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GETTER FOR VACUUM DEVICES

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14 Claims. (Cl. 176—2)

This invention relates to the manufacture of vacuum devices and, more particularly, to the evacuation of incandescent electric lamps, and is a division of my application Serial No. 638,995 filed October 21, 1932, now Patent 2,042,935 dated June 2, 1936 and owned by the assignee of the present application.

The practice of making incandescent electric lamps includes the operation of removing the gas from the bulb which is accomplished by the use of mechanical means, such as vacuum pumps, and in subsequently removing any residual gas by means of suitable substances termed "getters". The present invention is directed to an improved form of getter or clean-up agent to bring about a more complete clean-up or removal of residual gas in vacuum devices such as incandescent electric lamps, radio tubes, and the like. When the term getter is used in the following specification and claims, it is to be construed as a substance capable of removing the greater portion or, as near as possible, all of the residual gas.

Many substances and combinations of substances have been employed as clean-up agents and one form of getter which has been successfully used contains 100 parts by weight of cryolite and 13 parts by weight of phosphorus.

When using such a getter, it is applied in the form of a paste or liquid to the filament. When the filament is heated the getter is driven off. According to the accepted theory, the cryolite is precipitated to the surface of the bulb and remains there to receive particles resulting from the vaporization of the filament. The cryolite presents an irregular serrated surface so that the solid or opaque particles are widely distributed and become ineffective in obscuring the light or, in other words, the cryolite prevents blackening of the bulb.

The phosphorus is in the form of red phosphorus which, when heated, is converted to yellow phosphorus in the form of a vapor. This vapor is ionized by the electric discharge between the lead wires of the lamp or between the coils of the filament when such type of filament is employed. The ionization converts the yellow phosphorus vapor to red phosphorus which, during conversion, causes a physical chemical reaction with the residual gas and removes the same in the sense that such gas is taken up by the red phosphorus particles which are widely distributed on the wall of the bulb and rendered invisible by reason of the cryolite which receives them.

I have found that the residual gas may be

completely removed or rendered ineffective if the ionization of the phosphorus or other vapor is increased by a more copious supply of electrons.

It is an object of the present invention, therefore, to provide a getter capable of promoting ionization.

Another object of the invention is to provide a getter containing a thermionically active material to promote the clean-up action of the getter.

A further object of the invention is to improve the vacuum in a sealed envelope by providing a substance for increasing the ionization of a vaporized constituent of a getter.

Other objects and advantages of the invention will be apparent from the following description.

When practicing the present invention I have found that good results are obtained by using getter composed of 100 parts by weight of cryolite and 13 parts by weight of phosphorus to which may be added 1.3% or less of a thermionically active substance such as barium carbonate. These substances may be thoroughly mixed with a binder of nitrocellulose to provide a paste or it may be in liquid form so that the getter may be sprayed onto a filament. I have found that the barium oxide resulting from the heating increases the electron emissivity and the carbon dioxide increases the amount of gas to be ionized.

It is to be understood that the present invention in its broadest aspects contemplates the use of a material to increase the electron flow in the presence of a clean-up agent. Barium or other alkaline earth metals may be used such, for example, as strontium, or the oxides or compounds of these substances may be used. Furthermore, the material for increasing or promoting ionization may be used with other getter materials in which ionization is effective to clean up residual gases. As an alternative of the above getter composition, I may use inorganic halogen compounds such as fluorids or double fluorids or sodium chlorid and similar halogen compounds. By adding to such getters a substance such as barium or other substances to promote electron emission, the resultant ionization improves the vacuum by the removal of the residual gas.

By reason of the present invention a clean-up agent or getter is provided wherein the thermionically active material is a part of the mixture used. In the case of a cryolite phosphorus getter, for example, the cryolite performs its function as does the phosphorus while the added substance, by reason of the more copious supply of electrons furnished, promotes ionization thus making the clean-up action more complete, resulting in a

higher degree of vacuum than had heretofore been possible.

Although a preferred embodiment of the invention is shown and described herein, it is to be understood that modifications may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

I claim:

1. A getter for a vacuum device comprising phosphorus and barium oxide.
2. A getter for a vacuum device comprising cryolite, phosphorus and barium oxide.
3. A substance for removing residual gases from a sealed container, said substance comprising phosphorus, cryolite and an alkaline earth metal compound.
4. A substance for removing residual gases from a sealed container, said substance comprising phosphorus, cryolite and a barium compound.
5. A getter for a vacuum device comprising phosphorus and a barium compound.
6. A getter for a vacuum device comprising cryolite, a barium compound, and a clean up agent.
7. A getter for a vacuum device comprising cryolite, barium oxide, and a clean up agent.
8. A getter for a vacuum device comprising phosphorus and an alkaline earth metal compound.
9. A getter for a vacuum device comprising cryolite, an alkaline earth metal compound, and a clean up agent.

10. A clean-up agent for the residual gas in a sealed container, said agent comprising a substance vaporizable when heated to combine with said gas and an alkaline earth metal compound for supplying a copious amount of electrons to promote ionization of said vapor to improve its clean-up action.

11. A clean-up agent for the residual gas in a sealed container, said agent comprising a substance vaporizable when heated to combine with said gas and a barium oxide for supplying a copious amount of electrons to promote ionization of said vapor to improve its clean-up action.

12. A clean-up agent for the residual gas in a sealed container, said agent comprising a substance vaporizable when heated to combine with said gas and a barium compound for supplying a copious amount of electrons to promote ionization of said vapor to improve its clean-up action.

13. A clean-up agent for the residual gas in a sealed container, said agent comprising phosphorus to combine with said gas and an alkaline earth metal compound for supplying a copious amount of electrons to promote ionization of said phosphorus to improve its clean-up action.

14. A getter for an incandescent electric lamp comprising an alkaline earth metal compound and a clean-up agent applied to the filament of said lamp for temporarily promoting ionization of said clean-up agent when said filament is flashed.

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