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HANS KUZEL, OF BADEN, NEAR VIENNA, AUSTRIA-HUNGARY.

Carbon Niobium Nobium

PROCESS OF ELECTRICALLY CONNECTING FILAMENTS TO SUPPLY-WIRES IN ELECTRIC GLOW-LAMPS.

No. 898,979. Specification of Letters Patent. Patented Sept. 15, 1908.

Original application filed January 19, 1906, Serial No. 296,884. Divided and this application filed March 26, 1907. Serial No. 364,732.

To all whom it may concern:

Be it known that I, HANS KUZEL, a subject of the Emperor of Germany, and a resident of Baden, near Vienna, Empire of Austria-Hungary, have invented certain new and useful Improvements in the Processes of Electrically Connecting Filaments to Supply-Wires in Electric Glow-Lamps, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to make and use the same.

My invention relates to a process of electrically connecting the filaments of electric glow lamps to their supply wires and has for its object to establish the electric connection between the filaments and the supply wires of electric glow lamps by carbids of metals melting at very high temperatures.

This application is a division of my prior application filed January 19th 1906, Serial No. 296884.

In order to obtain a good connection of a metallic character which conducts the current better than the usual carbon cements and carbon coatings, a metallic material melting at a high temperature is required which adheres equally well to the carbon filament and to the metal supply wires.

I have found that metal carbids melting at high temperatures and their solid solutions in an excess of metal constitute the desired metallic connecting material. It has been found that the carbon compounds of the metals melting at extremely high temperatures, such as manganese, chromium, molybdenum, tungsten, uranium, vanadium, tantalum, niobium, titanium, zirconium, nickel, cobalt, iron are particularly suitable for the above purpose. The carbids of all of these metals and the solid solutions of such carbids in an excess of metal have a certain affinity for carbon owing to the fact that they contain carbon themselves and very firmly adhere to carbon if applied thereto in a molten state. If for instance the ends of a carbon filament are dipped into molten carbid of tungsten prepared by the method of Moissan the pores of the carbon filament ends are soaked or filled with the carbid and after withdrawing the ends of the filament from the molten carbid it will be found that these ends are covered with a metallic coating. The thickness of this coating may be increased at will by repeatedly dipping the filament ends into the molten carbid and this coating so firmly adheres to the carbon that in most cases it cannot be removed from the same without destroying the carbon. If instead of a carbon filament a metal wire is dipped into the molten carbid it becomes also coated with the latter. If therefore the molten carbid is applied in any suitable manner to the ends of a carbon filament and its metallic (say nickel) supply wires while they are held in juxtaposition or in contact with each other or temporarily secured to each other by any mechanical means such carbid will solder firmly together the two parts although they consist of heterogeneous materials and as the soldering knot or bead may be made as large as may be desired a connection is established thereby, the electric resistance of which is the minimum of what may be practically obtained. The same result may be obtained, if, instead of a carbon filament a filament of some other material, such as metal, boron or silicium, or, if instead of the carbid of tungsten another carbid melting at a very high temperature is used.

According to this invention I mix one or more of the above named metals in a finely powdered state with carbon, or an organic substance giving off carbon on being heated, with just a sufficient quantity of an agglomerant, such as gum arabic or sugar solution or the like so as to form a pasty mass. This mass is applied to the parts at the point where they are to be connected and then such mass is gradually heated to a white heat, either in the ordinary way or by means of the electric current or of the voltaic arc and if required in the absence of air, either *in vacuo* or in gases or vapors such as illuminating gas, hydrogen, nitrogen, benzine vapors etc.

The carbon present or given off combines with the metals used whereby carbids of the latter are formed.

This process is particularly suitable for metals capable of forming carbids very rich in carbon for instance for vanadium. From this a solder very suitable for the process described is obtained by mixing 90 parts of finely powdered vanadium, 5 parts of finely powdered graphite and 5 parts of gum arabic with a little water so as to form a pasty mass which is used in the manner described.

Instead of organic agglomerants also colloidal metals or—less advantageously—colloidal oxids may be used as agglomerants.

I wish it to be understood that in the following claim the terms "finely powdered metals melting at high temperatures" include one or more of such metals and that the term "carbonaceous substances" includes free carbon, such as graphite, or substances capable of giving off carbon when heated.

I do not claim in this application the article of manufacture produced by this process, as such product forms the subject of my application Serial No. 296,884.

Claim—

The process of electrically connecting filaments to supply wires in electric glow lamps which consists in mixing finely powdered metals melting and forming carbids at high temperatures with carbonaceous substances and with an agglomerant whereby a plastic mass is obtained, applying such plastic mass to the points to be connected and gradually heating such mass in the absence of air to a white heat whereby carbids of the said metals are formed and fused and finally permitting the same to cool, substantially as and for the purpose described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses.

HANS KUZEL.

Witnesses:
T. GEORGE HARDY,
ALVESTO S. HOGUE.