Jan. 31, 1967 H. A. FREY 3,301,938

LIGHT WEIGHT FLEXIBLE HIGH VOLTAGE BUSHING

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Fig. 1.

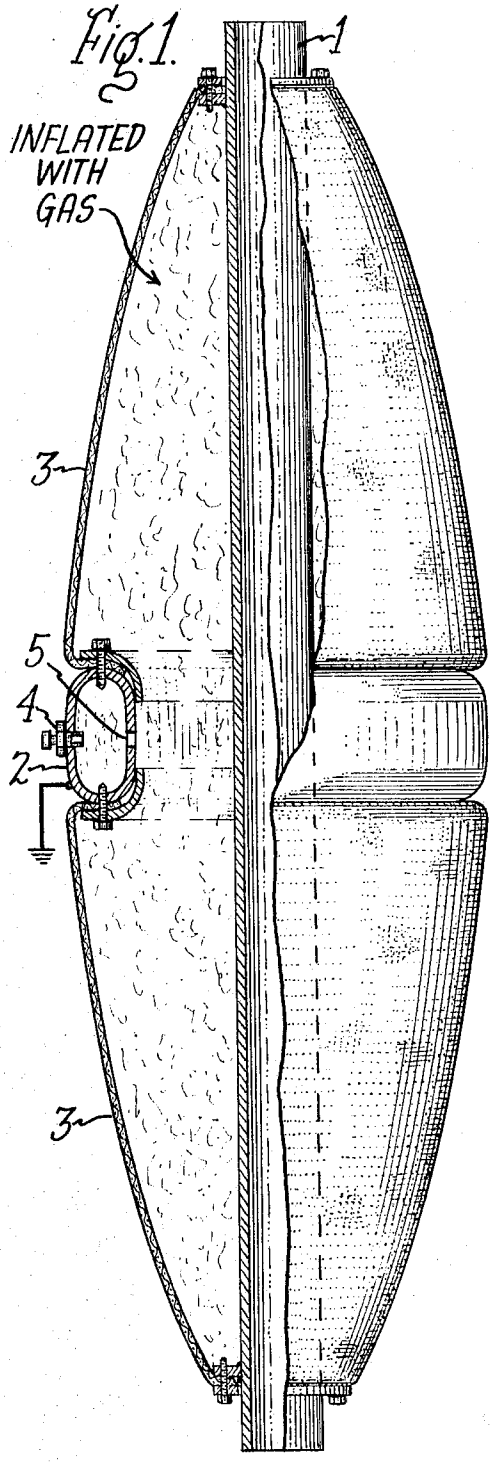
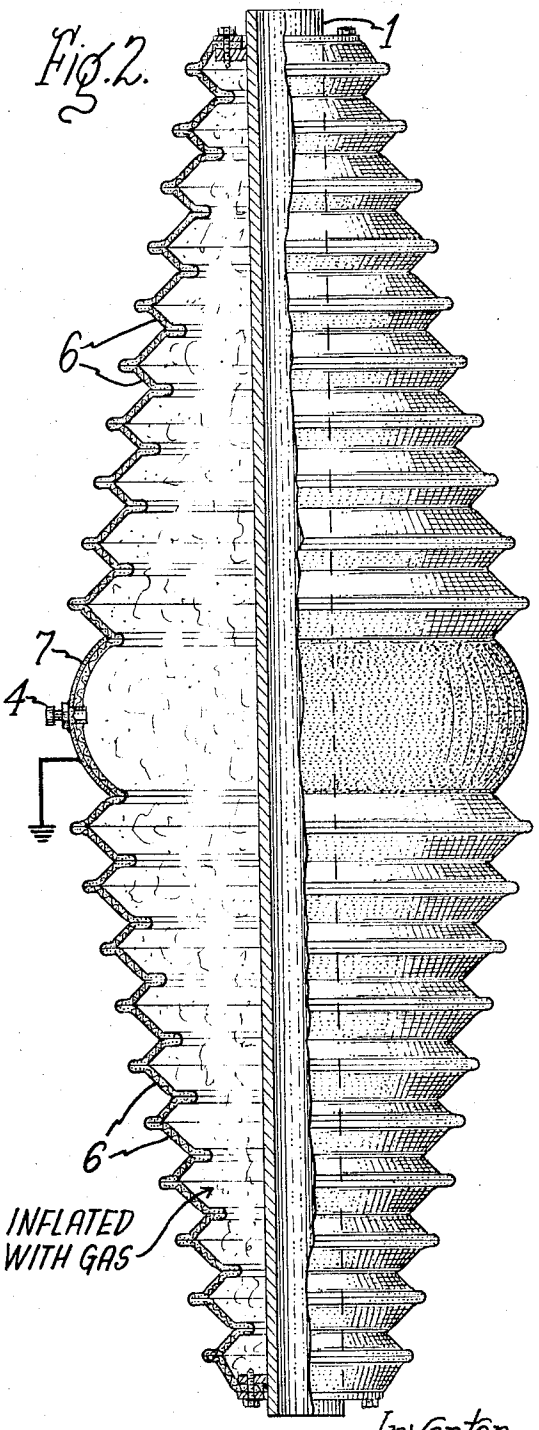


Fig. 2.



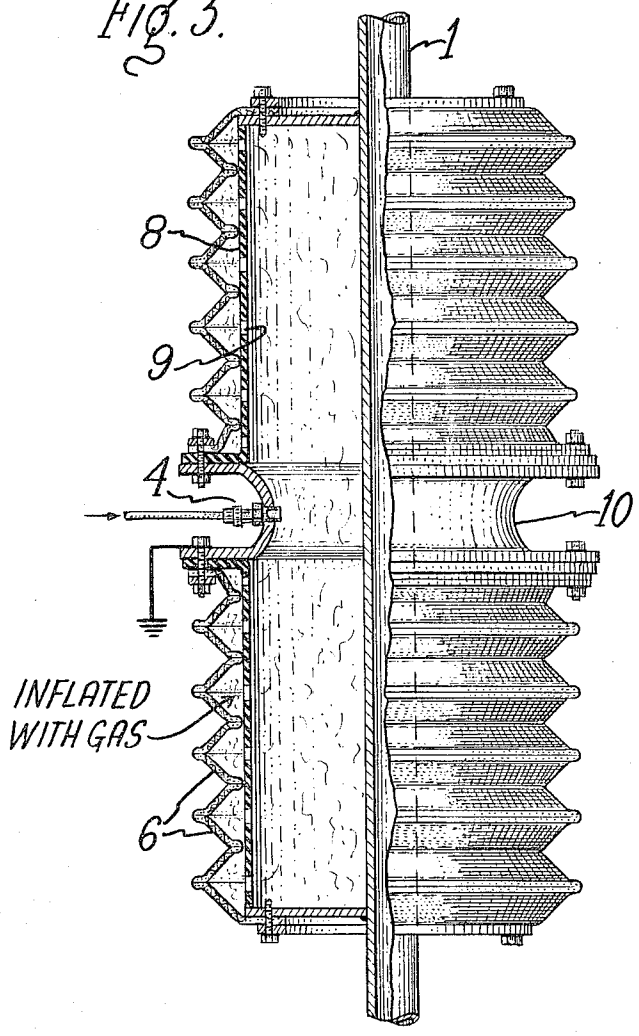
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Fig. 3.



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LIGHT WEIGHT FLEXIBLE HIGH VOLTAGE BUSHING

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5 Claims. (Cl. 174—31)

This invention relates to electric bushings and more particularly to a light weight flexible high voltage bushing.

In carrying high voltage lines through grounded barriers of various types, electrical bushings must be employed to insulate the high voltage lead from ground. Conventional bushings for this purpose have been made by a variety of methods. Present designs for high voltage bushings, however, almost invariably involve rigidity in the bushing member and relatively high weight. For example, a bushing capable of being used for carrying 900 kv. D.C. conductor through a grounded barrier would probably weigh something of the order of 6,000 pounds.

In accordance with this invention, a bushing is provided in which the prime insulation is pressurized gas contained in a flexible, inflated and distended housing or shell which maintains the relative orientation or operative spacing of the conductive parts of the bushing which are at different potential.

An object of the invention is to provide a new and improved electric bushing.

Another object of the invention is to provide a light weight, flexible high voltage bushing.

A further object of the invention is to provide a gas filled bushing having a flexible, inflated housing which maintains the relative orientation or operative spacing of the conductive parts of the bushing which are at different potential.

The invention will be better understood from the following description taken in connection with the accompanying drawing and its scope will be pointed out in the appended claims.

In the drawings:

FIG. 1 is an elevation view partly in section of an embodiment of the invention,

FIG. 2 is a similar view of a modification, and

FIG. 3 is a similar view of another modification in which a relatively light rigid stiffening element is used to help support the flexible covering.

Referring now to the drawings and more particularly to FIG. 1, the bushing comprises a conducting tube **1** made of sheet metal of the minimum gauge required for the current carrying capacity of the bushing. This conducting member **1** is surrounded by a torus **2** made of light sheet metal and so proportioned that the relationship between the inside diameter of the torus and the outside diameter of the conducting tube produces a field of controlled intensity at the required operating voltage. Methods of calculating the field of such concentric electrodes is well established in the art. This gap is enclosed with a sheet material **3** such as vinyl coated nylon. Teflon coated nylon, rubber coated canvas or similar materials which are common articles of commerce. As shown, the material **3** is in the form of a pair of frustoconical shells attached at their large ends in any suitable manner to the torus **2** and at their small outer ends in any suitable manner to the tube **1**.

The bushing is inflated with any suitable dielectric gas through an inlet valve **4**, the gas passing from the interior of the torus **2** into the interior of the bushing through a hole **5** in the wall of the torus. The gas may be either air or an electronegative gas such as sulfurhexafluoride under sufficient pressure to obtain the finally required

electrical characteristics in the gap and the required firmness of the structure so as to maintain the coaxial relationship between the tube **1** and the torus **2**.

In the modification shown in FIG. 2, additional external leakage distance is provided so that the bushing will not flash-over or leak excessively under rain or other conditions of surface contamination of the sheet material comprising the housing of the bushing. This is done by corrugating or pleating the bushing as shown. This can be accomplished by cutting rings **6** of the sheet material and fastening them together at their respective inner and outer edges using techniques which are well known.

Another feature of FIG. 2 is that the weight is further reduced by eliminating the central metallic ground sleeve torus **2** and merely coating the equitorial part of the flexible housing with a conductive spray or paint **7**.

In the modification shown in FIG. 3, a comparatively light weight rigid insulating tube **8** is provided for backing up the outer covering of flexible sheet material. The cylinder **8** may be formed of any suitable material such as wound resin impregnated paper. As shown, it is provided with a plurality of holes **9** through which the gas can pass for inflating the outer flexible covering which can be similar to that shown in FIGS. 1 or 2. In this figure, the central ground portion is shown as a ring **10** of conducting material such as light gauge metal.

While there have been shown and described particular embodiments of the invention, it will be obvious to those skilled in the art that changes and modifications may be made without departing from the invention, and therefore it is intended by the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An electrical bushing comprising, in combination, a pair of outer shells of flexible insulating sheet material attached at one of their ends to and extending in opposite directions from a circular conductive ground ring and attached at their opposite ends to the ends of a cylindrical conductor extending through the center of said ring perpendicular to the plane of the latter, said shells normally being inflated and distended by an insulating gas under pressure filling the space in said bushing between said cylindrical conductor on the one hand and said shells and ground ring on the other hand so as flexibly to maintain the relative orientation of the conductive parts and constituting the entire outer insulating surface of said bushing.

2. A bushing as in claim **1** in which said shells are pleated to increase the external leakage distance over their surface between the conductive parts, said pleating being produced by making said shells of a plurality of coaxial rings of inelastic sheet material with the outer edge of each ring hermetically joined to the outer edge of an adjacent ring and the inner edge of each ring hermetically joined to the inner edge of an adjacent ring.

3. A bushing as in claim **1** in which said shells are backed internally by stiffening elements of relatively rigid light weight insulation material pervious to said gas.

4. A bushing as in claim **1** in which the material of said shells is substantially inelastic.

5. A bushing as in claim **1** in which said ground ring is a conductive outer coating on a central web of flexible sheet material integrally joining said one end of said shells.

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LARAMIE E. ASKIN, *Primary Examiner.*