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# (54) Electrical connector

(57) An electrical connector includes a conductive shell, an insulator 26, a plurality of contacts 24, 27 mounted through the insulator, a laminate including a body made of a varistor material 29, 29′ having conductive strips fixed 30, 31, 32 to opposite sides of the body. Each contact has a leaf spring tine 35, 36 held in pressure contact with one conductive strip. The other conductive strip is electrically connected to the conductive shell. Thus the energy of a static discharge from a human operator to a contact will be dissipated within the varistor material.

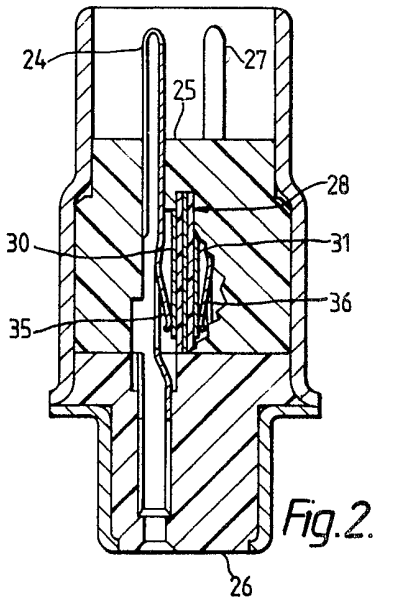
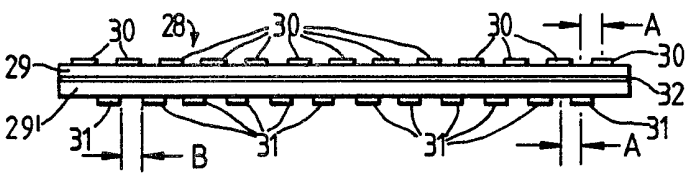



Fig.2.

Fig.4.

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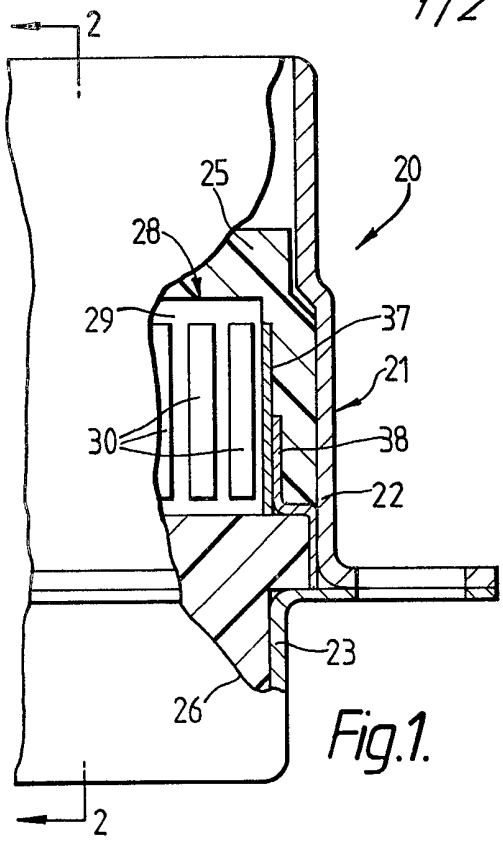



Fig.1.

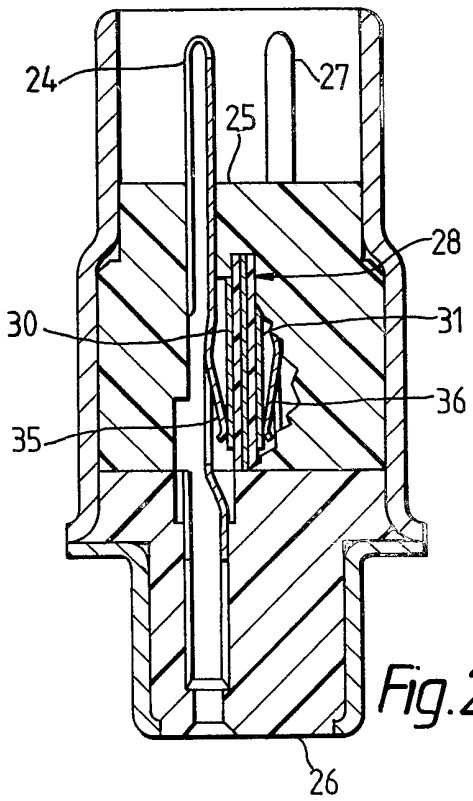



Fig.2.

Fig.3.

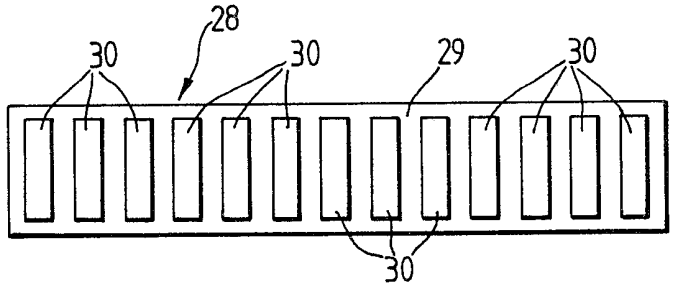



Fig.4.

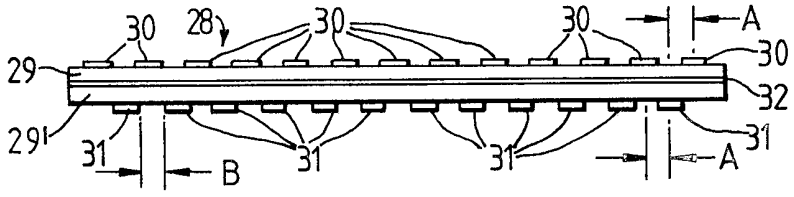



Fig.5.

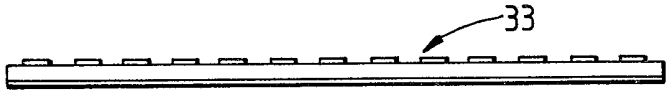
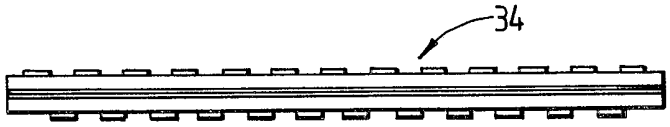



Fig.6.



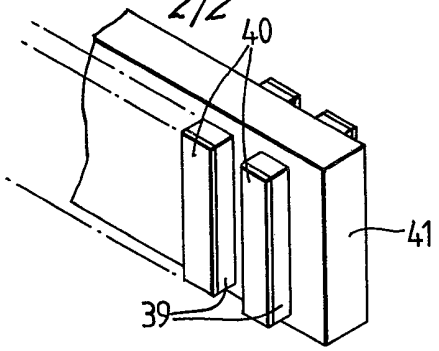



Fig.7.

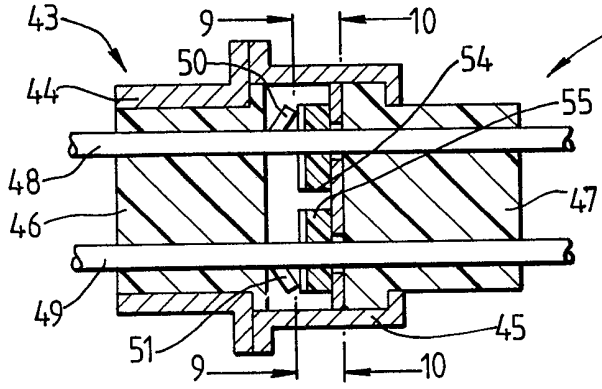



Fig.8.

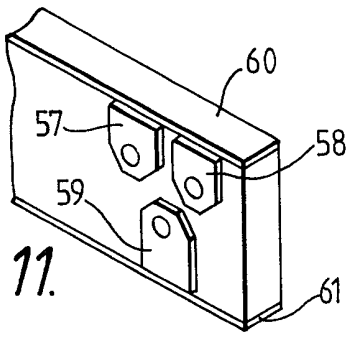



Fig. 11.

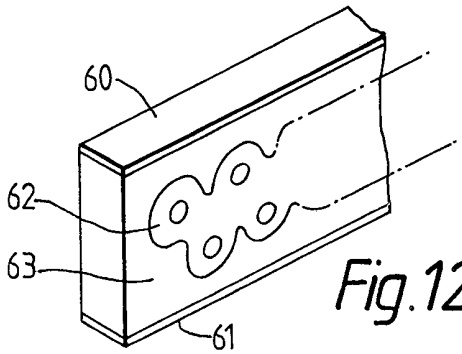



Fig.12.

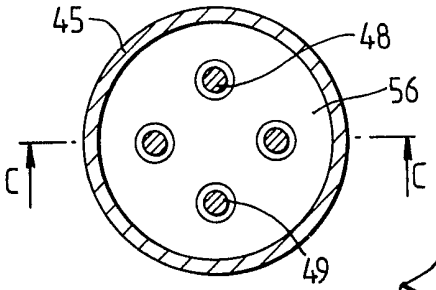



Fig. 10.

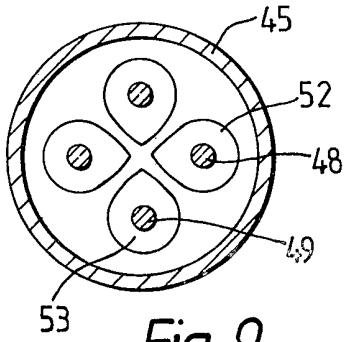



Fig.9.

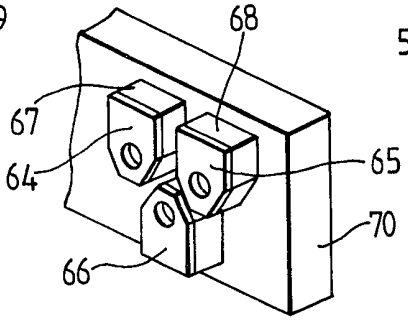



Fig.13.

SPECIFICATION

**Electrical connector**

*BACKGROUND OF THE INVENTION*

This invention relates to the dissipation of an electrostatic charge on electrical wiring associated with data processing and/or other equipment, and more particularly to an electrical connector for dissipating the energy of this electric charge.

*PRIOR ART STATEMENT*

It is known in the prior art that static electricity is a problem that exists in electrical equipment. For example, it is a problem in data processing (DP) equipment.

Static discharge often occurs when an operator contacts DP equipment either directly or through an intermediary device. When this contact is established, a stored electric charge, carried by the operator, can be transferred to the DP equipment. Such a charge transfer often damages or degrades sensitive electronic components. Moreover, parity errors and/or data errors may be caused.

Static electricity is an accumulation of a positive or negative electric charge (the absence or presence of electrons, respectively). The build-up of electric charge occurs due to rubbing or abrasion of certain dissimilar bodies. When one of these bodies contacts yet another body of different charge potential, a transfer of electrons occurs. A charge transfer ceases once both bodies are in equilibrium or when a subsequent interruption does not not permit further charge transfer.

A static charge build-up may even occur triboelectrically such as when a person walks across a room. The magnitude of the static charge thus produced depends largely upon the material of the person's shoes, the type of flooring on which he is walking, and the humidity of the ambient air.

In a typical static discharge, there may be a voltage potential gradiant of 5,000 volts to 12,000 volts between source and reception. However, 25,000 volts is not uncommon.

See the enclosed copy of "Static Discharge Problems on Data Processing Equipment" by Edward Nakauchi from K West, 9371 Kramer Avenue, Westminster,. California 92683, and the bibliography thereof.

It is well known that conventional varistors can be used to dissipate electrical energy. Disclosures are made in Carborundum Company publications. For example, "contact arc suppression on relays and switches". Further, see "ZnO Varistors for Transient Protection", by Lionel M. Levinson and Herbert R. Phillip, IEEE Transactions on Parts, Hybrids and Packaging, Vol. PHP-13, No. 4, December 1977.

It is also known to place circuit components in an electrical connector. For example, a capacitor is mounted in the filter connector of G.J. Selvin 8 U.S. Patent No. 4,126,840 issued November 21, 1978.

See also co-pending application S.Z. Muzslay 2, Serial No. 200,051, filed October 23, 1980, for FILTER CONNECTOR, and assigned to the assignee of the instant application.

*SUMMARY OF THE PRESENT INVENTION*

In accordance with the present invention, the above-described and other disadvantages of the prior art are overcome by conductivity connecting a contact of an electrical connector to ground through a varistor material which is integral with the connector.

*BRIEF DESCRIPTION OF THE DRAWINGS*

In the accompanying drawings which illustrate exemplary embodiments of the present invention:

*Figure 1* is a side electational view, partly in section, of an electrical connector constructed in accordance with the present invention.

*Figure 2* is a transverse sectional view of the connector taken on the line 2–2 shown in Fig. 1;

*Figure 3* is a side elevational view of a varistor assembly shown in Figs. 1 and 2;

*Figure 4* is a top plan view of the assembly shown in Fig. 3;

*Figure 5* is a top plan view of an alternative embodiment of the present invention;

*Figure 6* is a top plan view of two assemblies of the type shown in Fig. 5 bonded together;

*Figure 7* is a perspective view of still another embodiment of the present invention;

*Figure 8* is a longitudinal sectional view of an electrical connector constructed in accordance with another embodiment of the present invention;

*Figure 9* is a transverse sectional view of the connector taken on the line 9–9 shown in Fig. 8;

*Figure 10* is a transverse sectional view of the connector taken on the line 10–10 shown in Fig. 8; and

*Figures 11, 12 and 13* are perspective views of still other embodiments of the present invention.

*DESCRIPTION OF THE PREFERRED EMBODIMENTS*

In the drawings in Fig. 1, an electrical connector constructed in accordance with the present invention is shown at 20 having a shell 21 with parts 22 and 23 fixed together by conventional means.

Pin contacts 24 are held in placed by insulators 25 and 26 shown in Fig. 2. The axes of contacts 24 are equally spaced and lie parallel to each other in a single plane. The same is true of pin contacts 27. Contacts 24 and 27 may be socket contacts, if desired. The contact 27 shown has an axis that lies in

a plane of the paper midway between one adjacent pair of contacts 24.

An assembly 28 is provided between insulators 25 and 26 that has bodies 29 and 29′ (Fig. 4) made of a conventional zinc oxide or other varistor material. For example, bodies 29 and 29′ may be made of semiconductive metal oxide bonded in place with conductive material.

Assembly 28 is shown in Figs. 1, 2, 3 and 4 including one or more conductors 30. Conductors 30 typically are equally spaced a distance B apart and are bonded to body 29. Similarly, one or more conductors 31 are equally spaced distance B apart such that the centre of conductors 31 are positioned midway between conductors 30 (see distance A).

Bodies 29 and 29′ are bonded or fused to a conductor 32. If desired, assembly 28 may be fabricated by constructing a one-half assembly 33 (Fig. 5) and conductively bonding or fusing two of the same together as shown at 34 in Fig. 6.

In Fig. 2, tines 35 and 36 make conductive contact with conductors 30 and 31, respectively.

Conductors 30, 31 and 32 may be made of the same material. This material may be conductive ink, brit, epoxy or other depositions conventional with ceramic technology.

The conductor 32 is grounded by conventional means to shell 21 via parts 37 and 38 in Fig. 1.

In Fig. 7, bodies 39 are made of a varistor material and conductors are provided at 40 and 41.

In Fig. 8, an electrical connector is provided at 42 having a shell 43 of two parts 44 and 45 fixed relative to each other. Insulators 46 and 47 are fitted within shell parts 44 and 45, respectively.

Pin or socket contacts are provided at 48 and 49 having respective leaf spring tines 50 and 51 which engage conductors 52 and 53, respectively, shown in Fig. 9.

As shown in Figs. 8, 9 and 10, conductors 52 and 53 with a conductive plate 56 are bonded to opposite sides of bodies 54 and 55, respectively. Bodies 54 and 55 are made of a varistor material.

A section C–C in Fig. 10 would be identical to that of Fig. 8.

Alternative embodiments are shown in Figs. 11, 12 and 13. A single embodiment is shown in Figs. 11 and 12. Conductors 57, 58, 59, 60, 61 and 62 are bonded or fused to a body 63. Body 63 is made of a varistor material.

In Fig. 13, conductors 64, 65 and 66 are bonded or fused to bodies 67, 68 and 69, respectively. Bodies 67, 68 and 69 are then bonded to a conductive plate 70.

CLAIMS

1. An electrical connector comprising: a conductive shell; an insulator mounted in a fixed position inside said conductive shell; at least one contact mounted through and in a fixed position relative to said insulator; a body mounted in a fixed position in said insulator adjacent said contact, said body having a discharge portion, said body being made of a varistor material; first and second conductors bonded to opposite sides of said body portion, said contact having a connective portion in engagement with said first conductor; and conductive means providing a connection between said second conductor and said conductive shell, said contact being insulated from said conductive shell except through said connective portion, said first conductor, said discharge portion, said second conductor and said conductive means.

2. An electrical connector comprising: a conductive shell; and insulator mounted in a fixed position inside said conductive shell; first and second sets of contacts mounted through and in fixed positions relative to said insulator; first and second bodies mounted in a fixed position in said insulator adjacent said first and second sets of contacts, respectively, both of said bodies being made of a varistor material; first and second sets of spaced conductors bonded to said opposite sides of said bodies, said contacts having connective portions in engagement with said first and second sets of conductors, respectively; and conductive means providing a connection between said second conductor and said conductive shell, said contacts all being insulated from said conductive shell except through said connective portions, the conductors of said first and second sets, one of said bodies, and said conductive means.

3. The invention according to claim 2, wherein said conductive means includes an assembly of first and second conductive plates bonded together, said first and second bodies being bonded to the obverse and reverse sides of said assembly; and electrical conductor means connecting said assembly to said conductive shell.

4. The invention according to claim 3, wherein each said connective portion includes leaf spring tine positioned to lie in pressure contact with a corresponding one of said conductors in one of said first and second sets thereof.

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