

UNITED STATES PATENT OFFICE.

DANIEL HAND, OF NEWARK, NEW JERSEY, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

INCANDESCENT FILAMENT.

1,013,599.

Specification of Letters Patent.

Patented Jan. 2, 1912.

No Drawing.

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To all whom it may concern:

Be it known that I, DANIEL HAND, a citizen of the United States, residing at Newark, county of Essex, State of New Jersey, have invented certain new and useful Improvements in Incandescent Filaments, of which the following is a specification.

My invention relates to the production of carbon filaments to be mounted in incandescent lamps.

It comprises more particularly a method of improving the filament as a final product when subjected to the so-called "metallizing" process as described in U. S. Patent No. 916,905, issued to W. R. Whitney.

In the manufacture of lamp filaments by the process described in the above patent, filaments are subjected to a firing treatment at the high temperature obtainable in a carbon tube resistance furnace. According to my invention, the raw filaments are brought into contact with a solution of some inorganic compound, such as sodium chlorid. This treatment improves the uniformity of the ultimate product, as will be explained more fully hereinafter.

It sometimes happens that filaments which have been subjected to the metallizing process, when heated to a dull red color in the vacuum, are found not to be equally bright throughout their whole length. There may occur in any portion of the filament spots which are brighter than the rest of the filament, due to the fact that these regions have a higher resistance. Such "spotted filaments" are very apt to break at a bright spot after but a short life when mounted in lamps. It also frequently happens that certain of the metallized filaments are not round in cross section. I have supposed this to be due to the capillary action of the base on the shells of the treated filament when the shell is somewhat plastic from high temperature, so that the shell is distorted enough to produce an irregularity of cross section. Another source of trouble is the occurrence of blisters, or shiny spots in the filament after having been subjected to the metallizing process. My researches have led me to believe that one of the principal sources of these troubles may be the imperfect removal of the mineral matter in the base filament by the first firing process. I am confirmed in this belief by the fact that

filaments, when subjected to the treating process without previously firing the base, are very badly blistered and show a greater percentage of spots when metallized than filaments which are fired previous to treating.

In order to remove more completely the mineral impurities still retained in the base filament, I impregnate the filaments before carbonizing with some substance which has itself a low volatilizing temperature. Filaments thus impregnated are different in their appearance after the final metallizing process. It is my opinion that this substance, which has a low volatilizing temperature, combines with the refractory mineral matter in the filament to form, perhaps, a compound of lower volatility, so that the whole may be driven out.

The novel features of my invention are pointed out with particularity in the appended claims.

My process may be carried out by soaking the raw squirted filament in a solution of some inorganic substance such as a metallic chlorid. I have found the chlorids of sodium, potassium, calcium, magnesium, barium, and various others to give beneficial results, but I consider the chlorid of sodium to be preferable for this chemical treatment. A 15 per cent. solution gives good results. The filaments are then carbonized, which, of course, leaves the chlorid distributed through the filament. They are then, as before, fired to a high temperature in the electric furnace, and the chlorid of sodium, I believe, in some way combines with the refractory mineral matter in the base filament, and the mineral matter is thus removed more completely than in filaments which have not been thus impregnated. Whether my theory in this respect is correct or not, it is true that filaments which have thus been treated are free from spots of high resistance, are more uniform in cross section, and are less apt to show shiny or blistered spots. It may well be that the sodium chlorid, by removing the impurities in the base of the chlorided filament, renders the shell deposited upon the same less affected by the base when the filament is subjected to the final metallizing process.

It may perhaps be that part of the beneficial effect of bringing the fiber in contact

with a salt solution is due to a corrosion which may take place on the surface of the fiber. If the surface of the base filament is rough or porous, the shell will cling to it more firmly and uniformly, and by this means the irregular contraction of the shell upon cooling may be avoided.

It is possible that both effects, that is a removal of ash and a corrosion of the surface of the fiber, may contribute to produce the beneficial effect I obtain by my treatment.

As the beneficial effects of my invention may be obtained without reference to any theory, I do not wish to be limited by any view I have here expressed.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. The method of preparing a carbon filament which consists in impregnating a filamentary body of carbonaceous material with fluxing material and subjecting it to treatment including heating to a high temperature whereby it is converted into a carbon filament and such fluxing material eliminated.

2. The method of preparing a carbon filament which consists in subjecting a filamentary body impregnated with metallic chlorid to treatment including heating at a high temperature by which the chlorid is volatilized and a carbon filament of high purity and density produced.

3. In the manufacture of metallized carbon filaments, the step which consists in firing a carbon filament impregnated with sodium chlorid to a high temperature to

expel the chlorid and prepare it for coating with metallizable carbon.

4. In the manufacture of metallized carbon filaments, the method of preparing a carbon base which consists in treating uncarbonized filament with an inorganic compound adapted to be eliminated by heat, carbonizing it, and firing it to a very high temperature.

5. The method which consists in soaking uncarbonized filament in a salt solution, carbonizing it, and firing it at a temperature sufficient to cause elimination of the substance absorbed from said solution.

6. The process which consists in immersing cellulose in a solution of an inorganic salt, carbonizing it out of contact with the air, firing the resulting filament at a high temperature, depositing upon the filament a coating of carbon or carbon compound, and firing the product so formed at the highest temperature obtainable in a carbon tube furnace.

7. The process which consists in immersing a filamentary body of cellulose in a solution of sodium chlorid, carbonizing it, firing the carbonized filament at a high temperature, depositing upon the same a coating of carbonaceous material, and subjecting the carbon filament to a metallizing treatment.

In witness whereof, I have hereunto set my hand this 17th day of February, 1908.

DANIEL HAND.

Witnesses:

HARRY L. DITMARS,
J. HARRY ELKINS.