July 2, 1968 J. E. ANTES 3,391,383

ELECTRICAL CONNECTOR FOR INTEGRATED CIRCUIT ELEMENTS

Filed June 20, 1966 2 Sheets-Sheet 1

Fig. 1.

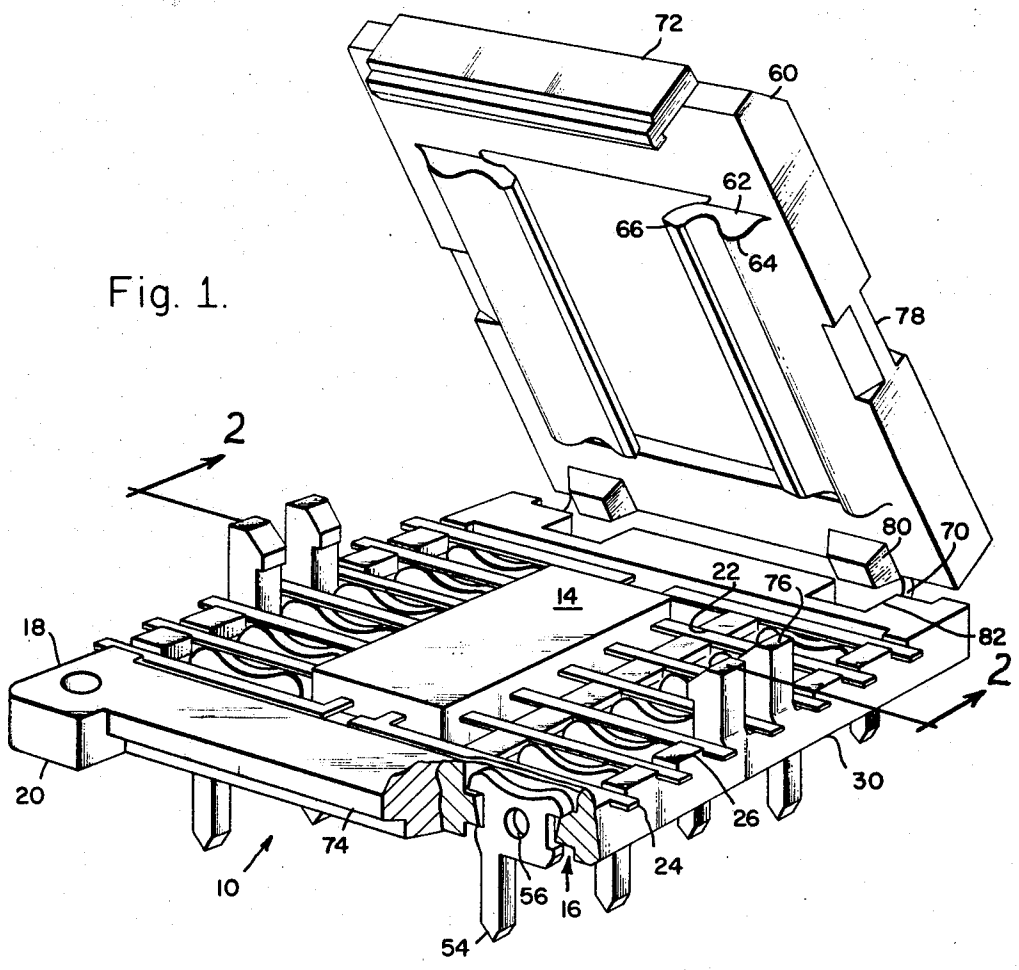
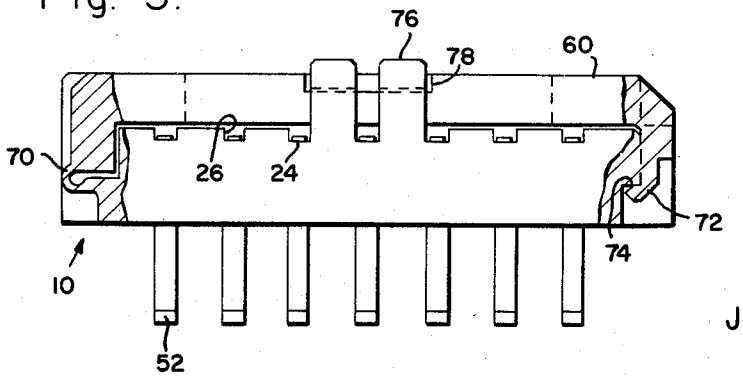


Fig. 3.



Jack E. Antes,
INVENTOR.
BY.
Walter R. Thiel
ATTORNEY.

ELECTRICAL CONNECTOR FOR INTEGRATED CIRCUIT ELEMENTS

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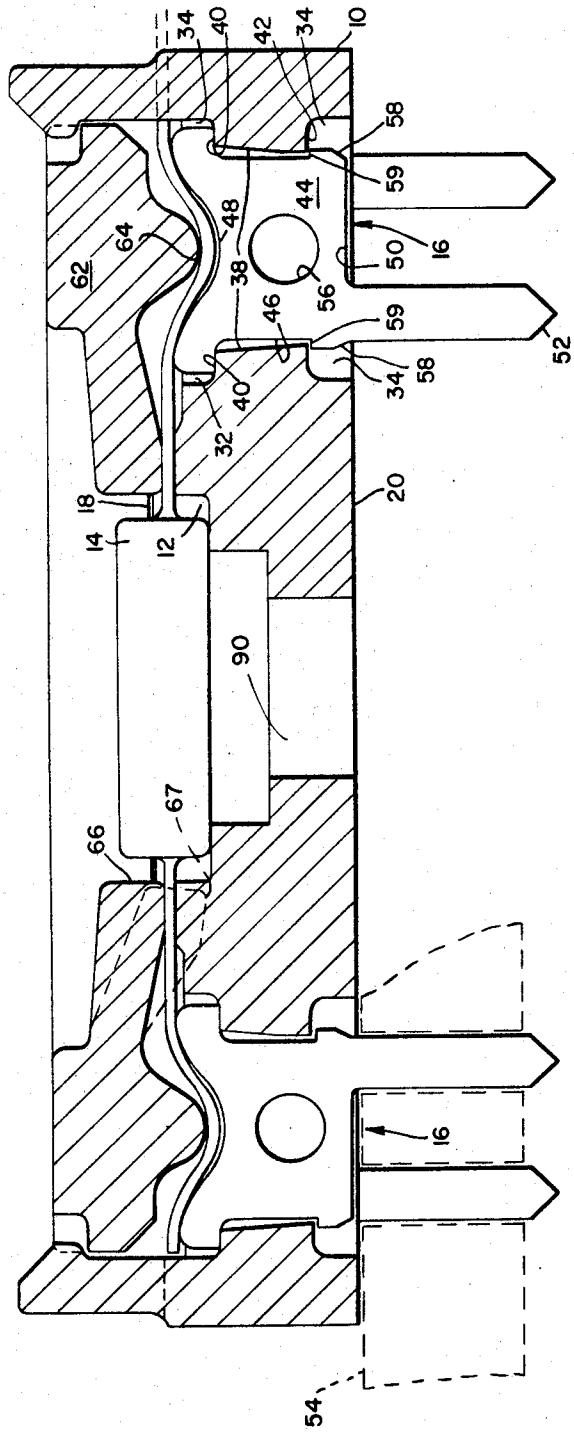

Fig. 2.

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ELECTRICAL CONNECTOR FOR INTEGRATED CIRCUIT ELEMENTS

Jack E. Antes, Lakewood, Calif., assignor to Hughes Aircraft Company, Culver City, Calif., a corporation of Delaware

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The present invention relates to an electrical connector and more particularly to an improved connector for flat circuit elements such as an integrated circuit assembly.

The miniaturization of electronic circuits and their packaging into small flat elements has resulted in considerable effort being devoted to the design of small reliable and efficient connectors for making electrical contact to such elements. Since integrated circuit assemblies have been made small to enable them to be used in electronic subsystems and systems of small size it is extremely important that the connectors used with such elements also be of small size.

Therefore, it is an object of the present invention to provide a novel and improved connector for integrated circuit elements which is relatively small in size yet highly reliable in operation.

A further object of the present invention is to provide an improved electrical connector for integrated circuit elements which is capable of making electrical connection to a lead extending from said element.

A still further object of the present invention is to provide an improved electrical connector for integrated circuit elements which rigidly and fixedly supports at least one lead extending from said element under a predetermined force and also deflects a portion of the lead into wiping contact with an electrical contact element.

In general, in its preferred form the present invention comprises a connector body constructed to support an integrated circuit element having at least one lead and at least one electrical contact element so that the lead is brought into contact with the contact element. The integrated circuit element is positioned within the connector body in such a fashion that the lead is supported adjacent to the contact element. A cover member is secured to the contact body and includes at least one rail portion of a configuration to deflect the lead under a predetermined force into wiping contact with the contact element. The securing of the cover member to the body is accomplished through a plurality of hooks and catches which are integrally formed in these members, and when desired, a hinge member.

Other advantages of the invention will hereinafter become more fully apparent from the following detailed description of the drawings which illustrate the preferred embodiment throughout which like reference characters indicate like parts and in which:

FIGURE 1 is a perspective view of an electrical connector constructed in accordance with the principles of the present invention and showing an integrated circuit element supported between the connector body and the open cover member. A portion of one corner of the connector body is cut away to show the position of a contact element in one of the chambers and its relationship with a lead of the integrated circuit element;

FIG. 2 is a sectional view of the electrical connector of FIG. 1 taken at 2—2 in that figure and showing the cover member secured to the connector body and in dashed lines in a portion of an electrical connector mated with a portion of the contact elements. Shown also in dashed lines is the undeflected position of the strain relief bar of the push rail as well as the undeflected length of the leads extending from the integrated circuit element; and

FIG. 3 is a side elevational view of the connector of FIG. 1 with the cover member in engagement with the contact body and with portions cut away to illustrate the continuous hinge and the securing member.

Referring first to FIGS. 1 and 2, the electrical connector for integrated circuit assemblies constructed in accordance with the principles of the present invention comprises a connector block or body **10** of a resilient dielectric material such as nylon which has a generally flat shape having a first transverse chamber **12** of a shape sufficient to receive a main body **14** of an integrated circuit assembly or as called in the electronic industry a "flatpack" and at least one second transverse chamber **16**. When the connector includes a plurality of second transverse chambers **16** they are located in rows on either side of the first chamber **12**, as shown in the figures. Both the first transverse chamber **12** and the second transverse chamber **16** extend from a first side or surface **18** of the body to a second side or surface **20**. The first side **18** also includes a plurality of grooves each having a first portion **22** of a depth substantially similar to the thickness of a lead **24** projecting from the main body **14** of the flatpack and a second portion **26** of a depth slightly greater than the thickness of the lead **24**. The first portion **22** is defined by one side of the first transverse chamber **12** and one side of one of the second transverse chambers **16** and the second portion **26** is defined by the other side of one of said second transverse chambers and a transverse side **30** of the body. Said first and second portions **22, 26** of each groove are aligned so that one of the leads **24** extending from the main body **14** of the integrated circuit element is supported by the body in contact with the groove.

Each of the second transverse chambers **16** has a first and second portion **32, 34** of similar width nearest the first and second sides of the connector body, respectively, and a third portion **38** substantially midpoint of the chamber and extending toward the first and second portions to define a pair of shoulders **40, 42**. The third portion **38** is of a width less than that of the first and second portions **32, 34** and to facilitate the insertion of a contact element **44** into the second transverse chamber it may be a varying width so that the shoulders **40, 42** are tapered with the greater dimension thereof nearest the first portion **32** of the chamber **16**.

The contact element **44** is of an electrically conductive material such as brass or beryllium copper and includes a pair of notches **46** on opposite surfaces of a dimension sufficient to engage the shoulders **40, 42** of one of the second transverse chambers and includes on a second pair of opposite surfaces contact portions; a first surface **48** having a concave shape for contact with one of the leads and a second surface **50** having a pin-like finger **52** extending therefrom which is mateable with another assembly such as a master board **54** having integral contact elements. Each of the notches **46** includes a retaining wall **59** which functions by engagement with the shoulder **42** to retain the contact element **44** in the chamber **16** once the other side of the notch engages the shoulder **40**. The finger **52** may extend from the contact element **44** at any location along the second surface **50**; however, to enable contact being made to adjacent fingers it is desirable to locate the finger at one end of the surface. This permits the contact elements **44** to be alternated in adjacent chambers **16** as clearly shown in FIGS. 1 and 2. If desired to facilitate handling each of the contact elements, an aperture **56** is formed in the contact element. The edges of the second surface **50** are slightly beveled as at **58** and as clearly seen from FIG. 2 this facilitates

the insertion of the contact element **44** into the chamber **16** since the beveled edge aids in the deflection of the resilient material of the shoulder **42**.

A resilient cover member **60** is typically positioned in contact with the connector body **10** and includes a rail portion **62** having a curved projection or hammer **64** which engages the leads and deflects them into contact with the concave first surface **48** of the connector elements **44**. In addition, the rail portion **62** includes a strain relief bar **66** which bears against the leads and clamps them against the connector body **10** to rigidly hold each of the leads. As shown in FIG. 2, a predetermined clamping force is built into the strain relief bar **66** by its deflection from a position shown in dashed lines at **67** which represents the shape of the bar **66** prior to cover member **60** being secured to the body **10**. As the cover member **60** is brought into contact with the body **10**, the strain relief bar **66** clamps the lead and the curved projection **64** causes the lead to deflect them into engagement with the connector element. Because the lead is deflected from its shape as shown in dashed lines in FIG. 2, the hammer **64** causes it to conform to the concave curvature of the connector element and in doing so a portion of it is wiped along the concave surface **48**. This wiping action has a very desirable electrical effect because a more reliable contact results from the cleaned surfaces.

As shown in FIG. 3 in addition to FIG. 1, the connector body **10** and cover member **60** may be formed from continuous material and connected together by a thin strip or member **70** junctioning as a hinge to facilitate the movement of the cover member **60** toward and away from the body **10**. The exposed end of both the body **10** and the cover member **60** are configured into a hook **72** and latch **74**, respectively, for securing the cover to the body. To assure a constant pressure on the leads a plurality of deflectable hooks **76** extend from the first surface **18** of the body and are engageable in detents **78** formed in the cover member. Also, a pair of raised bosses **80** extends from one surface of the cover member and each is aligned with a detent **82** in the end of the body adjacent to the hinge to provide proper alignment of the body and cover member.

As shown in FIG. 2, the connector body may include a number of apertures such as shown at **90** which can be used to attach it to a rigid support such as the master board **54** (FIG. 2) by conventional fastening devices such as bolts or screws (not shown) or if desired may act as a heat sink for the flatpack.

While the basic principle of this invention has been herein illustrated along with one embodiment it will be appreciated by those skilled in the art that variations in the disclosed arrangement both as to its details and as to the organization of such details may be made without departing from the spirit and scope thereof. Accordingly, it is intended that the foregoing disclosure and the showings made in the drawings will be considered only as illustrative of the principles of the invention and not construed in a limiting sense.

What is claimed is:

1. An electrical connector for an integrated circuit assembly having a body portion and at least one lead extending therefrom, comprising:

a resilient connector body including a first transverse chamber extending from a first side to a second side and adapted to receive said body portion and at least one second transverse chamber, said second chamber also extending from said first side to said second side and having first and second portions nearest said first and second sides, respectively, and a third portion intermediate said first and second portions defining pairs of shoulders, said third portion being of a width less than that of said first and second portions;

at least one groove in said first side having a first portion defined by another side of said connector body and one side of one said second transverse chambers and a second portion defined by the other side of one of said second transverse chambers and one side of said first transverse chamber, said first and second portions of said groove being aligned to support said lead;

a contact element in said second transverse chamber, said element having notches on each of a pair of first opposite sides, each notch being adapted to contact a different one of said pairs of shoulders to retain said element in said second chamber and a contact portion on one side of a second pair of opposite sides;

a resilient cover member in juxtaposition to said body and having at least one rail portion for deflecting said lead into engagement with the contact portion of said contact element; and

securing means associated with said connector body and said cover member for attaching said cover member to said body and for holding said rail portion in contact with said lead.

2. The electrical connector of claim **1** wherein the resilient connector body includes a plurality of second transverse chambers and said second transverse chambers are located in two rows each on an opposite side of said first transverse chamber, and the cover member includes a pair of rail portions each positioned in juxtaposition to a different one of said rows of second transverse chambers.

3. The electrical connector of claim **1** wherein the connector body and cover member are each a portion of a continuous member and intermediate the connector body and cover member is a resilient hinge which permits said cover member to be rotated toward and away from said body.

4. The electrical connector of claim **1** wherein the securing means includes a hook portion formed in the exposed end of said cover member which is engageable with a catch portion formed in the exposed end of said connector body.

5. The electrical connector of claim **4** wherein the securing means also includes a plurality of deflectable hook members extending from said first side of said connector body each engageable in a detent in the cover member to assure that the rail portion engages said lead with a predetermined force.

6. The electrical connector of claim **5** wherein the cover member includes a pair of alignment posts and the connector body includes a pair of detents in the first side thereof each aligned with one of said posts and engageable thereby when said cover member is secured to said connector block.

7. The electrical connector of claim **1** wherein the contact element includes first and second contact portions, said first contact portion having a concave configuration adapted to make wiping contact with said lead and said second contact portion having a pin-like configuration adapted to make contact with another electrical element.

8. The electrical connector of claim **1** wherein said third portion of said second transverse chamber has a varying width with the greatest dimension thereof nearest the first portion of said second transverse chamber and the least dimension of said third portion is less than the width of said contact element immediately adjacent the pair of notches therein.

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MARVIN A. CHAMPION, *Primary Examiner.*

J. R. MOSES, *Assistant Examiner.*