

Sept. 24, 1940.

R. F. HAYS, JR

2,215,644

METHOD OF MAKING A SEAL FOR DISCHARGE DEVICES

Filed Nov. 26, 1938

Fig. 1.

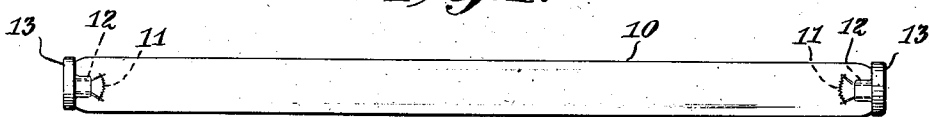


Fig. 2.

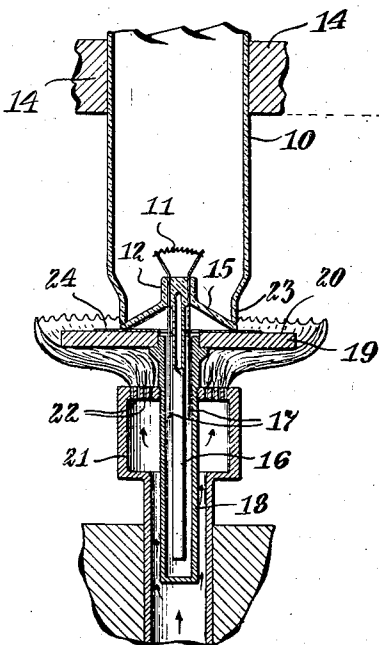


Fig. 3.

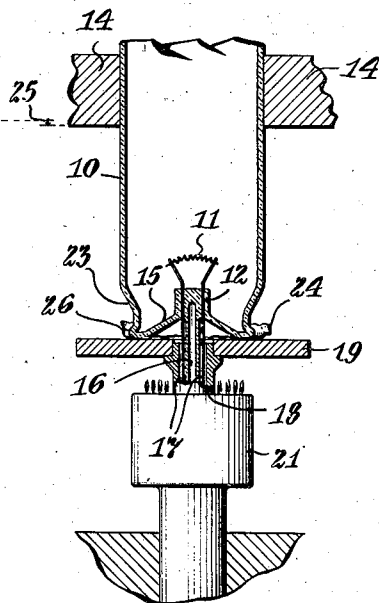


Fig. 5.

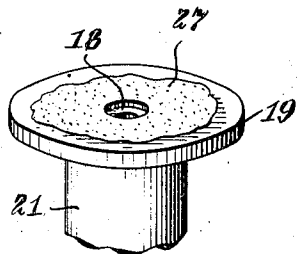
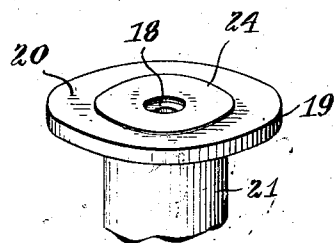


Fig. 4.



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2,215,644

METHOD OF MAKING A SEAL FOR
DISCHARGE DEVICES

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Application November 26, 1938, Serial No. 242,550

5 Claims. (Cl. 49—82)

My invention relates to seals and especially to seals that have to be molded for discharge lamps, tubes and similar devices.

5 An object of my invention is to form a molded seal by a method that will prevent impurities from effecting the vacuum tightness of the joint formed by the molding operation.

10 Other objects and advantages of the invention will be apparent from the following description and drawing, in which:

Fig. 1 is a front elevation of a lamp to illustrate the type of device to which the invention is applied.

15 Fig. 2 is a view mainly in cross-section through the apparatus and a portion of the tube illustrating an early step in the process of molding the seal.

20 Fig. 3 is a similar view illustrating the apparatus subsequent to the step illustrated in Fig. 2.

Fig. 4 is a perspective view of the carbon block and sheet of fibrous material illustrated in Fig. 2.

25 Fig. 5 is a perspective view illustrating the modification of finely divided powder or paste in place of the fibrous material of Fig. 4.

30 Certain types of lamps, discharge lamps and discharge tubes, require a molded seal so that there will be no sagging of the portions of the container and seal. The reason for this molded seal is generally the fact that the tube must be very carefully dimensioned in regard to contacts or there must be no direct application of a very high temperature flame that would result in electrodes or filaments sagging out of their desired alignment or position.

35 One such type of tube is illustrated in Fig. 1 which discloses the very popular luminescent tube comprising a long tubular glass casing 10 coated on its inside with fluorescent material and having filaments 11 at either end. These filaments are supported on a press 12 which is sealed to the tubular casing and a cap 13 is attached thereto for the purpose of making electrical contact with a commercial system. The 40 filaments 11 should be axially aligned for proper uniform fluorescence throughout the tube and the end contact caps 13 must be carefully spaced in order to fit in the definitely spaced contacts provided for such tubes. With a tube of this 50 type fitting into a contact connection at each end of the tube, there is not the tolerance of length that would be permitted with a tube having a contact only at one end. Accordingly, it is very important that the press 12 be carefully 55 fully molded in the sealing operation to the tubu-

lar casing 11 to provide an accurate over-all length for the tube.

One of the difficulties of the prior art construction of these molded seals has been the fact that particles of material have combined 5 with the glass at the molded joint and in operation have provided leaks that destroy the effectiveness of the tube. It is an object of my invention to prevent the incorporation of such impurities at the molded joint of such tubes. 10

In Fig. 2, I have disclosed a portion of the tube 10 held in movable jaws 14. The filament 11 in the press 12 has the flange 15 resting upon a special support. The tubulation 16 and leads 17 are in a central hollow closed-in tube 18 of 15 this support. A carbon disc 19 rests upon this central tube 18 and has its upper surface above the level of this tube. A special burner 21 surrounds the central tube 18 and has flame holes 22 to direct the flame at the under surface of the carbon disc 19. As illustrated in Fig. 2, this 20 flame strikes the lower edge and outer rim of the disc 19 but does not make direct contact with substances placed within the perforate of the upper surface 20 of the disc 19. The casing 25 10 of the tube has its end reduced in diameter at 23 to coincide with the outer diameter of the flange 15 of the press. Carbon is used for the disc 19 because it will readily conduct heat from the lower surface to the upper surface and will 30 not melt or sinter at the temperature necessary to mold the seal. Other heat resisting materials could, of course, be substituted for the carbon disc. One difficulty with carbon has been that particles of it would be detached from the disc 35 and stick to the molded joint between the flange 15 and the reduced diameter 23 of the tube. These particles of carbon or other impurities of a similar nature on the surface of the carbon would permit leaks through the joint after the 40 tube was supposedly sealed vacuum tight. In order to prevent this occurrence, I insert a sheet of fibrous material between the surface of the carbon block and the flange 15 of the press and this sheet is illustrated at 24 in Fig. 2 and also 45 in perspective Fig. 4. This fibrous material is preferably of paper, and preferably of a very soft type such as that used for facial tissue.

In Fig. 3, I have disclosed the tube 10 being moved down a predetermined distance 25 when 50 the glass on the upper surface of the carbon block 19 has been heated sufficiently by the heat transfer by conduction therethrough. This movement at 25, accordingly, forms the molded seal 26 between the flange 15 and the reduced end 55

23 of the tube. The paper 24 has, of course, been charred by the temperature of the flame but the paper does not form a crystalline structure that would unite with that of the glass and accordingly any traces of this charred paper can be easily removed from the molded seal.

I have also discovered that in place of the fibrous material 24, I can utilize an insulating powder or paste on the surface of the disc 19 which powder or paste will not crystallize at the temperature of the molded seal. A perspective view of such a powder or paste 27 is illustrated in Fig. 5. The material I have found especially adapted to this use has been powdered silica and especially powdered silica in such a fine state that it has been designated as "silica smoke" as an indication of the fineness to which it is ground or formed. This silica powder does not crystallize at the temperature of the molding of the joint and accordingly, does not interfere with the formation of a vacuum tight seal between the two glass bodies.

While I have disclosed carbon as the substance utilized for the disc 19 in the apparatus illustrated on the drawing, certain types of metal could be utilized in place of the carbon. It is necessary of course that the metal utilized will not melt at the temperature necessary to seal the glass and it is also desirable that this metal will not scale and warp during the sealing process. Nickel is one of the metals that could be utilized for the disc 19. Various other metals and their alloys might be utilized, such as the nickel-cobalt-iron alloy sold under the trade name of "Kovar." It is possible to use various other nickel and steel alloys, especially those containing silicon and chromium. In using these metals, I prefer to add a suitable binder to the powder illustrated in Fig. 5 of the drawing. Although various binders might be utilized, I have obtained good results with water and sodium silicate.

It is apparent that many modifications may be made in the particular steps and formation of the apparatus and the application thereof to various lamp and tube structures.

I claim:

1. The method of producing a seal between two glass sections which comprises placing a first substance that does not combine with the glasses at the sealing temperature of the glasses on a second substance capable of high heat conductance and not deformed by such high heat,

placing one of said glass sections on the first substance, applying heat to said second substance to heat said glass section by conduction, placing a second section against the first while it is still on the heated second substance and molding said glass sections together.

2. The method of producing a seal between two glass sections which comprises scattering a finely divided powder that does not combine with the glasses at the sealing temperature of the glasses on a second substance capable of high heat conductance and not deformed by such high heat, placing one of said glass sections on the finely divided powder, applying heat to said second substance to heat said glass section by conduction, placing a second section against the first while it is still on the heated second substance and molding said glass sections together.

3. The method of producing a seal between two glass sections which comprises placing a finely divided powder that does not combine with the glasses at the sealing temperature of the glasses on a carbon disc capable of high heat conductance and not deformed by such high heat, placing one of said glass sections on the finely divided powder, applying a flame to said carbon disc to heat said glass section by conduction, placing a second section against the first while it is still on the heated second substance and molding said glass sections together.

4. The method of producing a seal between two glass sections which comprises powdering silica, placing the powdered silica on a second substance capable of high heat conductance and not deformed by such high heat, placing one of said glass sections on the powdered silica, applying heat to said second substance to heat said glass section by conduction, placing a second section against the first while it is still on the heated second substance and molding said glass sections together.

5. The method of producing a seal between two glass sections which comprises placing a powdered silica on a carbon disc capable of high heat conductance and not deformed by such high heat, placing one of said glass sections on the powdered silica, applying heat to said carbon disc to heat said glass section by conduction, lowering the second glass section on top of the first glass section and molding said glass sections together.

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