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G. L. KING

2,183,841

MULTIPLE GETTER

Filed May 17, 1939

Fig. 1.

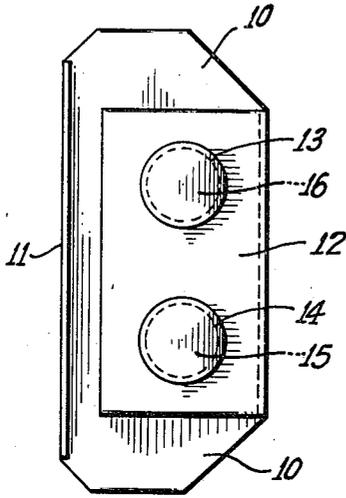


Fig. 3.

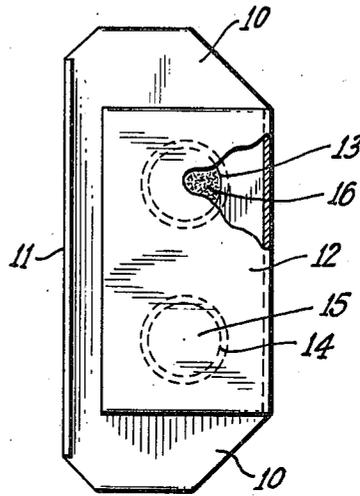


Fig. 2.

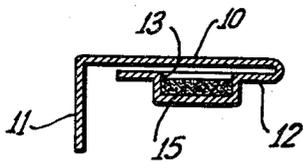
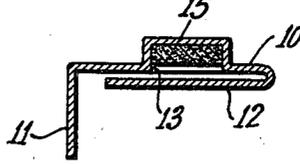


Fig. 4.



INVENTOR  
GEORGE L. KING  
BY  
*W. B. Rice*  
ATTORNEY

# UNITED STATES PATENT OFFICE

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## MULTIPLE GETTER

George L. King, Syracuse, N. Y., assignor to  
King Laboratories Inc., Syracuse, N. Y., a corporation of New York

Application May 17, 1939, Serial No. 274,189

1 Claim. (Cl. 250—27.5)

This invention relates to new and useful improvements in getters used in the radio tube or other industry requiring chemical and physical adsorption of the last traces of gas within partially evacuated enclosed spaces such as the envelope of an electron tube. A getter may comprise a definite amount of "active" metal or alloy supported on a metal sheet or otherwise mounted in the tube. The active material usually consists of a pellet of compressed powdered alloy comprising the metals barium and magnesium together with aluminum in any combination, to which may also be added, for example, other alkaline earth metals such as calcium and strontium. Upon heating the getter, the volatile constituents of the alloy vaporize and condense on the walls of the envelope. By varying the composition of the alloy, the temperature range over which the volatilization of the alloy takes place can be varied as desired.

This invention is characterized by the fact that the getter material is divided into two or more pellets which are separately embedded within the same metal sheet but spaced from each other.

With this new getter many unexpected and important advantages are attained. For example, if the two small pellets of the same alloy be employed whose combined weight equals the total quantity of getter material required we obtain a more rapid rate of volatilization or flash for the same power input applied. This probably results, in part, from the better contact between the alloy and the metal sheet and it may in part be due to the fact that each individual getter pellet has a smaller mass to be heated for flashing. In any event whatever the cause in practical experience it has been shown that better results are attained.

Still other advantages are attained if the two pellets are made of a different alloy composition having a different flash point. For example if one pellet be made of an alloy flashing over a range from 700° to 850° C. and the other pellet of an alloy having a flashing range from 800° to 950° C. a more thorough and complete cleansing of the tube is attained by reason of the fact that as the temperature is raised the one getter is flashed and on further continued raising the other getter is flashed giving a more continuous operation and a resultant more thorough cleansing.

For some purposes a further useful advantage may be attained if two pellets are constructed having a widely different range of temperatures. For example if one pellet with a high magnesium

content alloy be made to flash between 700° and 850° C. and the other pellet be made of an alloy composition, for example barium aluminum, it will flash between 1050° and 1150° C. With combinations of this type it is possible, under practical conditions of flashing rate so to control the flash that the low flashing temperature pellet is flashed completely without flashing the second pellet. There is thus obtained a getter which may be flashed on two successive occasions either immediately subsequent to each other or the second pellet may be flashed at a later time after new occluded gases have been given off from the parts.

The above double-pellet getter wherein the individual pellets are flashed at different temperatures and thus at different times may be employed equally well to vaporize another type of metal besides getter material. For example, one pellet may consist of a typical low flashing getter alloy composition; the second pellet may comprise a chemical reaction mixture of a suitable powdered alkali salt (e. g.  $\text{Cs}_2\text{CrO}_4$ ) plus powdered barium-aluminum as a reducing agent in suitable proportion. Reduction does not take place until a high temperature is reached, in the case of barium-aluminum as a reducing agent; i. e. above 1000° C. Thus the getter is flashed first, followed at any later time by reduction of the alkali salt and volatilization of the alkali metal.

Or if it be desired to vaporize the alkali metal first, calcium-aluminum may be used as reducing agent. Pellets made of powdered calcium-aluminum mixed with powdered alkali salt in suitable proportions flash at much lower temperatures (below 800° C.). Thus one pellet may be made from this mixture and the other from a getter alloy composition having a high flashing temperature (e. g. barium-aluminum at 1050°-1150° C.) whereupon the alkali metal will vaporize first, to be followed, at any later time, by the flashing of the getter pellet.

Due to the fact that the alloy is spread over a greater surface area of metal support sheet, it is possible to use a support sheet made of thinner stock, resulting in manufacturing economies. This is especially important in the case of alloys with high aluminum contents; during the flash the residual aluminum tends to fuse into and weaken the support sheet, causing pinholes which allow the volatile components to deposit on undesirable portions of the tube. The double-pellet getter, by spreading the alloy over a larger surface of support sheet, minimizes this danger.

The invention accordingly comprises an article

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of manufacture possessing the features, properties and the relation of elements which will be exemplified in the article hereinafter described and the scope of the application of which will be indicated in the claim.

5 For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description, taken in connection with the accompanying drawing in  
10 which:

Figure 1 is a front elevation of a getter embodying this invention as applied to the type of getter shown in the patent to Aden J. King, No. 2,146,374.

15 Figure 2 is a central cross section thereof.

Figure 3 is a side elevation of a modification of the device.

Figure 4 is a central section of a modification of Figure 3.

20 In the drawing the numeral 10 designates a metallic sheet which may be nickel or the like having a downwardly projecting skirt or shield 11 and having its outer end 12 bent downwardly and back upon itself beneath the body of the

25 sheet as shown. Either the body of the sheet at a point opposite the backwardly bent portion 12 as shown in Figures 3 and 4 or the backwardly bent portion as shown in Figures 1 and 2 at the point opposite the bent sheet is provided with two

30 separate indentations 13—14 and in each of these indentations there is embedded a quantity of getter material 15—16. This embedding is preferably accomplished by exerting sufficient pressure upon the material while it is within the

35 recess as to cause it to flow into the recess and to come into intimate contact with the walls thereof. This may be accomplished either by depositing a powdered getter material upon the sheet and then exerting such pressure as to com-

40 pact it into a hardened mass within the recess or the getter material may be applied in the form of a pellet and broken to pieces by the pressure

and reformed within the recess or, if the getter material be of a solid metallic form, it may be forced into the recess in such a manner as to spread the walls of the recess around the getter material in firm contact with it. In any event  
5 this firm contact of the getter material with the walls of the recess is of marked advantage in securing uniform flashing point and in enabling the getter to be flashed without unduly heating the plate.

10 It will be clear from the foregoing that the getter material 15 may be similar to or different from the getter material 16 and it will be clear that the results attained by the use of these separated pellets are markedly different from the  
15 results attained by the single pellet even though the single pellet be of the average composition of the two pellets.

20 Since certain changes may be made in the above construction and different embodiments of the invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or  
25 shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

30 It is also to be understood that the following claim is intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the  
35 invention which, as a matter of language, might be said to fall therebetween.

Having described my invention, what I claim as new and desire to secure by Letters Patent, is:

4 A getter comprising a supporting plate, a plurality of pellets of getter material embedded within said plates at points spaced from each other, said pellets being of different compositions whereby they may be flashed at different operating temperatures.

4 GEORGE L. KING.