Sept. 2, 1958 K. WALCHER 2,850,665

CATHODE OF AN ELECTRIC ARC LAMP

Filed Nov. 4, 1953

Fig.1

Fig.2

Fig.3

Fig.4

Fig.5

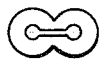

Fig.6

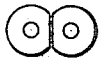

Fig.7

Fig.8

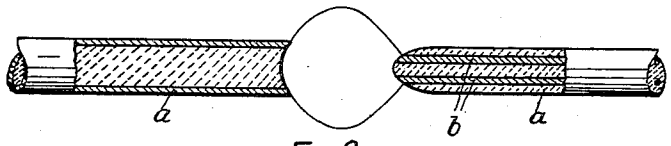

Fig.9

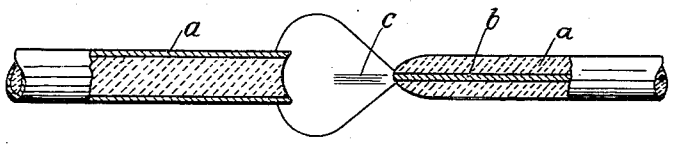

Fig.10

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CATHODE OF AN ELECTRIC ARC LAMP

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1 Claim. (Cl. 313—354)

The present invention relates to the cathode of an electric arc lamp.

The most important use in the art of carbon arc lamps, more particularly of the so-called Beck arc, is the projection of pictures on a screen. In this art, anodes and cathodes of circular cross section or of non-circular cross section are employed, both anodes and cathodes being equipped with a coaxial core. With such anodes and cathodes coaxially disposed in horizontal direction, currents of about 30 to 75 amperes are employed, whereas the current amounts to from 75 to 200 amperes where the carbon cathodes and anodes are disposed at an angle. While the coaxial guidance and movement of the carbon element is very convenient considered from a mechanical view point, such coaxial guidance is no longer used for currents exceeding the limit of about 75 amperes because, owing to the laws of physics controlling the Beck arc, the condition of the negative arc is subject to a change in that a well known contraction of the negative arc column occurs. When operated with currents of less than 80 amperes, the arc column is diffuse and wide spread, whereas when operated with a current of about 130 amperes, a fully developed contracted column will be present.

Therebetween there exists a range of unstable conditions which have the effect that the voltage of the arc, the current and the emission of light fluctuate. The method of the additional magnetic stabilization is known which, however, practically is not employed in the projection art, because it is difficult of control and has a limited applicability within the current range of interest, i. e. within the range of from 70 to 130 amperes. In a known case where the method of the additional magnetic stabilization is employed, it has not the object of delaying the contraction.

The object of the present invention is to render an arc lamp with horizontally disposed carbon elements applicable to an operation with a current of from 75 to 130 amperes under practical conditions by retarding the occurrence of the contraction of the arc column. This object is attained by altering the prior design of the cathode in such a manner that the cathode contains two parallel cores in distinction to its prior construction, said cores being spaced a distance which depends on the current-voltage-characteristic and on the diameter of the anode and amounts to at least .5 millimeter.

The use of the new cathode results in a stabilization of the rising section of the current-voltage-characteristic since the burning spot, which in the prior art was concentrated in the coaxial core, is enlarged or is split up into individual areas so that the current density is reduced in the entire root area of the arc. This increased root area so modifies the shape of the negative column that now the positive column is arrested and that a calm gas discharge is attainable.

Attempts have shown that in special cases it is of advantage to connect both cores over the entire length of the carbon element either entirely or partially by a core slot which is either straight or curved.

The outer profile of the carbon element may be non-circular where the disposition of the pair of cores so requires, the carbon element having the cross section of a flat body. The flat profile of the carbon element must be disposed in the axis of the lamp. In other words, the two cores must be arranged one beside the other. Therefore, a rectangular, oval or kidney-shaped profile of the carbon element has been found satisfactory, or, alternatively, the carbon element is flat on one side or on both sides. The use of a carbon element of such profile is preferable because where a carbon element of circular cross section is provided, the maintenance of the required horizontal adjustment of the two cores of the cathode within the lamp is difficult.

Moreover, it is preferable in special cases to arrange a pair of carbon elements in shunt, each carbon element being provided with a single core provided that the carbon element be given a suitable shape. Owing to such arrangement, the same effect will be obtained as is obtainable with a carbon element having a pair of cores.

In Figs. 1 to 8 a number of cross sectional shapes of the cathode used according to the present invention is shown. It is to be understood, however, that the invention is in no way limited to such shapes. In Figs. 1, 2, 3, 4, 5 and 6 carbon elements are shown each having a pair of cores, Fig. 6 showing an embodiment in which the pair of cores is interconnected. Each of Figs. 7 and 8 illustrates the cross section of a cathode composed of a pair of carbon elements, each carbon element being provided with a single core.

Figs. 9 and 10 are plan views of carbon arc lamps showing the difference in shape of the two arcs. Fig. 9 illustrates the materially widened arc produced by means of the novel twin core cathode, whereas Fig. 10 shows the normal arc, both obtained at the same current load of 4.5 kw. *a* denotes the coat consisting of graphite or carbon, while *b* denotes the core or cores. The contraction of the negative arc is indicated at *c*.

What I claim is:

A method of operating an electric arc lamp which comprises subjecting a direct current to a non-circular negative carbon electrode of horizontal coaxial electrodes at 75 to 130 amperes with the electrode having a pair of parallel cores to reduce the current concentration at the arc point, and regulating the current to determine the current load as to the spacing of the cores of at least .5 mm. with increasing space distance upon higher current load.

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