

Description

The invention relates to a filter unit for connectors, comprising a substrate of electrically insulating material which has two flat sides lying opposite each other and is provided with passages for the contact elements of the connector, capacitors being disposed on one flat side of the substrate in the region of one or more of the passages and being made up of first electrodes formed by at least one layer of electrically conducting material which extends over said side of the substrate and is provided with correspondingly situated larger passages, second electrodes formed by spaced-apart electrode patches of electrically conducting material which cover said passages of said substrate and can be connected to the contact elements of the connector, and at least one layer of dielectric material extending between the first and second electrodes in such a way that the passages are open.

A filter unit of this type is known from European Patent Application EP-A-123457, hereafter referred to as 'the known filter'.

In electrical transmission technology pulse-type signals are being used to an increasing extent for the transmission of data. As is known in electrical engineering, pulse-type signals can be broken down into a series of sinusoidal signals with increasing frequency, the so-called higher harmonics. In signals with a high pulse frequency, which are usual in computers, higher harmonics in the megahertz and even up to the gigahertz range can occur.

The steepness of the pulse edges, called the rise time, also plays an important role. A usual rise time of one nanosecond already corresponds to a higher harmonic frequency of about 350 MHz, irrespective of the pulse frequency itself.

These higher harmonics are found to cause great interference. In a room in which there are several interconnected electronic processing units producing pulse-type signals, the higher harmonics readily cause interference in the data processing. This interference can become so great that proper functioning of, for example, computers is no longer possible. US patent application US-A-3 538 464 refers to the use of multiple capacitor laminates in order to reduce radio frequency interference.

In order to keep the total interference level to a minimum, it is necessary to use filters by means of which the undesirable higher harmonic frequencies can be damped, without the desired data signal being deformed too much. A capacitor is a suitable element for this purpose, because the reactance thereof is inversely proportional to the frequency. This means that the reactance is greater for relatively low frequencies than for higher frequencies.

With the known filter unit each of the contact elements of a connector can be decoupled to earth by means of a capacitor. The filter unit is produced by the so-called thick film silkscreen printing technique on a flat substrate, so that capacitors with sufficiently low inductance can be produced cheaply for the effective damping of signals at high frequencies. The capacitance value of the flat capacitors thus formed is directly proportional to the surface area of the electrodes lying opposite and the relative dielectric constant of the dielectric between them, but is inversely proportional to the distance between the electrodes.

The disadvantage of the known filter unit is that the capacitance value of the filter capacitors formed therewith is limited by the space available on the one side of the substrate for the electrode patches surrounding the passages. The available surface area for an electrode patch is essentially determined here by the distance between the passages, which of course corresponds to the pitch of the connecting elements of the connector. For the arrow-shaped electrode patch of the known filter unit, the one pointed end of which surrounds the passage, while the other broad end extends towards the edge of the substrate, particularly with small pitches of the order of 2 mm and with more than two-row connectors, which are in great demand in the art, too little surface area is available to obtain that capacitance value which is necessary for good filtering.

The object of the invention is then to improve the known filter unit in such a way that filter capacitors with sufficiently high capacitance value can be provided also for connectors with relatively small pitch and/or for multiple row connectors. This is achieved according to the invention in that similarly constructed capacitors are disposed on the other opposite flat side of the substrate in the region of one or more of the passages. The electrode patches, which according to the invention are situated on either side of the substrate of the filter unit and which together with the first electrodes form the filter capacitors, can be arranged here in different ways relative to each other.

Another embodiment of the invention is to this end characterized in that the electrode patches situated on either side of the substrate are arranged in such a way that a passage on each side of the substrate is surrounded by electrode patches which can be connected to one and the same contact element of the connector. When a filter unit constructed in this way is connected to the contact elements of a connector, each contact element is decoupled by means of two parallel capacitors, the total decoupling capacitance value being equal to the sum of the capacitance values of the individual filter capacitors on either side of the substrate. It

will be clear that in the case of, for example, connectors with a small pitch, electrode patches with a surface area equal to half the surface area of the electrode patches of the known filter unit will suffice to achieve the same decoupling capacitance value. With electrode patches with a surface area equal to that of the known filter unit, twice the decoupling capacitance value can be achieved with the filter unit according to the invention.

Instead of a symmetrical distribution of the electrode patches on both sides of the substrate, yet another embodiment of the filter unit according to the invention is characterized in that the electrode patches situated on either side of the substrate are arranged in such a way that a passage is surrounded by an electrode patch on only one side of the substrate. Arranging the electrode patches alternately on either side of the substrate means that there is sufficient space available on either side of the substrate of decouple the contact elements of, for example, three-row and four-row connectors by means of a filter capacitor of suitable size.

The known filter unit is constructed in such a way that the individual electrode patches and the at least one first electrode acting as earth electrode must be connected to the appropriate connector by means of soldered joints. In practice, this means that the filter unit and the connector are integral, as described in the above-mentioned European Patent Application EP-A-123457. Inter alia, from the cost point of view, this is a disadvantageous solution because both connectors with and connectors without filter unit have to be produced and held in stock.

A further object of the invention is therefore to produce an independent filter unit which can be mounted simply on a standard connector by means of a holder, it being possible to connect the earth electrodes of the filter unit electrically via the holder. Yet another embodiment of the filter unit according to the invention is for this purpose characterized in that the first electrodes situated on either side of the substrate extend along at least one narrow edge of the substrate.

Undesired electrical contact of the various electrode patches is prevented here through providing the capacitors on one and the other side of the substrate with a coating, in such a way that the first electrodes extending along the at least one narrow edge of the substrate are not coated.

With yet another embodiment of the filter unit according to the invention, which is characterized in that the holder is an oblong frame bounded by four sides and having stop elements against which the filter unit can rest, with locking elements for holding the filter unit in the holder and fastening means by means of which the holder can be moun-

ted on a connector, a filter module which can be mounted as a separate unit on standard connectors is produced, so that each existing multiple-row connector can be extended in a simple manner quickly and cheaply by a filter unit to suppress the undesired, interfering higher harmonic frequencies.

Further, various embodiments of the invention relate to a connector and adaptor with an integrated filter unit as described above.

The invention will be explained below in greater detail with reference to a number of examples of embodiments of the filter unit and a preferred embodiment of a holder for accommodation thereof, a connector and an adaptor provided with the filter unit.

Fig. 1 shows in perspective an embodiment of the known filter unit in an exploded view.

Fig. 2 shows on an enlarged scale a cross section through a single electrode patch of the filter unit shown in Fig. 1 connected to a connector.

Figs. 3a-3c show schematically different views and a cross section of an embodiment of the filter unit according to the invention for use in a four-row connector.

Figs. 4a-4b show schematically a view and cross section of an embodiment of the filter unit according to the invention which is suitable for use in a three-row connector.

Fig. 5 shows in perspective the mounting according to the invention of the filter unit on a standard connector by means of a holder.

Figs. 6a-6b show in perspective two embodiments of a connector with a filter unit with holder mounted thereon, as shown in Fig. 5.

Fig. 7 shows schematically in perspective an embodiment of a connector with an integrated filter unit according to the invention, in an exploded view.

Fig. 8a shows schematically in perspective an embodiment of an adaptor with an integrated filter unit according to the invention, in an exploded view.

Fig. 8b shows schematically on an enlarged scale a cross section through the assembled adaptor according to fig. 8a.

Fig. 1 shows layer by layer the construction of an embodiment of the known filter unit 1. The flat substrate 2 has passages 3 which are spaced in such a way that the filter unit is suitable for mounting in a two-row connector. A first electrode 5 consisting of a layer of electrically conducting material is disposed over the substrate side 4, having passages 6 which are situated corresponding to the passages 3 in the substrate 2. The passages 6 are of greater diameter than the passages 3 of the substrate 2. A layer 7 of dielectric material having correspondingly placed passages 8 is disposed on

the first electrode 5. The diameter of these passages is preferably equal to or slightly larger than the diameter of the passages 3 in the substrate 2. Electrode patches 9 of electrically conducting material with a passage 10 are disposed on the layer 7 and together with the first electrode 5 and the dielectric layer 7 form the filter capacitors. The electrode patches 9 are arrow-shaped, the pointed end 11 enclosing the passage 10, and the broad end 12 extending towards an edge of the substrate 2. With the position of the electrode patches 9 shown, a filter unit for a two-row connector with a relatively small pitch of the order of magnitude of 2 mm can be produced. Although not necessary, the electrode patches 9 can extend along the wall of the passages 3 of the substrate 2. A coating 13 of electrically conducting material is provided on the electrode patches 9, the openings 14 of said coating being of such dimensions that the filter unit can be disposed over the contact elements of a connector. In the assembled state the electrode patches 9 can be connected here by means of soldering to the contact elements of the connector and the first electrode 5 is soldered fast to the connector housing.

Fig. 2 shows on an enlarged scale a cross section through an electrode patch 9 of the filter unit 1 shown in Fig. 1, connected to a connector, viewed from the narrow edge of the substrate 2. The part 19 of the electrode patch extends along the wall of the passage 3 of the substrate 2. The passage 10 bounded hereby contains a connecting pin 15 of the connector. The connecting pin 15 is connected by means of solder 16 to the electrode patch 9. The first electrode 5 is connected by means of solder 17 to a wall 18 of the housing of the connector.

The substrate 2 of the filter unit is preferably of aluminium oxide (Al_2O_3), the capacitor electrodes of an alloy of palladium and silver, and the dielectric of barium titanate ($BaTiO_3$). Several different dielectric layers of partial layers can, of course, be used instead of a single dielectric layer 7, and several coating layers 13 can also be used. The position of the capacitor electrodes 5, 9 can also be changed relative to each other from the structure shown in Fig. 1.

Based on the filter construction shown in Fig. 1, Fig. 3 shows the construction of an embodiment of the filter unit according to the invention for use in a four-row connector, in which capacitors are formed on both flat sides of the substrate of the filter unit. In Fig. 3 the layers and elements corresponding to the known filter unit according to Fig. 1 are indicated by the same reference number. The corresponding layers and elements situated on the opposite flat side of the substrate are also indicated by the same reference numbers, but pro-

vided with an apostrophe. Fig. 3b shows a cross section similar to that of Fig. 2, while Fig. 3b shows a view with cutaway parts of the one flat side and Fig. 3 of the other flat side of the filter unit according to the invention.

The electrode patches 9, 9' on either side of the substrate 2 are arranged in such a way that the electrode patches 9 belonging to the two outer rows of passages are disposed on the one side 4 and the electrode patches 9' belonging to the two inner rows of passages are disposed on the other side 4' of the substrate. Each passage 3 of the substrate 2 is thus enclosed only on one side of the substrate by an electrode patch 9, 9'. The parts 19, 19' of the electrode patches 9, 9' extending along the wall of the passages are of such length that they do not make electrical contact with the electrodes of the capacitors situated on the opposite side of the substrate.

The first two electrodes 5, 5' extend partially along the narrow edges 20, 21 in the lengthwise direction of the substrate and are not coated with a coating layer 13. The purpose of this will become clear later when Fig. 5 is being discussed.

The electrode patches 9, 9' can be arranged in ways differing from that of Fig. 3. The electrode patches belonging to the passages situated adjacent in a row and column can be disposed, for example, always on another side of the substrate. In the case of a substrate which is provided with at least two rows of passages the electrode patches belonging to the passages of a row or column can be situated on one side of the substrate and the electrode patches belonging to another, for example, adjacent row or column can be situated on the other side of the substrate.

It can be seen clearly from the views of the four-row filter unit according to the invention shown in Figs. 3a and c that there is sufficient space on both sides of the substrate for fitting electrode patches for the production of filter capacitors of suitable size, comparable with those of the known two-row filter unit shown in Fig. 1. Inter alia, as a result of the efforts towards miniaturisation, and due to the greater density of the present integrated circuits, there is a great demand for connectors with a high contact element density, in other words, with a large number of contact elements per unit volume. The filter unit according to the invention can be advantageously used for connectors of this type.

Figs. 4a-b show in a similar manner to that of Fig. 3 a view and cross section of the construction of an embodiment of the filter unit according to the invention for a three-row connector, in which each passage 3 is surrounded on either side of the substrate 2 by an electrode patch 9, 9'. Compared with the known filter unit of Fig. 1, the electrode

patches 9, 9', situated on either side of the substrate and belonging to a particular passage, can have such a surface area that they achieve at least the capacitance value of the filter capacitors of the known filter unit. Since for this purpose each individual electrode patch 9, 9' need have only half the area of the electrode patches of the known filter unit, the passages 3 can be disposed in the substrate with relatively small pitch. Although not directly necessary, the electrode patches 9, 9' belonging to a particular passage and situated on either side of the substrate are directly connected to each other electrically via a continuous metalisation 22 extending along the wall of the passage 3. The filter unit shown in Fig. 4 corresponds in structure to the filter unit shown in Fig. 3. The rows of passages can be placed staggered relative to each other in the direction of the row.

Although rectangular electrode patches are shown in the above embodiments of the filter unit according to the invention, electrodes of another geometrical periphery can also be used, for example, round, square, hexagonal electrode patches etc. Instead of round passages, it is, of course, also possible to use slot-shaped, square or other cross sections, depending on the shape of the connecting elements of the connector.

Although the first electrodes 5, 5' in Figs. 3 and 4 are shown on either side of the substrate as a single layer, they can, of course, also be in several partial layers extending over part of a substrate side 4, 4' to at least one edge of the substrate 2.

Fig. 5 shows a standard connector 23, over the connecting pins 15 of which the filter unit according to the invention can be fitted. The individual electrode patches 9, 9' of the filter unit, which in Fig. 5 are only shown schematically, can be connected by, for example, soldering to the connecting pins 15 of the connector. The first electrodes 5, 5' of the filter unit extending along the edges 20, 21 of the substrate 2 are now connected by means of the holder 24 of electrically conducting material to the housing 25 of the connector.

The holder 24 is to this end designed as an oblong open frame bounded by four sides 26, 27, 28, 29, which can be made as a whole of one piece of electrically conducting material. From the narrow sides 28, 29 of the frame opening 30 extend two lip-type stop elements 31, 32, against which the filter unit rests when fitted. Also extending outwards from the narrow sides 28, 29 in the lengthwise direction of the holder 24 are two fastening lips 33, 34, which are each provided with a fastening hole 35 for fastening the holder 24 on the connector 23.

The holder 24 is also provided on the long sides 26, 27 of the frame with projections 36 projecting inwards into the container, which in the embodiment shown in Fig. 5 are formed as V-

shaped lips in the sides 26, 27 of the frame of the container. The sides 26, 27 of the frame are also provided with a number of incisions 37, in order to improve the clamping action between the holder 24 and the filter unit according to the invention. The projections 36 are situated at such a distance from the frame opening 30 that when the filter unit is placed in the holder, said filter unit is confined between the lips 31, 32 acting as stop elements and the projections 36 acting as locking means, in such a way that good electrical contact of the first electrodes 5, 5' with the holder 24 is ensured.

The dimensions of the holder 24 are such that it can be slid together with the filter unit over the connecting side of the connector 23, in such a way that the fastening holes 35, 38 of the holder and the connector respectively coincide. A filter unit according to the invention with the holder mounted on a connector is shown in Fig. 6a. The connecting pins 15 can be connected, for example, to a printed circuit board or by means of so-called wire-wrap connections to electronic circuits.

Fig. 6b shows a connector 23 provided with a filter unit and holder 24, in which the whole nut is mounted by means of a screw 39 and nut 40 on a carrier 41, through which the connecting pins 15 of the connector are passed. A connector constructed in this way is suitable for, for example, mounting at right angles on a printed circuit board (not shown).

Instead of the lips 31, 32 and projections 36 shown in Fig. 5, the filter unit, in particular the electrodes 5, 5' extending along one or more of the edges of the substrate, can also be connected by, for example, soldering to the holder 24, in order to produce a good electrical contact of the first electrodes 5, 5' of the filter unit and the holder 24. With the holder and the filter unit, a so-called filter module is produced and can be mounted as a separate unit on standard connectors. Virtually any existing multiple-row connector can be extended herewith in a simple manner quickly and cheaply to form a so-called filter connector.

Fig. 7 shows in perspective a standard so-called D-SUB type connector, in an exploded view, comprising an oblong body 42 of electrically insulating material, supporting a plurality of contact elements 43. The contact elements 43 each have a pin shaped contact end 44 for contacting a further connector (not shown) and a pin shaped connecting end 45 for the connection of an electrical wiring, e.g. a printed wiring. In stead of a pin shaped contact end, the contact elements 43 may have socket shaped contact ends (not shown).

For reasons of dimensioning, the connector comprises a spacer 46 of electrically insulating material, having passages 47 which are situated correspondingly to the arrangement of the contact elements 43. Said spacer 46 slidably accommodates

the connecting pins 45, and is provided with a notch 48, which corresponds to a boss 49 on the face of the supporting body 42 facing said spacer 46. Further, the connector comprises an oblong housing of electrically conducting material, consisting of a first oblong shell 50 and a second oblong shell 51, with openings 52, 53 for receiving the contact ends and connecting ends of the contact elements, respectively.

Said first and second shells are provided with fastening lips 54, 55 respectively, extending outwards in the lengthwise direction of a shell, for riveted connection of said shells. Between the spacer 46 and the second shell 51, a filter unit 56 according to the present invention is mounted.

In assembling the connector, the first electrodes 5, 5' of said filter unit 56, extending along the edges thereof, are soldered to the second shell 51. This assembly, together with the spacer 46, is fitted over the connecting pins 45 of the contact elements 43, and the electrode patches 9, 9' of said filter unit 56 are soldered to the connecting pins 45. In this way, the contact elements are fixed to the filter unit 56 and the second shell 51. Lastly, the first shell 50 is mounted over the contact pins 44 and rivetingly connected to the second shell 51. With said first and second shell and the filter unit, a connector shielded for a broad range of frequencies is obtained.

Fig. 8a shows in exploded view an embodiment of an adaptor with a filter unit according to the invention. This adaptor can be used as a filter assembly for connectors not provided with filtered contact elements, or for a further enhancement of the filter action of a connector already provided with filtered contact elements. The embodiment shown is especially suited for the D-SUB type connector, as for example shown in figs. 5, 6 and 7.

The adaptor comprises an oblong block shaped body 57 of electrically insulating material, supporting a plurality of contact elements 58. These contact elements 58 each have a pin shaped contact end 59, for contacting a first connector, (not shown), and a socket shaped contact end 60, for contacting a second connector (not shown). In stead of a pin shaped and a socket shaped contact end, the contact elements 60 may either have only socket shaped contact ends or only pin shaped contact ends not shown).

In the embodiment shown, the adaptor comprises an oblong further supporting body 61 of electrically conducting material, with an oblong opening 62 for receiving the supporting body 57 with the contact elements 58. In said opening 62 a raised edge 63 is formed, acting as a stop for the filter unit 56 to be mounted over the pin shaped contact ends 59. The first electrodes 5, 5' extend-

ing along the edges of said filter unit 56 are soldered to the raised edge 63 of said supporting body 61. The electrode patches 9, 9' are soldered to the respective contact elements 58. The assembly thus formed, is confined between a first and second identical oblong shell 50, with an oblong opening 52 for receiving the contact ends 59, 60 of the contact elements 58.

Said first and second shell 50 are provided with fastening lips 54, extending outwards in the lengthwise direction of the shell, and each provided with a hole 64. On his narrow sides, the supporting body 61 is provided with correspondingly located holes 64, for fastening the shells with hollow rivets 65 to the supporting body 61. Of course, other suited fastening means may be used in assembling the adaptor. For reasons of dimensioning the adaptor comprises a spacer 66 of electrically insulating material with passages 67, correspondingly located to said contact elements 58.

Fig. 8b shows schematically, on an enlarged scale, a cross section through the assembled adaptor according to fig. 8a. With solder joints 68 the first electrodes 5, 5' of the filter unit are connected to the supporting body 62, and with solder joints 69 the contact elements of the adaptor are connected to the respective electrode patches 9, 9' of the filter unit 56. The electrically conducting supporting body 62 together with the conducting shells 50 provide for an effective shielding of the contact elements for low frequencies, and with said filter unit 56 a filter adaptor for a broad range of frequencies is obtained.

It is also possible to use semiconducting layers and/or electrode patches for forming combinations of resistors (R) and capacitors (C), the so-called RC filters. Structures consisting of a middle electrode acting as an earth electrode, having on either side thereof electrode patches separated by one or more dielectric layers can, for example, also be provided on each side of the substrate, in order to increase the filter capacity even further.

Claims

1. Filter unit (1) for connectors, comprising a substrate (2) of electrically insulating material which has two flat sides lying opposite each other and is provided with passages (3) for the contact elements (15, 43, 58) of the connector, capacitors being disposed on one flat side of the substrate in the region of one or more of the passages (3) and being made up of first electrodes (5, 5') formed by at least one layer of electrically conducting material which extends over said side of the substrate and is provided with correspondingly situated larger passages (6), second electrodes formed by



the connecting pins 45, and is provided with a notch 48, which corresponds to a boss 49 on the face of the supporting body 42 facing said spacer 46. Further, the connector comprises an oblong housing of electrically conducting material, consisting of a first oblong shell 50 and a second oblong shell 51, with openings 52, 53 for receiving the contact ends and connecting ends of the contact elements, respectively.

Said first and second shells are provided with fastening lips 54, 55 respectively, extending outwards in the lengthwise direction of a shell, for riveted connection of said shells. Between the spacer 46 and the second shell 51, a filter unit 56 according to the present invention is mounted.

In assembling the connector, the first electrodes 5, 5' of said filter unit 56, extending along the edges thereof, are soldered to the second shell 51. This assembly, together with the spacer 46, is fitted over the connecting pins 45 of the contact elements 43, and the electrode patches 9, 9' of said filter unit 56 are soldered to the connecting pins 45. In this way, the contact elements are fixed to the filter unit 56 and the second shell 51. Lastly, the first shell 50 is mounted over the contact pins 44 and rivetingly connected to the second shell 51. With said first and second shell and the filter unit, a connector shielded for a broad range of frequencies is obtained.

Fig. 8a shows in exploded view an embodiment of an adaptor with a filter unit according to the invention. This adaptor can be used as a filter assembly for connectors not provided with filtered contact elements, or for a further enhancement of the filter action of a connector already provided with filtered contact elements. The embodiment shown is especially suited for the D-SUB type connector, as for example shown in figs. 5, 6 and 7.

The adaptor comprises an oblong block shaped body 57 of electrically insulating material, supporting a plurality of contact elements 58. These contact elements 58 each have a pin shaped contact end 59, for contacting a first connector, (not shown), and a socket shaped contact end 60, for contacting a second connector (not shown). In stead of a pin shaped and a socket shaped contact end, the contact elements 60 may either have only socket shaped contact ends or only pin shaped contact ends not shown).

In the embodiment shown, the adaptor comprises an oblong further supporting body 61 of electrically conducting material, with an oblong opening 62 for receiving the supporting body 57 with the contact elements 58. In said opening 62 a raised edge 63 is formed, acting as a stop for the filter unit 56 to be mounted over the pin shaped contact ends 59. The first electrodes 5, 5' extend-

ing along the edges of said filter unit 56 are soldered to the raised edge 63 of said supporting body 61. The electrode patches 9, 9' are soldered to the respective contact elements 58. The assembly thus formed, is confined between a first and second identical oblong shell 50, with an oblong opening 52 for receiving the contact ends 59, 60 of the contact elements 58.

Said first and second shell 50 are provided with fastening lips 54, extending outwards in the lengthwise direction of the shell, and each provided with a hole 64. On his narrow sides, the supporting body 61 is provided with correspondingly located holes 64, for fastening the shells with hollow rivets 65 to the supporting body 61. Of course, other suited fastening means may be used in assembling the adaptor. For reasons of dimensioning the adaptor comprises a spacer 66 of electrically insulating material with passages 67, correspondingly located to said contact elements 58.

Fig. 8b shows schematically, on an enlarged scale, a cross section through the assembled adaptor according to fig. 8a. With solder joints 68 the first electrodes 5, 5' of the filter unit are connected to the supporting body 62, and with solder joints 69 the contact elements of the adaptor are connected to the respective electrode patches 9, 9' of the filter unit 56. The electrically conducting supporting body 62 together with the conducting shells 50 provide for an effective shielding of the contact elements for low frequencies, and with said filter unit 56 a filter adaptor for a broad range of frequencies is obtained.

It is also possible to use semiconducting layers and/or electrode patches for forming combinations of resistors (R) and capacitors (C), the so-called RC filters. Structures consisting of a middle electrode acting as an earth electrode, having on either side thereof electrode patches separated by one or more dielectric layers can, for example, also be provided on each side of the substrate, in order to increase the filter capacity even further.

Claims

1. Filter unit (1) for connectors, comprising a substrate (2) of electrically insulating material which has two flat sides lying opposite each other and is provided with passages (3) for the contact elements (15, 43, 58) of the connector, capacitors being disposed on one flat side of the substrate in the region of one or more of the passages (3) and being made up of first electrodes (5, 5') formed by at least one layer of electrically conducting material which extends over said side of the substrate and is provided with correspondingly situated larger passages (6), second electrodes formed by



spaced-apart electrode patches (9, 9') of electrically conducting material which cover said passages (3) of said substrate (2) and can be connected to the contact elements (15, 43, 58) of the connector, and at least one layer of dielectric material (7) extending between the first (5, 5') and second electrodes (9, 9') in such a way that the passages are open, characterized in that similarly constructed capacitors are disposed on the other opposite flat side of the substrate in the region of one or more of the passages.

2. Filter unit (1) according to claim 1, characterized in that the electrode patches (9, 9') situated on either side of the substrate (2) are arranged in such a way that a passage (3) on each side of the substrate (2) is surrounded by electrode patches which can be connected to one and the same contact element (15, 43, 58) of the connector.

3. Filter unit (1) according to claim 2, in which the electrode patches (9, 9') extend along the wall of the passage, characterized in that the electrode patches (9, 9') on either side of the substrate are connected to each other via the passage.

4. Filter unit (1) according to claim 1, characterized in that the electrode patches (9, 9') situated on either side of the substrate (2) are arranged in such a way that a passage (3) is surrounded by an electrode patch on only one side of the substrate.

5. Filter unit (1) according to claim 4, in which the electrode patches (9, 9') extend along the wall of the passage, characterized in that the electrode patches (9, 9') extend over such a distance in the passage that they make no electrical contact with the second electrodes on the opposite side of the substrate.

6. Filter unit (1) according to claim 4 of 5, provided with several rows of passages (10), arranged in columns, characterized in that the electrode patches (9, 9') belonging to the passages in one row and an adjacent row are always on an other side of the substrate.

7. Filter unit (1) according to claim 4 or 5, in which the substrate (2) is provided with at least two rows of passages, characterized in that the electrode patches (9, 9') belonging to the passages of one row are situated at one side of the substrate, and the electrode patches belonging to an other row are situated at the

other side of the substrate.

8. Filter unit (1) according to claim 7, characterized in that the substrate (2) is provided with three rows of passages (10) in which the electrode patches (9, 9') belonging to the passages (10) of the middle row are situated at one side of the substrate, and the electrode patches (9, 9') belonging to the outermost rows are situated at the other side of the substrate.

9. Filter unit (1) according to claim 7, characterized in that the substrate (2) is provided with four rows of passages (10), the electrode patches (9, 9') belonging to the passages (10) of the two outermost rows being situated at one side of the substrate, and the electrode patches belonging to the passages (10) of the two innermost rows being situated at the other side of the substrate.

10. Filter unit (1) according to one or more of the preceding claims, characterized in that the first electrodes (5, 5') situated on either side of the substrate (2) extend along at least one narrow edge (20, 21) of the substrate (2).

11. Filter unit (1) according to claim 10, in which the capacitors situated at one side of the substrate (2) are coated with at least one coating (13) of electrically insulating material, characterized in that the capacitors situated at the other side of the substrate are coated with a similar coating, while the first electrodes (5, 5') extending along the at least one narrow edge (20, 21) of the substrate (2) are not coated.

12. Filter unit (1) according to claim 10 or 11, characterized in that said filter unit is inserted into a holder (24) of electrically conducting material, formed in such a way that the passages (10) for passing through the contact elements of the connector are free and the first electrodes (5, 5') extending along the at least one narrow edge (20, 21) of the substrate (2) make electrical contact with the holder (24).

13. Filter unit (1) according to claim 12, characterized in that the holder (24) is an oblong frame bounded by four sides (26 ... 29) and having stop elements (31, 32) against which the filter unit can rest, with locking elements (36) for retaining the filter unit in the holder and fastening means (65) by means of which the holder can be mounted on a connector.

14. Filter unit (1) according to claim 13, characterized in that the stop elements (31, 32) consist



of two lips (31, 32) projecting from the narrow sides of the frame (24) into the frame opening.

15. Filter unit (1) according to claim 13 or 14, characterized in that the locking means (36) consist of several projections (36) projecting inwards from the sides of the frame, and positioned in such a way that when the filter unit is inserted in the holder (24), the filter unit is confined between the stop elements (31, 32) and the projections (36).

16. Filter unit (1) according to claim 15, characterized in that the projections (36) consist of V-shaped lips formed in the long sides of the frame, while from the intake opening for the filter unit the long sides of the frame are provided with incisions (37), in order to improve the clamping action of the holder (24), in such a way that a reliable, good electrical contact can be produced between the first electrodes (5, 5') of the filter unit and the holder (24).

17. Filter unit (1) according to claim 13, 14 or 15, characterized in that the sides of the frame (24) are at such a distance from each other that the holder can be fitted over the connection side of a connector of standard dimensions.

18. Filter unit (1) according to claim 17, characterized in that the holder (24) is provided on the narrow sides with lips (33) projecting outwards in the lengthwise direction thereof and having a fastening hole (35), for connecting the holder to the connector.

19. Connector (23), comprising an electrically conducting housing (25), said housing enclosing a supporting body of electrically insulating material, provided with a plurality of electrically conducting contact elements (15), each having a contact end for contacting a further connector, and a connecting end for the connection of an electrical wiring, in the housing of said connector at the side where the connecting ends of the contact elements are located, a filter unit (56) and holder (24) according to one or more of the claims 12 to 18 is mounted.

20. Connector, comprising an electrically conducting housing (50, 51), said housing enclosing an electrically insulating supporting body (42), provided with a plurality of electrically conducting contact elements (43), each having a contact end (45) for contacting a further connector, and a connecting end (44) for the connection of an electrical wiring, in the housing of said

connector at the side where the connecting ends (44) of the contact elements (43) are located, a filter unit (56) according to one or more of the claims 1 to 11 is mounted, the first (5, 5') and second electrodes (9, 9') of said filter unit (56) are connected to the housing (50, 51) and the connecting ends (44) of the contact elements (43, 58), respectively.

21. Adaptor, comprising an electrically conducting housing (50), an electrically insulating supporting body (57) provided with a plurality of electrically conducting contact elements (58) each having a first and second contact end (59, 60) for contacting a first and second connector respectively, said housing enclosing a filter unit (56) according to one or more of the claims 1 to 11, the first (5, 5') and second electrodes (9, 9') of said filter unit (56) are connected to the housing (50) and contact elements (58), respectively.

22. Adaptor according to claim 21, in which the housing (50) of said adaptor is comprised of a first and second oblong shell, with an electrically conducting oblong further supporting body (61), having an opening (62) for receiving the insulating supporting body (57) with the contact elements (58), said further supporting body (61) is mounted between and connected with said first and second shell (50), and the first electrodes (5, 5') of said filter unit are connected to said further supporting body (61).

Patentansprüche

1. Filtereinheit (1) für Verbinder, welche ein Substrat (2) aus elektrisch isolierendem Material aufweist, welches zwei ebene Seiten hat, die einander gegenüberliegen und welches mit Durchgängen (3) für die Kontaktelemente (15, 43, 58) des Verbinders versehen ist, wobei Kondensatoren auf einer ebenen Seite des Substrats im Bereich eines oder mehrerer Durchgänge (3) angeordnet sind und erste Elektroden (5, 5'), welche von wenigstens einer Schicht aus elektrisch leitendem Material gebildet werden, welches sich über die Seite des Substrats erstreckt und mit zugeordnet liegenden größeren Durchgängen (6) versehen sind, zweite Elektroden, welche von im Abstand angeordneten Elektrodenflächengebilden (9, 9') aus elektrisch leitendem Material gebildet werden, welche die Durchgänge (3) des Substrats (2) bedecken und mit den Kontaktelementen (15, 43, 58) des Verbinders verbunden werden können, und wenigstens eine Schicht aus dielektrischem Material (7) umfassen, welche zwi-



schen den ersten (5, 5') und den zweiten Elektroden (9, 9') derart verlaufen, daß die Durchgänge offen sind, dadurch gekennzeichnet, daß in ähnlicher Weise ausgelegte Kondensatoren auf der anderen, gegenüberliegenden, ebenen Seite des Substrats im Bereich eines oder mehrerer Durchgänge angeordnet sind.

2. Filtereinheit (1) nach Anspruch 1, dadurch gekennzeichnet, daß die Elektrodenflächengebilde (9, 9'), welche auf der jeweiligen Seite des Substrats (2) liegen, derart angeordnet sind, daß ein Durchgang (3) auf jeder Seite des Substrats (2) von Elektrodenflächengebilden umgeben ist, welche mit ein und demselben Kontaktelement (15, 43, 58) des Verbinders verbunden werden können.

3. Filtereinheit (1) nach Anspruch 2, bei der die Elektrodenflächengebilde (9, 9') entlang der Wand des Durchganges verlaufen, dadurch gekennzeichnet, daß die Elektrodenflächengebilde (9, 9') auf jeder Seite des Substrats über den Durchgang miteinander verbunden sind.

4. Filtereinheit (1) nach Anspruch 1, dadurch gekennzeichnet, daß die Elektrodenflächengebilde (9, 9'), welche auf der jeweiligen Seite des Substrats (2) liegen, derart angeordnet sind, daß ein Durchgang (3) von einem Elektrodenflächengebilde nur auf einer Seite des Substrats umgeben wird.

5. Filtereinheit (1) nach Anspruch 4, bei der die Elektrodenflächengebilde (9, 9') entlang der Wand des Durchganges verlaufen, dadurch gekennzeichnet, daß die Elektrodenflächengebilde (9, 9') sich über eine solche Strecke im Durchgang erstrecken, daß sie keinen elektrischen Kontakt mit den zweiten Elektroden auf der gegenüberliegenden Seite des Substrats schließen.

6. Filtereinheit (1) nach Anspruch 4 oder 5, welche mit mehreren Reihen von Durchgängen (10) versehen ist, welche in Spalten angeordnet sind, dadurch gekennzeichnet, daß die Elektrodenflächengebilde (9, 9'), welche zu den Durchgängen in einer Reihe und einer benachbarten Reihe gehören, immer auf einer anderen Seite des Substrats sind.

7. Filtereinheit (1) nach Anspruch 4 oder 5, bei der das Substrat (2) mit wenigstens zwei Reihen von Durchgängen versehen ist, dadurch gekennzeichnet, daß die Elektrodenflächengebilde (9, 9'), welche zu den Durchgängen einer Reihe gehören, auf einer Seite des Substrats

liegen, und die Elektrodenflächengebilde, die zur anderen Reihe gehören, auf der anderen Seite des Substrats liegen.

8. Filtereinheit (1) nach Anspruch 7, dadurch gekennzeichnet, daß das Substrat (2) mit drei Reihen von Durchgängen (10) versehen ist, in denen die Elektrodenflächengebilde (9, 9'), welche zu den Durchgängen (10) der mittleren Reihe gehören, auf einer Seite des Substrats liegen, und daß die Elektrodenflächengebilde (9, 9'), die zu der äußersten Reihe gehören, auf der anderen Seite des Substrats liegen.

9. Filtereinheit (1) nach Anspruch 7, dadurch gekennzeichnet, daß das Substrat (2) mit vier Reihen von Durchgängen (10) versehen ist, die Elektrodenflächengebilde (9, 9'), welche zu den Durchgängen (10) der beiden am äußersten liegenden Reihen gehören, auf einer Seite des Substrats liegen, und daß die Elektrodenflächengebilde, die zu den Durchgängen (10) der beiden am weitesten innen liegenden Reihen auf der anderen Seite des Substrats liegen.

10. Filtereinheit (1) nach einem oder mehreren der vorangehenden Ansprüche, dadurch gekennzeichnet, daß die erste Elektrode (5, 5'), die auf der jeweiligen Seite des Substrats (2) liegt, entlang wenigstens eines schmalen Randes (20, 21) des Substrats (2) verlaufen.

11. Filtereinheit (1) nach Anspruch 10, bei der die Kondensatoren, die auf einer Seite des Substrats liegen, mit wenigstens einem Überzug (13) aus elektrisch isolierendem Material versehen sind, dadurch gekennzeichnet, daß die Kondensatoren, die auf der anderen Seite des Substrats liegen, mit einem ähnlichen Überzug versehen sind, während die ersten Elektroden (5, 5'), die entlang wenigstens eines schmalen Randes (20, 21) des Substrats (2) verlaufen, nicht beschichtet sind.

12. Filtereinheit (1) nach Anspruch 10 oder 11, dadurch gekennzeichnet, daß die Filtereinheit in einen Halter (24) aus elektrisch leitendem Material eingesetzt ist, welcher derart ausgebildet ist, daß die Durchgänge (10) zum Durchführen der Kontaktelemente des Verbinders frei sind, und daß die ersten Elektroden (5, 5'), welche entlang wenigstens eines schmalen Randes (20, 21) des Substrats (2) verlaufen, einen elektrischen Kontakt mit dem Halter (24) schließen.



13. Filtereinheit (1) nach Anspruch 12, dadurch gekennzeichnet, daß der Halter (24) ein länglicher Rahmen ist, welcher durch vier Seiten (26....29) verbunden ist, und Anschlagelemente (31, 32) hat, gegen welche die Filtereinheit zur Anlage kommen kann, wobei Sperrelemente (36) zum Festhalten der Filtereinheit in dem Halter und eine Befestigungseinrichtung (65) vorgesehen sind, mittels welcher der Halter an einem Verbinder angebracht werden kann.

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14. Filtereinheit (1) nach Anspruch 13, dadurch gekennzeichnet, daß die Anschlagelemente (31, 32) zwei Lippen (31, 32) aufweisen, die von den schmalen Seiten des Rahmens (24) in die Rahmenöffnung vorstehen.

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15. Filtereinheit (1) nach Anspruch 13 oder 14, dadurch gekennzeichnet, daß die Sperreinrichtung (36) mehrere Vorsprünge (36) umfaßt, welche von den Seiten des Rahmens nach innen vorstehen und welche derart angeordnet sind, daß, wenn die Filtereinheit in den Halter (24) eingesetzt ist, die Filtereinheit zwischen den Anschlagelementen (31, 32) und den Vorsprüngen (36) eingeschlossen ist.

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16. Filtereinheit (1) nach Anspruch 15, dadurch gekennzeichnet, daß die Vorsprünge (36) V-förmige Lippen umfassen, welche in den langen Seiten des Rahmens ausgebildet sind, während ausgehend von der Eingangsöffnung für die Filtereinheit die langen Seiten des Rahmens mit Einschnitten (37) versehen sind, um die Klemmwirkung des Halters (24) derart zu verbessern, daß man einen zuverlässigen, guten elektrischen Kontakt zwischen den ersten Elektroden (5, 5') der Filtereinheit und dem Halter (24) erhält.

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17. Filtereinheit (1) nach Anspruch 13, 14 oder 15, dadurch gekennzeichnet, daß die Seiten des Rahmens (24) einen derartigen Abstand voneinander haben, daß der Halter passend auf der Verbindungsseite eines Verbinders mit üblichen Abmessungen angesetzt werden kann.

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18. Filtereinheit (1) nach Anspruch 17, dadurch gekennzeichnet, daß der Halter (24) auf den schmalen Seiten mit Lippen (33) versehen ist, welche in Längsrichtung hiervon nach außen vorstehen und eine Befestigungsöffnung (35) zum Verbinden des Halters mit dem Verbinder haben.

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19. Verbinder (23), welcher ein elektrisch leitendes Gehäuse (25) aufweist, das Gehäuse einen Tragkörper aus elektrisch isolierendem Materi-

al umschließt, welcher mit einer Mehrzahl von elektrisch leitenden Kontaktelementen (15) versehen ist, welche jeweils ein Kontaktende zum Kontaktieren eines weiteren Verbinders haben, und ein Verbindungsende für den Anschluß einer elektrischen Leitung in dem Gehäuse des Verbinders an der Seite haben, an der die Verbindungsenden der Kontaktelemente liegen, wobei eine Filtereinheit (56) und ein Halter (24) nach einem oder mehreren der Ansprüche 12 bis 18 angebracht ist.

20. Verbinder, welcher ein elektrisch leitendes Gehäuse (50, 51) aufweist, das Gehäuse einen elektrisch isolierenden Tragkörper (42) umschließt, welcher mit einer Mehrzahl von elektrisch leitenden Kontaktelementen (43) versehen ist, welche jeweils ein Kontaktende (45) zum Kontaktieren eines weiteren Verbinders und ein Verbindungsende (44) zum Umschließen einer elektrischen Leitung in dem Gehäuse des Verbinders an der Seite haben, an der die Verbindungsenden (44) der Kontaktelemente (43) liegen, wobei eine Filtereinheit (56) nach einem oder mehreren der Ansprüche 1 bis 11 angebracht ist, die ersten (5, 5') und die zweiten Elektroden (9, 9') der Filtereinheit (56) mit dem Gehäuse (50, 51) und den Verbindungsenden (44) der Kontaktelemente (43, 58) jeweils verbunden sind.

21. Adapter, welcher ein elektrisch leitendes Gehäuse (50) aufweist, ein elektrisch isolierender Tragkörper (57) mit einer Mehrzahl von elektrisch leitenden Kontaktelementen (58) versehen ist, welche jeweils ein erstes und ein zweites Kontaktende (59, 60) zum Kontaktieren eines ersten und eines zweiten Verbinders jeweils haben, das Gehäuse eine Filtereinheit (56) nach einem oder mehreren der Ansprüche 1 bis 11 umschließt, und die ersten (5, 5') und die zweiten Elektroden (9, 9') der Filtereinheit (56) mit dem Gehäuse (50) und den Kontaktelementen (58) jeweils verbunden sind.

22. Adapter nach Anspruch 21, bei dem das Gehäuse (50) des Adapters einen ersten und einen zweiten länglichen Mantel aufweist, wobei ein elektrisch leitender, länglicher, weiterer Tragkörper (61) vorgesehen ist, welcher eine Öffnung (62) zur Aufnahme des isolierenden Tragkörpers (57) mit den Kontaktelementen (58) hat, der weitere Tragkörper (61) zwischen den ersten und zweiten Mänteln (50) angeordnet und mit diesen verbunden ist, und die ersten Elektroden (5, 5') der Filtereinheit mit dem weiteren Tragkörper (61) verbunden sind.



Revendications

1. Unité de filtrage (1) pour connecteurs, qui comprend un substrat (2) en matériau électriquement isolant, qui présente deux faces planes opposées l'une à l'autre, et est muni de passages (3) destinés à recevoir les éléments de contact (15, 43, 58) du connecteur, des condensateurs étant disposées sur une face plane du substrat, dans la région de un ou plusieurs des passages (3), et étant constitués de premières électrodes (5, 5'), formées par au moins une couche de matériau électriquement conducteur, qui s'étend sur ladite face du substrat et est munie de passages plus grands (6) situés de manière correspondante, des secondes électrodes (9, 9') constituées d'électrode espacées en matériau électriquement conducteur, qui couvrent lesdits passages (3) dudit substrat (2) et peuvent être reliées aux éléments de contact (15, 43, 58) du connecteur, et au moins une couche de matériau diélectrique (7) s'étendant entre les premières (5, 5') et secondes (9, 9') électrodes de telle sorte que les passages soient ouverts, caractérisée en ce que des condensateurs de structures similaires sont disposées sur l'autre face plane opposée du substrat dans la région d'un ou plusieurs desdits passages.
2. Unité de filtrage (1) selon la revendication 1, caractérisée en ce que les pastilles d'électrode (9, 9') disposées de chaque face du substrat (2) sont agencées de telle sorte qu'un passage (3) sur chaque face du substrat (2) soit entouré de pastilles d'électrode qui peut être relié à un seul et même élément de contact (15, 43, 58) du connecteur.
3. Unité de filtrage (1) selon la revendication 2, dans laquelle les pastilles d'électrode (9, 9') s'étendent le long de la paroi dudit passage, caractérisée en ce que les pastilles d'électrode (9, 9') sur chaque face du substrat sont reliées l'une à l'autre à travers le passage.
4. Unité de filtrage (1) selon la revendication 1, caractérisée en ce que les pastilles d'électrode (9, 9') situées sur chaque face du substrat (2) sont disposées de telle sorte qu'un passage (3) soit entouré d'une pastille d'électrode sur une seule face du substrat.
5. Unité de filtrage (1) selon la revendication 4, dans laquelle les pastilles d'électrode (9, 9') s'étendent le long de la paroi du passage, caractérisée en ce que les pastilles d'électrode (9, 9') s'étendent dans le passage sur une

distance telle qu'elles ne puissent pas entrer en contact électrique avec les secondes électrodes sur la face opposée du substrat.

6. Unité de filtrage (1) selon la revendication 4 ou 5, munie d'une pluralité de rangées de passages (10), agencées en colonnes, caractérisée en ce que les pastilles d'électrode (9, 9') appartenant aux passages dans une rangée et dans une rangée adjacente sont toujours sur une autre face du substrat.
7. Unité de filtrage (1) selon la revendication 4 ou 5, dans laquelle le substrat (2) est muni d'au moins deux rangées de passages, caractérisée en ce que les pastilles d'électrode (9, 9') appartenant aux passages d'une rangée sont situées sur une face du substrat et en ce que les pastilles d'électrode appartenant à une autre rangée sont situées sur l'autre face du substrat.
8. Unité de filtrage (1) selon la revendication 7, caractérisée en ce que le substrat (2) est muni de trois rangées de passages (10) et dans laquelle les pastilles d'électrode (9, 9') appartenant aux passages (10) de la rangée du milieu sont situées sur une face du substrat et les pastilles d'électrode (9, 9') appartenant aux rangées les plus extérieures sont situées sur l'autre face du substrat.
9. Unité de filtrage (1) selon la revendication 7, caractérisée en ce que le substrat (2) est muni de quatre rangées de passages (10), les pastilles d'électrode (9, 9') appartenant aux passages (10) des deux rangées les plus extérieures étant situées sur une face du substrat et les pastilles d'électrode appartenant aux passages (10) des deux rangées intérieures étant situées sur l'autre face du substrat.
10. Unité de filtrage (1) selon une ou plusieurs des revendications précédentes, caractérisée en ce que les premières électrodes (5, 5') situées sur les deux faces du substrat (2) s'étendent le long d'au moins un bord étroit (20, 21) du substrat (2).
11. Unité de filtrage (1) selon la revendication 1, dans laquelle les condensateurs situés sur une face du substrat (2) sont revêtus d'au moins un revêtement (13) en matériau électriquement isolant, caractérisée en ce que les condensateurs situés sur l'autre face du substrat sont revêtus d'un revêtement similaire, tandis que les premières électrodes (5, 5') s'étendant le long d'au moins un bord étroit (20, 21) du



substrat ne sont pas revêtues.

12. Unité de filtrage (1) selon la revendication 10 ou 11, caractérisée en ce que ladite unité de filtrage est insérée dans un dispositif de maintien (24) en matériau électriquement conducteur, et conformé de telle sorte que les passages (10) pour la traversée des éléments de contact du connecteur soient libres et que les premières électrodes (5, 5') s'étendant le long d'au moins un bord étroit (20, 21) du substrat (2) entrent en contact électrique avec le dispositif de maintien (24).

13. Unité de filtrage (1) selon la revendication 12, caractérisée en ce que le dispositif de maintien (24) est constitué d'un cadre oblong limité par quatre faces (26 à 29) et présentant des éléments d'arrêt (31, 32) contre lesquels l'unité de filtrage peut s'appuyer, et comportant des éléments de blocage (36) destinés à retenir l'unité de filtrage dans le dispositif de maintien et des moyens de fixation (65) grâce auxquels le dispositif de maintien peut être monté sur un connecteur.

14. Unité de filtrage (1) selon la revendication 13, caractérisée en ce que les éléments d'arrêt (31, 32) sont constitués de deux lèvres (31, 32) qui font saillie depuis les faces étroites du cadre (24) dans l'ouverture du cadre.

15. Unité de filtrage (1) selon la revendication 13 ou 14, caractérisée en ce que les moyens de blocage (36) consistent en plusieurs parties en saillie (36) saillant vers l'intérieur depuis les faces du cadre, et disposées de telle sorte que lorsque l'unité de filtrage est insérée dans ledit dispositif de maintien (24), l'unité de filtrage soit confinée entre les éléments d'arrêt (31, 32) et les projections (36).

16. Unité de filtrage (1) selon la revendication 15, caractérisée en ce que les parties en saillie (36) sont constituées de lèvres en forme de V formées dans les faces longues du cadre, tandis que depuis l'ouverture d'entrée de l'unité de filtrage, les faces longues du cadre sont munies d'incisions (37) de façon à améliorer l'effet de pincement du dispositif de maintien (24) de telle sorte que l'on obtienne un contact électrique fiable et efficace entre les premières électrodes (5, 5') de l'unité de filtrage et le dispositif de maintien (24).

17. Unité de filtrage (1) selon la revendication 13, 14 ou 15, caractérisée en ce que les faces du cadre (24) sont disposés à une telle distance

l'une de l'autre que le dispositif de maintien puisse être monté sur la face de connexion d'un connecteur de dimensions standard.

18. Unité de filtrage (1) selon la revendication 17, caractérisée en ce que ledit dispositif de maintien (24) est muni sur ses faces étroites de lèvres (33) qui font saillie vers l'extérieur dans la direction longitudinale du dispositif de maintien, et qui présentent un trou de fixation (35) destiné à relier le dispositif de maintien au connecteur.

19. Connecteur (23) comprenant un boîtier électriquement conducteur (25), ledit boîtier entourant un corps de support en matériau électriquement isolant muni d'une pluralité d'éléments de contact électriquement conducteurs (15), chacun présentant une extrémité de contact destinée à entrer en contact avec un autre connecteur, et une extrémité de connexion destinée à la connexion d'un fil électrique, dans le boîtier duquel connecteur sont montés une unité de filtrage (56) et un dispositif de maintien (24) selon l'une ou plusieurs des revendications 12 à 18, du côté où sont situées les extrémités de connexion des éléments de contact.

20. Connecteur comprenant un boîtier électriquement conducteur (50, 51), ledit boîtier contenant un corps de support électriquement isolant (42), muni d'une pluralité d'éléments de contact électriquement conducteurs (43), chacun présentant une extrémité de contact (45) pour venir en contact avec un autre connecteur, et une extrémité de connexion (44) pour la connexion d'un fil électrique, dans le boîtier duquel connecteur, est montée une unité de filtrage (56) selon l'une ou plusieurs des revendications 1 à 11, du côté où sont situées les extrémités de connexion (44) des éléments de contact (43), les premières (5, 5') et secondes (9, 9') électrodes de ladite unité de filtrage (56) sont reliées respectivement au boîtier (50, 51) et aux extrémités de connexion (44) des éléments de contact (43, 58).

21. Adaptateur comprenant un boîtier électriquement conducteur (50), un corps de support électriquement isolant (57) muni d'une pluralité d'éléments de contact électriquement conducteurs (58), chacun présentant une première et une seconde extrémités de contact (59, 60) pour venir en contact respectivement avec un premier et un second connecteurs, ledit boîtier contenant une unité de filtrage (56) selon l'une ou plusieurs des revendications 1 à 11, dans



lequel les premières (5, 5') et secondes (9, 9') électrodes de ladite unité de filtrage (56) sont reliées respectivement au boîtier (50) et à l'élément de contact (58).

22. Adaptateur selon la revendication 21, dans lequel le boîtier (50) dudit adaptateur est constitué d'une première et d'une seconde enveloppes allongées, présentant un autre corps de support électriquement allongé (61) muni d'une ouverture (62) destinée à recevoir le corps de support isolant (57) avec les éléments de contact (58), ledit autre corps de support (61) est monté entre et relié auxdites première et deuxième enveloppes (50), et les premières électrodes (5, 5') de ladite unité de filtrage sont reliées audit autre corps de support (61).

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