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2,183,085

SNAP FASTENER

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Fig. 1.

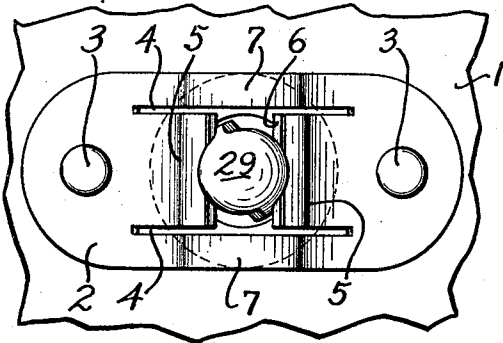


Fig. 5.

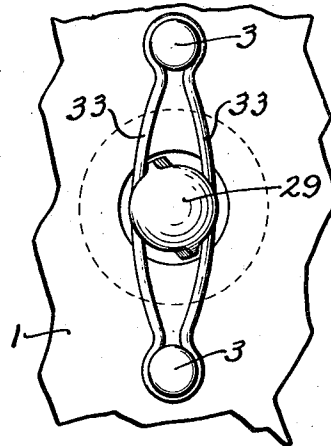


Fig. 2.

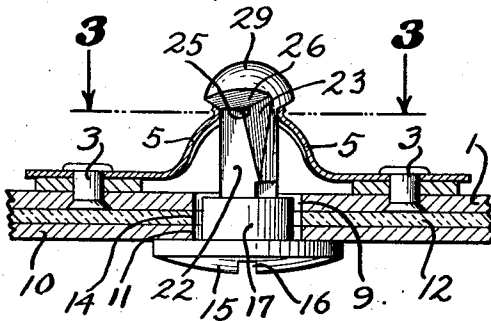


Fig. 3.

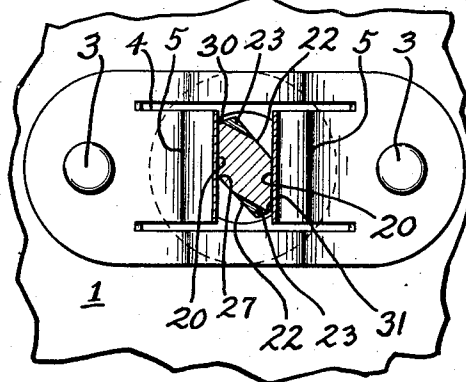
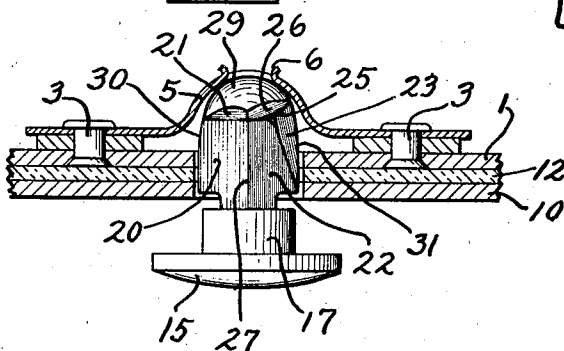


Fig. 4.



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SNAP FASTENER

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5 Claims. (Cl. 85-5)

My invention relates to snap fasteners, and more particularly to a snap fastener which is ideally adapted for coupling metal members.

One desirable use of my invention is in the locking of cowls around airplane engines, wherein a fastener is required that is quickly removable but which is positively locked in use.

Among the objects of my invention are: To provide a snap fastener that can be locked; to provide a snap fastener which can be easily removed by rotation; to provide a separable fastener which is simple in construction, cheap of manufacture, and efficient in use; and to provide a separable fastener having a self-centering stud.

Other objects of my invention will be apparent or will be specifically pointed out in the description forming a part of this specification, but I do not limit myself to the embodiment of the invention herein described, as various forms may be adopted within the scope of the claims.

Referring to the drawing:

Fig. 1 is a top view in elevation of one preferred form of my invention.

Fig. 2 is a view partly in section and partly in elevation, of the device shown in Fig. 1.

Fig. 3 is a view partly in section and partly in elevation, taken as indicated by the line 3-3 in Fig. 2.

Fig. 4 is a view partly in elevation and partly in section, showing an intermediate stud position.

Fig. 5 is an elevational view of my invention, utilizing a wire type spring.

My invention may be more fully understood by direct reference to the drawing.

A foundation member 1, for example, made of sheet metal or similar material, is provided with a spring member 2 fastened to foundation member 1 by rivets 3. Longitudinal cuts 4 are made in the spring member 2, the material between the cuts is centrally split, and spring lips 5 are turned upwardly away from the foundation member 1 to create parallel spring edges 6 which are rolled to provide smooth, parallel working edges thereon. In some instances, in order to give a sufficiently long upward throw to the spring lips 5, it is desirable to form a bow 7 on each side of the spring lips 5.

Foundation member 1 is provided with a foundation aperture 9 immediately below parallel edges 6, and a movable member 10, which is to be attached to foundation member 1 by the use of the stud later to be described, is also provided with a movable member aperture 11. In many

cases it is desirable to have a chafing strip 12 between the movable member and the foundation member 1, and this chafing member is also provided with a registering aperture 14.

In order to lock the movable member 10, 5 chafing member 12, and foundation member 1 firmly together, I make use of a stud, preferably of hardened, rustless material, having a head 15 provided with a slot 16, the latter being of sufficient width to accommodate a tool, such as a screw driver, a coin, or similar device. Adjacent the head 15 of the stud and forming a part of the body thereof is a shoulder 17 which can be made of any size desired and utilized, if necessary, to obtain absolute registration of the movable member and the foundation member. Many times, however, this absolute registration is not desirable, and in the stud illustrated a space is provided between the shoulder 17 and the members to be fastened, in order that a slight movement 20 or give to the joint may occur.

The remainder of the body of the stud has four separate surfaces comprising two similar pairs of surfaces diagonally spaced, the cross-section of the stud at the level of these surfaces being roughly of diamond shape. One pair of surfaces 20 is completely planar, and each surface 20 joins outwardly with an end plane 21. The line of junction of surface 20 and surface 21 crosses the axis of the stud at an angle of 90°.

Each one of the other pair of surfaces has a main portion 22 in one plane and an auxiliary portion 23 in another plane at an obtuse angle to the first portion. Portions 22 and 23 terminate outwardly along a curved junction 25 with an angular planar end surface 26, and junction 25 is at an angle greater than 90° to the axis of the stud and to junction line 27 between planes 20 and 22. The end of the stud is a bulbous terminal 29 which, in this case, is shown as substantially spherical but may of course be of other curvatures, although a section of terminal 29, taken immediately above end planes 21 and 26, will be substantially circular. Opposing acute planar junctions 30 and 31 form the sharp edges of the stud and are continuations of the curvature of bulbous terminal 29, and the widest portion of the stud occurs below the level of both end planes 21 and 26.

Having described the angular relationships of the planar surfaces on the main body of the stud, I will now describe its operation as a fastener, and it is to be distinctly understood that curved surfaces following the general extent of the planes described can be used. In this case the

cross-section will be elliptical rather than diamond shaped.

In Fig. 4 the bulbous portion 29 of the stud is inserted through apertures 11, 14 and 9 in the three members to be coupled. If the stud is forced directly ahead, with the stud in the position shown in Fig. 4, it will not lock because the spring edges 6 will be bearing wholly on junctions 30 and 31, spreading the springs 5 but not allowing any coupling to take place. If, however, the stud is turned from its position in Fig. 4 very slightly clockwise, or to the right in the drawing, the right hand spring edge 6 will, when the stud is forced in to its limit, pass onto angular end plane 26 on one side and the opposite edge 66 will do the same for the similar surface 26 diagonally across from terminal plane 26. Angular plane 23 then automatically turns the stud onto main planar surface 22, due to the urge of the springs, and spring edges 6 are caught beneath end plane 26. The stud thereby couples elements 1, 10 and 12. If, when edges 6 are resting on plane 22 the stud is turned counter-clockwise, spring edges 6 will ride up onto junctions 30 and 31 and the stud will be thrown out of the apertures because of the convergence of junctions 30 and 31.

Thus, the stud may always be engaged by forcing the stud inwardly, with planes 22, 31 and 26 roughly parallel to edges 6, and may always be disengaged by turning the stud counter-clockwise when edges 6 are on the same surfaces. It will of course be obvious to those skilled in the art that all four main surfaces might be made similar to the main surface comprising planes 22, 23 and 26, and when this is done it will be obvious that the stud can be disengaged by turning the stud in either direction and engaged by pushing the stud inwardly in practically any position except the dead center position shown in Fig. 4.

However, I prefer to provide the assembly with a positive lock, and for that reason end plane 21 has a junction which is rectangular with obtuse junction 27 or to the axis of the stud, so that after the stud has been engaged and has come to rest in its normal engaged position directly after engagement, i. e., with edges 6 in contact with plane 22, the stud can be rotated one-quarter turn so that edges 6 will then rest adjacent the junction of planes 20 and 21. This position is shown in Fig. 3, and this position is a stable position because of the urge of spring lips 5 against the stud with all surfaces parallel, and the stud is locked. The stud cannot be removed by continued rotation clockwise because the springs can be made to have insufficient travel to accommodate the extreme width of the stud. To unlock, the stud is rotated first from the position shown in Fig. 3 back onto plane 22. This rotation must be made forcibly by a tool because of the spring pressure tending to hold the stud in its locked position. Continued rotation counter-clockwise will then release the stud in its entirety.

It will thus be seen that I have provided a stud which is rotatable in a counter-clockwise direction to unlock first and release later, and may be pushed in to engage and thereafter rotated clockwise to lock. Obviously, however, the reverse sequence may be used. The locking position is extremely valuable when such fasteners are utilized on airplanes, for example, where it is imperative that vibration will not release the stud, as might be the case if the stud were not rotated to locking position after engagement.

In Fig. 5 I have shown a modification wherein the entire spring is made of wire formed roughly

into the shape of an ellipse, bent upwardly in the center. The wire itself, under these conditions, forms edges 33 corresponding to edges 6 of the previously described embodiment. Other modifications of the spring means will be apparent to those skilled in the art, and I do not wish to be limited to the particular modification shown herein.

I claim:

1. A separable fastener for fastening a removable member to a foundation member, said members having registering apertures therein comprising a spring member mounted on one of said members and having parallel spaced edges positioned above and on each side of the axis of said apertures, and a stud having a head of greater diameter than said aperture, and a bulbous end thereon of greater diameter than the spacing between said edges, whereby said edges will be forced apart against the urge of said spring when said stud is passed through said apertures and said bulbous end forced against said edges, said stud having a portion intermediate said bulbous end and said head, said intermediate portion having four surfaces positioned to give substantially a diamond shaped cross-section to said intermediate portion with the acute angles of said diamond forming a continuation of the curve of said bulbous end with the greatest diameter of said intermediate portion, and terminal surfaces for guiding said edges by rotation of said stud onto two of said intermediate portion surfaces.

2. A separable fastener for fastening a removable member to a foundation member, said members having registering apertures therein comprising a spring member mounted on one of said members and having parallel spaced edges positioned above and on each side of the axis of said apertures, and a stud having a head of greater diameter than said aperture, and a bulbous end thereon of greater diameter than the spacing between said edges, whereby said edges will be forced apart against the urge of said spring when said stud is passed through said apertures and said bulbous end forced against said edges, said stud having a portion intermediate said bulbous end and said head, said intermediate portion having four surfaces positioned to give substantially a diamond shaped cross-section to said intermediate portion with the acute angles of said diamond forming a continuation of the curve of said bulbous end with the greatest diameter of said intermediate portion, and terminal surfaces for guiding said edges by rotation of said stud onto two of said intermediate portion surfaces, said terminal guiding surfaces being associated with two parallel intermediate portion surfaces only.

3. A separable fastener for fastening a removable member to a foundation member, said members having registering apertures therein comprising a spring member mounted on one of said members and having parallel spaced edges positioned above and on each side of the axis of said apertures, and a stud having a head of greater diameter than said aperture, and a bulbous end thereon of greater diameter than the spacing between said edges, whereby said edges will be forced apart against the urge of said spring when said stud is passed through said apertures and said bulbous end forced against said edges, said stud having a portion intermediate said bulbous end and said head, said intermediate portion having four surfaces positioned to give substantially a diamond shaped cross-section to said intermediate portion with the acute angles of said diamond

forming a continuation of the curve of said bulbous end with the greatest diameter of said intermediate portion, and terminal surfaces for guiding said edges by rotation of said stud onto two of said intermediate portion surfaces, said terminal guiding surfaces being associated with two parallel intermediate portion surfaces only, and a terminal surface on the other two intermediate portion surfaces parallel to and in contact with said edges when said stud is further rotated onto said other two intermediate portion surfaces.

4. Apparatus in accordance with claim 1,

wherein said terminal guiding surfaces are cut into said bulbous end at an outwardly extending angle to said edges.

5. Apparatus in accordance with claim 1, wherein said terminal guiding surfaces are cut into said bulbous end at an outwardly extending angle to said edges, and wherein there are auxiliary guiding surfaces modifying the angle of the first two mentioned intermediate portion surfaces, said auxiliary surfaces forming a junction with said terminal guiding surfaces at an angle to said edges.

HARRY W. RICHARDSON.