April 26, 1932. F. HOLBORN 1,855,760

ELECTRON DISCHARGE DEVICE

Filed Feb. 20, 1924

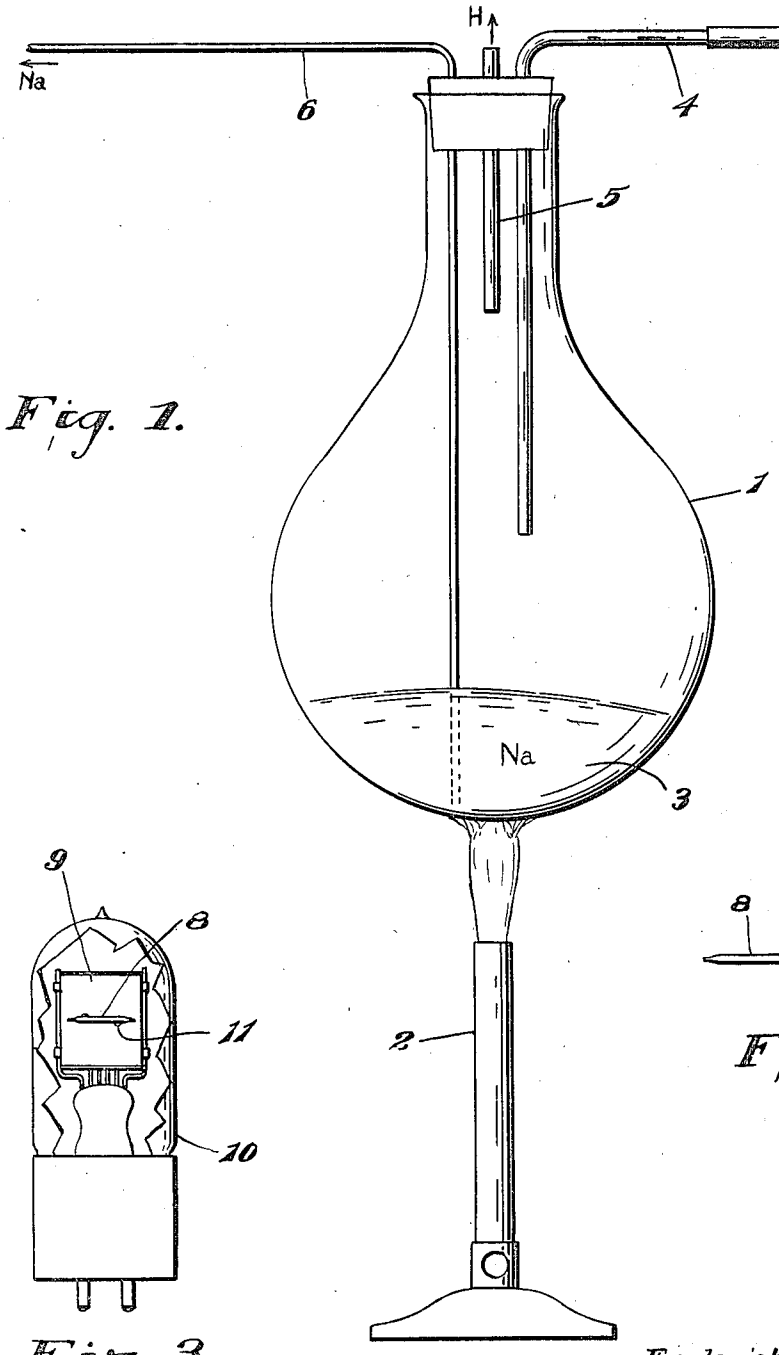


Fig. 1.

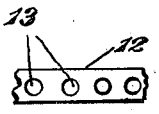


Fig. 4.

Fig. 3.



Fig. 2.

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UNITED STATES PATENT OFFICE

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ELECTRON DISCHARGE DEVICE

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This invention relates to electron discharge devices, and particularly to the method and means for obtaining a reduction of residual gases, generally known as the operation of "flashing" the device.

The objects of this invention are to employ an active substance, that is, a substance which will very readily and freely unite with residual gases in the bulb; to enable use of an alkaline metal to be used, and more specifically to employ sodium as the active substance for flashing; to protect the alkaline metal from the atmosphere until incorporated in the tube and flashed; to provide means for containing the requisite amount of the alkaline metal for each tube; to provide means whereby the alkaline metal may be safely handled and applied; to secure simplicity of construction and operation, and to obtain other advantages and results as may be brought out in the following description.

Referring to the accompanying drawings in which like numerals of reference indicate similar parts throughout the several views;

Figure 1 is a view in elevation showing one method of carying out my invention;

Figure 2 is a view in elevation showing the manner of obtaining a protected portion of the alkaline metal;

Figure 3 is an elevation of an electron discharge device in which is positioned a protected portion of the alkaline metal before being flashed; and

Figure 4 is another elevation similar to Figure 2 showing a modified manner of obtaining a protected portion of the alkaline metal.

In the specific embodiment of the invention illustrated in said drawings, the reference numeral 1 indicates any suitable container, such as the retort shown, wherein the alkaline metal, as sodium, may be melted by application of heat or otherwise. In the drawings I have shown heating means 2, and have indicated the melted alkaline metal with numeral 3.

Suitable precaution has to be taken in handling and melting the alkaline metal, and by way of illustration I have shown the said metal protected by hydrogen which I prefer to keep in circulation as indicated. For this purpose I have shown an inlet tube 4 extending well down into the container 1 so that the hydrogen introduced therethrough will replace gas at the upper part of the container. An outflow tube 5 at the upper part of the container may be employed to carry off the replaced gas if so desired, reclaiming or reusing the same at the option of the user of my method, or permitting the gas to escape if such be preferred.

In order to remove the alkaline metal from the container, I employ a suitable tube 6 which extends practically to the bottom of the container and is connected at its outer end to any suitable pump or suction means. Said tube is preferably of aluminum or other material not acted upon chemically by the particular alkaline metal and also of a material not deleterious to an electron discharge device when used therein and the alkaline metal flashed. Aluminum tubing answers the requirements very well. Said tubing is furthermore provided with only a small opening or bore so it will not hold a great deal of the alkaline metal to fill it.

After the tube 6 is filled, the ends are sealed in any suitable manner as by use of a chemical such as collodion, or by tightly pinching the ends of the tube together. The tube may now be handled freely, and may be severed into short lengths or pellets. In order to secure short lengths without affecting the alkaline metal by exposing it, I prefer to pinch the tubing together where it is intended to sever it, as indicated at 7 in Figure 2, and then cut the tubing where it is pinched together. In this manner, the atmosphere will not have a chance to react with the alkaline metal in the tube or the severed portion or pellet, and the pellets may be freely handled and applied to the electron discharge device.

Various means may be employed for retaining the pellets in place in an electron discharge device, but for the sake of simplicity, I have shown one of the pellets 8 mounted upon a plate 9 of an electron discharge device 10 as by spot welding as at 11. This manner of holding is merely illustrative and not to be construed as restrictive of the invention.

Furthermore, I wish it to be understood that there are other means of manufacturing pellets, as by enclosing an amount of the alkaline metal in a coating of another metal, as tin, tin foil, lead, etc., or in a chemical coating such as collodion, paraffin, etc., all of which may be done in accordance with my invention by heating the alkaline metal under proper conditions and removing such as is required to make the pellet, protecting the same by the coating before exposing to the atmosphere. As one means of obtaining a pellet coated with metal, I have shown in Figure 4 a strip 12 with a plurality of holes 13 therein. The strip and holes are of such size and proportions as to enable the alkaline metal to be carried within the hole when applied as by dipping or otherwise. While the strip is still under the protection of the hydrogen, the metal as tin, lead, aluminum and so forth, or the chemical as collodion, paraffin, etc., may be sprayed or otherwise caused to surround the alkaline metal and protect it. The strip may then be taken out of the hydrogen without detriment and sections thereof cut off and used as described above in connection with the tubing.

In use, the pellet applied to the electron discharge plate is heated in any suitable manner to a point where the expansion of the alkaline metal causes the same to force its enclosure open and permits it to immediately flash or unite with and reduce the residual gases present in the bulb.

Obviously other detail changes and modifications may be made in the manufacture and use of my invention and in the method disclosed for obtaining the structure, and I do not wish to be understood as limiting myself to the details of the construction or method specifically set forth in this application, except as set forth in the following claims when construed in the light of the prior art.

Having now described my invention, I claim:

1. The method of introducing a chemically active material into an electron discharge device which consists in melting sodium in a nonoxidizing atmosphere, drawing the molten sodium into a thin tube, sealing the ends of said tube, mounting said sealed tube within the electron discharge device and heating said tube to release the sodium therefrom within said device.

2. The method of introducing a vaporizable getter material into an envelope consisting in enclosing said material in a metal sheath, inserting said sheath in the envelope and subsequently heating the sheath to liberate said material by vaporization.

3. The method of introducing a readily vaporizable material into a vacuum device consisting in placing said material in the device before evacuation thereof, protecting said material from the heat to which the device is subjected during evacuation and subsequently applying additional heat to destroy said protective means and to vaporize the material.

4. A getter for a vacuum electric device comprising a capsule containing a vaporizable material, said capsule being composed of a low melting point metal.

5. A getter for a vacuum electric device comprising a capsule containing a vaporizable material, said capsule being composed of low melting point metal, the ends of which are closed by compressing the metal thereof over the material contained therein.

6. The method of introducing a readily vaporizable material into an envelope consisting in enclosing said material in a metal sheath, inserting said sheath in the envelope and subsequently melting the sheath to liberate the material by evaporization.

7. The method of introducing an easily vaporizable material into a container consisting in encasing said material in a less easily vaporizable material, placing said encased material in the container and heating the casing to render the same pervious and to liberate the material therefrom.

8. The method of introducing an extremely chemically active material into an evacuated container consisting in sealing said material in a metal capsule, introducing the capsule into the container and heating the capsule to liberate the material therefrom.

9. The method of introducing sodium into a vacuum device consisting in enclosing said sodium in a metal capsule, placing said capsule in the vacuum device and treating the capsule to liberate the sodium therefrom.

10. A capsule containing an alkali metal composed of a low melting point metal.

11. The method of introducing a chemically active material into a bulb which consists in enclosing said material in a protecting sheath of more refractory material, introducing the material in the bulb while so enclosed and subsequently heating the sheath to destroy the same and liberate the material.

12. The method of introducing an extremely chemically active material into a bulb which consists in placing said material in a metal tube, reducing the size of said tube, severing a portion of said reduced tubing from the main body thereof, introducing said section into the bulb and liberating the material therefrom.

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