

W. T. BIRDSALL.

SEAL.

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1,320,114.

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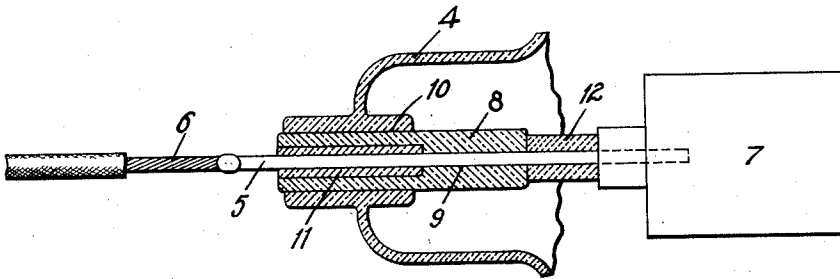


Fig. 1.

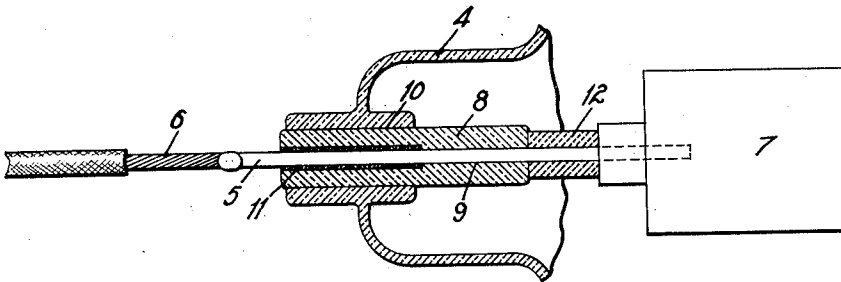


Fig. 2.

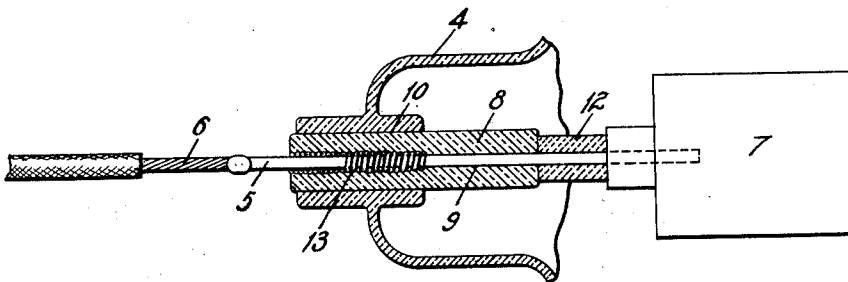


Fig. 3.

WITNESSES:

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SEAL.

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To all whom it may concern:

Be it known that I, WILFRED T. BIRDSALL, a citizen of the United States, and a resident of Montclair, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Seals, of which the following is a specification.

My invention relates to seals between masses of vitreous material and electric conductors projecting therethrough and it has for its object to provide a device of the character described which shall be simple and inexpensive to manufacture and adapted to remain vacuum tight over wide temperature ranges.

In the accompanying drawing, Figures 1, 2 and 3 illustrate different modifications of seals embodying my invention.

In the manufacture of vapor electric apparatus, such, for example, as mercury-vapor rectifiers and lamps, it is necessary that electric conductors be sealed into the walls of the containers, said seals being adapted to maintain a high vacuum within a container throughout the wide temperature ranges occasioned by climatic conditions and the effect of heavy load currents on the temperature of the container and of the leading-in conductor. It has been an extremely difficult matter to provide a seal of the character described directly between the wall of a container and the leading-in conductor because of differences in the coefficients of expansion in the materials suitable for the two uses. This has been especially the case since the price of platinum reached such a high point as to practically prohibit its commercial use except for seals of very small capacity. There has been developed, therefore, what is known as the "graded" seal wherein a layer of material, preferably glass, having an intermediate coefficient of expansion, is inserted between the material of the container wall, such, for example, as hard glass and the leading-in conductor composed, for example, of tungsten. In the operation of a seal of the character described, the points of sealing of the wall and of the conductor to the intermediate mass are immediately adjacent to each other, with the result that there is a great concentration of stresses with consequent development of mechanical failure.

By my invention, I offset the two points of sealing with respect to each other, thus

distributing the strain over such a large amount of material that there is no stretching beyond the elastic material and, at the same time, I provide a structure that is mechanically strong by inserting a material of elastic nature between the conductor and the intermediate mass at a point opposite the seal with the container wall.

Referring to the drawing for a more detailed understanding of my invention, I have shown a portion of a container at 4. A conductor 5, projecting through the wall 4, is provided with a supply conductor 6 at its outer end and with an electrode 7 at its inner end. There will, of necessity, be a slight difference between the coefficients of expansion of a material suitable for use in the container wall 4 and the material of which the conductor 5 is made and I therefore provide an auxiliary mass 8 of material, preferably glass, having a coefficient of expansion intermediate that of the conductor 5 and that of the wall 4. The mass 8 is sealed to the conductor 5 at a point 9 and to the wall 4 at a point 10. The points 9 and 10 bear an offset relation with respect to each other so that strains, arising from differences in the coefficients of expansion, are taken up by the elasticity of the material of the mass 8 lying between the two points of sealing. The above-described structure, while providing a vacuum-tight seal for the container, is mechanically somewhat weak and I therefore provide a layer of highly elastic material 11 between the conductor 5 and the mass 8 at a point opposite the seal 10. The material of the mass 11 need not necessarily seal tightly to either the mass 8 or to the conductor 5 but provides merely a mechanical spacer for the purpose of supporting, while preventing close adhesion between, the mass 8 and the conductor 5 under the seal 10 and hence preventing the concentration of stresses. The arc may be prevented from impinging directly upon the conductor 5 by means of a lava or porcelain bead 12, as is known in the art.

Referring to the form of my invention shown in Fig. 2, the essential features are all as shown in Fig. 1 with the exception that the layer of material 11 is provided by the electrolysis of the glass of the mass 8, thus destroying the adhesion of the seal at this point, while maintaining a certain mechanical support.

In the form of my invention shown in Fig. 3, a wrapping 13, composed preferably of tungsten or molybdenum wire, is applied to the conductor 5 opposite the point of sealing 10 and provides an exceptionally firm mechanical joint with practically no accompanying adhesion of the mass 8 to the wire 5 at undesired points.

While I have illustrated and described only three distinct embodiments of my invention, I desire my invention to be construed broadly to cover any and all modifications, within the scope of the appended claims, whereby the desired results may be secured.

I claim as my invention:

1. The combination with a container of vitreous material, of a conductor projecting through the wall thereof and having a different coefficient of expansion therefrom, and a joint connecting said two members comprising a mass of material having an intermediate coefficient of expansion and surrounding said conductor, sealed thereto, at one point thereof and loosely bearing thereagainst at another point, and a seal between said mass and said wall and adjacent said second point.
2. The combination with a container of vitreous material, of a conductor projecting

through the wall thereof and having a different coefficient of expansion therefrom, and a joint connecting said two members comprising a mass of material having an intermediate coefficient of expansion and surrounding said conductor and sealed to both of said members, the points of sealing having an offset relation with respect to each other, and a layer of highly elastic material between said mass and said conductor opposite the point of sealing of said wall.

3. The combination with a container of vitreous material, of a conductor projecting through the wall thereof and having a different coefficient of expansion therefrom, and a joint connecting said two members comprising a mass of material having an intermediate coefficient of expansion and surrounding said conductor and sealed to both of said members, the points of sealing having an offset relation with respect to each other, and a layer of highly elastic porous material between said mass and said conductor opposite the point of sealing of said wall.

In testimony whereof, I have hereunto subscribed my name this 29th day of September 1915.

WILFRED T. BIRDSALL.