June 29, 1965 L. E. SAUER 3,192,312

CERAMIC SUSPENSION INSULATOR WITH AN ELASTOMERIC BOOT

Filed June 7, 1961 2 Sheets-Sheet 1

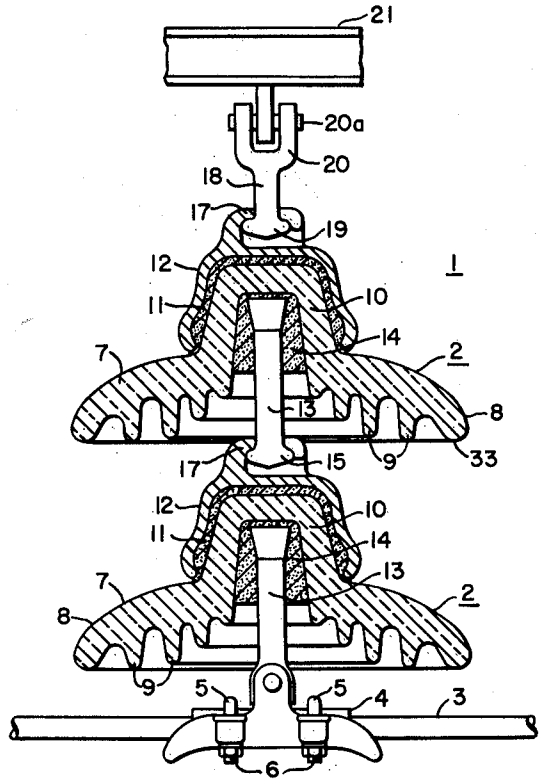


Fig.1.

PRIOR ART

Fig.2A.

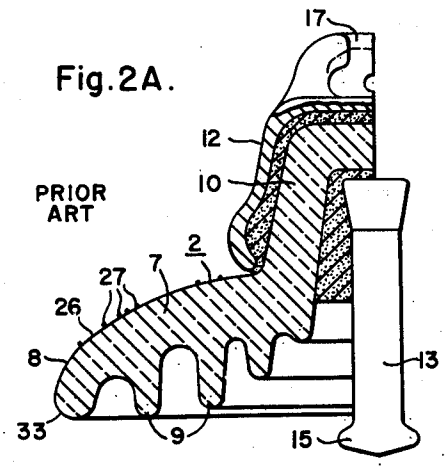
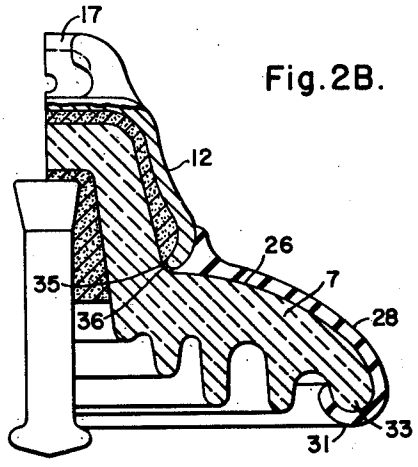


Fig.2B.



WITNESSES

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CERAMIC SUSPENSION INSULATOR WITH AN ELASTOMERIC BOOT

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Fig.4.

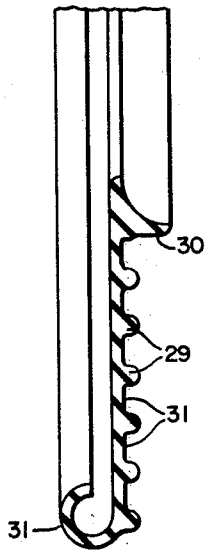
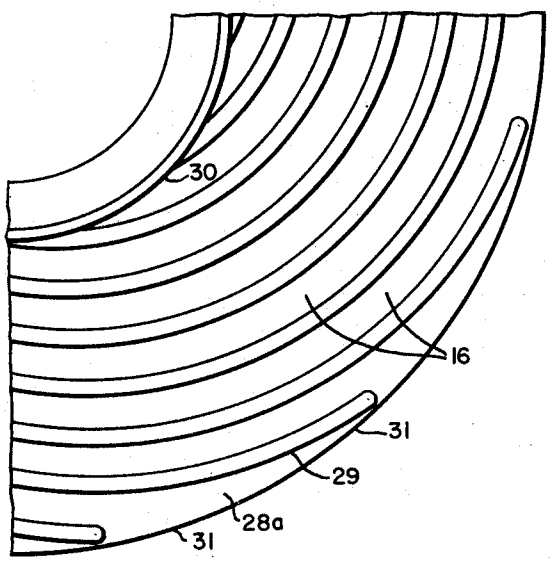


Fig.3.



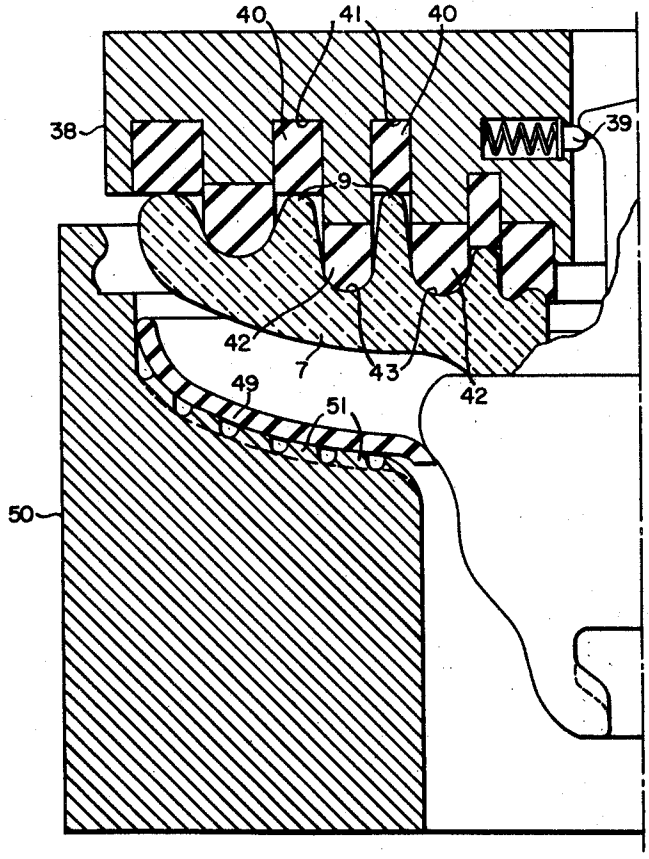


Fig.5.

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CERAMIC SUSPENSION INSULATOR WITH AN ELASTOMERIC BOOT

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4 Claims. (Cl. 174—209)

This invention relates generally to elastomeric boots for ceramic insulators to assist in increasing the flashover resistance of the booted ceramic insulator.

It is well known in the art to utilize suspension insulators, post insulators, pin insulators, etc. for power lines, support insulators for bus-bars and switchgear and for like uses. In many installations, such insulators are subjected to contaminated and dirty atmospheres, heavy fog areas, or salt fog conditions, which require frequent cleaning to prevent flashover.

It is a general object of the present invention to provide a boot, preferably formed from an elastomeric resinous material, which will provide a non-tracking covering for such types of insulators.

It is a further object of the present invention to provide a non-tracking boot for the upper surface of a suspension-type insulator, pin insulator, post insulator, or the like, to reduce the radio interference, and to provide self-cleaning action when leakage currents start over the surface by the gas evolution from the covering boot. Preferably, such a boot has a plurality of involute, or spiral ridges, or ribs which assist in the aforesaid cleaning action by swirling action of rain water and providing distinct separate leakage channels.

The improved rubber boot of the present invention may be molded as a premolded separate part, which may be stretched into position upon the ceramic insulator, or the rubber boot can be molded on the insulator itself with the insulator included in the mold.

It is a further object of the present invention to provide an improved configuration for a flexible rubber-like boot covering for a ceramic insulator.

Further objects and advantages will readily become apparent upon reading the following specification, taken in conjunction with the drawings, in which:

FIGURE 1 is a vertical sectional view taken through a string of suspension insulators supporting a high-voltage aerial transmission line;

FIGURE 2A is a fragmentary vertical cross-section through a conventional-type prior-art ceramic suspension insulator illustrating the contamination which may occur leading to resultant flashover;

FIGURE 2B is a fragmentary view somewhat similar to FIGURE 2A, but showing the application of the improved elastomeric boot of the present invention to the upper exposed surface of the ceramic shell;

FIGURE 3 is a top plan view of a modified-type of elastomeric boot constructed in accordance with the teachings of the present invention;

FIGURE 4 is a vertical sectional view taken substantially along the line IV—IV of the modified boot of FIGURE 3; and

FIGURE 5 is a fragmentary view illustrating how the rubber boot of the present invention may be molded on the ceramic insulator itself, both being present in the heated mold.

Broadly, the present invention comprises the provisions of a boot of an elastomeric material shaped and adapted to be applied closely to the upper or weather surface of porcelain supporting insulators. The boot protects the porcelain surfaces to which it is applied and prevents dust, fog, salt, corrosive atmospheres from reducing the dielectric properties of the porcelain insulator. Furthermore, the rubber boot is relatively self cleaning and can be readily prepared from non-tracking and creep-resistant compositions. Accordingly, a highly improved electrical supporting insulator is produced by the application of the boot thereto.

Referring to the drawings, and more particularly to FIGURE 1 thereof, the reference numeral **1** generally designates a string assembly of suspension-type ceramic insulators **2** of a type well known in the prior art for supporting a high-voltage aerial transmission line **3** by means of a suitable line clamp **4**. The line clamp **4** preferably has a pair of spaced U-bolts **5** and cooperable nuts **6** for clamping to the line **3**.

It will be noted that each suspension-type insulator **2** includes a ceramic body **7** having a skirt portion **8** and a plurality of circumferential ribs **9**. As shown, each insulator **2** has a head portion **10**, which is cemented, by cement **11**, to a metal cap **12** preferably formed of galvanized forged steel, or malleable iron. In addition, a supporting ball bolt **13** is provided, being cemented within a recess **14** and having a ball portion **15** associated therewith. As shown in FIGURE 1, the ball portion **15** is preferably assembled into a slotted socket **17** for stringing several of the suspension insulators **2** in series.

Superimposed upon the upper suspension-type insulator **2**, as shown in FIGURE 1, is a ball clevis **18**, having a ball portion **19** at one end thereof. The upper end of the ball clevis **18** preferably has a clevis **20** for accommodating a pin **20***a* for pivotal connection with a cross-arm **21**. The cross-arm **21** may form a part of a grounded tower-like supporting structure, not shown, for fixedly supporting the high-voltage aerial line **3** a suitable distance above ground potential.

Depending upon the voltage of the high-voltage transmission line **3**, a plurality of the suspension-type insulators **2** will be provided in stringed array, as shown in FIGURE 1.

With reference to FIGURE 2A of the drawings, which shows, in enlarged fashion, a vertical sectional view taken through one of the suspension-type insulators **2**, it will be noted that the surface **26** is exposed to contaminants **27** contained in the surrounding atmosphere. For certain applications, the atmosphere may be quite dirty, or heavily concentrated with contaminants **27**. The contaminants **27** may include cement dust, fly ash, ore dust, carbon particles, lint, etc. In addition, there may be heavy fog areas in which salt fog is dispersed. As is well known by those skilled in the art, frequent cleaning is necessary to prevent flashover in conventional - type suspension insulators **2**. It is an important purpose of the present invention to remove the settling contaminants **27** by leakage-current action producing gases which blow the surface clean, and consequently to minimize the effect of flashover conditions.

To accomplish the aforesaid purpose of removing contamination by such gas-blowing action, there is provided, according to the present invention, an annularly-shaped boot **28**, or covering, preferably made from an elasto-

meric resinous material, such as natural rubber, artificial rubber, or synthetic rubber. Examples of particularly satisfactory synthetic rubber are neoprene, and G.R.S. rubber, polyurethane elastomer, butyl rubber, buna-N rubber and silicone rubber. The rubbers preferably should include fillers, and particularly a substantial proportion of hydrated alumina, which latter enables improved track and creep resistance. Butyl rubber filled with at least 10% by weight of alumina trihydrate has been found to be a particularly desirable molding material for the boot **28** shown in FIG. 2B.

FIGURES 3 and 4 more particularly illustrate the configuration of a modified-type elastomeric boot **28***a* according to the present invention. With particular reference to FIGURE 3, it will be noted that there are provided a plurality of spaced spiral ridges, or ribs **29** curving generally angularly outwardly, as the involutes of the inside circle **30** of the boot **28***a*. Situated at the outer periphery of the boot **28** is a curled lip portion **31**, which renders the flexible boot **28** adaptable for stretching over the surface **26** of a standard suspension-type insulator, post insulator, pin insulator, etc., and permitting thereby the curled lip **31** to curl around the outer edge **33** of the ceramic body **7** of the insulator **2**.

The thickness of the boot may be, for example, 3/32 inch with ribs 5/32 inch high and ½ inch lateral spacing between adjacent ribs. The thickness of the outer lip may be 3/32 inch, for example. The outer diameter of the boot may be 11 inches and a hole diameter 3⅜ inches. The latter dimensions, of course, will vary depending on the size of the base insulator.

The thickness of the boot may vary from say 1/16 inch to say ¼ inch depending on the flexibility and resilience of the elastomeric material of the boot.

The involute, or spiral ribs **29** have the advantage of causing, or directing a swirling action for rain water, or melted ice or snow, which may fall upon the booted insulators **2** in operation. As a result, any deposited contaminants **27** will be quickly washed away. In addition, the channels **16** formed by the ridges **29** provide separate multiple leakage current paths for reducing the flashover possibilities.

Preferably, before the flexible boot **28***a* is stretched over the surface **26** of the insulator **2**, a conducting rubber paste **35** will be previously spread in the crevice **36** between the cap **12** and porcelain body **7** to prevent ionization of trapped air bubbles by eliminating any voltage stress in this area.

The foregoing description concerns a premolded covering part, or boot, in which the rubber boot **28** is molded separately, as an independent item, and subsequently preferably applied with the conducting paste **35** to a conventional ceramic insulator **2**.

However, it is within the contemplation of the present invention to provide a construction in which a rubber boot **28***b* is molded over the insulator body **7** rather than premolded, as a separate piece, and subsequently stretched over the insulator **2**. With reference to FIGURE 5 of the drawings, it will be noted that the insulator **2** is removably secured to the upper mold piece **38** by a detent **39**. This maintains the circular ribs **9** into engagement with circular shock-absorbing rings **40** held within circular holding grooves **41** of the upper mold piece **38**. Moreover, additional circular pressure rings **42** are secured to the upper mold piece **38** to engage the circular recesses **43** between the ribs **9**. As a result, substantially uniform pressure is exerted over the entire upper ceramic surface of the insulator **2**. The shock-absorbing rings **40**, **42** are preferably made of a hard rubber such, for example, as that sold under the trade name "Enrupt," sold by the United States Rubber Company.

An uncured elastomeric annular piece **49** is placed in the formed upper surface of the lower mold piece **50**, which may be heated by means, not shown. The involutes **51** form the spiral ribs **29** of the cap **28***b* during

the pressing and curing steps. Following vulcanization, the molded rubber boot **28***a* will firmly adhere to the surface **26** of the insulator body **7** which is molded therewith. The combined molding step may appeal to insulator manufacturers, whereas the separate boot could be applied as a subsequent step by utility companies.

The present invention has particular application to standard stand-off, pin-type, post-type, or suspension-type insulators operating in dirty atmospheres or in heavy fog areas where the deposition of salt fog, or alkali requires frequent cleaning to prevent flashover. The present invention is particularly concerned with applying a non-tracking rubber boot **28**, **28***a* over the surface **26** upon which the contamination **27** builds up. To improve this surface further, involutes of circle ridges **29** starting next to the metal cap **12** and running to the outer edge **31** may be added. The rubber boot **28***a* may be molded over the insulator **2**, or a premolded part **28** may be stretched on, in which case preferably a conducting rubber paste or Coronox paint **35** will be used in the crevice **36** between the cap fitting **12** and the porcelain body **7** to prevent ionization of trapped air bubbles.

Particular advantages of utilization of the present elastomeric boot are reduced radio interference, self-cleaning action when leakage current starts over the surface by gas-evolution from the boot, improved wet flashover conditions, protection of the porcelain body **7** from rocks, gun shots and power arcs. In addition, and most importantly, no periodic cleaning is necessary.

Although the present invention has been illustrated and described in connection with particular elastomeric boots, it is to be clearly understood that changes and modifications will readily occur to those skilled in the art, without departing from the spirit and scope of the invention.

I claim as my invention:

1. In combination, a suspension-type ceramic insulator having a ceramic body portion with an outwardly and downwardly flared skirt portion extending laterally therefrom, a plurality of circumferential ribs on the lower surface of said body portion, said body portion having an upwardly extending head portion, a metallic cap secured over said head portion, an annularly-shaped removable boot of an elastomeric resinous material covering entirely the upper weather-exposed portion of said skirt portion, said removable boot closely adhering to all of said upper weather-exposed skirt portion and having a curled lip extending peripherally around the outer edge thereof and frictionally curling over the outer edge of said skirt portion, said boot having a central opening through which said metallic cap protrudes.

2. The combination of claim **1**, wherein upwardly jutting ribs are integrally formed with said boot and extend generally transversely of an outwardly extending radius of the boot.

3. The combination of claim **1**, wherein the boot contains a substantial proportion of hydrated alumina as a filler for providing a self-cleaning gas-evolution action during the existence of leakage currents.

4. The combination of claim **1**, wherein a conducting rubber paste is spread in the crevice between the metallic cap (**12**) and the ceramic body portion at the junction of the central opening of the boot with the metallic cap.

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