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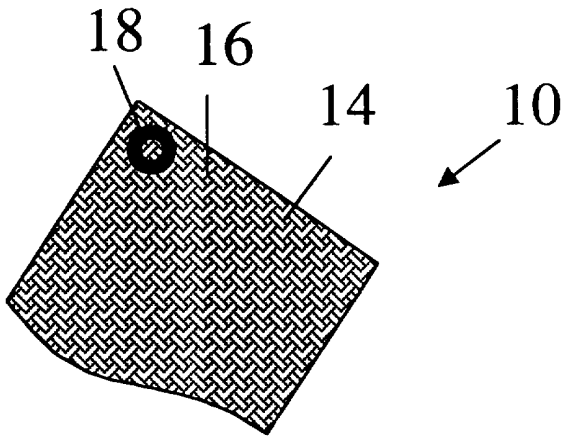
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(54) Title: IONIZING WIPER



(57) Abstract: An ionizing wiper for removing static charge from a substantially insulative surface. The wiper is made of wiping material with a high density of ionizing points being disposed along the surface of the wiper such that the air between the ionizing points and an object is sufficiently ionized to remove static charge from the object.

IONIZING WIPER

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims priority of Provisional Application Number 60/204,268, entitled IONIZING ANTISTATIC WIPER filed on May 15, 2000, and which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

The present invention relates to static control devices, and particularly relates to wiping cloths providing control of static charge buildup.

Wiping of plastic, glass, and other substantially insulative surfaces to remove particles of dust and dirt may result in a buildup of static charge on the surface of the material, which re-attracts the particles to the surface. Re-attraction of dust and dirt particles to surfaces such as photographic film, computer monitor screens, acrylics, and other common polymeric materials can result in such problems as scratching of the surface from repeated wiping of computer screens, visual defects in picture framing, or dust spots on photo enlargements.

Conventional antistatic wipers use conductive yarn or treatments to change their surface resistivity. However, the resistivity of the wiper is not related directly to the reduction of static charge on an insulative surface because by definition, an insulator cannot be grounded. Many surfaces such as polymeric materials and glass are good insulators and tend to accumulate electrons on their surfaces. A conductive material can transfer electrons readily to such a surface when it is wiped. A grounded conductive, static dissipative, or anti-static surface is not able to consistently remove static from an insulative surface. This concept is described more fully in U.S. Patents Nos. 5,501,899, 5,690,014, and 5,740,006, all by the same inventor as the present application and incorporated herein by reference. This concept is important in

the understanding of the present invention and the differences between the wiper described herein and conventional wipers.

Accordingly, it is an object of the present invention to provide an ionizing wiper that overcomes the disadvantages of the prior art.

It is another object of the invention to provide an ionizing wiper that combines the characteristics of a conventional wiper with at least one wiper portion that uses ionizing points at the surface of the wiper.

SUMMARY OF THE INVENTION

The present invention is an ionizing wiper for removing static charge from a substantially insulative surface comprising a cloth, being made of ordinary wiping material, and a plurality of ionizing points being disposed on said cloth defining an ionizing wipe area. The plurality of ionizing points being of sufficient density such that air between said plurality of ionizing points and an object is sufficiently ionized to remove static charge from the object.

For a better understanding of the present invention, together with other and further objects thereof, reference is made to the accompanying drawings and detailed description and its scope will be pointed out in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a pictorial view of an ionizing antistatic wiper in accordance with one embodiment of the present invention;

Figure 2 is a top view of a portion of the wiper of Figure 1, showing a pattern of ionizing strands exposed on one surface of the wiper;

Figure 3 illustrates a pictorial section of prior art ionizing strand including soft fibers twisted together with electrically conductive microfibers having a multiplicity of ionizing points provided by ends of and bends in each microfiber; and

Figure 4 is a top view of a portion of an ionizing wiper in accordance with another embodiment of the present invention, showing a pattern of ionizing strands at the periphery of one side of the wiper;

Figures 5, 6, 7a, 7b, 7c, 7d, and 7e are top views of portions of the ionizing wiper in accordance with alternate embodiments of the invention.

Figure 8 is a schematic of the grounding/ionization neutralization circuit.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In one exemplary embodiment, an ionizing wiper includes a cloth with two wiping surfaces that have different characteristics. One wiping surface of the cloth exhibits the characteristics of an ordinary wiping cloth for a particular application, e.g., a photonegative, a computer screen, or a polymeric material. The opposite surface of the cloth is an ionizing static control surface incorporating a multiplicity of ionizing points, preferably provided by one or more ionizing static control strands or ionizing static control cords (discussed in detail below). An surface, substantially insulative, may be wiped with the conventional side of the cloth, and then the cloth may be reversed to rewipe the surface with the ionizing static control surface for removal of the static charge built up during the conventional wiping.

Referring now to FIGS 1,2, and 3, ionizing wiper 10 in accordance with one embodiment of the present invention includes conventional wiping surface 12 and opposite, ionizing wiping

surface 14. Conventional wiping surface 12 may be e.g., woven of a soft yarn such as cotton, nylon, or other conventional wiping cloth material selected for a particular application. Ionizing wiping surface 14 includes ionizing static control strand 16, e.g., woven into the wiper material to be exposed only on the ionizing surface 14. Ionizing static control strands 16 are electrically interconnected with one another and with connector 18. Connector 18, in turn, may be electrically connected by conventional means to ground for static removal, or to a source of electrical power for static neutralization, as illustrated in FIG 8.

A magnified cross-section of an ionizing static control strand 16, as described in U.S. Patent No. 5,690,014, incorporated by reference herein, that is used in all wiper embodiments, is illustrated in FIG 3. The ionizing static control strand 16 includes soft fibers 19 twisted together with a multiplicity of electrically conductive microfibers 20 in electrical communication with one another. The softer fibers 19 most preferably account for approximately 2/3 of the surface of each ionizing static control strand 16, and also provide a non-abrasive surface to prevent scratching of the wiped surfaces. The electrically conductive microfibers 20 provide a multiplicity of ionizing points 22 at the ends and at the bends of the electrically conductive microfibers 20. Therefore, a multiplicity of ionizing points 22 are disposed along the length of the ionizing static control strand 16 and exposed at or extending minimally above the outer surface 23 of the ionizing static control strand 16.

In a preferred embodiment, the ionizing surface 14 includes in its weave a pattern of the above-described ionizing static control strands 16 exposed at that surface. Where the ionizing static control strand 16 are to be effective over an entire surface of the wiper 10 (FIG 2), the weave is selected to expose the ionizing static control strand 16 at only one wiping surface. In either embodiment, a significant portion of the

ionizing wiper 10 provides a conventional, non-static removal surface for conventional wiping.

The electrically conductive microfibers 20 of each ionizing static control strand 16 in the above-described pattern are in electrical contact with one another to form a network of ionizing points 22. Thus, when this network is electrically grounded (or, alternatively electrically charged), air between the ionizing points and a surface adjacent to or contacting the ionizing surface or portion of the wiper is sufficiently ionized to remove static charge from the surface being wiped.

The electrically conductive microfibers 20 of the ionizing static control strand 16 typically are about 0.5 to 50 microns in diameter and about 2 - 8 cm long. The electrically conductive microfibers 20 of a diameter less than 40 microns are greatly preferred to prevent scratching of the surfaces on which they are used. Preferred conductive materials for the electrically conductive microfibers 20 include carbon, metal-coated carbon, copper, stainless steel, metal-coated acrylic, metallized acrylic, or electrically conductive polymers.

In the preferred embodiment, the ionizing static control strand 16 is adapted to be grounded or electrically charged (FIG 8). One grounding method electrically connects the connector 18 to a wire or coiled wire or an extension of the ionizing cord (to be discussed below), to a conventional grounding means, e.g., by draping a length of wire or ionizing cord to contact a grounded surface. The connector 18 is in electrical communication with the network of ionizing points 22, thereby transferring the ionized particles to ground. Alternatively, an electric charge can be passed in the opposite direction to neutralize the static charge at the insulating surface.

In applications in which the charge is minimal, the grounding means may be the human operator, who may act as an ungrounded reservoir for the charge. Alternatively, the

operator may be conventionally grounded, e.g., using a heel or wrist strap.

The description below of various illustrative embodiments shown in the Drawings refers to embodiments similar to those described above. However, it is not intended to limit the scope of the present invention, but merely to be illustrative and representative thereof.

In an alternative embodiment the ionizing static control strand 116 is only disposed along the periphery, as illustrated in FIG 4. The weave of ionizing static control strand 116 may be a conventional weave selected to expose the ionizing static control strand 116 at both wiping surfaces or only one wiping surface. FIG 4 shows the ionizing static control strands 116 exposed only at the outer surface 124 of the wiper 110. The ionizing static control strand 116 may be exposed at one or more outer surfaces 124 of the wiper 110, and at one or both sides of the wiper 110. The wiper 110 includes ionizing static control strand 116 at the outer surface 124 of wiper 110, while central portion 128 includes no ionizing strands 116. Central portion 128 of wiper 110 may be, e.g., woven of the soft yarns as described above. Wiper 210 may be grounded or connected to a source of electrical power via connector 218, as described above.

Alternatively, the electrically conductive microfibers 220 described above may be directly attached to a wiper surface or portion using an electrically conductive adhesive material, as illustrated in FIG 5. In this embodiment, the wiper 210 may be fabricated from a woven or non-woven material. Wiper 210 includes wiper base 212 of a conventional wiper material. Layer 230 of a conductive adhesive bonds electrically conductive microfibers 220 to wiper base 212 in such a way that a multiplicity of ionizing points 222 is provided at only one wiping surface 214 of wiper 210. Wiper 210 may be grounded or connected to a source of electrical power via connector 218, as described above.

In yet another alternative embodiment 310 illustrated in FIG 6, electrically conductive microfibers 320 are included in a felted, e.g., by known flocking methods, or equivalent material in such a way as to expose the multiplicity of ionizing points 322 at only one wiping surface of the wiper or only at all or part of the periphery of one or both wiping surfaces. Wiper 310 is fabricated from soft fibers 328 and electrically conductive microfibers 320 matted together to form non-woven fabric 312. The wiper 310 is fabricated in such a way that electrically conductive microfibers 320 are exposed at only one wiper surface 314, providing ionizing points 322 (as described above in FIG 3) exposed at that one surface 314 of the wiper 310. Wiper 310 may be grounded or connected to a source of electrical power via connector 318, as described above.

Alternatively, a surface 412 of the wiper 410 includes a pattern of small diameter ionizing cords 426, each fabricated by braiding or twisting together a plurality of ionizing static control strand 16, at least one of which is an above-described electrically conductive microfibers 20. These ionizing cords 426 are described in Patent 5,690,014 and herein incorporated by reference. A multiplicity of the ionizing points 22 (same as shown in FIG 3) of the one or more ionizing static control strand 16 (same as shown in FIG 3) of each ionizing cords 426 are disposed along the length of the ionizing cords 426 and are exposed at or extend minimally above the outer surface of the ionizing cords 426. FIGS 7a, 7b, 7c, 7d, and 7e illustrate examples of wipers 410 with a varying array of patterns.

In all alternative embodiments utilizing ionizing cords 426, an ionizing cord 426 is stitched or otherwise attached along a conventional wiping surface 412 (FIGS 7a, 7b, and 7d) or a ionizing wiping surface 414 (FIG 7c, 7e) with ionizing points 422. Wiper 410 may be grounded or connected to a source of electrical power via connector 418, as described above. The ionizing cord 426 can be stitched or otherwise attached to the wiper 410 in a variety of patterns providing the density of

ionizing points are sufficient to ionize the charged particulars on the surface of the substantially insulative object, including the outer surface 424, the central portion 428, and the edges 430, as illustrated in FIG 7a.

MODE OF OPERATION

Below are two examples of typical modes of operation of the present invention. These examples are presented for illustrative purposes and are not intended to limit the invention.

Before painting a plastic car part it is wiped with clean tack wipers to remove dust particles. The operator utilizes the ionizing wiper during final inspection to remove any remaining dust particles and to remove the residual static charge caused by the wiping itself. The conventional soft fibers of the ionizing wiper collect the remaining particles and the residual charge ionizes to the conductive microfiber points on the ionizing portion. The ionized charge is carried across the conductive microfiber network to the grounding connection and to ground via a ground wire or cord.

An operator is examining the surface of a photographic negative before exposing it to light in order to form an enlarged image onto photo paper. She wipes the surface of the negative first with the conventional, soft fiber surface of the Ionizing wiper to remove any dust and dirt and then allows the negative to pass near the ionizing surface portion to remove the residual static charge. The surface static charge ionizes to the conductive microfiber points of the ionizing portion and the ionized charge is carried across the conductive network to her body that acts as ground. The negative is free of dust and dirt and has lower residual static charge. Thus it does not re-attract dust or lint particles as it is being exposed onto the photo paper.

The invention described herein presents to the art a novel, improved wiper which includes a surface or portion exhibiting ionizing microfiber points for efficient static removal from wiped surfaces. The surface or portion is conveniently included as part of a conventional wiper, so that no exchange of wipers is required to effect static charge removal. Fabrication of the wiper is sufficiently low-cost to provide a wiper that is disposable when it becomes dirty or contaminated.

While there has been shown and described what are at present considered the preferred embodiments of the invention, it will be apparent to those skilled in the art that modifications and changes can be made therein without departing from the scope of the present invention.

What is claimed is:

Claims

1. An ionizing wiper for removing static charge from an surface, said wiper comprising,

a cloth having at least one surface; and

an ionizing point network, said ionizing point network including a plurality of electrically interconnected ionizing strands having a plurality of ionizing points, said plurality of electrically interconnected ionizing strands being connected to said at least one surface, whereby air between said ionizing points adjacent to the surface is sufficiently ionized to remove static charge from the surface.

2. The ionizing wiper as recited in claim 1, wherein said ionizing point network is interwoven into said at least one surface.

3. The ionizing wiper as recited in claim 1, wherein said ionizing point network is glued to said at least one surface.

4. The ionizing wiper as recited in claim 1, wherein said ionizing point network is an ionizing cord, said ionizing cord being stitched into said at least one surface.

5. The ionizing wiper as recited in claim 1, wherein said wiper is made from material selected from a group consisting of cotton, nylon, other conventional wiping material, and combinations thereof.

6. An ionizing wiper comprising,

a plurality of soft fibers; and

a plurality of electrically conductive microfibers having a plurality of ionizing points, said plurality of electrically conductive microfibers and said plurality of soft fibers being joined together to form a fabric, whereby air between said

ionizing points adjacent to an surface is sufficiently ionized to remove static charge from the surface.

7. The ionizing wiper as recited in claim 6, wherein said non-ionizing points being exposed on at least one side of said fabric.

8. The ionizing wiper as recited in claim 6 further comprising a connector, said connector being electrically connected to said plurality of electrically conductive microfibers, whereby static charge is transferred from said electrically conductive microfibers to ground.

9. The ionizing wiper as recited in claim 6, wherein said fabric is woven.

10. The ionizing wiper as recited in claim 6, wherein said fabric is non-woven.

11. An ionizing wiper for removing static charge from an surface, said wiper comprising,

a cloth being made of ordinary wiping material, said cloth including at least one outer surface, at least one wiper surface, and at least one edge; and

a plurality of ionizing points, said plurality of ionizing points being disposed on said cloth, said plurality of ionizing points being of sufficient density such that air between said plurality of ionizing points and the insulative surface is sufficiently ionized to remove static charge from the insulative surface.

12. The ionizing wiper as recited in claim 11, wherein said plurality of ionizing points are disposed on said at least one outer surface.

13. The ionizing wiper as recited in claim 11, wherein said plurality of ionizing points are disposed on said at least one wiping surface.

14. The ionizing wiper as recited in claim 11, wherein said plurality of ionizing points are interwoven into said at least one wiping surface.

15. The ionizing wiper as recited in claim 11, wherein said plurality of ionizing points are adhered to said at least one wiping surface.

16. The ionizing wiper as recited in claim 11, further comprising at least one ionizing cord, wherein said plurality of ionizing points are disposed on said at least one ionizing cord, said at least one ionizing cord being fabricated with a plurality of microfibers including said plurality of ionizing points, said at least one ionizing cord being stitched into said at least one outer surface.

17. The ionizing wiper as recited in claim 16, wherein said ionizing cord is stitched into said at least one edge.

18. The ionizing wiper as recited in claim 16, wherein said ionizing cord is stitched into said at least one wiping surface.

19. The ionizing wiper as recited in claim 11, wherein said wiper further comprises grounding means for transferring ionized particles to ground.

20. The ionizing wiper as recited in claim 19, wherein said grounding means includes a grounding connector fixedly attached to said wiper.

21. The ionizing wiper as recited in claim 20, wherein said grounding means further includes a grounding coil wire removeably attached to said grounding connector.

22. The ionizing wiper as recited in claim 20, wherein said wiper further comprises electrical charging means for neutralizing static charge at the surface, said electrical charging means is removeably attached to said grounding connector.

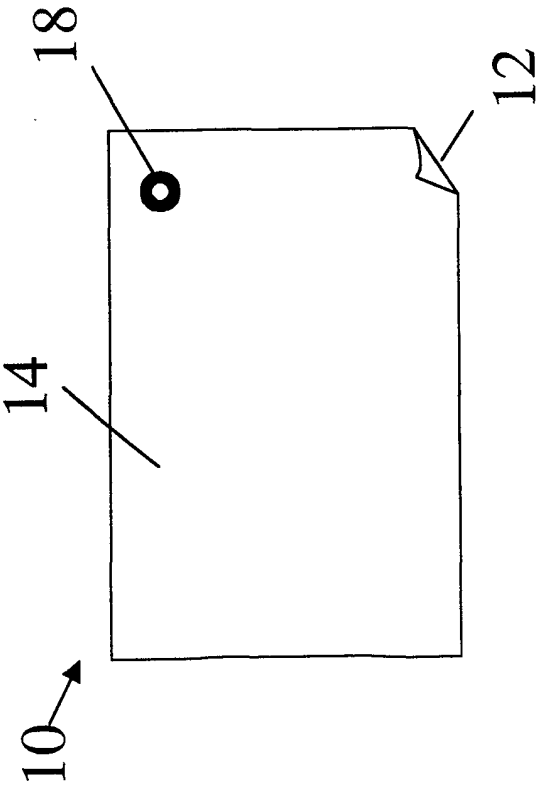


FIG 1

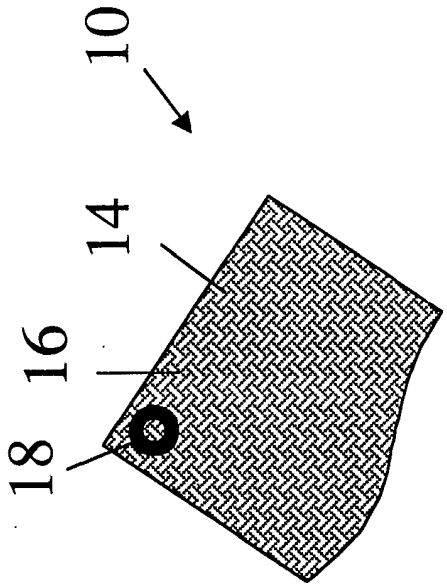


FIG 2

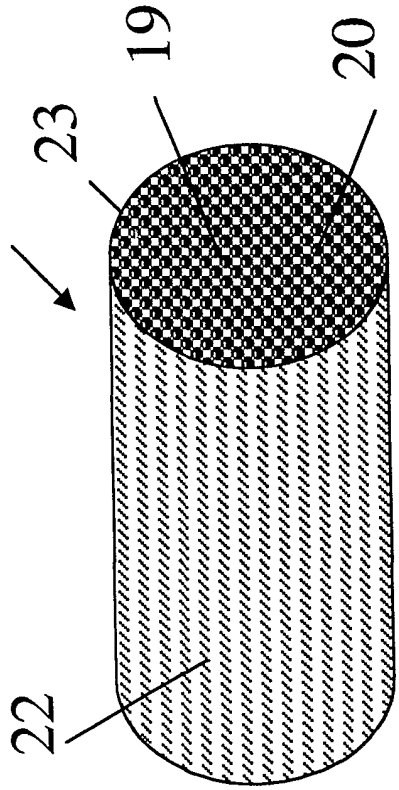


FIG 3
(PRIOR ART)

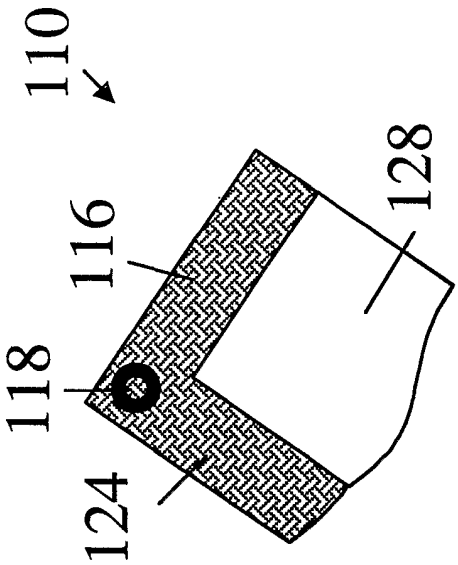


FIG 4

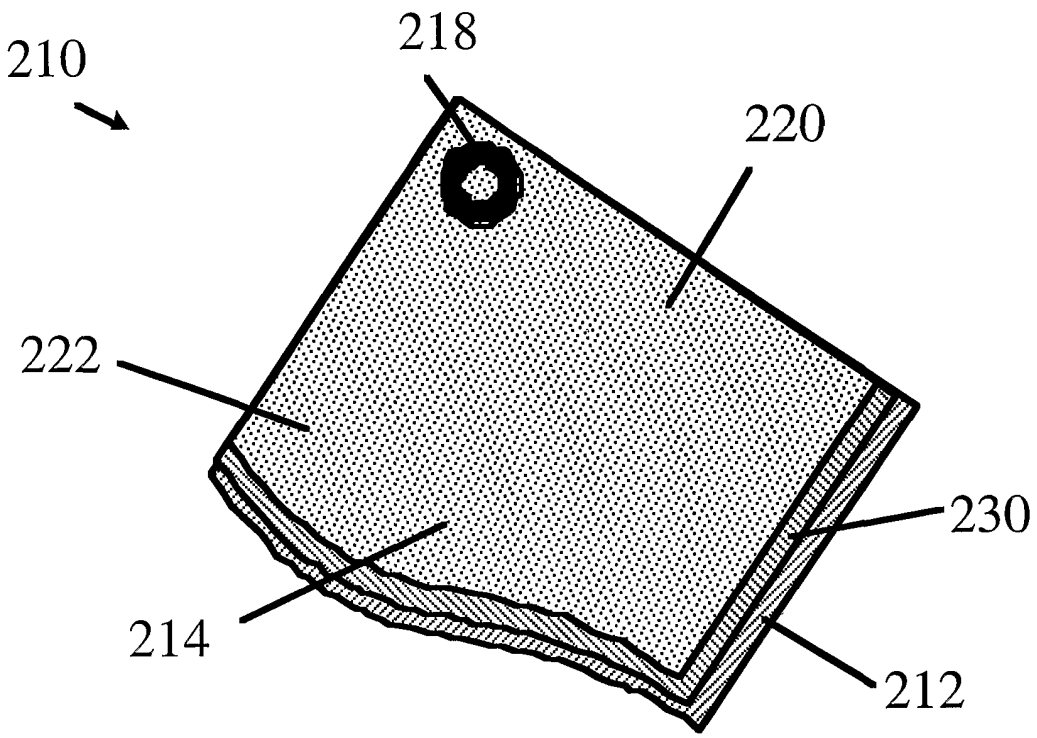


FIG 5

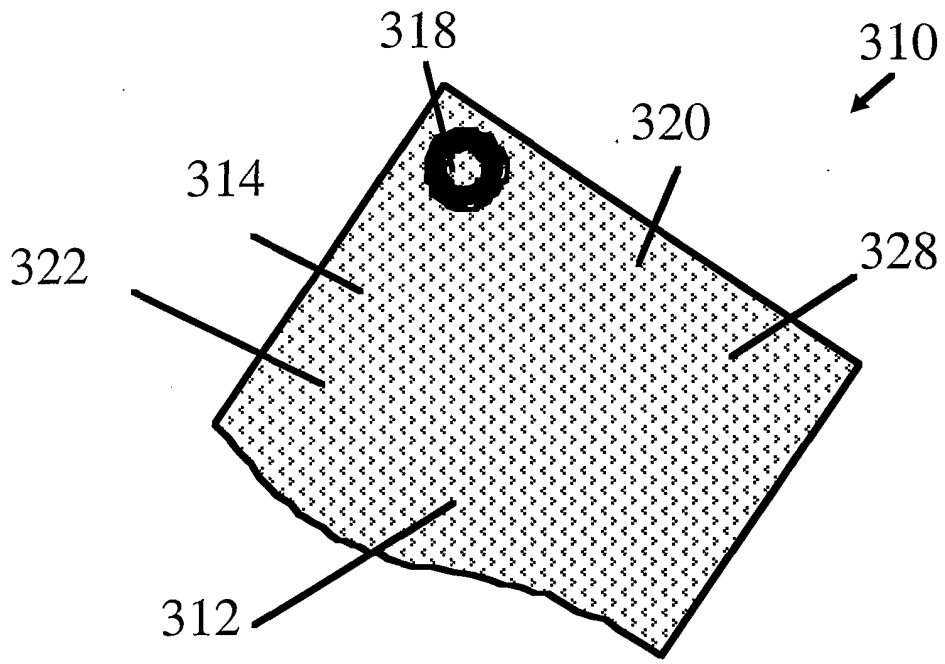


FIG 6

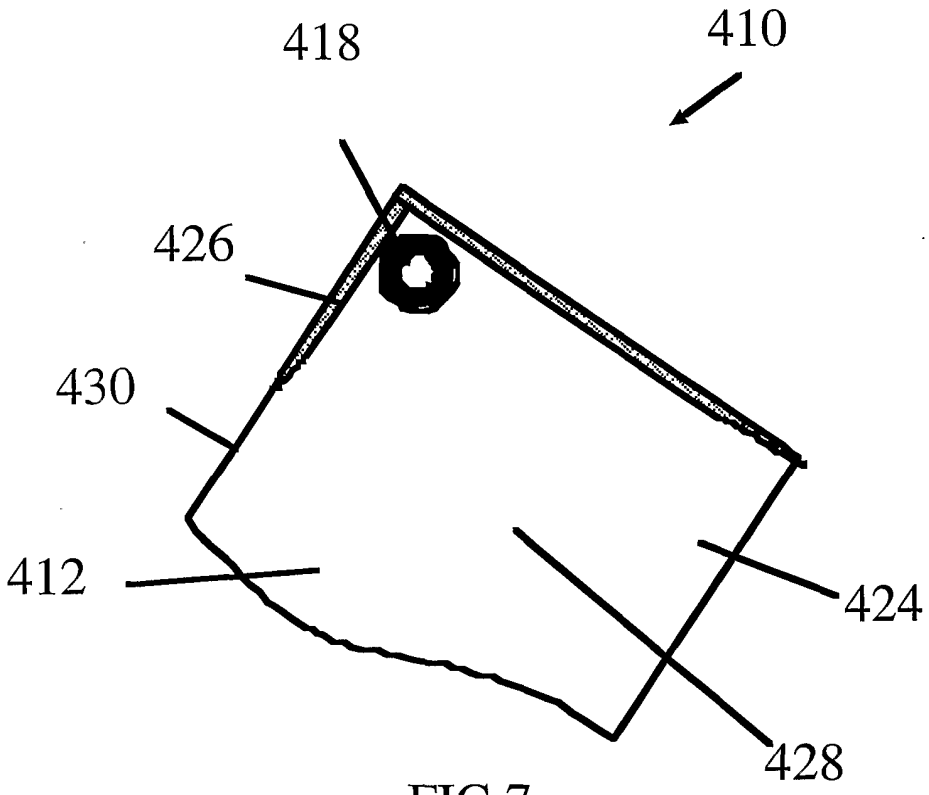


FIG 7a

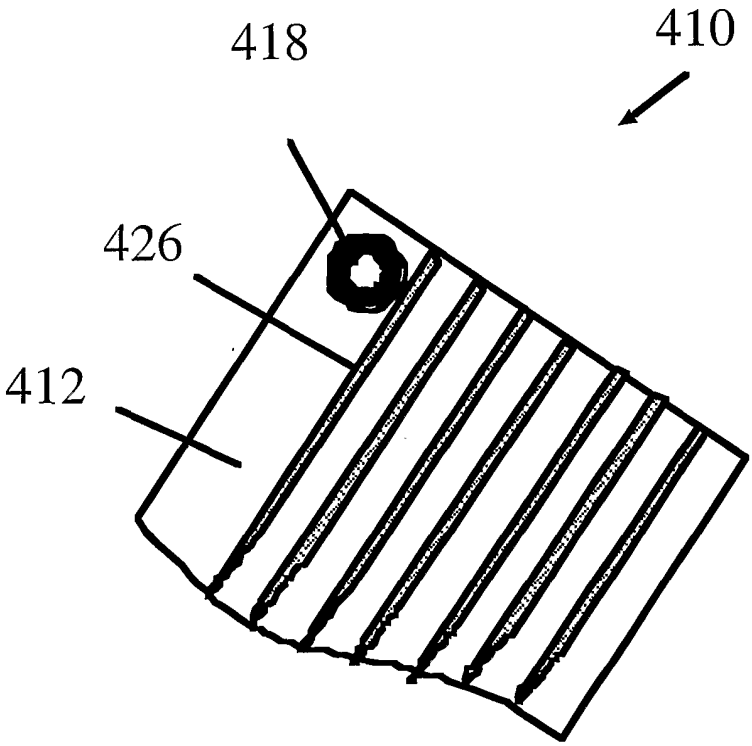


FIG 7b

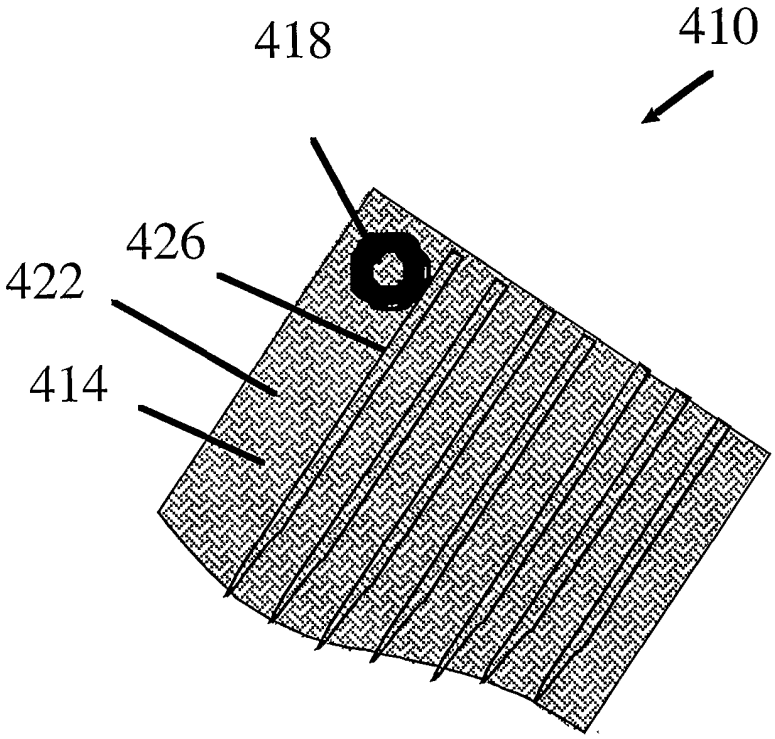


FIG 7c

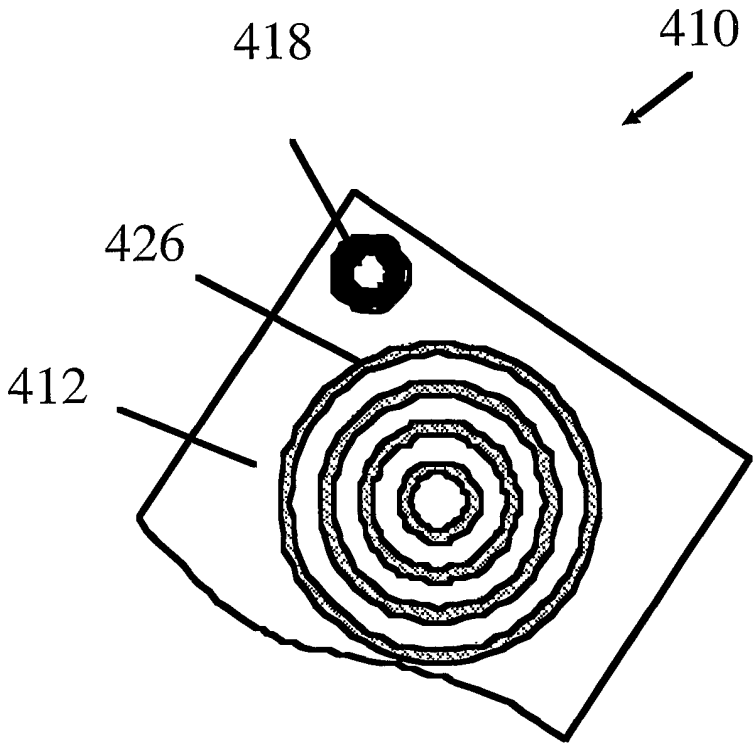


FIG 7d

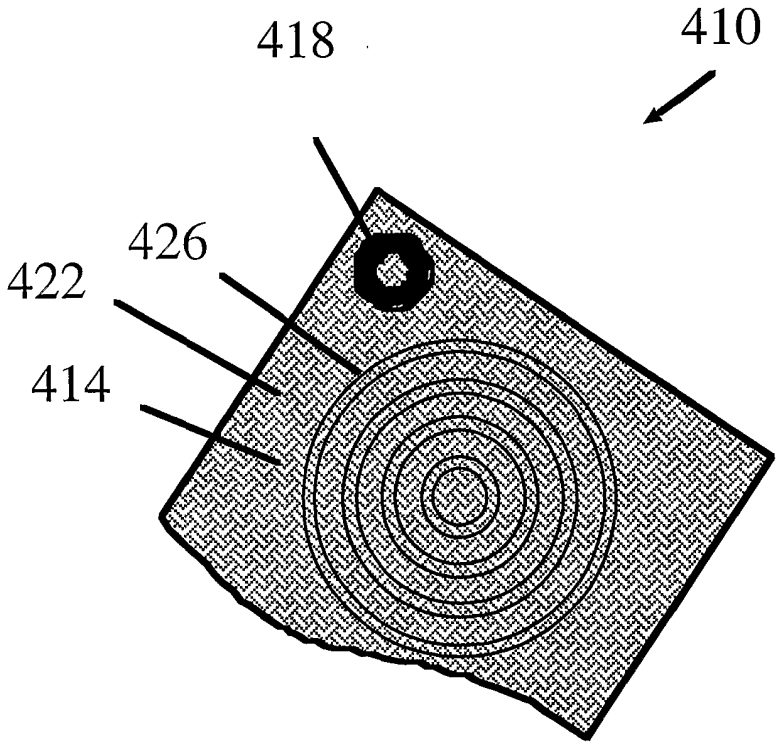


FIG 7e

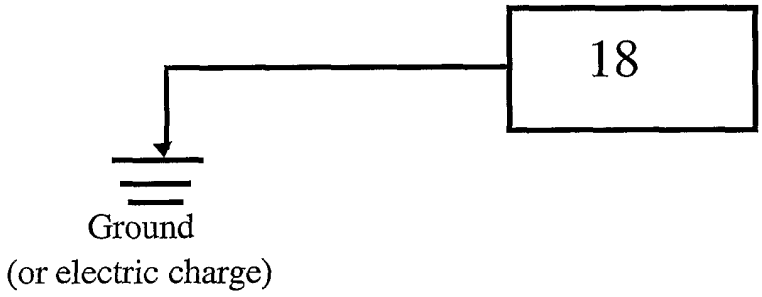


FIG 8