Oct. 6, 1964 P. DELLA PORTA 3,151,736

GETTER DEVICES OF THE RING SHAPED KIND

Filed June 22, 1961 2 Sheets-Sheet 1

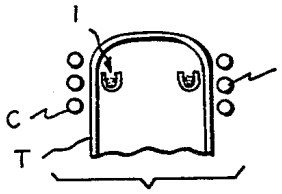

FIG.1

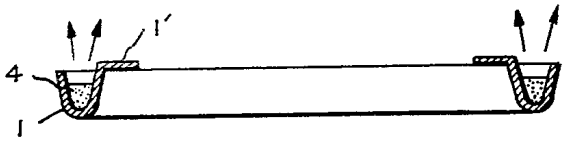

FIG. 4

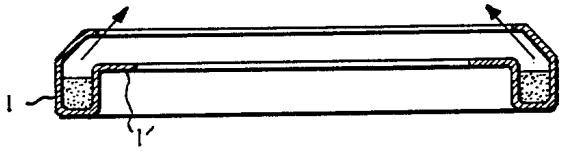

FIG. 5

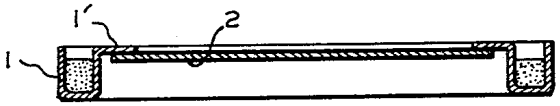

FIG. 6

FIG.6A

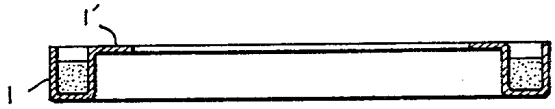

FIG. 6B

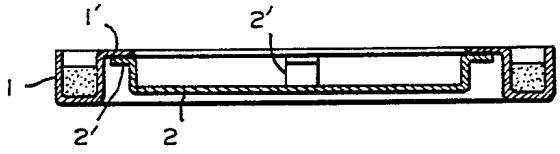

FIG.7

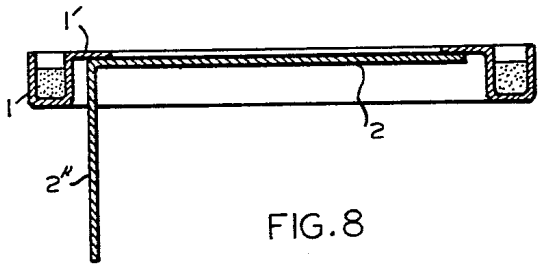

FIG.8

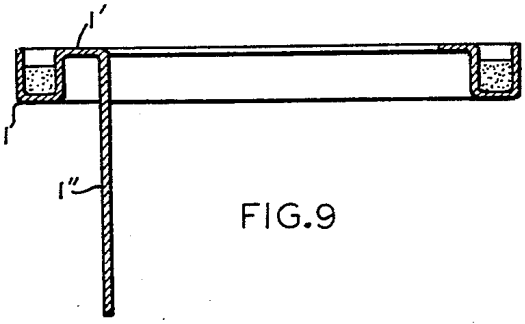

FIG.9

GETTER DEVICES OF THE RING SHAPED KIND

Filed June 22, 1961 2 Sheets-Sheet 2

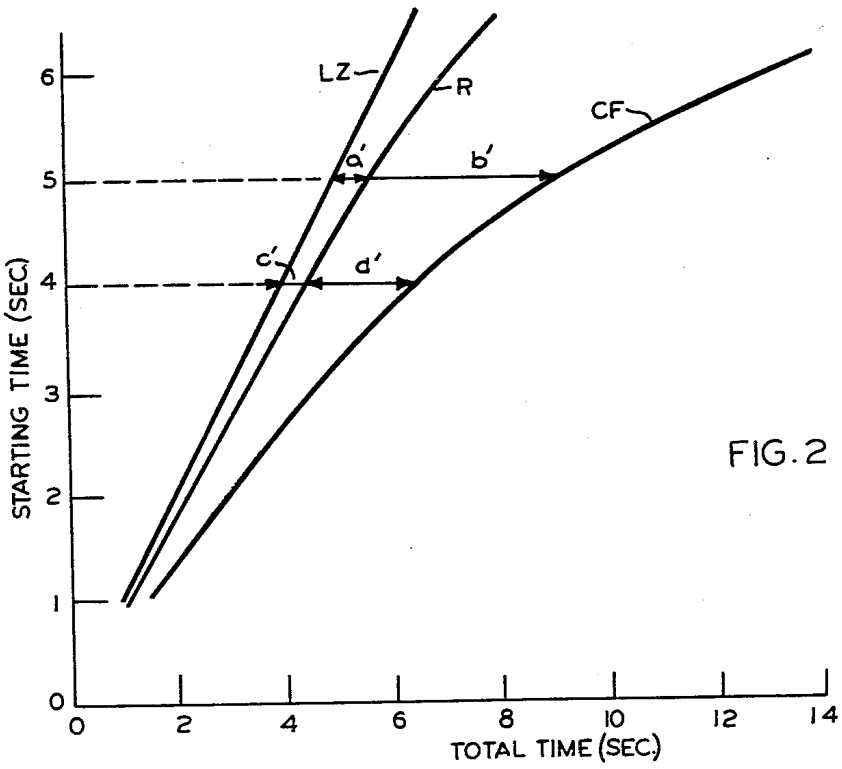

FIG. 2

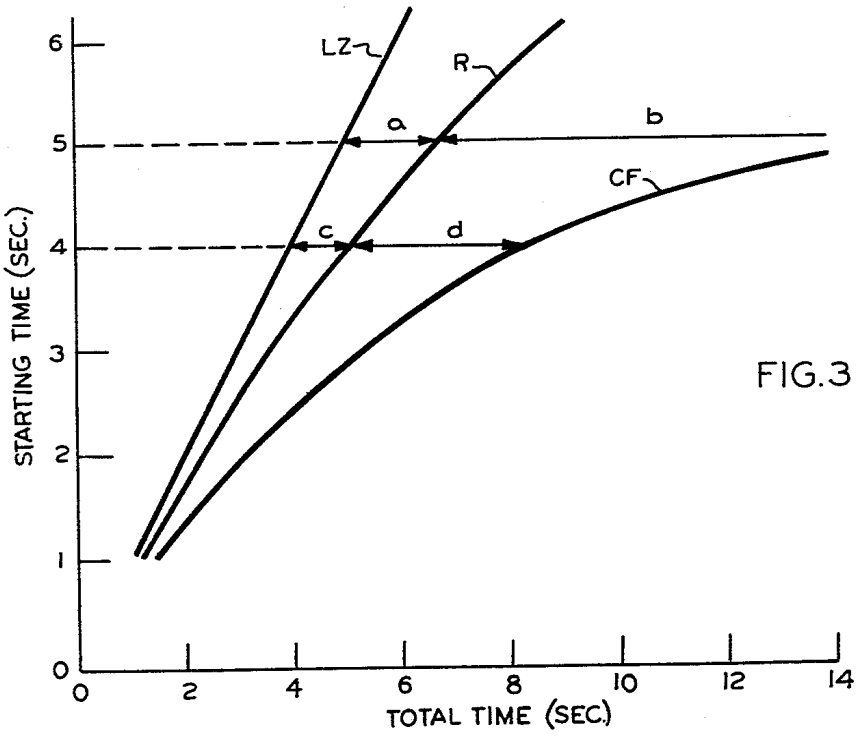

FIG. 3

United States Patent Office

3,151,736
Patented Oct. 6, 1964

3,151,736

GETTER DEVICES OF THE RING SHAPED KIND

Paolo della Porta, Via Gallarate 215, Milan, Italy

Filed June 22, 1961, Ser. No. 118,860
3 Claims. (Cl. 206—.4)

This invention relates to getter devices for obtaining and keeping vacuum in electronic tubes and more particularly the invention has for its object an improvement in that kind of getter device which is consisting of an endless channel, such as for instance, a ring shaped container having an U or V section.

There are known several embodiments of such getter containers, which have wings for the guide of the getter vapours and a shielding disc for protection against falling getter particles, when the getter device is heated inside a tube and the getter vapours are escaping from the container.

The present invention has for its object the achievement of a substantial improvement in the use of the above said kind of getter device in so far as the problem of the undesirable fusion of the getter container is concerned. Such fusion frequently happens in the practical use of the said getter devices.

Other objects and advantages of the present invention will become apparent from the following description taken in connection with the accompanying drawing wherein:

FIGURE 1 is a schematic diagram of an electronic tube embodying a getter container according to the present invention;

FIGURE 2 is a graph showing characteristic curves of a ring shaped getter device;

FIGURE 3 is a graph showing characteristic curves of a ring shaped getter device with a heat sink;

FIGURE 4 is a schematic diagram of another embodiment of the getter container;

FIGURE 5 is a schematic diagram of another embodiment of the getter container;

FIGURE 6 is a schematic diagram of another embodiment of the getter container;

FIGURE 6*a* is a section of a portion of FIGURE 6;

FIGURE 6*b* is a partial section of a portion of FIGURE 6;

FIGURE 7 is a schematic diagram of another embodiment of the getter container;

FIGURE 8 is a schematic diagram of another embodiment of the getter container;

FIGURE 9 is a schematic diagram of another embodiment of the getter container.

It is known that in order to obtain the evaporation of the active getter metal contained in the getter container, this latter is heated by a high frequency current which is inducted in the getter device inside the tube T from a bobin or coil C which is arranged outside the tube and coaxially with the getter device, as is diagrammatically shown in FIG. 1 of the annexed drawing. The getter container is heated up to a point at which the active getter metal contained therein evaporates; possibly the total amount of the active getter metal should be evaporated. The heating must be stopped, however, before the container metal begins to melt. The fusion of the container metal would have the consequence of a diffusion of metal particles inside the tube and also the diffusion of getter vapours in undesired directions, and deposition of said particles and vapours on parts of the tube, such as the electrodes, where this is undesired. For these reasons, the melting characteristic of the getter device is accurately studied in the technics and is known as the "melting curve," which is related to the starting time and to the total time of the getter device, where the starting time is the time from from beginning of the heating till the beginning of the evaporation of the active getter metal, and the total time is the time from beginning of the heating till the reaching of evaporation of 80% of the active getter metal contained in the device.

In the manufacture of the electronic tubes it is desired that both the starting time and the total time should be very brief, so as to be adapted to the production speed of the tubes. On the other hand, it is also desired that the melting curve of the getter device be as far as possible from the efficiency curve of 80% as above specified, in order to surely avoid the fusion of the container.

The present invention achieves a substantial improvement of the getter devices of the ring shaped kind under the said aspect of the melting curve and it essentially consists in that the ring shaped getter container be made with a wing on the internal part of the container wall, which wing has the task of a heat sink or thermobrake during the heating of the container. Said wing absorbs a part of the heating energy during the evaporation of the active getter metal and the heat absorption by said wing becomes particularly efficient when the getter evaporation is finishing and when the thermostating action of the evaporating getter metal is finishing. The said wing is made in one piece with the getter container and, therefore, has metallic continuity with the container. The wing becomes heated with some delay with respect of the getter container; this delay is due to the fact that the high frequency current which is used for heating the getter container, is running mainly along the outer periphery of the container, while the inner part of the container is heated more by conduction than by inducted current. Therefore, on one hand, the wing does not influence at all the swift reaching of the beginning of the evaporation and on the reaching of the 80% evaporation within the desired brief total time, which is in the order of a few seconds, whilst, on the other hand, its action is that of delaying the reaching of the melting point of the container and just this is the object of the present invention.

FIGURES 2 and 3 of the annexed drawings show the characteristic curves in respect of the starting time and the total time, as above specified, of two ring shaped getter devises; namely FIG. 2 shows the curves of a known ring shaped getter device, having for instance a diameter of 13 mm., and FIG. 3 shows the curves of the same ring shaped getter device which is, however, executed according to this invention with an internal wing made in one piece with the container wall and acting as a heat sink or thermobrake.

In said figures, the total time is marked on the abscissa and the starting time is marked on the ordinate. The characteristic curves are the following *LZ*=zero curve, that is to say the beginning of the evaporation of the getter metal; *R*=efficiency curve of 80%, that is to say an amount of 80% of the getter metal contained in the device is evaporated; *CF*=melting curve, that is to say the getter container metal begins to melt.

It may be seen from FIG. 2—which refers to a known getter device—that with a starting time of four seconds, that is to say beginning of the evaporation of the active getter metal four seconds after beginning of the heating, the 80% efficiency curve R is reached within a time *c'* which is less than a second, and the melting curve CF is reached within a time *d'* and this is about two seconds after reaching the R curve. It is evident that such very brief times within which the R curve and the melting curve CF are reached, give rise to serious difficulty in the practical use of the getter device in the tube production, since a very accurate registration of the high frequency heating is required under these circumstances. It must be observed here that the getter devices are not always

located in the same position inside the electronic tubes and this creates further difficulties because an eccentric location and/or orientation of the getter device inside the tube may bring as a consequence a still more critical melting curve than that shown in FIG. 2. Indeed, the practical use of the getter devices of the kind as here considered, has shown that fusion of the getter container happens frequently.

Considering now the characteristic curves of a getter device according to this invention, as shown in FIG. 3, is can be seen that with the same starting time as in FIG. 2, that is four seconds, the 80% efficiency curve R is reached within time *c*, that is more than a second, and the melting curve CF is reached within a time *d* which is more than three seconds. It is evident that the increased total time largely avoids the danger of reaching said melting curve CF in the practical use of the getter device.

FIG. 3 shows also that with a starting time of five seconds, the 80% efficiency curve R is reached within the time indicated at *a* to be slightly less than two seconds and the melting curve CF will never be reached, as indicated by time *b*, within a total time of fourteen seconds. With the known getter device, as shown in FIG. 2, with a starting time of five seconds, the 80% efficiency curve R is reached within the time indicated at *a'* to be less than one second and the melting curve CF is reached, as indicated by time *b'*, within about three seconds after the reaching of the R curve.

Figures 4 to 9 of the annexed drawings show, by way of example, some embodiments of the improved getter device with thermobraking wing, according to this invention, all figures showing a ring shaped getter device in a sectional view.

FIG. 4 shows a device with a V-shaped container **1** containing active getter metal **4**. The container is filled up with getter metal for only a part of the height of its walls, so that the upper parts of said walls are forming directional wings to guide the getter vapours as indicated by arrows and as is known. According to this invention, the internal part of said container walls is extending inwardly so as to form a wing **1'** which has the thermobraking action as above said.

FIG. 5 shows another ring shaped getter device with an U-shaped channel, in which the outer wall is bent, with its upper part, to form an angle with respect of the container axis, while the inner wall is extending inwardly to form the wing **1'** according to this invention.

FIG. 6 shows a getter device having an U-shaped channel and an inwardly extending wing **1'**, as above; this wing **1'** is further utilized for fixing on it a disc **2** in order to obtain a circular getter device with an internal shielding disc. The disc **2** is advantageously fixed onto the wing **1'** in a few points only and the fixing can be made by soldering, grappling or the like (see FIGURES 6*a* and 6*b*).

FIG. 7 shows the same getter device as in FIG. 6, whereby an internal shielding disc **2** is soldered onto the wing **1'** by means of a plurality of bent tongues **2'**.

FIG. 8 shows again the same getter device as in FIG. 6, whereby an internal shielding disc **2** is fixed onto the wing **1'**, and whereby this disc **2** is made with a tongue **2''**,

which is bent downwardly so that it can be used as a support of the getter device inside the tube.

FIG. 9 shows again the same getter device as in FIG. 6, whereby the wing **1'** is made with a tongue **1''** which is bent downwardly so that it can be used as a support of the getter device inside the tube. This tongue **1''** can be obtained in one piece with the container **1** and its wing **1'** in the production of the container.

Referring to FIGURES 6 to 8, it is pointed out, that a circular getter device with an internal shielding disc was already known before this invention. In the known device, however, the shielding disc is made from one piece with the container. There is, therefore, metallic continuity between the container and the disc. The practical use has shown, that there is a very high heat absorption by this disc, when heating the getter device by means of high frequency inducted current. The getter must be heated to a higher temperature in order to obtain evaporation of the active getter metal and as a consequence the fusion of the getter container occurs within a very brief time after the reaching of the R curve. Such high heat absorption by the shielding disc is avoided, when the disc has not metallic continuity with the container, but when it is fixed onto the container in a few points only. A further improvement is obtained, when the support **2''** of the getter device, as such shown in FIG. 8, is fixed on to the disc **2**, or is part of said disc, instead of being fixed onto the container. In a device as shown in FIG. 7, the support is advantageously fixed on to the disc **2**, in a point which is displaced with respect of the tongues **2'**.

Inasmuch as the present invention is subject to many variations, modifications and changes in structural details it is intended that all matter contained in the foregoing description and shown on the accompanying drawing be interpreted as illustrative and not in a limiting sense.

What I claim is:

1. In an annular getter container including an evaporable getter material, said container being adapted to be heated to evaporate said getter material by means of high frequency heating currents induced in the outer periphery thereof, integral heat sink means adjacent the inner periphery of said container, said heat sink means being substantially free of said heating currents and acting to retard the rate of temperature rise of said container during evaporation of said getter material.

2. The invention defined in claim 1, wherein said heat sink means comprises an annular wing member integral and coextensive with the inner periphery of said annular getter container.

3. The invention defined in claim 2, wherein said wing member further includes an integral depending tongue means, said tongue means being adapted to support said getter container within an electronic tube.

References Cited in the file of this patent

UNITED STATES PATENTS

2,430,995	Roos	Nov. 18, 1947
2,647,678	Olson	Aug. 4, 1953

FOREIGN PATENTS

736,475	Great Britain	Sept. 7, 1955
1,054,183	Germany	Apr. 2, 1959