D. BOURQUE.

STUD AND SOCKET FASTENER.

APPLICATION FILED JUNE 14, 1917.

1,321,974.

Patented Nov. 18, 1919.

Fig. 3.

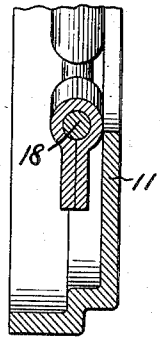


Fig. 1.

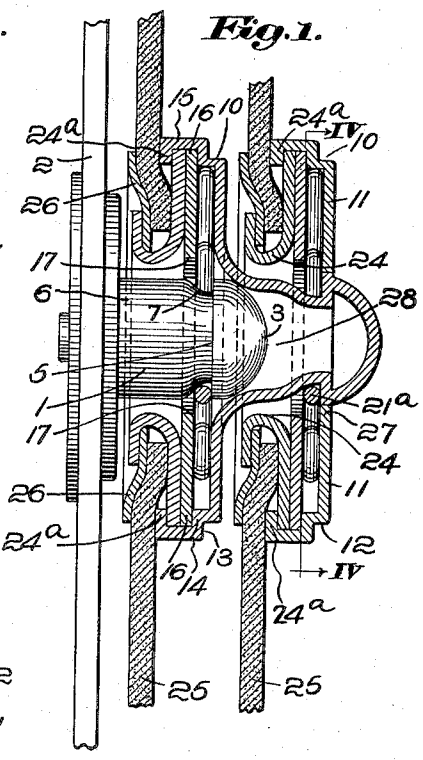


Fig. 2.

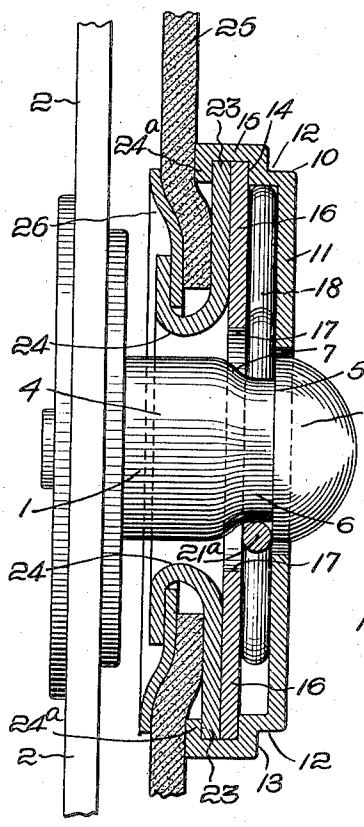


Fig. 7.

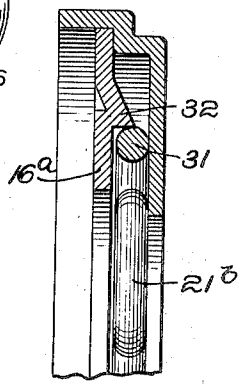


Fig. 5

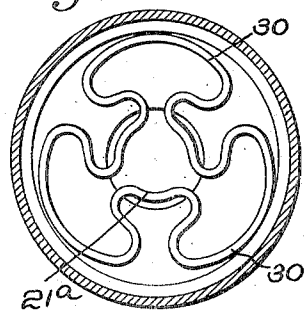


Fig. 4.

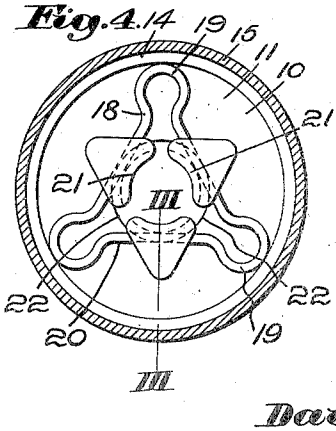
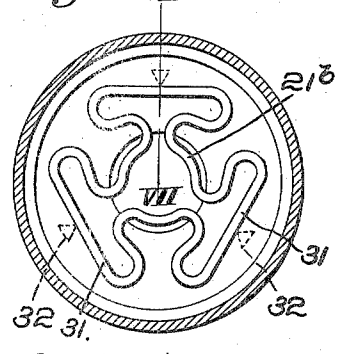


Fig. 6.



Inventor:

David Bourque.

by Emery, Booth, Janney & Varney

Attys.

UNITED STATES PATENT OFFICE.

DAVID BOURQUE, OF AMESBURY, MASSACHUSETTS, ASSIGNOR TO G. W. J. MURPHY CO., OF AMESBURY, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

STUD-AND-SOCKET FASTENER.

1,321,974. Specification of Letters Patent. Patented Nov. 18, 1919.

Continuation of application Serial No. 109,378, filed July 14, 1916. This application filed June 14, 1917 Serial No. 174,765.

To all whom it may concern:

Be it known that I, DAVID BOURQUE, a subject of the King of Great Britain, and a resident of Rocky Hill, Amesbury, in the county of Essex and Commonwealth of Massachusetts, have invented an Improvement in Stud-and-Socket Fasteners, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to that class of stud-and-socket fasteners in which the socket is provided with yielding jaws to receive and lock over the head of the stud.

My invention provides a fastener of the type described, suitable for almost universal use as a snap fastener, but particularly adapted for use on vehicle curtains, and the like, where it is essential that the curtain carrying the socket be so securely attached to the stud that it will not be disengaged therefrom by the flapping of the curtain or an outward strain thereon due to wind pressure. A fastener constructed in accordance with my invention is more convenient to apply and use than those hitherto known and also has superior holding power.

My invention will best be understood by reference to the following description of an illustrative embodiment thereof taken in connection with the accompanying drawing showing the same, wherein:

In the drawings, Figure 1 is a central sectional view of the fastener showing one socket member carrying a stud, and a second socket engaged over said stud;

Fig. 2 a central sectional view of a stud and socket member, said socket member being formed without the integral stud;

Fig. 3 a detail sectional view on the line III—III of Fig. 4;

Fig. 4 a transverse sectional view of the socket member on the line IV—IV of Fig. 1;

Fig. 5 a view similar to Fig. 4, showing a slightly different form of spring locking jaws;

Fig. 6 a similar view of another slightly different form of locking jaws;

Fig. 7 a detail sectional view on the line VII—VII of Fig. 6.

Referring more particularly to Fig. 2, the fastener which I have there shown for purposes of illustration includes a stud member 1 adapted to be fastened to a curtain or suitable rigid support 2. The stud, which may be secured to the support in any suitable manner, is formed with an enlarged head 3 and a comparatively long shank 4. The head defines inwardly thereof a shoulder 5 and, while such a construction is not necessary to all embodiments of my invention, preferably the shoulder 5 is abrupt or square, that is, the shoulder is substantially perpendicular to the axis of the stud or is undercut so that the jaws presently to be described when seated behind the shoulder will be positively locked by the same without the latter exerting any force tending to unseat the jaws. The diameter of the shank portion of the stud may be reduced adjacent the head to form a neck 6, this neck in the embodiment shown being joined to the main portion of the shank by a curved surface 7. The purpose of thus reducing the shank to form a neck is to provide positioning means for the socket member so that it will not slide inwardly along the shank of the stud. This construction, however, while desirable is not essential. It should be noted that the neck 6 is substantially co-axial with the shank and head or, in other words, is uniformly reduced at every side and that the stud is therefore perfectly symmetrical. The head 3 beyond the shoulder 5 is here shown as rounded but of course it may be of any desired or suitable contour.

The socket member may consist of a cylindrical casing or eyelet 10, having a front or outer wall 11 and a short cylindrical wall 12. At the inner end of the cylindrical wall is formed a short annular flange 13, said flange forming the radial shoulder 14. At the outer end of the radial flange is formed a cylindrical portion 15. Within this cylindrical portion and bearing against the shoulder 14 is a washer 16, the purpose of which is to retain in place the spring jaws of the socket as hereinafter described, said washer having a central aperture 17. Between the front wall 11 of the socket member, and the washer 16, is arranged the spring locking jaws, the wall 12 being of sufficient length to form a narrow space or jaw-receiving chamber in which the jaw structure fits snugly, but yet is free to be operated by the stud member.

The locking jaws may be formed of suitable spring wire. In Fig. 4 I have shown one suitable arrangement of these jaws comprising a spring structure 18 which is of generally triangular form the parts corresponding to the apices of the triangle being formed as circular spring members 19 connecting the straight side members 20.

At the center of each of the three straight members is secured a jaw piece 21, said jaw pieces being clamped about said straight portions and preferably being concave on their inner faces so that the three jaw pieces coöperate to form a substantially annular gripping surface adapted to engage behind the shoulder 5 of the stud. Between adjoining jaws or stud-engaging portions is a space 22 so that the jaws may move inwardly and outwardly without engaging each other.

It will be noted that the spring structure shown in Fig. 4, as well as those illustrated in Figs. 5 and 6 (which will be described in detail hereinafter) has manifold, and preferably as shown three-fold, symmetry about the center. By manifold symmetry I mean that if a portion of the structure were imagined as rotating about the center for a fraction of a revolution, one-third for three-fold symmetry, one-quarter for four-fold symmetry, etc., that it would in its new position coincide with the part of the structure already occupying that position. This is sometimes referred to as "radial" symmetry and is similar to that of the petals of a flower. The importance of this construction in the present instance lies in the fact that it provides a perfectly balanced structure. The jaws are permitted to yield outwardly in truly radial directions in one plane and they press inwardly to locking position equally on all sides, thus firmly securing the head structure in place. Furthermore, by this symmetrical arrangement it is immaterial how the socket is placed on the curtain 25 so long as it is adapted to register with the stud 1.

As I have stated the jaw structure might be of the general form of any polygon but it is preferably substantially triangular as shown, or, more accurately expressed, it has a three-fold symmetry. The reason for this is that a triangle forms in itself a trussed frame which apart from the actual bending of the material of which it is composed, can not be distorted or changed in shape as, for example, a square can be distorted into an oblique parallelogram without bending or breaking the sides. This arrangement of the jaws as elements of a trussed frame contributes to accurate centering thereof as each will be held by the other two at the same radial distance from the center and at the same angle. Furthermore, this arrangement contributes to the symmetrical and accurately radial yielding of the several jaws and therefore the stud is much more securely held.

While not essential to all embodiments of my invention, particularly those in which the shoulder 5 of the stud is abrupt as described, I preferably so design the spring jaw structure that it will have a definite limit of outward yielding. Referring to Fig. 4, it will be apparent that as the jaws are spread outwardly the sides of the triangular structure tend to straighten out and that the distance which they may give in practice is limited, this distance varying with the gage and resiliency of the wire used. The diameter of the circle formed by the arc-shaped gripping jaws 21 is normally equal to the diameter of the neck 6 of the stud. The extreme diameter to which they may be spread should preferably be less than the diameter of the head 3 measured across the shoulder 5. It would, however, be greater than the distance measured from one side of the neck 6 to the opposite extremity of the shoulder. Thus if the jaws are symmetrically pressed apart they still can not be brought over the locking head 3 but will reach their limit of elasticity before such release can take place. If a downward pull, viewing Fig. 2, is exerted on the socket member, however, the lower jaw can be carried past the edge of the shoulder and if the socket is then tipped, it can be removed from the stud, the action being like that of a button in a button hole. While, as will later appear, this construction of the spring is not necessary if the shoulder 5 is an abrupt one, I prefer to use it. The length of the shank of the stud as described provides a clearance which permits the socket member to be tipped sharply so as to permit this manipulative action.

The socket may be secured in position in any suitable manner but I preferably make use of a gromet of tubular rivet 24 having a large flange 23 fitting against the washer 16, said gromet being secured in position by an annular inturned flange 24^a of the socket casing. This flange 24^a also serves to permanently secure the washer 16 in position against the shoulder 14. The tubular rivet or gromet extends through an aperture in the curtain 25, and its inner end is turned outwardly and bent down over a clenching washer 26, the said washer and the turned-over portion of the rivet clenching and locking the curtain against the flange 23 of the rivet and against the inturned flange 24^a of the socket. By this means the curtain material is clenched and locked over the said flange 24^a, thereby strongly attaching the socket member to the curtain. The stud member enters the socket member through the tubular rivet and passes through the aperture 17 in the spring-retaining washer.

While it is within the scope of my invention in certain aspects thereof to utilize the flange 23 of the tubular rivet as a wall of the chamber which retains the spring jaw structure in position, it is preferable to use a separate washer 16 as shown. The reason for this is that the wall of the chamber should, as shown in Fig. 4, extend very close to the gripping faces of the jaws 21 so as to afford a firm support for the jaw structure when the stud pulls lengthwise upon it. If it were attempted to utilize the flange of the rivet for this purpose and to carry it down as far as the inner edge of the washer 16 as shown in Fig. 2, it would be necessary to bend the flange 23 at a very sharp angle and when it was attempted to fasten the socket to a curtain by riveting on the other end of the rivet on the washer 26, the rivet might break where bent and in any event would be pressed down toward the front wall 11 of the socket and probably would jam the spring structure 18 between itself and such front wall. When the washer 16 is utilized, however, the rivet may be turned outwardly at a much greater distance from the center of the socket as shown and bent along a curve, thus providing a conical support which will transfer along the elements thereof the forces developed when the end of the rivet is turned over at the other side of the curtain. The jaw structure 19 may, therefore, when a separate washer is used, be disposed in a chamber which fits it snugly and confines its action to a single plane but in which there is no tendency for it to jam.

In Fig. 1 two forms of socket member are shown. In one the front wall 11 of the socket is formed with a central aperture 27, through which the head of a stud member may project. The other socket member is formed with an outwardly extending hollow stud 28, the said stud being in form like the stud member 1. As shown in said Fig. 1, the head of the stud member 1 extends into the hollow stud 28, and the head of the stud 28 projects through the aperture 27 in the second socket member. This arrangement of parts, and these two forms of socket members, are desirable where two or more curtains are to be secured at the same point. Heretofore it has been the custom to use what are termed "double" curtain fasteners, or "triple" curtain fasteners for securing two or more curtains at the same point. Such curtain fasteners are usually provided with long studs adapted to receive two or more curtains. These special forms of studs rendered the fasteners expensive to manufacture and were unsightly when the curtains were not in position. By the form of fastener described herein the stud member attached to the rigid part of the vehicle will always be a short stud adapted to receive a single curtain. Where two or more curtains are to be fastened at the same point, the first curtain to be fastened to the stud will be provided with a socket having an integral supplemental stud 28. The curtain to be fastened over the supplemental stud 28 may be provided with a socket member having the aperture 27 in its outer wall 11, or with a supplemental stud 28 formed thereon, depending on whether or not another curtain is to be secured at the same point. Where a single curtain is to be secured as shown in Fig 2, a socket member having the aperture 27 in its front wall will be used.

In Fig. 5 I show a slightly different form of jaw structure. In this form of device the jaw structure consists of a spring wire bent to form jaw sections 21^a, said jaw sections being connected together by the outwardly curved spring portions 30. These curved portions bear against the inner wall of the annular part 12 of the socket member, thereby centering the jaw members in the socket and permitting said members to spring outwardly to permit of the passage of the stud member.

In Fig. 6 another slightly different form of jaw structure is shown. In this form of the device the jaw sections 21^b are connected together by the straight members 31. The spring-retaining washer 16^a is formed with the inwardly extending lugs 32 which engage the straight portions 31 of the jaw structure, as shown clearly in Fig. 7, and in dotted lines in Fig. 6. These lugs center the jaw structure in the socket member and permit the jaw sections to spring outwardly under the action of the stud and during the operations of inserting and withdrawing the stud from the jaw member.

All of the jaw structures shown have threefold symmetry about a center. The three jaws are arranged equal distances apart around the center of the socket member, and each jaw is free to move radially outwardly; and in each structure there is a slight space between adjoining jaw members.

The locking jaws preferably are circular or semi-circular in cross section and the head 3 of the stud may be of such diameter that the shoulder 5 will extend slightly beyond the center of the circular or semi-circular portions of the locking jaws as indicated in Figs. 1 and 2. The result of this is that, even independently of the strength of the springs as described above, the two members of the fastener cannot be disengaged or disconnected by a direct outward or separating pull. The shoulder 5 will engage the jaw members on their outer sides at a point directly in line with the center of the wire forming the jaws and the head will extend outwardly beyond said point of engagement.

If it is desired to separate the parts they must be laterally moved relatively to each other to distort the jaws and permit one of them to move clear of the shoulder and they must then be sharply tilted to move the jaw over the shoulder with an unbuttoning action. The shank 4 of the stud is formed of such length as to provide a clearance for the socket member which permits it to be placed in the sharply angular position relative to the stud which permits this action. Only such a tipping of the stud as would result from an intentional manipulation thereof will cause disengagement, the slight tipping which might be caused by the bellying of the curtain 25 under wind pressure not being sufficient. The arc shape of the gripping jaws which collectively substantially embrace the neck of the stud coöperates in keeping the fastener locked against accidental displacement, since a considerable segment must be lifted clear from its seat. These arc-shaped surfaces clasp the neck of the stud and effectually prevent such movement as might cause the head to enter between adjacent parts of the spring jaw system and wedge the jaws away from their seats at times when it was not desired to loosen the fastener. As will be seen in Figs. 4, 5 and 6, the portions of the spring other than the arc-shaped jaw portion are housed in the casing away from the opening which receives the stud and so shielded from contact with the head 3. The jaw portions proper which project at the margins of the opening are adapted to lie entirely behind the shoulder 5. This result is most conveniently obtained by giving them the arc-like form shown and described.

It will be noted that the operation of unfastening the device is a perfectly natural one, since the sockets are usually placed at the edge of a curtain or the like, which would naturally be seized by its edge and given a combined downward and outward pull which would release one of the jaws and tip the socket so as to move this jaw over the head 3. At the same time, the structure of my fastener must not be confounded with that of the ordinary snap fastener such as is used on gloves and the like, which is ordinarily released by a strain similarly applied. These fasteners are not positively locked but depend for their security solely on the strength of a spring which is seated at the inward end of a beveled shoulder. When outward pressure is exerted the springs ride up this shoulder and are released. Although the strain in unfastening a glove, for example, is applied from one side, the fastener might equally be separated by a direct pull and in fact is so separated, since the socket member of such a snap fastener has no clearance from the base of the stud member which would permit such an unbuttoning action as I have described. Such snap fasteners obviously would be unadapted for use on vehicle curtains and in similar situations where wind pressure can apply considerable strain. A fastener is desired which will be positively locked except when it is deliberately manipulated for unfastening.

An important feature of my invention is the absolute symmetry of the device. This is of importance in applying the fasteners since it is not necessary to consider at what angle the sockets need to be placed properly to mate with the sides as has been necessary in stud and socket fasteners of the prior art. It will be appreciated that in the case of the curtain for example, which has a curved edge, that this accurate positioning would be a very delicate operation and that slight inaccuracies would cause a good deal of trouble in the manipulation of the stud. A major advantage is that while the stud is firmly held from all sides, except when the socket is voluntarily tipped as described, this tipping action may take place from any side of the stud. For example, if a person in a vehicle desires to manipulate the side curtains on the outside without leaving his seat, it is a very considerable convenience to be able to separate them by a pull in whatever direction chances to be most convenient.

While I have herein described in considerable detail the form of fastener illustrated in the accompanying drawings and in describing its structure and function used specific words and phrases, it will be understood that my purpose in so doing was to make the form and purpose of the mechanical elements disclosed more readily apparent and that it was not intended to imply thereby that the specific details illustrated are of the essence of the invention. What I do claim and desire to secure by Letters Patent is:

1. A fastener comprising, in combination, a socket member having a set of radially yieldable jaws and a stud member having an enlarged head to engage said jaws and a long shank, said head being joined to said shank by an abrupt shoulder positively to lock against said jaws when the socket member is strained longitudinally of the shank, said shank being of a length to provide a clearance to permit the socket member to be tipped relatively to the shank whereby to permit the jaw structure to be drawn over one side of the head, said socket member being freely tippable in any direction about said stud member.

2. A fastener comprising, in combination, a socket member having a set of radially yieldable jaws and a stud member having a shank and an enlarged head, said jaws being designed for a limit of yielding to provide an opening between them less than the

maximum diameter of the head and said shank being of a length to provide a clearance to permit the socket to be tipped relatively to the shank whereby the jaw structure can be drawn over one side of the head.

3. A fastener comprising, in combination, a socket member comprising a casing and a jaw system therein including three or more outwardly yieldable jaws arranged about a center and a stud having a shank and an enlarged head joined to said shank by an abrupt annular shoulder positively to lock against said jaws when the socket member is strained longitudinally of the shank, said shank being of a length to provide a clearance to permit the socket member to be tipped relatively to the shank whereby to permit the jaw structure to be drawn over one side of the head.

4. A fastener comprising, in combination, a socket member comprising a casing and a jaw system therein comprising three or more outwardly yieldable jaws arranged about a center and a stud having a shank and an enlarged head behind which the jaws are adapted to seat, said jaws having a limit of outward yielding to provide an opening between them of less size than the maximum diameter of the head and said shank being of a length to provide a clearance to permit the socket to be tipped relatively to the shank whereby the jaw structure can be drawn over one side of the head.

5. A fastener as described in claim 3 in which the engaging faces of the jaws are arcs collectively substantially embracing the shank of the stud.

6. A fastener as described in claim 4 in which the engaging faces of the jaws are arcs collectively substantially embracing the shank of the stud.

7. A fastener as described in claim 3 wherein the jaw system has threefold symmetry whereby undesired distortion of the system is prevented.

8. A fastener comprising, in combination, a stud having an enlarged head with a shoulder, a socket member comprising a casing having a central opening to receive the stud and stud holding means in said casing comprising arc-shaped gripping jaws presented at the margin of said opening and collectively substantially embracing the stud behind said shoulder and spring sustaining means for the jaws housed within the casing laterally of the opening, the shank of the stud being of a length to provide a clearance to permit the socket to be tipped.

9. A fastener comprising, in combination, a stud having an enlarged head with a shoulder, a socket member comprising a casing having a central opening to receive the stud and stud holding means in said casing comprising gripping jaws presented at the margin of said opening and adapted to lie entirely behind said shoulder and spring sustaining means for the jaws housed within the casing laterally of the opening, the shank of the stud being of a length to provide a clearance to permit the socket to be tipped.

10. The fastener as defined in claim 8 wherein the stud holding means comprises three or more jaws symmetrically mounted for radial yielding.

11. The fastener as defined in claim 9 wherein the stud holding means comprises three or more jaws symmetrically mounted for radial yielding.

12. As a means for attaching two separate curtains or the like independently or conjointly to a support, one element of a separable fastener for attachment to the support, a duplex element for one curtain comprising both male and female parts, one adapted to interfit with the said one element and the other being similar to said element, and a fastener element for the second curtain adapted for engagement either with said one element or that which is similar thereto, the fastening formed by complementary elements being inseparable by direct pull and the parts thereof being relatively sharply tippable to permit separation thereof, whereby independent manipulation of the curtains is made possible.

13. A compound stud and socket fastener for the securing of superposed elements comprising a stud having an enlarged head, a duplex member comprising a casing having a rear wall apertured to receive the stud and a front wall coöperating with the rear wall to support and position a spring jaw to engage behind the head, the material of the front wall being extruded in line with the stud and providing a hollow stud-like member, said member having an enlarged head, the inner portion of said hollow member receiving the head of the stud when the parts are assembled, and a third element comprising a socket having means for engaging the head of said hollow member.

14. A fastener comprising a stud having a long shank and a head joined to said shank by an abrupt annular shoulder and a socket having jaws to engage behind said shoulder and be positively locked thereby against outward withdrawal and yieldable to release over the head when the socket is sharply tipped from any direction, the length of the stud providing a clearance for tipping the socket.

In testimony whereof, I have signed my name to this specification.

DAVID BOURQUE.