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POINT CONTACT DEVICE FOR HIGH VOLTAGE
RADIO FREQUENCY APPARATUS
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Fig. 1

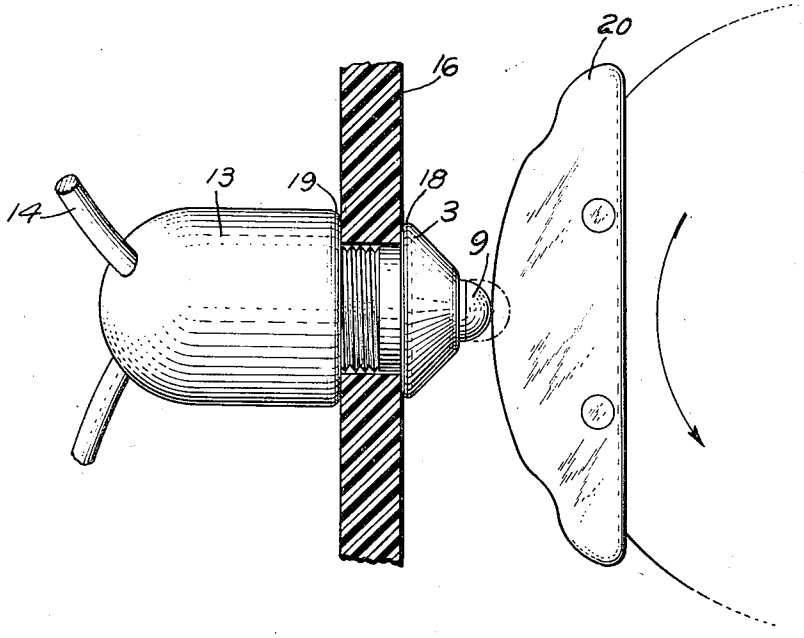
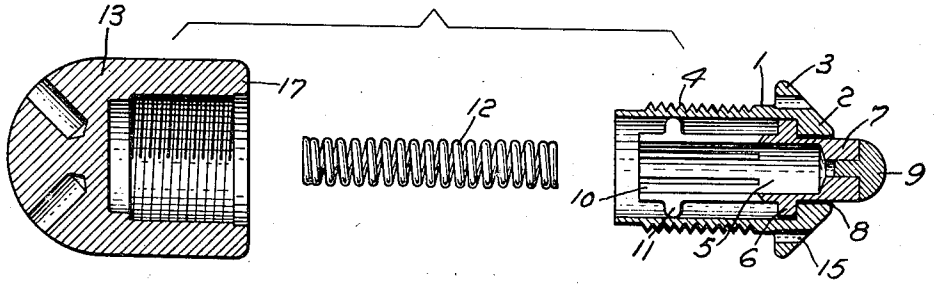


Fig. 2



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POINT CONTACT DEVICE FOR HIGH VOLTAGE RADIO FREQUENCY APPARATUS

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2 Claims. (Cl. 200—166)

This invention relates to electrical contact devices and more particularly to contact devices useful in high voltage radio frequency circuits.

While resilient point contact devices have long been used for making connections in electrical circuits, considerable difficulty has been experienced when such devices were used in radio frequency circuits and particularly at high voltages. These difficulties included troublesome occurrence of corona and sparking with resulting electrical noise due to variations in proper electrical connections between the relatively movable parts of such device.

The object of this invention is to provide a resilient contact device which overcomes the aforementioned difficulties. An important feature of the invention is the provision of a resilient movable contact member within a housing so arranged that when the projected contact button of the member is engaged and dis-engaged by a switching element the member resiliently reacts for relative movement with respect to the housing and at the same time maintains good electrical connection therewith. This is accomplished by providing the sliding member with rearwardly projecting spring-like fingers which engage the inside surface of the housing with spring tension so as to insure good electrical contact regardless of sliding and vibratory movement of the contact member.

Another feature is the rounding of the external surfaces of the device including the mounting flanges thereof so as to distribute electrostatic stress and thereby minimize corona.

The above-mentioned and other features and objects of this invention will become more apparent by reference to the following description taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a view in elevation showing the contact device supported for coaction with a switching element; and

Fig. 2 is a view in longitudinal cross-section showing the parts exploded.

Referring to the drawings the contact device of this invention is shown to comprise a cylindrical housing 1 which is provided at its forward end with a radially inwardly disposed flange or abutment 2 and a radially outwardly disposed flange or abutment 3, and at its rearward end a threaded portion 4. A movable member 5 is receivable in the housing, the movable member having a radially outwardly projecting flange 6 adapted to engage the inner flange 2 to limit its movement in the forward direction. Forward of the flange 6 is an extension 7 in the form of a cylindrical shank which is loosely received in the opening 8 defined by the inner edge of the flange 2. The forward-most end of the extension is provided with a contact button 9 of silver alloy. The rearward portion of the member 5 is provided with a plurality of fingers 10 which carry radially outwardly projecting convex-like surfaces 11 adapted to engage the inner surface of the housing 1. These finger projections 11 are spaced rearwardly a distance from the flange 6 so that the member 5 tends to pivot about one or more of the surface projections 11 in response to angular and vibratory forces.

Since the body of the member 5 is of spring-like material, beryllium-copper being a satisfactory material, the fingers 10 exert a spring tension against the inner wall surface of the housing. This continuous tension of the fingers against the housing at a distance rearwardly of the contact button 9 insures continuous electrical contact between the member 5 and the housing for all positions and movement of the member 5. This is particularly important where the contact device is used in radio frequency circuits at high voltages. Since good electrical contact is maintained at all times between the extensions 11 and the wall surface of the housing 1 vibratory movement of the contact member is permissible thus making this device particularly useful on board ships and aircraft.

The member 5 is urged resiliently toward its forward position against the abutment 2 by a spring 12 which may also be of beryllium-copper. The spring 12 is maintained under compression by an end cap 13 which is threadably received on the threaded portion 4 of the housing. The end cap is provided with circuit connection 14 as indicated in Fig. 1. The openings 15 on the housing 1 are provided for the reception of tools required for mounting parts on the contact device.

As shown in Fig. 1 the device may be supported on a dielectric panel 16 by inserting the threaded portion 4 through an opening in the panel and applying the end cap 13 thereto. The lateral extension of the flange 3 and the thickness of the end cap wall 17 are chosen so as to provide an extended surface adjacent the panel to distribute the electrostatic charge that occurs on such devices when incorporated in radio frequency high voltage circuits. To further insure proper distribution and thereby minimize concentration of the electrostatic charge the flange 3 is rounded as shown at 18 and the surfaces of the end cap 13 are also rounded particularly at the edge 19 for the same purpose. It is found in practice that by making the parts of these relative proportions and curvatures that the contact device will withstand voltages exceeding 22,000 volts at 2 megacycle frequency without the occurrence of troublesome corona. It is believed that the device will withstand much higher frequencies as well as higher voltages although the test equipment available did not exceed the figures herein supplied.

In operation the contact device is normally associated with movable equipment where circuits are completed for different positions of the movable parts of the equipment. In Fig. 1 a movable cam contact member is shown at 20 which is adapted to be brought into engagement with the contact button 9 for certain positions of the cam 20. This cam action applies lateral force to the button 9 and if, as in the prior art devices, the shank of the button had any freedom of movement poor electrical connection would result not only from such lateral forces but in the presence of vibratory forces as well. The present device, however, insures good electrical contact at all times since the projecting surfaces 11 are held under spring tension against the inner wall surfaces of the housing 1 regardless of lateral forces and vibratory forces applied to the movable member 5.

While I have described above the principles of my invention in connection with specific apparatus, it is to be clearly understood that this description is made only by way of example and not as a limitation to the scope of my invention as set forth in the objects thereof and in the accompanying claims.

I claim:

1. A resilient point contact device for high voltage radio frequency apparatus comprising a cylindrical housing having an end wall which has an opening disposed axially of the housing, a hollow cylindrical member disposed for axial movement in said housing, said member having a shoulder flange slidably engaging the inner surface of said

housing and adapted to abut against said end wall and an end extension adapted to protrude through said opening, means in said housing to resiliently urge said member so that said end extension functions as a resilient contact, and said hollow cylindrical member being slotted at the end thereof opposite said extension to provide a plurality of resilient fingers and said fingers being provided with laterally disposed portions spaced rearwardly of said shoulder flange for resilient sliding engagement with the inside surface of said housing.

2. A resilient point contact device for high voltage radio frequency apparatus comprising a housing of hollow cylindrical form having an inwardly and outwardly projecting flanges at one end and a threaded portion at the other end, a movable member having a shoulder flange slidably engaging the inside wall surface of said housing and adapted to engage said inwardly projecting flange, an axially disposed extension to protrude past said inwardly projecting flange and a plurality of resilient fingers extending rearwardly of said shoulder flange and having projections thereon extending radially outwardly for sliding engagement with the inside wall surface of said housing, an end cap threadably receivable over the threaded end portion of said housing to close that end of said housing and to clamp a support between the end cap and said outwardly projecting flange, and a spring in said housing between said end cap and said movable member to resiliently urge said member toward said inwardly projecting flange, said end cap and said housing including said outwardly projecting flange having the surfaces thereof rounded to minimize corona.

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