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Peverill

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[54] **ELECTRICAL CONNECTOR**

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[52] **U.S. Cl.** ..... **339/14 R,** 339/143 R, 339/147 R

[51] **Int. Cl.** **H01r 3/06**

[58] **Field of Search** ..... 339/14 R, 14 L, 176 R, 339/176 M, 177 R, 143 R, 143 C, 143 S, 147 R, 147 M

[56] **References Cited**

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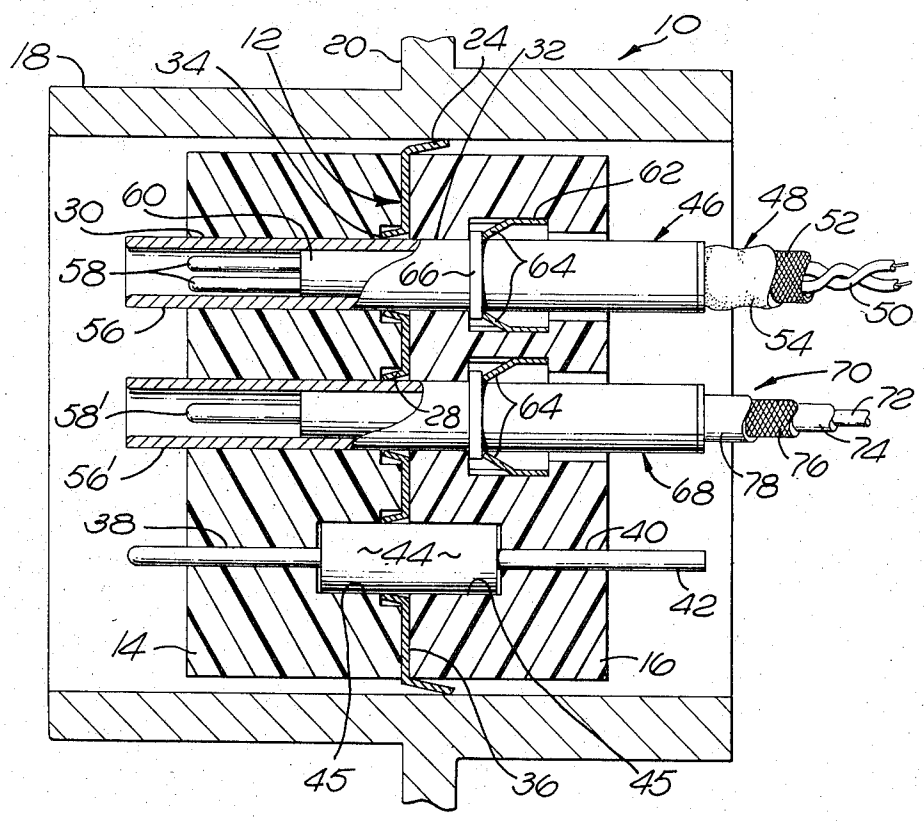
Primary Examiner—Bobby R. Gay
Assistant Examiner—Robert A. Hafer
Attorney, Agent, or Firm—Thomas L. Peterson

[57] **ABSTRACT**

An electrical connector with an internal grounding foil for grounding outer conductors of multi-conductor cables. The invention is particularly suited for Twinax cables in which the shields are grounded to the connector shell by the grounding foil to preclude or minimize the transmission of electromagnetic pulses (EMP) through the connector. The connector also houses pin contacts which may be either insulated from the grounding foil or carry filter elements which attenuate radio frequency interference (RFI).

5 Claims, 2 Drawing Figures



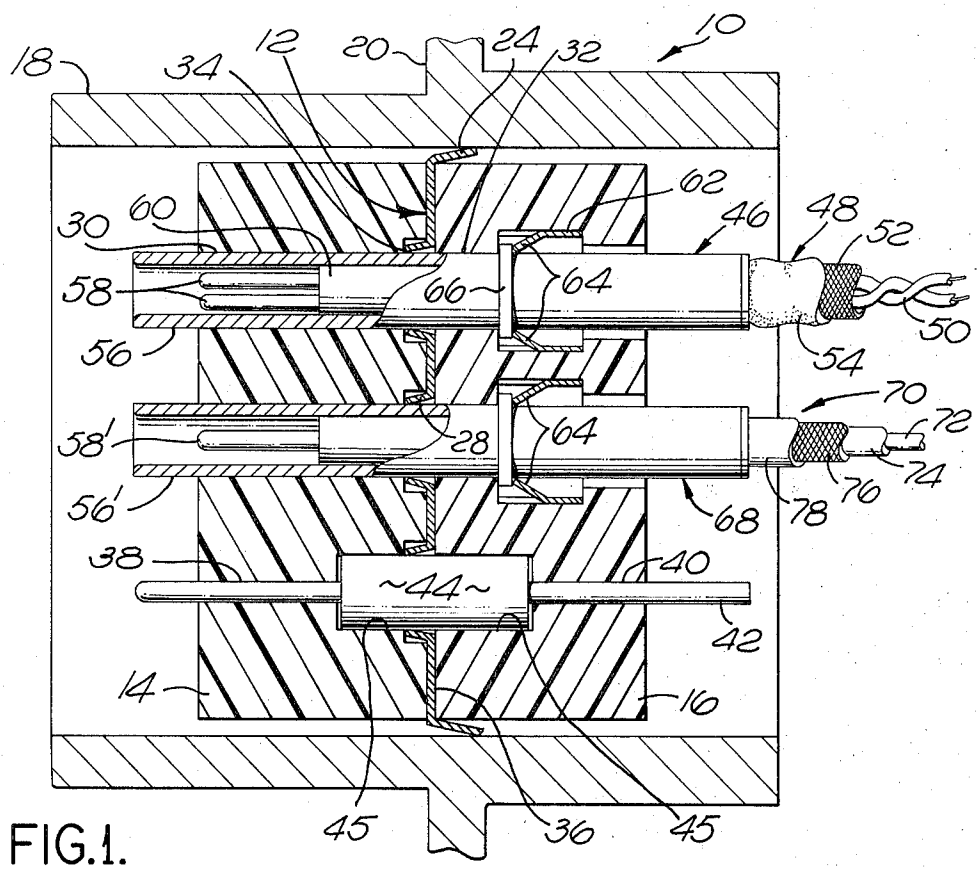

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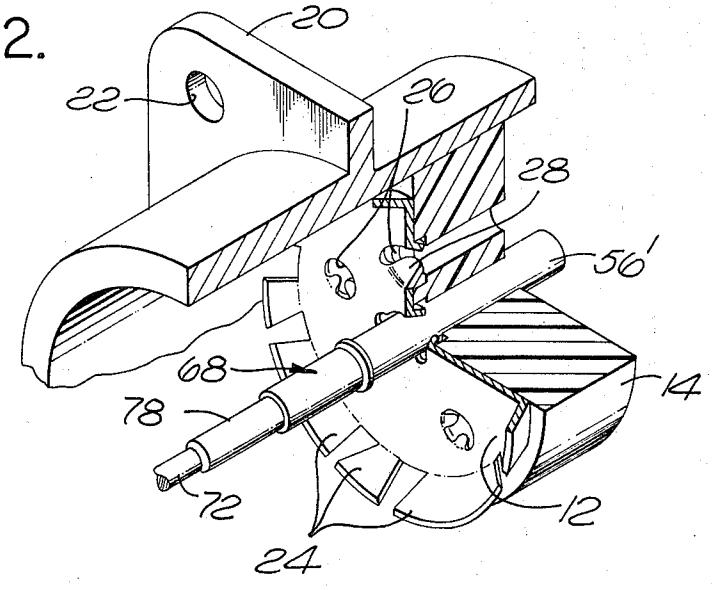
FIG.1.

FIG.2.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ELECTRICAL CONNECTOR

BACKGROUND OF THE INVENTION

The present invention relates generally to an electrical connector and, more particularly, to a connector which precludes or minimizes the transmission of electromagnetic pulses (EMP).

For certain applications, such as in aircraft, it is important to provide protection against electromagnetic pulses which induce high electrical currents in electrical systems. Typically, such systems employ what is known in the art as Twinax cables for the transmission of electrical signals. In such a cable, twisted insulated wires are covered by a metallic sheath or braid which, in turn, is enclosed by an insulation sleeve. Such cables are utilized inasmuch as they provide better resistance to electromagnetic pulses (EMP) than do coaxial cables, yet also provide good RFI (radio frequency interference) protection. Such cables are carried from one compartment of an aircraft to another through electrical connectors. Typically these connectors have been separate and apart from conventional multi-pin contact connectors utilized in the electrical system. In addition, no convenient means are provided for grounding the outer conductor or metallic sheath of these cables when they are terminated to a multi-pin connector. Such grounding has been accomplished by the use of sheet metal straps or braces which are soldered, swaged, or welded to the outer conductor of the cable. Also, no multi-contact Twinax connectors are now available, thus requiring a plurality of separate electrical connector members for interconnecting a plurality of cables as well as separate grounding straps for each such cable.

What is desired, then, and constitutes the principal object of the present invention is an electrical connector which allows the interconnection of pluralities of Twinax cables and the grounding of the outer conductors of these cables without the necessity of soldering, swaging or welding. It is also desirable that the connector employ single pin contacts for single conductors as well as multi-pin contacts for Twinax and coaxial cables so that a single connector may provide complete electrical connection between various signal carrying conductors in the compartments of an aircraft or other facility. It is also an object of the invention to provide a connector which allows the contacts therein to be easily installed and removed so that alterations may be readily made in the connection assembly at the site of use.

SUMMARY OF THE INVENTION

It is the principal aspect of the present invention to provide an improved electrical connector which allows the interconnection of multi-conductor cables as well as single conductors. The connector employs a grounding foil which frictionally engages the inner surface of the shell of the connector. The foil is formed with a plurality of apertures through which the contacts extend. Some of the contacts are pin contacts for transmission of signals by single conductors. In other of the apertures, the contacts include an inner conductor and outer conductor surrounding and spaced from the inner conductor. A cable, which may be either a Twinax cable or a coaxial cable, is connected to each of such contacts. The outer metallic sheath of the cable is joined to the outer conductor of the contact which in turn frictionally engages the grounding foil so as to provide a grounding connection between the sheath and the shell of the connector. Since the contacts are releasably mounted in the grounding foil, any variety of contacts and arrangement thereof may be provided in the connector at the location of use, thus facilitating maintenance, repair, and substantial variation in the electrical interconnection of the electrical system in which the connector is employed.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a longitudinal, partial, sectional view through a connector constructed in accordance with the present invention; and

FIG. 2 is a perspective view, partially in section, of the connector illustrated in FIG. 1, looking in the direction of the rear of the connector, with the rear insulator removed.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing in detail, the connector of the present invention, generally designated **10**, comprises a grounding plane or foil **12**, sandwiched between a front insulator **14** and rear insulator **16** mounted in a metal shell **18**. The shell is formed with a mounting flange **20** which may be secured to a rigid structure by means of a bolt (not shown) passing through the hole **22** in the flange. The grounding foil is a metal sheet generally circular in shape and having a diameter slightly less than the inner diameter of the shell **18** at the point where the foil is to be mounted. The foil is formed with a plurality of peripheral fingers **24** which frictionally engage the inner surface of the shell **18**. A plurality of individual apertures **26** are formed in the foil. As can been seen from the drawing, all the apertures **26** have the same diameter. Each of the apertures contains a plurality of short tangs **28** which are bent at an angle to form a funnel. The tangs deflect radially outwardly when an electrical contact element is mounted in one of the apertures and frictionally engage the outer surface of the contact. Reference is made to U.S. Pat. No. 3,569,915 which provides a detailed disclosure of a grounding foil of a type utilized in the present invention. Such disclosure is incorporated herein by reference.

The insulators **14** and **16** are formed with a plurality of a first set of coaxial passages **30** and **32**, respectively, which are aligned with selected ones of apertures **26** in the grounding foil. Recesses **34** are formed in the rear face **36** of the front insulator **14** for receiving the tangs **28** on the grounding foil. A plurality of a second set of aligned passages **38** and **40** are formed in the front and rear insulators, respectively, aligned with certain other apertures in the grounding foil. The passages **38** and **40** are smaller in diameter than the passages **30** and **32**. Conventional pin contacts **42** are mounted in the passages **38** and **40** in the front and rear insulators, respectively, only one being illustrated in FIG. **1**. The contact **42** may be surrounded by an insulation sleeve **44**, as shown, positioned in cavities **45** in the insulators or an RFI filter. The outer surface of the filter is in frictional contact with the tangs of the grounding foil so that the filter will be grounded to the shell **18** of the connector.

The contacts mounted in the coaxial passages **30** and **32** in the insulators may be Twinax contacts, coaxial

contacts, or both, as shown. The contact **46** illustrated in FIG. **1** is connected to a Twinax cable **48.** This cable includes a pair of twisted insulated wires **50** which are surrounded by a metal braid or sheath **52.** This sheath is covered by an insulation sleeve **54.**

The contact **46** comprises an outer cylindrical metal sleeve **56** which is terminated to the cable braid **52** by standard methods such as mechanical clamping with a ferrule or a clamp nut, or by mechanical crimping. The twisted wires **50** of the Twinax cable are connected to respective pin contacts **58** which are mounted in an insulator **60** mounted in the metal sleeve **56.** The contact **46** is held in the insulators **14** and **16** by a metallic contact retaining clip **62** captivated in the rear insulator **16.** The clip is formed with a pair of forwardly and inwardly extending fingers **64** which engage behind a collar **66** formed on the outer sleeve **56** of the contact **46.** Reference is made to U.S. Pat. No. 3,158,424 for a detailed disclosure of such a retaining clip and means for releasing the clip to allow the contact to be withdrawn rearwardly from the insulators. Such disclosure is incorporated herein by reference.

The coaxial contact, generally designated **68,** illustrated in FIG. **1** differs from the contact **46** only in that it employs a single pin contact **58'** mounted coaxially within the outer metal sleeve **56'.** The contact **68** is connected to a coaxial cable **70** having an inner conductor **72** surrounded by an insulation sleeve **74.** This sleeve is surrounded by a metallic braid **76** which is covered by an insulation sleeve **78.** The braid **76** is joined to the outer sleeve **56'** of the contact **68** in a conventional manner while the inner conductor **72** is connected to the pin contact **58'** such as by crimping. The contact **68** is retained in the insulators in the same manner as is contact **46.**

Any number of Twinax contacts **46,** coaxial contacts **68,** and pin contacts **42** may be mounted in the connector **10** of the present invention. Also, the contacts **46** and **68** may be all Twinax contacts or coaxial contacts, depending upon the particular electrical system in which the connector is employed. To preclude or minimize the transmission of electromagnetic pulses through the connector, preferably the contacts **46** and **68** are all Twinax contacts and to minimize radio frequency interference, the pin contacts **42** should be surrounded by filters. By such an arrangement complete EMI/RFI/EMP protection is provided within a single connector. The connector may be easily disassembled for replacement of the contacts for the purpose of varying the types of contacts utilized in the connector at the place of use.

What is claimed is:

1. An electrical connector comprising:

an electrical connector shell;

a grounding foil in said shell frictionally engaging the inner surface of said shell;

a plurality of apertures in said foil having substantially the same diameter, each said aperture being bordered by a plurality of inwardly extending tangs integral with said foil;

first and second electrical contacts;

said first contact comprising a pin contact having a diameter substantially less than that of said second contact and said apertures, said pin contact passing through one of said apertures without engaging the tangs associated with said one aperture;

a cylindrical member surrounding said pin contact and passing through said one aperture, the outer surface of said member frictionally engaging said tangs associated with said one aperture;

said second contact including an inner conductor and an outer conductor surrounding and spaced from said inner conductor, said second contact extending through another of said apertures with said outer conductor frictionally engaging the tangs associated with said other aperture; and

a cable connected to said second contact, said cable having a pair of conductors coupled, respectively, to the inner and outer conductors of said second contact.

2. An electrical connector as set forth in claim **1** wherein:

one of the conductors of said cable connected to said second contact comprises a pair of twisted insulated wires; and

said second contact has a pair of said inner conductors each connected to a respective one of said wires.

3. An electrical connector as set forth in claim **1** including:

a pair of insulators each positioned on opposite sides of said foil;

said insulators having pairs of coaxial passages therein aligned with each of said apertures, the portions of said pairs of passages adjacent to said foil having substantially the same diameter;

said second contact being positioned in one of said pairs of passages; and

means in one of said passages of said one pair for releasably retaining said second contact in said one pair of passages.

4. An electrical connector as set forth in claim **1** wherein:

said shell is cylindrical; and

said grounding foil is formed with a plurality of peripheral fingers frictionally engaging the inner cylindrical surface of said shell.

5. An electrical connector as set forth in claim **1** wherein:

there are provided a plurality of said first and second contacts each positioned in one of said foil apertures.

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