



⑫ **EUROPEAN PATENT SPECIFICATION**

④⑤ Date of publication of patent specification :
02.08.95 Bulletin 95/31

⑤① Int. Cl.⁶ : **H01R 23/70, H01R 43/16**

②① Application number : **92901266.4**

②② Date of filing : **21.11.91**

⑧⑥ International application number :
PCT/US91/08674

⑧⑦ International publication number :
WO 93/10580 27.05.93 Gazette 93/13

⑤④ **CONNECTOR BOARDLOCK.**

④③ Date of publication of application :
17.08.94 Bulletin 94/33

⑦③ Proprietor : **ITT INDUSTRIES, INC.**
1105 North Market Street,
Suite 1217
Wilmington, Delaware 19801 (US)

④⑤ Publication of the grant of the patent :
02.08.95 Bulletin 95/31

⑦② Inventor : **MOSQUERA, Rene, Augusto**
29722 Michelis Street
Laguna Niguel, CA 92677 (US)

⑧④ Designated Contracting States :
DE FR GB

⑦④ Representative : **Esser, Wolfgang**
c/o Deutsche ITT Industries GmbH
ITT Regional Patent Office-Europe
Hans-Bunte-Strasse 19
D-79108 Freiburg (DE)

⑤⑥ References cited :
EP-A- 0 388 478
EP-A- 0 393 864
WO-A-89/08339
US-A- 3 072 104

EP 0 610 188 B1

Note : Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid (Art. 99(1) European patent convention).

Description

BACKGROUND OF THE INVENTION:

One type of electrical connector has a housing designed to mount directly against the upper surface of a circuit board, with the connector contacts having termination ends engaged with conductive traces on the circuit board. The connector housing can be held to the circuit board by a pair of boardlocks that pass through holes in a pair of housing flanges and through corresponding holes that have been drilled into the circuit board. In most cases, the circuit board holes have been plated, with some of the plating coating the walls of the hole and additional portions lying on upper and lower faces of the board around the hole, to establish the board hole and connector housing at ground potential. With the boardlocks installed, the electrical connections between the connector and board may be soldered as by wave soldering. Each boardlock preferably has portions that abut both the upper and lower portions of the flange to lock securely to the connector during handling and shipment to the customer who will assemble it to the circuit board. Each boardlock also preferably makes firm contact with plated walls of the circuit board hole at several locations. In addition, the boardlock should offer high resistance to pullout from the circuit board in the final assembly. A boardlock which could be constructed at low cost and which provided the above features, would be of considerable value.

SUMMARY OF THE INVENTION

In accordance with one embodiment of the present invention, a low cost boardlock is provided which can be inserted through holes in a connector flange and in a circuit board to securely hold the connector and board together while assuring good electrical connection between them. The boardlock is designed to fit through a connector flange hole of a first diameter and a board hole of a second larger diameter. The boardlock is formed from a piece of sheet metal that is bent around a vertical axis to form largely tubular upper and lower hole-received portions that are received respectively in the flange hole and the larger board hole. A pair of horizontal separator slots extend from each edge of the sheet metal partially around the boardlock to allow edge regions of the lower tubular portion to be bent to a larger radius of curvature to fit tightly in the larger circuit board hole. The vertical middle portion of the boardlock, where the tubular upper and lower portions are not separated by a slot, preferably has at least one radially outward projection as in the form of a bump; the bump lies in the tubular lower portion to center it in the board hole. The tubular lower portion has slits forming a pair of fingers that extend at upward and radially outward inclines so the

upper surfaces of the fingers substantially abut the lower surface of the flange. A bottom portion of the boardlock is tapered and has inclined slits that form ramps that can lie substantially under the lower board surface and which are soldered thereto, so any upward pullout force on the boardlock tends to compress solder lying between the ramp and the bottom surface of the circuit board.

The novel features of the invention are set forth with particularity in the appended claims. The invention will be best understood from the following description when read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an isometric view showing a connector installed on a circuit board by the use of boardlocks, all constructed in accordance with the present invention.

Fig. 2 is a front and top isometric view of one of the boardlocks of Fig. 2, ready to be installed.

Fig. 3 is a left side and top isometric view of the boardlock of Fig. 2.

Fig. 4 is a plan view of a piece of sheet metal which has been cut out, and which can be bent to form the boardlock of Fig. 2.

Fig. 5 is a front elevation view of the boardlock of Fig. 2, but with the top tabs not folded to the horizontal.

Fig. 6 is a view taken on the line 6 - 6 of Fig. 5.

Fig. 7 is a view taken on the line 7 - 7 of Fig. 5.

Fig. 8 is a view taken on the line 8 - 8 of Fig. 5.

Fig. 9 is a sectional view of the boardlock of Fig. 6, with the tabs folded, shown installed on a connector housing and circuit board, but prior to a final soldering operation.

Fig. 10 is a sectional side view of the arrangement of Fig. 9, but taken on a view perpendicular to that of Fig. 9.

Fig. 11 is an enlarged view of a portion of Fig. 9, with the boardlock fully soldered in place.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Fig. 1 illustrates an assembly 10 of an electrical connector 12 and a circuit board 14. The connector 12 has a housing 16 that includes a pair of flange elements or flanges 20, 22 that have lower surfaces that lie facewise against the upper surface of the circuit board element or circuit board. A pair of identical boardlocks 24, 26 each extend through aligned holes 30, 32 in the connector flange and in the circuit board to mechanically and usually electrically connect them together. The connector 12 is of the type that has multiple contacts 34 with mating ends 36 that mate with the contacts of another connector, and with termina-

tion ends 38 that bear against conductive traces (not shown) on the upper surface of the circuit board and which will eventually be soldered thereto. It should be noted that terms such as "upper", "lower", "vertical", etc. are used herein only to aid in the description of the invention, and that the parts can be used in any orientation with respect to gravity.

Fig. 2 illustrates details of the boardlock 24. The boardlock 24 is formed of a piece of sheet metal that was originally flat, but which has been bent to form largely tubular upper and lower hole-received portions 40, 42. The tubular upper portion 40 is designed to lie tightly within the flange hole, while the tubular lower portion 42 is designed to lie tightly within the circuit board hole. The tubular upper portion 40 has a pair of adjacent largely vertical edge portions or edges 44, 46 that are designed to bear firmly against the walls of the flange hole, while the tubular lower portion has a pair of adjacent lower edges 50, 52 that are designed to bear firmly against the walls of the circuit board hole. It is noted that it is not necessary that each edge be sharp, but can even be bent-around. The boardlock has five tabs 54 at the top which bear against the upper surface of the connector flange. The tubular lower portion 42 has a pair of fingers 56, 58 designed to substantially abut the lower surface of the flange to prevent upward pullout of the boardlock from the connector flange. The tubular lower portion also has a bump 60 along the vertical middle region or middle 62 of the boardlock, to help center the tubular lower portion in the larger circuit board hole. The boardlock has a pair of bottom tapered parts 62, 64 which facilitate insertion of the boardlock. Each bottom tapered part has slits such as 66 which form a pair of largely upwardly-facing ramps or abutments 70, 72 which can abut solder used in the final assembly. Each of these features will be discussed below.

Fig. 4 illustrates the piece of sheet metal 74 which has been blanked from a larger sheet, and which is to be bent into the form shown in Fig. 2. The sheet metal has a pair of separator slots 76, 78 that divide part of the tubular upper portion from the tubular lower portion. The separator slots 76, 78 leave a pair of upper edge regions 80, 82 which are separated from a pair of lower edge regions 84, 86. Each edge region extends from a boardlock vertical edge 88, 89 to the bottom 90 of a corresponding slot. The bottoms 90 of the slots are widely spaced apart, to leave a wide vertical middle 62 where the tubular upper and lower portions merge and which constitutes about one-third the width of the sheet metal.

Fig. 8 shows a bottom view of the boardlock of Fig. 2, showing it in relation to the holes 30, 32 in the flange and in the circuit board. It can be seen that the tubular upper portion is bent to a radius of curvature R1 so the tubular upper portion extends largely in a circle. Contact with the walls of the flange hole is made at the corners 100, 102 and at the vertical mid-

dle 62. The tubular lower portion 42 has a middle which is substantially a vertical extension of the middle of the tubular upper portion. However, the lower edge regions 84, 86 are bent so part of each extends substantially straight to leave corners 104, 106 that engage the walls of the circuit board hole 32. The average radius of curvature of a lower edge region such as 86 is much larger than the average radius of curvature of the upper portion 40. The radius of curvature of the region 86 can be considered to be the radius of curvature of an imaginary circle that lies on point 110 at the bottom of the separation slot, on a point at 104 formed by the edge, and on a point 112 that is halfway in between the other two points. The bump 60 serves to provide three points of contact (at bump 60 and edges 104, 106) to position the tubular lower portion 42 in the circuit board hole, so the boardlock tends to remain untilted, that is, so its axis tends to remain vertical and coincident with the axis of the flange and board holes. Without the bump 60, the lower part of the vertical middle would tend to be pressed towards the walls of the hole.

Fig. 10 shows the boardlock 24 installed in the holes 30, 32 of the connector flange 20 and of the circuit board 14. The flange has upper and lower surfaces 120, 122, while the circuit board has upper and lower surfaces 124, 126. The boardlock is initially installed in the flange 20 and the connector is shipped with the boardlock in place, to the customer. The customer has holes drilled in his circuit board, and presses the connector with the boardlocks thereon, downwardly so the boardlocks enter the holes in the circuit board. The two fingers 56, 58 are each formed by a pair of slits 130 (Fig. 4) on the lower side of each separation slot 76, 78. As shown in Fig. 10, each finger is bent so its upper end 132 lies further from the axis 134 of the boardlock than the lower end of the finger. The upper end of each finger lies at the upper end of the circuit board hole, and lies substantially abutting the lower face 122 of the flange. Thus, once the boardlock has been pressed downwardly through the flange and circuit board, the boardlock is locked in place against upward pullout of the flange. The fact that the hole 32 in the circuit board is larger (preferably at least 5 per cent larger) than the hole in the flange, results in providing room at the bottom surface 122 of the flange beyond its hole 30, against which the finger upper ends 132 can press.

As shown in Fig. 4, slits 66 - 69 are formed at opposite sides of each bottom tapered part 62, 64. As shown in Fig. 2, the portion under each slit such as 66 forms a bottom tab 140 which is bent further from the axis 134 than the lower edge region such as 86 lying above the slit 66. This results in the upwardly-facing ramp or abutment 70, 72. Referring to Fig. 11, the upwardly-facing abutment 72 is bent sufficiently that it lies either directly below the bottom surface 126 of the circuit board 14 at its point of intersection

144 with the hole 32, or lies very close thereto. After the connector with boardlocks has been installed, the circuit board may be subjected to wave soldering, which results in solder 145 filling the gap 146 between the tubular lower portion 42 and the plated walls 147 of the circuit board hole 32 with solder. One trapped solder portion 150 lies between the abutment 72 and the corner 144, by lying either directly below it or close to a position directly below it. When an upward force is applied to the boardlock 24, the trapped portion 150 is subjected to compression force between the abutment 72 and the board lower surface 126. Tin lead solder is weak in shear, but is stronger in compression. The fact that an appreciable quantity of the solder is under compression force when the boardlock is pulled upwardly relative to the circuit board, results in the solder being able to withstand significantly greater pullout forces than it could in the absence of such compression loading of the solder. Applicant prefers to angle the ramp or abutment 72 at an appreciable angle A from the horizontal, the angle shown being about 22° and preferably being at least about 15°. Such angling assures that part of the abutment 72 lies closely below the lower surface of a circuit board for boards of a range of thicknesses such as between about 54 and 70 thousandths inch.

Applicant has designed a boardlock of the construction shown, with an overall height between the bottom and the bent-over tabs 54 of 4.70 mm (0.185 inch). The boardlock was designed to fit into a circuit board hole having a diameter of 2.77 mm (0.109 inch) and a flange hole of a diameter of 2.26 mm (0.089 inch). The relative shape of the parts of the boardlock are as shown in the figures.

Thus, the invention provides a connector which mounts facewise against a circuit board, with boardlocks of low cost that reliably mechanically and electrically connect the connector housing to the circuit board. The boardlock is formed from a piece of sheet metal that has opposite vertical edges and a vertical middle, the boardlock having at least one separation slot separating it into tubular upper and lower portions, with the separation slots preferably extending largely horizontally from each vertical edge. The tubular lower portion has edge regions below each separation slot, that are bent to a larger average radius of curvature than edge regions of the tubular upper portion lying above the slot. This allows the tubular lower portion to lie snugly within a larger diameter hole in the circuit board. The lower tubular portion has a projection in its vertical middle portion or middle, such as in the form of a bump, to center the tubular lower portion in the circuit board hole. The tubular lower portion has a pair of fingers that are bent to extend upwardly and radially outwardly with respect to the axis of the boardlock, so upper ends of the fingers which lie within the larger circuit board hole, can abut the lower surface of the housing flange. The board-

lock has tapered bottom portions with slits forming abutments that lie closely below the lower surface of the circuit board, to provide compression resistance of solder therebetween to resist upward pullout of the boardlock from the circuit board.

Although particular embodiments of the invention have been described and illustrated herein, it is recognized that modifications and variations may readily occur to those skilled in the art.

Claims

1. A connector having a housing (16) that includes at least one flange (20, 22) that mounts facewise against a circuit board (14), where the flange and board have aligned largely cylindrical holes (30, 32), and said connector includes at least one boardlock (24) extending along a vertical axis (134) through said holes of said flange and board to lock them together, characterized by:

said board hole has a larger diameter (2R2) than the diameter (2R1) of said flange hole;

said boardlock comprises a metal sheet (74) which is bent to form largely tubular upper and lower hole-received portions (40, 42) received respectively in said flange hole and said board hole, with each hole-received portion having a pair of largely vertical edges (44, 46 and 50, 52) that bear against the walls of a corresponding hole and with each largely tubular board-received portion having a vertical axis (134);

said boardlock having a pair of separation slots (76, 78) lying between parts of said tubular upper and lower portions, each separation slot extending largely horizontally from one of said vertical edges and partially around said sheet so said slots separate parts of said tubular upper and lower portions into upper and lower edge regions (80, 82 and 84, 80), with each upper edge region extending upwardly from one of said slots and each lower edge region extending downwardly from one of said slots (76, 78), and with each of said lower edge regions of said tubular lower portion having a larger average radius of curvature than each corresponding upper edge region of said tubular upper portion.

2. The connector as claimed in claim 1 wherein:

said boardlock has a vertical middle (62) lying about halfway between said vertical edge regions, with the portion of said vertical middle which is part of said tubular lower portion having a projection (60) that projects to a greater distance from said axis than areas of said vertical middle that surround said projection.

3. The connector as claimed in claim 2 wherein:

said projection is in the form of a bump in said vertical middle.

4. The connector as claimed in claim 1 wherein:

said metal sheet includes at least two bottom tapered portions (62, 64), each having an edge (50, 32) and each having a slit (66, 69) extending at least partially horizontally into said edge and forming a bottom tab (140, 142) lying below said slit with each tab having a largely upwardly-facing abutment (70, 72);

said tubular lower portion lies in said circuit board hole, with said board having upper and lower faces (124, 126), and each of said slit edges has an abutment (70, 72) lying slightly below said circuit board lower face;

said board includes metal plating (147) covering the walls of said board hole and extending over portions of each of said board faces; and including

a quantity of solder (145) joining said circuit board plating to said boardlock, with a trapped portion (150) of said solder lying between said largely upwardly-facing abutment of said bottom tab and said lower board face, whereby upward pullout of said boardlock is resisted by compression of said trapped portion of said solder.

5. The connector as claimed in claim 4 wherein:

said upwardly-facing abutment (70, 72) of said tab extends at an upward incline from said edge, of at least 15°.

6. The connector as claimed in claim 1 wherein:

said boardlock lies with said tubular upper portion (40) lying in said flange hole and said tubular lower portion (42) lying in said board hole;

said tubular lower portion having a pair of largely vertical slits (130) along each of said separation slots forming a finger (56, 58), with each finger bent so its upper end (132) lies further from said axis than its lower end;

the upper end of each said finger lying in said circuit board hole and substantially abutting the lower face of said flange.

7. A method for attaching a flange (20, 22) on a connector housing (16) to a circuit board (14), where

the flange has a through hole (30) of a first diameter, by forming a hole (32) in said circuit board, and by forming a boardlock (24) from a piece of sheet metal and bending much of the piece of sheet metal into a largely tubular shape having an axis (134) and having a vertical middle (62) and with largely vertical edges (44, 46) that lie on a side of said axis substantially opposite said middle and pressing the bent boardlock downwardly

through said flange and circuit board holes, characterized by:

said step of forming said circuit board hole including forming it with a second diameter (2R2) that is larger than said first diameter (2R1) of said flange hole;

said step of forming said boardlock includes forming at least one primarily horizontal separation slot (76, 78) in said sheet metal to separate said sheet metal into largely tubular upper and lower portions (40, 42) that lie respectively in said flange hole and in said circuit board hole;

bending said tubular lower portion so a lower edge region (84, 86) thereof that lies beneath said separation slot is bent to a larger average radius of curvature than an upper edge region (80, 82) of said boardlock that lies above said separation slot, so each of said tubular portions firmly engages the walls of a corresponding one of said holes.

8. The method as claimed in claim 7 wherein:

said step of forming said separation slot includes forming two separation slots, each extending largely horizontally from one of said vertical edges to a location (90), and said step of bending said lower portion includes bending each lower edge region (86, 88) that lies under one of said separation slots, to a larger radius of curvature than a middle of said lower portion that lies between said edge regions.

9. The method as claimed in claim 8 including:

forming a protuberance (60) in said middle part of said tubular lower portion.

10. The method as claimed in claim 7 including:

forming said board hole so it includes a layer (147) of metal on the walls of the board hole;

forming a pair of largely vertical finger-forming slits (130) in the lower edge of each said separation slot to form a pair of fingers (56, 58), and bending said fingers to extend at an upward and radially-outward incline, so the upper ends (132) of said fingers lie firmly against walls of said plated board hole and substantially against the lower surface of said flange.

11. A boardlock (24) for locking a connector (12) to a circuit board (14) or the like comprising:

a piece of sheet metal (14) having upper and lower ends, opposite largely vertically extending edges (44, 46), and a vertically extending middle (62);

said piece of sheet metal having a pair of largely horizontal separation slots (76, 78) each extending largely horizontally from one of said largely vertical edges to a location (90) near said

vertical middle, to divide part of said piece of sheet metal into upper and lower hole-receivable portions (40, 42) lying respectively above and below the height of said separation slots;

said upper and lower hole-receivable portions each have their vertical middles bent to approximately the same first radius of curvature, with upper edge regions (80, 82) of said upper portion lying above said separation slots and having about said first radius of curvature, but with lower edge regions (84, 86) of said lower portion that lie beneath each of said separation slots each being bent to a greater average radius of curvature than said first radius;

said boardlock having an axis (134) substantially centered on said first radius of curvature of said upper portion;

said middle of said lower portion has a projection (60) that projects to a greater distance from said axis than adjacent portions of said middle of said lower portion.

12. The boardlock as claimed in claim 11 wherein:

said piece of sheet metal has a pair of largely vertical slits in the lower edge of each said separation slot, to form a pair of fingers, each finger being bent at an upward-radially outward incline, whereby when said upper hole-received portion lies in a hole of an upper element, each finger can lie in a larger hole of a lower element and abut both the walls of said larger hole and the bottom surface of said upper element.

Patentansprüche

1. Steckverbinder mit einem Gehäuse (16), das mindestens einen Flansch (20, 22) aufweist, welcher mit seiner Stirnseite an einer Platine (14) befestigt ist, wobei der Flansch und die Platine gegenüberliegende, im wesentlichen zylindrische Löcher (30, 32) besitzen, und wobei der Steckverbinder mindestens einen Platinenhalter (24) besitzt, der sich über eine senkrechte Achse (134) durch die Löcher von Flansch und Platine erstreckt, um diese zusammenzuhalten, dadurch gekennzeichnet, daß das Platinenloch einen größeren Durchmesser (2R2) als der Durchmesser (2R1) des Flanschloches hat; daß der Platinenhalter ein Metallblech (74) besitzt, das so gebogen ist, daß es großteils röhrenförmige, in den Löchern plazierte obere und untere Teilbereiche (40, 42) bildet, die jeweils im Flanschloch und im Platinenloch aufgenommen werden, wobei jeder im Loch aufgenommene Teilbereich ein Paar großteils senkrechter Kanten (44, 46 und 50, 52) besitzt, die gegen die

Wände des entsprechenden Loches anliegen, und wobei jeder großteils röhrenförmige, in den Löchern plazierte Teilbereich eine senkrechte Achse (134) besitzt;

daß der Platinenhalter ein Paar Trennspalten (76, 78) besitzt, die zwischen Teilen der röhrenförmigen oberen und unteren Teilbereichen liegen, wobei jeder Trennspalt sich hauptsächlich horizontal von einer der senkrechten Kanten und teilweise um das Blech herum erstreckt, so daß die Spalte Teile der röhrenförmigen oberen und unteren Teilbereiche in obere und untere Kantenregionen (80, 82 und 84, 86) trennen, wobei jede obere Kantenregion sich von einer der Spalte nach oben erstreckt und jede untere Kantenregion sich von einer der Spalte (76, 78) nach unten erstreckt, und wobei jede der unteren Kantenregionen des röhrenförmigen unteren Teilbereiches einen größeren durchschnittlichen Krümmungsradius als die entsprechende obere Kantenregion des röhrenförmigen oberen Teilbereiches besitzt.

2. Steckverbinder nach Anspruch 1, bei dem der Platinenhalter ein senkrechtes Mittelteil (62) besitzt, das etwa in der Mitte zwischen den vertikalen Kantenregionen liegt, wobei der Teilbereich des vertikalen Mittelteiles, der zum röhrenförmigen unteren Teilbereich gehört, einen Vorsprung (60) besitzt, der weiter aus der Achse vorspringt als Bereiche des vertikalen Mittelteiles, der diesen Vorsprung umgibt.
3. Steckverbinder nach Anspruch 2, bei dem der Vorsprung im vertikalen Mittelteil als Auswölbung ausgebildet ist.
4. Steckverbinder nach Anspruch 1, bei dem, das Metallblech mindestens zwei konisch zulaufende Teilbereiche (62, 64) besitzt, die jeweils eine Kante (50, 32) und einen Schlitz (66, 69) haben, der zumindest teilweise sich horizontal in diese Kante erstreckt und einen unteren Lappen (240, 142) bildet, der unter dem Schlitz liegt, wobei jeder Lappen ein hauptsächlich nach oben weisendes Widerlager (70, 72) besitzt; der röhrenförmige untere Teilbereich im Platinenloch liegt und die Platine obere und untere Stirnseiten (124, 126) hat, und wobei jede Schlitzkante ein Widerlager (70, 72) hat, das geringfügig unter der unteren Stirnseite der Platine liegt; sowie die Platine einen Metallüberzug (147) besitzt, der die Wände des Platinenloches bedeckt und sich über Teilbereiche jeder Platinenstirnfläche erstreckt, und eine Lotmenge (145) besitzt, die den Metallüberzug der Platine mit dem Platinenhalter verbindet, wobei ein eingeschlossener Teilbereich (150) des Lots zwischen dem hauptsächlich

- nach oben weisenden Widerlager des unteren Lappens und der unteren Stirnseite der Platine liegt, wobei das Hochziehen des Platinenverschlusses vom Zusammenpressen des eingeschlossenen Teilbereichs des Lots gehemmt wird. 5
5. Steckverbinder nach Anspruch 4, bei dem das nach oben weisende Widerlager (70, 72) des Lappens sich in einem ansteigenden Winkel von mindestens 15° von der Kante erstreckt. 10
6. Steckverbinder nach Anspruch 1, bei dem der Platinenhalter mit dem röhrenförmigen oberen Teilbereich (40) liegt, der im Flanschloch liegt, und dem röhrenförmigen unteren Teilbereich (42), der im Platinenloch liegt; der röhrenförmige untere Teilbereich ein Paar hauptsächlich vertikale Schlitz (130) entlang jedes Trennspalts besitzt, die so einen Finger (56, 58) bilden, wobei jeder Finger so gebogen ist, daß sein oberes Ende (132) weiter von der Achse entfernt als sein unteres Ende liegt; das obere Ende des Fingers im Platinenloch liegt und wesentlich an der unteren Stirnfläche des Flansches anstößt. 15
7. Verfahren zur Befestigung eines Flansches (20, 22) an einem Steckverbindergehäuse (16) auf einer Platine (14), wobei der Flansch ein Durchgangsloch (30) mit einem ersten Durchmesser hat, indem ein Loch (32) in der Platine angebracht wird, und indem ein Platinenhalter (24) aus einem Stück Blech geformt wird, und indem ein großer Teil des Blechs in ein hauptsächlich röhrenförmiges Gebilde mit einer Achse (134) und einem Mittelteil (62) und mit hauptsächlich vertikalen Kanten (44, 46), die auf einer Seite der Achse im wesentlichen gegenüber des Mittelteils liegen, gebogen wird, und indem der gebogene Platinenhalter durch die Flansch- und Platinenlöcher hindurch nach unten gedrückt wird, gekennzeichnet durch den Arbeitsgang, das Platinenloch zu bilden, einschließlich der Ausbildung eines zweiten Durchmessers (2R2), der größer als der erste Durchmesser (2R1) des Flanschlochs ist; den Arbeitsgang, den Platinenhalter zu bilden, einschließlich der Ausbildung zumindest eines hauptsächlich horizontalen Trennspalts (76, 78) im Metallblech, um das Blech in hauptsächlich röhrenförmige obere und untere Teilbereiche (40, 42) zu trennen, die jeweils im Flanschloch bzw. Platinenloch liegen; Biegen des röhrenförmigen unteren Teilbereichs, so daß seine Kantenregion (84, 86), die unter dem Trennspalt liegt, mit einem größeren durchschnittlichen Krümmungsradius gebogen wird 20
8. Verfahren nach Anspruch 7, bei dem der Arbeitsgang zur Bildung des Trennspalts die Ausbildung von zwei Trennspalten einschließt, wobei jeder Trennspalt hauptsächlich horizontal von einer der vertikalen Kanten sich zu einer Stelle (90) erstreckt, und der Arbeitsgang zum Biegen des unteren Teilbereichs das Biegen jeder unteren Kantenregion (86, 88), die unter einer der Trennspalte liegt, mit einem größeren Krümmungsradius als die Mitte des unteren Teilbereichs, der zwischen den Kantenregionen liegt, einschließt. 25
9. Verfahren nach Anspruch 8, einschließlich der Bildung einer Erhebung (60) im Mittelteil des röhrenförmigen unteren Bereichs. 30
10. Verfahren nach Anspruch 7, das einschließt: die Bildung des Platinenlochs in der Art, daß es eine Metallschicht (147) auf den Wänden des Platinenlochs enthält; die Bildung eines Paares von hauptsächlich vertikalen, Finger bildenden Schlitz (130) in der unteren Kante jedes Trennspalts, um ein Paar Finger (56, 58) zu formen, und das Biegen der Finger, um die Finger mit einer Neigung nach oben und radial nach außen erstrecken zu lassen, so daß die oberen Enden (132) der Finger fest gegen die Wände des metallisierten Platinenlochs und wesentlich gegen die untere Fläche des Flanschs liegen. 35
11. Platinenhalter zur Halterung eines Steckverbinders (12) auf einer Platine o.ä., das Folgende umfaßt: ein Stück Metallblech mit oberen und unteren Enden, gegenüberliegenden, sich hauptsächlich vertikal erstreckende Kanten (44, 46) und ein sich vertikal erstreckendes Mittelteil (62); wobei das Metallblech ein Paar hauptsächlich horizontale Trennspalte (76, 78) enthält, die sich jeweils hauptsächlich horizontal von einer der vertikalen Kanten zu einer Stelle (90) neben dem vertikalen Mittelteil erstrecken, um einen Teil des Metallblechs in obere und untere Teilbereiche (40, 42) zum Einsetzen in die Löcher zu trennen; wobei die vertikalen Mittelteile der oberen und unteren in die Löcher einzusetzenden Teilbereiche jeweils etwa denselben ersten Krümmungsradius haben, wobei die oberen Kantenregionen (80, 82) des oberen Teilbereichs über den Trennspalten liegen und etwa denselben ersten Krümmungsradius haben, jedoch mit niedrigeren Kan-

tenregionen (84, 86) des unteren Teilbereichs, die unter den Trennspalten liegen, wobei jede mit einem größeren durchschnittlichen Krümmungsradius als der erste Radius gebogen ist; wobei der Platinenhalter eine Achse (134) besitzt, die im wesentlichen auf dem ersten Krümmungsradius des oberen Teilbereichs zentriert ist; wobei das Mittelteil des unteren Teilbereichs einen Vorsprung (60) besitzt, der weiter von der Achse vorspringt als angrenzende Teilbereiche des Mittelteils des unteren Teilbereichs.

12. Platinenhalter nach Anspruch 11, bei dem das Metallblech ein Paar hauptsächlich vertikale Schlitze in der unteren Kante jedes Trennspalts besitzt, um ein Fingerpaar zu bilden, wobei jeder Finger mit einer Neigung nach oben und radial nach außen gebogen wird, so daß, wenn der obere in die Löcher einzusetzende Teilbereich in einem Loch eines oberen Elements liegt, jeder Finger in einem größeren Loch eines unteren Elements liegen kann und sowohl an die Wände des größeren Lochs als auch an den Boden des oberen Elements anstoßen kann.

Revendications

1. Connecteur ayant un boîtier (16) qui comporte au moins une bride (20, 22) qui se monte contre une plaquette de circuit imprimé (14), dans lequel la bride et la plaquette comportent des trous alignés sensiblement cylindriques (30, 32), et ledit connecteur comporte au moins un dispositif verrouilleur de plaquette (24) s'étendant selon un axe vertical (134) à travers lesdits trous de ladite bride et de ladite plaquette afin de les verrouiller solidairement, caractérisé en ce que :
- ledit trou de plaquette présente un diamètre (2R2) supérieur au diamètre (2R1) dudit trou de la bride ;
- ledit dispositif verrouilleur de plaquette comporte une feuille métallique (74) qui est cintrée pour former des portions supérieure et inférieure sensiblement tubulaires à insérer dans les trous (40, 42) insérées respectivement dans ledit trou de la bride et ledit trou de la plaquette, chaque portion à insérer dans un trou ayant deux bords sensiblement verticaux (44, 46 et 50, 52) qui viennent s'appuyer contre les parois d'un trou correspondant et chaque portion sensiblement tubulaire à insérer dans la plaquette ayant un axe vertical (134) ;
- ledit dispositif verrouilleur de plaquette ayant deux fentes séparatrices (76, 78) situées entre des parties desdites portions supérieure et inférieure tubulaires, chaque fente séparatrice

s'étendant sensiblement à l'horizontale à partir d'un desdits bords verticaux et partiellement autour de ladite feuille de sorte que lesdites fentes séparent des parties desdites portions supérieure et inférieure tubulaires en des régions de bords supérieures et inférieures (80, 82 et 84, 80), chaque région de bord supérieure s'étendant vers le haut partir d'une desdites fentes et chaque région de bord inférieure s'étendant vers le bas à partir d'une desdites fentes (76, 78) et chacune desdites régions de bord inférieures de ladite portion inférieure tubulaire présentant un rayon de courbure moyen plus important que chaque région de bord supérieure correspondante de ladite portion supérieure tubulaire.

2. Connecteur selon la revendication 1, dans lequel :
- ledit dispositif verrouilleur de plaquette a une partie médiane verticale (62) située environ à mi-chemin entre lesdites régions de bord verticales, la portion de ladite partie médiane verticale qui fait partie de ladite portion inférieure tubulaire présentant une saillie (60) qui s'étend à une plus grande distance à partir dudit axe que les zones de ladite partie médiane verticale entourant ladite saillie.
3. Connecteur selon la revendication 2, dans lequel :
- ladite saillie a la forme d'une bosse dans ladite partie médiane verticale.
4. Connecteur selon la revendication 1, dans lequel :
- ladite feuille métallique comporte au moins deux portions inférieures effilées (62, 64) comportant chacune un bord (50, 32) et ayant chacune une encoche (66, 69) se prolongeant au moins partiellement à l'horizontale jusqu'audit bord et formant une languette inférieure (140, 142) placée sous ladite encoche et chaque languette ayant une butée sensiblement dirigée vers le haut (70, 72) ;
- ladite portion inférieure tubulaire est placée dans ledit trou de plaquette de circuit imprimé, ladite plaquette ayant des faces supérieure et inférieure (124, 126) et chacun desdits bords d'encoche a une butée (70, 72) située légèrement sous ladite face inférieure de la plaquette de circuit imprimé ;
- ladite plaquette comporte un revêtement métallique (147) recouvrant les parois dudit trou de la plaquette et se prolongeant sur des portions desdites faces de la plaquette ; et comportant :
- une certaine quantité de soudure (145) assemblant ledit revêtement de la plaquette de circuit imprimé sur ledit dispositif verrouilleur de

- plaquette, une portion piégée (150) de ladite soudure étant située entre ladite butée sensiblement dirigée vers le haut de ladite languette inférieure et ladite face inférieure de la plaquette, de telle sorte que la compression de ladite portion piégée de ladite soudure s'oppose à une extraction vers le haut dudit dispositif verrouilleur de plaquette.
- 5
5. Connecteur selon la revendication 4, dans lequel :
- 10 ladite butée tournée vers le haut (70, 72) de ladite languette s'étend selon une inclinaison ascendante à partir dudit bord, d'au moins 15°.
6. Connecteur selon la revendication 1, dans lequel :
- 15 ledit dispositif verrouilleur de plaquette est disposé avec ladite portion supérieure tubulaire (40) placée dans ledit trou de la bride et ladite portion inférieure tubulaire (42) placée dans ledit trou de la plaquette ;
- 20 ladite portion inférieure tubulaire ayant une paire d'encoches sensiblement verticales (130) le long de chacune desdites fentes séparatrices formant un doigt (56, 58) et chaque doigt étant cintré de sorte que son extrémité supérieure (132) est plus éloignée dudit axe que son extrémité inférieure ;
- 25 l'extrémité supérieure de chacun desdits doigts étant située dans ledit trou de la plaquette de circuit imprimé et venant sensiblement buter contre la face inférieure de ladite bride.
- 30
7. Procédé de fixation d'une bride (20, 22) d'un boîtier de connecteur (16) sur une plaquette de circuit imprimé (14), dans lequel la bride comporte un trou traversant (30) d'un premier diamètre, en formant un trou (32) dans ladite plaquette de circuit imprimé et en formant un dispositif verrouilleur de plaquette (24) à partir d'une feuille de métal et en cintrant la majeure partie de la feuille de métal en une forme sensiblement tubulaire ayant un axe (134) et ayant une partie médiane verticale (62) et des bords sensiblement verticaux (44, 46) qui sont situés sur un côté dudit axe sensiblement à l'opposé de ladite partie médiane et en enfonçant le dispositif verrouilleur cintré vers le bas à travers lesdits trous de la bride et de la plaquette, caractérisé en ce que :
- 35
- 40 ladite étape de formation dudit trou de plaquette de circuit imprimé comporte la formation de celui-ci avec un second diamètre (2R2) qui soit supérieur audit premier diamètre (2R1) dudit trou de la bride ;
- 45 ladite étape de formation dudit dispositif verrouilleur de plaquette comporte la formation d'au moins une fente séparatrice principalement horizontale (76, 78) dans ladite feuille de métal
- afin de séparer ladite feuille de métal en des portions supérieure et inférieure sensiblement tubulaires (40, 42) situées respectivement dans ledit trou de la bride et dans ledit trou de la plaquette de circuit imprimé ;
- on cintré ladite portion inférieure tubulaire de sorte qu'une région de bord inférieure (84, 86) de celle-ci qui est située sous ladite fente séparatrice soit cintrée selon un rayon de courbure moyen supérieur à celui d'une région de bord supérieure (80, 82) dudit dispositif verrouilleur de plaquette qui se situe au-dessus de ladite fente séparatrice, de sorte que chacune desdites portions tubulaires s'emboîte fermement dans les parois d'un trou correspondant parmi lesdits trous.
8. Procédé selon la revendication 7, dans lequel :
- ladite étape de formation de ladite fente séparatrice comporte la formation de deux fentes séparatrices, s'étendant chacune sensiblement à l'horizontale à partir d'un desdits bords verticaux jusqu'à un emplacement (90), et ladite étape de cintrage de ladite portion inférieure comporte le cintrage de chaque région de bord inférieure (86, 88) située sous une desdites fentes séparatrices, selon un rayon de courbure supérieur à une partie médiane de ladite portion inférieure située entre lesdites régions de bord.
9. Procédé selon la revendication 8 comprenant :
- la formation d'une protubérance (60) dans ladite partie médiane de ladite portion inférieure tubulaire.
10. Procédé selon la revendication 7 comprenant :
- la formation dudit trou de plaquette de sorte qu'il comporte une couche (147) de métal sur les parois du trou de la plaquette ;
- la formation de deux encoches (130) sensiblement verticales formant des doigts dans le bord inférieur de ladite fente séparatrice afin de former une paire de doigts (56, 58) et le cintrage des doigts pour qu'ils s'étendent selon une inclinaison ascendante et radialement dirigée vers l'extérieur, de sorte que les extrémités supérieures (132) desdits doigts soient appliquées fermement contre les parois dudit trou revêtu de plaquette et sensiblement contre la surface inférieure de la bride.
11. Dispositif verrouilleur de plaquette (24) visant à verrouiller un connecteur (12) sur une plaquette de circuit imprimé (14) ou analogue comprenant :
- une pièce de feuille métallique (14) ayant des extrémités supérieure et inférieure, des bords opposés sensiblement verticaux (44, 46) et une partie médiane s'étendant verticalement

(62) ;

ladite pièce de feuille métallique ayant une paire de fentes séparatrices sensiblement horizontales (76, 78) s'étendant chacune sensiblement à l'horizontale à partir d'un desdits bords sensiblement verticaux jusqu'à un emplacement (90) proche de ladite partie médiane verticale, de façon à diviser une partie de ladite pièce de feuille métallique en des portions supérieure et inférieure insérables dans des trous (40, 42) situées respectivement au-dessus et en-dessous du niveau en hauteur desdites fentes séparatrices ;

lesdites portions supérieure et inférieure insérables dans des trous ont chacune des parties médianes cintrées selon approximativement le même premier rayon de courbure, les régions de bords supérieures (80, 82) de ladite portion supérieure étant situées au-dessus desdites fentes séparatrices et ayant environ le même premier rayon de courbure, mais les régions de bord inférieures (84, 86) de ladite portion inférieure située sous chacune desdites fentes séparatrices étant chacune cintrée selon un rayon de courbure supérieur audit premier rayon ;

ledit dispositif verrouilleur de plaquette ayant un axe (134) sensiblement centré sur ledit premier rayon de courbure de ladite portion supérieure ;

ladite partie médiane de ladite portion inférieure a une saillie (60) qui s'étend à une distance supérieure à partie dudit axe que des portions adjacentes de ladite partie médiane de ladite portion inférieure.

12. Dispositif verrouilleur de plaquette selon la revendication 11, dans lequel :

ladite pièce de feuille métallique a une paire d'encoches sensiblement verticales dans le bord inférieur de chacune desdites fentes séparatrices, afin de former une paire de doigts, chaque doigt étant cintré selon une inclinaison ascendante radialement dirigée vers l'extérieur, chaque doigt pouvant ainsi être placé dans un trou plus grand d'un élément inférieur et venir buter contre les parois dudit trou plus grand ainsi que contre la surface inférieure dudit élément supérieur, lorsque ladite portion supérieure insérée dans un trou est placée dans un trou d'un élément supérieur.

5

10

15

20

25

30

35

40

45

50

55

10

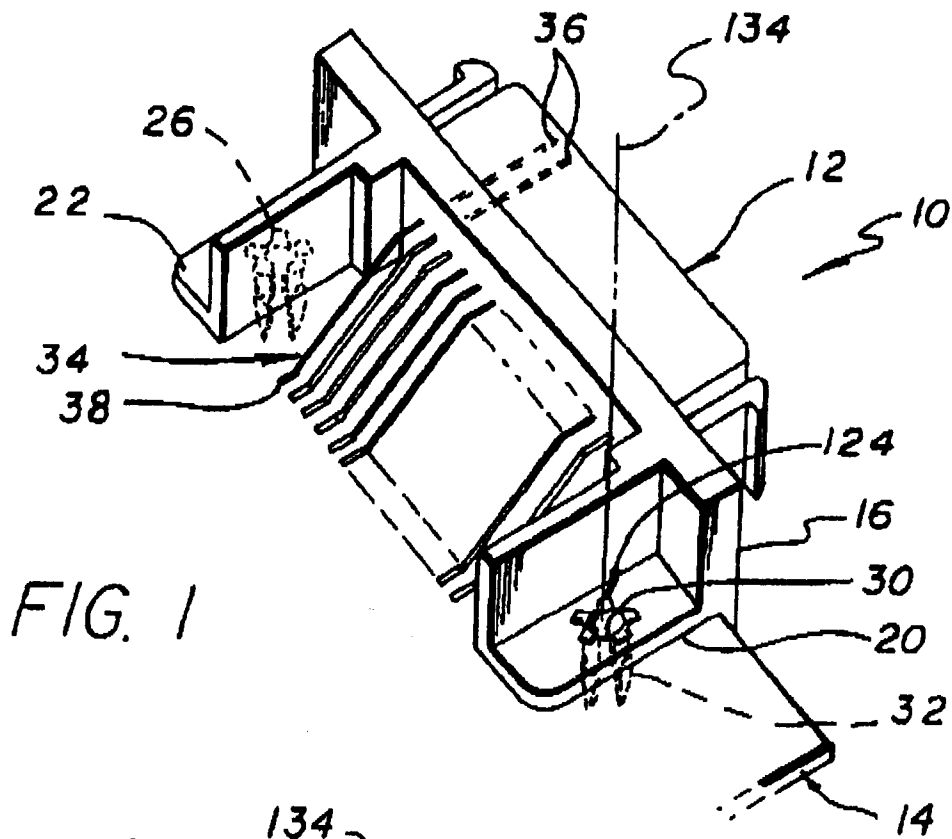


FIG. 1

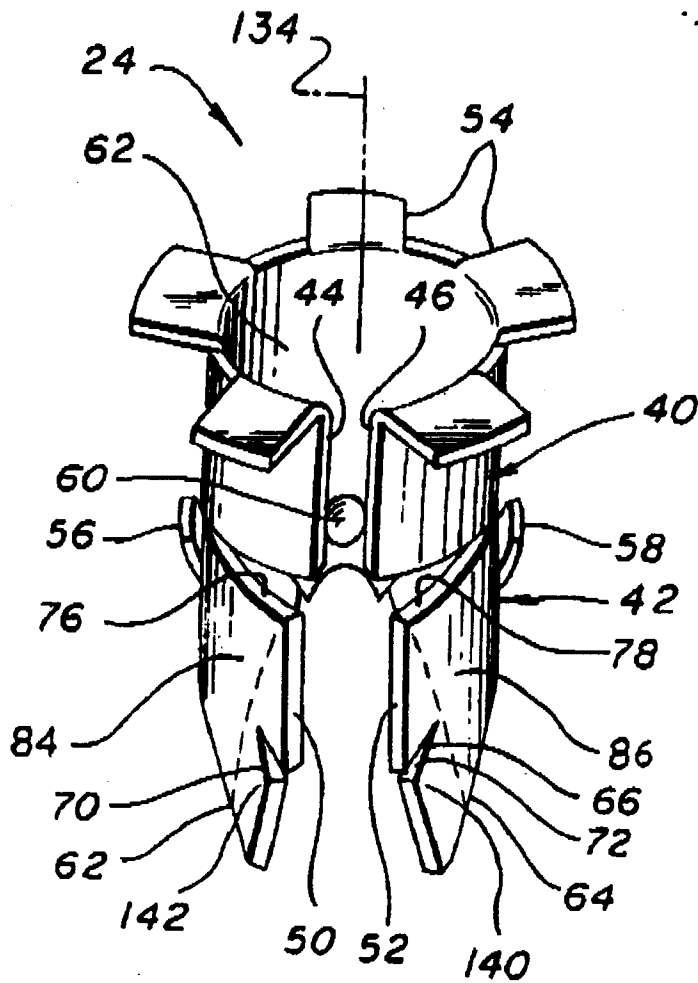


FIG. 2

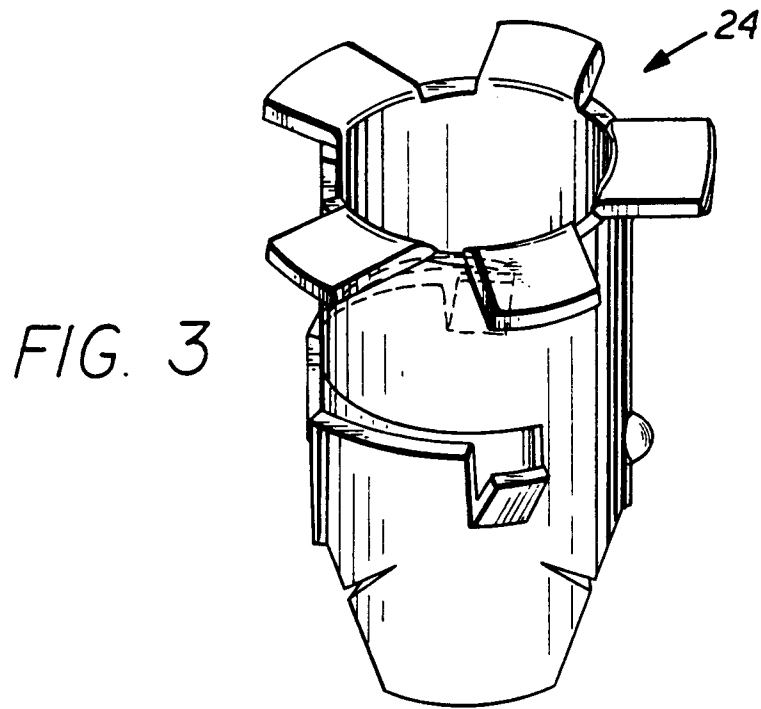


FIG. 4

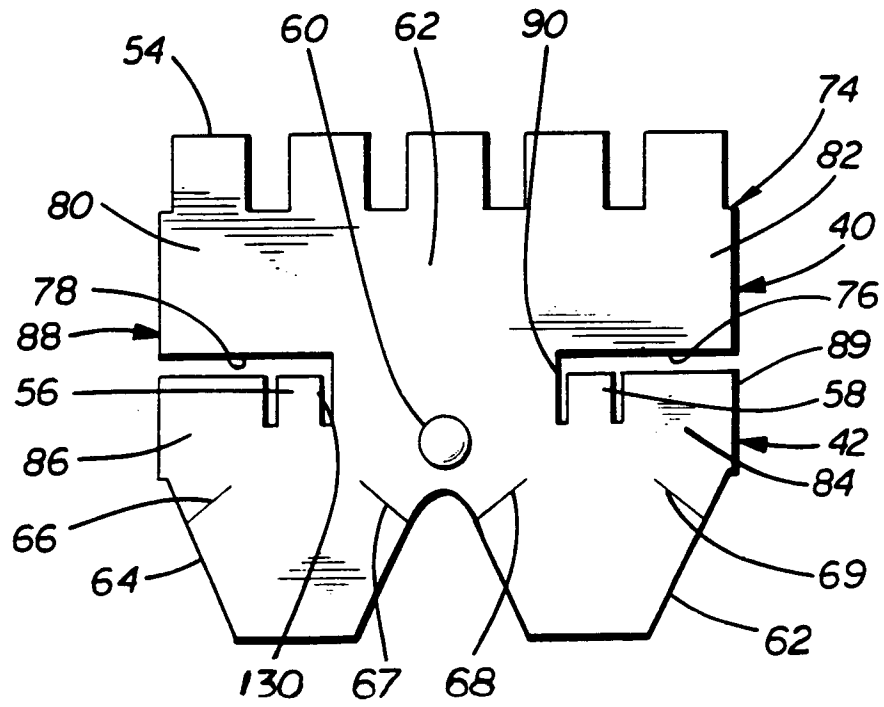


FIG. 5

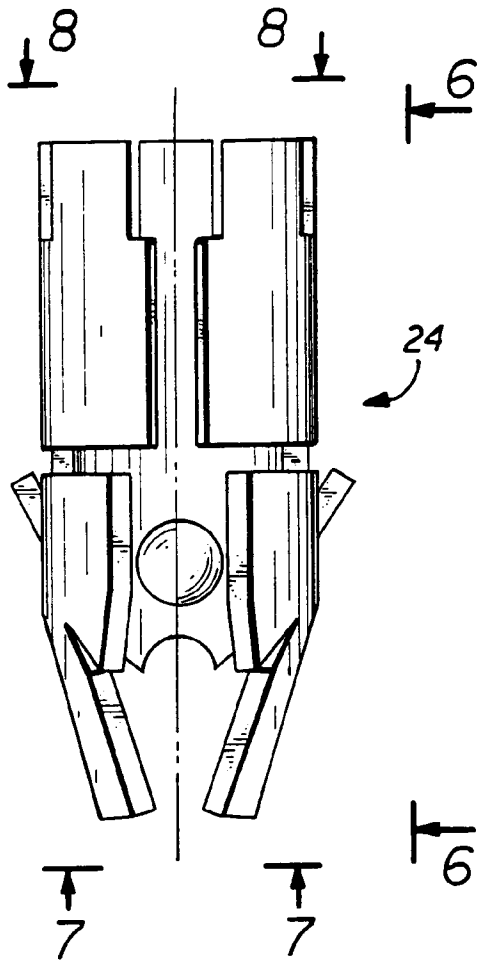
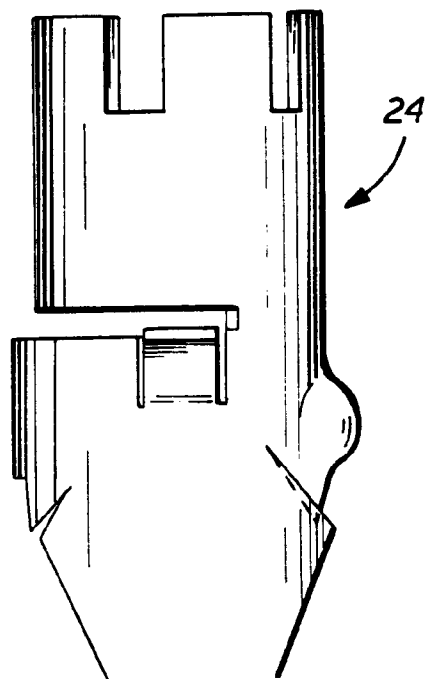
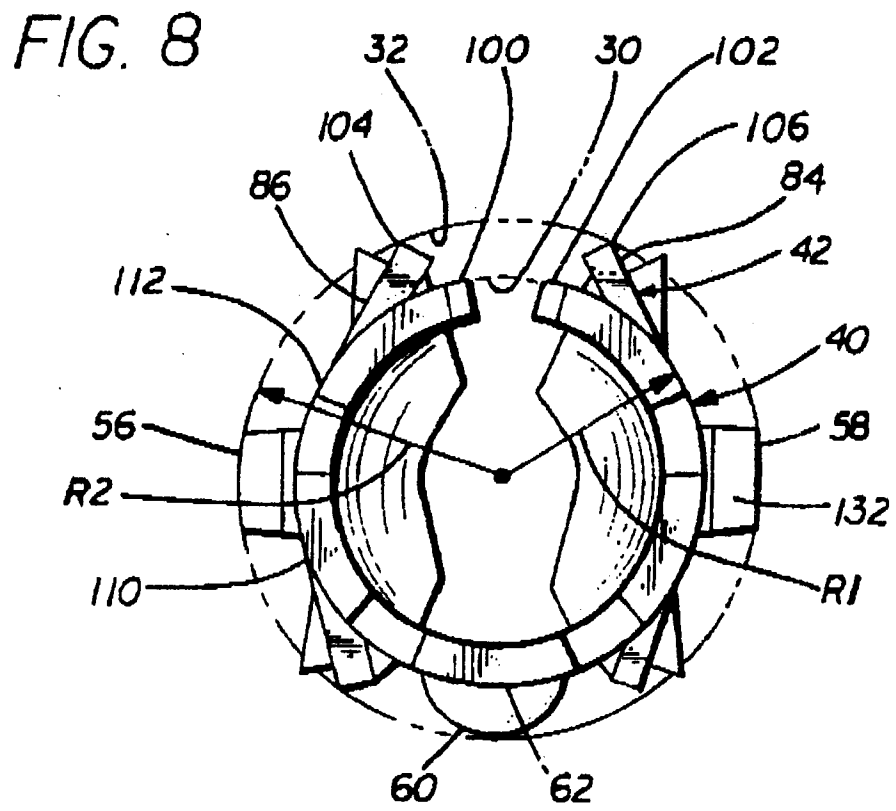
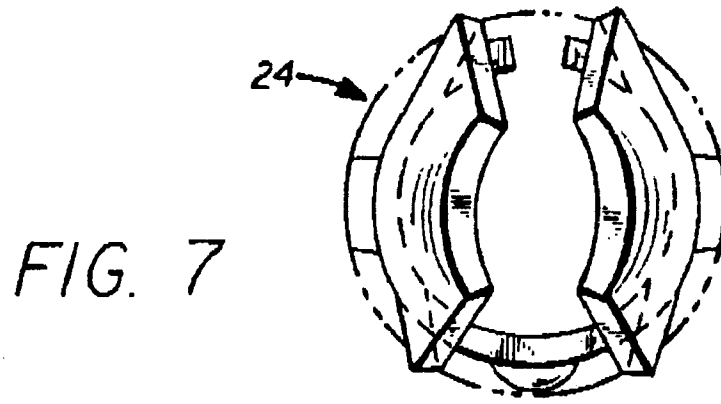


FIG. 6





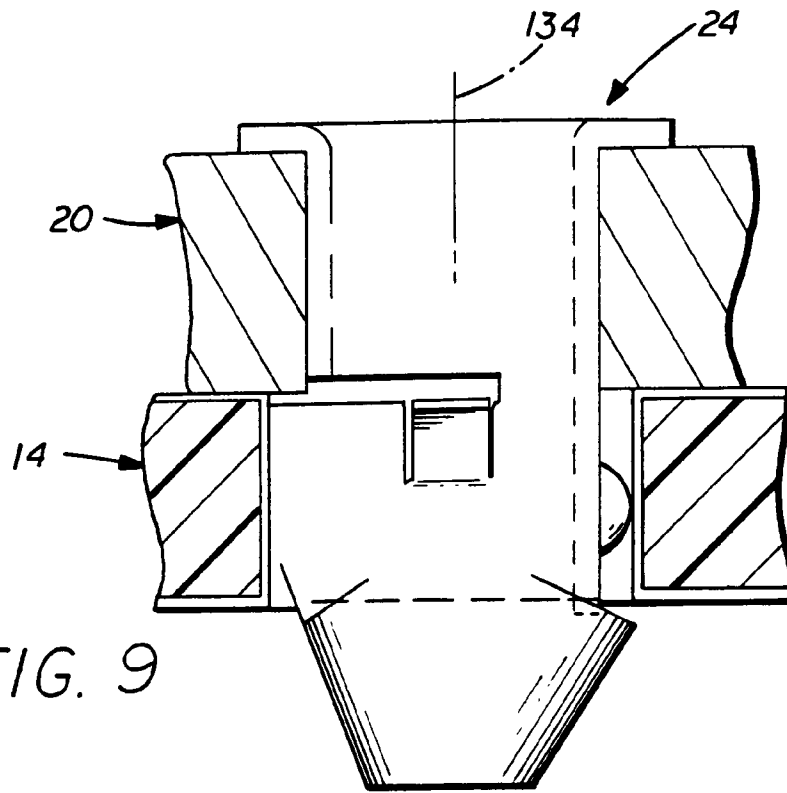


FIG. 9

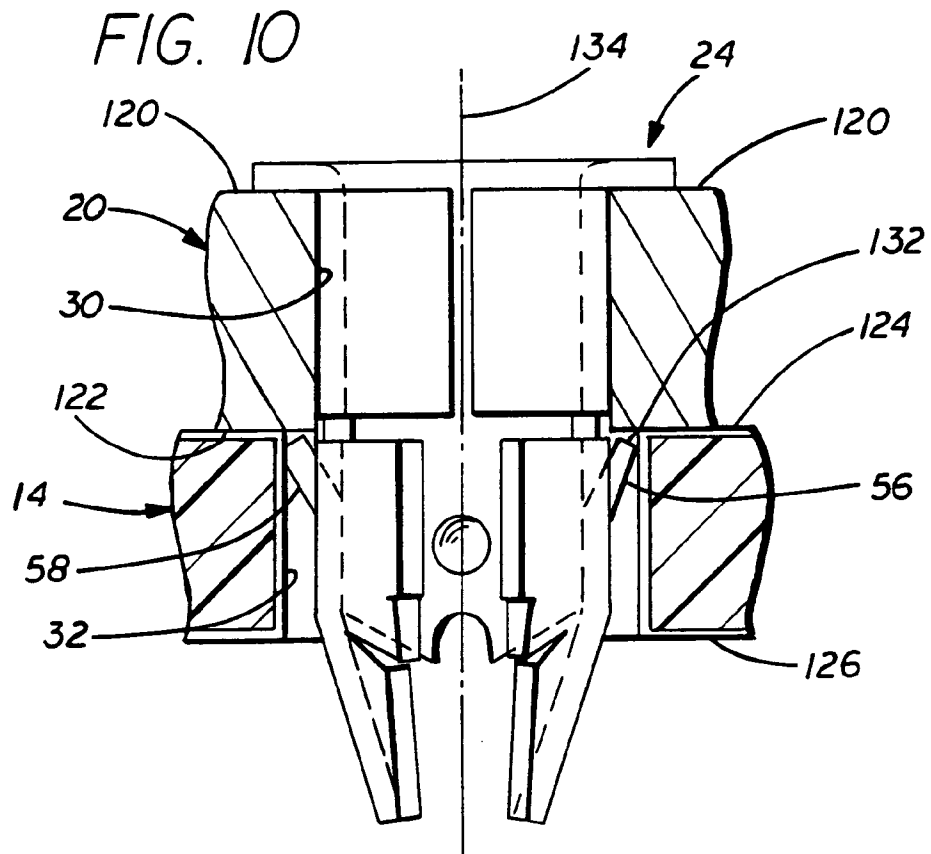


FIG. 10

