United States Patent

[11] **3,549,791**

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[54] **PROTECTED ROD INSULATOR WITH SOFT ELASTOMER FILLER**
3 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** **174/179,** 174/186
[51] **Int. Cl.** **H01b 17/02**
[50] **Field of Search** 174/30, 179, 209, 150, 186

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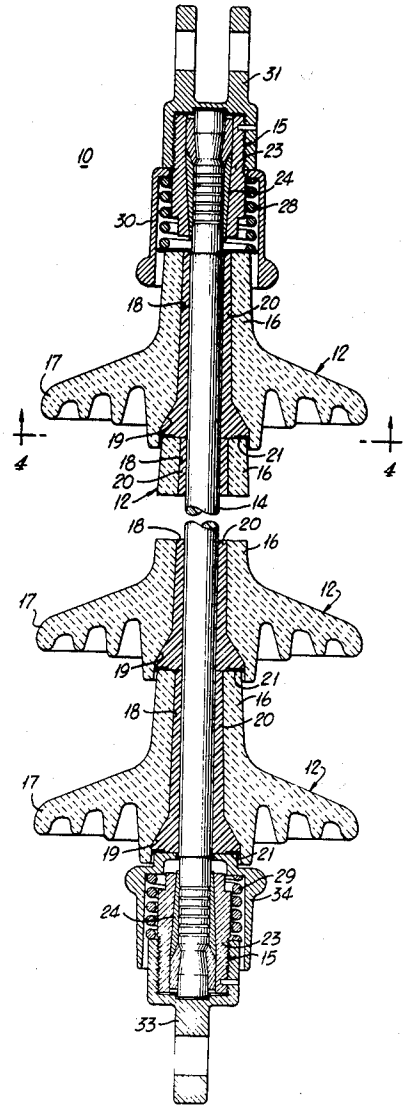
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ABSTRACT: There is provided a suspension insulator for power transmission application including a central tension rod of nonconducting material such as of glass fibers. End fittings are secured to the respective ends of the tension rod. A number of insulator members are strung in axial relation on the tension rod. The insulator members each include a sheath spaced from the rod. The space between the rod and the sheaths is filled with soft-elastomer filler and the filler is spring loaded by suitable compression means to maintain void-free interface between the elastomer filler and the rod, and between the elastomer filler and the insulator members.



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SHEET 1 OF 2

Fig. 1

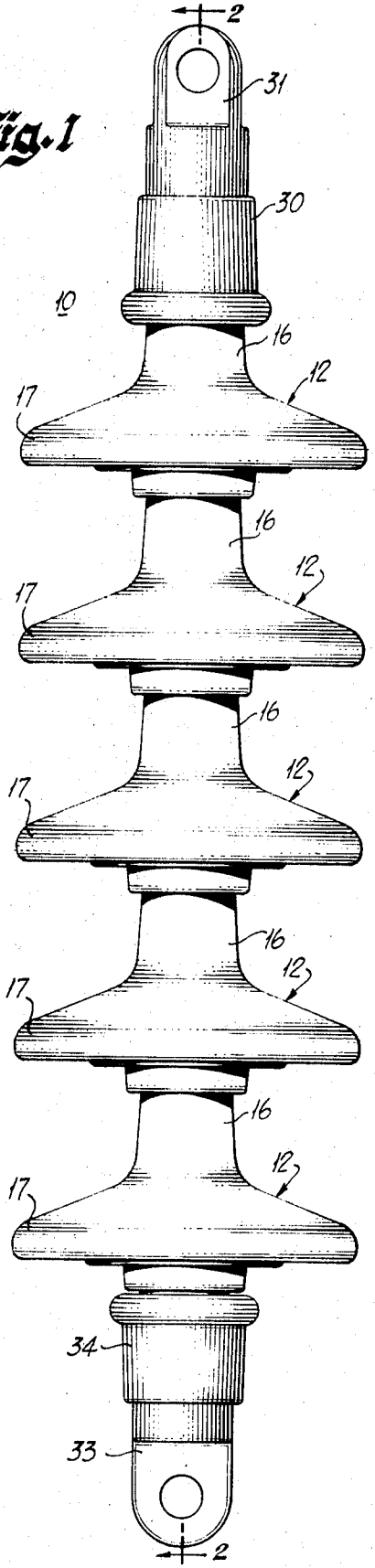
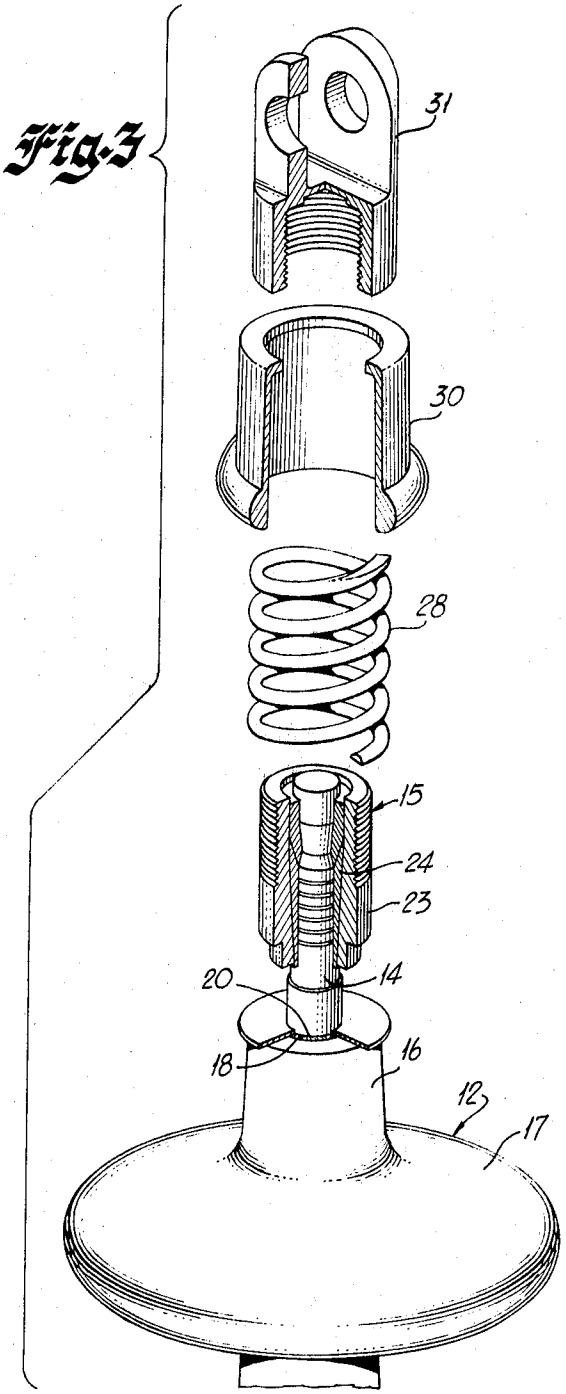


Fig. 3



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Fig. 2

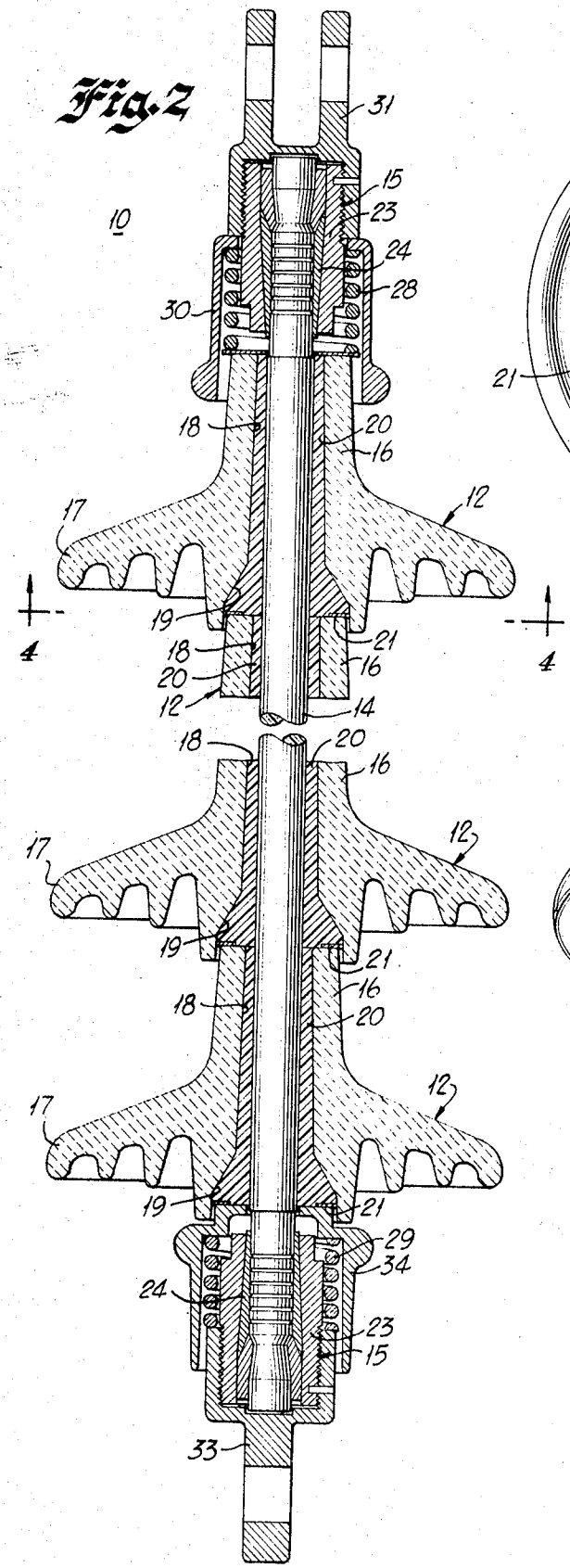
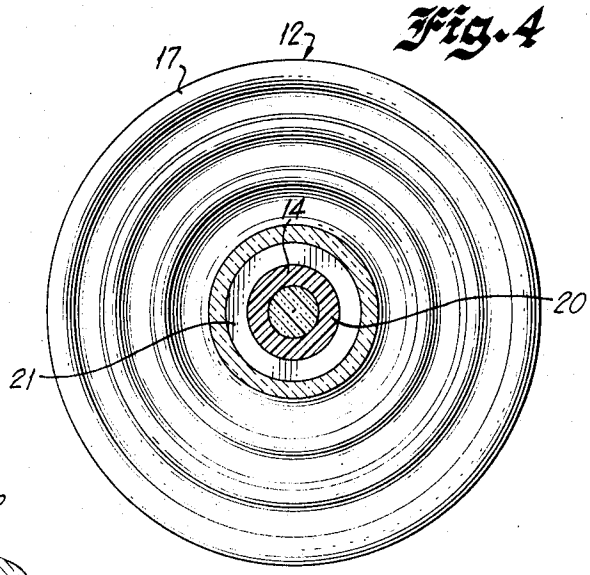


Fig. 4



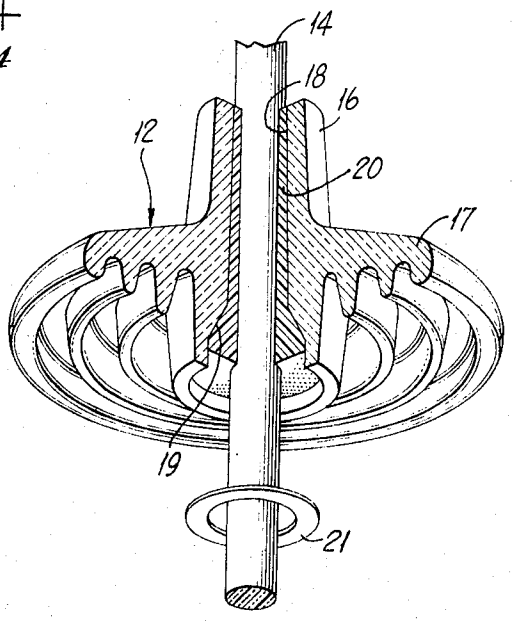


Fig. 5

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PROTECTED ROD INSULATOR WITH SOFT ELASTOMER FILLER

The present invention relates to an elongated suspension insulator, and more particularly to a unitary suspension insulator of the type employing a central tension member and suitable for power transmission applications.

Although porcelain as conventionally used in insulator members has excellent weather and track resistance and therefore has been used for decades in supporting transmission lines, nevertheless there are severe mechanical limitations on the use of such porcelain insulators.

Accordingly it is an object of the present invention to provide an improved suspension insulator having improved mechanical-supporting properties.

A further object of the present invention is the provision of a new and improved suspension insulator.

Further objects and advantages of the present invention will become apparent as the following description proceeds and the features of novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

In accordance with these and many other objects of the present invention, there is provided a unitary suspension insulator including a central tension rod of nonconducting material such as of polymer bonded axially aligned glass fibers as the tension element. End fittings secured to the respective ends of the glass fiber rod are adapted for connecting a conductor to the power transmission structure. Suitable juxta-positioned insulator members of porcelain or other suitable material are strung in axial relation on the tension rod, each including a hollow sheath and a hood. The sheath of each insulator is spaced-apart from the rod and the space between the rod and sheath is filled with soft-elastomer filler such as a urethane elastomer. Spring loading of the filler assures that the interfaces between the glass fiber-elastomer and the elastomer-porcelain are kept in void-free tightness under all ambient conditions so that moisture and contaminants are not permitted ingress and leakage currents and flashover currents occur outside of the porcelain.

For a better understanding of the present invention, reference may be had to the accompanying drawings wherein:

FIG. 1 is an elevational view of a suspension insulator according to the present invention;

FIG. 2 is a fragmentary cross-sectional view of the suspension insulator of FIG. 1, drawn to a larger scale;

FIG. 3 is a cross-sectional exploded perspective view of an end of the suspension insulator of FIG. 1;

FIG. 4 is a cross-sectional view of the suspension insulator of FIG. 1, taken along line 4–4 of FIG. 2; and

FIG. 5 is a fragmentary cross-sectional perspective view of the suspension insulator illustrating one of the insulator members strung on the tension rod.

Referring now to the drawings, there is illustrated an elongated suspension insulator assembly **10** including a string of insulator members **12** of suitable material such as porcelain. The string of insulator members **12** is held together by a central tension rod **14** of suitable material such as of polymer bonded axially aligned glass fibers. The rod **14** terminates in suitable end fittings **15**, which may be similar to those described and claimed in my copending application for Letters Patent of the U.S. Ser. No. 733,131, filed May 29, 1968, now U.S. Pat. No. 3,534,989, filed even date herewith entitled END FITTING.

As is conventional in the insulator art, each of the insulator members **12** includes a generally elongated sheath portion **16** and an enlarged hood portion **17**. The sheath portion is formed with an axial opening **18** terminating in a bell-shaped chamber **19**, FIGS. **2** and **5**, to provide an expansion chamber. The space between the tension rod **14** and the axial opening **18** is filled with a soft elastomer such as a urethane elastomer filler **20**.

As best illustrated in FIG. **2**, the insulator members **12** are juxtaposed in axial relation so that the sheath end of one insulator member is received within the bell-shaped chamber of the adjacent insulator member permitting relative movement of the insulator members to each other. A metal washer **21** may be provided to close and seal the space between the sheath end of an insulator member and the adjacent bell-shaped chamber **19**.

The end fittings **15** may be of any suitable configuration, but in the illustrated embodiment include an outer housing **23** tapered on its inner surface to receive a collet assembly **24** gripping the end of the tension rod **14** by wedge action.

To maintain a void-free interface between the tension rod **14** and the filler **20** and between the filler **20** and the axial opening **18** of the insulator members **12**, the filler **12** is maintained under compressive load by suitable compression springs **28** and **29**. The upper string **28** acts between a spring cover **30** and an upper clevis member **31** secured to the outer housing **23** of the upper end fitting **15**, and the uppermost one of the insulators **12**. The lower compression spring **29** acts between a tongue member **33** secured to the outer housing **23** of the lower one of the end fittings **15** and a lower spring cover **34** which in turn bears against the filler **20** in the lowermost one of the insulator members **12**. Thus the filler **20** is constantly under compression by the compressive force of the springs **28** and **29**.

It will be understood that the relatively large expansion chambers **19** formed in the lower end of the sheath portion **16** minimize axial expansion of the filler **20** due to ambient temperature changes. Moreover the spring loading of the filler **20** insures void-free interfaces between the glass fiber rod **14** and the elastomer filler **20**, and between the elastomer **20** and the porcelain of the insulator members **12**. Leakage currents and flashover currents must occur outside the porcelain. Tests have indicated a slightly higher flashover value for the instant insulator string as compared to a conventional insulator string employing similar insulator members. Advantageously the suspension insulator according to the present invention provides positive and reliable mechanical loading. Moreover since the mechanical integrity of the string is maintained even though an insulator may break, there is no danger of dropping a power line upon cracking or failure of an insulator member, and therefore there is less urgency for replacing insulator strings with damaged insulator members. In addition since there is no porcelain puncturing, the insulator string may be made with a lower weight, provides less possibility of porcelain damage, and may be manufactured at considerably less cost than standard cap and pin suspension insulators.

Although the present invention has been described by reference to only a single embodiment thereof, it will be apparent that numerous other modifications and embodiments will be devised by those skilled in the art which will fall within the true spirit and scope of the present invention.

I claim:

1. An elongated suspension insulator comprising:
a central tension rod of nonconducting material;
end-fitting means secured to respective ends of said tension rod;
a plurality of juxtaposed insulator members strung in axial relation on said tension rod, each including a hollow sheath and a hood, the sheath of each insulator member being spaced from said rod;
soft-elastomer filler entirely filling the space between said rod and said sheath:
the opening in each sheath being formed with a bell-shaped chamber to provide for expansion of said elastomer and loosely receiving the opposite end of an adjacent sheath for relative movement therewith.

2. An elongated suspension insulator as set forth in claim **1** including compression spring means acting between at least one of said end fitting means and said elastomer to compression load said elastomer permitting expansion thereof against the bias of said spring.

3. An elongated suspension insulator comprising:
a central tension member of nonconducting material;

a plurality of insulator members strung on said tension member and spaced-apart therefrom;

soft-elastomer filler entirely filling the space between said tension member and said insulator members; and

an expansion chamber for said elastomer formed in each of said insulator members.