

March 14, 1944.

J. SAUL

2,343,933

METHOD OF MAKING CONNECTORS

Filed Feb. 8, 1941

2 Sheets-Sheet 1

Fig. 1

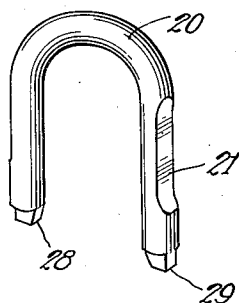


Fig. 2

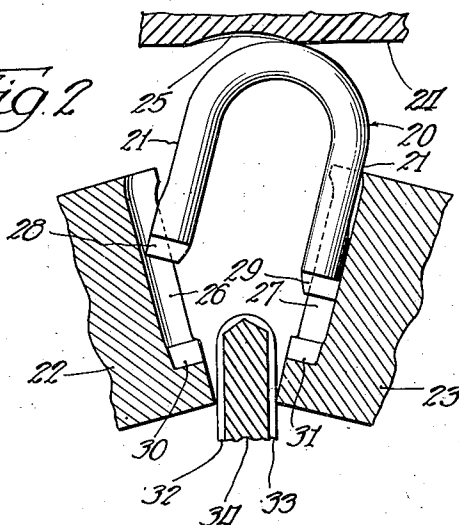


Fig. 3

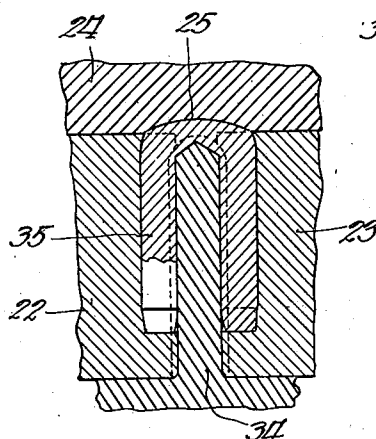


Fig. 4

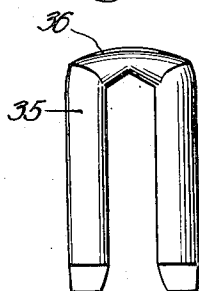


Fig. 5

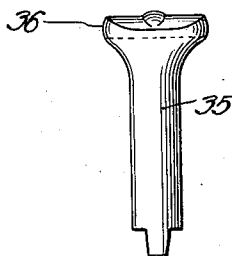
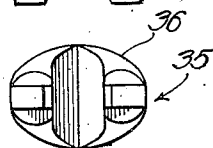


Fig. 6



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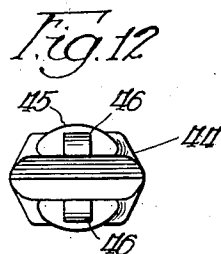
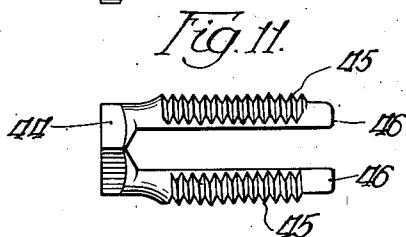
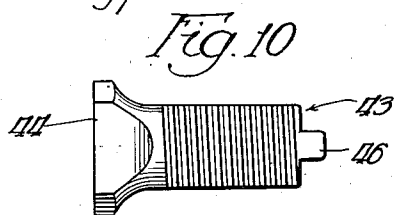
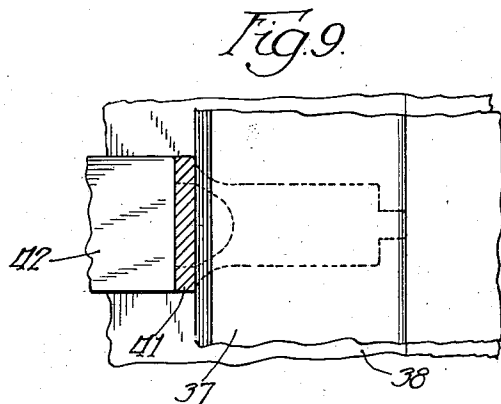
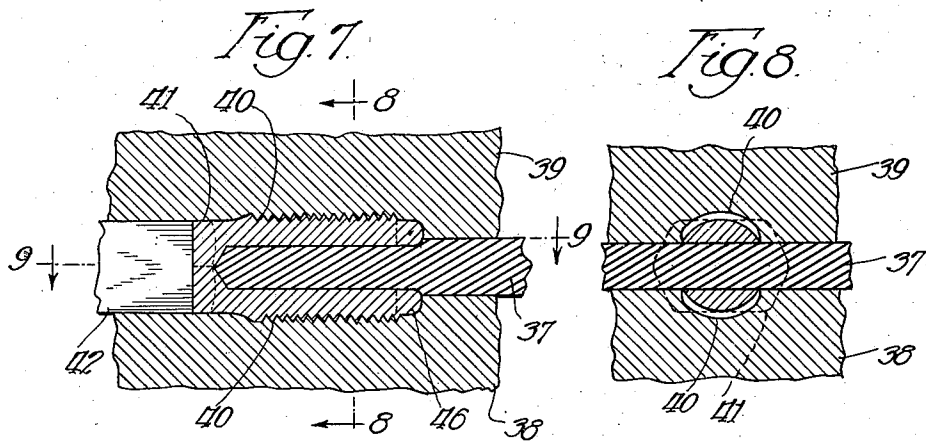
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,343,933

METHOD OF MAKING CONNECTORS

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Application February 8, 1941, Serial No. 378,010

3 Claims. (Cl. 10—27)

This invention relates to a cold forging process and in particular to a means for and a method of making a headed bifurcated member such as a split bolt connector.

A split bolt connector is used for connecting together wires or other electrical conductors. Such a connector is preferably made of copper or of an alloy having a high copper content. It is the principal object of this invention to provide a method of making such a connector without any appreciable scrap or waste. This connector is manufactured by a cold forging operation in order that the more expensive processes of milling and of thread cutting may be dispensed with. My invention as herein described has reference primarily to its applicability in the manufacture of such a split bolt connector, although obviously it may be applied to advantage in other headed bifurcated members or articles.

Split bolt connectors have been made by cold forging processes in the past, but such processes have generally involved the working of the metal to an extent which is undesirable. The apparatus and process herein disclosed requires a working of the stock to a lesser extent, and one which is well within the plastic limits of the metal used, while at the same time there is sufficient working to strain-harden the metal so that a copper connector is produced which is well adapted for the use to which it is subjected.

In particular it is an object of my invention to produce a split bolt connector from stock of relatively small cross-section; that is, a cross-section the area of which approximates the cross-sectional area of the threaded legs or bifurcations of the connector. The amount of metal necessary for the head of the connector is obtained by upsetting a portion of a member taken from wire stock of the cross-sectional area indicated above.

Other objects, features and advantages of my invention will become apparent as the description proceeds.

With reference to the accompanying drawings, in which a preferred embodiment of my invention is disclosed,

Fig. 1 is a perspective view of a U-shaped blank taken from wire stock;

Fig. 2 is a fragmentary sectional view showing the blank of Fig. 1 at the beginning of its heading operation;

Fig. 3 is a broken section illustrating the termination of the heading operation;

Fig. 4 is an elevation of the blank as partially

formed by the operation shown in Figs. 1, 2 and 3;

Fig. 5 is an elevation of the blank shown in Fig. 4, taken at right angles to Fig. 4;

Fig. 6 is a bottom view of the blank shown in Fig. 4;

Fig. 7 is a sectional elevation of the apparatus which performs the final step in the forming of a split bolt connector;

Fig. 8 is a sectional elevation taken along line 8—8 of Fig. 7;

Fig. 9 is a section taken along line 9—9 of Fig. 7;

Fig. 10 is an elevation of the split bolt connector in its final form;

Fig. 11 is a plan view of the connector shown in Fig. 10; and,

Fig. 12 is an end view of the connector shown in Fig. 11.

With further reference to the drawings in which like reference numerals indicate like parts, the wire stock is first formed to produce a U-shaped blank 20 shown in Fig. 1. In the operation by which the blank 20 is bent the dies flatten the sides thereof as indicated at 21, and cause some of the metal to flow downwardly toward the ends of the legs of the U-shaped blank 20. This however does not create any material deformation in the U-shaped blank or the legs thereof. The effect of contact of the original bending dies against the legs is somewhat exaggerated in the showing in Fig. 1. Fig. 2 indicates more definitely the degree of flattening which takes place because of the pressure of the bending dies.

In the initial operation the blank 20 is formed with the legs thereof spaced considerably farther apart than the final distance desired between the two threaded bifurcations of the split bolt. Sufficient metal is thus provided in the connecting portion for the bolt head.

The U-shaped blank 20 is then further formed by squeezing together its legs and upsetting the connecting portion as shown in Figs. 2 and 3.

When the U-shaped member is inserted in the grooves of two die blocks 22 and 23, it may assume either an upright position or a position where it is tilted to one side or the other (see Fig. 2). As a punch 24 descends, a curved recess 25 in the punch cooperates with the rounded connecting portion of the blank 20 to cause the blank to shift laterally to an upright position. The force of the descending punch block 24 serves first to wedge the leg ends of the blank 20 toward each other, the resulting deformation of the blank taking the

form of an increased bending of the connecting portion. When each leg of the blank has been forced down to the bottom of two grooves 25 and 27, provided in the die blocks 22 and 23, and two lugs 26 and 29 on the blank 20 have been fitted into two slotted portions 30 and 31 of the die blocks, downward motion of the punch 24 is continued and the die blocks 22 and 23 are brought together. This results in a squeezing force of high magnitude which compresses and thereby enlarges the cross-section of the rounded connecting portion of the blank. As the die blocks approach their final position as shown in Fig. 3, the punch block 24 upsets the connecting portion of the blank. At the same time the legs of the blank are shaped by the coaction of the grooves 26 and 27 in the die blocks and corresponding grooves 32 and 33 in a mandrel 34. This shaping operation, which is performed under considerable lateral pressure, causes the legs of the blank to assume a shape wherein the area of the cross-section is equal to the cross-sectional area of the threaded leg of the finished connector as shown in Figs. 10 and 11.

It will be seen that this process entails a certain amount of working in the legs which is sufficient to give them the required hardness, but there is no drawing of the legs which might cause undesirable fractures or strains therein.

The partially formed blank 35 is shown in Figs. 4, 5 and 6 wherein it will be seen that the connecting portion of the blank 20 has been upset into the head portion 36. This headed portion has sufficient amount of metal therein so that it may be readily shaped into the desired form by the final operation.

The final operation wherein screw threads are punched into the connector legs is shown in Figs. 7, 8 and 9.

The partially formed blank 35 is mounted on a mandrel 37. Die blocks 38 and 39, which are formed with screw threads 40 are disposed at either side of the mandrel and cooperate therewith to impart the final shape to the connector. The threaded grooves in the die blocks terminate in an unthreaded flared hexagonal portion 41 which is shown in dotted lines in Fig. 8. A punch 42 further upsets the head 36 within the confines of the flared portions 41 to finally shape the head into the desired hexagonal shape.

The final product is illustrated in Figs. 10, 11 and 12 wherein the connector 43 comprises a hexagonal head 44 and threaded legs 45. The ends of the legs comprise the lugs 46 which facilitate the threading of a nut onto the connector.

The flow of the metal is such during working of the legs that it is necessary to provide an excess of metal near the extremities of the legs in order to completely fill out the screw threaded grooves in the dies. This excess of metal is provided on the blank in the first operation by which the blank shown in Fig. 1 is formed from plain wire stock.

From the foregoing description it is believed that the construction and operation of the present invention will be readily apparent to those skilled in this art. Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. The method of making a headed bifurcated article from a U-shaped blank comprising forcing the legs of the blank toward each other, confining and squeezing the connecting portion of the blank as the legs are brought toward each other forcing the connecting portion to become shorter and thereby enlarging its cross section without stretching or materially deforming the leg portions other than the shaping thereof, and upsetting said connecting portion to form a head.

2. The method of making a headed bifurcated article from a U-shaped blank comprising shortening and upsetting the connecting portion of the blank to bring the leg portions closer to each other to form a head and simultaneously pressure shaping the leg portions thereof without stretching or materially deforming said leg portions other than the shaping thereof.

3. A method of making a headed bifurcated article comprising the steps of severing from wire stock a predetermined amount of material, bending said material into a U-shaped blank, bending and squeezing the legs of said U-shaped blank toward each other and simultaneously compressing the connecting portion endwise to increase its cross section and form it into a head without stretching or materially deforming said leg portions other than the shaping thereof, and shaping the legs while the head remains partially unconfined and stamping the head.

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