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L. R. PETERS

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LEAD WIRE FOR FLUORESCENT LAMPS

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Fig. 1

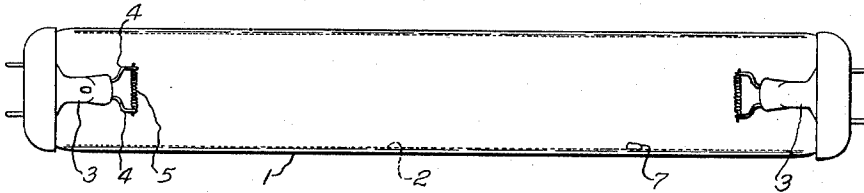
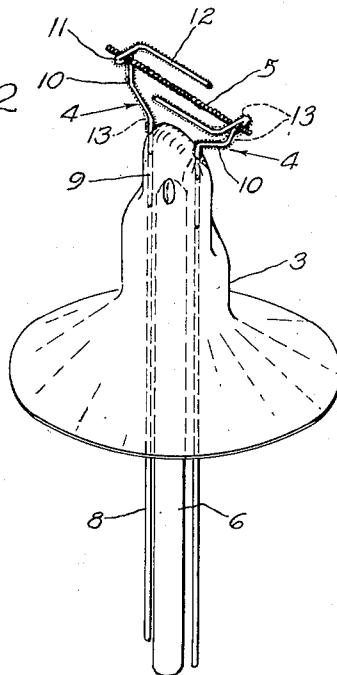


Fig. 2



Inventor:
Leo R. Peters,
by *Vernon C. Gayffman*
His Attorney.

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LEAD WIRE FOR FLUORESCENT LAMPS

Leo R. Peters, Cleveland Heights, Ohio, assignor
to General Electric Company, a corporation of
New York

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5 Claims. (Cl. 176-126)

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My invention relates to electric gaseous discharge lamps, and more particularly to fluorescent lamps.

An object of my invention is to reduce the end discoloration which normally occurs in such lamps in the form of dark deposits near the ends of the lamps adjacent the electrodes. Other objects are to improve the maintenance and efficiency of such lamps. Further objects and advantages of my invention will appear from the following description of species thereof.

In the drawing, Fig. 1 is an elevation of a lamp comprising my invention, and Fig. 2 is a perspective view, on an enlarged scale, of the mount structure at each end of the lamp.

Referring to the drawing, the lamp shown therein is generally representative of the well-known fluorescent lamps of low pressure mercury vapor positive-column type. The lamp comprises an elongated tubular envelope 1 of glass or the like having on its interior surface a coating 2 of fluorescent material such as manganese-activated zinc beryllium silicate or magnesium tungstate or mixtures thereof. The ends of the envelope are sealed by mounts such as shown in Fig. 2 and each comprising a stem 3 through which extend lead-in wires 4-4 between which is mounted a thermionic activated electrode 5 which may be a coiled or coiled-coil filament of tungsten coated with an electron emissive material, such as one or more of the oxides of alkaline earth metals like barium or strontium. One of the stems 3 may be provided with the usual exhaust tube 6. The envelope may be filled with a rare gas at a pressure of a few millimeters, for example argon at about 2 to 5 mm. pressure, and a small amount of mercury 7. Such lamps are ordinarily operated at a current density such as to result in a mercury vapor pressure of the order of magnitude of 10 microns.

As pointed out above, during the operation of such lamps dark deposits are formed on the normally white fluorescent powder 2 on the interior of the envelope 1 adjacent the electrodes 5, 5. According to the present invention, such discoloration is appreciably reduced by constituting at least the surfaces of the portions of the lead-in wires 4, within the envelope 1, of metallic aluminum.

Each of the lead-in wires 4 usually consists of three sections, including an outer lead 8 usually of copper, a short press lead 9 consisting of a copper-sleeved nickel-iron core, and an inner lead 10. The inner leads 10 are here shown as of the form disclosed and claimed in the Flaws Patent

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2,312,245 which is assigned to the same assignee as the present case, wherein intermediate portions of the leads are shaped to form hooks 11 clamped around the ends of the filamentary cathode 5 and the extremities of the leads are bent to extend parallel to the cathode to constitute anode portions 12.

In accordance with my invention, the entire surface of each of the inner leads 10 may be provided with a coating or covering 13 of metallic aluminum (indicated by dotted lines), for example a coating of aluminum paint, or of electrolytically plated aluminum. The base or core wire of said inner leads may consist of a suitable metal or alloy such as iron or nickel, although the presently preferred material is deoxidized copper. Alternatively, the inner leads 10 may be made of solid aluminum although at present I prefer the abovementioned construction since aluminum wire is somewhat difficult to work with.

A thin coating 13 of aluminum may be applied to the inner leads 10 prior to assembly of the then straight composite lead wires 4, 4 into the stem 3, by dipping the inner lead portions 10 into a bath of aluminum paint consisting, for example, of 325 mesh degreased aluminum powder in a solution of nitrocellulose in amyl acetate. The thin coating of aluminum paint does not interfere with the operation of the automatic stem-making and mount-making machines ordinarily used in the manufacture of the mount shown in Fig. 2. The binder in the aluminum paint is in this case burned out during the course of manufacture of the stem and lamp. In some cases where the stem and lead wires are assembled by a process involving excessive heating of the inner leads 10, it may be desirable to brush the aluminum paint on the said inner leads after such assembly has been made, in order to avoid a reaction between the aluminum and the core or base metal (copper, for instance) of the said inner leads.

In comparative tests, lamps with aluminum-coated iron inner leads showed substantially less end discoloration and longer life (from 10-50%) than lamps with bare iron inner leads. The aluminum-coated lead wire lamps also had a higher efficiency of 2.8 lumens per watt which persisted throughout lamp life. In another test, lamps with aluminum-dipped and aluminum-electroplated copper inner leads both gave longer life than lamps with bare nickel leads. On the other hand, I found that coating the inner leads with alundum (Al_2O_3) resulted in excessive etch-

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ing of the cathode on cold starting of the lamps. Moreover, coatings of magnesium, in place of aluminum, resulted in very bad discoloration at the ends of the lamp.

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

1. A fluorescent electric discharge lamp comprising a sealed tubular glass envelope having a coating of fluorescent material on the interior thereof and containing an ionizable atmosphere including mercury vapor, a glass stem sealed to each end of said envelope, composite multi-section lead-in wires projecting into said envelope through said stems and each having an intermediate seal section thereof fused in one of said stems and an outer section projecting exteriorly of the envelope and an inner section projecting interiorly of the envelope, filamentary electrodes mounted on and electrically connected to the said inner portions of the lead-in wires at respective ends of the envelope and having thereon an electron emissive coating of alkaline earth oxides, the intermediate sections of said lead-in wires being constituted of copper-clad nickel-iron wire, the said inner sections only of said lead-in wires having at least the surface layer thereof constituted of metallic aluminum which serves to minimize the formation of dark deposits on the fluorescent coating at the ends of the envelope during operation of the lamp.

2. A fluorescent electric discharge lamp comprising a sealed tubular glass envelope having a coating of fluorescent material on the interior thereof and containing an ionizable atmosphere including mercury vapor, a glass stem sealed to each end of said envelope, composite multi-section lead-in wires projecting into said envelope through said stems and each having an intermediate seal section thereof fused in one of said stems and an outer section projecting exteriorly of the envelope and an inner section projecting interiorly of the envelope, filamentary electrodes mounted on and electrically connected to the said inner portions of the lead-in wires at respective ends of the envelope and having thereon an electron emissive coating of alkaline earth oxides, the intermediate sections of said lead-in wires being constituted of copper-clad nickel-iron wire, the said inner sections only of said lead-in wires consisting of a base metal wire covered with metallic aluminum which serves to minimize the formation of dark deposits on the fluorescent coating at the ends of the envelope during operation of the lamp.

3. A fluorescent electric discharge lamp comprising a sealed tubular glass envelope having a coating of fluorescent material on the interior thereof and containing an ionizable atmosphere including mercury vapor, a glass stem sealed to each end of said envelope, composite multi-section lead-in wires projecting into said envelope through said stems and each having an intermediate seal section thereof fused in one of said stems and an outer section projecting exteriorly of the envelope and an inner section projecting interiorly of the envelope, filamentary electrodes mounted on and electrically connected to the said inner portions of the lead-in wires at respective ends of the envelope and having thereon an elec-

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tron emissive coating of alkaline earth oxides, the intermediate sections of said lead-in wires being constituted of copper-clad nickel-iron wire, the said inner sections only of said lead-in wires consisting of a base metal wire of copper covered with metallic aluminum which serves to minimize the formation of dark deposits on the fluorescent coating at the ends of the envelope during operation of the lamp.

4. A fluorescent electric discharge lamp comprising a sealed tubular glass envelope having a coating of fluorescent material on the interior thereof and containing an ionizable atmosphere including mercury vapor, a glass stem sealed to each end of said envelope, composite multi-section lead-in wires projecting into said envelope through said stems and each having an intermediate seal section thereof fused in one of said stems and an outer section projecting exteriorly of the envelope and an inner section projecting interiorly of the envelope, filamentary electrodes mounted on and electrically connected to the said inner portions of the lead-in wires at respective ends of the envelope and having thereon an electron emissive coating of alkaline earth oxides, the intermediate sections of said lead-in wires being constituted of copper-clad nickel-iron wire, the said inner sections only of said lead-in wires consisting of a base metal wire of iron covered with metallic aluminum which serves to minimize the formation of dark deposits on the fluorescent coating at the ends of the envelope during operation of the lamp.

5. A fluorescent electric discharge lamp comprising a sealed tubular glass envelope having a coating of fluorescent material on the interior thereof and containing an ionizable atmosphere including mercury vapor, a glass stem sealed to each end of said envelope, composite multi-section lead-in wires projecting into said envelope through said stems and each having an intermediate seal section thereof fused in one of said stems and an outer section projecting exteriorly of the envelope and an inner section projecting interiorly of the envelope, filamentary electrodes mounted on and electrically connected to the said inner portions of the lead-in wires at respective ends of the envelope and having thereon an electron emissive coating of alkaline earth oxides, the intermediate sections of said lead-in wires being constituted of copper-clad nickel-iron wire, the said inner sections only of said lead-in wires consisting of metallic aluminum which serves to minimize the formation of dark deposits on the fluorescent coating at the ends of the envelope during operation of the lamp.

LEO R. PETERS.

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