April 9, 1957 G. M. RAPATA 2,788,047

PLASTIC NUT HAVING WORKPIECE ENGAGING MEANS

Filed March 5, 1953

Fig. 1.

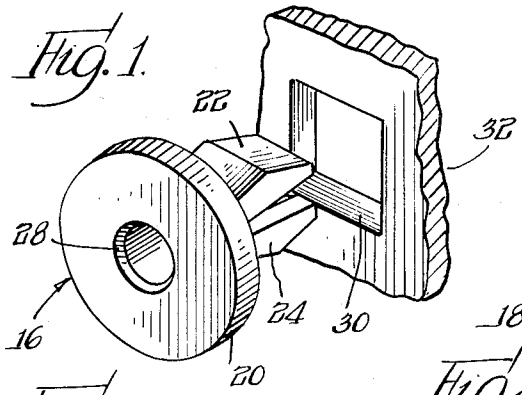


Fig. 2.

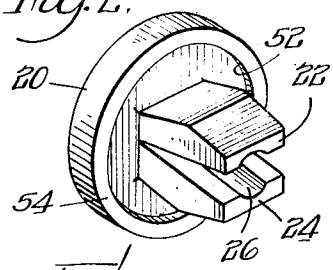


Fig. 3.

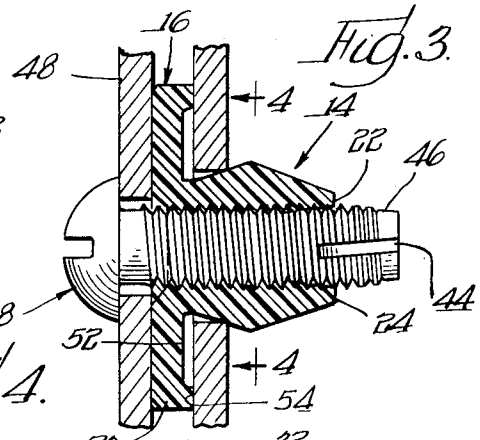


Fig. 4.

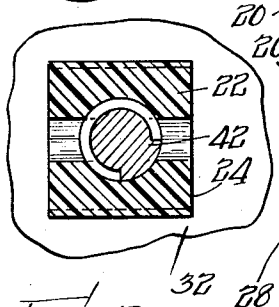


Fig. 5.

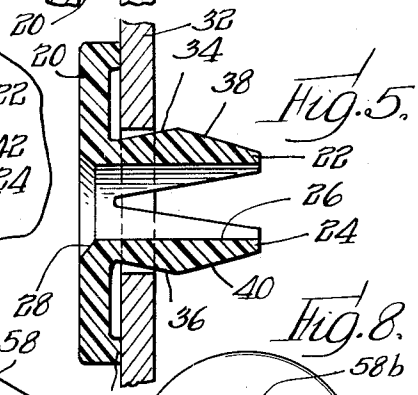


Fig. 6.

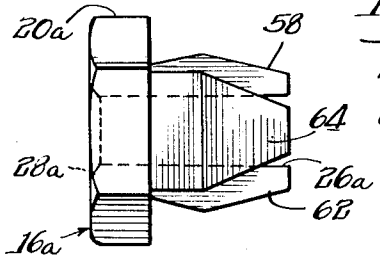


Fig. 7.

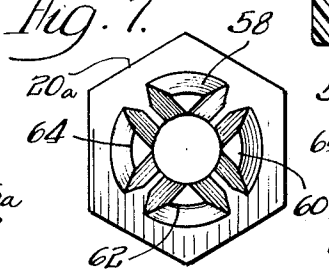


Fig. 8.

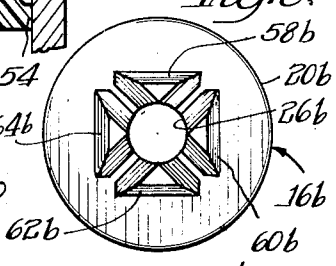


Fig. 9.

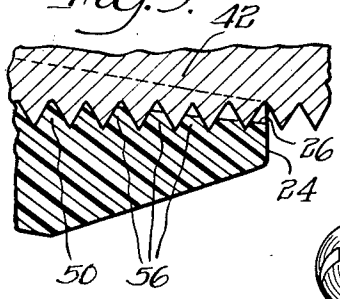


Fig. 11.

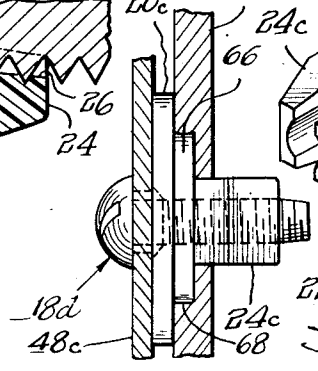


Fig. 10.

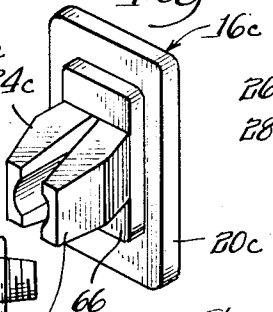
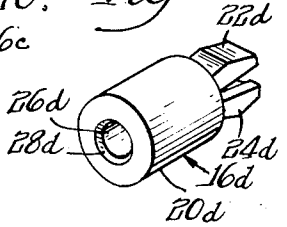


Fig. 12.



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PLASTIC NUT HAVING WORKPIECE ENGAGING MEANS

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Application March 5, 1953, Serial No. 340,625

7 Claims. (Cl. 151—41.75)

The present invention relates to a novel fastening device, and more particularly to a novel fastening device including a novel anchorage member or insert adapted to be placed within an aperture in a work piece to receive and hold a threaded fastener, such as a screw.

An object of the present invention is to provide a novel fastener of the above described type including a novel anchor member adapted to receive and lock a threaded member such as a screw against retrograde movement.

Another object of the present invention is to provide a novel anchor member into which a threaded fastener such as a screw may be easily inserted.

Another object of the present invention is to provide a novel anchor member of the above described type with means for spacing a plurality of work pieces and constructed to seal the aperture into which the anchor member is inserted.

Another object of the present invention is to provide a novel anchor member of the above described type which includes expandable portions insertable in a suitable aperture in a work piece, which anchor member is constructed so as to prevent undue shear strains from being applied to the expandable portions.

A more specific object of the present invention is to provide a novel anchor member of the above described type which is constructed of suitable material so as to provide an insulator.

Other objects and advantages of the present invention will become apparent from the following description and the accompanying drawings, wherein:

Fig. 1 is a perspective view, showing one form of a novel anchor member embodying the principles of this invention in position to be inserted through an aperture in a work piece;

Fig. 2 is another perspective view, showing the anchor member of Fig. 1;

Fig. 3 is a vertical cross sectional view, showing the anchor member of Figs. 1 and 2 assembled in a work piece and a screw threaded through the anchor member and securing another work piece;

Fig. 4 is a cross sectional view taken along line 4—4 in Fig. 3;

Fig. 5 is a vertical cross sectional view similar to Fig. 3, but showing the anchor member before the insertion of the screw;

Fig. 6 is a side elevational view, showing another form of an anchor member embodying the features of this invention;

Fig. 7 is an end view of the anchor member shown in Fig. 6;

Fig. 8 is an end view of another modified form of the present invention;

Fig. 9 is an enlarged fragmentary cross sectional view similar to Fig. 3 and showing the parts in greater detail;

Fig. 10 is a perspective view, showing another form of the present invention;

Fig. 11 is a side elevational view partially in cross section, showing the anchor member of Fig. 10 assembled with suitable work pieces and a screw member; and

Fig. 12 is a perspective view, showing still another modified form of the present invention.

Referring now more specifically to the drawings, wherein like parts are designated by the same numerals throughout the various figures, one form of a fastening device **14** embodying the features of this invention is shown in Figs. 1 through 5 and includes a novel anchor member **16** and a screw **18**. The anchor member **16** may be made of any suitable material which is softer than the material of the screw and is preferably constructed of a suitable plastic to provide desired insulating characteristics.

The anchor member **16** includes a head portion **20** and a pair of shank portions **22** and **24** formed integrally with and extending axially from the head portion. An axially extending bore **26** of substantially uniform diameter throughout its length is provided through the head and shank portions of the anchor member. The diameter of the bore **26** is less than the diameter of the threaded shank of screw **18** so that as the screw is threaded into the bore, complementary threads will be formed in the sides of the bore, and the shank portions will be spread apart, as described more fully hereinbelow. The bore is provided with an enlarged mouth having bevelled sides **28** in order to guide the end of the screw shank and facilitate the initial starting of the screw shank into the bore.

It should be noted that the shank portions **22** and **24** are constructed so as to provide a generally rectangular exterior surface so that upon insertion of the shank portions through a suitable rectangular opening **30** in a work piece **32**, the anchor member will be held against rotation during the application of the screw **18**. Referring particularly to Fig. 5, it will be seen that the shank portions **22** and **24** taper outwardly, as at **34** and **36**, respectively, in order to provide inclined surfaces adapted to engage behind the work piece **32** when the shank portions are expanded or spread apart, as shown in Fig. 3. In addition, it will be noted that the portions of the shanks provided by the inclined surfaces **34** and **36** are thickened to provide added strength and rigidity. The outer free ends of the shanks **22** and **24** taper inwardly, as at **38** and **40**, respectively, to provide cam surfaces for facilitating insertion of the anchor member through the aperture **30**. Furthermore, it will be noted that these free end portions of the shanks are relatively thin and considerably more flexible than the thickened portions of the shanks, which structure has the advantage more fully described below.

The screw **18** is preferably a thread cutting screw which may be of any of the usual constructions. In the embodiment illustrated, the screw **18** includes a threaded shank **42** which is slotted in the usual manner, as at **44**, to provide thread cutting edges. The threads at the free ends **46** of the screw shank preferably are of decreased height so that the end of the screw is in effect tapered to facilitate insertion in the anchor member.

When utilizing the novel fastener of this invention, the anchor member **16** is first assembled with a work piece **32** by passing the shank portions through the aperture **30**. The inwardly inclined surfaces **38** and **40** act as cams to compress the shank portions toward each other so that the thickened portions of the shanks may pass through the aperture to the position shown in Fig. 5. Any suitable work piece **48** is then assembled over the head **20** of the anchor member, and the screw is inserted through a suitable opening in the work piece and into the anchor member. As the screw is threaded into the anchor member, complementary threads are cut in the

walls of the bore **26**, as shown best at **50** in Fig. 9. Furthermore, as the screw progresses through the anchor member, the shank portions **22** and **24** are expanded away from each other so that the inclined surfaces **34** and **36** are pressed tightly against the back of the work piece **32** to hold securely the anchor member in place and to draw the head **20** of the anchor member securely against the face of the work piece. If desired, the work clamping surface of the head **20** may be provided with an annular recess, as at **52**, to assure tight contact of the peripheral edge or flange **54** with the face of the work piece, whereby the aperture **30** is effectively sealed. It should be noted that because of the rigidity of the thickened portions of the anchor shanks, which portions are also backed up by the work piece, the threads **50** cut in the walls of the bore are of full depth for maximum strength. However, as the end of the screw progresses toward the outer thin and relatively flexible ends of the shank portions, only partial threads are formed in the walls of the bore, as shown at **56** in Fig. 9. This is because the relatively flexible free ends of the shank portions are not sufficiently rigid to withstand the forces necessary for cutting full depth threads. It has been found that these partial threads provide an advantage in that they grip the threads of the screw under the pressure caused by the inherent resiliency in material and thereby lock the screw against retrograde movement. In order to get the full benefit of this gripping action, the shank of the screw **18** is preferably sufficiently long so that the tapered end portion **46** thereof is located beyond the end of the anchor member when the screw is fully tightened, and only threads of full height on the screw shank are gripped by the partial threads **56** on the anchor member.

Fig. 6 illustrates an anchor member **16*a***, which is essentially identical to the above described anchor member **16**, as shown by the application of identical reference numerals. However, in this embodiment, four shank portions **58**, **60**, **62**, and **64** are provided and constructed so as to have a cylindrical cross section. Therefore, in order to hold the anchor member **16*a*** against turning while the screw is being inserted, the head portion **20*a*** is provided with a hexagonal configuration. However, it is understood that the particular shape of the head portion **20*a*** may be modified as desired.

Fig. 8 shows an anchor member **16*b*** embodying the novel features of this invention and which combines the features of the above described anchors **16** and **16*a***. Thus, the anchor member **16*b*** is provided with four shank portions **58*b*, 60*b*, 62*b*,** and **64*b***, but these shank portions are constructed to provide a rectangular cross section, whereby upon insertion within a rectangular aperture, the anchor member will be held against rotation. By providing four shank portions, as shown in Figs. 6, 7, and 8, rather than two shank portions, as shown in Figs. 1 and 2, greater flexibility may be imparted to the shank portions so that materials having a greater inherent rigidity may be utilized.

Fig. 10 illustrates an anchor member **16*c***, which is constructed in a substantially identical manner to the anchor member **16**. However, another important feature of this invention is illustrated by this embodiment, and this feature includes a strain relief shoulder **66** between the shank portions and the head portion of the anchor member. Thus, when the anchor member **16*c*** is assembled in a suitable work piece **32*c*** having a recess **68** adapted to accommodate the strain relief shoulder substantially the greater portion of shear stresses is removed from relatively weak shank portions of the anchor member. It will be understood, of course, that the strain relief shoulder **66** may be applied to any of the forms of the invention illustrated and described herein and that if desired the undercut or recessed work clamping surface for providing a seal, as described with particular reference to Fig. 3, may also be provided in any of the embodiments illustrated herein.

Fig. 12 shows an anchor device **16*d***, which is identical to the previously described anchor device **16**, except that the head **20*d*** is of considerable axial extent to provide greater a space between the work pieces.

From the above description, it is seen that the present invention provides a simple fastening device including the novel anchor, which novel anchor may be simply and economically manufactured from an integral blank of suitable material, such as plastic, and which anchor may be easily assembled with a work piece. Furthermore, it is seen that the novel construction of the anchor permits the screw to be easily assembled therewith and effectively locks the screw against retrograde movement. The preferred form of the anchor shown in Figs. 1 through 5, which has only two shank portions, has been found to provide the greatest resistance to thread stripping and also greater locking action by the partial threads formed at the free ends of the shanks. In addition, it is seen that the novel anchor member provided by this invention may be easily held against rotation during the application of a screw thereto either by the rectangular formation of the expandable shanks or by the non-circular formed head. The novel structure of the present invention also provides an anchor member, wherein shear strains are substantially relieved from the relatively weak expandable shanks, and wherein the aperture in the work piece may be effectively sealed.

While the preferred embodiments of the present invention have been shown and described herein, it is obvious that structural details may be changed without departing from the spirit and scope of the appended claims.

I claim:

1. A one-piece plastic rivet type fastener including a four-sided shank adapted for axial insertion within a complementary work aperture, and a head extending radially outwardly from one extremity of said shank, said shank being bifurcated by a longitudinal recess which bisects the opposed peripheral sides of the shank so as to present a pair of laterally spaced, transversely yieldable shank sections having opposed longitudinal grooves along their inner surfaces defining axial continuations of a central substantially cylindrical aperture in the head for accommodating a rotary thread-forming screw, the bisected opposed peripheral sides of the shank being sufficiently flat to join adjacent sides of the shank at relatively sharp angles to provide relatively sharp meeting edges whereby to counteract tendency of the fastener to rotate in the work, said shank sections being separated by said longitudinal recess a distance less than the diameter of said central aperture whereby to provide opposed peripheral shank sides of substantial width adjacent said recess, the peripheral surfaces of said shank sections oppositely disposed from each of said longitudinal grooves also having substantial width and tapered at their free ends to facilitate initial insertion of the shank within a complemental work aperture, shoulders intermediate the head and free extremities of said yieldable shank sections cooperating with the head to secure the fastener within the work after the shank has been snapped into position within a work aperture, the peripheral surfaces defined by said opposed sides of each shank section in the vicinity of the head which intersects the shank bifurcation and the other peripheral shank surfaces being cooperatively disposed for engagement with complemental work surfaces which define a work aperture to prevent rotation of the fastener in the work when a thread-forming screw is rotatably applied thereto.

2. A one-piece plastic rivet type fastener as set forth in claim 1, wherein the free extremities of the shank sections are relatively thin as compared with the remainder of said shank sections whereby said free extremities will yield radially outwardly when the external thread of a thread-forming screw is rotated into engagement therewith and thus counteracting tendencies for the screw to experience retrograde rotation.

3. A one-piece plastic rivet type fastener as set forth in claim 1, wherein the head of the fastener is undercut between the shank and the outer periphery of the head so as to facilitate sealing engagement of the head with the work surface.

4. A one-piece plastic rivet type fastener as set forth in claim 1, wherein the central aperture in the head is enlarged in the vicinity of the outer surface of said head to facilitate insertion within said recess of a thread-forming screw.

5. A one-piece plastic rivet type fastener as set forth in claim 1, wherein a shear relief shoulder is provided at the juncture of the shank with the head.

6. A one-piece plastic rivet type fastener as set forth in claim 1, wherein the substantially cylindrical recess within the fastener is unthreaded over a substantial portion of its extent.

7. A one-piece plastic rivet type fastener including a four-sided shank adapted for axial insertion within a work aperture, a head extending radially outwardly from one extremity of said shank, said shank being bifurcated by a longitudinal recess which bisects the opposed peripheral sides of the shank so as to present a pair of laterally spaced, transversely yieldable shank sections having opposed longitudinal grooves along their inner surfaces defining axial continuations of a central substantially cylindrical aperture in the head for accommodating a rotary thread-forming screw, the bisected opposed peripheral sides of the shank being sufficiently flat to join adjacent sides of the shank at relatively sharp angles to provide relatively sharp meeting edges, said shank sections being separated by said longitudinal recess a distance less than the diameter of said central aperture whereby to provide opposed peripheral shank sides of substantial

width adjacent said recess, the peripheral surfaces of said shank sections oppositely disposed from each of said longitudinal grooves also having substantial width and tapered at their free ends to facilitate initial insertion of the shank within a work aperture, shoulders intermediate the head and free extremities of said yieldable shank sections cooperating with the head to secure the fastener within the work after the shank has been snapped into position within a work aperture, and shear relief shoulder means projecting axially from the clamping side of said head and including portions extending laterally from opposed bifurcated peripheral shank surfaces, said shoulder means being shaped and disposed for engagement with complemental surfaces which define a work aperture to oppose rotation of the fastener in the work when a thread-forming screw rotatably applied thereto.

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