

ST AVAILABLE COPY

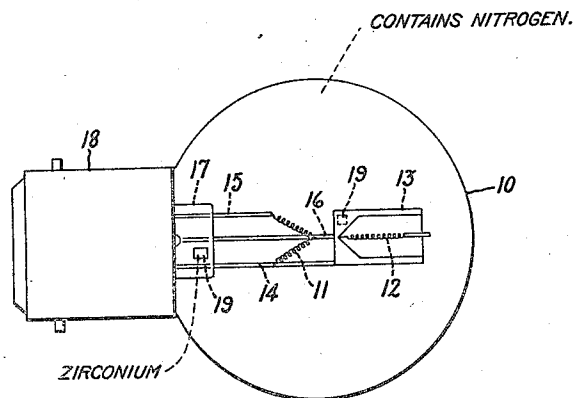
June 11, 1940.

A. DE GRAAFF

2,203,897

ELECTRIC INCANDESCENT LAMP

Filed Oct. 27, 1938



Inventor:  
Antonius de Graaff,  
by *Harry E. Smith*  
His Attorney.

## UNITED STATES PATENT OFFICE

2,203,897

## ELECTRIC INCANDESCENT LAMP

Antonius de Graaff, Eindhoven, Netherlands, assignor to General Electric Company, a corporation of New York

Application October 27, 1938, Serial No. 237,365  
In the Netherlands November 2, 1937

2 Claims. (Cl. 176-16)

My invention relates in general to electric incandescent lamps comprising a tungsten or other refractory metal filament mounted within a sealed envelope containing a gaseous filling composed at least partly of nitrogen. More particularly, my invention relates to so-called "getters" for such lamps.

It is known in electric discharge tubes and high-vacuum tubes to place some metallic zirconium in the bulb of the tube for the purpose of binding impurities in the gas filling or in order to absorb traces of gas. During the operation of the tube, the zirconium absorbs these impurities or gas traces. However, to my knowledge, zirconium has never been successfully employed as a getter in electric incandescent lamps having a gas filling that contains a certain quantity of nitrogen for the reason that the zirconium, in addition to absorbing the impurities in the gas filling and the traces of residual gas, also absorbs the nitrogen in the gas filling. This absorption of the nitrogen is objectionable since the presence of nitrogen in the bulb is desirable for the proper operation of the lamp. As is well known, the nitrogen in the gas filling serves to give a suitably high value to the breakdown voltage of the gas filling which, as a rule, consists for a great part of one or several rare gases such as krypton or argon. If in such a lamp zirconium were to be added, then the possibility might exist, because of the affinity of zirconium for nitrogen, that the nitrogen would be absorbed by the zirconium. The absorption of the nitrogen might then result in the occurrence of a premature breakdown between the leading-in wires in the lamp.

One object of my invention is to provide a getter which will effectively absorb the residual gases in an electric incandescent lamp to thereby reduce blackening of the lamp bulb and also to prevent failure of the lamp on account of the attack of the filament by water vapor.

Another object of my invention is the provision of a getter, in an electric incandescent lamp having a gaseous filling consisting partly of nitrogen, which will effectively absorb the impurities in the gaseous filling and the traces of residual gas but not the nitrogen.

Still another object of my invention is the provision of a gas-filled electric incandescent lamp with a getter located at a point in the lamp bulb where the temperature, during lamp operation, is within a certain definite range whereby the getter will effectively absorb the impurities in the gase-

ous filling and the traces of residual gas but not the nitrogen contained in the gaseous filling.

Further objects and advantages of my invention will appear from the following description of a species thereof.

The applicant has found that zirconium will or will not absorb certain gases depending upon the temperature to which it is heated. Consequently, a so-called selective absorption by the zirconium takes place. This fact is utilized in the lamp according to the invention in order to absorb the hydrogen or hydrogen compounds which are always located in the metal parts of the lamp, such as the nickel current supply wires and the like, and which are liberated during the operation of the lamp. The hydrogen and hydrogen compounds have a destructive effect on the material of the filament, such as tungsten, which effect is unfavorable to the properties of the filament. Thus, the liberated hydrogen, together with the traces of oxygen which are always present in the lamp, will result in the so-called water cycle, while a certain hydrogen compound, such as a hydrocarbon, will, in addition, carburize the filament and thereby give the lamp a lesser degree of resistance to shocks. The result is that the filament fails prematurely.

In the lamp according to the invention, in which a gas filling is present which contains nitrogen, some metallic bodies of zirconium are located at a point in the lamp at which the temperature is of the order of magnitude of 200-600° C. when the lamp is in operation. Within this temperature zone, the zirconium will bind the liberated hydrogen and hydrogen compounds, but the temperature of the zirconium is not high enough for a noticeable absorption of the nitrogen which is present in the lamp and which is necessary for its proper operation. The zirconium parts can, according to the invention, be provided for instance on the stem press of the lamp. In the case of automobile lamps, such as shown in Patent 1,716,048, A. Graves, which have a filament that is partly surrounded by a shield, the zirconium can be conveniently applied to this shield. It is also possible to provide the zirconium at a suitable point on the current supply wires. The zirconium can be placed in the lamp in the pulverulent state or in any other suitable form, such as in the form of a wire, strip, or foil. It is obviously desired to degasify the zirconium as thoroughly as possible before it is used. This degasification is carried out preferably by annealing the zirconium in a high vacuum.

Regardless of the fact that the filament is attacked by the hydrogen or hydrogen compounds, the disadvantage occurs, when the invention is not utilized, that due to the water cycle the lamp blackens relatively more rapidly where-  
5 by a considerable portion of the light emitted by the filament is absorbed. Especially when the available bulb surface is small is this disadvantage of importance. This is particularly the case  
10 in those lamps in which a filament with a rather high power consumption is used in a small bulb, which is the case, for instance, in automobile lamps. The blackening is particularly evident in  
15 that type of automobile lamp in which the filament is partly surrounded by a shield, because in such lamps very many metal parts are located in a relatively small bulb volume. In such lamps, the use of zirconium according to the invention is highly advantageous.

20 For a further understanding of my invention, reference may be had to the drawing which is a plan view of an automobile lamp of the type referred to above.

Referring to the drawing, the lamp comprises  
25 a glass bulb 10 containing a gaseous atmosphere comprising nitrogen and enclosing a major filament 11 and a minor filament 12, with a metal shield 13 located under the said minor filament. The said filament 11 is connected to leads 14 and  
30 15, and filament 12 is connected, through shield 13, to common lead 14 and to lead 16. The said

leads 14, 15 and 16 extend through a glass stem 17 to contacts on the base 18. For obtaining the gettering effect referred to above, a quantity of zirconium 19 is preferably disposed on the stem 17. If desired, the zirconium 19 may be  
5 disposed on the shield 13, as indicated by dotted lines.

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

1. An electric incandescent lamp comprising  
10 an envelope having a gas filling containing nitrogen, and a body of metallic zirconium within said envelope, said body being located at a point in said envelope at which the temperature, during operation of the lamp, is of the order of magnitude of 200° C. to not over about 600° C. whereby  
15 the heated zirconium absorbs hydrogen and hydrogen compounds present in the lamp but does not appreciably absorb the nitrogen in the lamp.

2. An electric incandescent lamp comprising  
20 an envelope having a gas filling containing nitrogen, a filament in said envelope, a stem extending into said envelope for supporting said filament, and a body of metallic zirconium located within  
25 said envelope on said stem where it is heated to a temperature of the order of 200° C. to not over about 600° C. whereby the heated zirconium absorbs hydrogen and hydrogen compounds present in the lamp but does not appreciably absorb the  
30 nitrogen in the lamp.

ANTONIUS DE GRAAFF.