Oct. 2, 1945. E. H. SHAFF 2,385,886

RIVET

Filed Nov. 5, 1942

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Fig. 1

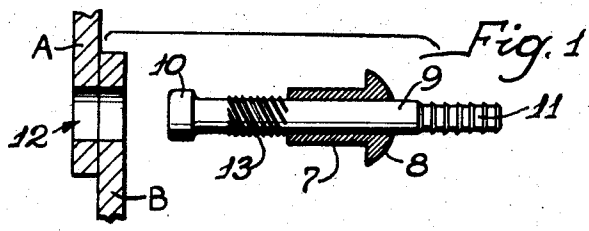


Fig. 2

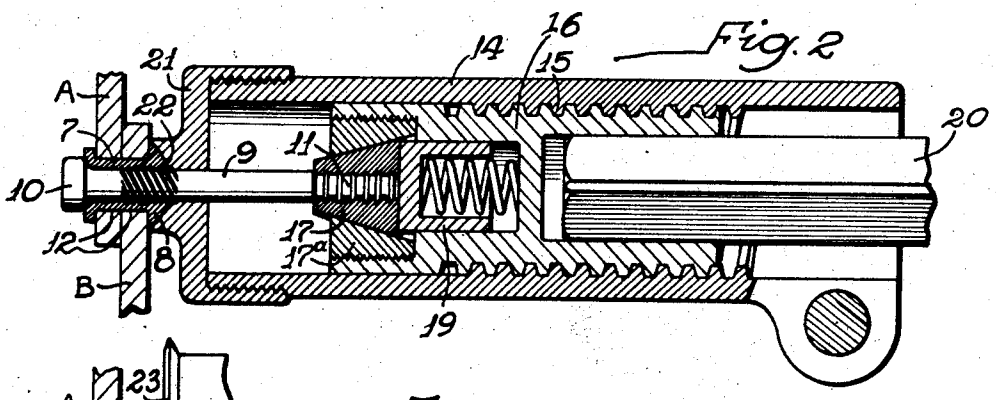


Fig. 3

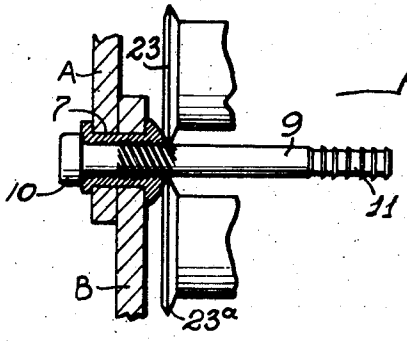


Fig. 4

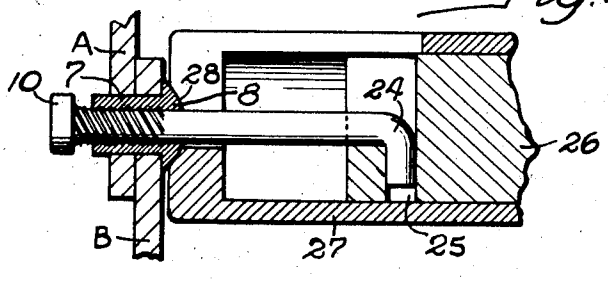
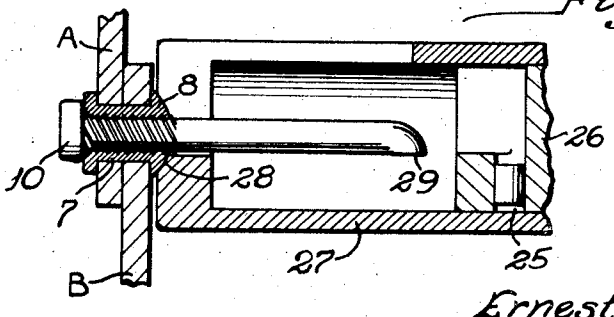


Fig. 5



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Patented Oct. 2, 1945 2,385,886

UNITED STATES PATENT OFFICE

2,385,886

RIVET

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Application November 5, 1942, Serial No. 464,677

2 Claims. (Cl. 85—40)

The invention pertains to rivets of the type commonly referred to as blind rivets, and it has for its primary object the provision of a new and improved construction for the rivet to insure that the rivet will be held securely in position with the parts firmly fastened together.

Another object of the invention is to provide a rivet assembly comprising a tubular rivet and a forming stem operative as an incident to the upsetting of the inner end of the tubular shank to exert an expansive force upon the shank radially thereof with the result that the forming stem is secured firmly within the rivet and the shank of the latter expanded into engagement with the edges of the holes in the plates being fastened together.

A further object is to provide for upsetting of the inner end of a blind rivet with a combined axial and rolling action.

The objects of the invention thus generally stated together with other and ancillary advantages are obtained by the construction and arrangement shown by way of illustration in the accompanying drawing forming a part hereof, in which

Figure 1 is a longitudinal sectional view through a tubular rivet and showing its cooperating forming member in elevation the assembly being further shown in connection with the parts to be fastened together.

Fig. 2 is a fragmentary longitudinal sectional view illustrating the method and means for applying the rivet.

Fig. 3 is a fragmentary sectional view illustrating the operation of cutting off and upsetting the stem after the inner rivet head has been formed.

Fig. 4 is a fragmentary longitudinal sectional view of the improved rivet with its forming stem modified for cooperation with a slightly different form of tool.

Fig. 5 is a similar view but showing the relation of the parts after the rivet has been set.

The rivet assembly comprises two principal parts, namely, the rivet proper and its forming stem. The rivet proper consists of a tubular shank 7 having a head 8 at its outer end. The shank 7 has a smooth axial bore through which is inserted a forming stem 9 having at its inner end a forming head 10 and at its outer end a section 11 specially constructed to permit of a firm gripping action on the stem. The head 10 is of a diameter adapted to be entered through registering holes 12 in two plates or parts A and B which are to be fastened together.

The forming stem 9 is provided near the head 10 with a portion 13 of an external diameter somewhat larger than the internal diameter of the rivet bore and having one or more radially extending helical ribs or threads formed thereon and operative when the forming stem is withdrawn axially through the shank 7 to exert a radial expansive force upon the shank which serves not only to bind the forming stem in the shank but also to expand the latter into engagement with the edges of the holes 12 of the parts A and B. In the operation of upsetting the inner end of the tubular shank 7 a combined axial and rotational movement is imparted to the forming stem 9. As will be seen from a comparison of Figs. 1 and 2 the helically threaded portion 13 is in this operation first moved into intimate binding engagement with the rivet shank 7, and upon engagement between the forming head 10 of the stem and the inner end of the shank 7 the continued rotational and axial movement imparted to the forming stem causes the helically threaded portion 13 to continue its movement with a screw feed during the upsetting operation. As a result, the upsetting is performed not only because of an axial movement imparted to the stem but by a rotary screw threading action substantially augmenting the force required to be applied axially to perform the upsetting operation.

Referring now to Fig. 2, I have provided a preferred form of puller for use in applying the rivet. This device comprises a cylindrical casing 14 internally threaded as at 15 to receive a screw 16. The inner end of the screw is provided with a suitable chuck 17 for gripping the outer serrated end of the forming stem 9. The chuck jaws are yieldably held contracted by means of a spring pressed plunger 19 cooperating with a contracting cone 17a. The screw 16 may be rotated in any suitable way as by means of a squared shank 20 operated either manually or by a suitable source of power. The forward end of the casing 14 has a cap 21 apertured for the passage of the forming stem 9, and when the screw is advanced to the front end of the casing the chuck jaws engage with the cap and are forced rearwardly in the actuating cone 17a to permit of insertion and removal of the forming stem. The cap 21 also has formed integral therewith a concave recess 22 shaped to form a seat for the head 8.

In applying the rivet, the serrated end 11 of the forming stem is inserted into the chuck 17 of the puller. The rivet assembly is then in-

serted through the alined holes 12 in the parts A and B, and with the concave nose 22 of the tool engaging with the head 8, a rotary motion is imparted to the shank 20. As the screw 16 is turned, the end portion 11 of the forming stem is gripped by the jaws of the chuck 17 which are coincidentally forced by the contracting cone 17a tightly into firm gripping engagement with the stem.

A combined rotational and axial force is thus imparted to the forming stem and as the latter is drawn through the tubular shank, the head 10 thereof is forced axially and simultaneously rotated so as to upset the inner end of the tubular rivet shank with a rolling motion. Coincidentally, the threaded portion 13 of the stem, being of an external diameter somewhat larger than the internal diameter of the shank, forces the latter radially outward into engagement with the edges of the holes 12 while at the same time exerting a binding action between the forming stem and the tubular rivet. The axial movement of the forming stem through the tubular shank is facilitated by the fact that the pitch of the screw 16 corresponds to the pitch of the threaded portion 13. Finally, a reverse rotation is imparted to the driving member 20 to permit the chuck 17 to be disengaged from the serrated end portion 11 of the stem 9.

Referring now to Fig. 3, the portion of the forming stem protruding from the outer end of the applied rivet may be cut off by any suitable means. Herein I have shown diametrically opposed cutters 23 and 23a which may in any suitable way be rotated and simultaneously forced radially inward to sever the stem substantially flush with the outer end of the head 8. As an incident to this cutting action, the stem is upset slightly, thus further restraining any tendency of the parts of the assembly to become separated.

In the embodiment of the invention illustrated in Figs. 4 and 5 the construction and method of applying the rivet is substantially similar to that above described. In this instance, however, the outer end portion of the forming stem is bent at right angles, as indicated at 24, for insertion into an open ended socket 25, extending radially outward from the axis of an actuator member 26. The latter is slidable axially within a casing 27 having at its forward end a concave nose portion 28 for receiving the head 8 of the tubular rivet. As in the case of the pulling device of Fig. 2, a combined rotational and axial force is applied to the actuator 26. Upon the completion of the setting operation, the bent end portion 24 of the forming stem is sheared off as indicated at 29. Rupture of the forming stem at the end of the riveting operation is desirable in that it provides a definite indication to the operator that the rivet has been headed; and provision for such rupture by a shearing action has been found to be advantageous because it permits of an accurate determination of the amount of force necessary to be applied to insure best results. It will be understood that the bent end portion 24 facilitates chucking of the forming stem both for purposes of axial as well as rotational movement.

The improved rivet is principally advantageous as compared to prior rivets in that the forming stem is positively held in position within the rivet after it has been set, thereby insuring that the parts of the assembly shall continue indefinitely to be held firmly together; and this result is additionally assured by reason of the expansive force exerted by the tubular shank upon the edges of the holes through which the rivet passes.

I claim as my invention:

1. The combination of a tubular rivet having a shank with an axial bore and a head on one end of the shank, and a forming stem having a head thereon for cooperation with the end of the rivet opposite the head to upset the same, said stem further having adjacent its head a helically threaded portion of an external diameter greater than the internal diameter of the bore of the shank and operative when the stem is drawn through the rivet with a combined axial and rotational movement to effect a binding engagement between the stem and the shank.

2. A blind rivet comprising a tubular rivet having a shank with a smooth bore extending longitudinally therethrough of substantially uniform diameter, a forming stem extending through said bore to protrude beyond both ends of said rivet member, said stem having a forming head at its inner end to engage and deform the inner end of the shank to secure the rivet in place, a portion of said stem adjacent said head having a helical rib extending laterally therefrom to a diameter greater than the diameter of said bore, whereby drawing upon the end of said stem which protrudes through the outer end of said rivet to pull said stem through said bore will perform the operations of deforming said inner end of said shank, laterally expanding said shank, and threading said rib into the material of said rivet.

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