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ELECTRICAL CONNECTOR FILTER COMPRISING AT
LEAST ONE ELECTRICALLY CONDUCTIVE COATED
DIELECTRIC DISC AND A FERROMAGNETIC DISC
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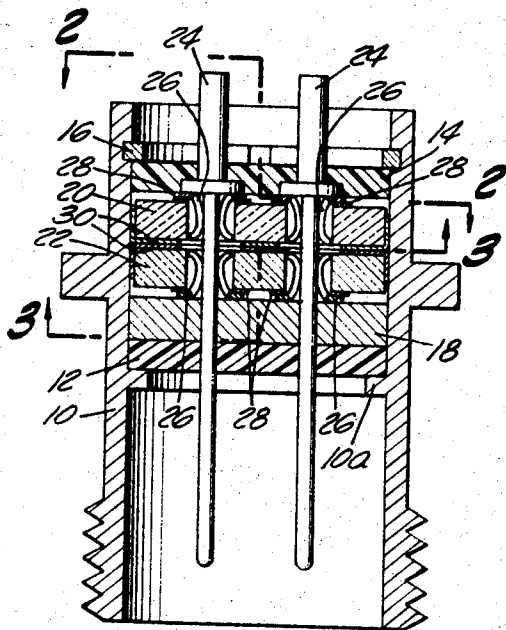


FIG. 1.

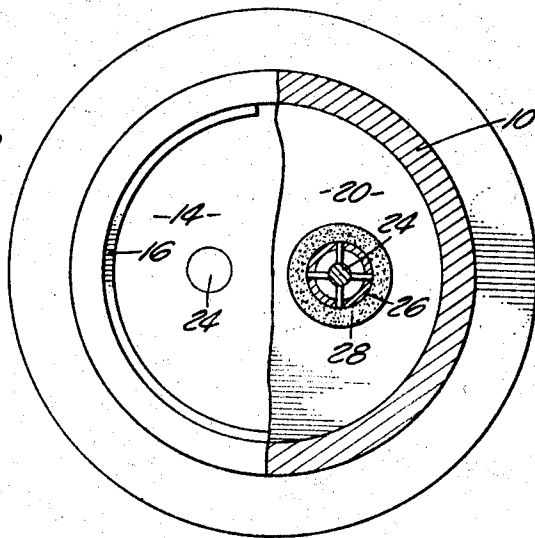


FIG. 2.

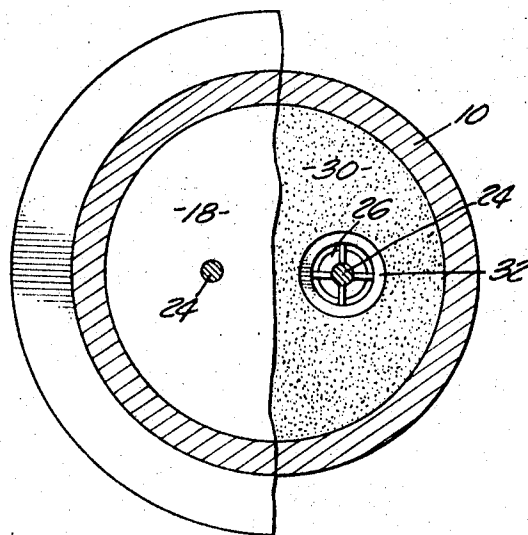


FIG. 3.

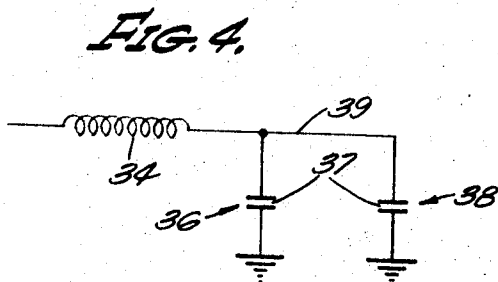


FIG. 4.

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ELECTRICAL CONNECTOR FILTER COMPRISING AT LEAST ONE ELECTRICALLY CONDUCTIVE COATED DIELECTRIC DISC AND A FERROMAGNETIC DISC

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6 Claims

ABSTRACT OF THE DISCLOSURE

A filter assembly includes a capacitor means employing a disc made of high dielectric material and having a plurality of axially extending apertures for receiving connector terminals. One side of the disc is formed with spaced areas of an electrically conductive coating surrounding each of the apertures. Each terminal extending through the apertures is electrically connected by suitable means to the surrounding coating. The opposite axial face of the disc is provided with a second electrically conductive coating over its entire face except the areas immediately surrounding each of the apertures so that the terminals extending therethrough will not be electrically connected to the second coating. This latter coating also extends onto the outer annular surface of the disc so that the coating may be grounded to a casing enclosing the connector and filter assembly. Such construction provides a single capacitor for each terminal. If additional capacitors are desired, similar discs may be added. If two discs are employed, the grounded coatings may be placed in contact with each other. To provide inductance for the filter, a disc made of ferromagnetic material is utilized with a plurality of apertures therein for receiving the terminals.

The present invention relates to electrical connectors wherein one or more contact terminals are mounted in one connector member and complementary contact terminals are mounted in another connector member, the contact terminals mating to provide one or more electrical circuits upon interengagement of the two connector members. The invention relates more particularly to such an electrical connector wherein one or more RF filter assemblies comprising a capacitor and an inductor, are electrically coupled with contact terminals of one of the connector members so as to attenuate or ground out unwanted RF signals which might otherwise pass through the connector.

In many circuits it is necessary or desirable to include an RF filter which may include one or more capacitors, and which preferably also includes at least one inductor, and it is frequently particularly desirable to embody such RF filter components in an electrical connector so that the circuit is not interrupted by the filter at any point. The embodying of RF filter components in one or more electrical connectors eliminates the necessity for a large amount of expensive shielding which would otherwise be required in certain applications.

In one form of prior art RF filter, each electrical terminal in a connector having a large number of such terminals is provided with its individual filter assembly, including a plurality of small ferrite annular elements and a fragile ceramic tube which are assembled together in proper fashion to form the filter. In view of the large number of terminals employed in certain connectors, it will be appreciated that there are a very considerable number of small parts required when the filtering capacity is provided. This naturally results in a costly construction in terms of manufacturing and assembly.

In another form of prior art filter construction, the filter inductance is provided by a ferrite disc having a plurality of apertures for receiving connector terminals, thereby minimizing the number of parts required. Also, a conductive disc having a plurality of apertures receiving the terminals has been employed as a part of the capacitor features of the filter; however, an individual dielectric tube for each capacitor is required. Since each terminal typically utilizes two or more capacitors, a large number of parts are involved.

It is a primary object of this invention to provide an improved, low-cost RF filter assembly for use with an electric connector having a plurality of terminals.

It is a further object of this invention to provide such a filter assembly having a minimum number of parts for providing a maximum of filtering capability within a compact construction.

In accordance with the invention, the filter assembly includes a capacitor means employing a disc made of high dielectric material and having a plurality of axially extending apertures for receiving connector terminals. One side of the disc is formed with spaced areas of an electrically conductive coating surrounding each of the apertures. Each terminal extending through the apertures is electrically connected by suitable means to the surrounding coating. The opposite axial face of the disc is provided with a second electrically conductive coating over its entire face except the areas immediately surrounding each of the apertures so that the terminals extending therethrough will not be electrically connected to the second coating. This latter coating also extends onto the outer annular surface of the disc so that the coating may be grounded to a casing enclosing the connector and filter assembly. Such construction provides a single capacitor for each terminal. If additional capacitors are desired, similar discs may be added. If two discs are employed, the grounded coatings may be placed in contact with each other. To provide inductance for the filter, a disc made of ferromagnetic material is utilized with a plurality of apertures therein for receiving the terminals.

Further features, objects and advantages will become apparent with reference to the following specification and drawing in which:

FIG. 1 is a side elevational view, partially sectionalized, of an electrical connector embodying the filter construction of the invention;

FIG. 2 is a view along 2—2 of FIG. 1;

FIG. 3 is a view along 3—3 of FIG. 1; and

FIG. 4 is a schematic diagram illustrating the circuitry of the filter.

Referring now to the drawing, the filter of the invention is shown illustrated in an electrical connector including a cylindrical casing 10 adapted to be connected to additional connector components. Positioned within the casing are a plurality of discs including a front insulator 12, a rear insulator 14, a ferrite disc 18 and two discs 20 and 22 made of high dielectric material such as ceramic. Each of these discs is provided with a plurality of axially aligned openings or apertures for receiving connector terminals 24. Naturally, the discs may be formed to accommodate the number of terminals desired. The stack of discs is axially positioned within the casing by inwardly extending casing shoulder 10a and a retaining washer 16 positioned within a groove at the rear portion of the casing.

In accordance with the invention, the ceramic discs 20 and 22 are provided with electrically conductive coatings which are uniquely arranged and formed to produce the necessary filter capacitance. One axial face of each ceramic disc is provided with a plurality of areas 28 of a silver coating or other electrically conductive coating surrounding each of the apertures. Each area 28 is electrically connected to the terminal 24 extending through the apertures

by some suitable means such as an eyelet type spring 26 positioned within each aperture to receive the terminal. Each eyelet is formed with a plurality of radially and axially extending fingers to frictionally engage a terminal.

The opposite axial face of each disc is given an electrically conductive coating 30 which extends onto the annular side surface of the disc to make electrical contact with the surrounding casing 10 which serves as a ground. If necessary, a suitable grounding spring may be employed to make a good connection. The coating 30 is interrupted around each of the apertures to form an uncoated area 32 around each aperture. With such arrangement, the terminal extending therethrough will not be in electrical contact with the coating 30.

Hence, it will be realized that the coatings 28 and 30 form capacitors 36 and 38 illustrated in the circuit diagram of FIG. 4 connected to a conductor 39 which represents terminal 24. The ceramic discs 20 and 22 represent the gaps 37 between the capacitors shown in the diagram. As illustrated, when two capacitor discs are employed adjacent each other, the coated surfaces 30 of the discs are placed in contact with each other.

Ferrite disc 18 which surrounds each of the terminals provides the necessary filtering inductance as indicated by coil 34 in the diagram of FIG. 4. Naturally, the amount of inductance obtained may be varied by suitably selecting the desired ferromagnetic material together with the proper disc dimensions.

From the foregoing, it can be seen that the filter construction of the invention requires a minimum number of individual elements and yet provides considerable filtering capability within a compact area.

The coating process for the ceramic disc can be highly automated to minimize manufacturing costs. Also, the construction is quite versatile in that if a given terminal is not to be filtered, an eyelet made of insulating material may replace the electrically conductive eyelet.

While only one embodiment of the invention has been illustrated, it will be understood that various other modifications will become apparent and accordingly, it is intended that all such modifications that fall within the true scope of the invention be included in the appended claims.

What is claimed is:

1. An electrical filter assembly comprising: capacitor means including a disc of high dielectric material having a plurality of axially extending apertures for receiving connector terminals, a plurality of spaced areas of electrically conductive

coating on one axial face of said disc surrounding each of said apertures,

means for providing good electrical connection between each of said areas of coating and the terminal extending through the aperture within the area,

a second electrical conductive coating formed on the other axial face of said disc and a portion of the outer annular surface of the disc for being connected to an electrical ground,

said second coating being spaced from each of said apertures so that the second coating is insulated from said terminals when inserted within the apertures, and a disc of ferromagnetic material contacting said terminals positioned adjacent said dielectric disc and having a plurality of openings therein aligned with said apertures.

2. The invention of claim 1 wherein said means for providing good electrical connection comprises:

a plurality of eyelets having an outer annular surface engaging each of said areas and having inwardly extending fingers for engaging the terminals to be inserted therein.

3. The invention of claim 1 in which said high dielectric material is ceramic.

4. The invention of claim 1 including a connector casing enclosing said filter assembly and a plurality of electric terminals extending through said apertures and said openings.

5. The invention of claim 1 including a second dielectric disc substantially identical to the first mentioned dielectric disc with the grounded coatings on said dielectric discs being in axial contact with each other.

6. The invention of claim 5 including additional dielectric discs having substantially identical coating arrangement as the aforementioned dielectric discs and additional ferromagnetic discs having openings for receiving said terminals.

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