United States Patent

Brubaker

[15] **3,702,104**

[45] **Nov. 7, 1972**

[54] **METHOD OF MANUFACTURE FOR WIRE GRIP TERMINAL**

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[73] Assignee: **Berg Electronics Inc.,** New Cumberland, Pa.

[22] Filed: **Aug. 20, 1970**

[21] Appl. No.: **65,406**

Related U.S. Application Data

[62] Division of Ser. No. 851,030, Aug. 18, 1969, Pat. No. 3,601,786.

[52] **U.S. Cl.** **113/119**

[51] **Int. Cl.** **B21d 53/36**

[58] **Field of Search**.....113/119, 116 H, 116 P, 116 DD, 113/121 A, 121 E; 339/258 R, 258 RR, 242, 47, 95 R, 95 A, 95 T, 95 B, 95 D, 47 R, 47 C

[56] **References Cited**

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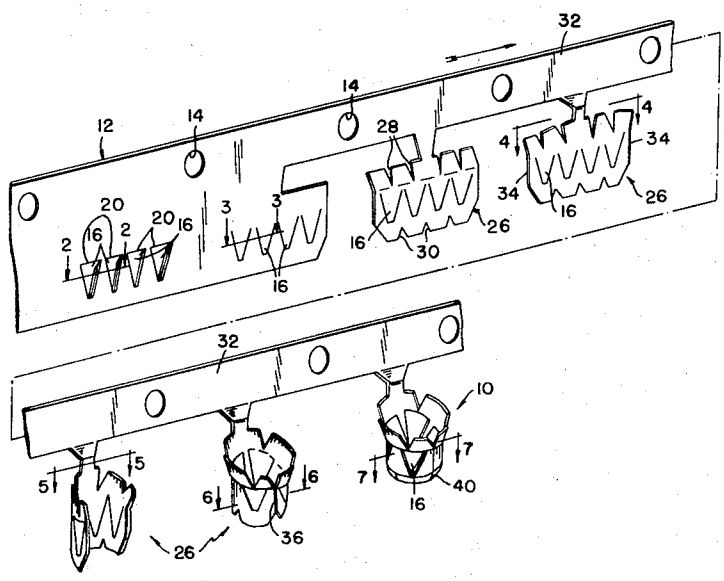
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Primary Examiner—Richard J. Herbst
Attorney—Thomas Hooker

[57] **ABSTRACT**

A wire grip circuit board eyelet with wire-engaging burrs on the edges of the wire grip fingers and the method of making the same.

2 Claims, 8 Drawing Figures



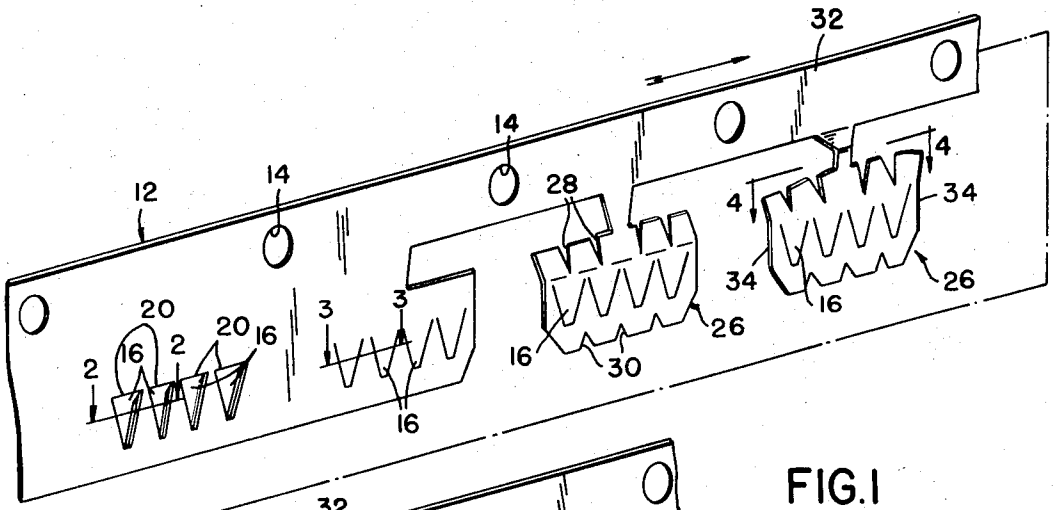
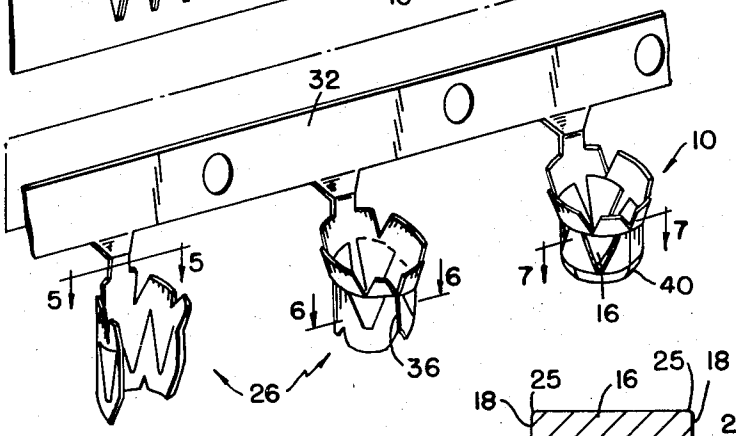


FIG.1



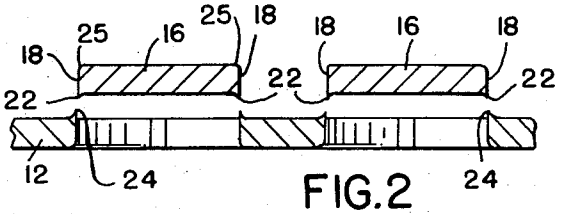


FIG.2

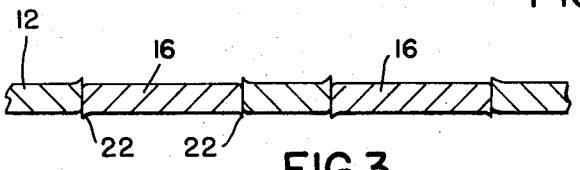


FIG.3

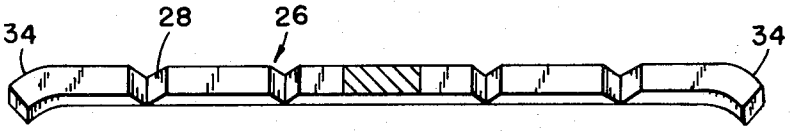


FIG.4

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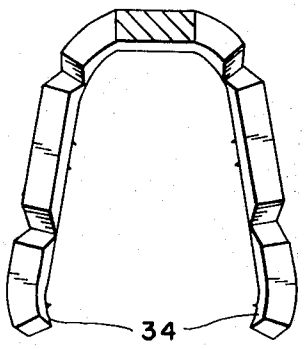


FIG.5

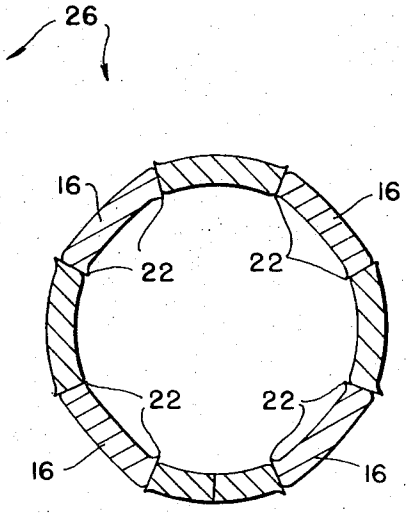


FIG.6

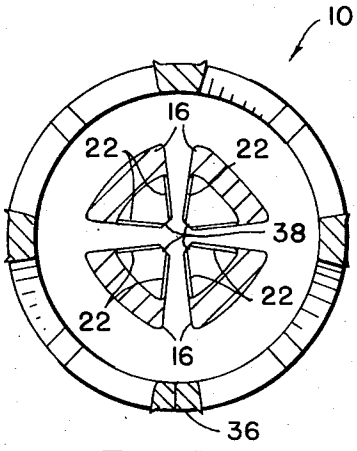


FIG.7

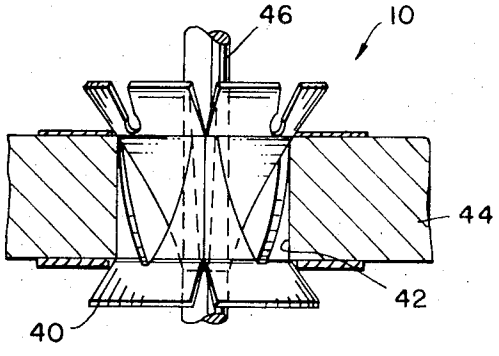


FIG.8

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METHOD OF MANUFACTURE FOR WIRE GRIP TERMINAL

This application is a division of my earlier filed application Ser. No. 851,030, filed Aug. 18, 1969, for Wire Grip Terminal and Method of Manufacture which issued on Aug. 24, 1971, as U.S. Pat. No. 3,601,786.

This invention relates the wire grip terminals and in particular to wire grip circuit board eyelets and the method of making the same. Wire grip fingers in the terminals are provided with wire-engaging burrs on the edges thereof so that when a lead wire is inserted into a terminal, the burrs bite into the wire and hold it relative to the terminal. The burrs are formed by punching the wire grip fingers out of one side of metal stock and then bending the fingers back through the thickness of the stock into the interior of the terminal.

Circuit board eyelets of the type disclosed in U.S. Pat. No. 3,368,188 and in Olsson copending U.S. Pat. application Ser. No. 712,317, filed Jan. 3, 1968, now U.S. Pat. No. 3,504,328 both assigned to Berg Electronics, Inc., utilize wire grip fingers to hold a lead wire fixed relative to the eyelet prior to and during soldering. Other terminals, such as those disclosed in U.S. Pat. No. 3,283,288 also use wire grip fingers for holding a lead prior to and during soldering.

In some terminals using wire grip fingers it has been found desirable to increase the gripping ability of the fingers so that leads inserted into the terminals are more tightly held against shifting within the terminal. This is particularly true in the case of circuit board eyelets of the type referred to where the eyelets are very small in size and are used to hold leads supporting relatively heavy circuit components. The weight of the components tends to shift the leads in the eyelet, with the result that the leads may project beneath the bottom of the circuit board, thereby requiring clipping following soldering. Additionally, the leads may even be pulled out of the eyelets so as to require reinsertion prior to soldering.

The invention improves the wire gripping capacity of circuit board eyelets and other terminals using wire grip fingers by providing sharp lead-engaging burrs on the edges of the fingers facing the interior of the terminal. When a lead is inserted into the terminal the fingers are force apart and the burrs bite into the lead to provide an improved grip on the lead.

The wire grip burrs are formed by a manufacturing process in which the wire grip fingers are punched from the stock forming the eyelet so that burrs are formed on the edges of the fingers adjacent the stock. The fingers are then pushed back into the finger cut-outs in the stock and the stock is rolled to form the body of the eyelet with the burrs on the fingers facing the interior of the eyelet. After rolling of the eyelet, the fingers are bent into the eyelet with the ends of the fingers positioned together within the eyelet. The burrs face the interior of the eyelet so that they engage leads inserted into the eyelet with improved wire gripping ability.

Other objects and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawings illustrating a preferred embodiment of the invention, wherein:

FIG. 1 is a perspective view of the progression of a metal strip through a progressive die illustrating the formation of a circuit board eyelet according to the invention;

FIGS. 2, 3, 4, 5, 6 and 7 are sectional views taken respectively along lines 2—2, 3—3, 4—4, 5—5, 6—6, and 7—7 of FIG. 1; and

FIG. 8 is a sectional view illustrating the use of a circuit board eyelet according to the invention.

As illustrated in FIG. 1, circuit board eyelet 10 is formed from a strip of relatively thin sheet metal stock 12 which is moved past a number of die stations. At each station a die pair performs an operation on the strip. The strip 12 may be made of brass suitably coated with solder or other metal. The strip is provided at regular intervals with pilot holes 14 which run the length of the strip and are used to assure proper orientation of the strip at each die station. The strip is moved in the direction of the arrow in FIG. 1.

At the first station of the progressive die, four triangularly shaped wire grip fingers 16 are punched from the strip 12. Each finger is severed from the strip along the edges 18 and remains attached to the strip at connection portion 20. The fingers are punched to one side of the strip as illustrated in FIG. 2.

During punching of the fingers from the strip, sharp burrs 22 are formed on the fingers at edges 18 facing strip 12. Burrs 24 adjacent edges 18 are also formed on strip 12. The burrs 22 extend along the sheared edges of each finger and around the finger from one end of the strip connecting portion 20 to the other end of the portion. The edges 25 of the fingers facing away from strip 12 are rounded somewhat during the punching operation.

Following indexing of strip 12 to the second station of the progressive die, the fingers 16 are moved back into the thickness of strip 12 as illustrated in FIG. 3. It is necessary to position the fingers within the strip so that the eyelet may be rolled without collapsing the body portion. Movement of the fingers back into the strip does not materially dull the burrs 22. At the second station strip 12 is partially blanked to define the portion from which the eyelet 10 will be formed.

At the third station, blanking of the strip is completed to form eyelet preform 26. Slits 28 are formed in the top of the preform and the top of the preform is slightly flared. Notches 30 are formed on the bottom of the perform.

At the fourth station, preform 26 is offset relative to carrier strip 22 and the ends 34 of the preform are rolled slightly as illustrated in FIG. 4. The preform is rolled in a direction so that the burrs 22 on fingers 16 will face the interior of the completed eyelet. At the fifth station the preform 26 is rolled further to the configuration illustrated in FIG. 5.

At the sixth station, rolling of the preform is completed so that ends 34 abut each other at seam 36 and the portion of the preform containing fingers 16 is cylindrical. At the sixth station, as illustrated in FIG. 6, fingers 16 remain located within the thickness of the preform 26 and burrs 22 on the fingers face the interior of the rolled preform.

The formation of eyelet 10 is completed at the seventh station where fingers 16 are bent into the interior of the eyelet body so that, as illustrated in FIG. 7, the free ends 38 of the fingers are grouped together. At this time the portions of the eyelet 10 between notches 30 may be bent inwardly to provide a rounded lead-in 40 to facilitate positioning of the eyelet within a circuit board hole.

As illustrated in FIG. **8**, a circuit board eyelet **10** may be severed from strip **32** and seated within hole **42** of circuit board **44**, with lead-in **40** flared outwardly to secure the eyelet within the hole. Upon insertion of a lead wire **46** within the eyelet, fingers **16** are spread apart so that burrs **22** engage the wire. Movement of the wire past the burrs causes the burrs to bite into the wire so that the fingers grip the wire securely. The burrs at the long edges **18** of the fingers are urged into contact with a lead inserted into eyelet **10** and form a locking grip on the lead which resists removal of the lead from the eyelet. This is because the burrs cross the surface of the lead at an acute angle. The burrs at the free ends of the fingers also engage the lead.

In the manufacture of conventional wire grip terminals, the fingers are punched from the stock in a direction opposite the direction in which fingers **16** are punched at the first position of the progression illustrated in FIGS. **1** and **2** so that the wire grip fingers on the completed terminal are not provided with wire or lead engaging burrs facing into the body of the terminal. Rather, the edges of the fingers facing the interior of the terminal are rounded and do not bite into the lead.

While I have illustrated and described a preferred embodiment of my invention, it is understood that this is capable of modification, and I therefore do not wish to be limited to the precise details set forth.

What I claim my invention is:

1. The method of forming a wire grip finger from thin sheet metal stock comprising the steps of punching a finger through the thickness of the stock to one side thereof to form burrs on the edges of the finger facing the stock, and then moving the finger back toward the stock, through the thickness of the stock and to the other side thereof without deforming the burrs so that the edges of the finger are free of the stock and the burrs on the edges of the finger project away form the stock.

2. The method of forming a wire grip terminal from thin metal stock comprising the steps of punching a plurality of tapered wire grip fingers from the stock so that the fingers are located to one side of the stock and burrs are formed along the edges of the fingers facing the stock, and moving the fingers back into the cut-outs in the stock formed during punching of the fingers, rolling said stock to form a cylindrical body with the burrs facing the interior of said body, and then moving said fingers into the interior of the body.

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