United States Patent [19]

Kirby

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[45] **July 16, 1974**

[54] **ELECTRICAL CONNECTOR ASSEMBLY**

[75] Inventor: **Edward Kirby,** Des Plaines, Ill.

[73] Assignee: **TRW, Inc.,** Cleveland, Ohio

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[21] Appl. No.: **256,685**

[52] **U.S. Cl.** ..... **339/128,** 339/91 R, 248/223

[51] **Int. Cl.** **H01r 13/54,** H02b 1/02

[58] **Field of Search** 339/91, 126, 128, 132, 339/134; 248/223

[56] **References Cited**

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Primary Examiner—Bobby R. Gay
Assistant Examiner—Lawrence J. Staab
Attorney, Agent, or Firm—Lawrence S. Cohen; Joseph E. Kieninger

[57] **ABSTRACT**

An electrical connector assembly adapted to be mounted to a support chassis by snap-in action, the assembly being provided with deflectable clip elements insertable into mating openings in the support chassis to engage the chassis and secure the assembly thereto, said clip element being deflectable to permit removal of the assembly from the chassis by displacement of the clip elements to a position where they will pass through the chassis openings upon said removal.

5 Claims, 8 Drawing Figures

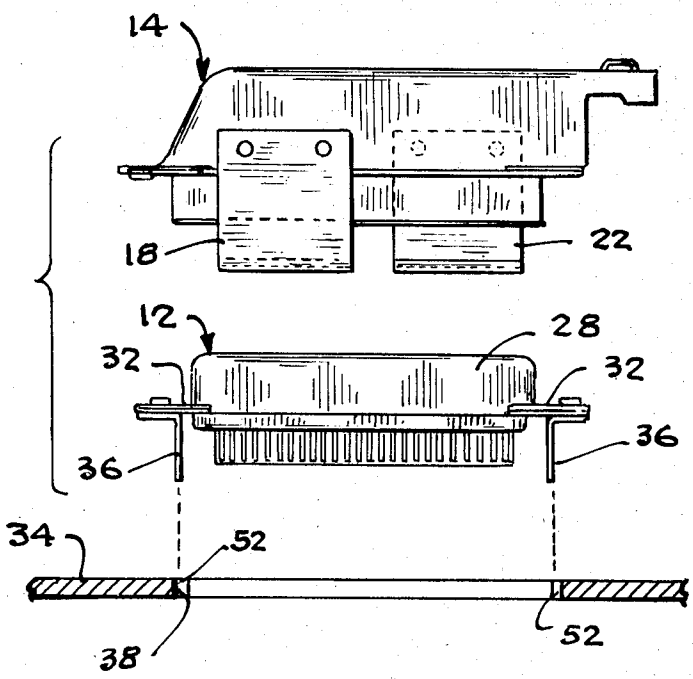

FIG.1

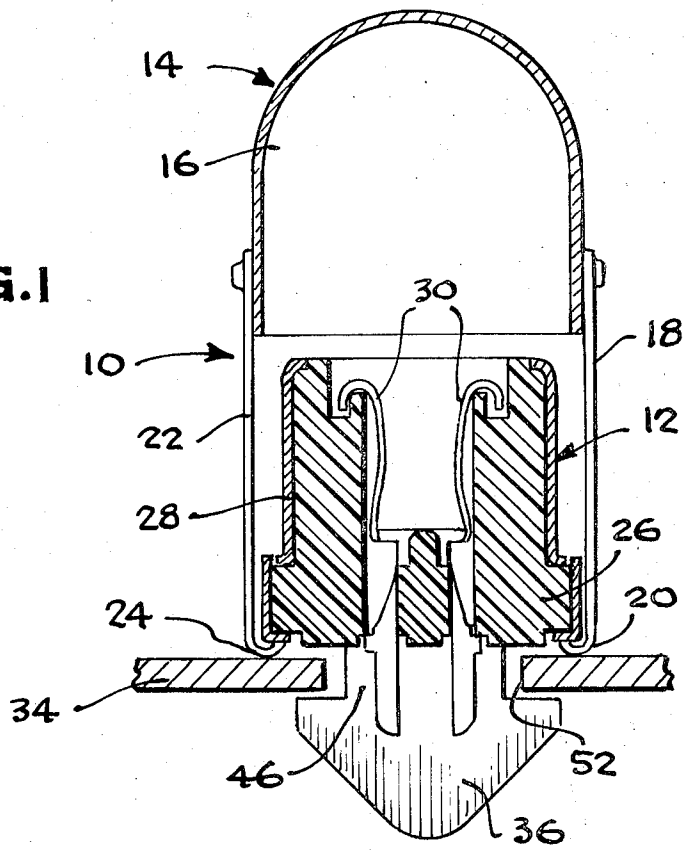
14
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FIG.2

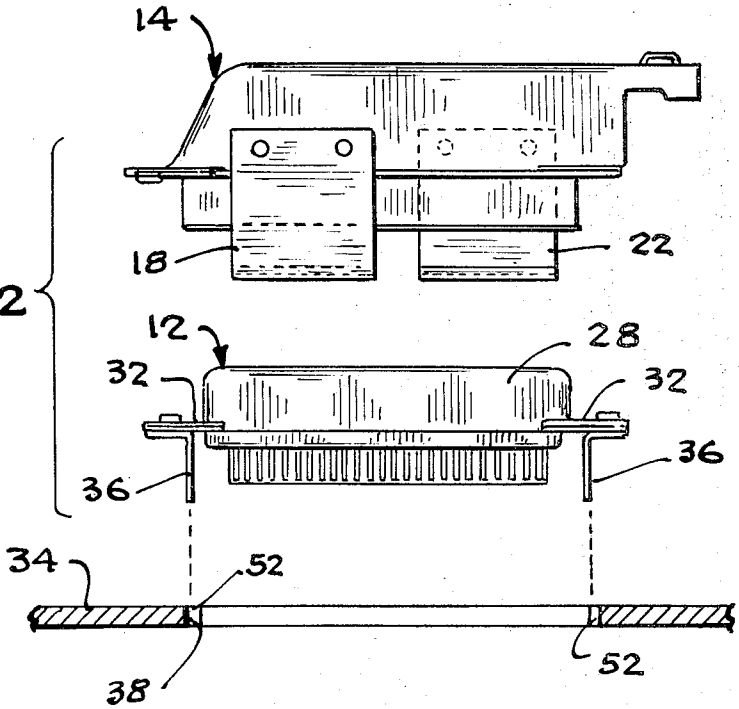
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FIG.3

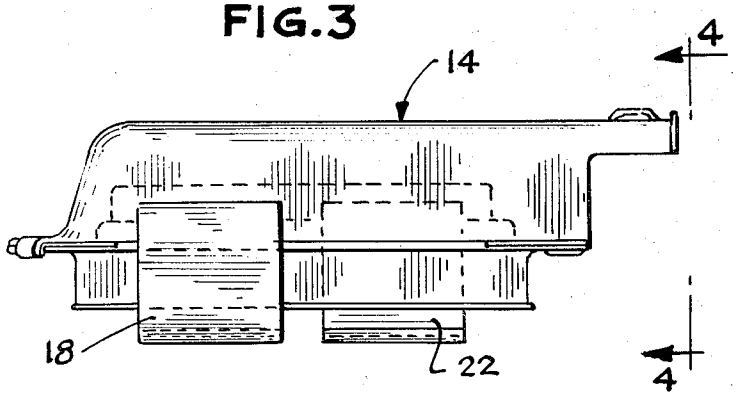


FIG.4

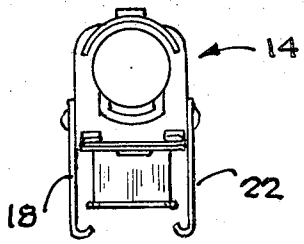


FIG.5

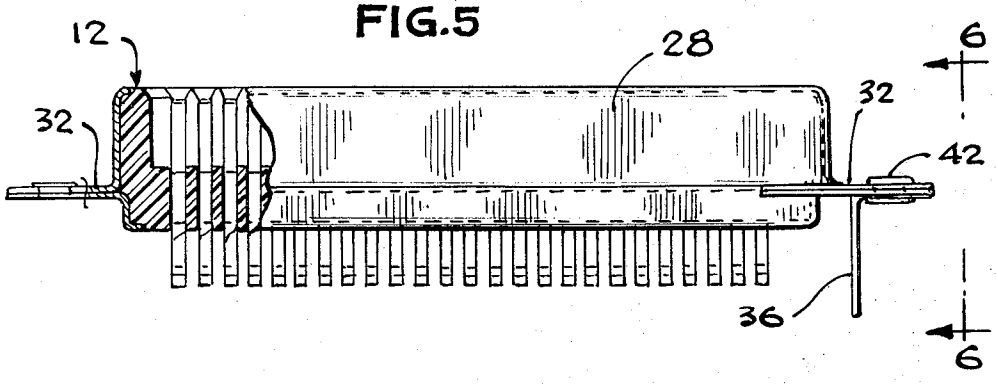


FIG.6

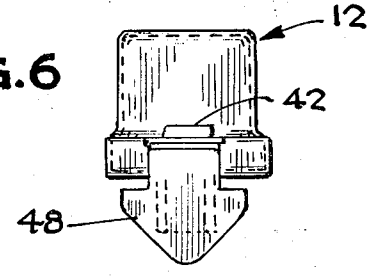


FIG.7

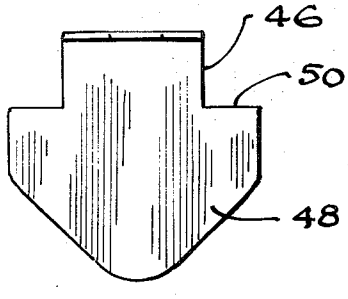
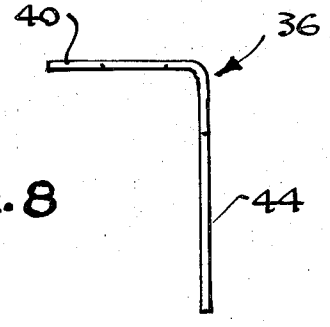


FIG.8



ELECTRICAL CONNECTOR ASSEMBLY

The present invention relates to a connector assembly and more particularly it relates to an improved electrical connector assembly which is removeably secured to a support chassis by deflectable clip elements and which is provided with a mating plug element adapted to be secured to the connector assembly by deflectable elements.

The snap-in connector concept set forth herein is useful with connector assemblies generally but is particularly useful in conjunction with the conventional connector having a plurality of ribbon-like contacts in high density configuration.

As is commonly known, the socket portion of such connectors is comprised of a plastic insulating body disposed within a rigid protective metal shell.

Socket elements of connector assemblies of the type noted above are commonly attached to a support chassis by threaded members. That is, a nut and bolt assembly may be used or other threaded fastening means commonly employed in the art may be employed here to secure the socket rigidly to the chassis.

The concept set forth herein is intended to eliminate the use of threaded members to attach the connector assembly to the chassis and to provide a quick-connect and disconnect means for mounting of the socket with respect to the chassis.

Accordingly, it is a general object of the present invention to provide an improved electrical connector assembly having a quick-connect snap-in feature which permits easy insertion and removal of the socket member of the connector assembly with respect to the chassis.

Other objects and advantages of the present invention reside in the provision of an improved electrical connector assembly having spring clip elements associated therewith which are deflectable to permit easy insertion and removal of the connector assembly with respect to the chassis; in the provision of a plug assembly which is removeably secured to the socket of the connector assembly by forcing deflectable elements associated with the plug assembly over the rigid shell of the socket element to secure the plug to the socket; in the provision of a connector assembly which is relatively inexpensive to manufacture, easy to use and durable in use and which permits ready replacement of connector elements of the assembly, when necessary; and in the provision of mounting means for the elements of the assembly which are readily adapted to connector assembly elements presently in use.

The novel features which are believed to be characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, together with further objects and advantages thereof will best be understood by reference to the following description taken in connection with the accompanying drawings, in which:

FIG. 1 is a view of the plug and socket of the connector assembly shown in assembled relation with respect to the chassis;

FIG. 2 is an exploded view of the plug, socket and chassis;

FIG. 3 is a side elevation of the plug element of the connector assembly;

FIG. 4 is an end view of the plug element of FIG. 3 taken along lines 4—4 of FIG. 3;

FIG. 5 is a side elevation of the socket element of the connector assembly, partly in section, illustrating a clip element at the right (as viewed in FIG. 5);

FIG. 6 is an end elevation of the socket assembly of FIG. 5 taken along lines 6—6 of FIG. 5;

FIG. 7 is one view of the clip element of the connector assembly; and

FIG. 8 is a view of the spring element of FIG. 7 rotated 90° with respect to the view of FIG. 7.

Referring more particularly now to the drawings the connector assembly of the present invention is indicated generally at **10** in FIG. 1 and includes the socket element of the assembly, illustrated at **12**, and the plug **14** associated therewith.

The plug **14** is defined by a rigid hood **16** which extends over the insulating body disposed within the hood and shields the insulating body and connector elements (not shown) disposed therein. A first spring clip element **18** is securely mounted to one side of the hood **16** of the plug **14** and extends downwardly therefrom to terminate in an upturned lip portion **20**. A second spring clip element **22** is secured to the other side of the hood **16** of the plug **14** and extends downardly from the hood **16** to terminate in the upturned lip portion **24**, as illustrated in FIG. **1**.

The hood **16** may be formed from aluminum in a drawing process. The spring metal clips **18** and **22** are fastened to the hood by rivets, or similar fastening means, and have the depending skirt portions described herein above which are adapted to fit over the socket **12**, as described below.

It should be noted that a spreader tool of conventional form may be employed to remove the plug assembly from the socket. However, such element forms no part of the present invention and will not be described herein.

As shown in FIG. **2** of the drawings, the clip elements **18** and **22** are laterally displaced with respect to the hood to define a staggered relationship. This is eseential in view of the nature of use of the connector elements with which these assemblies are employed. That is, the plug and socket assembly characterized in the drawings and description herein are commonly designated as ribbon contact connectors. The assemblies are relatively small and intended to define circuit continuity for a relatively large number of circuit paths. When these connectors are placed in an array on a chassis they are in very close spaced relationship. Accordingly, it is necessary to stagger the spring clips on the hood **16** so that the plug assemblies may be mounted on the sockets **12** without interference between spring clips on adjacent plugs **14**.

The socket **12** of the connector assembly is defined by an insulating body **26** which is disposed in a rigid protective shell **28**. The shell may be of aluminum or other suitable rigid material to protect the insulating body. Connector elements **30** are conventionally disposed in the insulating body **26** to electrically mate with associated circuit elements to define continuous circuit paths through the connector assembly.

The rigid protective shell **28** of the socket **12** is provided with outwardly extending flanges **32** at either end thereof. In conventional mounting of the socket elements **12**, as described herein, the flanges would be provided with openings through which threaded members would be inserted to secure the socket **12** to the chassis **34**. It can readily be seen that this involves a rel-

atively time consuming operation in that appropriate alighment of the socket **12** with respect to the chassis **34** must first occur and then separate elements must be inserted through openings in the flange members **32** and the chassis **34** and threaded together to define a rigid inter-connection between the socket **12** and the chassis **34.** The concept set forth herein is intended to eliminate the relatively cumbersome operation previously associated with securing sockets **12** to the chassis **34** in the manner described above.

Clip elements **36** are secured to the socket **12** by mounting them rigidly to the flanges **32** associated with the rigid metal shell **28** of said sockets. Accordingly, the clip elements **36,** in effect, become a rigid part of the socket assembly when so mounted.

The clip elements **36** are arranged on the socket assembly **12** in a manner such that they will pass into the opening **38** defined in the chassis **34** and be captured by the chassis to prevent inadvertent withdrawal of the socket **12** from the chassis **34.**

The clip elements **36** may have any desired configuration. One configuration which is suitable for the purpose described herein is illustrated in FIGS. **1, 6 – 8.** In the form illustrated the clip element **36** has a generally L-Shaped cross section appearance. The upper leg **40** of the clip **36** is adapted to be placed in juxtaposed relation to the flange **32** of the socket **12** and to be secured to the flange by a rivet **42,** or other suitable fastening means. The depending leg **44** of the clip element **36** is intended to pass through the opening **38** in the chassis **34** and to be captured by the chassis to prevent withdrawal of the socket **12.**

The clip element **36** preferably are of a spring material or will possess some elastomeric characteristic so that they may be deflected to readily pass to the chassis opening **38** and to permit inward deflection of the clip elements **36** so that socket **12** may readily be removed from the chassis **34,** when desired.

The depending leg **44** of the clip elements **36,** in the configuration illustrated for purposes of description of the inventive concept, is defined in the form of a "spade" configuration having a neck portion **46** which is generally the same lateral dimension as the upper leg **40** (for illustrative purposes) and a lower gripping portion **48** extending from the neck portion **46** with a sholder **50** being defined between the neck **46** and lower gripping portion **48** of the clip **36.**

It can readily be seen from FIGS. **1** and **2** of the drawings herein, that the socket **12** is rigidly secured to the chassis **34** by simple plug-in insertion of the socket with respect to the chassis opening **38.** That is, the socket **12** is pushed into the chassis opening **38** and the clip elements **36** deflect inwardly to pass through the recess area **52** of the chassis opening **38.** The neck portion **46** of the clip element **36** is substantially the same width as the recess portion **52** of the chassis opening **38** and will slip into the opening **52** when the socket **12** is pushed into the chassis opening **38** a sufficient distance. The spring clip then will deflect outwardly (as illustrated) and the sholder **50** of the clip **36** will extend beneath the lower surface of the chassis **34** to define an interference capture and to lock the socket **12** with respect to the chassis **34.**

It will be readily apparent that the socket **12** is removeable from engagement with the chassis **34** by deflecting the spring clips **36** inwardly to move the sholder **50** out of engagement with the chassis **34** whereby the socket **12** may be withdrawn from engagement with the chassis opening **38** for repair, maintenance, or any other purpose.

Different gripping portion designs may be provided on the clip elements **36.** For example it is not necessary to taper the lower portion of the gripping element or portion **48** of the leg **44.** A rectangular configuration or square configuration may be employed equally well.

While a specific embodiment of the present invention has been shown and described it will, of course, be understood that other modifications and alternative constructions may be used without departing from the true spirit and scope of this invention. It is intended by the appended claims to cover all such modifications and alternative constructions as fall within their true spirit and scope.

What we intend to secure by United States Letters Patent, is:

1. An improved electrical connector assembly to define the means for circuit continuity and to be removably secured to a support chassis, the support chassis having an opening therein to receive and secure the assembly with respect to said chassis, the electrical assembly comprising:

a connector assembly having a plurality of electrically conductive elements disposed therein;

at least two flat deflectable clip elements opposedly mounted on the connector assembly and extending forwardly of the connector assembly, the clip element having a neck portion extending from the connector assembly to a lower and wider gripping portion comprising shoulders fixedly spaced apart extending on each side of the clip where the neck and gripping portion join, the shoulders being spaced from the mounting of the clip to the connector assembly to permit capture of a chassis between the shoulders and the connector.

2. The improved electrical connector assembly of claim **1** wherein the clip elements are rigidly secured to a shell extending about an insulating body of the connector assembly and one disposed at either of longitudinal ends of said shell with the clip elements being received in respective openings in a chassis to define the rigid interconnection between the electrical connector assembly and the chassis.

3. The electrical connector assembly of claim **1** having a mating plug assembly mounted thereon, said plug assembly being secured to the connector assembly of claim **1** by a pair of deflectable clip elements rigidly attached to and disposed in laterally displaced relation on opposed sides of the plug element whereby the deflectable clip elements are adapted to engage the rigid shell of the connector assembly to removeably secure the plug element with respect to the connector.

4. The improved electrical connector assembly of claim **1** wherein the clip elements are rigidly secured to a shell extending about an insulating body of the connector assembly and are disposed at either of longitudinal ends of said shell.

5. The improved electrical connector assembly of claim **1** further comprising a chassis having an opening therein for receiving the connector assembly and having recesses extending from the opening for receiving the neck portion of the respective clip elements.

* * * * *

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,824,552 Dated July 16, 1974

Inventor(s) Edward Kirby

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 5, "removeably" should read --removably--

Column 1, line 41, "removeably" should read --removably--

Column 3, line 2, "alighment" should read --alignment--

Column 3, line 24, insert a comma (,) after the word "illustrated"

Column 3, line 33, "element" change to "elements"

Column 3, line 46, "sholder" should read --shoulder--

Column 3, line 60, "sholder" should read --shoulder--

Column 3, line 65, "removeable" should read --removable--

Column 4, line 1, "sholder" should read --shoulder--

Column 4, line 6, insert a comma (,) after the word "example"

Column 4, line 54, "removeably" should read --removably--

Signed and sealed this 29th day of October 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents