United States Patent Office 3,684,745
Patented Aug. 15, 1972

3,684,745

SPECIAL ELECTRODES FOR LIGHT ARC FURNACES

Bernhard Reichelt, Nuremberg-Laufamholz, Wolfgang Lippert, Schwabach, Dieter Zollner, Erlangen, and Kurt Kegel, Essen-Steele, Germany, assignors to C. Conradty, Nuremberg, Germany

No Drawing. Filed Jan. 30, 1970, Ser. No. 7,236
Claims priority, application Germany, Jan. 31, 1969, P 19 04 672.1
Int. Cl. H01b 1/06
U.S. Cl. 252—507 1 Claim

ABSTRACT OF THE DISCLOSURE

A carbon or graphite electrode which contains of from 0.5 to 6% by weight of a titanium compound and method of making such electrode. According to a preferred method TiO_2 or a titanium metal is admixed to the starting material for the electrode, and the mixture is graphitized at a temperature of approximately 2600° C.

When operating electrodes in a light arc furnace, particularly during the melting-in period, there will when the light arc works on the relatively cold scrap, occur an unstable burning and a considerable distortion of the voltage curve with high ignition tips, which voltage curve under idealistic conditions is sine-shaped. Numerous methods have become known, all of which aim at eliminating the so-called flickering because the entire electric network will in the vicinity of such unstable consumer be subjected to the danger of following such shock-like distortions in the voltage.

Methods suggested to overcome the above mentioned drawbacks from the angle of operation of the furnace consist in the following steps: Adoption of the high output light arc (which while bringing a reduction in the flickering does not satisfactorily eliminate it), operation with slightly ionizng gases (which while solving the problem is too expensive), additions to the electrodes, which additions in the form of metals or metal vapors have slight ionizing voltages and low electron exit work. To this end, there were employed boron, sodium, cesium and thorium compounds with large electrodes. While alkali and earth alkali compounds which primarily have to be introduced by a post-impregnating operation into the electrodes, have high stabilizing effects they bring about an increased electrode wear in view of the ability of the metals to react with graphite and are not suitable for economical reasons. Other substances, such as thorium compounds, which like-wise have good stabilizing effects are not to be used in view of radioactive dangers.

The present invention is based on certain findings encountered when producing cored carbon for electrodes of movie projectors, a type of arc carbon, the manufacturing knowledge of which has heretofore not been taken into consideration in connection with the elimination of flickering. It has been found that additions to the wick or core in the form of titanium compounds greatly add in the improvement of a stable burning of kinocarbons. It has now been attempted to find out whether independently of the presence of a core, as it is used in the form of special mass from rare earth employed with tar/pitch and/or synthetic resins with and without additions for filling in a central cavity of kinocarbons, titanium compounds will also with massive electrodes exert a stabilizing effect and also with relatively small additions exert a stabilizing effect. The surprising result described in the present invention confirm these ideas and brought about a stabilization of the burning behavior of large electrodes

in a light arc furnace almost up to the stabilized operation of a direct current arc. The considerable advantages need not be specifically recited. The stabilizing titanium compounds may from the very start, as is known with possible additions for influencing the expansion and graphitizing behavior of graphite electrodes, be added directly to the starting mixture and withstand the graphitizing operation at approximately 2,600° C. The stabilizing titanium compounds convert primarily to titanium carbide so that an additional working step will be superfluous. Similarly, the complicated method as is required by the hollow electrode operation with gas stabilization becomes superfluous. The admixture of a few percent of titanium compounds as, for instance, TiO_2 or Ti-metal in order to obtain the desired stabilizing effect during the later light arc operation of the finished electrode. Additions in the amount of from 0.5 to 6%, of which already 3% will bring about very good results, will generally suffice for the desired stabilizing effect. In difficult instances, in view of the electric installation or the furnace itself, or desired by a special way of operation, no objections exist against the increase in the addition of the titanium compounds. If desired, the titanium compounds may be introduced also into the already finished electrodes, and this may be effected by a post-impregnating operation.

There will now be described an example:

EXAMPLE

40% by weight of oil coke with a granular size of from 2 to 4 mm.
27% by weight of oil coke with a granular size of from 0.5 to 2 mm.
31% by weight of oil coke with a granular size of less than 0.5 mm.
2% by weight of titanium-dioxide with a granular size of less than 0.1 mm.

To the above mentioned dry starting mixture there were added 25% by weight of pitch with a softening or fusion point of 82° C.

The thus obtained substance was then further processed in a manner customary with the manufacture of carbon and graphite electrodes by mixing, pressing, glowing, and graphetizing, while the stabilizing effect of titanium-dioxide was not harmfully affected thereby.

It is, of course, to be understood that the present invention is, by no means, limited to the particular example set forth above, but also comprises any modifications within the scope of the appended claim, in other words, also additions of titanium compounds other than those specifically listed above will bring about the favorable effect according to the present invention. Furthermore, titanium dioxide may have a granular size of less than $^{6}/_{1000}$ mm.

What we claim is:

1. An electrode for a light arc furnace, said electrode being composed of a mixture of carbon and a titanium compound in the amount of 0.5% to 6%, graphitized to form an electrode consisting of titanium carbide and the remainder of carbon.

References Cited

UNITED STATES PATENTS

859,292	7/1907	Harden	252—507
1,164,728	12/1915	Ladoff	252—507
3,054,166	9/1962	Spendelow, Jr. et al.	252—504
1,024,257	4/1912	Harden	252—504
3,065,088	11/1962	Janes et al.	252—504

DOUGLAS J. DRUMMOND, Primary Examiner