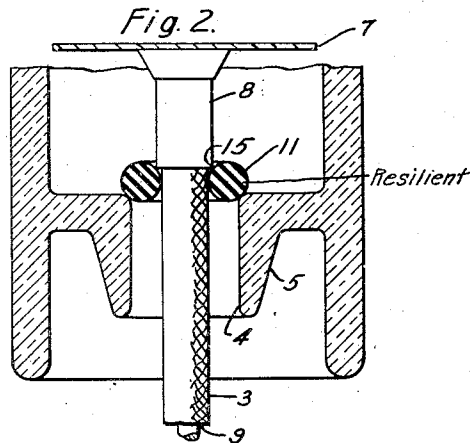
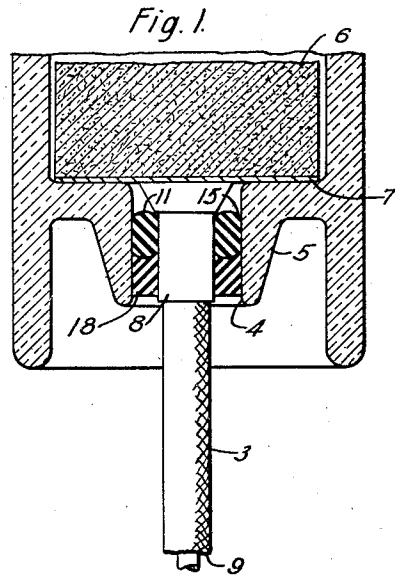


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A. M. OPSAHL
GENERAL BUSHING SEAL
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WITNESSES:

N. J. Lussier
Wm. C. Groome

INVENTOR

Alert M. Opsahl

BY *O. B. Buchanan*
ATTORNEY

UNITED STATES PATENT OFFICE

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GENERAL BUSHING SEAL

Alert M. Opsahl, Forest Hills, Pa., assignor to
Westinghouse Electric & Manufacturing Com-
pany, East Pittsburgh, Pa., a corporation of
Pennsylvania

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My invention relates to a novel form of radially compressed gasket-seal, and it has particular relation to improvements in the sealing-means for a terminal bushing of an electrical apparatus, for the purpose of reliably securing a more economical, and more easily assembled, seal, than has heretofore been possible, to provide a moisture-proof joint around the terminal-lead of an electrical apparatus, at the point where said lead emerges from the housing-member of the apparatus.

A more specific object of my invention is to provide a seal utilizing a terminal-lead, or other cylindrical plug-member, having an enlarged cylindrical surface-portion which is radially separated from the bore or hole of the surrounding housing-member, in combination with a rubber-like toroidal member which rolls, during the assembly of the parts, in a peculiar manner subsequently to be described, with the result that the toroidal member is strongly compressed radially, between the enlarged portion of the terminal-lead and the bore of the housing-member, in the final sealed position of the assembly.

My invention is particularly designed for the ground-lead of a lightning arrester, and it is so illustrated in the accompanying drawing, but I desire it to be understood that the invention is generally applicable to any electrical terminal-lead, or in fact, more generally still, to any sealing means.

In the drawing,

Figure 1 is a fragmentary vertical sectional view of the bottom end of a lightning arrester, indicating the application of my invention to the sealing of the ground-lead thereof, and

Fig. 2 is a sectional view illustrating the method of assembly of the ground-lead seal, showing the initial position of the parts of the seal.

In Fig. 1, I illustrate my invention as applied to an electrical terminal-lead 3 which passes out through a bore 4 in a surrounding housing-member 5 of a piece of electrical apparatus. In Fig. 1, the terminal-lead 3 is the ground-lead of a lightning arrester, one of the arrester elements being indicated at 6. The ground-lead 3 is illustrated as being electrically connected to the center of the bottom of a terminal plate 7 which rests upon the bottom of the housing-member 5 in a position surrounding the bore or opening 4 therein. Adjacent to the terminal plate 7, the ground-lead 3 is provided with a sealed ferrule 8 which I utilize for the purpose of giving the ground-lead a configuration defining an enlarged cylindrical portion of increased di-

ameter, as compared with the diameter of the rest of the ground-lead. The particular ground-lead which is illustrated is provided with an insulating coating 9, but my invention is applicable to bare conductors as well as insulated conductors.

In accordance with my invention, I provide a sealing-means in the form of a toroidal or ring-like member 11 which is made of a solid material which is capable of being resiliently stretched and compressed, like rubber, and which is preferably also an insulator. Instead of utilizing any of the available commercial forms of rubber, I prefer to utilize one of the several available forms of synthetic rubber, or rubber-substitutes, as having a longed life, and the ability to maintain its resiliency without deterioration for a much longer period of time.

The cylindrical enlargement which is provided by the ferrule 8 on the terminal-lead 3 has an axial or longitudinal extent which is of the order of at least two-thirds of the cross-sectional circumference of the toroidal gasket 11, and the bore 4 of the housing-member 5 has a still greater axial or longitudinal extent, so as to provide, in effect, a tubular member surrounding the terminal-lead 3.

In the initial, unassembled position of the parts, the toroidal gasket 11 preferably loosely or lightly surrounds the terminal-lead 3 at a point immediately next to the ferrule 8. Before the lightning-arrester element 6 is placed in the housing-member 5, the assembled terminal plate 7, with its short length of ground-lead 3 attached thereto, is inserted in place from the top of the arrester-housing 5, with the ground-lead 3 extending out through the hole 4 in the bottom of the arrester-housing 5. The parts then assume the position shown in Fig. 2, with the rubber-like toroidal gasket 11 resting between the ferrule 8 and the top of the hole 4 in the bottom of the housing-member 5. The toroidal gasket 11 has a normal thickness greater than the radial distance between the ferrule 8 and the bore 4, in the final assembled position of the parts.

To assemble the seal, a longitudinal force is applied to the terminal member 3, so as to forcibly pull it further down in the hole 4. During this downward movement of the terminal-lead 3, relatively to the hole 4 in the housing-member 5, the inner and outer surfaces of the toroidal gasket 11 frictionally engage, respectively, against the cylindrical surface of the ferrule 8 and the cylindrical bore 4 of the housing 5, caus-

ing the rubber-like toroidal gasket 11 first to roll inside-out, with the portion 15 of its surface which was initially in contact with the edge of the ferrule 11, as shown in Fig. 2, rolled over to the outside of the torus in engagement with the bore 4; and the downward movement of the terminal-lead is thereafter still continued until the toroidal gasket 11 is finally caused to roll beyond this point, so that the aforesaid portion 15 of its surface has now rolled to a point where it is free of contact with the bore 4, as shown in Fig. 1.

When the compressible toroidal gasket 11 makes the above-described rolling-movement, it is strongly compressed in a radial direction, as shown in Fig. 1, the force for effecting this compression being applied in a longitudinal direction, in the step of pulling the ground-lead down into place within the housing-member 5.

Moreover, the toroidal gasket 11, because of the resilience of its material, has a strong tendency to return to its initial position or condition, shown in Fig. 2. Thus, the inside of the torus, which is designated by the numeral 15 in Fig. 2, is like a rubber band which is smaller than the outside of the torus, but when the toroidal ring is forced into its final position, as shown in Fig. 1, the small inside rubber-band portion 15 has been stretched to the outside portion, and a little beyond its outermost stretching, so that the resiliency of this material acts to try to cause the ring to roll still further, so that said rubber-band portion 15 might return again to the inside of the ring, where it belongs. In like manner, the portion of the ring which was originally on the outside has been compressed to make it assume a position on the inside of the torus, and it is moved around a little further, in the final rolling movement of the toroidal gasket 11, in order to cause it, too, to tend to expand and to cause the toroidal or ring-like gasket to continue its rolling movement, pushing the terminal-lead 3 still further down, or outwardly, through the hole 4 in the housing 5.

It is a desirable feature of my invention that the terminal plate 7 operates as a stop-means for limiting the axial or longitudinal movement of the terminal-lead 3 through the hole 4 at a point which the resiliency of the gasket-material is still trying to roll the gasket further, thus resulting in a positive force holding the terminal-lead in place within the hole 4, and positively holding the gasket 11 under a strong radial compressional force, as indicated by the distortion of the gasket which is shown in Fig. 1.

After the above-described assembly of the sealing member, I prefer to turn the arrester-housing 5 upside down, and fill the exposed space between the terminal-lead 3 and the hole 4 with a gum 18 or other initially flowable sealing-material, for the purpose of not only sealing the rubber-like toroidal gasket 11 against access to air, so as to prolong its life, but also to effect a water-proof seal between the terminal-lead 3 and the bore 4 of the housing 5 by means of the gum itself, the effectiveness of this gum-sealing being enhanced by the presence of the rubber-like ring or gasket within the hole or opening 4.

I claim as my invention:

1. A seal comprising a cylindrical plug, a tubular surrounding-member, the bore of the tube being larger than the plug, a rubber-like toroidal member, the normal thickness of the toroidal member being greater than the radial distance between the plug and the bore of the tubular

surrounding-member whereby the toroidal member will frictionally engage said plug and said bore, respectively, as the parts are assembled by means of a relative axial displacement between the plug and the tubular surrounding-member, causing the rubber-like toroidal member first to roll inside-out, with the portion of its surface which was initially on the inside, rolled over to the outside of the torus in engagement with the bore, and finally causing the toroidal member to roll beyond such a point, and means for stopping the rolling of the toroidal member while the resiliency of the rubber-like material still acts in a direction tending to cause the toroidal member to roll still further, whereby the parts are held forcibly in their final, stoppered position with the material of the toroidal member in considerable radial compression between the plug and the bore.

2. A gasket sealing-device for an electrical terminal-lead, comprising the combination, with said terminal-lead, of a housing-member having a bore larger than said terminal-lead, the terminal-lead extending through said bore from the inside of the housing-member, abutment means secured to an inner portion of the terminal-lead for limiting the amount which it can be pulled out through said bore in the housing-member, and a rubber-like insulating toroidal member normally surrounding the terminal-lead within said housing-member in the initial, unassembled position of the parts, with the toroidal member disposed in a position against the inner end of said bore and spaced longitudinally from said abutment-means by a distance at least of the order of two-thirds of the cross-sectional circumference of the toroidal member, the normal thickness of the toroidal member being greater than the radial distance between the terminal lead and the bore whereby the toroidal member will frictionally engage said terminal-lead and said bore, respectively, as the parts are assembled by means of a pulling out of the terminal-lead through the bore, causing the rubber-like toroidal member first to roll inside-out, with the portion of its surface which was initially on the inside, rolled over on the outside of the torus in engagement with the bore, and finally causing the toroidal member to roll beyond such a point until the pulling out of the terminal-lead is finally stopped by said abutment-means, so that the resiliency of the rubber-like material still acts in a direction tending to cause the toroidal member to roll still further, whereby the parts are held forcibly in their final, stoppered position with the material of the toroidal member in considerable radial compression between said terminal-lead and said bore.

3. A seal comprising a cylindrical plug, a tubular surrounding-member, the bore of the tube being larger than the plug, a rubber-like toroidal member of a size adapted to loosely surround a portion of the plug in the unassembled position of the parts, the plug having an enlarged portion of increased diameter, said enlarged portion having an axial extent of the order of at least two-thirds of the cross-sectional circumference of the toroidal member, the normal thickness of the toroidal member being greater than the radial distance between the enlarged portion of the plug and the bore of the tubular surrounding-member whereby the toroidal member will frictionally engage said enlarged portion and said bore, respectively, as the parts are assembled by means of a relative axial displacement between

the plug and the tubular surrounding-member, causing the rubber-like toroidal member first to roll inside-out, with the portion of its surface which was initially in contact with the edge of the enlarged portion rolled over to the outside of the torus in engagement with the bore, and finally causing the toroidal member to roll beyond such a point, and means for stopping the rolling of the toroidal member while the resilience of the rubber-like material still acts in a direction tending to cause the toroidal member to roll still further, whereby the parts are held forcibly in their final, stoppered position with the material of the toroidal member in considerable radial compression between the enlarged portion of the plug and the bore of the tubular surrounding-member.

4. A gasket sealing-device for an electrical terminal-lead, comprising the combination, with said terminal-lead, of a housing-member having a bore larger than said terminal-lead, the terminal-lead extending through said bore from the inside of the housing-member, said terminal-lead having a ferrule surrounding a portion thereof which is initially inside of the housing-member in the unassembled position of the parts, said ferrule defining an enlarged portion which lies within the bore of the housing-member in the final assembled position of the parts, means secured to an inner portion of the terminal-lead for limiting the amount which it can be pulled out through said bore in the housing-member, and a rubber-like insulating toroidal member

normally surrounding the terminal-lead within said housing-member in the initial, unassembled position of the parts, with the toroidal member disposed in a position spaced longitudinally between said enlarged portion and said bore, the longitudinal extent of said enlarged portion being of the order of at least two-thirds of the cross-sectional circumference of the toroidal member, the normal thickness of the toroidal member being greater than the radial distance between the enlarged portion and the bore whereby the toroidal member will frictionally engage said enlarged portion and said bore, respectively, as the parts are assembled by means of a pulling out of the terminal-lead through the bore, causing the rubber-like toroidal member first to roll inside-out, with the portion of its surface which was initially in contact with the edge of the enlarged portion rolled over to the outside of the torus in engagement with the bore, and finally causing the toroidal member to roll beyond such a point until the pulling out of the terminal-lead is finally stopped by said means secured to an inner portion thereof, so that the resilience of the rubber-like material still acts in a direction tending to cause the toroidal member to roll still further, whereby the parts are held forcibly in their final, stoppered position with the material of the toroidal member in considerable radial compression between said enlarged portion and said bore.

ALERT M. OPSAHL.