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APPLICATION OF GETTERS TO ELECTRIC INCANDESCENT LAMPS AND THE LIKE.

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This invention relates to getters and more particularly to the application thereof to incandescent electric lamps and the like.

An object of my invention is the introduction of getter material into bulbs for evacuated devices in the form of a non-crystalline film on the interior surface thereof.

Another object of my invention is the application of getter material to lamp bulbs and the like by vaporization from an auxiliary filament prior to sealing the regular mount therein.

A further object of my invention is the application of candle-power maintenance material or getter to the inner surface of bulbs for incandescent electric lamps, rather than to the filament thereof, whereby the harmful effect of getter on the filament is obviated.

A still further object of my invention is the manufacture of incandescent electric lamps and the like with getter material applied initially to the inner surface of the bulb, rather than to the filament.

Other objects and advantages will become apparent as the description proceeds.

The usual method of introducing candle-power maintenance material or getter into incandescent electric lamps, is to apply the same from a suspension on the incandescible filament, before the same is sealed into the bulb of the lamp. The filament is subsequently incandesced after the lamp has been evacuated, causing evaporation or volatilization of the getter material and deposition thereof in the form of a film of finely-divided getter material on the interior of the bulb. Such a film serves as a candle-power maintenance material.

Among the disadvantages of such a method of introducing a getter, is the deleterious effect such material exerts on the filament, to which it has been applied, when the same is incandesced to vaporize it to the bulb. Another disadvantage lies in the fact that a binder is usually desirable or necessary to hold the getter in place on the filament while handling and after the filament is incandesced the binder is decomposed into gases and vapors which are deleterious to the operation of the lamp.

According to my invention, I obviate the above noted difficulties and apply the getter material to the inner surface of the bulb of the lamp or the like where it is desired that it shall be placed eventually before the regular mount and filament supported thereon is sealed into the bulb.

A prefered method of applying the getter material, according to my invention, consists in employing an auxiliary filament of platinum, nichrome or some other material not readily attacked by the atmosphere when incandesced, applying the desired getter material from a suspension to such a filament, introducing the same temporarily into the lamp bulb and flashing or vaporizing the same from the filament by means of an electric current passed through the filament. This operation is preferably performed when the bulb is at least partially exhausted and the getter material is thereby deposited in the form of a finely-divided film substantially free from moisture and in condition for exerting the desired candle-power maintenance action.

No binder is necessary in applying the getter to the auxiliary filament because it is only necessary that it be held thereon for a very short space of time. For example, an auxiliary filament may be dipped in a suspension of salts of the desired concentration, no binder being mixed therewith, the gettered filament placed within the bulb, the bulb preferably exhausted and the filament heated to throw off the material to be recondensed on the bulb, after which the auxiliary filament is removed and the regular mount and filament are preferably immediately introduced into the bulb which is then sealed-in and exhausted.

Other means for treating the interior walls of the bulb to obtain getter action were also tried and may be mentioned as follows: Etching the inner surface of the bulb with hydrogen fluoride vapor or a solution thereof, washing the interior of the bulb with a concentrated solution of chromic acid; coating the walls of the bulb with a solution of di-ammonium hydrogen phosphate and applying a solution of getter material to the bulb to wet the inner surface thereof and heating the bulb to drive off the moisture therefrom. Although these last methods are mentioned as possibilities, I prefer to apply the getter to the inner surface of the lamp bulb by vaporization from an auxiliary filament to which it has been applied as described.

My invention will be better understood by the following more detailed description of a preferred method of practicing the same.

I shall consider the application of getter according to my invention as a "pregettering" operation, because the getter is applied to the inner surface of the bulb, prior to sealing the mount and filament therein, instead of as heretofore from said filament after said sealing-in and heating the same. In such a pregettering operation, a nichrome filament has been used, but it is obvious that platinum or other material which is not attacked by the getter material and which is resistant to oxidation or other attack when incandesced, may be used.

The auxiliary filament, which should necessarily be strong enough for the purpose and which may be about 20 mils thick, is preferably mounted on a stem and dipped in a suspension of cryolite or any desired getter material in methyl alcohol or other non-aqueous liquid of similar properties, the use of a binder being unnecessary and preferably not being used. The exact proportion of cryolite and methyl alcohol necessary for the desired results is preferably determined in a series of preliminary tests, the proportion being so regulated that after flashing, the deposit of cryolite is just visible to the naked eye. The use of the mixture in the proportion of 30 grams of cryolite to 150 cc. of methyl alcohol has been found to give the best results.

After drying, the gettered auxiliary filament may be inserted into the bulb, which may be supported by an ordinary sealing-in holder. If the flashing operation is conducted at atmospheric pressure, that is, when the bottom of the bulb is not stoppered, it may be found that after flashing, the getter material is not evenly distributed over the walls of the bulb. It is preferable that the bottom of the bulb be stoppered and connected with means for creating a partial vacuum therein. If such is done, there will result a great increase in the impact of the cryolite particles against the glass surface when the auxiliary filament is connected to a source of electricity and heated to incandescence. Accordingly, the auxiliary filament is preferably incandesced and placed in the bulb in a partial vacuum.

The better the vacuum, the better the condition of the deposited film for candle-power maintenance purposes. One of the most important effects of conducting the flashing in the vacuum is the elimination of moisture. It has been found that any substance having candle-power maintenance action loses this property when exposed even for a short period, to atmospheric conditions. It is thought that this is because atmospheric moisture promotes crystallization of the salt, which thereby is placed in a condition where getter action is practically destroyed. The bulb is therefore preferably immediately stoppered after flashing and not opened until just previous to sealing-in; the sealing-in process following as closely after the flashing process as possible. It will be obvious that even the method outlined does not entirely eliminate atmospheric moisture, so that any improved means toward this end would probably result in improved getter action for the deposited material. After sealing the regular mount into the bulb, the bulb may be exhausted and if desired, vaporized phosphorus or other clean-up material may be introduced into the bulb during the exhausting operation, although, as an alternative, such material may be applied to the filament before sealing-in. After exhausting the lamp may be tipped off as is usual.

Upon testing lamps manufactured according to my invention, it is found that an increase in life was effected by the pregettering operation.

Etching the walls of the bulb with hydrogen fluoride was tried using two different methods. In one, the bulb was closed at one end and filled with a dilute solution of hydrogen fluoride. The solution was allowed to remain in the bulb until etching had proceeded to the desired extent, after which the bulb was thoroughly dried and sealed-in. Using the other method of etching, the bulb was placed over a crucible containing a concentrated solution of hydrogen fluoride. The solution was heated to the desired temperature to evolve hydrogen fluoride to etch the glass. Care was taken to perform this operation under enough suction to catch the poisonous fumes of hydrogen fluoride and avoid danger to the operator. This hydrogen fluoride treatment of the bulb did not give as good results as that obtained by the use of an auxiliary filament.

The lamps used in one test were made with bulbs washed in a concentrated sulphuric solution of chromic acid. By this treatment, any grease or other organic matter is removed. The results secured were not as good as those using an auxiliary filament. Di-ammonium hydrogen phosphate $(NH_3)_2HPO_4$ was deposited on the walls of the bulb by dipping in a solution of the salt and then evaporated to dryness. The results secured by this method were not as good as when using an auxiliary filament.

In pregettering lamps according to my invention, any clean-up agent such as phosphorus which it may be desired to introduce, may be applied on the arbor of the regular mount of a lamp, thereby making it unnecessary to apply any material to the regular filament, although it is obvious that if desired, the clean-up material may be applied to the filament, the candle-power mainte-

nance ingredient or getter being preferably applied by means of an auxiliary filament as heretofore described.

Although I have described what is now considered a preferred method of practicing my invention, it is to be understood that the same is merely illustrative and that variations in the getter material used and modifications in the method of applying the same, may be employed without departing from the spirit and scope of my invention, as defined by the appended claims.

What is claimed is:

1. The method of gettering incandescent electric lamps and the like comprising vaporizing a candle-power maintenance material on the inner surface of the bulb thereof, prior to sealing a regular mount therein and subsequently sealing therein an illuminating body having its surface free from said candle power maintenance material.

2. The method of gettering incandescent electric lamps and the like comprising applying a getter material to an auxiliary filament, introducing the same into a bulb, heating the filament to vaporize the getter to the interior surface of the bulb and subsequently introducing into the bulb the main illuminating body free from said getter material.

3. The method of gettering incandescent electric lamps and the like comprising coating an auxiliary filament with a non-aqueous suspension of a getter material, temporarily inserting said filament into the lamp bulb, exhausting said bulb and flashing said filament to vaporize the getter therefrom, removing the auxiliary filament, introducing and sealing-in the regular filament free from said getter material and exhausting said bulb.

4. The method of gettering an incandescent lamp comprising vaporizing a thin layer of a candle power maintenance material onto the interior surface of the bulb from a source independent of the main illuminating body of the lamp and maintaining said illuminating body free from said candle power maintenance material.

In testimony whereof, I have hereunto subscribed my name this 20th day of August, 1923.

WILLIAM CHARLES SPROESSER.