Aug. 17, 1943. C. E. HATHORN 2,326,855

RIVET

Filed Nov. 12, 1941 2 Sheets-Sheet 1

Fig. 1

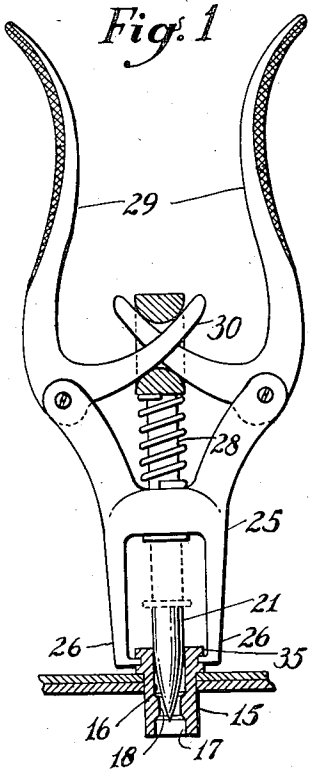


Fig. 2

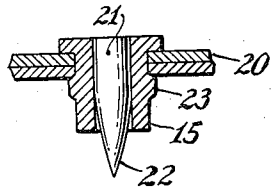


Fig. 3

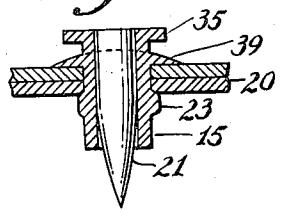


Fig. 4

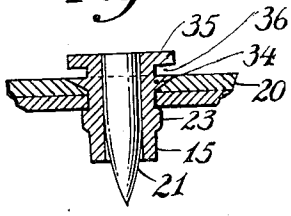


Fig. 5

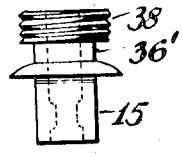


Fig. 6

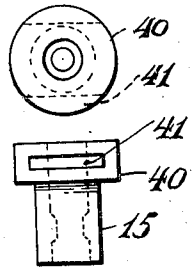


Fig. 7

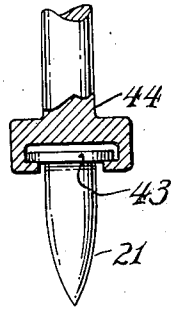
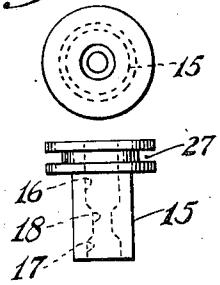


Fig. 8



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Aug. 17, 1943. C. E. HATHORN 2,326,855

RIVET

Filed Nov. 12, 1941 2 Sheets-Sheet 2

Fig. 9

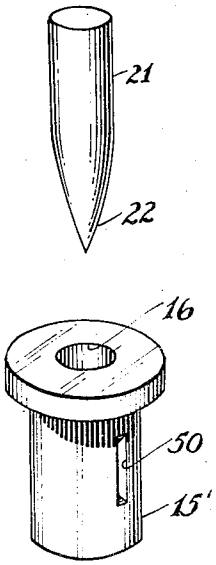


Fig. 10

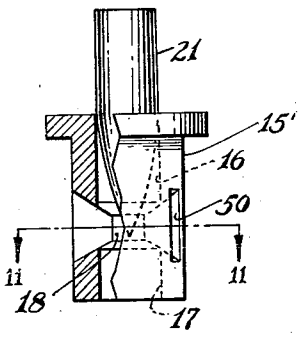


Fig. 11

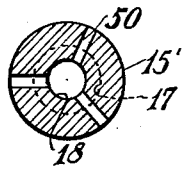
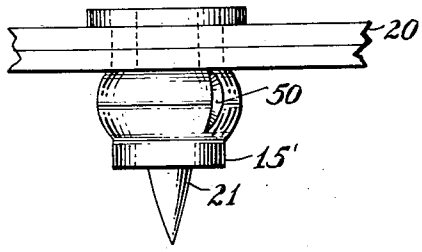


Fig. 12



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2,326,855

UNITED STATES PATENT OFFICE

2,326,855

RIVET

Charles E. Hathorn, Kenmore, N. Y., assignor to Curtiss-Wright Corporation, a corporation of Delaware

Application November 12, 1941, Serial No. 418,670

5 Claims. (Cl. 85—40)

This invention relates to blind rivets and is concerned with improvements, both in the rivet and in the mode of driving same, over the arrangement shown in my Patent No. 2,248,755, issued July 8, 1941.

In the rivet taught in said patent, an initial internal bulge is formed in the rivet bore and, by drawing a ball-headed mandrel outwardly through the rivet, the internal bulge is transposed to an external bulge which engages the material through which the rivet is inserted. The present invention contemplates the use of substantially the same character of rivet but, instead of drawing a mandrel outwardly through the rivet, I provide means for securing the rivet by pressing a core inwardly through the rivet. For a clearer understanding of the details of the invention reference may be made to the attached specification and to the drawings, in which:

Fig. 1 is a sectional elevation through a rivet according to the invention, including driving means therefor;

Fig. 2 is a section through a rivet showing a completed joint;

Fig. 3 is a section through an alternate arrangement of a rivet;

Fig. 4 is a section through an alternate arrangement of a rivet;

Fig. 5 is a side elevation of an alternate form of rivet;

Fig. 6 includes a plan and side elevation of an alternate form of rivet;

Fig. 7 is a side elevation partly in section of a rivet driving core and a mandrel for withdrawing same from a driven rivet;

Fig. 8 is a combined plan and side elevation of a form of rivet such as that shown in Fig. 1;

Fig. 9 is a disassembled view of a core and rivet assembly;

Fig. 10 is a fragmentary section through the core and rivet assembly of Fig. 9;

Fig. 11 is a section on the line 11—11 of Fig. 10, and

Fig. 12 is a side elevation of a riveted joint using the modification of Fig. 9.

All of the several rivet modifications shown in the drawings have certain elements in common which will first be described. The rivet includes a cylindrical shank 15 having a counterbore 16 at its head end, a counterbore 17 of the same diameter as the bore 16, at its shank end, and a through bore 18 between said counterbores, of a diameter less than the counterbore diameter. The wall of the rivet shank is, therefore, thin in the vicinity of the bores 16 and 17, and relatively thick in the region of the bore 18. The rivet is applied through a suitable predrilled opening in work pieces 20 whereupon a core 21, having an ogival inner end 22, is forced inwardly, from the external (upper) surface of the work. This core has an external diameter substantially the same as that of the bores 16 and 17 so that, when it is forced through the small bore 18, the shank material of the rivet is expanded outwardly, forming a bead 23 on the exterior surface of the shank, which binds against the inner surface of the work pieces 20 to hold the rivet firmly in position and to secure the work pieces to one another.

Now referring to Fig. 1, I show a driving tool 25 comprising prongs 26 which are engaged with a groove or recess 27, as shown in Fig. 8. Centrally of the tool 25 is a plunger 28 which may be moved inwardly by squeezing together bell-crank handles 29 having tangs 30 engaging the outer part of the plunger 28. The inner end of the plunger presses against the outer end of the core 21, as shown in dotted lines, and pushes the core into the rivet until the outer surface of the core is flush with the rivet head. If the protrusion of the rivet head is permissible in the work to be accomplished, the tool may merely be removed from the rivet and the head left intact. On the other hand, if such head protrusion is obnoxious, the outer portion of it may be dressed off to produce the result shown in Fig. 2.

Fig. 4 shows a flush rivet having a basic head 34 occupying a countersunk hole in the work pieces 20. The rivet is also provided with an auxiliary head 35, spaced from the head 34 to form a groove or recess 36 for engagement by the prongs 26 of the driving tool. After driving, the auxiliary head 35 may be dressed off to produce a flush rivet.

In Fig. 5, an auxiliary head 38 takes the form of a screw shank, to be engaged by a nut element which would be substituted for prongs 26 of the driving tool. However, obviously the driving tool 25 of Fig. 1 could be used with the rivet illustrated in Fig. 5, with the tool prongs 26 engaging in the groove 36' below the threaded head 38. In Fig. 3, an oval head rivet is shown, as at 39, provided with the auxiliary driving head 35 which is subsequently dressed off. In Fig. 6 the straight-sided head 40 of the rivet is provided with parallel opposed grooves or recesses 41 for engagement by the prongs 26 of the tool in Fig. 1.

If it is desired to withdraw the driving core from the rivet, the core may be provided with a flanged head **43**, as shown in Fig. 7, and a clawhammer or equivalent device indicated at **44** may be used to withdraw the core after the rivet has been driven.

The forms of rivets herein described would be appropriate for production work or repair work where adequate facilities are available for driving the rivets and dressing their heads. Where field repairs are called for, and where the structure to be riveted is sufficiently rigid to permit hammer driving of a rivet core **21**, the rivet may take the form shown in Figs. 9 to 12 wherein the shank **15'**, in addition to the bores **16**, **17** and **18**, is formed with a plurality of longitudinal slits **50**, intermediate the length of the shank, and providing openings from the outside of the shank to the bore **18**. These slits tend to weaken the bulge in the rivet bore to permit easier driving of the rivet. That is, when the core **21** is assembled as in Fig. 10, said core may be forced inwardly of the rivet by a series of light hammer taps which will force the segmental inward projections of the rivet bore outwardly to provide a riveted joint as shown in Fig. 12. If the core is left inside the rivet, as would normally be the case, this joint is quite strong and is adequate for field repair work.

As in my previous patent above mentioned, the skirt formed at the inner end of the rivet shank serves to prevent fracturing and bursting of the material of the rivet when it is driven, and the bore **18** is preferably tapered at its ends to provide a smooth transition from the large to the small diameter portions of the rivet shank so as to distribute the stress uniformly in the rivet material.

The rivets herein shown are primarily adapted for light sheet metal work as used in aircraft. Though they may be made of any material, I contemplate making them of aluminum alloy for aircraft work and the core **21** for rivet driving may likewise be made of an aluminum alloy somewhat harder than that alloy used in the rivet per se.

While I have described my invention in detail in its present preferred embodiment, it will be obvious to those skilled in the art, after understanding my invention, that various changes and modifications may be made therein without departing from the spirit or scope thereof. I aim in the appended claims to cover all such modifications and changes.

I claim as my invention:

1. A unitary blind rivet comprising a head having recess means for engagement by a driving tool, a shank extending from said head for engagement with sheets to be riveted, said rivet being hollow and having an inward integral annular protrusion in the rivet hollow, and a core fitted to the rivet hollow, protruding from the rivet head, adapted to be pressed into the rivet by said driving tool, to bulge said protrusion outwardly on the rivet shank.

2. A unitary blind rivet comprising a head, a shank extending from one end of the head, a head extension including a radial recess for engagement by a driving tool, said rivet being hollow, an annular inward protrusion integral with the shank and extending into the rivet hollow, and a driving core fitted to the rivet hollow and protruding outwardly beyond said head extension, whereby the core may be pressed into the rivet hollow by said tool to bulge said protrusion outwardly on the rivet shank.

3. A unitary blind rivet comprising a head, a shank extending from one end of the head, a head extension including a recess, said rivet being hollow, an annular inward protrusion integral with the shank and extending into the rivet hollow, and a driving core fitted to the rivet hollow and protruding outwardly beyond said head extension, said extension comprising a flange adapted to be engaged by a rivet pressing tool for pressing the core into the rivet hollow to bulge said protrusion outwardly on the rivet shank.

4. A unitary blind rivet comprising a head, a shank extending from one end of the head, a head extension including a screw threaded flange portion and a radial recess between said flange and head, said threaded flange and recess each being adapted for engagement by an appropriate driving tool, said rivet being hollow, an annular inward protrusion integral with the shank and extending into the rivet hollow, and a driving core fitted to the rivet hollow and protruding outwardly beyond said head extension, whereby the core may be pressed into the rivet hollow by a tool engaging either said threaded flange or said recess to thereby bulge said protrusion outwardly on the rivet shank.

5. A unitary blind rivet comprising a head portion, a shank portion extending from said head portion for engagement with material to be riveted, said rivet being hollow and having an inward annular protrusion in the shank portion of the rivet hollow, and a core fitted to the rivet hollow, protruding from the rivet head and adapted to be pressed into the rivet to bulge said protrusion outwardly on the rivet shank, said rivet head portion having opposed configurations thereon for interfitting engagement with a driving tool to facilitate alinement therewith, whereupon said tool may be operated to press said core into the rivet.

CHARLES E. HATHORN.