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Errichiello

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[54] **ELECTRICAL CONNECTOR ASSEMBLY PRODUCTION**

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[52] **U.S. Cl.** ..... **339/176 M**; 339/198 R

[51] **Int. Cl.**[2] **H01R 13/50**

[58] **Field of Search** ..... 339/198 R, 198 C, 198 E, 339/64 M, 65, 66 M, 154 R, 156 R, 157 R, 176 M, 217 S, 218 R, 218 M, 214 R; 29/629, 630 D

[56] **References Cited**

UNITED STATES PATENTS

3,412,369	11/1968	Fox	339/217 S
3,551,877	12/1970	Telmosse et al.	339/156 R
3,601,762	8/1971	Eshelman	339/64 M

FOREIGN PATENTS OR APPLICATIONS

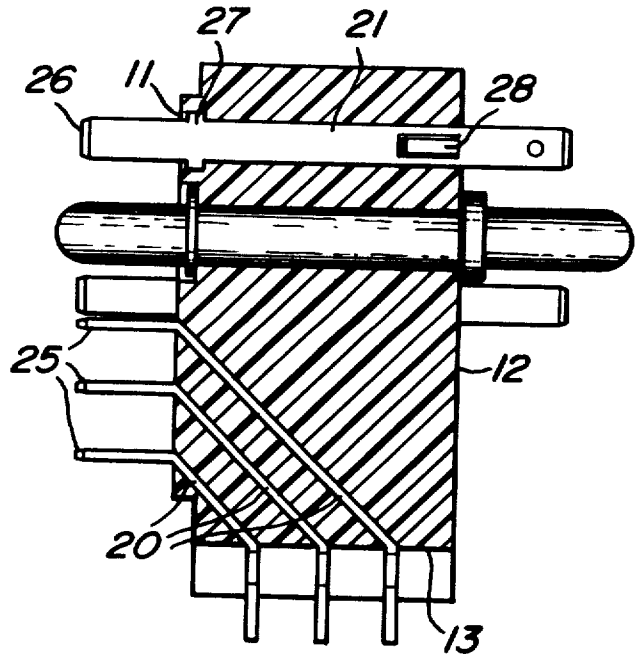
1,134,588	4/1957	France	339/198 H

Primary Examiner—Joseph H. McGlynn
Assistant Examiner—James W. Davie
Attorney, Agent, or Firm—Eugene A. Parsons; James W. Gillman

[57] **ABSTRACT**

An electrical connector assembly including a one piece molded body with first and second parallel opposed surfaces and a third surface generally perpendicular and adjacent to said first surface, having a first plurality of openings each extending angularly in a substantially straight line from said first surface to said third surface and each containing an elongated contact element with the ends bent so as to extend perpendicularly from the first and third surface, and a second plurality of openings extending in a substantially straight line from said first surface to said second surface with a plurality of elongated contact elements positioned therein and held in place by means of portions of the contact extending transversely outwardly at each surface.

5 Claims, 4 Drawing Figures



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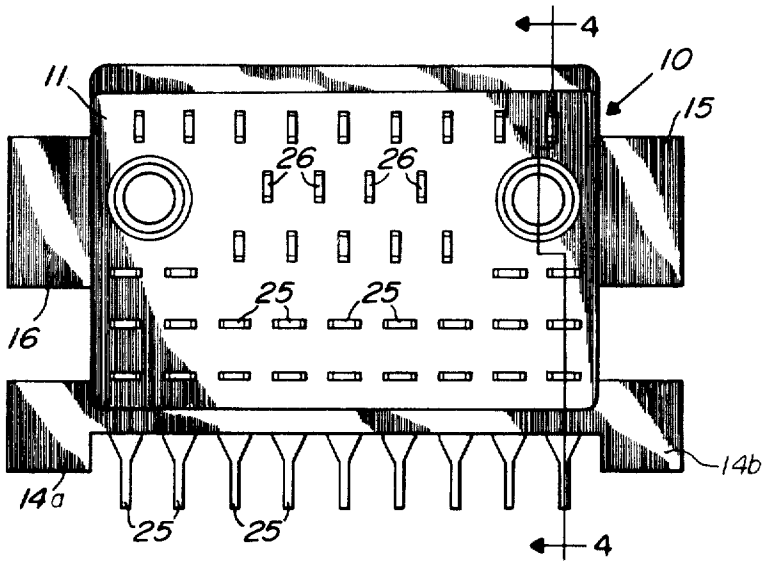


Fig. 1

Fig. 2

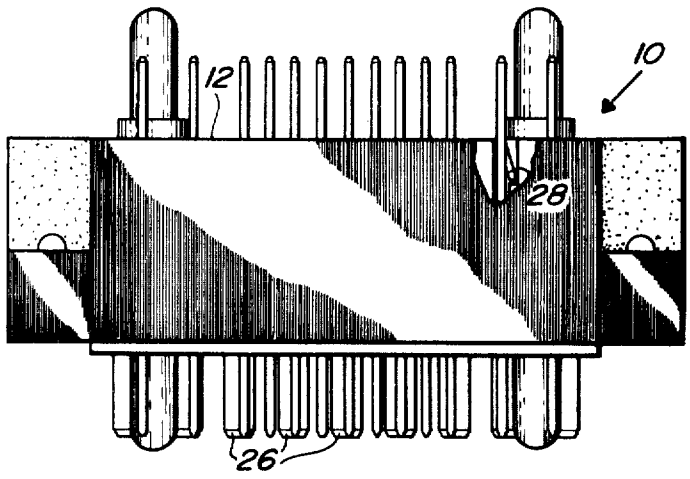
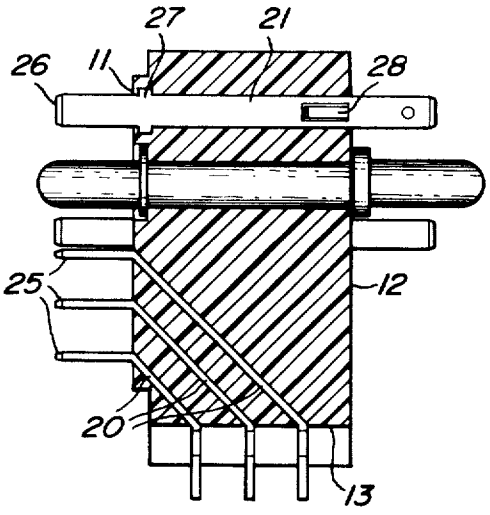


Fig. 4



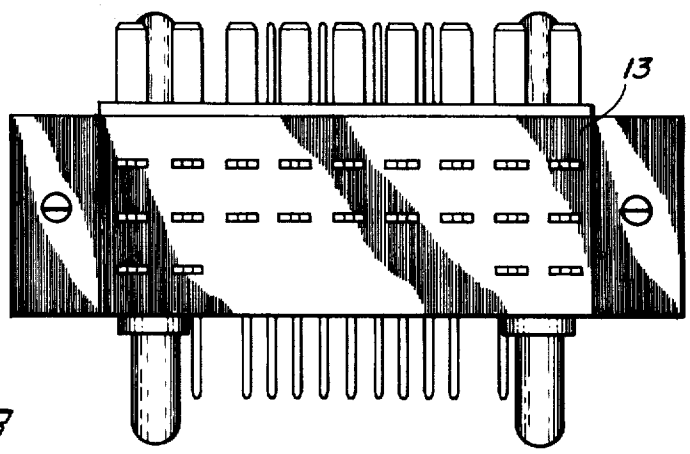


Fig. 3

ELECTRICAL CONNECTOR ASSEMBLY PRODUCTION

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present electrical connector assembly is designed for use in electronic apparatus wherein the body is affixed to the housing of the apparatus so that a portion thereof extends outside of the housing and is adapted to mate with a second connector assembly, and a portion of the connector assembly extends inside the housing and is adapted to receive a plurality of wires fixedly attached thereto. In many types of electronic apparatus it is desirable to have wires and other circuitry directed toward the connector assembly from two different directions. Thus, the present connector is directed to an improved electrical connector assembly for straight through connections and 90° connections in a single connector.

2. Description of the Prior Art

In the prior art, electrical connector assemblies for straight through connections and 90° connections in the same assembly are constructed with a two piece body, as described in U.S. Pat. No. 3,601,762, entitled "Electrical Connector." This prior art connector is relatively complicated and expensive to manufacture because the contacts and the two portions of the body are assembled in one or more complicated assembly steps and locked in position. When the two body portions are locked together all of the contacts are held fixedly in the desired position.

SUMMARY OF THE INVENTION

The present invention pertains to an improved electrical connector assembly including a single piece body formed of nonconducting material with first and second generally parallel opposed surfaces and a third surface generally perpendicular and adjacent to said first surface and having a first plurality of openings extending angularly therethrough in a substantially straight line from said first surface to said third surface and a second plurality of openings extending in a straight line through said body from said first surface to said second surface, a first plurality of elongated contact elements positioned one each in each of said first plurality of openings with each end of each element being bent to extend outwardly from said first and third surfaces generally perpendicularly, and a second plurality of elongated contact elements positioned one each in each of said second plurality of openings and held in place by transverse projections adjacent each end thereof.

It is an object of the present invention to provide an improved electrical connector assembly which is substantially easier and less expensive to manufacture.

It is a further object of the present invention to provide an improved electrical connector assembly having straight through and 90° connections therein and formed with a one piece body.

It is a further object of the present invention to provide a method of manufacturing an improved electrical connector assembly.

These and other objects of this invention will become apparent to those skilled in the art upon consideration of the accompanying specification, claims and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Referring to the drawings, wherein like characters indicate like parts throughout the figures:

FIG. **1** is a front elevational view of an improved electrical connector assembly constructed in accordance with the present invention;

FIG. **2** is a view in top plan of the connector assembly illustrated in FIG. **1**, portions thereof broken away and shown in sections:

FIG. **3** is a view in bottom plan of the connector assembly illustrated in FIG. **1**; and

FIG. **4** is a sectional view as seen from the broken line **4—4** in FIG. **1**.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the figures, the numeral **10** generally designates a body formed of nonconducting material, such as plastic or the like, which forming may be accomplished by some convenient means such as molding, etc. The body **10** has a first surface **11**, a second generally parallel opposed surface **12** and a third surface **13** which is generally perpendicular and adjacent to the first surface **11**. The body **10** also has a pair of mounting ears **14***a* and **14***b* integrally formed on opposite sides thereof for fixedly attaching the connector assembly to an electronic housing or the like. A pair of integrally formed cam surfaces **15** and **16** are also positioned on either side of the body **10** to aid in positioning a female connector for mating engagement with the present connector assembly.

A first plurality of openings **20** (seen most clearly in FIG. **4**) are formed in the body **10** to extend from the first surface **11** angularly through the body to the third surface **13**. In the present embodiment three rows of openings **20** are formed and each row extends a different distance through the body **10**. However, it should be understood that the plurality of openings **20** might be provided in any desired and necessary configuration. A second plurality of openings **21** extend through the body **10** from the first surface **11** to the second surface **12**. It should be noted that all of the openings **20** and **21** extend in a substantially straight line for ease in assembly, which will be described presently.

A plurality of elongated contact elements **25**, in this embodiment, are formed from a flat conducting metal and provided with a bend adjacent one end. The bend adjacent the one end of each of the contact elements **25** is formed so that the end will extend substantially perpendicularly outwardly from the surface, either **11** or **13**, when the contact element is engaged in one of the plurality of openings **20**. The opposite end of the contact element **25** is then bent so that the contact element is captured in the body **10** and the opposite end extends substantially perpendicularly outwardly from the other surface **11** or **12**. In the present assembly method all of the contact elements **25** are inserted into the body **10** from the surface **11** and all contact elements are bent simultaneously at the surface **13**. Thus, the insertion and locking into place of the contact elements **25** is greatly simplified and can be easily mechanized.

A second plurality of elongated contact elements **26**, in this embodiment, are formed from a flat conducting metal with ears or projections **27** (See FIG. **4**) adjacent one end. Each opening **21** has an enlarged portion adja-

cent the surface **11** formed so that the ears **27** will engage a shoulder to prevent the contact element **26** from passing through the opening **21** but the ears **27** will not protrude outwardly from the surface **11.** A second transversely extending projection **28** is pressed from the main body of each contact element **26** adjacent the opposite end thereof. The projection **28** is a barb which is directed generally towards the first end of the element **26** and biased transverse outwardly by the natural resilience of the metal. The openings **21** adjacent the surface **12** are enlarged slightly so that a shoulder is formed within the body **10** generally parallel with the surface **12.** When a contact element **26** is inserted into an opening **21** far enough to allow the projections **27** to butt against the shoulders adjacent and parallel to the surface **11,** the projection or barb **28** springs outward in the enlarged portion of the opening **21** adjacent the surface **12** and engages the shoulder therein to prevent retraction of the contact element **26.** It should be noted, however, that the contact element **26** can be removed (for replacement purposes) by simply inserting an instrument into the opening **21** to force the barb **28** into axial alignment with the element **26.** The element **26** can then be withdrawn and a new one substituted therefor, in case of damage, etc., to the original element **26.** It should be understood that other means for preventing substantial movements of the contact element **26** might be utilized in place of the barbs **28,** such as twisting the ends of the elements **26** protruding from the surface **12.** However, the barbs **28** greatly simplify the assembly of the connector and easily provide for substitution of the contact elements **26.**

Thus, an improved electrical connector assembly and method of producing the same are disclosed, which improved connector assembly is substantially simpler to produce and provides for the easy removal and replacement of any contact elements therein. Further, because the contact elements are insertible at any time (even after the connector assembly has been installed in an electronic housing) only the required number of contact elements need be inserted into the body. Whereas, in the prior art twopiece assemblies, all of the contact elements must be inserted during assembly.

While I have shown and described a specific embodiment of this invention, further modifications and improvements will occur to those skilled in the art. I desire it to be understood, therefore, that this invention is not limited to the particular form shown and I intend in the appended claims to cover all modifications which do not depart from the spirit and scope of this invention.

I claim:

1. An improved electrical connector assembly comprising:

a. a body formed of nonconducting material and having first and second generally parallel opposed surfaces and a third surface generally perpendicular and adjacent to said first surface, said body being formed of one integral member;

b. said body defining a first plurality of openings each extending angularly therethrough in a substantially straight line from said first surface to said third surface;

c. said body defining a second plurality of openings each extending therethrough in a substantially straight line from said first surface to said second surface;

d. a first plurality of elongated contact elements positioned one each in each of said first plurality of openings with each end of each element being bent to extend outwardly from said first and third surfaces generally perpendicularly; and

e. a second plurality of elongated contact elements positioned one each in each of said second plurality of openings, each of said elements in the second plurality having a projection adjacent one end to prevent the passage thereof through the associated opening and the opposite end of each element in the second plurality having means adjacent thereto for preventing substantial movement thereof in the associated opening.

2. An improved electrical connector assembly as claimed in claim **1** wherein each element in the first and second pluralities has a generally rectangular cross section and each opening in the first and second plurality of openings has a generally rectangular cross section generally matingly receiving one of said elements.

3. An improved electrical connector assembly as claimed in claim **1** wherein the ends of both pluralities of contact elements extending outwardly from the first surface are formed for removable engagement into a mating plug and the ends of both pluralities of contact elements extending outwardly from the second and third surfaces are formed for fixedly engaging wires and the like thereto.

4. An improved electrical connector assembly as claimed in claim **1** wherein the means for preventing substantial movement of each of the contact elements in the second plurality include a barb having an end extending transversely outwardly from the longitudinal axis of each of said second plurality of elongated contact elements and said end of said barb directed generally toward said one end.

5. An improved electrical connector assembly as claimed in claim **4** wherein the barb is an elongated spring like portion pressed from the contact element and is retractable to allow removal of the contact element.

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