

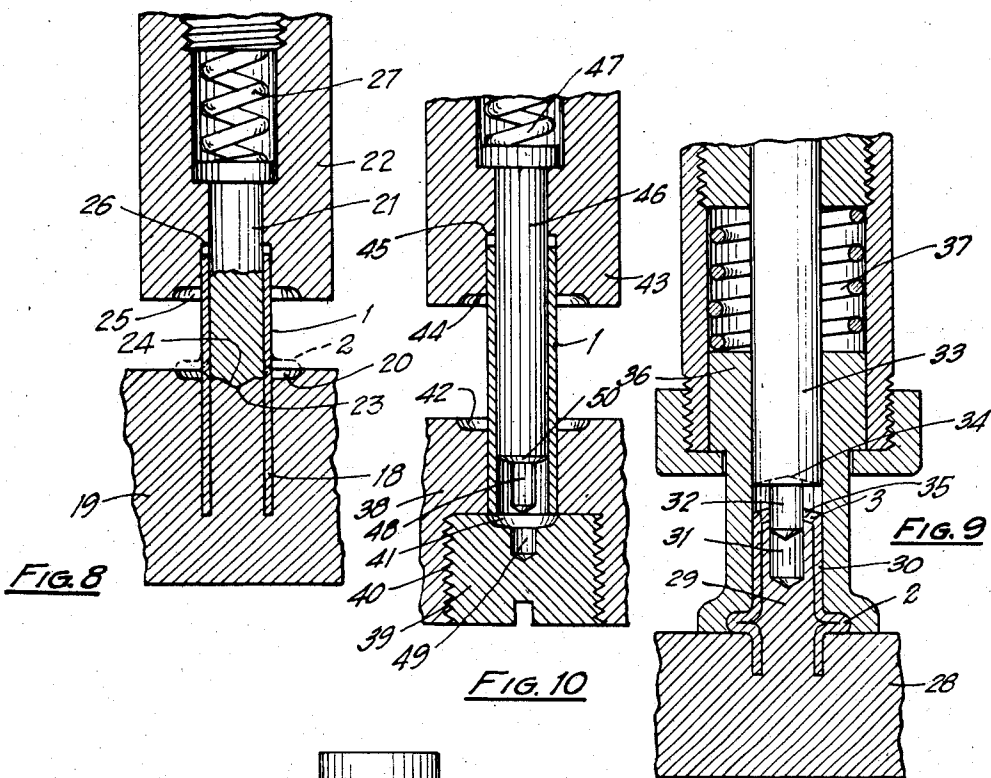
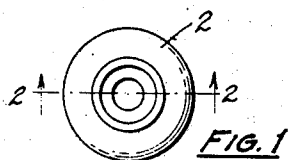
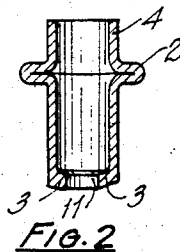
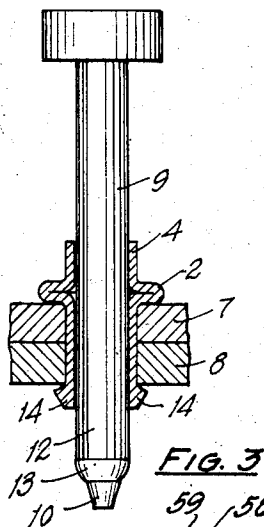
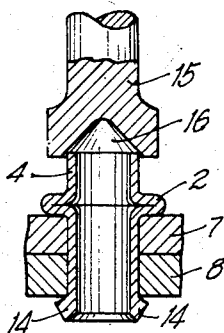
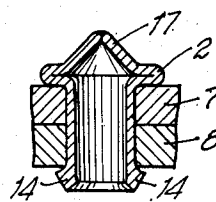
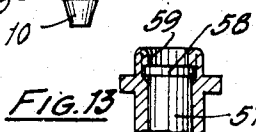
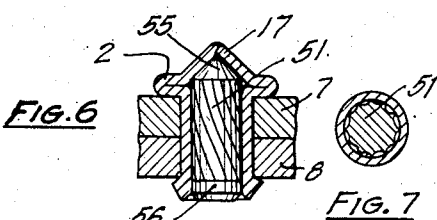
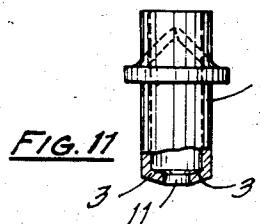
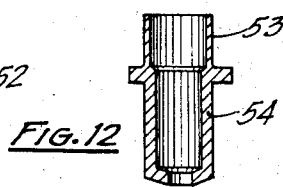
Aug. 8, 1944.

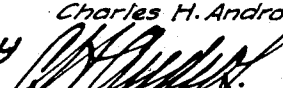
K. W. HORTON ET AL.

2,355,439

RIVET

Filed June 22, 1943



INVENTORS
Kenneth W. Horton
Charles H. Andros
by 
ATTORNEY

UNITED STATES PATENT OFFICE

2,355,439

RIVET

Kenneth W. Horton, De Freestville, and Charles
H. Andros, Nassau, N. Y.

Application June 22, 1943, Serial No. 491,844

7 Claims. (Cl. 85—40)

Our invention relates to rivets and particularly to rivets adapted for use where one end of the rivet is inaccessible for the application thereto of a dolly. Such situations are encountered in riveting the metal sheathing on airplane wings of shallow depth and in similar places. Rivets of various designs have been proposed for this purpose including rivets containing a small charge of explosive which spreads or upsets the inaccessible end of the rivet, and hollow rivets in which the inaccessible head is formed by driving a pin into the rivet to expand the end thereof. But rivets of this last mentioned type which have heretofore been suggested are open to the objection that water can flow readily through the axial passage thereof unless a plug is permanently secured therein.

Therefore, one of the objects of our invention is to provide a hollow rivet of cheap and simple construction in which the inaccessible end may be easily upset to secure the rivet firmly in place by driving a pin therethrough from the other end, but in which the exposed end is provided with a portion adapted to effect a closure of the axial passage through the rivet. Another object is to provide a rivet which can be readily die-formed from tubular stock or formed from bar or tubular stock by means of an automatic screw machine.

In the drawing—

Fig. 1 is a top plan view of a rivet formed from tubular stock;

Fig. 2 is a section of Fig. 1 in the plane 2—2;

Fig. 3 is a sectional view of a rivet with a head spreading or upsetting pin shown in elevation therewith;

Fig. 4 is a section of a rivet similar to that illustrated in Fig. 3 but showing, in connection therewith, a fragmentary view of a head forming tool, partially in section;

Fig. 5 is a section of a finished rivet in place;

Fig. 6 is an elevation view partially in section of a rivet having a fluted pin driven therein to increase its shearing strength;

Fig. 7 is a sectional view through the shank of the rivet shown in Fig. 6.

Fig. 8 is a sectional view, partially in elevation, of a device for forming the head of the rivet;

Fig. 9 is a sectional view, partially in elevation, of a device for forming the inaccessible end of the rivet;

Fig. 10 is a sectional view, partially in elevation, of a device for forming a complete rivet;

Fig. 11 is an elevation view, partially in section of a modified type of rivet;

Fig. 12 is a sectional view of another modification; and

Fig. 13 is a fragmentary sectional view of a rivet, such as shown in Fig. 12, with a headed pin inserted therein and the top of the rivet spun or crimped over on the head of the pin.

Referring to the drawing, our rivet, in one embodiment thereof, is formed from a tube of appropriate length, as shown at 1 in Fig. 8, and from any suitable malleable material such as copper, brass, aluminum, soft iron or steel, etc. The ends of the tube are forced towards each other in a suitable die to expand and flatten a portion of the tube intermediate the ends thereof to form the head 2 of the rivet. By means of a suitable die, one end of the tube is then turned inwardly as shown at 3 so that, at this end, the tube is partially but not entirely closed. If there is no objection to having the rivet open at each end, that portion 4 of the tube which is above the head 2 may be omitted. However, if it is important to close the rivet at one end then, the portion 4 should extend above the head 2 a sufficient distance to permit a closing operation which will hereinafter be described.

The distance between the head of the rivet and the inturned end should be only slightly greater than the thickness of the plates 7 and 8 which are to be secured together. The rivet is inserted in the hole through these plates and a tool, such as is shown at 9, is then driven downwardly through the rivet. The extreme end of this tool is preferably frusto-conical, as shown at 10; the small end of the frustum being slightly smaller in diameter than the opening 11 in the bottom of the rivet and the diameter of the large end of the frustum being somewhat in excess of that of the opening so that, when the tool is inserted in the rivet it is accurately centered. Between the frusto-conical portion 10 of the tool and the shank 12 there may be a spherical zone 13. Thus, when the tool is driven completely through the rivet the inturned portions 3 are turned out, as shown at 14, and the end of the rivet is expanded to engage the outer surface of the plate 8.

Where it is necessary to close the rivet at the top, a spinning tool 15 having a suitable depression 16 in the head thereof may be employed to spin the sides of the rivet together, as shown at 17 in Fig. 5; or, the head may be shaped by means of a hammer and a set similar to the tool 15.

In Figs. 8 and 9, we have shown a device for forming the rivets. The tubular stock 1 may be

dropped into an annular opening 18 in the block 19; said block having an annular recess 20 in the top thereof which is concentric with the tube and adapted to form one half the head of the rivet. In order to prevent the tube from crushing inwardly a plug 21 is slidably mounted in the die 22, and the block 19 and the plug 21 are provided with complementary, interfitting, centering portions 23 and 24. The die 22 is provided with a recess 25 adapted to form the upper half of the head, and the annular shoulder 26 within the die 22 is designed to force the tube downwardly as the die descends. The plug 21 is normally urged toward the block 19 by means of the helical spring 27 and this spring is of course compressed as the die descends.

In Fig. 9, we have shown a die for inturning the periphery of the rivet shell at the end which is inaccessible when the rivet is in place. Here, the block 28 is provided with an upstanding cylindrical projection 29 over which the partially formed rivet 30 is dropped. At the upper end the cylindrical projection 29 is provided with a cylindrical recess 31 adapted to receive the projection 32 on the plug 33. The bottom of the plug 33 around the projection 32 is concaved as shown at 34 to form the exterior bottom 35 of the rivet. Here the plug 33 is moved positively downward while the member 36 which surrounds the rivet on the outside may be moved upwardly against the compression spring 37.

In Fig. 10, we have shown a device in which a rivet may be formed from tubular stock in a single operation. Here the block 38 is provided with a cylindrical opening in the top thereof adapted to receive the tubular stock 1. The plug 39 is threaded into the bottom of the block as shown at 40 and the top of this plug is provided with a depression 41 adapted to shape the exterior of that end of the rivet which is inaccessible when it is in place. The top of the block 38 is also provided with a depression 42 adapted to form one half of the rivet head. The die 43 which slides down over the tubular stock 1 is provided with a depression 44 adapted to form the other half of the rivet head and with an annular shoulder 45 adapted to contact the upper end of the tubular stock 1 and force it downwardly as the die 43 is lowered. A plug 46 is mounted to reciprocate in the die 43 against the compression of spring 47. This plug fits within the tubular stock 1 and is provided at its lower end with the projection 48 adapted to be received in the recess 49 in the plug 39. When the projection 48 bottoms in the depression 49 an annular space is provided around the projection 48 and between the bottom of the recess 41 and the annular portion 50 of the plug 46 into which the metal at the lower end of the tubular stock is forced by the downward movement of the die 43 to form the inaccessible end of the rivet. Almost simultaneously therewith the head is formed in the manner described in connection with Fig. 8. Where it is desirable to provide a rivet more resistant to shearing stress than a tubular rivet a fluted pin 51 may be driven into the axial passage through the rivet, as shown in Figs. 6 and 7, the edges of the flutes biting into the inner walls of the rivet. The upper end 55 of the pin may be conical and for a short distance from the other end of the pin may be cylindrical as at 56, and of a diameter equal to the diameter of the root circle of the flutes which should fit the inside of the rivet. The addendum circle of the flutes has a diameter

slightly in excess of the inside diameter of the rivet to provide the bite.

In Fig. 11, we have shown a rivet adapted to be formed on an automatic screw machine from solid bar stock. Except at the end of the rivet which is to become inaccessible the side walls 52 of the rivet are all uniform thickness throughout.

In Fig. 12, we have shown a rivet similar to that shown in Fig. 11 with the exception that the walls 53 above the head of the rivet are made substantially thinner than the walls 54 below the head in order to facilitate spinning or otherwise collapsing the walls above the head in order to seal the rivet. In a rivet of this type a pin 57 having a head 58 thereon may be driven into the rivet and the edges of the rivet shell above the head crimped or spun over as shown at 59 in Fig. 13.

While we have described our invention in its preferred embodiment it is to be understood that the words which we have used are words of description rather than of limitation and that changes within the purview of the appended claims may be made without departing from the true scope and spirit of our invention.

What we claim is:

1. A rivet comprising a hollow, substantially cylindrical shell having a head extending outwardly therefrom in a zone intermediate the ends thereof, and a portion immediately adjacent one end thereof extending inwardly therefrom; whereby said end may be expanded by driving a pin through said shell from the opposite end; and the thickness of said shell adjacent said opposite end being appreciably less than the thickness of the other portions thereof whereby to facilitate forcing the sides of said shell together to effect a closure thereof at said opposite end.

2. A hollow rivet comprising an externally cylindrical shell, and a head intermediate the ends of said shell; said shell on that side of said head forming the shank of said rivet having portions at the extremity thereof extending inwardly and partially closing said shell; whereby said shell may be expanded at said extremity by driving a pin through said shell from the opposite end thereof; and the walls of said shell being substantially thinner throughout that portion of said rivet extending from said opposite end to said head than throughout said shank; whereby to facilitate the partial collapsing of said thinner walls to effect a closure of said shell.

3. A rivet formed of cylindrical tubular stock and comprising a tubular shell having a portion intermediate the ends thereof collapsed to form an outwardly-extending, annular head for said rivet; portions of said shell being inturned at one end thereof, whereby said shell at said one end may be expanded to form the other head of said rivet by driving a pin axially through said shell from the opposite end; and the wall of said shell between said head and said opposite end being of relatively thin, pliable material continuous throughout and of such length that it is adapted to be forced inwardly to form a substantially complete closure for said shell over said first mentioned head.

4. A rivet comprising a hollow cylindrical body open at each end and having a portion intermediate the ends extending outwardly from said body and forming an annular head for said rivet; the wall of said body between the head and one end of said rivet being a continuous cylin-

der throughout and of a length and thickness adapting it to be spun inwardly to form a substantially complete closure for said body at said one end.

5. A rivet comprising a hollow cylindrical body portion open at each end and having a portion intermediate the ends extending outwardly from said body and forming an annular head for said rivet; portions of said body being intumed at one end thereof, whereby said body at said one end may be expanded to form the other head of said rivet by driving a pin axially through said hollow body from the opposite end thereof; and the wall of said body between said annular head and said opposite end being a continuous cylinder throughout and of a length and thickness adapting it to be spun inwardly to form a substantially complete closure for said body at said opposite end.

6. A rivet comprising a tubular body portion and a head intermediate the ends thereof; the internal diameter of said body portion being substantially reduced in a zone immediately adjacent one end of said rivet; whereby said rivet

may be expanded by driving a pin through said rivet from the opposite end; and the wall of said tubular portion of said rivet between said head and said opposite end being continuous for such length and formed of such relatively thin, pliable material that it is adapted to be collapsed to form a complete closure for said body at said head.

7. A rivet comprising a hollow, substantially cylindrical shell having a head extending outwardly therefrom in a zone intermediate the ends thereof, and a portion immediately adjacent one end thereof extending inwardly therefrom; whereby said one end may be expanded by driving a pin through said shell from the opposite end thereof; and said shell between said head and said opposite end being continuous throughout and of such length and formed of such relatively thin, pliable material that said shell may thereafter be closed at said opposite end by forcing the sides of said shell together.

KENNETH W. HORTON.
CHARLES H. ANDROS.