



BACKGROUND OF THE INVENTION

1. Technical Field:

The present invention relates, generally, to a device for providing electromagnetic charge protection and, more particularly, to a conductive insert for providing electromagnetic charge protection to electronics externally connected to an associated structure.

2. Description of the Related Art:

Microelectronics circuits, specifically, the fabricated integrated circuits therein, can be readily destroyed or rendered temporarily inoperable if exposed to electrostatic discharge (ESD) or radio frequency interference (RFI). Typically, once the integrated circuits are placed in a finished product, they are insulated from electrostatic discharge or radio frequency interference. This is accomplished by placing the devices inside metal cages that shield or dissipate ESD and RFI. Unfortunately, some electronic devices must be outside these metal cages and, therefore, are exposed to ESD and RFI problems.

One type of device includes the operation panels typically found on a large computer, such as, for example, a mid-range or mainframe computer system. Accordingly, a plastic decorative bezel, whose inside surface is painted with nickel or copper conductive paint to provide ESD and RFI shielding, is fastened to the system frame such that it makes electrical contact with the metal case and encloses the electronics within a conductive envelope.

Problems associated with this solution include the use of expensive extensive hand masking around the areas that must remain non-conductive. Secondly, the plastic bezels, once painted with this conductive paint, cannot be recycled, and, thus, are environmentally poor. Additionally, the paint is difficult to apply with the required consistency as it is hard to maintain even paint coverage inside tight inside corners. In this case, bridging and paint

- 1 blow-back occur as the paint is sprayed on. Accordingly, what is needed is a
- 2 structure that protects externally mounted electronic devices without requiring
- 3 extensive design and manufacturing effort and expense to implement.





SUMMARY OF THE INVENTION

1
2
3 It is therefore one object of the present invention to provide
4 electromagnetic charge protection.

5
6 It is another object of the present invention to provide a
7 conductive insert for electromagnetic discharge and radio frequency
8 interference protection to electronics externally connected to an associated
9 structure.

10
11 The foregoing objects are achieved as is now described.

12
13 According to the present invention, a conductive insert for
14 protecting an externally mounted microelectronic device is disclosed. The
15 conductive insert is designed to prevent destruction or inoperability of the
16 microelectronic device caused by electrostatic discharge or radio frequency
17 interference. The conductive insert includes a first exterior surface and a
18 second interior surface. The second interior surface has a conductor material
19 applied thereon for providing ESD and RFI protection to the externally mounted
20 electronic device. To protect the externally mounted microelectronic device, the
21 conductive insert mounts within a mounting plate for covering the externally
22 mounted electronic device. Instead of having a conductive material applied to
23 the interior surface, the conductive insert may be manufactured from a
24 conductive material initially. Additionally, electrically conductive finger springs
25 can be formed in the conductive insert to provide electrical connection, if
26 necessary, between the conductive insert and the microelectronic device or to
27 enhance electrical connection between the conductive insert and the metal case
28 of the product.
29

THIS SHEET HAS BEEN
REPLACED

1 The above as well as additional objects, features, and advantages
2 of the present invention will become apparent in the following detailed written
3 description.
4

This Sheet Has Been Replaced





BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself however, as well as a preferred mode of use, further objects and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

Figure 1 is a perspective view of an operating bezel normally covering an externally mounted device;

Figure 2 depicts a conductive insert for providing ESD and RFI protection; and

Figure 3 shows an exploded view of how the conductive insert of Figure 2 sandwiches between the operating bezel and a microelectronics part to be protected.

Figure 4 depicts an exploded view of the attachment of the electronic device to a computer system according the present invention; and,

Figure 5 is a partial exploded view of the assembled computer system with ESD and RFI protection bezel insert.



DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

With reference now to the figures and in particular with reference to **Figure 1**, a partial cutaway perspective view of an operator bezel or panel **10** used in the prior art is shown.

Figure 2, is a perspective view of a conductive insert **12**, disclosed for inserting between an externally mounted electronic device and its operator panel **10**.

Conductive insert **12** is made from a thermal formed plastic part made conductive so as to provide electrostatic discharge protection and radio frequency interference protection of an externally mounted electronic device. Conductive insert **12** is made conductive by adding a conductive surface film through either vacuum deposition, via laminated foil, to the base material prior to forming insert **12**. This method, although somewhat expensive, eliminates any expensive secondary operation, such as masking, to the operator panel bezel itself, and yields a cost reduction of about one-half of what is required to prepare the operator bezel to be conductive so as to provide ESD and RFI protection.

Another method for providing conductivity to insert **10** is to incorporate conductive particles in the raw material before performing the process thermal forming of insert **12**. Another method is to paint a non-conductive, pre-made, thermal formed insert, already having all openings and features in place, with a conductive paint similar to that used on the operator panel bezels in the prior solutions. The use of conductive paint is the preferred method since it is simplistic and well known. Additionally, the electrical characteristics of conductive paint are well known and approved for standard use. Other processes may, however, be used to apply conductive surface coatings to a pre-made thermal formed insert by either electrolysis copper or

1 nickel plating or vacuum deposition of aluminum or other materials, which are
2 but two examples.

3
4 Although painting the insert appears to be identical to painting a
5 bare bezel, important advantages are achieved. Specifically, the thermal formed
6 insert is inexpensive to manufacture as it can be made from low cost material,
7 such as styrene or unfilled polycarbonate sheet, and requires little tooling and
8 can be produced in high volumes. Further, the part does not need to be
9 masked before painting or thermal deposition, or the like. When painting
10 panel 10, some areas must stay non-conductive; therefore, masking is required
11 such as to prevent overspray from the decorative portion of panel 10. For
12 areas that must remain non-conductive on conductive insert 12, those areas
13 can be punched out as conductive insert 12 merely serves as a laminate
14 between operator panel 10 and a microelectronics device. Additionally, the
15 operator bezels typically are processed one bezel at a time. Using conductive
16 inserts allows for high volume output as multiple inserts may be thermally
17 formed in a sheet at one time and then painted prior to cutting. This results in
18 tremendous labor and cost savings over the prior methods.

19
20 Conductive insert 12 also serves as a spring when spring fingers
21 14, which, being conductive, can provide electrical contact between the
22 elements for which the spring fingers, are designed. This allows the metal
23 finger stock normally used in some applications to be eliminated for a further
24 cost savings. The only increase in complexity of preparing the conductive
25 insert is to provide trim tooling and slight design modifications.

26
27 Figure 3 depicts an exploded view of conductive insert 12
28 sandwiching between operator panel bezel 10 and microelectronics device 16.
29 Microelectronics device 16 is affixed to operator panel bezel 10 with small
30 screws or other fasteners (not shown) via molded standoffs 26, thus trapping
31 conductive insert 12. Conductive insert 12 fits over standoffs 26 via holes



1 punched in its body; the holes provide a friction fit, assuring correct lateral
2 positioning with respect to bezel 10, microelectronics device 16, and the other
3 assembled parts described below. The friction fit assures there is not lateral
4 shifting of the insert or inadvertent contact between its conductive side and any
5 logic or parts within the bezel. Further assembled is operator accessible
6 keyswitch 22, which is affixed to operator panel bezel with nut and washer 20
7 via molded boss 18. Keyswitch 22 is an item that, electrically, cannot be
8 mounted to a conductive surface and, thus, protrudes through a clearance hole
9 in conductive insert 12. Keyswitch 22 is electrically connected to
10 microelectronics device 16 via a cable and connector integral with the
11 keyswitch. In the original configuration where operator panel bezel 10 was
12 painted with conductive paint, the mounting area for keyswitch 22 required
13 expensive masking. An additional electronic strap 24, which has LED's at the
14 terminated end of the strap provides information to the operator,
15 communicating system performance or other status through microelectronics
16 device 16. The LED's at the end of strap 24 are snap fit into features molded
17 to bezel 10 and, similar to keyswitch 22, protrude through holes punched in
18 conductive insert 12. In the original configuration using a conductive painted
19 bezel, expensive masking was also required in this area. Completing the
20 assembly is a small battery 28 that friction fits in another molded feature in
21 bezel 10 and, again similarly to keyswitch 22, protrudes through a punched
22 opening in conductive insert 12, thus avoiding the masking required in the
23 original configuration mentioned previously.

24
25 Conductive insert 12, being laterally constrained by standoffs 26,
26 is further constrained in a direction perpendicular to the plane of
27 microelectronics device 16 when the assembly is mounted to the surface of the
28 machine or computing system, which is constructed of metal and is unpainted
29 to provide a conductive surface, via screws through the outer flange of bezel
30 10. It will be noted that the outer flange of insert 12 (parallel to the plane of
31 microelectronics device 16 and larger than the outside perimeter of bezel 10)



1 is thus trapped between the bezel and the machine surface, (not shown in the
2 figure but to the right of the depicted components) ensuring proper location in
3 the direction perpendicular to microelectronics device 16. The action of
4 trapping the insert as described creates electrical contact between the insert
5 and the machine surface and places microelectronic device 16 within a
6 conductive enclosure.

7
8 Figure 4 depicts an exploded view of how conductive bezel 12
9 and operator panel bezel 10 fit over microelectronic device 14 and connect to
10 a computer system 30. Conductive bezel 12 electrically connects with an
11 exterior surface panel 32, which is made of a conductive material to provide
12 ESD and RFI protection to the components within computer system 30. The
13 assembled computer system 30, shown in Figure 5, provides a protective
14 conductive enclosure for the microelectronic device. A protective coverplate 34
15 protects the front of computer system 30 while allowing operator bezel 10 to
16 fit through appropriate openings 36 for access by a system user.

17
18 Although insert 12 is not easily recyclable, operator bezel 10,
19 which otherwise would have been manufactured with the conductive coating or
20 particles, is much more readily recyclable. Additionally, insert 12 requires less
21 material than bezel 10, thus reducing further the amount of waste that would
22 normally occur once the bezel is discarded.

23
24 While the invention has been particularly shown and described
25 with reference to a preferred embodiment, it will be understood by those skilled
26 in the art that various changes in form and detail may be made therein without
27 departing from the spirit and scope of the invention.





1 CLAIMS:

2
3 1. A conductive insert for protecting an externally mounted microelectronic
4 device from damages due to electrostatic discharge (ESD) or radio frequency
5 interference (RFI), comprising:

6 a first exterior surface;

7 a second interior surface; and

8 a conductive material applied to said second interior surface thereby
9 providing ESD and RFI protection to said externally mounted microelectronic
10 device.

11
12 2. The invention according to claim 1 further comprising spring fingers with
13 said conductive material applied thereto.

14
15 3. The invention according to claim 1 wherein said conductive material is
16 a conductive paint.

17
18 4. The invention according to claim 1 wherein said conductive material is
19 a metal applied through deposition.

20
21 5. A conductive insert for protecting an externally mounted microelectronic
22 device from ESD and RFI comprising:

23 a first exterior surface;

24 a second interior surface; wherein said first exterior surface and said
25 second interior surface are made from a conductive material thereby providing
26 said ESD and RFI protection to said externally mounted microelectronic
27 device.
28



1 6. A structure for providing ESD and RFI protection to an externally
2 mounted electronic device comprising:

3 a mounting plate for covering said externally mounted electronic device;
4 and

5 a conductive insert, mounted within said mounting plate, having a first
6 exterior surface and a second interior surface, said second interior surface
7 having a conductive material applied thereto for providing said ESD and RFI
8 protection.

9
10 7. The invention according to Claim 6 wherein said electronic device
11 mounts to a conductive surface, thereby forming a conductive enclosure with
12 said conductive insert and said conductive surface.

This Sheet Has Been Replaced



* C L N S *

1 8. A computer system having a structure for providing ESD and RFI
2 protection to an externally mounted electronic device comprising:

3 a conductive system enclosure having an exterior surface;

4 a mounting plate for covering said externally mounted electronic device;

5 and

6 a conductive insert, mounted within said mounting plate and to said
7 exterior surface thereby forming a protective conductive device enclosure for
8 providing said ESD and RFI protection to said externally mounted electronic
9 device.

10
11 9. The invention according to Claim 8 wherein said conductive insert further
12 comprises conductive spring fingers.

13
14 10. The invention according to claim 8 wherein said conductive insert is
15 made conductive by use of a conductive paint applied to at least one surface.

16
17 11. The invention according to claim 8 wherein said conductive insert further
18 includes a metal applied through deposition thereby providing said conductivity.

19
20 12. The invention according to claim 8 wherein said conductive insert further
21 comprises:

22 a first exterior surface;

23 a second interior surface, wherein said first exterior surface and said
24 second interior surface are made from a conductive material thereby providing
25 said ESD and RFI protection to said externally mounted electronic device.
26

This Sheet Has Been Replaced

