

[54] **SPRING MEANS**

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[57] **ABSTRACT**

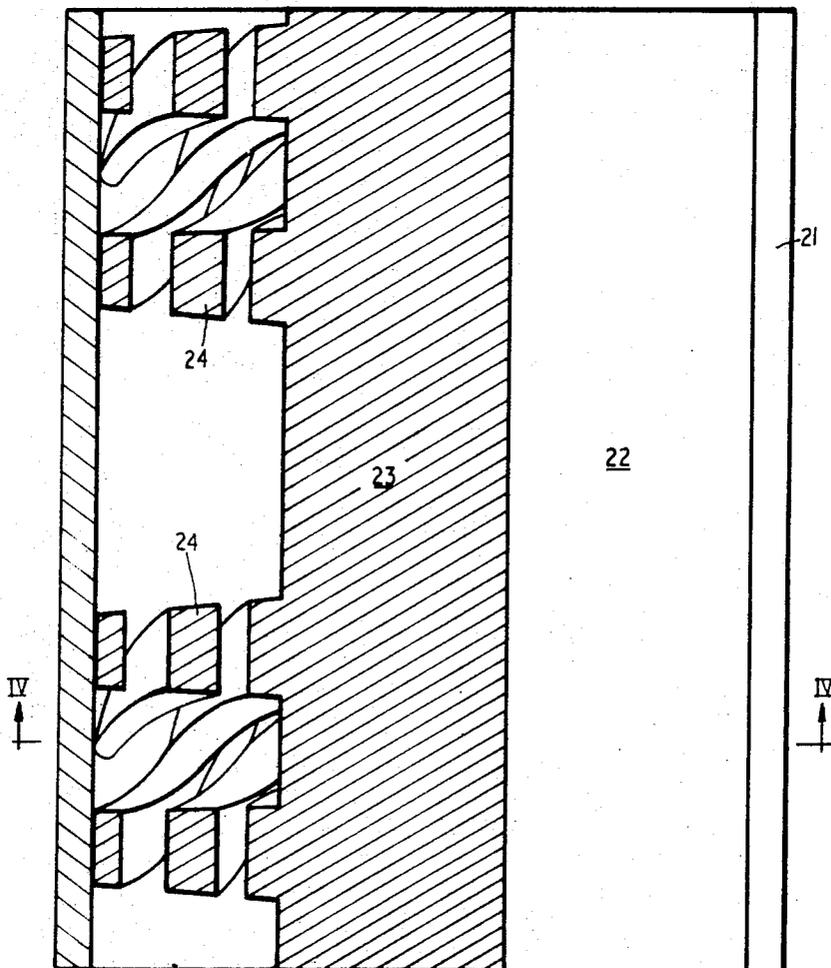
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A spring means formed integrally with a base the spring means consisting of a number of leaves projecting from the base at spaced intervals around a point, the leaves being all angularly inclined to the base and extending along helical paths in the same direction and being arranged so that spaces are left between them in an axial direction. It is preferred that the base and the leaves are moulded together for example, by injection moulding from a synthetic plastic material. The spring means are of general applicability but have a special application in connection with aerosol valves.

[52] **U.S. Cl.**..... 267/180, 267/166
[51] **Int. Cl.**..... **F16f 1/06**
[58] **Field of Search** 267/180, 161, 159, 166

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7 Claims, 7 Drawing Figures



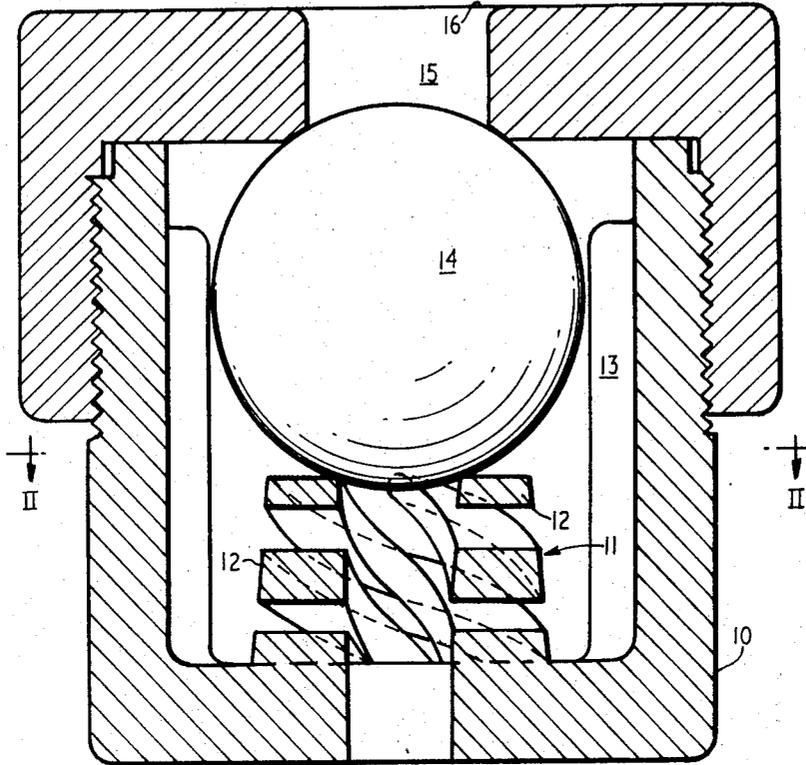


FIG. 1

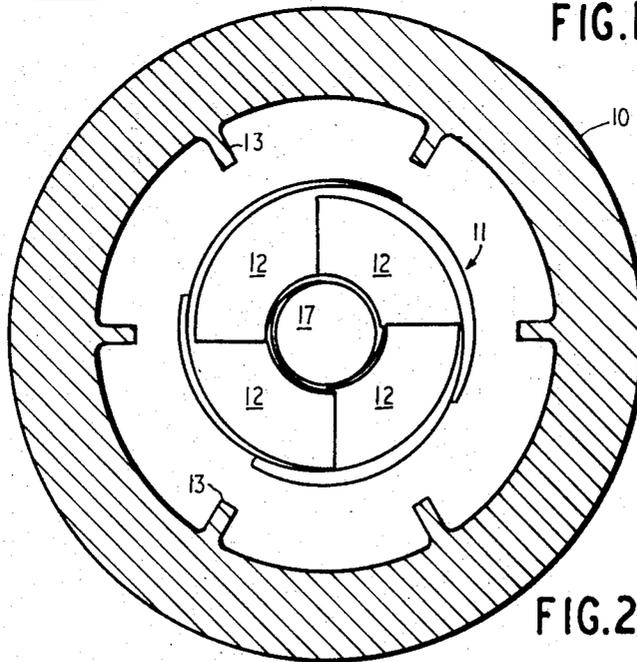


FIG. 2

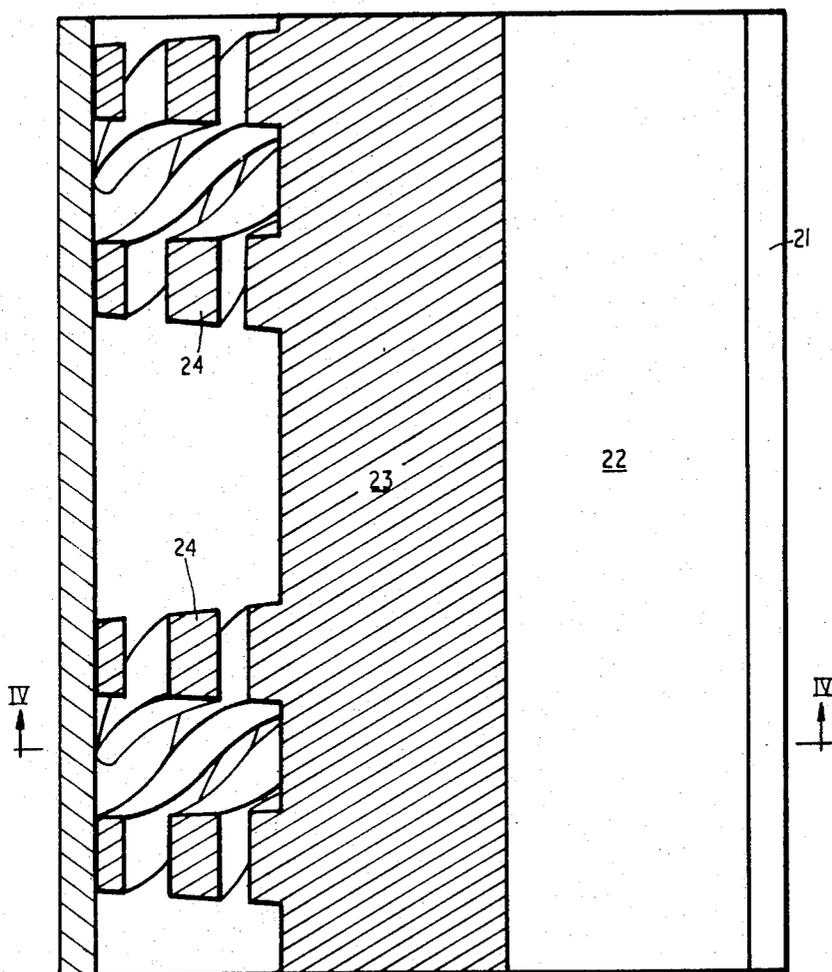


FIG. 3

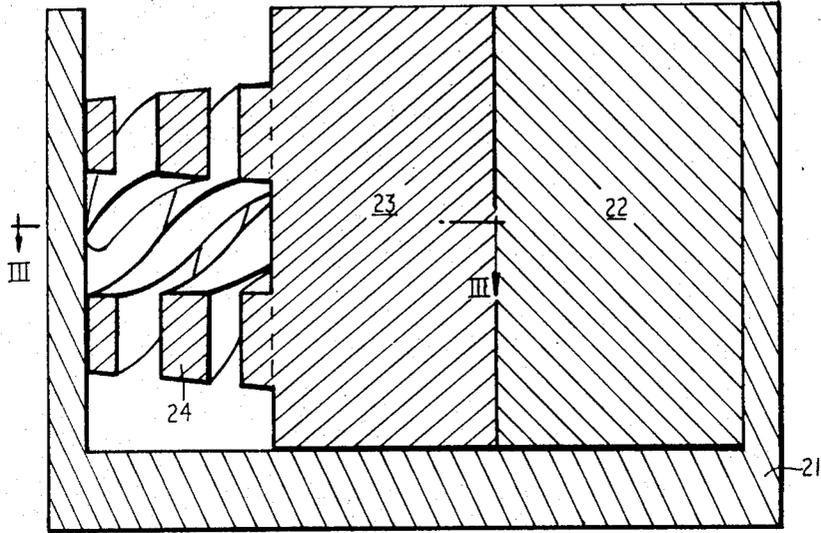


FIG.4

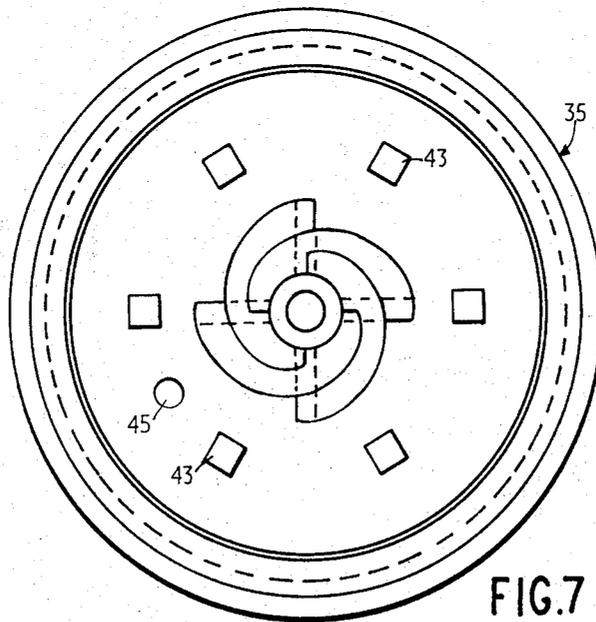


FIG.7

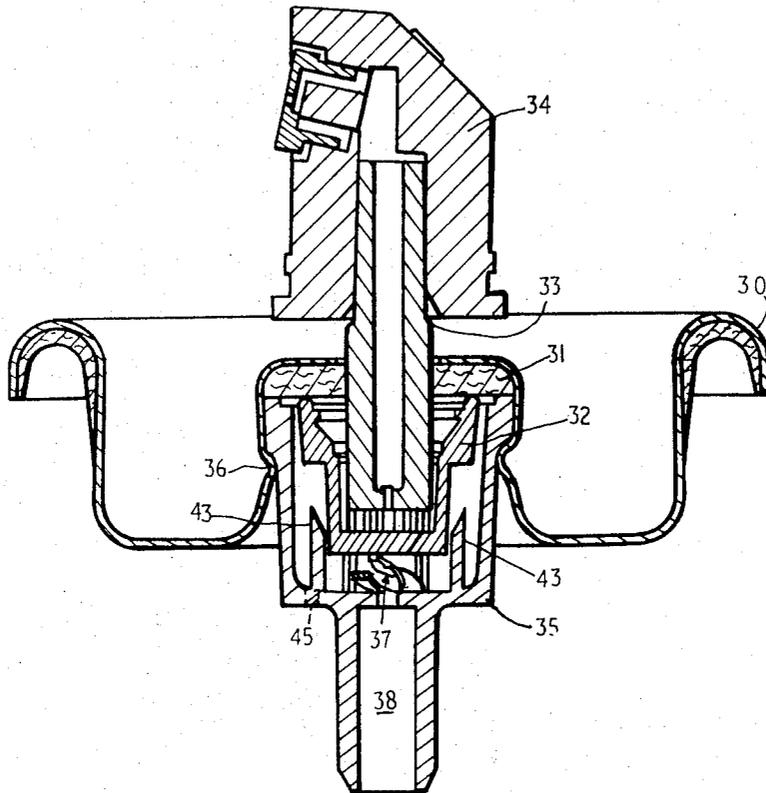
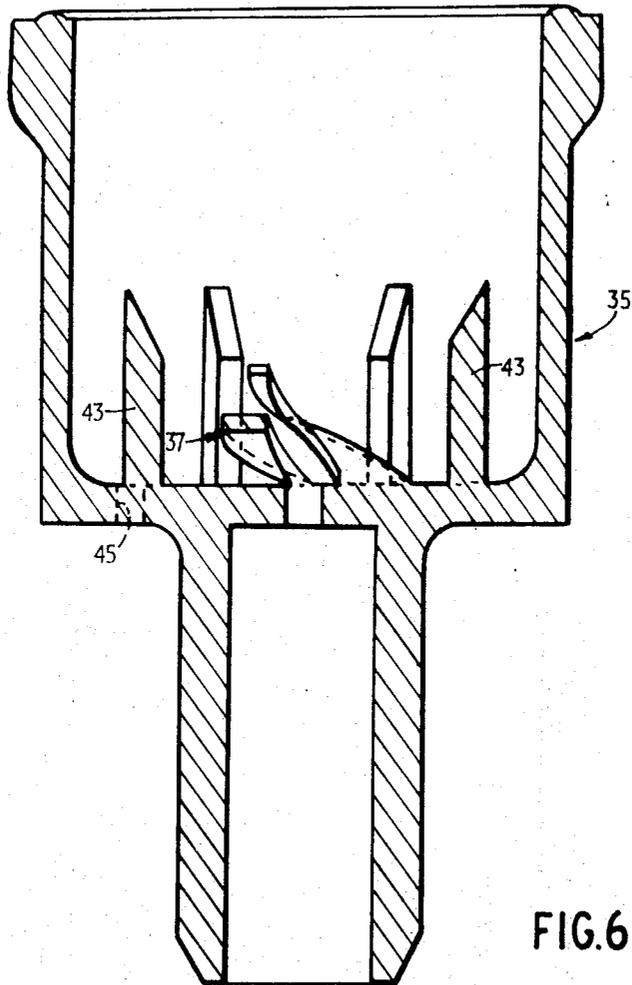


FIG. 5



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SPRING MEANS

This invention relates to spring means, and more particularly to means for the transfer of resilient pressure between two members, as between two relatively displaceable parts of a device.

Spring means of this type are used in many devices such as check valves and in any situation in which one part is mounted for limited resilient movement relative to another part. A particular application, referred to below in more detail, is in relation to aerosol valves.

For many uses, especially in aerosol valves, it is of great advantage if such spring means not only possess the necessary resilience but are resistant to corrosion and can be manufactured inexpensively.

It was previously proposed to replace the conventional metal spring in aerosol valves by a single, centrally arranged substantially pin-like or conical element made of a resiliently deformable material, said element being preferably made to be integral with one of the relatively displaceable parts of the valve mechanism. Making the resiliently deformable element in one piece with one of said parts offered the additional advantage of simplifying the manufacture of the valve mechanism and, more particularly, its assembly.

While this construction proved to be feasible and advantageous, it was found nevertheless that the central element provided only a limited axial movement or displacement of the parts relative to each other.

The present invention provides a construction which permits the advantages achievable by the use of a thrust symmetrically disposed in relation to the axis of the sealing element of the valve, and also the use of a non-corrosive material in the construction of the spring means to be retained, and the further advantage of manufacturing said spring means integrally with one of the two relatively displaceable members, e.g., with one of the relatively displaceable parts of an aerosol valve.

The present invention consists in spring means which comprise a plurality of elastically deformable leaf elements formed integrally with a base, said leaf elements projecting from said base at spaced intervals around a point, the leaf elements being all angularly inclined to the base and extending along substantially helical paths of the same winding sense and being arranged to leave spaces between them in an axial direction.

In order that the invention may be better understood and put into practice a preferred form thereof is hereinafter described by way of example, with reference to the accompanying drawings in which:

FIG. 1 is a median sectional elevation of a check valve incorporating the invention,

FIG. 2 is a section on line II—II of FIG. 1,

FIG. 3 is a part sectional plan view on line III—III of FIG. 4 of a spring loaded sliding member in a housing,

FIG. 4 is a sectional elevation on line IV—IV of FIG. 3,

FIG. 5 is a sectional elevation of an aerosol valve incorporating the invention,

FIG. 6 is a sectional elevation to an enlarged scale of the shell of FIG. 5, and

FIG. 7 is a plan view of the shell.

The check valve shown in FIG. 1 consists of a housing 10 moulded from a plastic material by injection moulding. Moulded integrally with the housing 10 is

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the spring means 11 consisting of four individual leaves 12 each of which rises from the base of the housing in a helical path, the leaves as seen in plan following arcs of substantially concentric circles. As shown in FIG. 1 the leaves are spaced apart in an axial direction.

The housing and the leaves are moulded in a synthetic plastic material such as polypropylene, high-density, polyethylene, polyamides, polycarbonates, polyurethanes and acetates such as those sold under the Trade Marks "DELTRIN" or "CELCON."

The leaves may be arranged as close to each other as may be desired, as long as there are spaces left between them which make it possible for them to be independently deformed by a force or pressure applied thereto, at least a component of which acts perpendicularly to the base. It is not essential to use four leaves but preferably the leaves number at least three. The cross-sectional configuration of the leaves is optional and may be of any desired shape.

Although separate from each other, the leaves act nevertheless in a manner similar to that of a single coil spring, which means to say that by pressure exerted on the tips of the leaves, the latter can be deformed all at the same time, and moved towards the base through a distance substantially corresponding to that of a coil spring in which the spacing between consecutive windings corresponds to that between the individual leaves of the spring means according to the invention, when they are not subjected to pressure.

A special advantage of the novel spring means over a coil spring is the uniform application of the pressure caused by the thrust of each of a multitude of resilient parts symmetrically disposed around an axis, instead of the single off-centre thrust of the single-helix coil spring.

Ribs 13 are also moulded integrally with the housing 10 to guide the movement of a ball 14, which constitutes the valve member and seals in an aperture 15 in the cap 16, which screws to the housing 10. The check valve operates in a conventional manner to permit the flow of a liquid into the aperture 15 and out of the aperture 17 in the housing 10 but not in the reverse direction. From the constructional point of view the fact that the spring means is formed integrally with the housing, provides economic advantages in manufacture and assembly and in use the fact that the spring means may be readily moulded in a corrosion resistant material is advantageous.

In the construction shown in FIGS. 4 and 5 21 is a housing moulded, for example from plastic material, within the housing is a slide 22 which is free to slide longitudinally in the housing, being pressed lightly against the right hand wall of the housing by the pressure plate 23, under the influence of the spring means 24, which are moulded integrally with the pressure plate 23 and which bear on the left hand wall of the housing. The construction of the spring means 24 is the same as that of the spring means 11 of FIGS. 1 and 2.

The embodiment of the invention described above is given to illustrate the generality of its application. The slide 22 could, for example, constitute the slide of a slide projector or any other sliding member required to operate under similar circumstances.

From the embodiment described it will be appreciated that the invention may be applied in any situation

in which a moulded plastic member is required to be associated with spring means.

A very specific and advantageous application of the invention is in connection with aerosol valves and such an application is illustrated in FIG. 5.

The general construction of the valve shown in FIG. 5 is in the main well known, and it is therefore, necessary only to refer briefly to the main component parts to assist in an understanding of the present invention. The valve is attached to the opening of an aerosol container by means of the metal container cap 30, which contains within it a sealing disc, or gasket 31, against the underside of which the periphery of the cupped flange 32 seals. A discharge tube 33 extends into the interior of the cupped flange and projects above the periphery of the container cap 30. To the upper end of the discharge tube 33 is attached a spray tip 34. A generally cylindrical plastic shell 35 fits around the cupped flange 32 within the central part of the container cap 30 being held in position by the internal annular rib 35 of the container cap 30. The shell contains within it integrally moulded a spring means 37 which is arranged centrally in the shell above the passage 38 which leads into the interior of the aerosol container and into which a dip tube (not shown), which extends to the bottom of the container, is normally fitted. Surrounding the spring means 37 are a plurality of upstanding integrally moulded prongs 43.

The shell 35 is shown enlarged in FIGS. 6 and 7. The spring means 37 is constructed in substantially the same manner as the spring means 11 of FIG. 1 and it is therefore unnecessary to describe it further.

The functioning of the valve described is as follows. If the spray tip is displaced by finger pressure to one side of the axis, the cupped flange is caused to tilt and thus the seal with the sealing disc 31 is broken and the contents of the aerosol container can pass into the discharge tube to be sprayed from the spray tip in a known manner.

The hole 45 in the base of the shell 35 permits gas to be released from the upper part of the container together with the liquid or semi-liquid contents which in some applications is found desirable. The prongs 43 are adapted to be engaged by the cupped flange 32 forming a part of the valve means, and they are deformed by the latter when it is displaced laterally within the shell by finger pressure applied to spray tip 14 of the aerosol valve. The resilient deformation of the prongs acts on the flange and returns it immediately, and automati-

cally, on release of the valve to its normal or sealing position, thereby eliminating, or at least effectively minimizing, delay in the closing of the valve on such release.

5 The spring means according to the invention are also applicable to other forms of aerosol valves, to eliminate the use of coil springs, or of other springs required for the valve actuation.

10 The spring means of the invention may be used where it is desired to establish end electrical contact, by plating the leaves and a part at least of the base with a metallic electrically conducting coating. In this form the spring means may be used for applying pressure between the base of an electric torch and a battery contained within it.

15 In all forms of the invention the leaves may be readily moulded integrally with the base by injection moulding, using techniques used in moulding screw threads as a means of extracting the core of the mould.

20 We claim:

1. Spring means comprising a base and a plurality of deformable leaf elements integral with said base and projecting therefrom circumferentially spaced from each other about a common axis along substantially helical paths of the same winding sense, each of said leaf elements having distant from said base a free end.

2. Spring means as claimed in claim 1, and further comprising a peripheral wall integral with said base and surrounding said leaf elements radially spaced therefrom, said peripheral wall being coaxial with said common axis and projecting beyond the free ends of said leaf elements.

3. Spring means as claimed in claim 1, wherein the base and the leaf elements are formed by moulding from a synthetic plastic material.

4. Spring means as claimed in claim 3, wherein said synthetic plastic material is selected from the group comprising polypropylene, high-density polyethylene, polyamides, polycarbonates, polyurethanes and acetal resins.

5. Spring means wherein a plurality of spring means as claimed in claim 1 are formed on the same base.

6. Spring means as claimed in claim 1, wherein there are four leaf elements arranged symmetrically around said axis.

7. Spring means as claimed in claim 1, wherein said leaf elements and part at least of said base is coated with electrically conductive material.

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