

Description

Annular ring shaped getter devices are well known in the art and have been described, for example, in US Patents Nos. 3151736, 3381805 and 3385420. In order to have a higher yield of getter metal from such devices it has also been common practice to enlarge or widen the annular channel. Such "wide channel" getter devices have been described in US Patent Nos. 3719433 and 4642516.

However, even these types of device do not allow the evaporation of getter metal vapours in sufficient quantity without incurring the risk of detachment of getter metal vapour releasing material from its holder or even melting of the getter container walls.

It is therefore an object of the present invention to provide an improved wide channel getter device free from one or more of the disadvantages of prior art getter devices having the same shape.

It is another object of the present invention to provide a wide channel getter device having a high yield of getter metal.

A further object of the present invention is to provide a wide channel getter device which does not exhibit melting of the getter container walls.

Yet another object of the present invention is to provide a wide channel getter device free from detachment of getter metal vapour releasing material from its holder.

Claim 1 describes an evaporable getter device according to the invention. The dependent claims describe preferred embodiments of the invention.

The objects and advantages of the present invention will become apparent to those skilled in the art by reference to the following detailed description thereof and drawings wherein:

FIGURE 1 is a top plan view of a first preferred embodiment of getter device of the present invention;

FIGURE 2 is a cross-sectional view taken along line 2-2' of Fig. 1;

FIGURE 3 is a top plan view of a second preferred embodiment of a getter device of the present invention;

FIGURE 4 is a cross-sectional view taken along line 4-4' of Fig. 3; and

FIGURE 5 is a graph comparing the flashing (barium evaporation) characteristics of getter devices of the present invention with those of prior art getter devices.

Referring now to the drawings and in particular to Figs. 1 and 2, in which identical details are identified by identical number, there is shown a first preferred embodiment of an evaporable getter device 100 of the wide channel annular ring shaped type suitable for mounting in an electron tube. Getter device 100 comprises a holder 102, preferably of stainless steel, adapted to support an evaporable getter metal vapour

releasing material 104. Holder 102 comprises a vertical outer side wall 106, a vertical inner side wall 108 and a bottom 110 which joins said outer side wall 106 to said inner side wall 108. Bottom wall 110 is provided with means 112 for preventing detachment of the getter metal vapour releasing material from the holder. In this first preferred embodiment means 112 is in the form of an annular groove 114 integrally formed in the bottom wall and penetrating into the space formed by outer side wall 106 and inner side wall 108. Annular groove 114 has a generally bulb-shaped cross-section which narrows down adjacent bottom wall 110.

Getter metal vapour releasing material 104 is supported by holder 102 by pressing it into the space defined by said inner, outer and bottom walls. Getter material 104 comprises an upper surface 116 and a plurality of heat transfer retarding means 118, 118', 118'', 118''' in said upper surface, adapted to delay the transfer of heat in circumferential direction through the getter metal vapour releasing material when the getter device is heated by currents induced from a RF field created by a coil positioned outside the electron tube. Preferably the heat transfer retarding means comprises four equally spaced radial grooves compressed into the upper surface of said getter metal vapour releasing material at least partially penetrating into the space formed by said side walls and said bottom wall. In general the radial grooves have a length longer than their width.

Referring now to Figs. 3 and 4 there is shown a second preferred embodiment of an evaporable getter device 200 in the form of a holder 202 having an outer side wall 204 and an inner side wall 206, joined together by a bottom wall 208. Holder 202 supports an evaporable getter metal vapour releasing material 210. Material 210 has an upper surface 212 containing a plurality of heat transfer retarding means 214, 214', 214'', 214'''. Preferably the heat transfer retarding means comprises four equally spaced radial grooves compressed into the upper surface of said getter metal vapour releasing material at least partially penetrating into the space formed by said side walls and said bottom wall. In general the radial grooves have a length longer than their width.

Bottom wall 208 is provided with means for preventing detachment of the getter metal vapour releasing material 210 in the form of a plurality of holes 218 extending through bottom wall 208 and exposing lower surface 216 of getter material 210. This prevents excessive pressure build up between the getter material and bottom wall 208.

EXAMPLE 1

This example is illustrative of the behaviour of prior art getter devices. Thirty (30) getter holders were manufactured having an outer side wall diameter of 15

mm and having an inner side wall diameter of 4 mm. The bottom wall has no annular groove. The holder was filled with 1000 mg of 50% BaAl₄- 50% Ni (by weight) powder mixture. The upper surface was not provided with heat transfer retarding means. The getters were flashed according to American National Standard ASTM F 111-72 in order to determine the barium yield curves. A total time of 35 seconds was adopted. The yield curves obtained are plotted in Fig. 5 as curve 1. The start time at which the getter containers commenced to melt is indicated by line A.

EXAMPLE 2

This example is illustrative of the behaviour of further prior art getter devices. Thirty (30) getter devices were produced and flashed exactly as for example 1 except that the bottom wall of the holder was provided with a groove as described in US Patent No. 4642516. The yield curve obtained is shown in Fig. 5 as curve 2. The start time at which the getter containers commenced to melt is indicated by line B.

EXAMPLE 3

This example is illustrative of the present invention. Thirty getter devices were manufactured according to example 2 except that the upper surface of the getter powder mixture was provided with heat transfer retarding means as shown in Figs. 1 and 2. The yield curves obtained are shown in Fig. 5 as curve 3. The start time at which the getter containers commenced to melt is indicated by line C.

EXAMPLE 4

This example is illustrative of the present invention. Thirty getter devices are manufactured according to example 3 except that the groove in the bottom wall was replaced by holes as shown in Figs. 3 and 4. The results are found to be identical with curve 3 and point C on Fig. 5.

DISCUSSION

As can be seen from Fig. 5 the prior art getter devices of Example 1 and 2 start to melt when the getter metal (barium) yield is only slightly greater than 180 mg which is only about 72% of the barium content of the getter device (250 mg).

Getter devices of the present invention can yield approximately 230-240 mg of barium before starting to melt which is from 92-96% of the barium content.

The term "getter metal vapour releasing material" as used in the specification and claims herein is meant to include both the material prior to and after getter metal vapour release. This term embraces both the material in the form sold with the getter device

and in the form in which it is found in an operating tube wherein the bulk of the getter metal has been evaporated from the material and is in the form of a film on the inside surfaces of the tube.

Although the invention has been described in considerable detail with reference to certain preferred embodiments designed to teach those skilled in the art how best to practice the invention, it will be realized that other modifications may be employed without departing from the scope of the claims.

Claims

1. An evaporable getter device (100) for mounting in an electron tube comprising:
 - A) A holder (102) for supporting an evaporable getter metal vapour releasing material (104), said holder comprising:
 - i) a vertical outer side wall (106),
 - ii) a vertical inner side wall (108), and
 - iii) a bottom wall (110) joining said inner side wall and said outer side wall,
 said bottom wall provided with means (112) for preventing detachment of the getter metal vapour releasing material from the holder; and
 - B) an evaporable getter metal vapour releasing material (104) supported by said holder and pressed into the space defined by said inner, outer and bottom walls, said getter vapour releasing material comprising an upper surface (116); and
 characterized by also comprising a plurality of heat transfer retarding means (118, 118', 118", 118''') in said upper surface, adapted to delay the transfer of heat in a circumferential direction through the getter metal vapour releasing material when the getter device is heated by currents induced from a RF field created by a coil positioned outside the electron tube.
2. A getter device of claim 1 in which the heat transfer retarding means comprises four equally spaced radial grooves compressed into the upper surface of said getter metal vapour releasing material at least partially penetrating into the space formed by said side walls and said bottom wall.
3. A getter device of claim 2 in which the radial grooves have a length longer than their width.
4. A getter device of claim 1 in which the means for preventing detachment of the getter metal vapour releasing material from the holder is an annular groove (114) integrally formed in the bottom wall and penetrating into the space formed by said side walls and said bottom wall, said annular

mm and having an inner side wall diameter of 4 mm. The bottom wall has no annular groove. The holder was filled with 1000 mg of 50% BaAl₄- 50% Ni (by weight) powder mixture. The upper surface was not provided with heat transfer retarding means. The getters were flashed according to American National Standard ASTM F 111-72 in order to determine the barium yield curves. A total time of 35 seconds was adopted. The yield curves obtained are plotted in Fig. 5 as curve 1. The start time at which the getter containers commenced to melt is indicated by line A.

EXAMPLE 2

This example is illustrative of the behaviour of further prior art getter devices. Thirty (30) getter devices were produced and flashed exactly as for example 1 except that the bottom wall of the holder was provided with a groove as described in US Patent No. 4642516. The yield curve obtained is shown in Fig. 5 as curve 2. The start time at which the getter containers commenced to melt is indicated by line B.

EXAMPLE 3

This example is illustrative of the present invention. Thirty getter devices were manufactured according to example 2 except that the upper surface of the getter powder mixture was provided with heat transfer retarding means as shown in Figs. 1 and 2. The yield curves obtained are shown in Fig. 5 as curve 3. The start time at which the getter containers commenced to melt is indicated by line C.

EXAMPLE 4

This example is illustrative of the present invention. Thirty getter devices are manufactured according to example 3 except that the groove in the bottom wall was replaced by holes as shown in Figs. 3 and 4. The results are found to be identical with curve 3 and point C on Fig. 5.

DISCUSSION

As can be seen from Fig. 5 the prior art getter devices of Example 1 and 2 start to melt when the getter metal (barium) yield is only slightly greater than 180 mg which is only about 72% of the barium content of the getter device (250 mg).

Getter devices of the present invention can yield approximately 230-240 mg of barium before starting to melt which is from 92-96% of the barium content.

The term "getter metal vapour releasing material" as used in the specification and claims herein is meant to include both the material prior to and after getter metal vapour release. This term embraces both the material in the form sold with the getter device

and in the form in which it is found in an operating tube wherein the bulk of the getter metal has been evaporated from the material and is in the form of a film on the inside surfaces of the tube.

Although the invention has been described in considerable detail with reference to certain preferred embodiments designed to teach those skilled in the art how best to practice the invention, it will be realized that other modifications may be employed without departing from the scope of the claims.

Claims

1. An evaporable getter device (100) for mounting in an electron tube comprising:
 - A) A holder (102) for supporting an evaporable getter metal vapour releasing material (104), said holder comprising:
 - i) a vertical outer side wall (106),
 - ii) a vertical inner side wall (108), and
 - iii) a bottom wall (110) joining said inner side wall and said outer side wall, said bottom wall provided with means (112) for preventing detachment of the getter metal vapour releasing material from the holder; and
 - B) an evaporable getter metal vapour releasing material (104) supported by said holder and pressed into the space defined by said inner, outer and bottom walls, said getter vapour releasing material comprising an upper surface (116); and
- characterized by also comprising a plurality of heat transfer retarding means (118, 118', 118'', 118''') in said upper surface, adapted to delay the transfer of heat in a circumferential direction through the getter metal vapour releasing material when the getter device is heated by currents induced from a RF field created by a coil positioned outside the electron tube.
2. A getter device of claim 1 in which the heat transfer retarding means comprises four equally spaced radial grooves compressed into the upper surface of said getter metal vapour releasing material at least partially penetrating into the space formed by said side walls and said bottom wall.
3. A getter device of claim 2 in which the radial grooves have a length longer than their width.
4. A getter device of claim 1 in which the means for preventing detachment of the getter metal vapour releasing material from the holder is an annular groove (114) integrally formed in the bottom wall and penetrating into the space formed by said side walls and said bottom wall, said annular



groove having a generally bulb-shaped cross-section which narrows down adjacent said bottom wall.

5. A getter device of claim 1 in which the means for preventing detachment of the getter metal vapour releasing material from the holder is in the form of a plurality of holes (216) extending through said bottom wall.

Patentansprüche

1. Verdampfbare Gettereinrichtung (100) zum Anbringen in einer Elektronenröhre, enthaltend

A) eine Halterung zur Lagerung eines verdampfbaren Gettermetall dampf freisetzenden Materials (104), wobei diese Halterung

- i) eine vertikale äußere Seitenwand (106),
ii) eine vertikale innere Seitenwand (108)
und

iii) eine Bodenwand (110), welche die innere und die äußere Seitenwand verbindet, enthält und

die Bodenwand mit Mitteln (112) versehen ist, die dem Ablösen des den Gettermetall dampf freisetzenden Materials von der Halterung vorbeugen, und

B) ein verdampfbares Gettermetall dampf freisetzendes Material (104), das in der Halterung gelagert und in den durch die innere, äußere Wand und Bodenwand umgrenzten Raum hineingepreßt ist, wobei das Getterdampf freisetzende Material eine obere Oberfläche (116) enthält und dadurch gekennzeichnet ist,

daß es auch eine Vielzahl von die Wärmeübertragung verzögernden Mitteln (118, 118', 118'', 118''') in der Oberfläche enthält, die zur Verzögerung der Wärmeübertragung in einer Kreislängsrichtung durch das Gettermetall dampf freisetzende Material bestimmt sind, wenn die Gettereinrichtung durch Ströme erwärmt wird, die durch ein mittels einer außerhalb der Elektronenröhre angeordnete Magnetspule gebildetes Hochfrequenzfeld induziert werden.

2. Gettereinrichtung nach Anspruch 1, in der die Mittel zur Verzögerung der Wärmeübertragung vier gleichartig angeordnete sternförmige Aussparungen enthalten, die in der Oberfläche des Gettermetall dampf freisetzenden Materials eingepreßt sind und wenigstens teilweise in den durch die Seitenwände und die Bodenwand gebildeten Raum eindringen.

3. Gettereinrichtung nach Anspruch 2, in der die

sternförmig angeordneten Aussparungen eine größere Länge als ihre Breite aufweisen.

4. Gettereinrichtung nach Anspruch 1, in der die dem Ablösen des Gettermetall dampf freisetzenden Materials aus der Halterung vorbeugenden Mittel ringförmige, in der Bodenwand ausgebildete Ausbauchungen (114) sind, die in den durch die Seitenwände und die Bodenwand umgrenzten Raum eindringen, wobei die ringförmige Ausbauchung im allgemeinen einen wulstförmigen, sich angrenzend an die Bodenwand verengenden Querschnitt aufweist.

5. Gettereinrichtung nach Anspruch 1, in der die dem Ablösen des Gettermetall dampf freisetzenden Materials aus der Halterung vorbeugenden Mittel die Form einer Vielzahl von sich durch die Bodenwand erstreckenden Löchern (216) aufweisen.

Revendications

1. Un dispositif dégazeur évaporable (100) pour le montage dans un tube électronique comprenant :
A) un support (102) pour porter une matière (104) libérant la vapeur du métal dégazeur évaporable, ledit support comprenant :

i) une paroi latérale verticale externe (106),

ii) une paroi latérale verticale interne (108), et

iii) une paroi de fond (110) reliant ladite paroi latérale interne et ladite paroi latérale externe,

ladite paroi de fond étant munie de moyens (112) pour éviter le détachement de la matière libérant la vapeur du métal dégazeur du support ; et

B) une matière (104) libérant la vapeur du métal dégazeur évaporable portée par ledit support et pressée dans l'espace défini par lesdites parois interne, externe et de fond, ladite matière libérant la vapeur du métal dégazeur comprenant une surface supérieure (116) ; et caractérisé par une pluralité de moyens (118, 118', 118'', 118''') retardant le transfert thermique dans ladite surface supérieure, qui sont appropriés pour retarder le transfert de la chaleur dans une direction circonférentielle à travers la matière libérant la vapeur du métal dégazeur quand le dispositif dégazeur est chauffé par des courants induits par un champ HF crée par une bobine positionnée à l'extérieur du tube électronique.

2. Un dispositif dégazeur de la revendication 1,



dans lequel les moyens retardant le transfert thermique comprennent quatre rainures radiales à égale distance comprimées dans la surface supérieure de ladite matière libérant la vapeur du métal dégazeur pénétrant au moins partiellement dans l'espace formé par lesdites parois latérales et ladite paroi de fond.

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3. Un dispositif dégazeur de la revendication 2, dans lequel les rainures radiales présentent une longueur supérieure à leur largeur.

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4. Un dispositif dégazeur de la revendication 1, dans lequel les moyens pour éviter que la matière libérant la vapeur du métal dégazeur ne se détache du support présentent une rainure annulaire (114) formée intégralement dans la paroi de fond et pénétrant dans l'espace formé par lesdites parois latérales et ladite paroi de fond, ladite rainure annulaire présentant une coupe transversale sensiblement en forme d'ampoule qui se rétrécit vers le bas près de ladite paroi de fond.

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5. Un dispositif dégazeur de la revendication 1, dans lequel les moyens pour éviter que la matière libérant la vapeur du métal dégazeur ne se détache du support présentent la forme d'une pluralité de trous (216) s'étendant à travers ladite paroi de fond.

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