

SEMICONDUCTOR COMPONENT HANDLING DEVICE HAVING AN ELECTROSTATIC DISSIPATING FILM

The present invention claims priority to Provisional Application No. 60/333,686,
5 filed November 27, 2001, entitled POLYMER FILM INSERT MOLDING FOR
PROVIDING ELECTROSTATIC DISSIPATION and is incorporated by reference herein.

Field of the Invention

The present invention relates generally to film insert molding, and more
10 particularly to insert molding a thin conductive polymer film during the molding of
semiconductor component handlers or carriers to provide electrostatic dissipation away
from the semiconductor components.

Background of the Invention

15 Conventional film insert molding techniques are generally utilized in
manufacturing processes to increase aesthetic appeal in various consumer products.
Namely, decorative decals, instructions, logos, and other visual graphics are printed on
one surface of a thin transparent polymer film for use in the insert molding process. Later
developments expanded the use of the film to permanently fix functional features such as
20 barcodes to the products. In both circumstances, the film is placed into a portion of the
mold prior to the injection of the moldable material. This creates a bond between the film
and the molded part such that inexpensive decoration or indicia can be selectively placed
on the part, while at the same time simplifying the use of indicia around complicated
contours and in difficult-to-reach locations. Similarly, such film insert molding or
25 decorative molding simplifies the manufacturing process by eliminating the need to have

the indicia etched or shaped into the actual surface of the mold itself. This increases design and manufacturing flexibility, and the level of detail that can be included in the final product.

5 The semiconductor industry introduces unique and unconventional purity and anti-contamination requirements into the development and implementation of product designs and manufacturing processes. Most importantly, material selection is essential in the manufacturing, storage, and transportation of components and assemblies. For instance, various polymer materials such as polyethylene (PE), polycarbonates (PC), perfluoroalkoxy (PFA), polyetheretherketone (PEEK), and the like are generally utilized in
10 the manufacturing of components and structures incorporated in constructing wafer carriers and chip trays.

Wafer Carriers

The processing of wafer disks into integrated circuit chips often involves several steps where the disks are repeatedly processed, stored and transported. Due to the delicate
15 nature of the disks and their extreme value, it is vital that they are properly protected throughout this procedure. One purpose of a wafer carrier is to provide this protection. Additionally, since the processing of wafer disks is generally automated, it is necessary for disks to be precisely positioned relative to the processing equipment for the robotic removal and insertion of the wafers. A second purpose of a wafer carrier is to securely
20 hold the wafer disks during transport.

Carriers are generally configured to axially arrange the wafers or disks in shelves or slots, and to support the wafers or disks by or near their peripheral edges. The wafers or disks are conventionally removable from the carriers in a radial direction upwardly or laterally. Carriers may have supplemental top covers, bottom covers, or enclosures to
25 enclose the wafers or disks. There are a number of material characteristics which are

useful and advantageous for wafer carriers depending on the type of carrier and the particular part of the carrier at issue.

During processing of semiconductor wafers or magnetic disks, the presence or generation of particulates presents very significant contamination problems.

5 Contamination is accepted as the single largest cause of yield loss in the semiconductor industry. As the size of integrated circuitry has continued to be reduced, the size of particles which can contaminate an integrated circuit has also become smaller, making minimization of contaminants all the more critical. Contaminants in the form of particles may be generated by abrasion such as the rubbing or scraping of the carrier with the
10 wafers or disks, with the carrier covers or enclosures, with storage racks, with other carriers, or with the processing equipment. A most desirable characteristic of a carrier is therefore a resistance to particle generation upon abrasion, rubbing, or scraping of the plastic molded material. U.S. Pat. No. 5,780,127 discusses various characteristics of plastics which are pertinent to the suitability of such materials for wafer carriers, and is
15 incorporated herein by reference.

Carrier materials should also have minimal outgassing of volatile components as these may leave films which also constitute a contaminant which can damage wafers and disks. The carrier materials must have adequate dimensional stability, that is rigidity, when the carrier is loaded. Dimensional stability is necessary to prevent damage to the
20 wafers or disks and to minimize movement of the wafers or disks within the carrier. The tolerances of the slots holding wafers and disks are typically quite small and any deformation of the carrier can directly damage the highly brittle wafers or increase the abrasion and thus the particle generation when the wafers or disks are moved into, out of, or within the carrier. Dimensional stability is also extremely important when the carrier is
25 loaded in some direction such as when the carriers are stacked during shipment or when

the carriers integrate with processing equipment. The carrier material should also maintain its dimensional stability under elevated temperatures which may be encountered during storage or cleaning.

Conventional carriers used in the semiconductor industry may develop and retain static charges. When a charged plastic part comes into contact with an electronic device or processing equipment it may discharge in a damaging phenomena known as electrostatic discharge (ESD). Additionally, statically charged carriers may attract and retain particles, particularly airborne particles. Also, static buildup on carriers can cause semiconductor processing equipment to automatically shut down. As a result, it is most desirable to have a carrier with static dissipation characteristics to channel away ESD and to avoid attracting particles.

Visibility of wafers within closed containers is highly desirable and may be required by end users. Transparent plastics suitable for such containers, such as polycarbonates, are desirable in that such plastic is low in cost but such plastics do not have innate static dissipative characteristics nor desirable abrasion resistance.

Other important characteristics include the cost of the carrier material and the ease of molding the material. Carriers are typically formed of injection molded plastics such as PC, acrylonitrile butadiene styrene (ABS), polypropylene (PP), PE, PFA, PEEK, and like materials.

One major benefit of particular specialized polymers, such as PEEK, is their abrasion-resistant qualities. Typical inexpensive conventional plastics release tiny particles into the air when abraded or even when rubbed against other material or objects. While these particles are typically invisible to the naked eye, they result in the introduction of potentially damaging contaminants that may adhere to semiconductor components being processed, and into the necessarily controlled environments. However, specialized

thermoplastic polymers are dramatically more expensive than conventional polymers. In fact, the various specialized thermoplastic polymers themselves can vary greatly – i.e., PEEK is more expensive than PC.

In addition to their abrasion-resistant qualities, thermoplastic polymers can have additives such as carbon fiber or powder filler added to create conductive qualities. Fillers which have been added to injection molded plastics for static dissipation include carbon powder or fiber, metal fibers, metal coated graphite, and organic (amine-based) additives. Therefore, thermoplastics having such additives can be utilized in the material construction of semiconductor component handlers to promote ESD.

Conventional practices include constructing an entire wafer carrier/handler component of a material such as, PEEK or other compatible materials, to promote ESD. As stated, however, the manufacturing and use of particular materials is dramatically more expensive and it is often undesirable and even infeasible to utilize the material in the construction of large handler components. Additionally, materials like PEEK can be difficult to manipulate and mold in the manner required in manufacturing such semiconductor handlers. Currently, a manufacturer of wafer carriers is forced to make a decision between the benefits of the ESD properties of a conductive thermoplastic, and the cost to manufacture all, or a substantial portion, of the product out of the material. While ESD-promoting materials may only be needed in particular applications at those contact surfaces of the carrier that touch delicate semiconductor components or processing equipment, the entire section or part of the handler is typically constructed of the ESD-promoting polymer to avoid static-causing damage to the components. For instance, Japanese Publications JP62205616, JP8293536, JP3012949, JP9036216, and JP9162273 disclose various means of molding entire components of a wafer carrier out of a thermoplastic having conductive characteristics, wherein the conductive characteristics are

obtained through conductive additives such as carbon filler, resins, and the like. Further, Japanese Publications JP1013717 and JP62287638 disclose wafer carrier bodies having conductive rods or wires running along a surface of the wafer carrier to provide a path to ground. Each of these conventional attempts at ESD are innately problematic due to manufacturing inefficiencies and costs. In addition, the employment of conductive metal objects in the construction of a wafer carrier can introduce contaminants and result in unacceptable component abrasion.

As a result, there is a need in the semiconductor industry for manufacturing techniques that substantially reduce unnecessary manufacturing processes and permit targeted and localized implementation of conductive materials to provide electrostatic dissipation. Such an innovation would significantly reduce the costs of manufacturing and design by permitting selective use of desirable, but often expensive, thermoplastics having conductive additives.

Summary of the Invention

The present invention relates generally to a system and method for including a thin conductive polymer film, such as carbon-filled polymers, in the molding process for handlers, transporters, carriers, trays and like devices utilized in the semiconductor processing industry. The conductive film of predetermined size and shape is selectively placed along a shaping surface in a mold cavity for alignment with a desired target surface of a moldable material. The molding process causes a surface of the film to bond to a contact surface of the moldable material such that the film is permanently adhered to the moldable material. As a result, a compatible conductive polymer can be selectively bonded only to those target surfaces where ESD is needed. For instance, semiconductor wafer carrier support structures can include such a conductive polymer film along at least

a portion to provide a pathway to direct electrostatic away from the receiveably securable wafers. Further, the ESD film can include addition film layers to comprise a film laminate for bonding to the semiconductor component handling devices, and to add polymer layers having other functional characteristics such as abrasion resistance, heat resistance,
5 absorption barrier protection, chemical resistance, and a myriad of other performance characteristics.

An object and feature of particular embodiments of the present invention is that it provides a cost-efficient method of selectively utilizing desirable polymers, and the polymers' corresponding functional characteristic, wherein it is not necessary to utilize
10 more of the polymer than is required.

Another object and feature of particular embodiments of the present invention is that a conductive thermoplastic film can be bonded to a portion of a wafer carrier, chip tray, or other semiconductor component handler or transporter that contacts sensitive parts, components, or processing equipment to provide for ESD. In addition, said dissipation
15 minimizes the environmental static charges that attract undesirable contaminate particles.

A further object and feature of particular embodiments of the present invention is the selective use of preferred abrasion-resistant polymer films on parts being used in the semiconductor industry. As such, both ESD and desirable abrasion-resistance functions can be advanced at a targeted surface utilizing a single polymer film or film laminate.

20 Still another object and feature of particular embodiments of the present invention is forming a semiconductor component handling device with a polymer filmed surface area that is transparent or translucent. Such a handling device is formed by utilizing a thin enough layer of a material on a selected target structure of the device, and overmolding the structure, with or without an intermediate layer, to the substantially transparent device
25 body constructed of a material such as PC.

Yet another object and feature of particular embodiments of the present invention is that the at least one conductive film can be insert molded to various parts of the semiconductor handling device to promote matable alignment with other parts of the same device, or with stackably matable parts of a substantially identical device, to provide
5 conductive communication along a common pathway to ground.

Brief Description of the Drawings

Fig. 1 is a side cross-sectional view of a conductive film insert molding system in accordance with an embodiment of the present invention.

10 Fig. 2 is a side cross-sectional view of portion of the conductive film insert molding system of Fig. 1.

Fig. 3 is a side cross-sectional view of a conductive film insert molding system in accordance with an embodiment of the present invention.

15 Fig. 4 is a side cross-sectional view of a molded part and bonded conductive film in accordance with an embodiment of the present invention.

Fig. 5 is a side cross-sectional view of a molded part and bonded conductive film laminate in accordance with an embodiment of the present invention.

Fig. 6 is a perspective view of a semiconductor wafer handling device in accordance with an embodiment of the present invention.

20 Fig. 7 is an exploded perspective view of a semiconductor wafer handling device in accordance with an embodiment of the present invention.

Fig. 8 is a perspective view of stackable chip handling devices in accordance with an embodiment of the present invention.

25 Fig. 9 is a side cross-sectional view of stackable chip handling devices in accordance with an embodiment of the present invention.

Detailed Description of the Preferred Embodiment

Referring to Figs. 1-9, the present invention includes insert molding a conductive electrostatic dissipating thermoplastic film 10 to a selected target surface of semiconductor component handling device 12 utilizing a molding unit 20.

ESD Film

The at least one conductive or ESD film 10 is a thermoplastic polymer having a measurable level of conductivity. The film 10 is at least partially defined by a limited level of thickness. For instance, a single film layer thickness equal to or less than approximately .040 inches (forty-thousandths) is envisioned. Preferably, the single film layer is less than or equal to approximately .030 inches (thirty-thousandths). Of course, the implementation of laminates of multiple layers will alter this preferred thickness criteria. It should be noted that the term conductive in this application is to include various levels of conductivity and/or ESD. Generally, surface resistivity, or Ohms per Square, defines the conductivity of materials. For the purpose of this application, conductivity will include antistatic, static dissipative, and conductive characteristics. An acceptable resistivity range for the present invention can be approximately greater or less than 1×10^{12} ohms/square, or between 1×10^{-5} ohms/square to 1×10^{12} ohms/square. This range is exemplary and provides acceptable ranges understood to one skilled in the art. Any compatible material can be utilized for the film 10 assuming it has available conductive characteristics. For example, polyester, polyimide (PI), polyether imide (PEI), PEEK, perfluoroalkoxy resin (PFA), fluorinated ethylene propylene copolymer (FEP), polyvinylidene fluoride (PVDF), polymethyl methacrylate (PMMA), polyether sulfone (PES), polystyrene (PS), polyphenylene sulfide (PPS), and a myriad of other compatible polymers are available. One embodiment will include a thermoplastic material having

additives such as carbon fiber or powder filler added to create conductive qualities to promote ESD. These fillers can include carbon powder or fiber, metal fibers, metal coated graphite, organic (amine-based) additives, and the like. Other polymers and additives that advance conductive characteristics for thermoplastics are also well known to those skilled in the art and can be used without deviating from the spirit or scope of the present invention. As is described herein, the ESD functionality of the film 10 can provide a path to ground and can serve to remove charges from relevant semiconductor components to reduce the attraction of particles and other contaminants. Co-pending U.S. Application No. _____, owned by the present Applicant and entitled "SEMICONDUCTOR COMPONENTS HANDLING DEVICE HAVING A PERFORMANCE FILM" is incorporated herein by reference in its entirety.

To employ the conductive film 10 in manufacturing of semiconductor component handling devices 12, the film 10 is generally cut to a predetermined shape and size depending on the particular needs of the bonding application. After cutting, the film 10 can then be thermoformed. The film 10 is generally thin and sheet-like to better facilitate moldability and to capitalize on the transparent or translucent characteristics of the material.

In addition to insert molding a single conductive film 10, a plurality of films 10 can be laminated to comprise a composite film structure for moldable bonding to the semiconductor component handling devices 12. For instance, various film layers can include differing conductive intensities. In one embodiment, the layer of the film laminate bonding to the surface of the handler 12 can have a higher conductivity than the external layer to increase the effectiveness of the conductive pathway and minimize potential damage from static charges. Still other embodiments can combine other film layers with the conductive film 10 to add abrasion resistance, chemical resistance, temperature

resistance, absorption barriers, outgassing barriers, and like characteristics to the portion or surface of the handling device 12 moldably receiving the film laminate. A myriad of film lamination techniques known to one skilled in the film lamination art are envisioned for use with the present invention. For instance, U.S. Patent Nos. 3,660,200, 4,605,591, 5,194,327, 5,344,703, and 5,811,197 disclose thermoplastic lamination techniques and are incorporated herein by reference.

ESD Film Insert Molding

Referring primarily to Figs. 1-7 the molding unit 20 generally includes a mold cavity 22, a cover portion 24, and at least one injection channel portion 28. The at least one injection channel 28 is in fluid communication with the mold cavity 22. The mold cavity 22 can include a shaping surface 26, or surfaces, designed to shape the injected moldable material 30 and/or the film 10 during the molding process. The cover portion 24 selectively engages or covers the mold cavity 22. Various embodiments of the molding unit 20 can further include at least one vacuum channel 29 in communication with the mold cavity 22 and/or the shaping surface 26 to introduce vacuum suction in securing an object, such as the film 10, to the mold cavity 22. Other known techniques for securably conforming the film 10 within the cavity 22 and shaping surface 26 employing static securement and forceable engagement are also envisioned for use with the present invention. It should be noted that various figures depict the film 10 as disproportionately large in comparison to the corresponding handling devices for illustrative purposes only and is not intended to represent actual proportions for the present invention.

In one embodiment, the cover portion 24 is removably securable to the mold cavity 22 to facilitate film 10 insertion, and removal of the finished handling device portion or part 32. The molded part 32 is generally something less than a completed handling device 12. For example, it is common for sidewall inserts and shelves of wafer carriers to be

separately molded, and often to be molded of dissimilar plastics in comparison to the main body of the carrier. Various injection and insert molding techniques are commonly known to those skilled in the art and can be implemented without deviating from the spirit or scope of the present invention.

5 The moldable material 30 is preferably a substantially non-conductive thermoplastic material commonly used in molding parts used in the semiconductor processing industry. Again, the material 30 can be PFA, PE, PC, and the like. More specifically, the moldable material 30 can be the material conventionally used to construct wafer carriers, chip trays, and components and parts thereof.

10 In operation, the conductive film 10 is generally cut to a predetermined shape and then thermoformed to a required form. The thermoformed film 10 is placed into the molding unit 20 such that the film 10 is in surface contact with at least a portion of the at least one shaping surface 26 of the mold cavity 22. As indicated herein, various techniques such as vacuum, static, and forceable securement can be implemented to
15 facilitate proper positioning of the film 10 to the cavity 22 or the shaping surface 26. The cover portion 24 may then be closed in preparation for injection of the material 30. At this stage of the process, the moldable material 30 is injected in a molten state into the cavity through the at least one injection channel 28. After waiting a requisite cooling period, the moldable material 30 within the molding unit 20 cools to form the substantially solidified
20 molded part 32. The molten injection combined with the cooling process forms a permanent adhering bond between the at least one film 10 and the molded part 32.

 After completion of the molding process, the molded part 32 can be ejected from the molding unit 32 with the part 32 having a conductive film 10 permanently bonded to a selective target surface. Conventional tooling, techniques, and practices known by those
25 skilled in the art can be used in injecting the material 30 and ejecting the part 32.

Wafer Handler/Carrier

Various conventional wafer handling devices 34 and device 34 components or parts are shown in Figs. 4-7. The conductive film 10 or film laminate can be bonded to selective components and/or portions of the wafer handling device 34 (i.e., wafer carrier) with the film insert molding processes described herein. Wafer handlers 34 are generally formed from at least two different melt processable materials. Consequently, once a part 32 of the wafer handler 34 has been injection molded as described, it is often necessary to later place the part 32 in a second mold cavity for overmolding with another molded part or component of the wafer handler 34. This is yet another reason why it is necessary to have a film 10 made of a durable polymer plastic. Repeated exposure to the shear forces and high temperatures of molding processes requires use of a preferred thermopolymer. Co-pending U.S. Patent Application 09/317,989 owned by the present applicant discloses the use of overmolding to manufacture wafer carriers and is herein incorporated by reference. In addition, U.S. Patent No. 6,439,984 discloses molding techniques for wafer carriers and is herein incorporated by reference as well.

U.S. Patent Nos. 6,428,729 6,039,186, 5,485,094, and 5,944,194, and disclose particular configurations and processes for constructing wafer handling devices 34, and are incorporated herein by reference. In one embodiment the wafer handler 34 includes at least a body portion 38, and a support structure 40 having a plurality of axial support shelves 42 capable of receivably supporting the wafers or disks by, or near, their peripheral edges. The wafers or disks are conventionally removable from the carriers 34, at the shelves 42, in a radial direction upwardly or laterally. The shelves 42 serve as the primary point of contact between the wafers and the carrier 34. As a result, one embodiment of the present invention includes insert molding the ESD film 10 to at least a portion of this support structure 40 and/or the supporting shelves 42. The ESD film 10 can

be selectively placed within the mold cavity 22 of the molding unit 20 such that it covers an entire surface or side of the molded part, wherein the molded part 32 is the support 40, the support shelves 42, a limited predefined portion of the shelves 42, or various other combinations. Further, the film 10 can be specifically bonded for alignment with a
5 grounding path such as a corresponding film 10 on the body, or any other adjacent and abutable component of the wafer handler 23 to provide for an extended ground pathway along the wafer handler 34. By advancing selective bondable placement of the film 10 to nearly any surface or component surface of the wafer handler 34, contacting handler 34 components can be brought into ESD communication without employing conventional
10 techniques of molding each of the contactable components entirely of the conductive material.

In other embodiments of the present invention, the wafer handler 34 can include flanges 44 (Fig. 6) along the outside portion of the handler body 38 to facilitate transporting, including engagement by robotic equipment during semiconductor
15 processing. These flanges 44 can similarly include the insert molded conductive film 10 to provide ESD benefits. As such, the remaining portions and surfaces of the body 38 can be constructed of non-conductive polymers. Fig. 6 further demonstrates various overmolding path to ground components of the handling device 34 that can be brought into contact with the selective placement of the at least one conductive film 10 such that
20 combinatorial conductive communication is possible between overmolded and insert molded film and parts. Still further embodiments can included the molded film 10 at selected surfaces of a kinematic coupling structure 46, wherein the kinematic coupling 46 (Fig. 7) is adapted to facilitate equipment engagement with the handling device 34 as described in U.S. Patent No. 6,010,008.

In certain instances, the insert molded conductive film 10 may not adhere sufficiently to other polymers. For example, PEEK (i.e., film 10) does not adhere in all cases to overmolded PC (i.e., wafer handler 34 components such as the body 38). Referring to Fig. 5, it has been found that an intermediate film, or tie layer, such as PEI
5 adheres to both the PEEK and PC material. Thus, a film laminate 10 of at least two polymer films may be inserted individually in a mold, as a laminate, before injecting the PC material with the intermediate film being positioned intermediate the film 10 and the molten moldable PC material 30. Alternatively, the two films may be adhered to one another, such as by vacuum molding, lamination processes as described herein, or by other
10 means wherein the two layers or films are bonded prior to insertion and positioning within the molding unit 20. Other materials can be utilized as well to promote adhesion and the applicable molding processes.

With such selective bonding of the at least one conductive film 10, a surface-to-ground communication can be established to direct electrostatic charges away from
15 sensitive components or equipment. At these contact points for instance, the conductive ESD film 10 provides a continuous conductive communication with a ground whereby any charges will be directed away from the sensitive semiconductor components or equipment to minimize costly damage. The use of such a film 10 on a limited target location on the part 32 (i.e., a shelf within the carrier) allows the end user to obtain the full benefits of the
20 ESD while at the same time being able to construct the remainder of the part, or the entire part body, of other preferred polymers. The desired or even required film 10 material may be quite different than what is needed in the construction of the remainder of the wafer carrier 34, or even the specific part 32.

Chip Handler/Tray

In another embodiment, the handling device 12 is a chip tray 36 including a plurality of seating recesses or recess assemblies 50 adapted to secure a plurality of chips, and peripheral side walls 52, as shown in Figs. 8-9. U.S. Patent Nos. 5,484,062 and 6,079,565 disclose such chip trays and are incorporated herein by reference. As with the processes and material described herein for the wafer handlers 34, it is beneficial to provide an ESD pathway to direct electrostatic charges away from the receivable chips, and/or processing equipment. Conventional techniques are typically directed at molding the entire chip tray 36 of a polymer having conductive characteristics. As stated, this conventional technique is costly, inefficient, and often undesirable.

One embodiment of the present invention includes insert molding the conductive film 10 to a selected portion or surface of the chip tray 36, such as the seating recesses 50, such that electrostatic charge is directed away from the seated chips. Other embodiments can include insert molding the film 10 to the entire top surface of the tray 36 including the recesses 50, the side walls 52, and combinations thereof.

The peripheral side walls 52 of chip trays 36 are generally shaped for stackable engagement with other chip trays 36. Stacking posts/members and/or peripheral wall ledges on the bottom portion of the trays 36 can be sized and shaped for alignment with corresponding grooves or lips on the top surfaces of the trays 36. Other stacking techniques and tray designs known to one skilled in the art are also envisioned for implementation with the present invention. To provide a conductive pathway to ground, the film 10 can be molded along a region from the seating recesses 50 to the peripheral side walls 52 to provide conductive communication along a plurality of stacked trays 36.

As with the wafer handlers 34, selective bonding of the at least one conductive film 10 to selected target surfaces of the chip tray 36 provides a preferred employment of ESD

benefits while still allowing a manufacturer to construct the remaining portions of the tray
36 of desirable non-conductive polymers.

The present invention may be embodied in other specific forms without departing
from the spirit or essential attributes thereof, and it is, therefore, desired that the present
5 embodiment be considered in all respects as illustrative and not restrictive.

Claims

1. A semiconductor wafer handling device, comprising:
at least one non-conductive substantially rigid thermoplastic component structure making up a part of the wafer handling device; and
at least one conductive thermoplastic film bonded by an insert molding process to a portion of the at least one non-conductive thermoplastic component structure to provide electrostatic dissipation characteristics to the semiconductor wafer handling device;
2. The device of claim 1, wherein the at least one conductive thermoplastic film includes additives to promote conductivity.
3. The device of claim 2, wherein the conductive additives are selected from a group consisting of: carbon powder, carbon fibers, metal fibers, metal coated graphite, and organic amine-based additives.
4. The device of claim 1, wherein a second conductive film is bonded by an insert molding process to a second wafer handling device component separate from, but adapted for contact with, the at least one conductive film to provide a conductive pathway from the at least one conductive film to the second conductive film.
5. The device of claim 1, wherein the at least one conductive film is a film laminate having at least two film layers such that at least one of the at least two film layers is a conductive film.

6. The device of claim 5, wherein the at least two film layers each have measurably different levels of conductivity.
7. The device of claim 5, wherein at least one of the at least two film layers includes a film having performance characteristics selected from a group consisting of: abrasion resistance, chemical resistance, heat resistance, fluid absorption barrier characteristics, and outgassing barrier characteristics.
8. The device of claim 5, wherein at least one of the at least two film layers is an intermediate tie layer for improving the bond strength between the conductive film and the non-conductive thermoplastic component structure.
9. The device of claim 1, wherein the at least one non-conductive thermoplastic component structure is a support structure having a plurality of spaced support shelves adapted to receive semiconductor wafers.
10. The device of claim 1, wherein the at least one non-conductive thermoplastic component structure is a kinematic coupling adapted for mechanical communication with semiconductor processing equipment.
11. The device of claim 1, wherein the at least one non-conductive thermoplastic component structure is a handling flange adapted for selective engageable communication with a robotic device.

12. The device of claim 1, wherein the at least one non-conductive thermoplastic component structure is a body shell portion of the wafer handling device.

13. The device of claim 1, wherein the at least one conductive film is substantially translucent.

14. The device of claim 1, wherein the at least one conductive film is constructed substantially of a material selected from the group consisting of: polyester, polyimide, polyether imide, polyetheretherketone, perfluoroalkoxy resin, fluorinated ethylene propylene copolymer, polyvinylidene fluoride, polymethyl methacrylate, polyether sulfone, polystyrene, and polyphenylene sulfide.

15. The device of claim 1, wherein the at least one conductive film is constructed substantially of polyetheretherketone.

16. A semiconductor component handling device, comprising:

a first substantially rigid thermoplastic portion not having conductive characteristics; and

at least one thermoplastic conductive film bonded to at least a portion of the first thermoplastic component by way of a film insert molding process, wherein the thermoplastic conductive film provides a conductive pathway to ground away from the first thermoplastic portion.

17. The device of claim 16, wherein the first thermoplastic portion is a portion of a semiconductor wafer handling device, the wafer handling device including a body shell, and a wafer support structure for receiving semiconductor wafers.

18. The device of claim 17, wherein the at least one thermoplastic conductive film is bonded to at least a portion of the wafer support structure to dissipate electrostatic charges away from the received semiconductor wafers.

19. The device of claim 16, wherein the first thermoplastic portion is a portion of a semiconductor chip handling tray, the tray including a plurality of recesses adapted to receive semiconductor chips, and a plurality of peripheral side wall sections.

20. The device of claim 19, wherein at least one of the peripheral side wall sections is adapted for matable stackable engagement with a separate semiconductor chip handling device.

21. The device of claim 20, wherein the at least one conductive film is bonded to a plurality of the recesses and to at least one of the peripheral side wall sections to provide a conductive pathway to dissipate electrostatic charges away from the received semiconductor chips.

22. The device of claim 16, wherein the at least one conductive film is substantially translucent.

23. The device of claim 16, wherein the at least one conductive film is constructed substantially of a material selected from the group consisting of: polyester, polyimide, polyether imide, polyetheretherketone, perfluoroalkoxy resin, fluorinated ethylene propylene copolymer, polyvinylidene fluoride, polymethyl methacrylate, polyether sulfone, polystyrene, and polyphenylene sulfide.

24. The device of claim 16, wherein the at least one conductive film is constructed substantially of polyetheretherketone.

25. A method of film insert molding an electrostatic dissipating component of a semiconductor component handling device through meltably bonding of at least one conductive thermoplastic film to at least a portion of a non-conductive thermoplastic material, comprising the steps of:

forming at least one conductive thermoplastic film;

accessing a molding unit having a mold cavity, the mold cavity including at least one shaping surface;

positioning the at least one formed conductive thermoplastic film within the cavity of the molding unit along at least a portion of the at least one shaping surface;

injecting a non-conductive substantially molten thermoplastic material into the cavity of the molding unit to conform to the shape of the at least one shaping surface;

waiting a cooling period wherein the non-conductive thermoplastic material substantially solidifies to matably bond with the at least one conductive thermoplastic film to generate the electrostatic dissipating component having a path to ground capability defined by the at least one conductive thermoplastic film; and

ejecting the electrostatic dissipating component from the molding unit.

26. The method of claim 25, wherein the molding of the electrostatic dissipating component forms a component part of a semiconductor wafer handling device.

27. The method of claim 26, wherein the molding of the electrostatic dissipating component forms a support structure of the semiconductor wafer handling device, the support structure having a plurality of spaced support shelves, wherein the at least one conductive thermoplastic film is bonded to a portion of the spaced support shelves.

28. The method of claim 25, wherein the molding of the electrostatic dissipating component forms a component part of a semiconductor chip handling tray having a plurality of chip receiving recesses, wherein the at least one conductive thermoplastic film is bonded to at least one surface defining the plurality of chip receiving recesses.

29. The method of claim 28, wherein the at least one conductive thermoplastic film is bonded at least one surface defining the chip receiving recesses and at least one of a plurality of side wall sections of the semiconductor chip handling tray to facilitate conductive communication between the at least one conductive thermoplastic film of each of a plurality of stackable semiconductor chip handling trays.

30. The method of claim 25, wherein forming the at least one conductive thermoplastic film includes forming a multi-layer film laminate wherein at least one of the film layers is a conductive thermoplastic film.

31. The method of claim 30, wherein the multi-layer film laminate includes at least two film layers, wherein a first one of the at least two film layers has a conductivity level measurably different than a second one of the at least two film layers.

32. The method of claim 25, wherein forming the at least one conductive thermoplastic film includes forming at least one substantially translucent conductive thermoplastic film.

33. The method of claim 25, wherein forming the at least one conductive thermoplastic film includes forming the at least one conductive thermoplastic film substantially constructed of a material selected from a group consisting of: polyester, polyimide, polyether imide, polyetheretherketone, perfluoroalkoxy resin, fluorinated ethylene propylene copolymer, polyvinylidene fluoride, polymethyl methacrylate, polyether sulfone, polystyrene, and polyphenylene sulfide.

34. The method of claim 25, wherein forming the at least one conductive thermoplastic film includes forming the at least one conductive thermoplastic film substantially constructed of polyetheretherketone.

35. A semiconductor chip handling tray, comprising:
a plurality of recessed portions capable of receiving semiconductor components;
an outside perimeter wall portion adapted to promote stackability with other semiconductor chip handling trays; and
at least one conductive thermoplastic film bonded to at least a plurality of the recessed portions and at least a portion of the outside perimeter wall portion by an insert

molding process to provide a conductive path to ground away from the receivable semiconductor chips.

36. The chip handling tray of claim 35, wherein the portion of the at least one conductive thermoplastic film molded to at least a portion of the outside perimeter wall portion of the chip handling tray provides conductive communication to a second stackably receivable chip handling tray to dissipate electrostatic charge.

37. The chip handling tray of claim 35, wherein the at least one conductive thermoplastic film is substantially translucent.

38. The chip handling tray of claim 35, wherein the at least one conductive film is constructed substantially of a material selected from the group consisting of: polyester, polyimide, polyether imide, polyetheretherketone, perfluoroalkoxy resin, fluorinated ethylene propylene copolymer, polyvinylidene fluoride, polymethyl methacrylate, polyether sulfone, polystyrene, and polyphenylene sulfide.

39. The chip handling tray of claim 35, wherein the at least one conductive film is constructed substantially of polyetheretherketone.

40. A conductive film insert molding system for molding at least a portion of a semiconductor component handling device with at least one conductive film, comprising:

a quantity of substantially molten non-conductive polymer material for shaping at least a portion of the semiconductor handling device;

a molding unit having a molding cavity and at least one shaping surface, the molding cavity and the at least one shaping surface adapted to receive the quantity of substantially molten non-conductive polymer material; and

at least one conductive film insertable within the molding cavity along at least a portion of the at least one shaping surface for permanent bonding to the quantity of substantially molten non-conductive polymer material during the molding process.

41. The system of claim 40, wherein the at least one conductive film is substantially translucent.

42. The system of claim 40, wherein the at least one conductive film is constructed substantially of a material selected from the group consisting of: polyester, polyimide, polyether imide, polyetheretherketone, perfluoroalkoxy resin, fluorinated ethylene propylene copolymer, polyvinylidene fluoride, polymethyl methacrylate, polyether sulfone, polystyrene, and polyphenylene sulfide.

43. The system of claim 40, wherein the at least one conductive film is constructed substantially of polyetheretherketone.

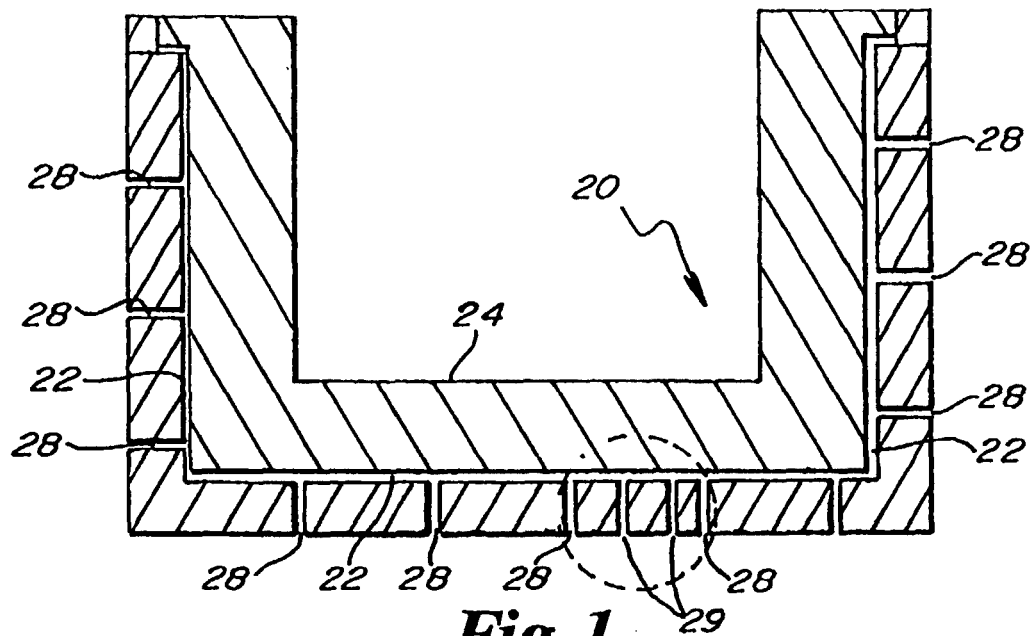


Fig. 1.

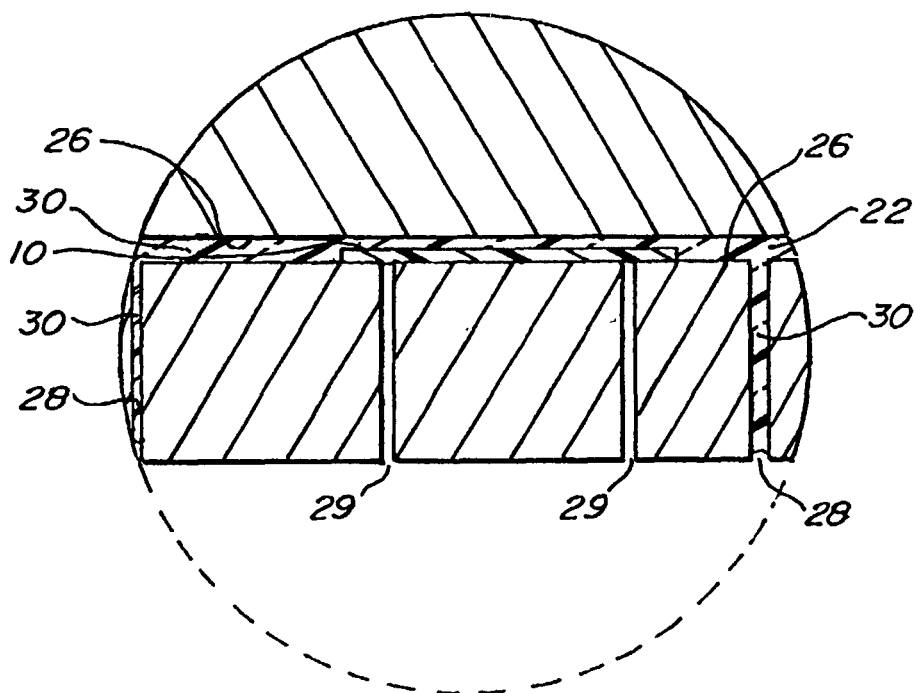
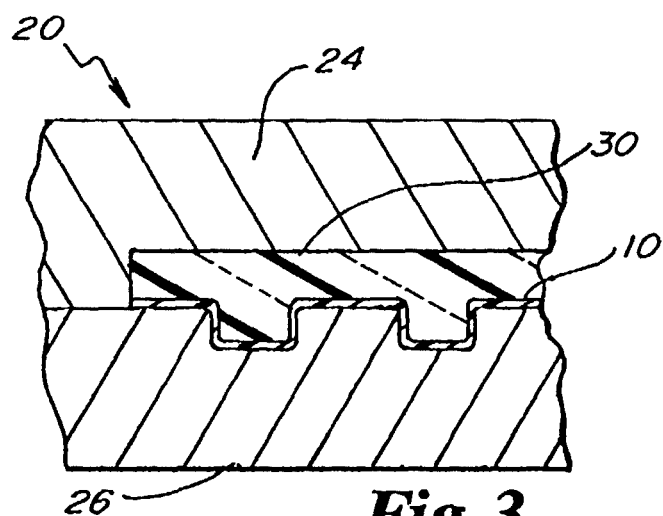
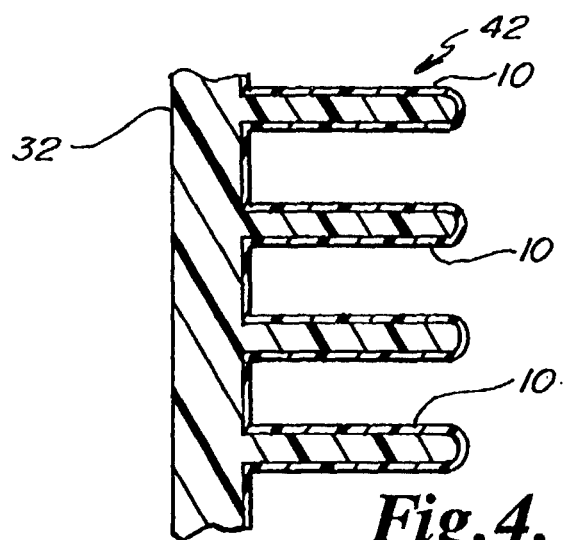
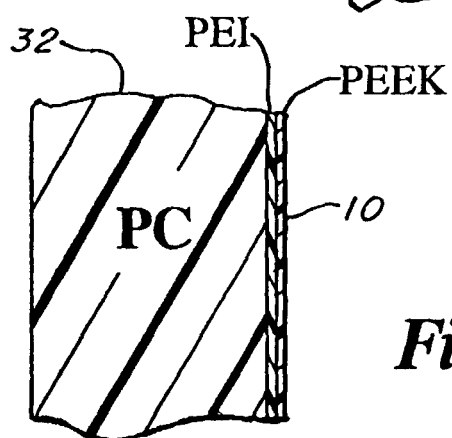


Fig. 2.

**Fig. 3.****Fig. 4.****Fig. 5.**

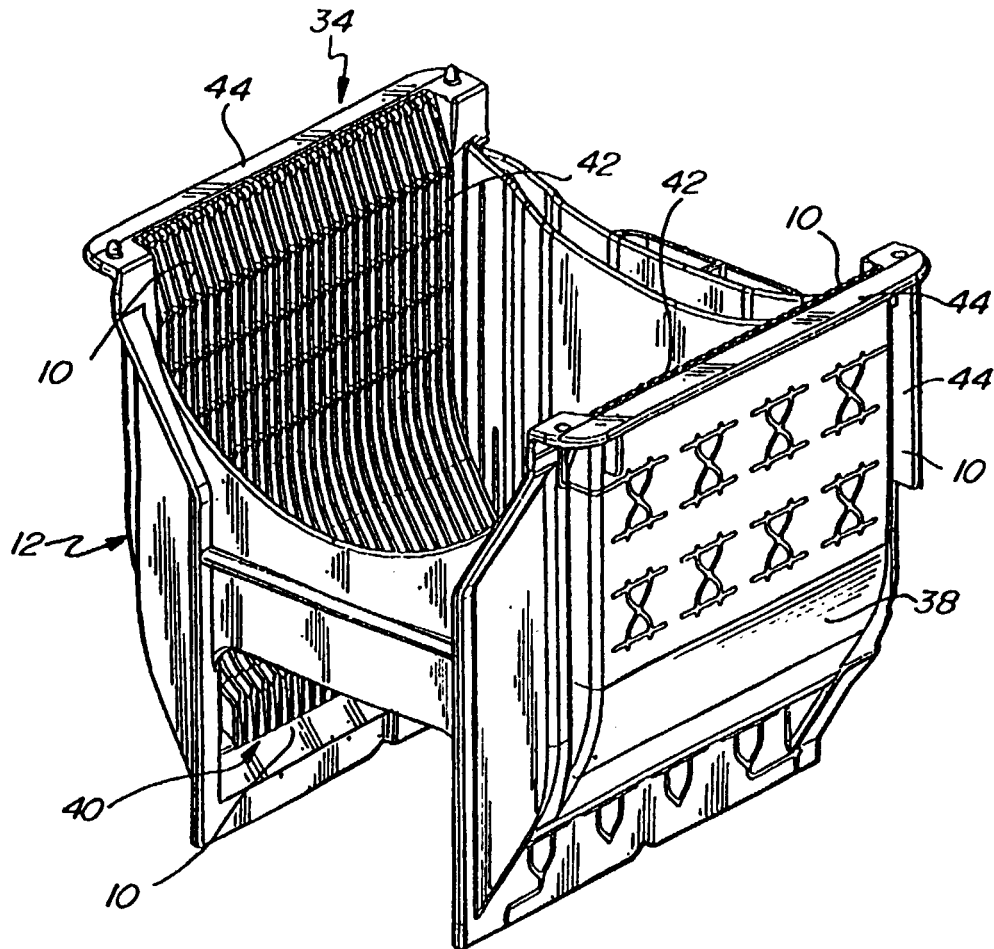
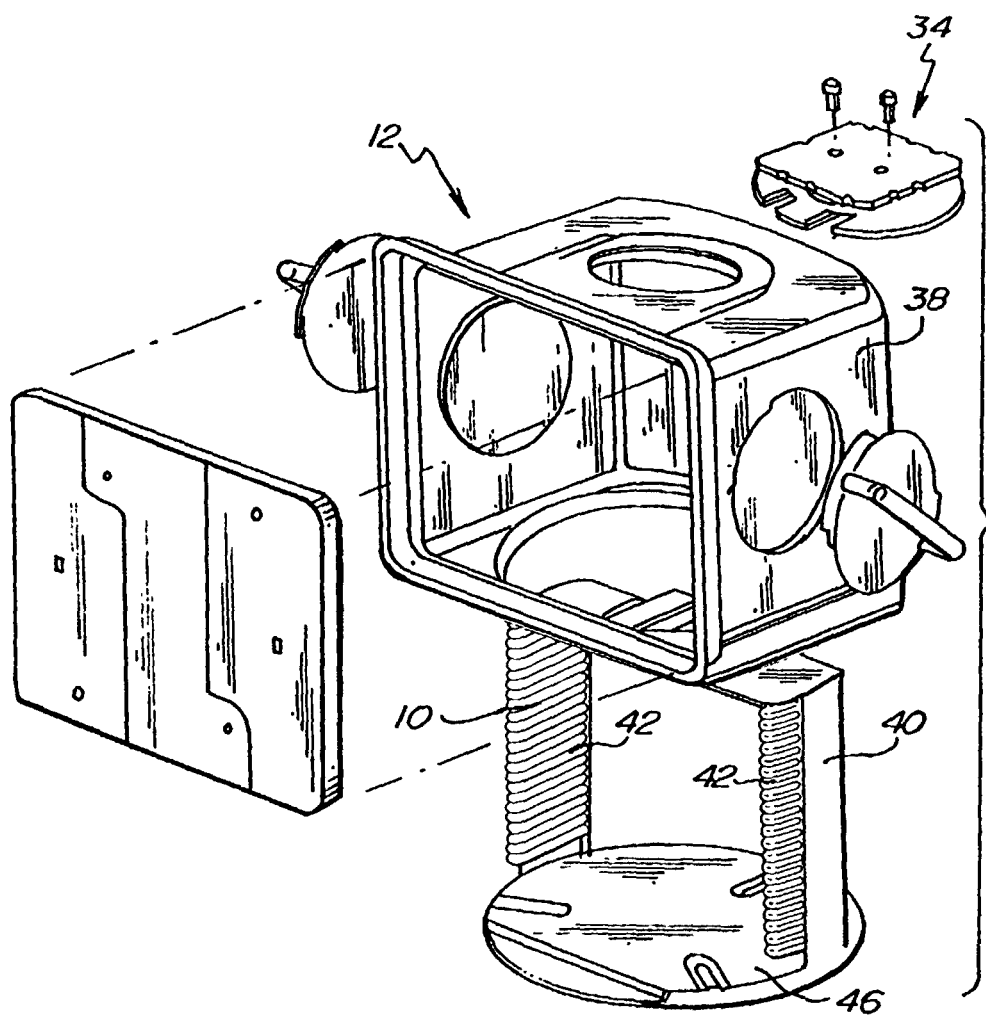


Fig. 6.

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*Fig. 7.*

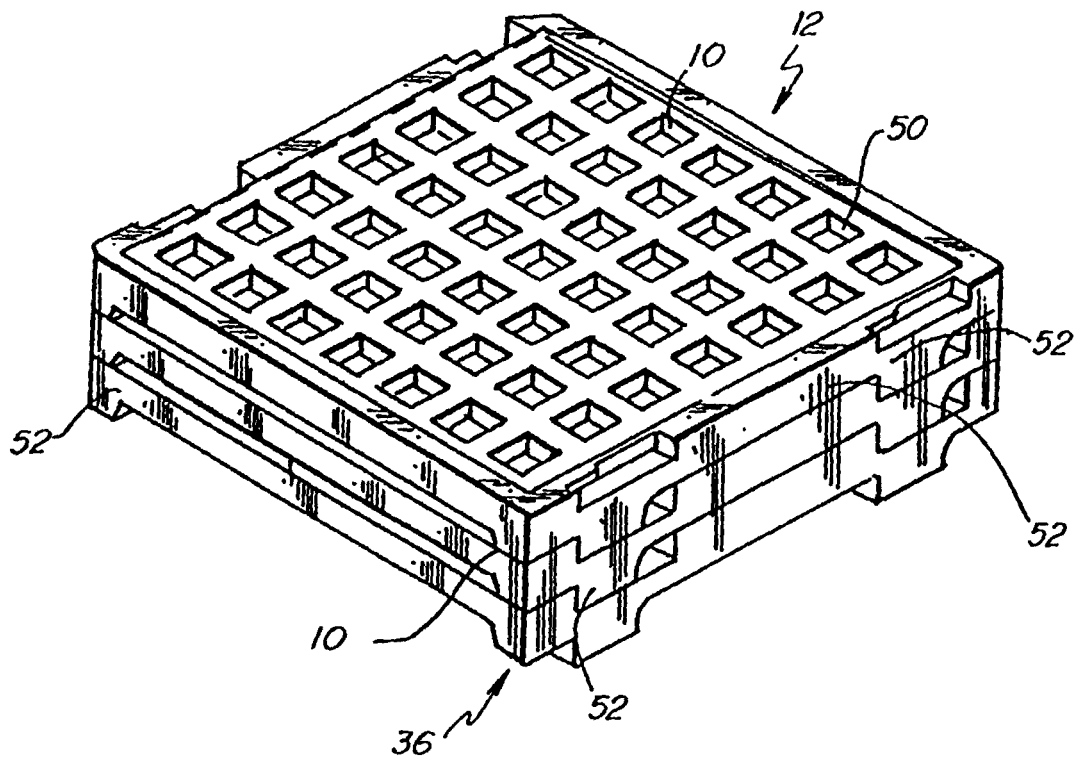


Fig. 8.

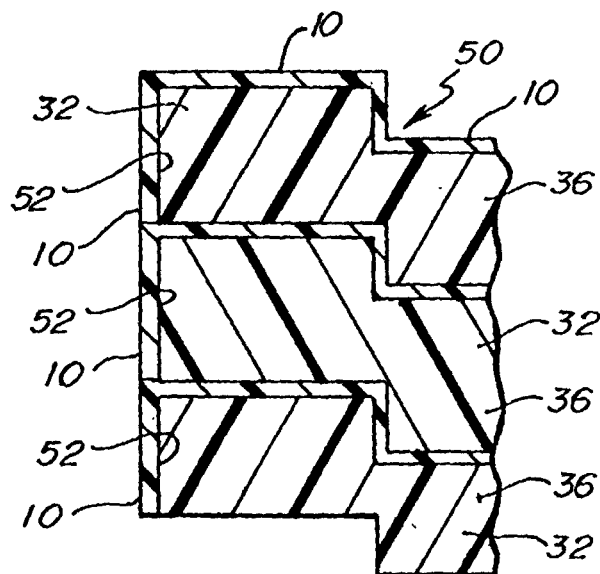


Fig. 9.