United States Patent [19]

Roy et al.

[11] **3,908,251**

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[54] **METHOD OF MAKING BEADED FILAMENT COIL**

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[52] **U.S. Cl.** **29/25.17**; 313/344

[51] **Int. Cl.**² **H01J 9/00**

[58] **Field of Search** 29/25.11, 25.13, 25.14, 29/25.17, 25.18; 313/343, 344, 345

[56] **References Cited**

UNITED STATES PATENTS

274,294	3/1883	Edison	313/343
3,778,664	12/1973	Petro et al.	313/344

FOREIGN PATENTS OR APPLICATIONS

217,381	6/1957	Australia	313/315

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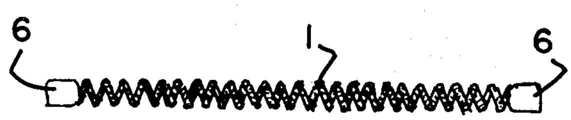
[57] **ABSTRACT**

A filamentary coiled electrode for a fluorescent lamp has a glass embedment at each end thereof to prevent coil entangling during lamp manufacture.

2 Claims, 2 Drawing Figures



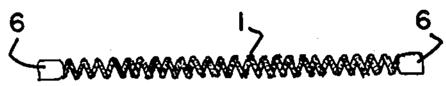


FIG. 1

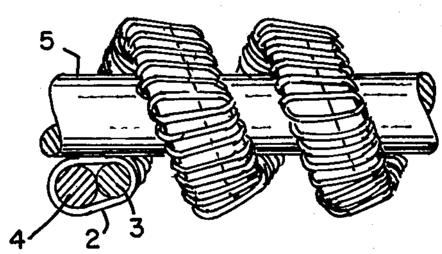


FIG. 2

METHOD OF MAKING BEADED FILAMENT COIL

THE INVENTION

Electrodes for fluorescent lamps generally comprise a coiled coil filament coated with an electron emissive coating.

In the manufacture of the filament, a fine tungsten basket wire is coiled around a mandrel. The mandrel consists of two parallel wires, a tungsten current-carrying wire and a temporary wire that will eventually be dissolved in acid.

This coiling is then coiled again, around another mandrel that will also eventually be dissolved in acid.

After heat setting, long lengths of this coiled coiling are cut into the lengths necessary for lamp electrodes and the temporary wires are removed by dissolving in acid.

The filaments are then placed in automatic feeds of lamp mount making equipment where they are fed to lamp mounts and secured in the support wires thereof. The automatic feeds are usually vibratory in nature and a common problem occurring therein is entangling of the filaments. The entangling results from burrs on the wire, caused by the cutting operation, or from unraveling of the basket wire on the current carrying wire.

U.S. Pat. No. 3,736,458 discloses a method of reducing basket wire unraveling by winding the primary coiling on a noncircular secondary mandrel, either oval or egg-shaped.

U.S. Pat. No. 3,792,224 discloses a method of preventing filament entangling by melting the metal at the ends of the filament to provide fused metal beads.

The instant invention is an improvement over the latter in that glass embedments are provided at the ends of the filaments to prevent entanglement. The glass embedments can be formed at much lower temperatures than fused metal beads. And there is about a 6 percent savings in tungsten wire, since the wire is not melted in forming the glass embedment.

FIG. **1** is an elevational view of a coiled coil filament in accordance with this invention.

FIG. **2** is an enlarged view of a portion of the secondary coiled wire prior to mandrel removal.

A filament **1** in accordance with this invention was made by coiling one mil tungsten wire **2** around a mandrel consisting of 2.2 mil tungsten wire **3** and 5.5 mil molybdenum wire **4** at 250 turns per inch. After heat treatment, the primary coiling was coiled on a secondary mandrel **5**, which consisted of 16 mil molybdenum wire, at 100 TPI.

After heat setting, the secondary coiling was then cut into 17.1 mm lengths and glass embedments **6** were formed at each end of the filament. Embedments **6** were formed by first coating the ends of the filament with a slurry of glass frit in a suitable liquid vehicle.

In this embodiment, the slurry consisted of a low melting point glass frit having an average particle size of 3 to 6 microns as measured by the Fisher sub-sieve sizer and having a composition of 2.6% ZnO, 22.5% SiO_2, 27.8% B_2O_5, 9.1% Na_2O, 5.0% Al_2O_3 and 9.0% BaO. This glass has a softening temperature of 596°C and a working temperature of about 900°C.

The glass frit was dispersed in a **12** second ethylcellulose vehicle to a specific gravity of 1,620, the vehicle consisting of 2.9% by weight of N-type ethylcellulose, 4.4% dibutyl phthalate, 91.4% xylol and 1.3% butanol.

The slurry is applied to the end one or two turns of the filament by, for example, spraying or dipping. After the coating is dry, the filament is fired at a temperature, about 900°C, high enough to volatilize and remove the organic material in the coating and to melt the glass frit, drawing it together to form embedment **6.**

The glass frit slurry may be applied to the ends of the filament either before or after mandrels **4** and **5** are removed by dissolving in acid. Preferably, however, the slurry is applied before, since mandrel removal results in a cavity within the primary turns which can undesirably draw slurry therein by capillary action; it is desirable, for material efficiency purposes, that only a minimum amount of the filament be embedded by glass embedment **6.**

We claim:

1. The method of making nonentangling filaments for fluorescent lamps comprising the steps of: primary coiling tungsten wire on a mandrel comprising tungsten wire in parallel with a wire of a dissimilar metal; secondary coiling the wire and mandrel on a second mandrel; cutting the secondary coiling to predetermined lengths; and forming a glass embedment at each end of the predetermined lengths.

2. The method of claim **1** wherein the glass embedment is formed by applying a glass frit slurry to said end, drying the applied slurry and firing the dried slurry to melt the glass frit therein.

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