Nov. 29, 1955 J. A. STORMS ET AL 2,725,498

DISC SEAL FOR ELECTRON GASEOUS DISCHARGE DEVICE

Filed June 25, 1952 2 Sheets-Sheet 1

Fig. 1.

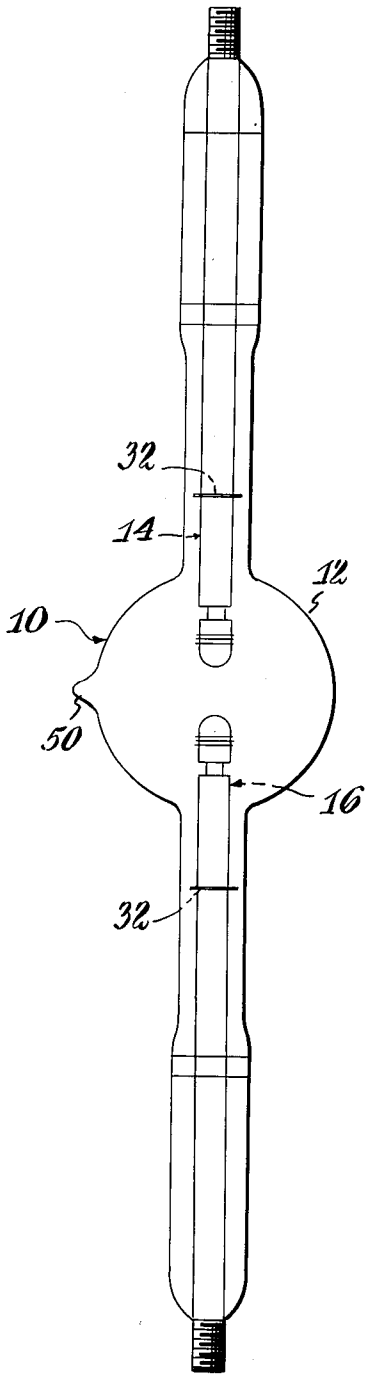


Fig. 2.

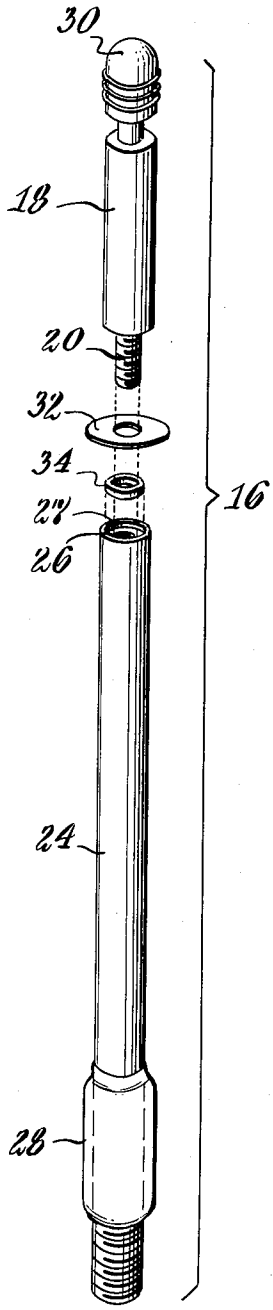
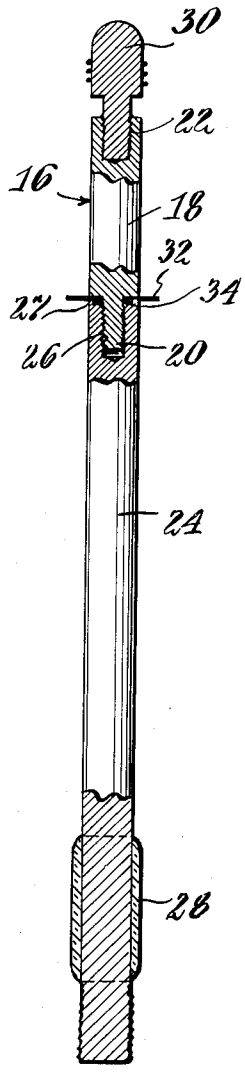


Fig. 3.



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Filed June 25, 1952 2 Sheets-Sheet 2

Fig. 4.

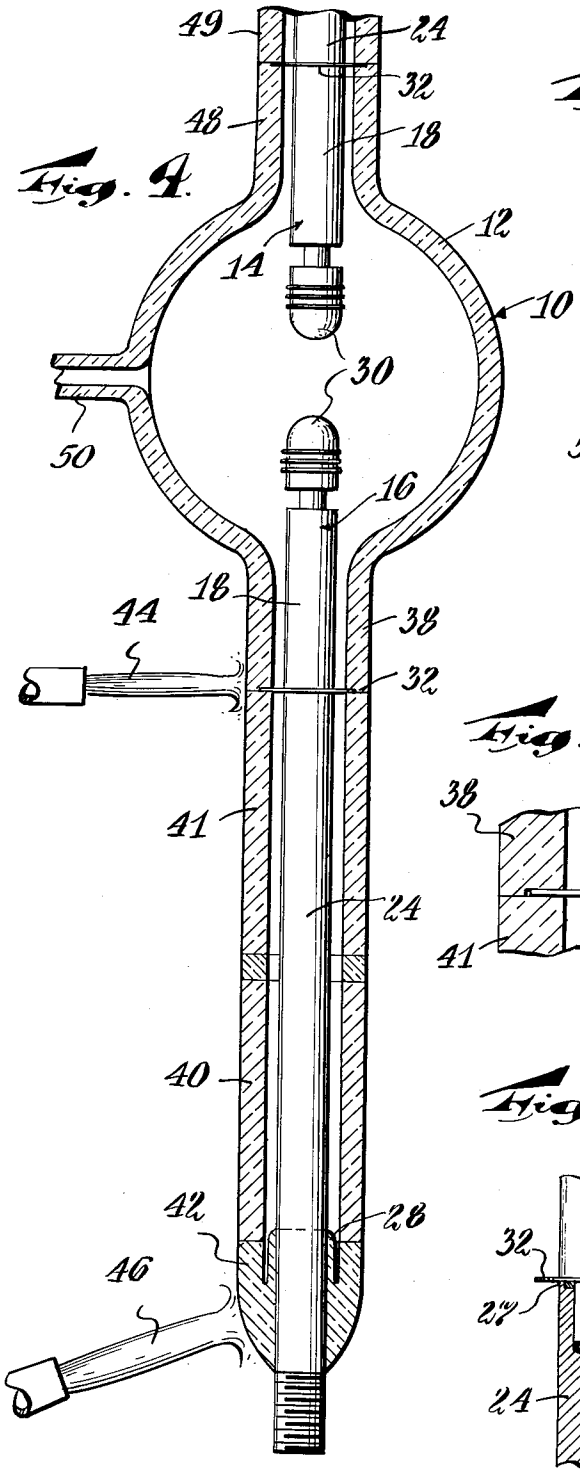


Fig. 6.

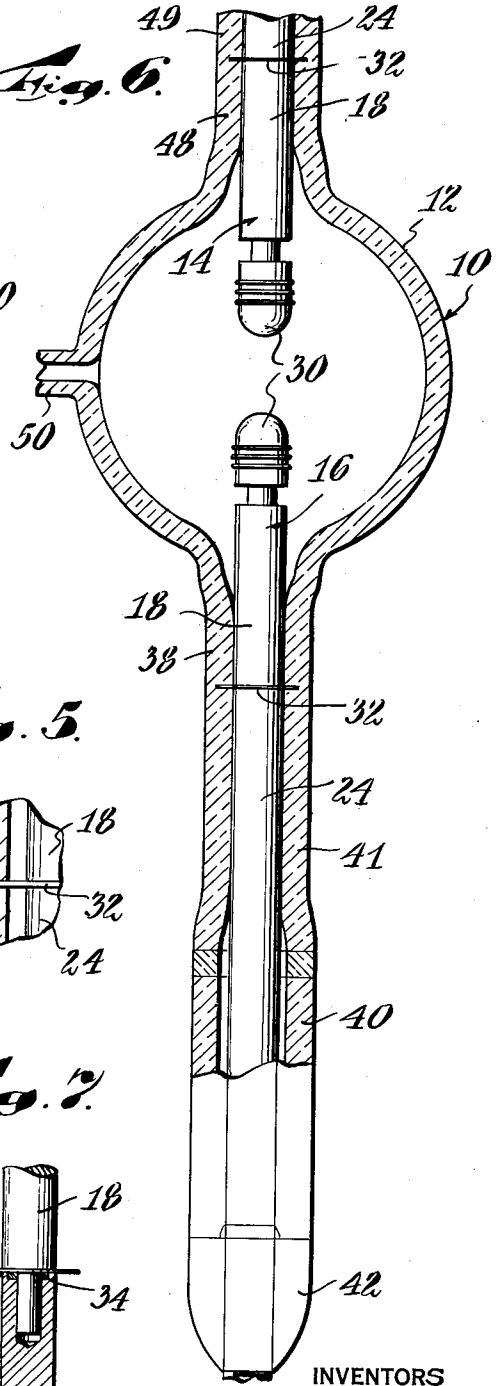
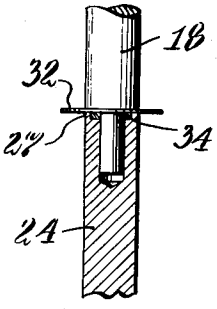


Fig. 5.

Fig. 7.



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DISC SEAL FOR ELECTRON GASEOUS DISCHARGE DEVICE

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2 Claims. (Cl. 313—217)

This invention relates to electric gaseous discharge devices and more specifically to a disc seal between the envelope and the electrode for such a device.

In the manufacture of gaseous discharge devices, such for example, as a high pressure short arc mercury vapor lamp, the quartz to metal seal involved therein has presented many problems of quality and control. In the past, seals have been made by either wrapping spiral molybdenum ribbon along a refractory metal electrode and shrinking the quartz glass end portion down onto the ribbon and electrode or by employing a thin molybdenum ribbon embedded by automatic techniques in the quartz end portion. While the spiral winding type of seal is satisfactory, the winding of the ribbon spiral on the electrode requires considerable skill. Further, the molybdenum ribbon type seal is limited by the amount of current which it will carry and the strength of the ribbon.

Hence, it has been found advantageous according to our invention to employ a disc seal which provides an easy but positive quartz to metal seal for a high pressure short arc mercury vapor lamp.

The electrode may be conveniently composed of two rods which are threadable into each other at their respective ends and hermetically brazed together with a thin refractory disc or washer therebetween. The exterior or lower rod of the electrode is then suitably beaded with a hard glass and inserted into a short quartz end portion of the lamp envelope with the disc seated in a convenient shoulder thereat. A tubular graded seal portion is then simultaneously sealed to the end portion of the lamp envelope and the bead on the lower end of the electrode. The lamp is then evacuated and the quartz glass in the end portion and graded sealed portion is collapsed upon the electrode and about the disc to provide an hermetic seal thereat.

In its general aspect the present invention has the object of overcoming the aforementioned disadvantages of prior art seals for gaseous discharge devices.

Specifically, an object of the present invention is a facile and positive disc seal for a gaseous discharge device such as a high pressure short arc mercury vapor lamp.

An additional object is an electrode for sealing into a gaseous discharge device comprising a pair of rods threadable one into the other with a refractory metal disc therebetween for sealing into a quartz end portion and a graded seal portion of a gaseous discharge device envelope.

Other objects of the invention will become apparent to those skilled in the art as the description proceeds both by direct recitation thereof and by implication from the context.

Referring to the accompanying drawing in which like numerals of reference indicate similar parts throughout:

Fig. 1 is a front elevational view of a gaseous discharge device wherein our invention is contained.

Fig. 2 is an exploded view of one of the electrodes of our invention for sealing into the gaseous discharge device of Fig. 1.

Fig. 3 is a side elevational view of the electrode of our invention partially in section.

Fig. 4 is a sectional view showing the first step of the sealing operation, namely, sealing the disc type electrode end portions and graded seal portion of the lamp envelope.

Fig. 5 is an enlargement of a fragmentary portion of Fig. 4 showing the sealing of the disc between the end portion and the graded seal portion.

Fig. 6 is a view similar to Fig. 4 showing the second step of the sealing operation, namely, collapsing the end portion and quartz portion of the graded seal portion onto the electrode and around the disc.

Fig. 7 is a view similar to a portion of Fig. 3 and showing an alternating embodiment of the connection between the two rod portions of the electrode.

Referring to the drawing and more particularly to Fig. 1 a gaseous discharge device such as a high pressure short arc vapor lamp is designated by the reference numeral **10**. This lamp comprises a vitreous envelope **12** suitably quartz or some other high silica content glass provided with oppositely disposed refractory metal electrodes **14** and **16** suitably molybdenum or tungsten, an inert gas, such as argon for initiating a discharge therebetween and an ionizable medium such as mercury. Each of the electrodes **14** and **16**, shown in Figs. 2 and 3, have an upper or inner rod **18** comprising a threaded lower portion **20** of reduced diameter and provided with a threaded opening **22** in its upper end. A lower or outer rod **24** for each electrode **14** and **16** has an annular opening **26** for threadable engagement with the lower portion **20** of inner rod **18** and is provided with a solder ring shoulder **27** at the upper end and a bead **28** of a suitable hard glass and a threaded connection on its lower end. An electrode tip **30** is threadable into the aperture **22** in the upper rod **18**. A refractory metal disc or washer **32**, conveniently molybdenum, secured between the rods **18** and **24**, completes the electrode. As shown in Fig. 7 the threading of the lower portion **20** of the rod **18** and of the opening **26** in the rod **24** may be dispensed with.

According to our invention the tip **30** is threaded into the hole **22** in the upper rod **18** and the lower threaded portion **20** of said rod is screwed into the opening **26** in the lower member **24** with the disc **32** therebetween and a solder ring **34** suitably cupro-nickel in the shoulder **27**. The electrode **14** or **16** is then baked in a hydrogen atmosphere at a temperature sufficiently high to cause the nickel ring **34** to melt and hermetically braze the rods **18** and **24** and the disc **32** together.

The electrode **16** for example is then inserted into an end portion **38** of the vitreous envelope **12** so that the disc **32**, shown in Fig. 4 rests in a suitable shoulder therein. A graded vitreous tube **40** having its quartz end **41** adjacent the disc **32** and its relatively soft glass end **42** adjacent the bead **28**, is then slipped over the lower rod **24** of the positioned electrode **16** and a suitable source of heat, such as the burners **44** and **46**, is employed to simultaneously fuse the end **41** of the envelope end portion **38** (as shown in Fig. 5) with the disc **32** therebetween and also the end **42** to the bead **28** of the electrode **16**.

The electrode **14** is then similarly sealed to an end portion **48** of the envelope **12** and a graded vitreous tube **49** as shown in Fig. 4. The envelope **12** is then evacuated thru a suitable exhaust tubulation **50** and heat is supplied to the quartz portion **41** of the graded seal tube **40** and the envelope end portion **38** to cause the collapse of said portions onto the electrode **16** and about the disc **32** to provide an hermetic seal thereat.

It will be understood that the relatively soft glass end **42** of the graded seal tube **40** is not collapsed onto the rod **24** of the electrodes **14** and **16** thereby preventing creation of any strains therein. The quartz end portion **48** of the envelope **12** and the quartz end of the graded vitreous tube **49** are similarly collapsed onto the electrode **14** and the lamp **10** is then ready for exhaust.

Thus it will be seen from the foregoing description that our invention has overcome the defects of the ribbon seal and the spiral wrapped electrode seal for gaseous discharge devices. We have provided a two piece electrode hermetically joined to a refractory metal disc for hermetic sealing between the quartz end portion of an envelope and a graded vitreous tube to provide an easy but positive quartz glass to metal seal for a high pressure short arc vapor lamp.

Whereas an embodiment of our invention has been disclosed it will be understood that modifications may be made within the spirit and scope of the invention.

We claim:

1. A gaseous discharge device comprising a sealed envelope provided with tubular end portions, an ionizable medium therein, a pair of oppositely disposed electrodes in said envelope, at least one of said electrodes having inner and outer refractory metal rods and a refractory metal disc of substantially greater diameter than said inner and outer rods hermetically joined between said rods, an inner hermetic seal comprising said disc, said end portion and a hard glass end of a graded vitreous tube, said inner seal embedding said disc and said electrode in said end portion and said hard glass end of said graded tube, and an outer hermetic seal comprising the soft glass end of said graded tube and the soft glass beaded outer end of said outer metal rod.

2. A stem for a gaseous discharge device comprising a vitreous end tube, an electrode having inner and outer refractory metal rods and a refractory metal disc of substantially greater diameter than said inner and outer rods hermetically joined between said rods, an inner hermetic seal comprising said disc, said end tube and the hard glass end of a graded vitreous tube, said inner hermetic seal embedding said disc and said electrode in said end tube and said hard glass end of said graded tube, and an outer hermetic seal comprising the soft glass end of said graded tube and the soft glass beaded end of said outer metal rod.

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