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TUBULAR RIVET

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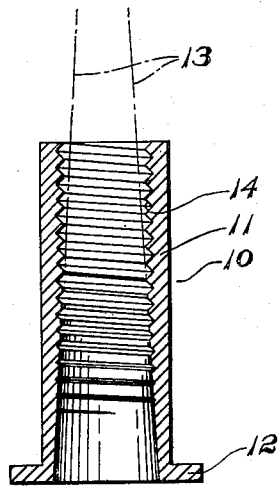


Fig-1

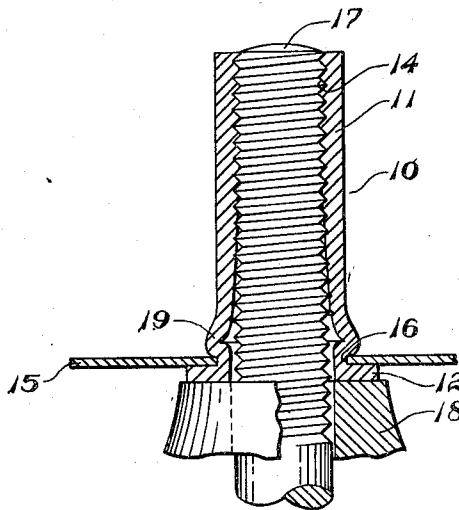


Fig-2

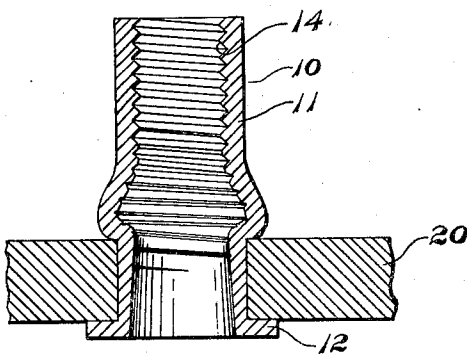
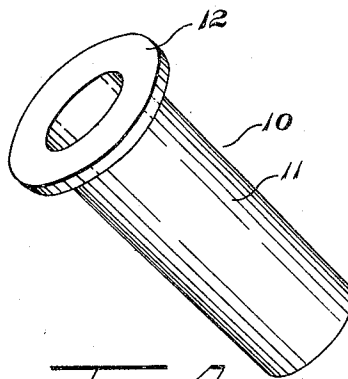


Fig-3



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TUBULAR RIVET

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8 Claims. (Cl. 85-40)

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This invention relates to tubular rivets and especially to rivets of the type which are applied and upset from one side of the work.

The rivet of the invention constitutes an improvement over the type rivet disclosed in the patent of Harry E. Waner No. 2,149,199 dated February 28, 1939. Rivets of the type disclosed in this patent have enjoyed wide commercial acceptance. As constructed heretofore they have comprised a shank having a cylindrical counterbore extending in from the head end providing a relatively thin wall adapted to be outwardly bulged against the work and terminating in a threaded portion engageable with a draw rod of a heading tool.

The prior rivet, while being capable of accommodating variations in work thickness, sometimes referred to as grip range, has been limited in the range of such thickness throughout which the most effective upsetting can be effected, this range having been dependent to a large extent upon the ratio of slenderness of the wall of the counterbored portion which is outwardly bulged in the upsetting operation. The material available for outward bulging has been that part of the wall of the counterbored portion between the work and the first thread convolution, and the recommended grip range has of necessity been considerably less than the total length of the counterbore. Mere extension of the length of the counterbore, to the end of increasing the grip range, has had the objection that for very thin work and for very thick work, the bulge has sometimes been formed in a faulty manner so that full holding strength has not been obtained.

An object of this invention is to provide a tubular rivet of an improved construction for accommodating work over an increased range of thicknesses. Further objects are to provide a tubular rivet having a wall construction such that it may be outwardly bulged for strong gripping of work both of very small thickness and of relatively great thickness, to provide for a self-regulating position of bulge in accordance with the work thickness, to provide an internal thread construction in which the thread does not begin with abrupt full depth but is of gradually increasing depth, thereby making a portion of the threaded region capable of outward bulging as needed to accommodate relatively thick work.

A more specific object is to provide a tubular rivet having a cylindrical shank, a tapered bore, and internal threads.

Other objects will appear from the following description and the accompanying drawings in which:

Fig. 1 is an elevation in section of a rivet constructed in accordance with and embodying the invention.

Fig. 2 is an elevation of the rivet shown in Fig.

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1 in the upset condition as applied to relatively thin work shown with a draw rod and setting anvil of a heading tool before the latter are removed, parts being sectioned and broken away.

Fig. 3 is a sectional elevation of the rivet in the upset condition as applied to relatively thick work, parts being broken away.

Fig. 4 is a perspective view of the rivet prior to insertion in the work.

In accordance with the invention a tubular rivet 10 as it appears before upsetting is shown in Figs. 1 and 4. The rivet 10 comprises a shank 11, which may be flanged at one end to form a head 12, and has a bore extending therethrough.

The bore is threaded at 14 for receiving a screw of a heading tool for upsetting the rivet 10 and for receiving a screw of a bolt after upsetting of the rivet. The wall of the shank 11 is of greater thickness at the threaded portion 14 than at the portion adjacent the head end 12 and gradually decreases in thickness toward the head end. Although a decrease in thickness may be obtained progressively in any suitable manner it is preferred to obtain this by tapering the wall in thickness toward the head end, as by tapering the bore from the head end to an angle such as is indicated by the broken lines 13, 13.

The tapered wall portion extends into the threaded portion 14 and the crest of the threads toward the head end 12 conform to the taper although the pitch and root of these threads remain the same. By removing part of these threads the load imposed in upsetting the rivet is distributed more evenly over the wall and is not concentrated in a few threads.

In Fig. 2 the rivet 10 is shown in the upset condition gripping work 15 which may comprise one or more thin sheets of metal or other material. The sheet member 15 is apertured at 16 to receive the rivet 10. In order to upset the rivet 10 it is inserted in the sheet member 15 with the flange of the head end 12 against the outer surface of the wall of the sheet member. A draw rod 17 of a heading tool is threaded to engage the threaded portion 14 of the shank 11. The draw rod 17 is pulled toward a setting anvil 18 of the heading tool which movement subjects the shank to an axial upsetting force through the threads of the shank. The upsetting force is applied with circumferential uniformity by virtue of the threaded connection which assures uniform pressure application entirely around the rivet by the draw rod 14. The taper of the shank portion 11 causes the wall portion having the least resistance to outward bulging to be adjacent the wall of the sheet member 15 as the shank wall thickness is progressively greater away from the work, and the wall is substantially supported in the aperture 16 of the sheet member 15 toward the head end 12. A correctly

shaped bulge 19 with good holding strength results upon upsetting as shown in Fig. 2. The heading tool may be removed by unscrewing the draw rod 17 whereupon the rivet 10 not only is held in the work but produces internal threads in which a holding screw may be inserted for attachment purposes if desired.

In Fig. 3 the rivet 10 is shown in the upset condition gripping a sheet member 20 of greater thickness than the sheet member 15 shown in Fig. 2. Because the position of outward bulging is determined by the thickness of the sheet member the same size rivet grips the relatively thick sheet member 20 with effectiveness, a part of the tapered and threaded wall being bulged in this application.

It is evident that a considerable range of thicknesses of work may be accommodated by the rivet of the invention. This is highly desirable for reasons among others of reducing the number of rivet sizes needed to accommodate the variety of thicknesses of work which may be used with this rivet.

Variations may be made without departing from the scope of the invention as it is defined in the following claims.

I claim:

1. A tubular rivet adapted to be upset in work by outward bulging of the wall of the rivet under an axial upsetting force and axial pressing of the bulge against the face of the work, said rivet comprising a shank having a bore extending therein from an end thereof and having a cylindrical threaded portion, the root diameter of the threaded portion being uniform throughout and the wall of the shank being gradually reduced in thickness from said threaded portion toward said end providing for outward bulging anywhere along the extent of the reduced wall thickness as determined by the thickness of the work against which the bulge is pressed in the axial direction.

2. A tubular rivet adapted to be upset in work by outward bulging of the wall of the rivet under an axial upsetting force and axial pressing of the bulge against the face of the work, said rivet comprising a shank having a bore extending into said shank from an end thereof, said shank being internally threaded with the root diameter of the threaded portion being uniform throughout and the wall of the shank being gradually reduced in thickness toward said end providing for outward bulging anywhere along the extent of the reduced wall thickness as determined by the thickness of the work against which the bulge is pressed in the axial direction.

3. A tubular rivet adapted to be upset in work by outward bulging of the wall of the rivet under an axial upsetting force and axial pressing of the bulge against the face of the work, said rivet comprising a shank having a head end and a bore extending into said shank from said head end, said bore tapering away from said head end and terminating in a cylindrical portion thereof for outward bulging anywhere along the extent of the tapered wall thickness as determined by the thickness of the work against which the bulge is pressed in the axial direction, said cylindrical portion of the bore having a thread therein with a constant diameter of the thread groove which extends into and along a tapered portion of the bore.

4. A tubular rivet adapted to be inserted in an aperture and upset therein from one side of the work, said rivet comprising a tubular shank hav-

ing a head end and a bore extending into the shank from said head end terminating in a threaded portion for engaging a threaded upsetting member to upset the rivet by outward bulging of the rivet against the work and axial pressing of the bulge against the face of the work under axial upsetting force applied through the member, the wall of said shank being of gradually increasing thickness from said head end, which gradually increasing thickness extends into said threaded portion, thereby providing for outward bulging anywhere along the extent of the tapered wall thickness against which the bulge is pressed in the axial direction.

5. A tubular rivet adapted to be inserted in an aperture in sheet work material and upset therein from one side of the work to grip work by outward bulging thereof and axial pressing of the bulge against the face of the work, said rivet comprising a tubular shank having a flanged head at one end thereof and a bore extending into the shank from said head and terminating in a threaded portion for engaging a threaded upsetting member, said bore being tapered away from said head with the thread depth reduced in height in accordance with said taper, thereby providing for outward bulging anywhere along the extent of the tapered wall thickness as determined by the thickness of the work against which the bulge is pressed in the axial direction.

6. A tubular rivet adapted to be upset in work by outward bulging of the wall of the rivet under an axial upsetting force and axial pressing of the bulge against the face of the work, said rivet comprising a shank with a substantially uniform outer diameter having a head end and a bore extending into said shank from said head end, said bore tapering away from said head end providing gradually changing wall thickness for outward bulging anywhere along the extent of the tapered wall as determined by the thickness of the work against which the bulge is pressed in the axial direction, said bore terminating in a cylindrical portion having a thread therein which extends into and along the tapered portion of the bore.

7. A tubular rivet adapted to be inserted in an aperture and upset therein from one side of the work to grip the work by outward bulging thereof and axial pressing of the bulge against the face at the opposite side of the work, said rivet comprising a shank having a bore extending into said shank from an end thereof and a threaded portion at the other end of said shank with a uniform root diameter not greater than the diameter of said bore at the first-mentioned end for engaging an upsetting tool inserted in the bore from said first-mentioned end, said shank having a wall of gradually decreasing thickness toward said first-mentioned end to provide for said outward bulging anywhere along the extent of the gradually decreasing wall thickness as determined by the thickness of the work against which the bulge is pressed in the axial direction.

8. A tubular rivet adapted to grip work by outward bulging thereof and axial pressing of the bulge against the face of the work, said rivet comprising a shank of substantially uniform outside diameter having a bore extending into said shank from an end thereof and being internally threaded at the other end of said shank with the diameter of said bore at the first-mentioned end being at least as great as the diameter of the thread roots and the diameter of the thread

roots being uniform throughout, said bore tapering away from said first-mentioned end of the shank toward said other end in a manner such that threads located in the tapered region have crests conforming to said taper to provide a tapered wall thickness for said outward bulging anywhere along the extent of the tapered wall thickness as determined by the thickness of the work against which the bulge is pressed in the axial direction.

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