 32, so that interference zones 34 exist between the lobes of the male thread and the adjacent portions of the female thread. As illustrated in the sectional view of FIG. 4, interference zones similar to the interference zones 34 also occur between the flanks of the lobes and the adjacent flanks of the female thread as indicated at 36. As illustrated in FIG. 3, while interference zones exist between the lobular portions of the male thread and the adjacent portions of the female thread, voids 38 occur between the crest of the male thread along the sides 18, 19 and 20 thereof. As illustrated in FIG. 5, voids 40 also exist between the adjacent flanks of the male and female threads in the areas of the sides 18, 19 and 20.

The part 25 including the female thread 28 is of a material which is harder than the material of the fastener device so that as the fastener device is driven in place, the excess material forming the interference zones 34 and 36 on the fastener lobes will be displaced either by scraping or by swaging into the voids 38 and 40 intermediate the lobes. Due to the polygonal cross section of the fastener device, frictional engagement thereof with the female thread is restricted to only a fraction of the circumferential extent of the male thread so that the excess metal may readily be displaced or removed from the lobes thereof at a driving torque which is well within the strength limitations of the fastener device. Thus, even though there may be considerable variation in the size of the fastener device due to the softness thereof as compared with the greater hardness of the female thread, the female thread will reduce the maximum radial dimension of the lobular portions of the male thread as may be necessary to permit driving of the fastener device to the fully seated condition.

In the foregoing description, it is assumed that the fastener device 10 is initially manufactured with a maximum radial dimension which is somewhat greater than the radial dimension of the female thread. Let us assume that the fastener device shown in FIG. 1 is initially manufactured to a standard dimension for cooperating with a female thread also of standard dimension. Under such circumstances, there will, of course, be no interference between the male and female threads. It will then be immaterial for present purposes as to whether the fastener device is hardened or not. Let us further assume that the screws have been hardened and that an order is received for plated screws. Such hardened screws may be plated to any reasonable thickness, and under such circumstances interference zones will be created between the lobes of the male thread and the female thread. With the plating material being softer than the material forming the part 25 including the female thread, the excess plating upon the lobes will be either scraped therefrom or displaced circumferentially of the male thread into the area repre-

sented by the voids 38 and 40. As previously described, the fastener device may be driven home to the fully seated condition without difficulty and with a smooth, tight fit between the male and female threads.

It is to be understood, of course, that in the last mentioned modification, in which the screw is hardened, as well as the part including the female thread, the interference zones will be limited to a thickness no greater than the thickness of the plating, or other coating, provided on the lobes of the male thread.

It will also be obvious from the foregoing description that screws of arcuate, triangular shape are not required and that it will be permissible for the fastener device to be of any other polygonal cross section. It is merely sufficient that frictional engagement between the male and female thread occur only at circumferentially spaced apart areas and that there be voids between the male and female threads intermediate the lobes and into which voids the excess material of the fastener device may be forced without creating an excessive driving torque beyond the strength limitations of the fastener device itself.

What I claim as my invention is:

1. In combination, a male member and a female member both having preformed, interfering mating thread,

the crest and root of the thread on said male member being of polygonal cross section including circumferentially spaced apart lobes,

the crest of said lobes extending a greater distance outwardly from the axis of said male member than the crest of the thread portions intermediate said lobes, said lobes merging smoothly and gradually with the thread portions of said male member on the opposite sides thereof,

the maximum radial dimension of the thread of said female member being substantially equal to the maximum radial dimension of the thread initially formed on said male member whereby spaces normally exist between the opposite flanks and crest of the thread on said male member and the adjacent flanks and root of the female member at points intermediate said lobes of the thread on said male member, the invention being characterized in that:

(a) said male member including the thread thereof is provided with a plating of a material softer than the material of said member including said female threads whereby there is a material interference between the plated lobes of said male thread and the adjacent portions of said female thread,

(b) the plating on the lobes of said male thread being adapted to be displaced in the circumferential direction of said male thread into said aforementioned spaces by said female thread when driving said male member relatively into said female member.

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U.S. Cl. X.R.

151—22; 85—1; 10—10