Description

FIELD OF THE INVENTION:

The present invention relates to electrical connectors and more particularly to an electrical filter connector for reducing electromagnetic interference and for providing higher voltage capability.

BACKGROUND OF THE INVENTION:

Electrical filter connectors for filtering electronic equipment from electromagnetic interference (EMI) and radio frequency interference (RFI) are well known in the electrical connector art. Such electrical filter connectors may utilize monolithic chip capacitors as shown in U.S. -A- 4,500,159 (Hogan et al.), thick film capacitors as shown in U.S. -A- 4,791,391 (Linell et al.) or ferrite materials as shown in U.S. -A- 4,761,147 (Gauthier), to identify several known examples.

While there are many applications for electrical filter connectors, increasing need has developed for use of such filter connectors in telecommunications and data-processing systems. In such systems, in addition to protecting the electronic equipment against EMI and RFI interference, there is also need to protect the equipment against electrical power surges that result from electro-static discharges caused, for example, by a lightning strike. While various of the known filtering devices as identified hereinabove, have been used to provide such filtering capability, size and cost are placing further demands upon the design of such electrical filter connectors. For example, enhanced filtering effectiveness can be achieved by smaller size devices due to a short conduction path from the capacitors to the ground plane on system circuit boards. Such size demands for reduced electronic devices, including connectors, presents a difficult problem in providing a filtering device capable especially of meeting the higher voltages experienced in power surge conditions without breakdown of the filtering device. One known technique of increasing the dielectric strength of the filtered connector is to cover the capacitors with dielectric oil. Such a technique disadvantageously requires some physical constraint for containing the oil and in some instances, depending upon the type of oil used, is hazardous. Accordingly, there is present need for an electrical filter connector that includes filtering devices enabling the connector to be constructed in the desired size and to meet the higher voltage demands occasioned by power surges as well as to be cost effective in its construction for manufacture.

GB-A-2201050 discloses an electrical filter connector including an insulative housing supporting a plurality of electrical contacts, a metal shell supported by the housing and substantially surrounding the contacts, a plurality of capacitive elements each having a pair of spaced terminations, a first termination of each capacitive element being in electrical engagement with respective electrical contacts and a second termination of each capacitive element being in electrical engagement with the metal housing. The connector of GB-A-2201050 also has a capacitive subassembly including an insulative substrate having a plurality of openings in individual receipt of respective contacts therethrough, said capacitive elements being supported by the substrate, said first terminations being electrically individually connected to the respective contacts by conductive elements on said substrate, said conductive elements comprising metallized portions disposed on said substrate and sockets extending into each of said openings, the contacts being disposed in a press-fit engagement with the sockets in each of the openings of the substrate, plural second terminations being electrically connected in common by a conductive member on said substrate, whereby said plural second terminations may be electrically commonly connected to ground.

The connector of GB-A-2201050 calls for a socket to be soldered in each opening, the socket soldering operation adding to manufacturing difficulty. The ground connection for the socket terminations of the capacitive elements relies on direct contact between a peripheral track on the substrate and the metal shell. There is no means of direct connection between the second terminations and a ground trace on a system circuit board.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an improved electrical filter connector.

It is a further object of the present invention to provide an improved electrical filter connector having a capacitor sub-assembly with enhanced dielectric strength.

In accordance with the invention, there is provided an electrical filter connector including an insulative housing supporting a plurality of electrical contacts, a metal shell supported by said housing substantially surrounding said contacts, a plurality of capacitive elements, each having a pair of spaced terminations, a first termination of each capacitive element being in electrical engagement with respective electrical contacts and a second termination of each capacitive element being in electrical engagement with a ground path, a capacitive sub-assembly including an insulative substrate having a plurality of openings in individual receipt of respective contacts therethrough, said capacitive elements being supported by said substrate, said first terminations being electrically individually connected to the respective contacts by conductive elements on said substrate, plural second terminations being electrically connected in common by

a conductive member on said substrate, whereby said plural second terminations may be electrically commonly connected to a ground path, characterised by a resilient ground spring in electrical engagement with said metal shell, said spring having a resilient portion projecting from said connector for resilient engagement with a ground trace on a system circuit board, said ground spring being electrically connected to said conductive member, and further characterised in that said elements comprise metallized portions disposed on said substrate and into each of said openings, each of said contacts including a compliant section, each of said compliant sections being disposed in a press-fit engagement with said metallized portions in each of said openings of said substrate.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a side elevation view of an electrical filter connector in accordance with a preferred embodiment of the invention, partially sectioned to reveal internal construction details thereof.

Figure 2 is a cross-sectional view of the electrical filter connector of Figure 1 as seen along viewing lines II - II of Figure 1, with the further showing of a system circuit board to which the electrical filter connector is connected.

Figure 3 is a bottom plan view of a capacitor subassembly in accordance with the improvement of the electrical filter connector of Figure 1.

Figure 4 is a side elevation view of the capacitor sub-assembly of Figure 3.

Figure 5 is an enlarged side view of the ground spring of the capacitor sub-assembly in accordance with a preferred embodiment thereof, showing in phantom a particular ground spring construction.

Figure 6 is a plan view showing a pair of electrical contacts of the improved electrical filter connector showing in phantom a carrier strip used during the manufacture thereof.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS:

Referring now to the drawings, there is shown in Figures 1 and 2 an electrical filter connector 10 in accordance with a preferred embodiment of the invention. The connector 10 includes an elongate insulative housing 12 supporting in two longitudinally disposed transversely spaced rows a plurality of electrical contacts 14. Each of the contacts 14 comprises an upper resilient spring section 14a for electrical engagement with contacts of a complementary electrical connector and pin sections 14b for electrical engagement with conductive circuits on a system circuit board 16, as will be described more fully hereinafter.

A metal shell 18 is supported by the housing 12, the shell having walls substantially surrounding the electrical contacts in a manner to provide EMI and RFI protection. A resilient ground spring 20 is supported by the connector housing 12 along each of the longitudinal edges thereof, the ground spring being in electrical engagement with the metal shell 18. As illustrated in Figure 1, the ground spring 20 has a series of cutaway portions 20a which provide enhanced resiliency of the spring 20. Each of the ground springs 20 is adapted, as will be further described hereinafter, to be in electrical connection with capacitors 22 provided in the electrical connector for electronic interference filtering. Upon attachment of the electrical filter connector 10 to the system circuit board 16, the metal shell 18 thereof is secured to the board 16 with fasteners inserted through bushings 24 disposed at the longitudinal ends of the shell 18.

By further reference now to Figures 3 and 4, an improvement of the electrical filter connector in accordance with a preferred embodiment of the invention is described. As shown therein, a capacitor subassembly 26 comprises an elongate insulative substrate 28 which supports thereon the resilient ground springs 20 and a plurality of capacitors 22. The substrate 28 preferably comprises a printed circuit board. The printed circuit board 28 includes therethrough a plurality of openings 30, each of which has its interior walls and an adjacent surface of the printed circuit board 28 metallized with conductive material by known conventional techniques. The metallized surfaces of the openings 30 and the surrounding surface areas, provide conductive elements 32 for electrical connection to the electrical contacts and capacitors, as will be described. The openings 30 are disposed in two longitudinally extending transversely spaced rows in a pattern the same as the electrical contacts such that the pin sections 14b thereof may be received therethrough.

Still referring to Figures 3 and 4, the printed circuit board 28 further includes along each of its longitudinal edges a metallized strip 34 extending along the respective edges for nearly the length of the printed circuit board 28. The metallized strips 34 each provide a conductive member for attachment to the capacitors 22 and to the ground springs 20. In the preferred embodiment, the capacitors 22 are discrete, monolithic, multilayer chip capacitors. As is known, each such capacitor 22 is formed generally in parallelepiped configuration having a pair of conductive terminations 22a and 22b disposed externally on a dielectric body 22c with a dielectric surface extending between the terminations 22a and 22b as further shown in Figure 2. The metallized portions 32 and the metallized strips 34 in a particular form of the printed circuit board 28 are provided identically on both major surfaces of the substrate 28.

With further reference now to Figure 5, the details of the ground spring 20 are described. The spring 20 is formed of a resilient conductive material, such as

phosphor bronze and includes an angularly formed portion 20a which is adapted to obliquely engage the upper surface of the system circuit board 16. The upper portion of the spring is formed generally in the shape of a sideways U-shaped cup 20b for attachment to the side edges of the printed circuit board 28. The cup 20b includes extents 20c and 20d that are adapted to lie adjacent opposed surfaces of the printed circuit board 28 and adjacent the metallized strips 34. Extent 20c, as illustrated in phantom in Figure 5, may be formed to project inwardly into such cup so as to provide a resilient attachment feature whereby the ground spring may be temporarily held on the edge of the printed circuit board 28 prior to permanent securement thereto.

Turning now again to Figures 3 and 4 as well as to Figure 2, the assembly of the capacitor sub-assembly 26 and its final construction are described. The plurality of capacitors 22 are each suitably held in alignment with the respective apertures 30 with the first set of terminations 22a in contact with respective metallized portions 32 and with the second set of terminations 22b in each row being in contact with a respective metallized strip 34. The capacitors are soldered thereto such that terminations 22a are individually electrically connected to the metallized openings 30 and the terminations 22b are electrically attached in common in each row to a metallized strip 34. The ground springs are temporarily held onto the respective edges of the printed circuit board 28 by the cup portion 20b. The extents 20c and 20d of the springs 20 are then soldered to the metallized strips 34, thereby electrically connecting each of the ground springs 20 to a row of capacitor terminations 22b. The capacitors 22 and the ground springs 20 may be soldered in a common operation.

Subsequent to the soldering of the capacitors 22 and the ground springs 20 to the board 28, in accordance with the invention, a quantity of dielectric material is applied onto the capacitors. As illustrated in Figures 2, 3 and 4, a dielectric material 36 is disposed on the dielectric surface of each of the capacitors between the terminations 22a and 22b. It has been found that the application of the additional dielectric material which places a high dielectric medium between the terminations of the capacitor, permitting a higher voltage capability whereby the electrical connector may withstand certain power surges. For example, size constraints of the connector likewise place constraints on the capacitor sizes that may be utilized. As such, in order to meet such size constraints, conventional capacitors may be able to meet power surges at voltages up to 500 volts RMS due to the breakdown of the air gap between the capacitor terminations. Utilization of additional dielectric material increases the dielectric strength of the medium between capacitor terminations thereby increasing the capability of the connector to withstand power surges at voltages up to 1,250 volts RMS, or greater.

In accordance with the preferred technique of applying the dielectric material to the capacitor sub-assembly, the material is applied subsequent to the soldering of the capacitors 22 to the printed circuit board 28. Upon attachment thereto, there exists between the printed circuit board 28 and the dielectric body 22c of the capacitors 22 a space 38 which would normally be filled with air. A series of apertures 40 is formed through the printed circuit board 28 in registry with each of the capacitors 22, apertures 40 communicating with the space 38. The dielectric material 36, which is in fluid curable form, is inserted through the apertures 40 into the spaces 38 and around the side surfaces of each of the capacitors 22. As used herein, the term "curable" is intended to mean a viscous material in fluid form that, with time, cures to a firm state without the need for physical constraints. Preferably, the curable dielectric material is applied under a suitable pressure. Further, an additional coating of curable dielectric material may be applied, as depicted in Figure 3, longitudinally continuously along the capacitors 22 on the surface of the capacitors opposite the spaces 38. In the preferred arrangement, the curable dielectric material is a material sold under the trade name CHIP BONDER purchased from Loctite Corporation, Connecticut. This material is normally used as an insulative adhesive to hold components in place for soldering and has been found to have the suitable dielectric properties for enhancing the dielectric capability of the electrical filter connector hereof as well as having the fluid properties for ease of application and curing. It should be appreciated that other techniques for applying the curable dielectric material may also be utilized within the contemplated scope of the invention. For example, a common aperture in registry with plural of the capacitors and communicating with plural spaces may be used. Also, the curable dielectric material 36 may be applied to the surface of the substrate 28 prior to soldering the capacitors thereto. Whatever the application technique, the application of the dielectric material, preferably fully perimetrically around the dielectric body 22c of each capacitor enhances the dielectric capability.

Referring now to Figures 2 and 6, the construction of the improved electrical filter connector is described. As illustrated in Figure 6, the electrical contacts, two of which are shown attached to a removable carrier strip 42 during the preferred manufacturing operation, comprise a spring section 14a, a pin section 14b and a support section 14c. In the preferred form of the electrical contacts, the pin section comprises two compliant sections 14d and 14e. As is known in the electrical connector art, a compliant section is of the type that is used to make resilient electrical engagement to metallized walls of openings in a printed circuit board, wherein the compliant section includes tines or arm portions that are elastically de-

formable upon insertion of the compliant section into such metallized openings.

Upon withdrawal of the compliant sections from the metallized openings, the board 28 may be used. In the preferred construction of the electrical contact of the subject connector, the compliant section 14d serves as a compliant terminal for insertion of the connector into a system circuit board, such as board 16. Compliant section 14e is utilized in the subject connector in the preferred arrangement, to make electrical connection to the capacitors in the capacitor subassembly as will be set forth.

In the preferred construction of the electrical filter connector, the insulative housing 12 comprises a base 44 and an insert 46. Captively retained between the base and the insert is the support section 14c which is defined particularly by a shoulder 14f which includes a portion projecting from each of the contacts substantially transversely to the pin sections thereof. The metal shell 18 is attached to and supported by the base 44.

The capacitor sub-assembly 26 is attached in the electrical filter connector 10 at its underside. The pin sections 14b of each of the electrical contacts are inserted through the metallized openings 30 of the printed circuit board 28 such that the compliant sections 14e are disposed in press fit electrical engagement with the metallized portions 32 of the openings 30. Tabs 18b on the metal shell 18 are bent around the marginal edges of the capacitor sub-assembly 26 to engage the ground springs 20, thus causing electrical connection amongst the metal shell 18, ground springs 20 and capacitor terminations 22b.

In use, as shown in Figure 2, the electrical connector 10 of the subject invention is attached to the system circuit board 16 by inserting the compliant terminals 14d into metallized openings 16a of the system circuit board 16 such that the compliant terminals 14d are disposed in a press fit engagement therewith. During such insertion, a force, such as force F, as schematically shown in Fig. 2, may be applied to the base 44 of the housing 12, either directly or through a dust cover (not shown). Force F is transferred to the shoulder portion 14f and thus to the pin sections 14b for attachment to the circuit board 16. During insertion of the contacts 14 into the system board 16, the ground springs 20 engage conductive traces 16b formed on the system board 16, and such ground springs 20 resiliently deform to provide a pressure engagement with the traces 16b. In use, traces 16b may be electrically connected to a ground potential, thereby attaching to ground through the ground. spring 20 the capacitor terminations 22b and the metal shell 18. Terminations 22a are electrically connected through respective contacts 14b to electrical circuit devices that may be connected to the metallized portions 16a on the system circuit board 16.

Having described the preferred embodiment of the invention, it should now be appreciated that variations may be made thereto without departing from the contemplated scope of the invention. For example, it should be understood that while the preferred contact structure comprises two compliant sections 14d and 14e the contact pin sections may be formed with neither of these compliant sections but rather with a straight-through pin which may be soldered to both the metallized portions 32 on the sub-assembly 26 and to the metallized portions 16a on the system board 16. Further, another variation may include the use of a single compliant section, such as 14e which may be press fit into the metallized openings 32 in the capacitor sub-assembly with the contact terminals comprising a straight-through pin for ultimate soldering to the metallized openings 16a in the system circuit board 16. Accordingly, the preferred embodiments described herein are intended in an illustrative rather than a limiting sense. The true scope of the invention is set forth in the claims appended hereto.

Claims

1. An electrical filter connector (10) including an insulative housing (12) supporting a plurality of electrical contacts (14), a metal shell (18) supported by said housing substantially surrounding said contacts, a plurality of capacitive elements (22), each having a pair of spaced terminations (22a, 22b), a first termination (22a) of each capacitive element being in electrical engagement with respective electrical contacts (14) and a second termination (22b) of each capacitive element being in electrical engagement with a ground path, a capacitive sub-assembly including an insulative substrate (28) having a plurality of openings in individual receipt of respective contacts (14) therethrough, said capacitive elements (22) being supported by said substrate (28), said first terminations (22a) being electrically individually connected to the respective contacts (14) by conductive elements on said substrate, plural second terminations (22b) being electrically connected in common by a conductive member (34) on said substrate, whereby said plural second terminations (22b) may be electrically commonly connected to a ground path, characterised by a resilient ground spring (20) in electrical engagement with said metal shell, said spring (20) having a resilient portion projecting from said connector for resilient engagement with a ground trace (16b) on a system circuit board (16), said ground spring being electrically connected to said conductive member (34), and further characterised in that said elements comprise metallized portions disposed on said substrate and into each of said openings, each of said contacts including a

formable upon insertion of the compliant section into such metallized openings.

Upon withdrawal of the compliant sections from the metallized openings, the board 28 may be used. In the preferred construction of the electrical contact of the subject connector, the compliant section 14d serves as a compliant terminal for insertion of the connector into a system circuit board, such as board 16. Compliant section 14e is utilized in the subject connector in the preferred arrangement, to make electrical connection to the capacitors in the capacitor subassembly as will be set forth.

In the preferred construction of the electrical filter connector, the insulative housing 12 comprises a base 44 and an insert 46. Captively retained between the base and the insert is the support section 14c which is defined particularly by a shoulder 14f which includes a portion projecting from each of the contacts substantially transversely to the pin sections thereof. The metal shell 18 is attached to and supported by the base 44.

The capacitor sub-assembly 26 is attached in the electrical filter connector 10 at its underside. The pin sections 14b of each of the electrical contacts are inserted through the metallized openings 30 of the printed circuit board 28 such that the compliant sections 14e are disposed in press fit electrical engagement with the metallized portions 32 of the openings 30. Tabs 18b on the metal shell 18 are bent around the marginal edges of the capacitor sub-assembly 26 to engage the ground springs 20, thus causing electrical connection amongst the metal shell 18, ground springs 20 and capacitor terminations 22b.

In use, as shown in Figure 2, the electrical connector 10 of the subject invention is attached to the system circuit board 16 by inserting the compliant terminals 14d into metallized openings 16a of the system circuit board 16 such that the compliant terminals 14d are disposed in a press fit engagement therewith. During such insertion, a force, such as force F, as schematically shown in Fig. 2, may be applied to the base 44 of the housing 12, either directly or through a dust cover (not shown). Force F is transferred to the shoulder portion 14f and thus to the pin sections 14b for attachment to the circuit board 16. During insertion of the contacts 14 into the system board 16, the ground springs 20 engage conductive traces 16b formed on the system board 16, and such ground springs 20 resiliently deform to provide a pressure engagement with the traces 16b. In use, traces 16b may be electrically connected to a ground potential, thereby attaching to ground through the ground. spring 20 the capacitor terminations 22b and the metal shell 18. Terminations 22a are electrically connected through respective contacts 14b to electrical circuit devices that may be connected to the metallized portions 16a on the system circuit board 16.

Having described the preferred embodiment of the invention, it should now be appreciated that variations may be made thereto without departing from the contemplated scope of the invention. For example, it should be understood that while the preferred contact structure comprises two compliant sections 14d and 14e the contact pin sections may be formed with neither of these compliant sections but rather with a straight-through pin which may be soldered to both the metallized portions 32 on the sub-assembly 26 and to the metallized portions 16a on the system board 16. Further, another variation may include the use of a single compliant section, such as 14e which may be press fit into the metallized openings 32 in the capacitor sub-assembly with the contact terminals comprising a straight-through pin for ultimate soldering to the metallized openings 16a in the system circuit board 16. Accordingly, the preferred embodiments described herein are intended in an illustrative rather than a limiting sense. The true scope of the invention is set forth in the claims appended hereto.

Claims

1. An electrical filter connector (10) including an insulative housing (12) supporting a plurality of electrical contacts (14), a metal shell (18) supported by said housing substantially surrounding said contacts, a plurality of capacitive elements (22), each having a pair of spaced terminations (22a, 22b), a first termination (22a) of each capacitive element being in electrical engagement with respective electrical contacts (14) and a second termination (22b) of each capacitive element being in electrical engagement with a ground path, a capacitive sub-assembly including an insulative substrate (28) having a plurality of openings in individual receipt of respective contacts (14) therethrough, said capacitive elements (22) being supported by said substrate (28), said first terminations (22a) being electrically individually connected to the respective contacts (14) by conductive elements on said substrate, plural second terminations (22b) being electrically connected in common by a conductive member (34) on said substrate, whereby said plural second terminations (22b) may be electrically commonly connected to a ground path, characterised by a resilient ground spring (20) in electrical engagement with said metal shell, said spring (20) having a resilient portion projecting from said connector for resilient engagement with a ground trace (16b) on a system circuit board (16), said ground spring being electrically connected to said conductive member (34), and further characterised in that said elements comprise metallized portions disposed on said substrate and into each of said openings, each of said contacts including a

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compliant section (14e), each of said compliant sections being disposed in a press-fit engagement with said metallized portions in each of said openings of said substrate (28).

2. An electrical filter connector according to Claim 1, wherein said substrate (28) comprises an edge portion disposed adjacent said metal shell and wherein said conductive member comprises a metallized strip (34) disposed on said substrate adjacent said edge portion and spaced from said metallized portions.

3. An electrical filter connector according to claim 2, wherein said fist terminations (22a) are individually soldered to said metallized portions and wherein said second terminations (22b) are commonly soldered to said metallized strip (34).

4. An electrical filter connector according to claim 2 or claim 3, wherein said ground spring (20) is soldered to said metallized strip (34).

5. An electrical filter connector according to any one of claims 2 to 4, wherein said ground spring (20) includes a portion extending around said substrate edge with extents lying adjacent opposed surfaces of said substrate (28).

6. An electrical filter connector according to claim 5, wherein said substrate (28) includes on a surface opposite said metallized strip a further metallised strip, and wherein said respective ground spring extents are attached to said metallized strip and to said further metallized strip.

7. An electrical filter connector according to claim 5 or claim 6, wherein said ground spring portion is formed such that the extents (20c, 20d) lying adjacent said opposed surfaces of said substrate, resiliently engage such surfaces.

8. An electrical filter connector according to any one of claims 1 to 7, wherein said insulative housing (12) includes a base and an insert, said electrical contacts being captively retained by said base and insert.

9. An electrical filter connector according to claim 8, wherein each of said contacts includes a compliant terminal (14d) for resilient electrical engagement with openings in said system circuit board, each of said contacts further including a shoulder (14c) disposed between said base and said insert, whereby an insertion force applied to said base is transferred to said contacts such that said compliant terminals of said contacts may be inserted in a press-fit engagement into openings in said system circuit board.

10. An electrical connector according to any one of claims 1 to 9, wherein said capacitive elements are monolithic, multi-layer capacitors.

Patentansprüche

1. Ein elektrischer Filterverbinder (10) mit einem eine Vielzahl von elektrischen Kontakten (14) abstützenden isolierenden Gehäuse (12), mit einer die Kontakte im wesentlichen umschließenden, von dem Gehäuse abgestützten Metallhülse (18), mit einer Vielzahl von kapazitiven Elementen (22), von denen jedes zwei auseinanderliegende Anschlüsse (22a, 22b) aufweist, wobei ein erster Anschluß (22a) jedes kapazitiven Elementes mit den entsprechenden elektrischen Kontakten (14) in elektrischer Verbindung steht und ein zweiter Anschluß (22b) jedes kapazitiven Elementes mit einem Massepfad in elektrischer Verbindung steht, mit einer kapazitiven Unteranordnung einschließlich eines isolierenden Substrates (28) mit einer Vielzahl von Öffnungen mit individueller Aufnahme der betreffenden Kontakte (14), wobei die kapazitiven Elemente (22) durch das Substrat (28) abgestützt werden, die ersten Anschlüsse (22a) durch leitende Elemente auf dem Substrat elektrisch individuell an die betreffenden Kontakte (14) angeschlossen sind, mehrere zweite Anschlüsse (22b) durch ein leitendes Glied (34) auf dem Substrat elektrisch miteinander verbunden sind, wodurch die zahlreichen zweiten Anschlüsse (22b) elektrisch gemeinsam mit einem Massepfad verbunden sind, gekennzeichnet durch eine elastische Massefeder (20) in elektrischer Verbindung mit der Metallhülse, wobei die Feder (20) einen zur federnden Anlage an einem Massepfad (16b) auf einer Systemleiterplatte (16) vom Verbinder vorspringenden elastischen Abschnitt aufweist, wobei die Massefeder mit dem leitenden Glied (34) elektrisch verbunden ist, und weiter dadurch gekennzeichnet, daß die Elemente auf dem Substrat angeordnete und in jede der Öffnungen hineinragende metallisierte Abschnitte aufweisen, jeder der Kontakte einen nachgiebigen Abschnitt (14e) aufweist und jeder dieser nachgiebigen Abschnitte mit den metallisierten Abschnitten in jeder der Öffnungen des Substrates (28) in enger Passung angeordnet ist.

2. Ein elektrischer Filterverbinder nach Anspruch 1, wobei das Substrat (28) einen an der Metallhülse angeordneten Eckenabschnitt aufweist und wobei das leitende Glied einen auf dem Substrat an dem Eckenabschnitt und in einem Abstand von den metallisierten Abschnitten angeordneten

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metallisierten Streifen (34) umfaßt.

3. Ein elektrischer Filterverbinder nach Anspruch 2, wobei die ersten Anschlüsse (22a) individuell an die metallisierten Abschnitte und die zweiten Anschlüsse (22b) gemeinsam an den metallisierten Streifen (34) angelötet sind.

4. Ein elektrischer Filterverbinder nach Anspruch 2 oder Anspruch 3, wobei die Massefeder (20) an den metallisierten Streifen (34) angelötet ist.

5. Ein elektrischer Filterverbinder nach irgendeinem der Ansprüche 2 bis 4, wobei die Massefeder (20) einen um die Substratkante verlaufenden Abschnitt mit an den gegenüberliegenden Oberflächen des Substrates (28) liegenden Erstreckungen aufweist.

6. Ein elektrischer Filterverbinder nach Anspruch 5, wobei das Substrat (28) auf einer Oberfläche gegenüber dem metallisierten Streifen einen weiteren metallisierten Streifen enthält und wobei die entsprechenden Massefedererstreckungen an dem metallisierten Streifen und an dem weiteren metallisierten Streifen befestigt sind.

7. Ein elektrischer Filterverbinder nach Anspruch 5 oder Anspruch 6, wobei der Massefederabschnitt so ausgebildet ist, daß die Erstreckungen (20c, 20d), die an den gegenüberliegenden Oberflächen des Substrates liegen, diese Oberflächen federnd erfassen.

8. Ein elektrischer Filterverbinder nach irgendeinem der Ansprüche 1 bis 7, wobei das isolierende Gehäuse (12) eine Basis und einen Einsatz enthält und die elektrischen Kontakte von der Basis und dem Einsatz unverlierbar zurückgehalten werden.

9. Ein elektrischer Filterverbinder nach Anspruch 8, wobei jeder der Kontakte einen nachgiebigen Anschluß (14d) zur federnden elektrischen Anlage mit den Öffnungen in der Systemleiterplatte enthält, jeder der Kontakte weiter eine zwischen der Basis und dem Einsatz angeordnete Schulter (14c) enthält, wobei eine auf die Basis ausgeübte Einschiebekraft auf die Kontakte so übertragen wird, daß die nachgiebigen Anschlüsse der Kontakte mit enger Passung in die Öffnungen in der Systemleiterplatte eingeschoben werden können.

10. Ein elektrischer Verbinder nach irgendeinem der Ansprüche 1 bis 9, wobei die kapazitiven Elemente monolytische, mehrlagige Kondensatoren sind.

Revendications

1. Connecteur électrique filtrant (10) comprenant un boîtier isolant (12) supportant une pluralité de contacts électriques (14), un capot métallique (18) supporté par ledit boîtier entourant globalement lesdits contacts, une pluralité de composants capacitifs (22), chacun étant pourvu d'une paire de bornes de connexion espacées (22a, 22b), une première borne de connexion (22a) de chaque composant capacitif étant en engagement électrique avec des contacts électriques respectifs (14) et une seconde borne de connexion (22b) de chaque élément capacitif étant en contact électrique avec un circuit de masse, un sous-ensemble capacitif comprenant un substrat isolant (28) disposant d'une pluralité d'ouvertures pour la réception individuelle de contacts (14) respectifs à travers elles, lesdits composants capacitifs (22) étant supportés par ledit substrat (28), lesdites premières bornes de connexion (22a) étant électriquement reliées individuellement aux contacts (14) respectifs par des éléments conducteurs sur ledit substrat, plusieurs secondes bornes de connexion (22b) étant reliées électriquement en commun par un élément conducteur (34) sur ledit substrat, ce par quoi lesdites plusieurs secondes bornes de connexion (22b) peuvent être reliées électriquement en commun à un circuit de masse, caractérisé par un ressort de masse élastique (20) en contact électrique avec ledit capot métallique, ledit ressort (20) disposant d'une partie élastique en saillie par rapport audit connecteur en vue d'un contact élastique avec un ruban de masse (16b) sur une carte à circuit imprimé (16) du système, ledit ressort de masse étant relié électriquement audit élément conducteur (34), et caractérisé en outre en ce que lesdits éléments comprennent des parties métallisées disposées sur ledit substrat et dans chacune desdites ouvertures, chacun desdits contacts comprenant une section déformable (14e), chacune desdites sections déformables étant placées en contact par ajustement serré avec lesdites parties métallisées dans chacune desdites ouvertures dudit substrat (28).

2. Connecteur électrique filtrant selon la revendication 1, dans lequel ledit substrat (28) présente une partie de bord disposée dans une position adjacente audit capot métallique et dans lequel ledit élément conducteur comprend une bande métallisée (34) disposée sur ledit substrat, dans une position adjacente à ladite partie de bord et à distance desdites parties métallisées.

3. Connecteur électrique filtrant selon la revendica-

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tion 2, dans lequel lesdites premières bornes de connexion (22a) sont soudées individuellement auxdites parties métallisées et dans lequel lesdites secondes bornes de connexion (22b) sont soudées en commun à ladite bande métallisée (34).

4. Connecteur électrique filtrant selon la revendication 2 ou la revendication 3, dans lequel ledit ressort de masse (20) est soudé à ladite bande métallisée (34).

5. Connecteur électrique filtrant selon l'une quelconque des revendications 2 à 4, dans lequel ledit ressort de masse (20) comprend une partie s'étendant autour dudit bord du substrat, avec des prolongements placés en position adjacente à des surfaces opposées dudit substrat (28).

6. Connecteur électrique filtrant selon la revendication 5, dans lequel ledit substrat (28) comprend, sur une surface opposée à ladite bande métallisée,une seconde bande métallisée, et dans lequel lesdits prolongements du ressort de masse sont respectivement fixés à ladite bande métallisée et à ladite seconde bande métallisée.

7. Connecteur électrique filtrant selon la revendication 5 ou la revendication 6, dans lequel ladite partie du ressort de masse est formée de telle façon que les prolongements (20c, 20d) placés en position adjacente auxdites surfaces opposées dudit substrat, s'appliquent de façon élastique sur de telles surfaces.

8. Connecteur électrique filtrant selon l'une quelconque des revendications 1 à 7, dans lequel ledit boîtier isolant (12) comprend une base et un insert, lesdits contacts électriques étant retenus de façon captive par ladite base et ledit insert.

9. Connecteur électrique filtrant selon la revendication 8, dans lequel chacun desdits contacts comprend une borne déformable (14d) destinée à venir élastiquement en contact électrique avec des ouvertures ménagées dans ladite carte à circuit imprimé du système, chacun desdits contacts comprenant en outre un épaulement (14c) disposé entre ladite base et ledit insert, ce par quoi une force d'insertion appliquée sur ladite base est transférée sur lesdits contacts de telle façon que lesdites bornes déformables desdits contacts puissent être insérées par accouplement à ajustement serré dans des ouvertures de ladite carte à circuit imprimé du système.

10. Connecteur électrique selon l'une quelconque des revendications 1 à 9, dans lequel lesdits composants capacitifs sont des condensateurs multicouches monolithiques.

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