July 2, 1940. R. SCHARFNAGEL 2,206,515

ELECTRIC DISCHARGE VESSEL

Filed April 21, 1938

Fig. 1

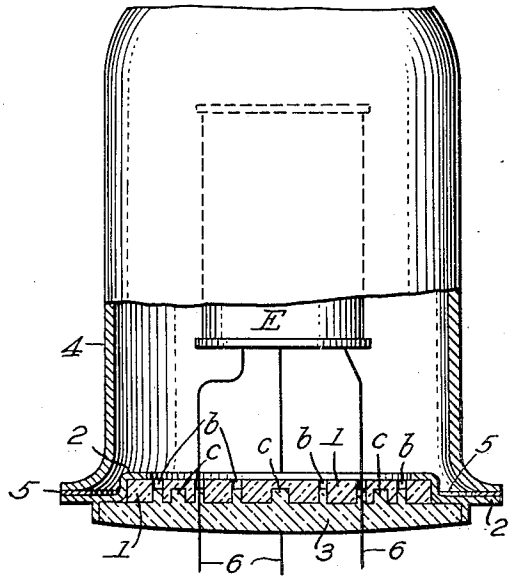
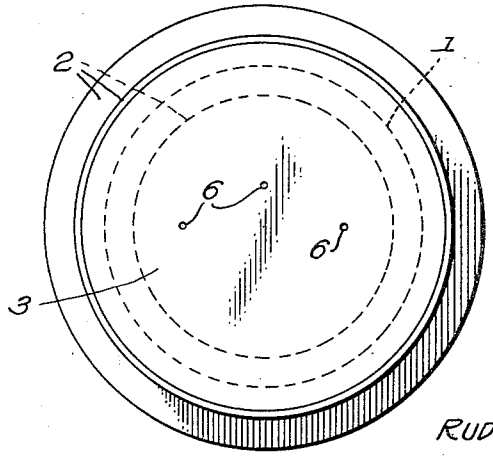


Fig. 2



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ELECTRIC DISCHARGE VESSEL

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6 Claims. (Cl. 250—27.5)

The invention relates to electric discharge vessels and is more particularly concerned with the insulating member thereof which serves to hold the leads joined to the electrode system, these being fastened in such insulating member by a suitable sealing material.

The invention has for its object to avoid cracks which may arise in this sealing material through strains occuring therein, and it consists in certain features of novelty which will be understood from the following description and be particularly pointed out in the appended claims, reference being had to the accompanying drawing in which

Fig. 1 is a partially diagrammatic fragmentary sectional view of a discharge vessel of the kind to which the invention relates, Fig. 2 is a bottom plan view to Fig. 1.

In the device here shown by way of example the insulating member holding leads 6 joined to an electrode system E is a disc 1 having a high melting point, preferably of ceramic material. Such ceramic material may be compact or porous. Disc 1 is at its edge united with an annular metal member or ring 2 by means of a seal 3 that preferably consists of glass. Ring 2 is fastened to the bulb 4 of the discharge vessel with the aid of glass 5 or the like.

As is well known, strains in the seal 3 mainly depend on the coefficient of expansion and the volume of the seal 3 in relation to the respective constants of the disc 1. If in consequence of the difference of the respective coefficients of expansion it is not possible to provide a seal 3 of a certain thickness, then it will be possible to arrange instead a thin glazing or to reduce the volume of the disc 1 or the like by providing therein bores *b* or recesses *c*. The recesses *c* may be cylindrical or slot-shaped hollows, for instance, and serve to diminish the thickness of disc 1, thus being a means for reducing the volume thereof. However, even if the curves illustrating in a well known manner the expansion of disc 1 or the like and that of the material of the seal 3 well agree with each other, yet at temperatures below softening point of the glass the coefficients of expansion may differ so greatly that strains arise in the glass seal 3 which will crack it before temperature equalization can take place. By "transformation point" is meant the temperature at which there is a distinct change in the expanding properties of the material in question. Since the coefficient of heat expansion materially changes at the transformation point, the mere fact that one material may be accommodated to the other below this point will be of no help at higher temperatures. This phenomenon is attributable to an unequal distribution of temperatures which especially occurs in the event of a rapid cooling. The coefficients of expansion of most ceramic materials of the kind employed for technical purposes are between 70.10^{-7} and 90.10^{-7} It is necessary either to accommodate to these values the expansion of the glass used for seal 3, or to accommodate thereto the expansion of the leads 6, or else to take other precautions in order to avoid harmful strains in this glass.

In accordance with the invention the ceramic material of disc 1, or of any other body arranged instead to hold the leads 6, is of a kind the expansion of which is considerably below the said values. For instance, the coefficient of expansion thereof may be half these values or still less, being below some such value as 48.10^{-7}. As a result, differences in the expansion of the parts 1, 3 will be much less effective and the assembly 1, 3 will be considerably less sensitive to rapid changes of temperature than heretofore. In this way assemblies of glass, ceramic material and metal can be obtained which may be quickly cooled and even may be chilled. For such assemblies pure metals, as tungsten, molybdenum, tantalum, etc., and a fairly large number of alloys are available, especially iron alloys being most suitable here on account of their adaptability in connection with glass material. For uniting these metals or alloys, such as ring 2, with the ceramic disc 1, diverse hard glasses and soft glasses are available, all well adapted to enter into a reliable vacuum tight connection with both metallic and ceramic material. Hard glass may be used as the vitreous material covering the ceramic body and it may have a coefficient of expansion of 32×10^{-7} cm. /°. The lead conductors sealed into this glass may have a coefficient of expansion of from 32 to 35×10^{-7} cm./°.

The bulb 4 may be of metal or glass. In the case of a metal bulb the disc 1 may be sealed into it directly, that is, without an intervening metal member such as ring 2.

If seal 3 is of glass this preferably ought to be of a kind softening at temperatures of 380 or 400 degrees centigrade or temperatures still lower than these.

Seal 3 may consist of a material which is elastic after solidification.

What is claimed is:

1. An electric discharge vessel having a bulb,

an electrode system contained in this bulb, leads joined to this electrode system, a disc-shaped insulating member through which these leads pass, an annular metal body encircling this insulating member, sealing material applied to such insulating member and annular metal body, and a seal at the joint between said bulb and annular metal body, the coefficient of expansion of the said insulating member being below the value 48.10^{-7}.

2. An electric discharge vessel according to claim 1, wherein the disc-shaped insulating member is of a ceramic material provided with bores or recesses.

3. An electric discharge vessel having an electrode system, leads joined to this electrode system, a disc-shaped insulating member through which these leads pass, metal parts, and seals interconnecting such metal parts and said insulating member and covering the surface of the latter, these metal parts being of an iron alloy, and the coefficient of expansion of said insulating member being below the value 48.10^{-7}.

4. An electric discharge vessel according to claim 1, wherein the said sealing material is of a glass softening at temperatures of 380 to 400 degrees centigrade.

5. An electric discharge vessel according to claim 1, wherein the said sealing material consists of a material which is elastic after solidification.

6. An electric discharge vessel having a metal bulb, an electrode system contained in said bulb, leads joined to said electrode system, a disc-shaped insulating member through which said leads pass, and closure means interconnecting said metal bulb and disc shaped insulating member said means comprising a glass seal covering the surface of the latter, the coefficient of expansion of said insulating member being below the value of 48.10^{-7}.

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