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Lemke et al.

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[54] **CARRIER STRIP FED SOCKET TERMINAL**

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[73] Assignee: **AMP Incorporated,** Harrisburg, Pa.

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[52] **U.S. Cl.** ..... **339/258 P;** 339/17 C; 339/256 R

[51] **Int. Cl.²** **H01R 13/12**

[58] **Field of Search** ..... 339/258 R, 258 RR, 258 A, 339/258 P, 259 R, 262 R, 262 P, 276 SF, 17 C, 17 CF, 256 R

[56] **References Cited**

UNITED STATES PATENTS

2,666,189	1/1954	Cook	339/259 R
3,189,869	6/1965	Avery	339/258 R
3,381,262	4/1968	Jeanrenaud	339/258 R
3,681,744	8/1972	Olsson	339/256 R
3,803,537	4/1974	Cobaugh et al.	339/276 SF

FOREIGN PATENTS OR APPLICATIONS

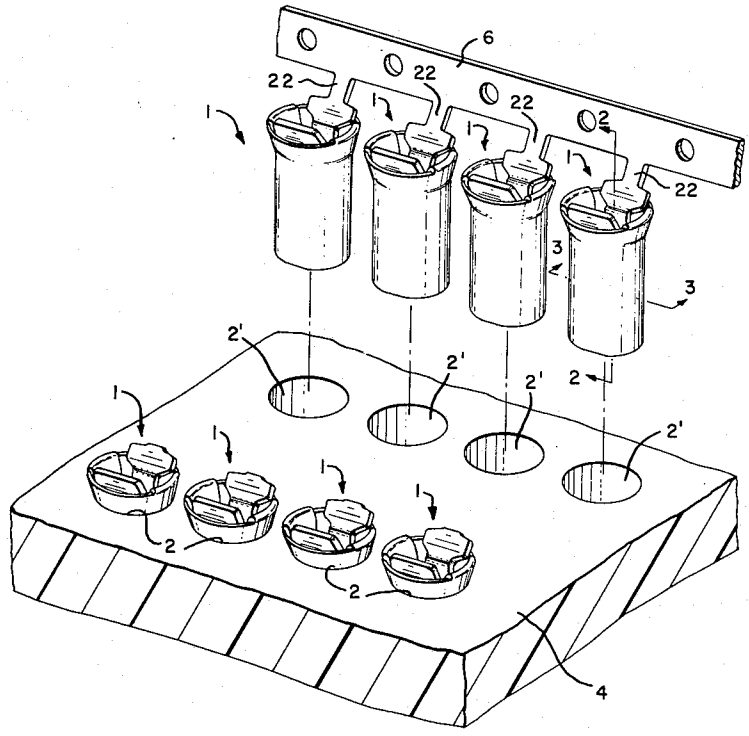
317,343	12/1919	Germany	339/262 R
206,628	11/1923	United Kingdom	339/262 R
662,195	4/1965	Belgium	339/256 R

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Assistant Examiner—James W. Davie
Attorney, Agent, or Firm—Gerald K. Kita

[57] **ABSTRACT**

A plurality of electrically conducting socket-type terminals are provided on a common carrier strip. The sockets comprise sleeves of conducting material which contain a resiliently expansible receptacle which forms a female terminal. Each receptacle is freely expansible internally of a corresponding sleeve. This is accomplished by providing a pair of opposed spring arms of the receptacle which are free to deflect resiliently toward and away from each other internally of a corresponding sleeve. Positive connection between a corresponding sleeve and a receptacle is accomplished totally externally of the receptacle in order to prevent undue constraint of its resilient expansion. Such a connection is accomplished by providing a tab integral with a non-deflectable portion of a receptacle, the tab projecting outwardly of the receptacle for connection to the enclosing sleeve. The free ends of the spring arms protrude outwardly of the sleeve to provide an enlarged flared entryway to the receptacle. The free ends are also exposed to allow visual inspection of their correct alignment. The ends are further widened to provide relatively large target surfaces for receiving and funneling the male electrical terminal which is to be connected within the receptacle.

5 Claims, 5 Drawing Figures



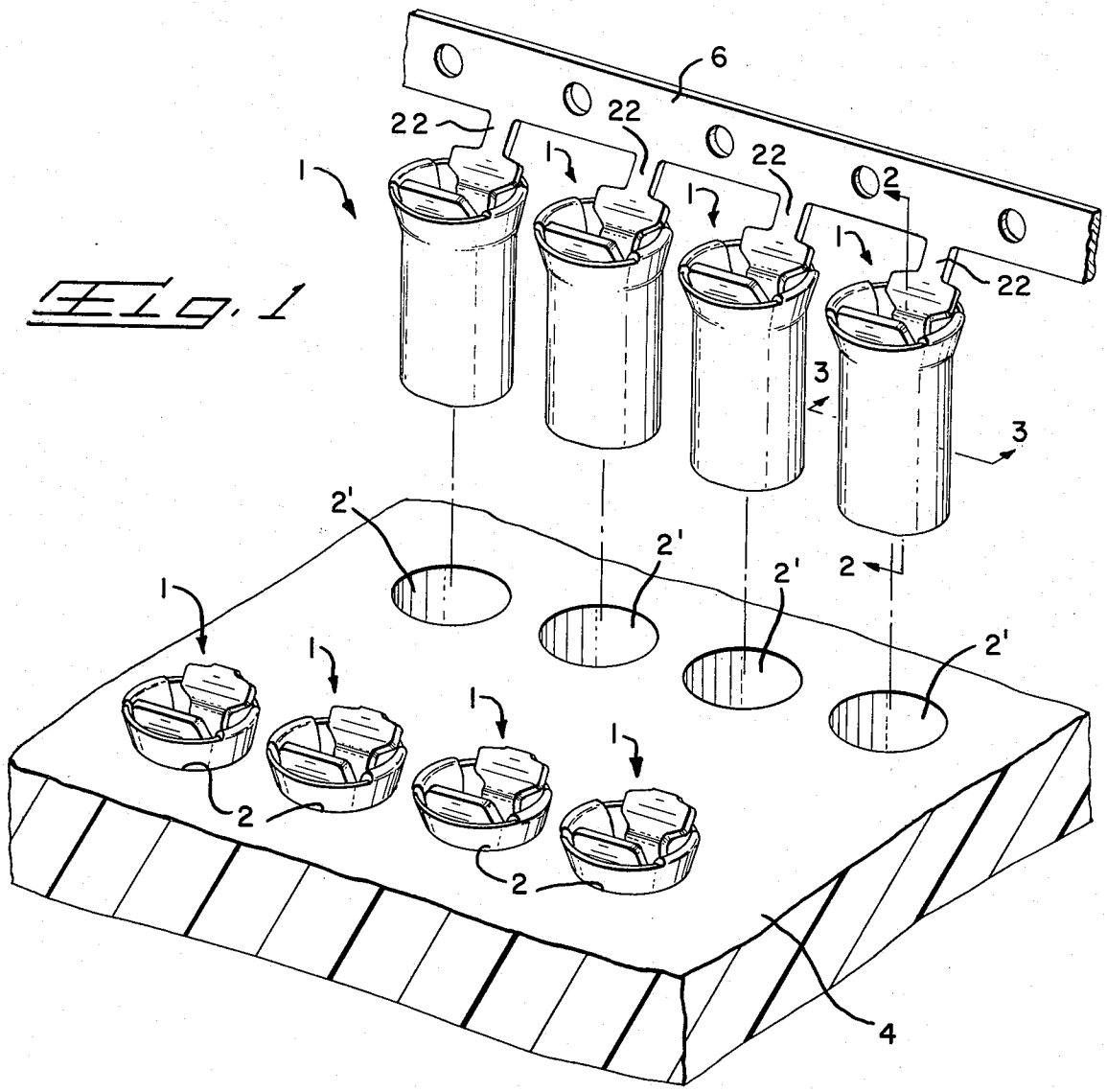

6
22
22
22
22
1
1
1
1
2
3
3
2'
2'
2'
2
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1
1
1
2
2
4

FIG. 1

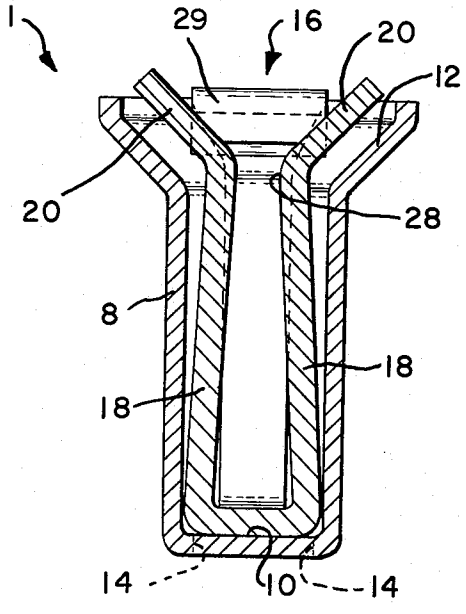

1
29
16
20
12
20
28
8
18
18
14
10
14

FIG. 2

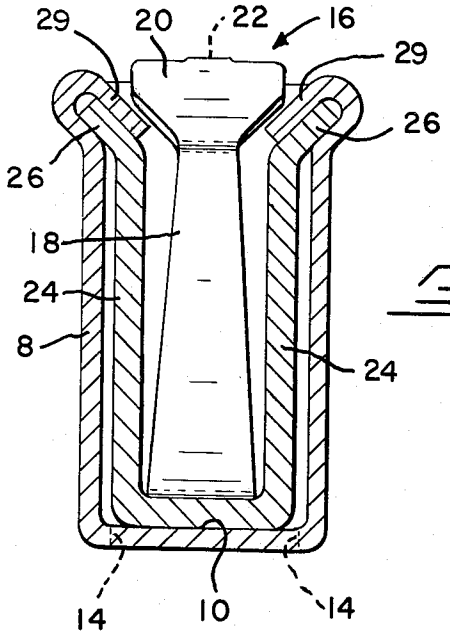


Fig. 3

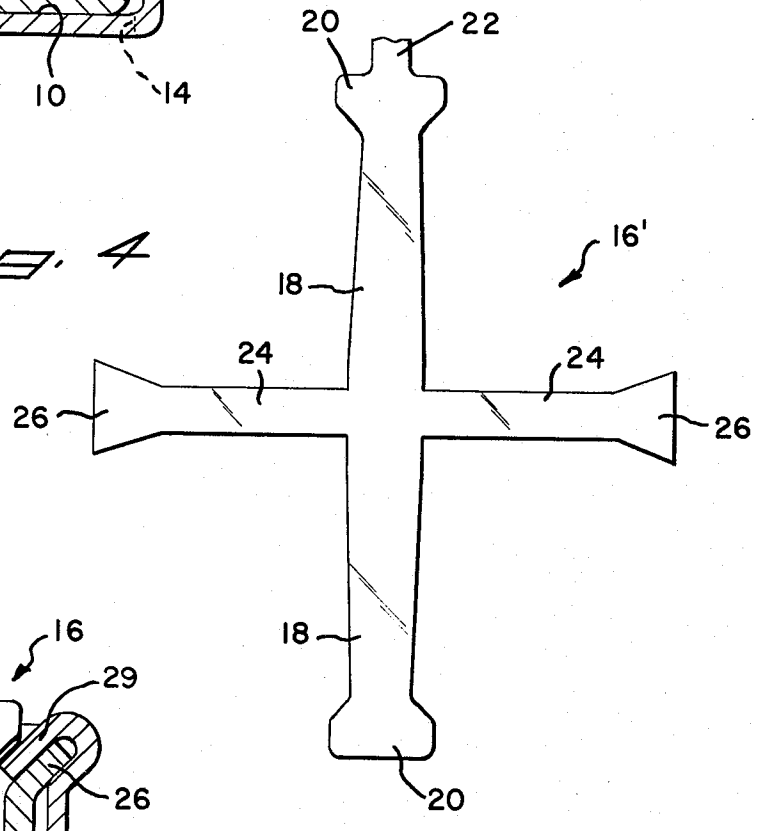


Fig. 4

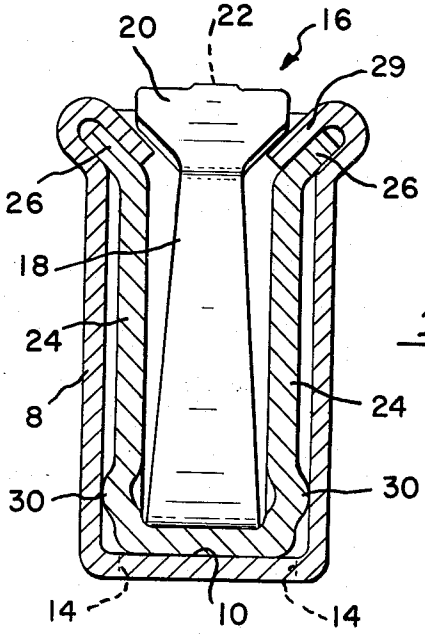


Fig. 5

CARRIER STRIP FED SOCKET TERMINAL

BACKGROUND OF THE INVENTION

The present invention relates to connection of electrical circuit elements to a printed circuit board. The circuit elements usually are provided with projecting electrical leads which are plugged into apertures of the printed circuit board and soldered in place to make permanent connections. However it is often desired that circuit elements be mounted to a printed circuit board by resilient socket connections to enable removal of the circuit elements for repair or replacement. Various types of electrical receptacles have been heretofore utilized. Some project above the printed circuit board and are secured within apertures of the printed circuit board by depending posts. Others take the form of sockets containing resilient receptacles therein, the sockets being advantageously of minimal height when mounted within corresponding apertures of the printed circuit board. The miniature size required of such sockets makes them difficult to handle. Since each socket is in the form of an expansible electrical receptacle contained within a sleeve or cup, it has been heretofore difficult to inspect the receptacle for defects or damage.

BRIEF DESCRIPTION

The present invention contemplates fabricating individual sockets along a common carrier strip in desired spaced relationship for ease in handling and assembly of the sockets within correspondingly spaced apertures of a printed circuit board. The present invention provides a receptacle which partially protrudes from the enclosing sleeve or cup to present the working parts of the receptacle visually available for inspection. In addition an enlarged funnel entry is provided for the receptacle by the exposed working parts thereof. Also an enlarged surface target area is made available for receipt and funneling of an electrical lead or male terminal into the receptacle. To insure unconstrained resilient expansion of the receptacle upon receipt of an electrical lead or male electrical terminal, the receptacle is freely received in the enclosing sleeve or cup, and attachment to the cup is accomplished by at least one, and preferably a pair of, projecting tabs which are integral with a nonexpansible portion of the receptacle and which project outwardly from the confines of the receptacle for connection to the sleeve or cup. Typically such a connection comprises a portion of the lip of the sleeve or cup being folded over into gripped relationship on the end of the projecting tab or tabs. Accordingly the receptacle is suspended within the cup or sleeve for relatively unrestricted resilient expansion.

OBJECTS OF THE INVENTION

Accordingly it is an object of the present invention to provide a socket-type electrical connector of miniature size containing a resiliently expansible electrical receptacle having a separate projecting tab for connection of the receptacle to the sleeve, and with the portion of the receptacle being frangibly connected in depending relationship from the carrier strip.

Another object of the present invention is to provide a resiliently expansible electrical receptacle of miniature size within an enclosing metal sleeve, the receptacle being connected to the sleeve by at least one tab portion integral with and projecting outwardly of a nonexpansible portion of the receptacle for retention against a portion of the sleeve.

Another object of the present invention is to provide a socket-type electrical terminal of miniature size having an outer metal sleeve containing a resiliently expansible electrical receptacle which is retained in suspended relationship within the confines of the sleeve by tab portions integral with the receptacle and connected to the sleeve at a location externally of the receptacle, the receptacle further being connected frangibly in depending relationship from a carrier strip for ease in handling.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is an enlarged fragmentary perspective of a printed circuit board and a plurality of socket-type electrical terminals according to the present invention with one row of the receptacles being mounted within corresponding apertures of a printed circuit board, and with an additional row of terminals shown in exploded configuration from the printed circuit board and attached to a common carrier strip.

FIG. **2** is an enlarged section taken along the lines **2—2** of FIG. **1.**

FIG. **3** is an enlarged section taken along the lines **3—3** of FIG. **1.**

FIG. **4** is an enlarged plan of a metal blank of an electrical receptacle according to the present invention prior to formation of the blank into a receptacle configuration.

FIG. **5** is a section similar to that of FIG. **3** of an alternative embodiment according to the present invention.

DETAILED DESCRIPTION

With particular reference to the drawings there is shown in FIG. **1** a plurality of discrete socket-type electrical terminals **1** according to the present invention mounted within corresponding apertures provided in a printed circuit board **4.** An additional row of terminals **1** are illustrated in depending relationship from a carrier strip **6** which is utilized to convey and locate the row of terminals **1** in a desired spaced relationship corresponding to that of the row of apertures **2'** provided in the printed circuit board **4.** The terminals **1** are then received in the corresponding apertures **2'.** Subsequently the carrier strip **6** is frangibly detached after mounting and soldering of the terminal in place within the printed circuit board.

The details of a examplary terminal **1** is illustrated with reference to FIGS. **2, 3,** and **4.** Each terminal **1** includes a generally cylindrical cup **8** of metal which is made by drawing, for example, to provide a bottom wall **10** and a cup sidewall having an outwardly flared and enlarged circular lip **12.** Alternatively the cup may have its bottom wall **10** removed as for example along the dotted outline **14** in order to provide a generally cylindrical sleeve instead of a cup having a bottom wall. The cup or sleeve contains an electrical receptacle **16,** the blank of which **16'** is illustrated in FIG. **4.** The receptacle is advantageously fabricated by stamping and forming the blank **16'** from metal strip. The receptacle includes a pair of elongated resilient spring arms **18,** which are integral with one another at first ends and which have free ends **20.** For example, one of the free ends **20** is frangibly attached by a frangibly separated stem **22** to the carrier strip **6** as shown in FIG. **1.** The receptacle further includes at least one and preferably

a pair of projecting tab portions **24** which are integral generally with the intersecting integral portions of the arms **18.** The free ends of the tab portions **26** are generally widened as shown in FIG. **4.**

In addition the spring arms **18** generally taper from their integral intersecting portions toward their free ends to reduce stiffness and resistance to resilient deflection. However the free ends are abruptly widened to provide an enlarged surface area thereto for a purpose to be described.

The resilient arms **18** of the blank are formed into opposing relationship in generally a U-shape as shown in FIG. **2.** As shown the U-shaped configuration is freely received within the confines of the sleeve or cup **8** and the arms **18** are generally in opposed relationship, angled generally toward each other to define a reduced throat area **28** adjacent the enlarged surfaced free ends **20** thereof. In addition the enlarged surface ends **20** are generally within the confines of the enlarged opening to the sleeve or cup **8** defined by the flared lips **12.** The ends **20** accordingly are permitted to be formed in diverging angled relationship to provide a funneled entrance to the reduced throat area **28.** As shown the reduced throat area **28** is advantageously adjacent the free ends **20** and in substantial spaced relationship from the integrally joined ends of the spring arms **18.** When a male terminal or electrical lead is inserted in the throat area **28,** the lead will bias apart the spring arm **18** by cantilever deflection, permitting resilient outward expansion of the receptacle **16.** Substantial resilient spring forces are produced by deflecting the spring arms **18** to provide a gripping action on the inserted lead or terminal. Such forces are proportional to the lengths of the spring arms from where they are supported mutually at their ends to the reduced throat area **28** at which the deflection forces are applied by the inserted lead or terminal. The receptacle is suspended within the confines of the cup or sleeve **8** and is thus allowed to expand freely in response to insertion of a lead or terminal therein. More particularly the receptacle is freely received within the cup or sleeve **8** and is retained by at least one and preferably a pair of tab portions **24** which, as shown in FIG. **3,** are formed into a U-shaped configuration with the widened ends **26** being outwardly flared in receipt against the outwardly flared lip **12** of the sleeve or cup **8.** As shown the tab portions **24** are in opposed relationship and project outwardly of the receptacle formed by the opposed spring arms **18.** The bottom portion of the U-shape formed by the spring arms **24** is in registration generally against the bottom **10** if member **8** is a cup. The end portions **26** are retained under flap portions **29** integral with the outwardly flared lip **12.** The tab portions being opposed thus center the receptacle within the confines of the sleeve or cup and retain the receptacle within the sleeve or cup **8.** If member **8** is a sleeve, the ends **26** are gripped sufficiently tight under the flap portions **28** to retain the receptacle in centered position within the sleeve despite the absence of the bottom wall **10.**

As a modification shown in FIG. **5,** the flap or tab portions **24** may each be provided with a formed projecting dimple **30** for registration against the cylindrical sidewall of the cup or sleeve **8,** force-fitting the opposed flap portions in the sleeve or cup. Such registration further serves to retain the receptacle and also to center the receptacle within the sleeve or cup **8.**

As a further feature of the present invention, the enlarged surface areas of the spring arm ends **20** may project slightly outwardly of the flared lip **12.** Such a configuration provides an enlarged target for receiving and guiding the male terminal or lead for insertion within the corresponding receptacle. In addition the enlarged sizes of the ends **20** as well as their projecting configuration allows for visual inspection of the receptacle. More particularly due to the miniature size of the receptacle, the visual portion of the receptacle is greatly enlarged and partially protrudes for ease in visual inspection for damage or misalignment of the receptacle.

Although preferred embodiments and modifications of the present invention are illustrated and described in detail other modifications and embodiments are intended to be covered by the spirit and scope of the appended claims.

We claim:

1. A socket terminal, comprising:

an outer metal enclosing container means having at least one enlarged open end defined by an encircling and outwardly flared lip,

an electrical receptacle in said container means defined by a pair of opposed elongated spring arms intersecting and integral with each other at respective first ends,

a pair of tab portions integral with said intersecting ends of said spring arms and projecting outwardly of said receptacle but within the confines of said container means,

said tabs having free ends engaging and secured to said lip of said container means suspending said receptacle within said container means,

said opposed spring arms forming generally a U-shaped receptacle and converging toward second free ends thereof and defining a reduced throat for said receptacle within and adjacent said encircling lip of said container,

said second free ends outwardly diverging from said throat defining a funnel entry at said throat,

said second free ends being widened to define enlarged surface target areas at said funnel entry, and

said outwardly diverging second free ends overlying and in spaced relationship from said outwardly flared lip of said container means, whereby said spring arms are capable of resilient cantilever deflection away from each other.

2. The structure as recited in claim **1,** wherein, said outwardly diverging ends project outwardly of the confines of said flared lip thereby projecting said target areas outwardly of said lip and allowing for visual inspection of said receptacle.

3. The structure as recited in claim **1** and further including:

a carrier strip, and a stem portion of said carrier strip frangibly attached to one of said second free ends of said spring arms.

4. The structure as recited in claim **1** and further including:

flap portions on said outwardly flared lip, said second free ends of said tabs being gripped under said flap portions.

5. The structure as recited in claim **1** and further including:

projecting dimple means on said tab portions engageable against said container means force fitting the opposed tab portions in said container means.

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