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FLUORESCENT LAMP

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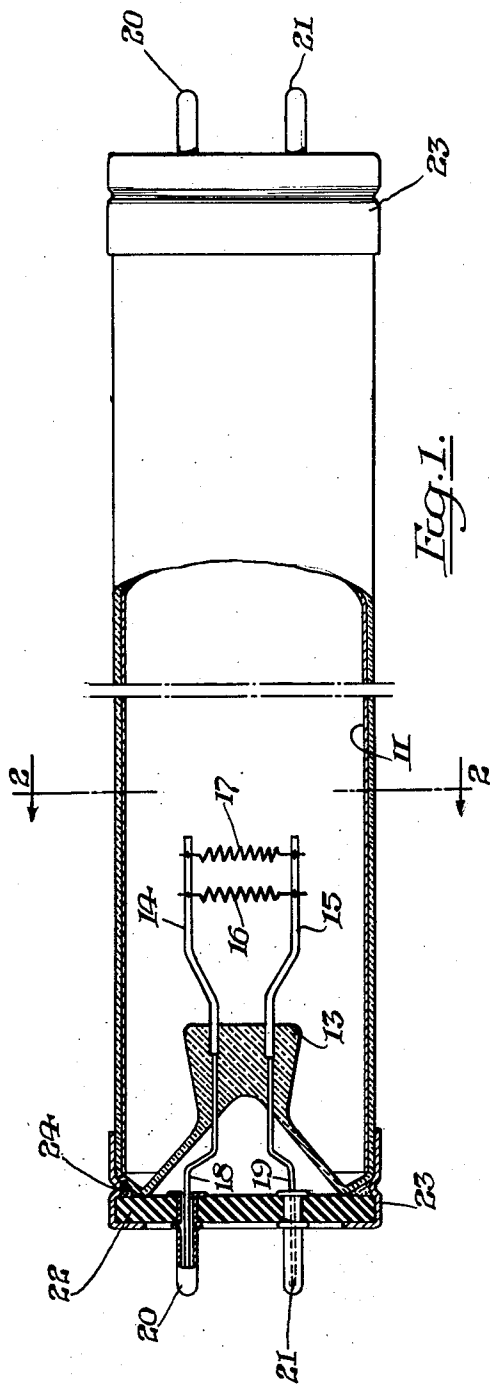


Fig. 1.

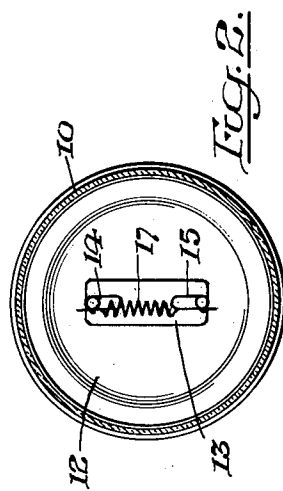


Fig. 2.

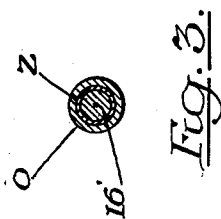


Fig. 3.

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FLUORESCENT LAMP

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6 Claims. (Cl. 313—109)

This invention consists in improvements in the cathode structure of fluorescent lamps.

The invention is specifically related to the double cathode type of fluorescent lamp, that is of the type wherein there is provided in parallel at each end of the lamp a pair of electron emissive cathodes.

Primarily the invention is concerned with improvements which are directed to increasing the normal useful life of fluorescent lamps.

Constant with this general object, it is one purpose of this invention to provide modified forms of cathode structure whereby the cathodes of each pair can be made to contribute equally to the electron stream and have approximately the same life.

A more specific object of the invention is to provide a novel form of "getter" system for use in double cathode fluorescent lamps.

There are additional and more specific objects of the invention which will be apparent from the following detailed disclosure of the embodiments thereof selected for disclosure purposes herein.

In the accompanying drawings,

Figure 1 comprises a view of a fluorescent lamp in accordance with this invention showing a portion in vertical cross-section and a portion in elevation;

Figure 2 is a cross-sectional view taken on the line 2—2 of Figure 1; and

Figure 3 is a typical cross-section of the cathode element.

As is common in fluorescent lamps, there is included a glass envelope 10, usually as shown of tubular form having a fluorescent coating 11 on the inner wall thereof, which may be of various chemical compositions and mixtures all as well known in this art, and dependent in part upon the visible spectrum desired. At each end of the envelope is a re-entrant conical portion 12 having a stem press 13 at its apex. Mounted in the stem press are a pair of support wires 14 and 15 upon which is shown in a diagrammatic manner, a pair of electron emissive filaments or electrodes 16 and 17 conductively and mechanically connected to the supports 14 and 15. This arrangement effects a spatial relationship between the cathode pairs which, of course, are duplicated at each end of the envelope so that the cathodes 17 of each pair are the closest longitudinally of the lamp, whereas the pair 16 are the most widely separated. There also results in this arrangement not only a mechanical association of the cathodes of each pair in parallelism, but similarly an electrical interconnection in parallel.

A pair of lead wires 18 and 19 are connected to the ends of the supports sealed in the stem press 13, and can include, as is well known in the art, the usual seal maintaining wires not separately indicated but well known in the art. The lead-in wires 18 and 19 are electrically connected to the terminal pins 20 and 21 which are mounted upon a disc of insulating material 22, forming part of the base 23 which is cemented, as at 24, to the envelope end.

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While the structures thus defined are conventional, it is intended that the diagrammatically illustrated emissive cathodes 16 and 17 be of a special construction. Thus, in accordance with this invention the basic conductor of each cathode is constructed as diagrammatically illustrated in Figure 3, wherein 16' is a wire of refractory metal of the characteristics commonly used for this purpose, and as exemplified for example, as being of tungsten, molybdenum, tantalum, and the like. This wire element is usually of circular cross-section and constructed and prepared so as to be suitable for cathode purposes.

In accordance with this invention there is first deposited upon the cylindrical surface of the refractory core wire 16', a very thin coating Z of any one of the metals or compounds which has the capacity for absorbing the residual gases under operating conditions, which are present in the envelope 10 after evacuation and sealing. There are many well known materials suitable for this purpose, so that it need only be noted that zirconium, barium and phosphorous are exemplary. This coating may be applied in many different ways, and is not a specific part of this invention. While the well known "getter" materials of this type have been used for this purpose, they are usually provided at some other point in the lamp. It is not known that "getter" materials have been directly applied to the refractory conductor as herein disclosed.

Superimposed upon the "getter" layer and applied thereto in any suitable manner, is a coating O of any of the well known materials of high electron emissivity commonly used for this purpose, such as thorium oxide, or an alkaline earth material. This invention is not concerned with the manner of forming the layer O, and is exemplary in the sense that, as will be explained later, it may be applied to the cathode structures either as a layer as shown in Figure 3, or as a filling material as will be explained later, or both in combination.

Diagrammatically shown cathodes 16 and 17 can be made in various ways in order to accomplish the objects of this invention. Preferably the cathodes 17 are of the triple coiled type, that is where the wire 16' is first totally coiled on an extremely small radius and the resultant cylindrical spring like structure is bodily coiled upon a larger radius and the resulting coil is again coiled upon a still larger radius. If the basic cathode element as shown in Figure 3 is used to form the triple coiled cathode 17, there results a vastly increased area of electron emissive capacity. This capacity in turn can be further increased by packing into the interstices formed from a triple coil structure, additional emissive material which can be prepared as a paste and worked into the spaces formed by the structural complexity of triple coiling. It is to be understood that the "getter" layer Z may or may not be used on the cathodes 17, as conditions dictate. It is, of course, understood that this description refers to a cathode 17 for each end of the lamp.

The diagrammatically illustrated cathode 16, of which there is of course a complement at the other end of the tube, is intended to be of the coiled type, in which case the basic element of Figure 3 is first tightly coiled on a small radius to form a cylindrical structure which in turn is coiled upon a larger radius to form the coil coiled structure. The "getter" layer may or may not be used, as conditions dictate. In this respect the point is, it is highly probable that the "getter" layer Z need only be used on one of the cathodes of one of the pairs, which may be either the cathode 16 or the cathode 17, or it may be used on one of the cathodes of each pair so that it may be part of the cathode 16 of one pair and the cathode 17 of the other pair, or the cathode 16 of that pair. It

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will be understood also that the coil coiled structure permits of the use of additional electron emissive material by filling in the interstices, if desired.

As one skilled in this art will appreciate, in using double cathodes in parallel at each end of the lamp the two cathodes of the pairs which approach each other the closest axially of the lamp, in this case the cathodes 17, will be subjected to the greatest demand for electron production by reason of this relatively closer spatial relationship. On the other hand, the more distant pair, namely the cathodes 16, will be subjected to a lesser demand. These conditions are met by making the cathode 17 of the triple coiled type and the cathodes 16 of the coil coiled type by reason of their permitting of the use of a larger quantity of emissive material.

Those skilled in the art will appreciate that two prime features of this invention, that is the use of the "getter" in the manner disclosed, and the provision of greater electron emissivity may be used individually.

It will be understood that in the preferred embodiment of this invention the basic conductor 16' of each of the cathodes of each pair will be of the same physical and electrical characteristics, so as to have the same current carrying capacity. It is also preferable that in each pair the basic conductor of each cathode of each pair will be designed to carry one-half of the heating current for that pair.

It is of course understood that the lamp of this invention is to have the other well known additional elements common to lamps of this type, as for example the use of a small quantity of mercury and other atmosphere additives to provide an efficient commercial structure.

It will also be understood that there are other ways in which the objects of this invention can be secured, and I do not, therefore, desire to be strictly limited to the illustrative embodiments herein set out, but only as required by the appended claims.

What is claimed is:

1. In a fluorescent lamp comprising an evacuated en-

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velope having an ionizable low pressure atmosphere and an interior coating of fluorescent material, a pair of electron emissive electrodes mounted within and at each end of said envelope, each pair of said electrodes consisting of parallel connected conductors carrying electron emissive coatings, at least one of said electrodes having a coating of getter material located between its conductor and its electron emissive coating, the conductors of each pair of electrodes being longitudinally spaced on the axis of said lamp, and the axially nearest electrodes of both pairs of electrodes having greater electron emissive capacity than the remaining electrodes of both pairs.

2. In the combination of claim 1, the conductors of said axially nearest electrodes being physically constructed to, and supporting a larger quantity of electron emissive material in their coatings than the conductors of said remaining electrodes.

3. In the combination of claim 1, the conductors of said axially nearest electrodes comprising triple coiled conductors.

4. In the combination of claim 1, the conductors of said axially nearest electrodes comprising triple coiled conductors and the conductors of said remaining electrodes comprising coil coiled conductors.

5. A cathode for a fluorescent lamp comprising a refractory metal conductor, a coating of getter material on said conductor, and a coating of electron emissive material overlying said coating of getter material, so that the rate of evaporation of said getter material is controlled thereby.

6. In the combination of claim 5, said coating of getter material containing zirconium.

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