June 28, 1949. W. C. ELLIS ET AL 2,474,473

BALLAST LAMP

Filed Jan. 29, 1947

FIG. 1

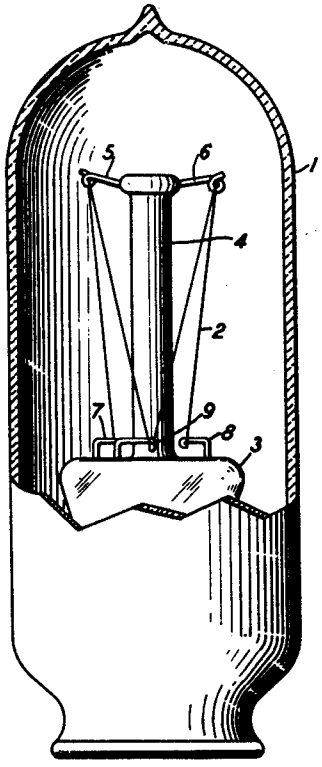


FIG. 2

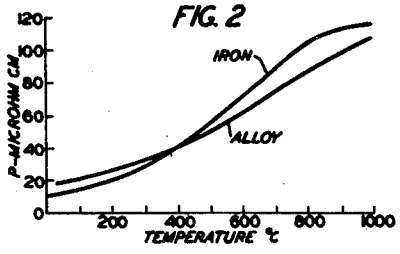


FIG. 3

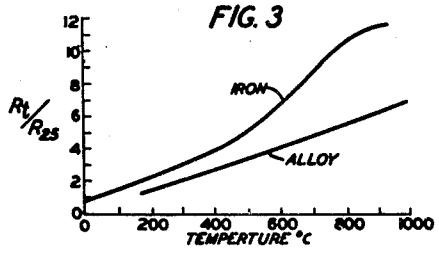
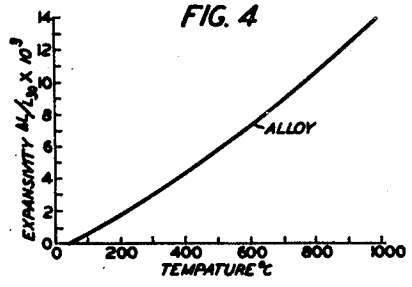


FIG. 4



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BALLAST LAMP

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6 Claims. (Cl. 201—76)

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This invention relates to ballast lamps and more particularly to filamentary material therefor.

Ballast lamps depend for their operation upon the combined effects of a large temperature coefficient of resistivity, radiation of a part of the I^2R power, and conduction and convection of the balance of the I^2R power through the low pressure gas atmosphere surrounding the filament and confined within the envelope of the lamp. The equilibrium conditions depend on the several variables involved in the thermal system of the lamp and its environment.

Heretofore iron and tungsten have been used as materials for filaments in ballast lamps.

In some cases iron wire has definite limitations in that the speed of action for a coiled filament may be about twenty-five per cent slower than the time required for an associated device to come into operation. The speed of action for a straight line filament is faster than a coiled wire filament but the current may be so irregular that it may be useless for some applications. The iron filament also exhibits an instability associated with hot spots which in turn probably originate from the transitions in iron at the Curie temperature and the α—Y transformation. In some instances these matters are so serious that iron is not used as a straight filament but as a coil which decreases the speed with which equilibrium is obtained.

Ballast lamps having filaments of tungsten have reduced temperature sensitivity as compared with ballast lamps having iron filaments.

One object of this invention, therefore, is to provide a filament for ballast lamps which has a high resistivity and high positive temperature coefficient of resistance in the operating range, the temperature coefficient increasing rapidly with temperature in the range of use.

Another object of the invention is to provide a filament for ballast lamps free from structural or other transitions which might introduce discontinuous resistivity changes or thermal effects.

A still further object of the invention is to provide a filament for ballast lamps which is mechanically satisfactory for lamp manufacture and resistant to corrosion.

These and other objects are attained in accordance with this invention by the use of a filament made of an alloy comprising cobalt, iron and an agent in the class of deoxidizers and desulphurizers, such as manganese or aluminum.

For a more complete understanding of the invention, reference is made to the following description taken in connection with the drawing which shows, in Fig. 1, a side view of a ballast lamp having a portion of the envelope of the lamp broken away to show more clearly the internal structure thereof, and in Figs. 2, 3 and 4 performance curves of the new alloy.

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In Fig. 1 of the drawing is shown a ballast lamp comprising a sealed envelope 1 containing hydrogen in which is mounted a filament 2. On a stem 3 sealed in one end of the envelope 1 is mounted a standard 4 of glass or other suitable insulating material. Hooks 7, 8 and 9 secured in the stem support the filament at one end and hooks 5 and 6 secured in the upper end of the standard support the filament at its other end.

One material for the filament is an alloy having substantially the following composition:

	Per cent
Cobalt	90.1
Iron	9.4
Manganese	0.5

The addition of manganese to this alloy is essentially to impart sufficient malleability and ductility to permit hot and cold fabrication. Instead of manganese a number of other agents in the class of deoxidizers and desulphurizers can be substituted, for example aluminum.

A casting may be made from a melt of these materials, which is then fabricated to rods and then drawn to wire. Care should be exercised in the drawing operation to finish the wire free from die lubricant and with a clean surface. Wire has been made of this composition in the following sizes: 0.005 inch, 0.0046 inch, 0.0041 inch, 0.0036 inch and 0.0030 inch.

The nature of the invention will be explained with the aid of the drawing in which Figs. 2 and 3 show curves comparing the resistance-temperature relationships for the new alloy and iron. In Fig. 2 the resistivity of the alloy is shown as a function of temperature and in Fig. 3 the ratio resistivity at any temperature to the resistivity at 25° C. as a function of temperature. The new alloy is reversible in characteristics and exhibits no singularities or reversals of slope in 1000° C. It is evident from curves shown in Figs. 2 and 3 that the new alloy can be used with higher operating temperatures than iron without encountering slope reversal and transitions in structure such as the magnetic transformation of iron at 770° C. and its α-Y transformation at 906° C.

Fig. 4 shows the expansivity characteristics of the alloy to 1000° C. illustrating the freedom of this alloy from structural transformations. The

dilation and contraction of the alloy are uniform and reversible.

Although the invention has been described in terms of its specific embodiments, certain modifications and equivalents will be apparent to those skilled in the art and are intended to be included in the scope of the present invention which is to be limited only by the reasonable scope of the appended claims.

What is claimed is:

1. A ballast lamp comprising an envelope containing a resistance element of an alloy of cobalt, iron and an agent in the class of deoxidizers and desulphurizers.

2. A ballast lamp comprising an envelope containing a non-oxidizing atmosphere and a resistance element of an alloy of cobalt, iron and manganese.

3. A ballast lamp comprising an envelope having an element therein adapted to be heated of an alloy of cobalt, iron and a deoxidizing metal.

4. A ballast lamp comprising an envelope having a resistance element therein adapted to be heated of an alloy of substantially 90 per cent cobalt, 9 per cent iron and the balance manganese.

5. A ballast lamp comprising an envelope having a filament therein of an alloy of 90.1 per cent cobalt, 9.4 per cent iron and .5 per cent manganese.

6. A ballast lamp comprising an envelope containing hydrogen and a resistance element of approximately 90 per cent cobalt, 9 per cent iron and the balance a desulphurizing metal.

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