

[54] CAPACITORS

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[56] References Cited

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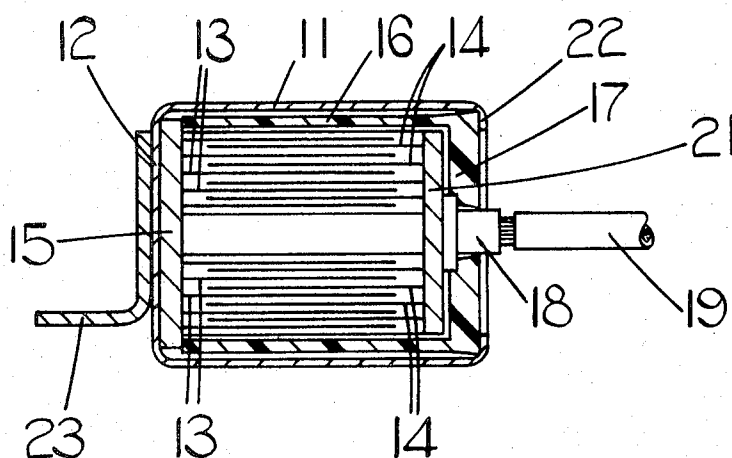
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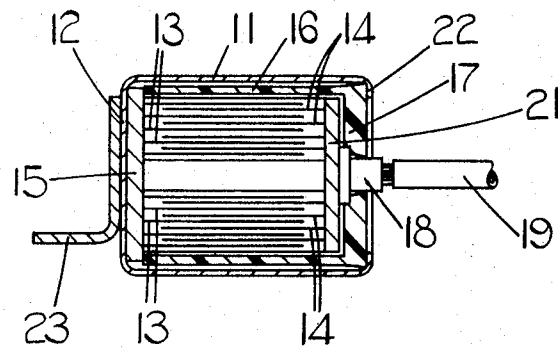
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ABSTRACT

A capacitor comprising a pair of capacitor plates each of which is defined by a conductive flexible ribbon. The two plates are spaced apart by a flexible ribbon of dielectric material and the three ribbons are wound to define a roll. One edge of one of the conductive ribbons projects from one axial end of the roll, and the opposite edge of the other projecting ribbon projects from the other axial end of the roll. The roll is housed in a conductive casing and the casing carries an insulated terminal. The projecting edges of the two conductive ribbons are connected electrically to the casing and said terminal respectively by respective conductive elements. Each conductive element consists of a flexible, electrically insulating elastomer containing particles of conductive material which define conductive paths through the element. One of the elements is positioned between said one end of the roll and the casing to establish the electrical connection between one of the capacitor plates and the casing, and the other element is positioned between the other end of the roll and the terminal so establishing the electrical connection between the other capacitor plate and the terminal.

2 Claims, 1 Drawing Figure





CAPACITORS

This invention relates to capacitors of the kind comprising a pair of capacitor plates each of which is defined by a conductive, flexible ribbon, the two plates being spaced apart by a flexible ribbon of dielectric material and the three ribbons being wound to define a roll with the edge of one of the conductive ribbons projecting at one axial end of the roll and the opposite edge of the conductive ribbon projecting at the other axial end of the roll, a conductive casing within which the roll is received electrically connected to the projecting edge of said one plate and a terminal electrically insulated from the casing, accessible at the exterior of the casing, and electrically connected to the projecting edge of the other plate.

In a known capacitor of the kind specified the electrical connections between the plates of the capacitor roll and the casing and the terminal are made by way of metal washers which are secured to the terminal and the casing respectively and which each include a plurality of angularly spaced resilient fingers which engage the respective end of the roll. In order to ensure an efficient electrical connection the ends of the roll are each plated to in effect define a conductive end cap electrically connected to the respective capacitor plate.

It is an object of the present invention to provide a capacitor of the kind specified in a more simple and convenient form.

According to the invention in a capacitor of the kind specified the projecting edges of the two conductive ribbons each engage a face of a respective conductive element; the conductive elements each consisting of a flexible, electrically insulating elastomer containing particles of conductive material which define conductive paths through the element, one of the elements being positioned between one end of said roll and the casing and so establishing the electrical connection between one of the capacitor plates and the casing, and the other element being positioned between the other end of the roll and said terminal and so establishing the electrical connection between the other capacitor plate and said terminal.

Preferably said elements are such that when the elements are in a relaxed state the particles of conductive material therein are held apart by the elastomer matrix, and are brought into contact with one another to establish the conductive paths through the element when the element is compressed beyond a predetermined amount, said one element being compressed beyond said predetermined amount between said one end of the roll and the casing, and the other element being compressed beyond said predetermined amount between the other end of the roll and said terminal.

The accompanying drawing is a cross-sectional view of a capacitor in accordance with one example of the invention.

Referring to the drawing the capacitor includes a hollow cylindrical metal casing 11 closed at one end by an integral base 12. Disposed within the casing 11 are first and second capacitor plates 13, 14 each of which is defined by a conductive ribbon, the two plates being spaced apart by a ribbon of dielectric material (not shown) the two conductive ribbons are engaged with opposite faces of the dielectric ribbons and the three ribbons are then wound as one to define a roll. The ribbon constituting the plate 13 is off-set from the ribbon

constituting the plate 14 so that one edge of the plate 13 projects from one axial end of the roll and the opposite edge of the plate 14 projects from the other axial end of the roll.

The projecting portion of the plate 13 is spaced from the base 12 of the casing 11 by means of a disc-like element 15 of an electrically insulating elastomer which contains discrete particles of electrically conductive material which are brought into contact with one another to define conductive paths through the element when the element is compressed beyond a predetermined amount. In the relaxed state of the element 15 the discrete conductive particles are held in spaced relationship by the matrix of the elastomer and so when relaxed the element 15 constitutes an insulating layer. However, when compressed the element 15 electrically connects the plate 13 with the casing 11. Received within the casing 11 and positioned between the outer surface of the roll and the inner surface of the casing 11 is a sleeve 16 of electrically insulating material. At the end of the sleeve 16 adjacent the open end of the casing 11 the sleeve 16 is formed with a peripheral, radially inwardly extending flange 17. The flange 17 defines a central aperture, and received in the central aperture is an electrical terminal member 18. The terminal member 18 includes a contact region projecting inwardly from the inner surface of the flange 17 and includes a portion which extends from the casing and receives a conductive lead 19. A second disc like element 21 of smaller diameter than the element 15, but otherwise identical, is positioned between the projecting parts of the capacitor plate 14 and the inner surface of the flange 17, and so engages the inwardly projecting contact region of the terminal 18.

In order to retain the components in their desired relative positions the open end of the casing 11 is spun over to define an inwardly projecting flange 22 engaging the outer surface of the flange 17. During the formation of the flange 22 the flange 17 is biased towards the base 12 so that the element 15 is compressed between the base 12 and the projecting parts of the plate 13, and the element 21 is compressed between the projecting parts of the plate 14 and the contact region of the terminal 18. Thus the element 15 and the element 21 are both rendered conductive and electrically connect respectively the plate 13 and the casing 11 and the plate 14 and the terminal 18, the terminal 18 being insulated from the casing by the flange 17. Physically and electrically connected to the base 12 is a mounting bracket 23 which defines the second external terminal of the capacitor.

It will be appreciated that since the elements 15, 21 are compressed then there is no axial free play within the casing 11.

As described above in a known form of capacitor it is necessary to provide, by a plating or spraying operation, a conductive end cap at each end of the roll to ensure that an efficient electrical connection is made to the capacitor plates by the resilient fingers of the metal connecting washers. Such a procedure is unnecessary with the arrangement shown in the drawing, since the elements 15, 21 are complete discs, and are sufficiently flexible to ensure that when compressed the surfaces of the discs follow the form of the ends of the roll and so the whole of the projecting edges of the capacitor plates 13, 14 make contact with their respective connecting element.

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It will be seen from the drawing that there is a clearance between the outer face of the element 21 and the flange 17. Thus strictly speaking only the central region of the element 21 beneath the terminal 18 will be compressed. However, the amount of compression which is necessary to achieve conduction through the element 21 is very small, and the effect of compressing the central region of the element 21 beneath the terminal 18 causes sufficient distortion over the whole of the element 21 to ensure that the whole of the element 21 is conductive. Thus the peripheral parts of the plate 14 will be connected by the element 21 to the terminal 18.

The flange 17 tapers from a maximum at the flange 22 of the casing, and the maximum diameter of the flange 17 is such that the flange 17 is an interference fit within the casing 11. Thus a seal is produced between the flange 17 and the casing 11 preventing ingress of water between the casing 11 and the sleeve 16. Similarly, the terminal 18 is an interference fit within the aperture of the sleeve 17 so producing a seal preventing ingress of water between the terminal 18 and the flange 17.

In the example described above the elements 15, 21 do not conduct until they are compressed. Thus in their relaxed state the elements 15, 21 are non-conductive. However, it is not essential that the elements 15, 21 are non-conductive in their relaxed state, and similar elements which are conductive even in their relaxed state can be substituted if desired. As will be appreciated it is the amount of conductive particles which are included in the elastomer matrix which determine the amount of compression which must be applied to the element to achieve conduction. In an element having a

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low proportion of conductive particles high compression is called for to establish conduction, but in an element having a high proportion of conductive particles conduction may always be present even in the relaxed state of the element.

I claim:

1. A roll capacitor comprising two conductive ribbons separated by a dielectric wherein the projecting edges of the two conductive ribbons each engage a face of a respective conductive element, the conductive elements each consisting of a flexible, electrically insulating elastomer containing particles of conductive material which define conductive paths through the element one of the elements being positioned between one end of said roll and the casing and so establishing the electrical connection between one of the capacitor plates and the casing, and the other element being positioned between the other end of the roll and said terminal and so establishing the electrical connection between the other capacitor plate and said terminal.

2. A capacitor as claimed in claim 1 wherein said elements are such that when the elements are in a relaxed state the particles of conductive material therein are held apart by the elastomer matrix, and are brought into contact with one another to establish the conductive paths through the element when the element is compressed beyond a predetermined amount said one element being compressed beyond said predetermined amount between said one end of the roll and the casing, and the other element being compressed beyond said predetermined amount between the other end of the roll and said terminal.

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