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PROCESS FOR GETTERING COILS

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This invention relates to incandescent lamps and more particularly relates to a method of removing residual gases from the interior of said incandescent lamps through the use of suitable gettering materials and comprises essentially a method of introducing the gettering material into the incandescent lamp by applying the same in a dry adherent compacted state to the lamp coil prior to mounting thereof.

In lamp manufacture it is necessary to provide within the evacuated glass chamber a material which will react and combine with the residual gases contained therein. There is also incorporated therein and admixed with the active element an inert material which will tend to volatilize and deposit upon the side walls of the glass envelope in such a manner as to absorb or break-up any volatilized deposit of the tungsten during the burning life of the device. Such combined materials to effect this two-fold result are commonly known as "getters." In the lamp industry the most commonly utilized getter materials are purified cryolite combined with from 1 to 30 parts red phosphorus depending upon the particular sized lamp or filament within which it is to be employed. In place of the cryolite a double fluoride compound of iron and sodium (sodium ferric fluoride) may be employed.

Heretofore, in the application of this getter material, it has been customary to thoroughly admix the finely comminuted "getter" material in the suitable proportions of cryolite to phosphorus and thereafter suspend the admixed material in a so-called binder medium comprised essentially of a quick drying lacquer type such as amylacetate and nitrocellulose. The "getter" suspended in the binding medium is then applied to the surface of the lamp filament in any suitable manner, such as by dipping, brushing, spraying, etc.

With the development and general adoption of the coil type filaments the difficulties of applying this type of getter material increased. The prior methods of applying the "getter" were directed to coating segmented type filaments and manufacturing difficulties were encountered in applying the same getters to the coil type filament. This resulted in a decided increase in variability of life and maintenance, due to insufficient or variable amounts of getter material within the evacuated incandescent lamps. The spraying method generally adopted in the gettering of coils is liable to cause a warping or distortion of the coil during the gettering process.

One of the disadvantages of the prior method of applying "getters" is therefore the non-uniformity thereby obtained in the operating life of incandescent lamps due to variations in the amount of the getter coating upon the wire. This is caused by unavoidable variations in the amount of binder material present in the mixture.

Another disadvantage is that in spite of precautions some of the red phosphorus in the getter material becomes oxidized from the unavoidable moisture contamination in the amylacetate mixture, thus causing variable results.

A third disadvantage is in the subsequent ineffective removal of the binder employed from the metal surface prior to the exhausting of the lamp so that during the operating life of the lamp interaction occurs between the decomposed organic portion of the binder material and the metal filament.

Another disadvantage is the usual manufacturing losses in getter material encountered in manufacturing processes.

One of the objects of the present invention is to provide a method of introducing the getter material into coil type filaments whereby uniformity in getter action is obtained.

Another object of this invention is to provide a simple and effective method of applying the getter to the coil type filament.

Another object of the invention is to increase the life and luminous efficiency of the incandescent lamp.

Another object is to increase the uniformity in the operating efficiency of incandescent lamps.

Another object is to increase the manufac-

turing efficiency in the production of incandescent lamps.

Other objects of my invention will be apparent as the process is more fully disclosed.

To effect the objects of my invention I have developed a method whereby the "getter" material is applied to the coil type filament in a "dry" state rather than in a "wet" state as heretofore employed. In this manner I am able to increase proportionately the amount of the cryolite or sodium ferric fluoride content of the getter over that heretofore practical to apply by the prior processes. Through this increase in the cryolite content I am enabled thereby to increase the normal luminous efficiency of the incandescent lamp. By the practice of my invention I am also enabled to accurately control and increase or decrease at will the proportionate amounts of the red phosphorus in the getter material, thereby increasing the efficiency of the exhaust with beneficial results upon the normal operating life of the incandescent lamp.

By the elimination of the amylacetate-nitrocellulose or other binder material from the getter I am enabled to increase thereby the exhaust efficiency during the manufacturing process and in addition remove the deleterious effects of the use of the binder upon the phosphorus content of the getter and upon the subsequent variable clean-up action of the getter material on the residual gases. I am also thereby enabled to normally decrease the amount of the phosphorus necessary to use in effecting substantial clean-up of residual gases in the evacuated lamp, thereby effecting an appreciable savings in production costs while increasing manufacturing efficiency. By the use of a "dry" method of gettering I am also enabled to effect an increase in production efficiency and a decrease in production losses in manufacture, caused by inexpert handling of the getter and filament.

In the practice of my invention I take the usual getter materials, such as cryolite and red phosphorus in the desired proportions, and finely comminute the admixed material in a ball mill in any suitable manner, as by dry milling or by milling under a fluid, such as alcohol, which may subsequently be removed by evaporation and which is non-reactive towards the getter ingredient. The degree of comminution obtained can best be described as being finely subdivided to the point where the material "packs" readily, almost from its own weight.

At the conclusion of the ball milling process the finely comminuted material is placed in an air tight container. Thereafter the coiled filaments, prior to mounting in the incandescent lamp, are placed in the same container and the two are vigorously shaken together or admixed.

The finely divided getter material is thereby forced into the interstices and between the windings of the coiled filament and retained there. To assist in this mechanical packing process it is permissible to employ as an added constituent of the getter, a dense heavy metal in particle sizes sufficient to prevent the same from being itself forced between the interstices in the coils but dense enough to provide packing weight upon the getter material. I have successfully employed zinc in shot in granulated form for this purpose, preferably as this metal also is an effective clean-up agent and if during the shaking process finely divided particles of the zinc should become detached, such particles would not thereafter become detrimental but beneficial in the subsequent clean-up of residual gases of the incandescent lamp, by vaporization from the filament.

At the conclusion of the packing process, the coils may be separated from the excess getter material by sieving through a coarse screen. The excess getter is then returned to an hermetically sealed container for future use. A coiled filament is considered gettered when the core and spaces between the turns of the coil are completely filled with the getter.

The gettered coils may thereafter be mounted in incandescent lamps in the usual manner and will withstand considerable rough handling without loss of the getter material or distortion of the coil.

Incandescent lamps made using coil type filaments gettered by my process showed an appreciable increase in life, efficiency and maintenance over those made by the "wet" or spray method.

In addition, however, the manufacturing efficiency through the use of my process permits in large savings of time, materials and reduces those manufacturing losses due to inexpert handling, and furthermore, produces a uniformity in gettered product not heretofore obtained by prior processes.

Having described my invention, it is apparent that many methods of applying the getter in a dry manner to the coil without essentially departing from the nature of the invention will occur to those skilled in the art, but such departures and variations are anticipated as may fall within the following claims.

What is claimed is:

1. The method of gettering a coiled filament comprising mechanically compacting finely divided dry getter material within the coils of the said coil filament.

2. The method of gettering a tubular filament which comprises mechanically compacting a core of the finely divided dry getter within the said filament.

3. The method of gettering coil type filaments comprising mechanically compacting

therein a core of finely divided dry getter material.

4. An article of manufacture comprising a coiled filament having a mechanically compacted core of dry, pulverulent getter material.

5. The method of gettering coil type filaments which comprises forming a finely divided pulverulent dry getter material, adding thereto a proportion of granular particles of metallic zinc, the individual size of said granules being substantially greater than the size of the interstices of said coil type filaments, incorporating therewith the coil type filaments to be gettered, enclosing the whole admixture in a sealed container, and vigorously agitating the container and contents to effect mechanical compacting of the dry pulverulent getter within the coil core of the coil type filament.

6. The method of gettering coil type filaments which comprises comminuting the getter composition to a finely divided pulverulent form, drying said getter, incorporating therewith the unmounted coil type filament to be gettered, enclosing said mixture in a sealed container, and vigorously agitating the container and contents to effect mechanical compaction of the dry pulverulent getter material within the interstices of the coil as a result of the kinetic energy developed by the agitated coils and getter material within the container.

7. The method of gettering coil type filaments which comprises finely comminuting the dry getter material, admixing therewith coarsely granular particles zinc, incorporating therewith the unmounted coil type filaments to be gettered, enclosing the mixture in a sealed container and thereafter vigorously agitating the container and contents to effect mechanical compaction of the dry pulverulent getter material within the coil interstices as a result of the kinetic energy developed by the agitated coils and getter mixture within the sealed container.

In testimony whereof, I have hereunto subscribed my name this 10th day of May 1928.

DANIEL SNYDER GUSTIN.