

- [54] **NOISE FREE INCANDESCENT LAMP** 2,473,888 6/1949 Jordan et al. 313/332 X
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[52] **U.S. Cl.** **313/315; 313/311; 313/331; 313/332**

[51] **Int. Cl.** **H01k**

[58] **Field of Search** 313/311, 331, 332, 315, 313/334; 174/50.64; 315/85

[56] **References Cited**

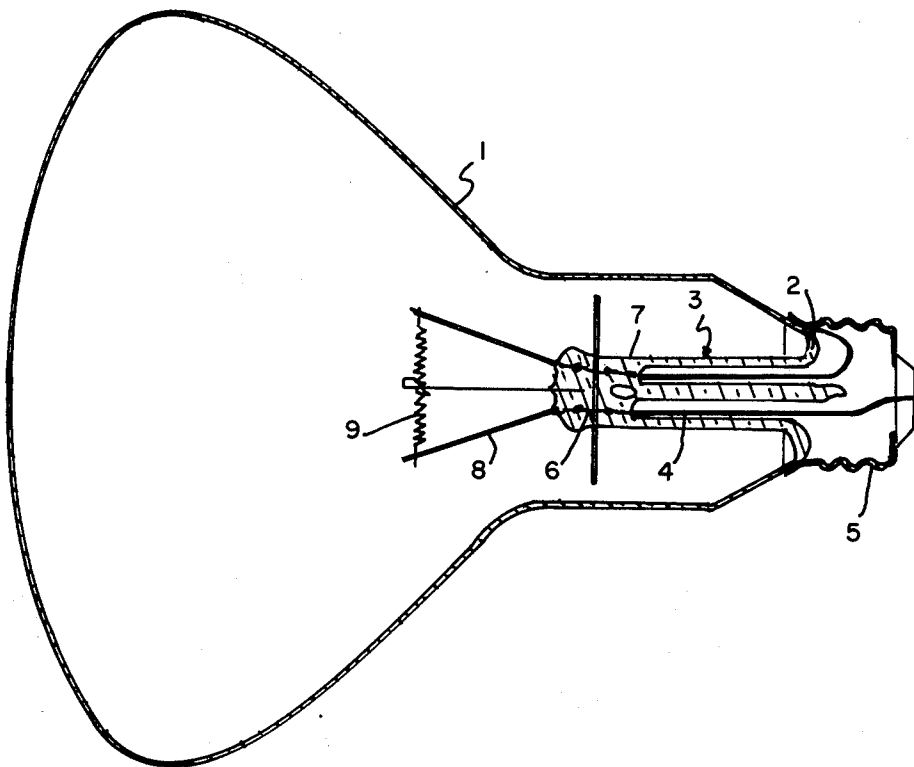
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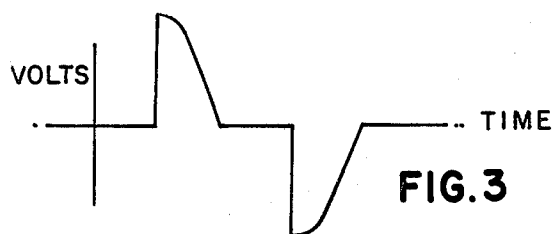
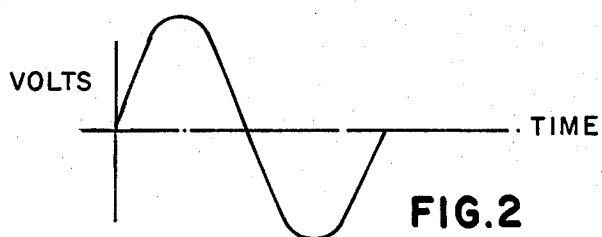
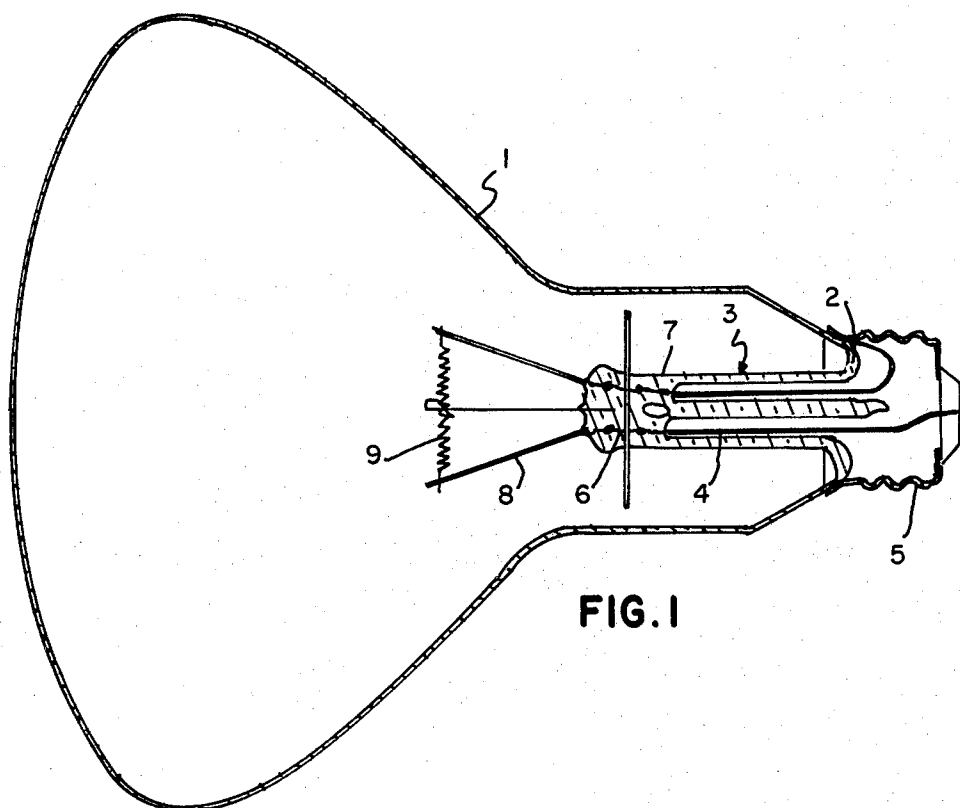
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[57] ABSTRACT

A gas-filled incandescent lamp in a solid-state dimming circuit has lead-in wires made of nonmagnetic metal in order to reduce magnetically-induced noise resulting from the modified voltage output of the dimmer.

4 Claims, 3 Drawing Figures





NOISE FREE INCANDESCENT LAMP

THE INVENTION

This invention relates to incandescent lamps and especially to such lamps for use with solid-state dimmers.

Incandescent lamps generally have a coiled filament, usually tungsten, in a glass bulb. The bottom of the bulb is sealed to a flare of a stem press glass mount which also includes an exhaust tube for exhausting, filling and sealing the lamp. Inner lead-in wires support the filament and provide an electrical path for current thereto. The lead-in wires are supported in the press seal where they are connected to intermediate wires embedded therewithin, which are selected to match the coefficient of expansion of the glass. Outer lead-in wires are connected between said intermediate wires and the usual screw-type base at the bottom of the lamp.

In the gas-filled incandescent lamps of the type with which this invention is concerned, the inner lead-in wires are usually made of nickel. Nickel has adequate strength to support the filament, is electrically conductive and is stable to the heat generated by the filament. Copper wire is sometimes used as the inner lead-in wire in low wattage (less than 40 watt) vacuum lamps. However, copper wire is not satisfactory for the higher wattage gas-filled lamps because of its lower strength and its inadequate resistance to heat. In addition, copper readily oxidizes during lamp processing and the oxides are detrimental to the filament in gas-filled lamps, but not in vacuum lamps, due to the well-known water cycle.

The intermediate wire embedded within the press seal is a combination wire consisting of a nickel-iron alloy core in a copper sleeve. The outer lead-in wire is usually made of copper.

When such lamps are used with present day solid-state dimmers, the lamps emit an audible noise. It is the purpose of this invention to provide substantially noise-free lamps for use with such dimmers.

FIG. 1 shows a 150 watt R40 incandescent lamp in accordance with this invention.

FIGS. 2 and 3 show, respectively, the typical sine wave voltage of a usual AC power supply and the voltage waveform as modified by a solid-state dimming circuit.

An incandescent lamp in accordance with this invention comprises a bulb or glass envelope 1 containing an inert gas filling, usually nitrogen or a mixture of nitrogen and argon. The bottom of bulb 1 is sealed to flare 2 of the usual stem press glass mount 3. Outer lead-in wires 4 are connected between their respective contacts on the usual screw base 5 to intermediate wires 6 embedded within stem press 7 of mount 3. Inner lead-in wires 8 are connected to intermediate wires 6 and are supported in press 7. The other ends of inner lead-in wires 8 are connected to, and support, coiled tungsten filament 9.

In the embodiment shown in FIG. 1, inner lead-in wires 8 were made of nickel plated nonmagnetic 30 mil 99.8% copper-0.12% zirconium wire. Intermediate wires 6 were the same as prior art wires; since they are completely embedded in glass, they cannot vibrate and therefore do not cause magnetically induced noise. Outer lead-in wires 4 were 12 mils in diameter and

were made of a nonmagnetic alloy consisting of 95.8% copper, 3.1% silicon and 1.1% manganese.

These lamps were compared with prior art 150 watt R40 lamps, which had nickel inner and outer lead-in wires, in a semi-anechoic chamber, using a G.R. Model 1551-C soundlevel meter and a G.R. Model 1564A analyzer to measure the frequency components of the sound emitted by the lamps. The lamps were operated with a Leviton 600 watt 120 solid-state dimmer.

With the pickup microphone at a distance of 3¼ inches from the lamps, the prior art lamps had an average noise level of 65.2 decibels while the lamps of this invention had an average noise level of 30.7 decibels. This is an improvement of 34.5 decibels for lamps of this invention. The frequency of the noise emitted by the lamps was in the range of 4,000 to 15,000 Hz.

The voltage waveform of a solid-state dimming circuit, FIG. 3, shows why such a circuit induces more noise in magnetic lead-in wires than does the usual AC voltage supply. In the latter, the voltage output is a sine wave in which the voltage rises gradually from zero to peak voltage. In the dimmer circuit, however, the leading edge of each sine wave is chopped off and the subsequent voltage rise is quite abrupt. This sudden voltage rise induces noisy physical vibrations in magnetic lead-in wires. This effect and the corresponding noise generally become more pronounced at lower dimmer voltages where the rate of voltage rise becomes more intense.

In a comparison in the same dimmer circuit of 120 volt, 200 watt, A23 incandescent lamps having prior art nickel wires with lamps having nonmagnetic lead-in wires (made of an alloy of 95.8% copper, 3.1% silicon and 1.1% manganese) the noise level was reduced from 62.1 decibels to 25.7 decibels.

Other examples of nonmagnetic lead-in wires may be used in this invention are those made of an alloy of 80% nickel 20% chromium.

We claim:

1. In an incandescent lamp for use with a solid-state dimmer of the type that can induce noisy physical vibrations in lamp magnetic lead-in wires, said lamp including a gas filled glass envelope sealed at its lower end to the flare of a stem press glass mount and a metal base attached to the lower end of the envelope, the improvement comprising two outer lead-in wires connected to said base and extending to said stem press where they are connected to intermediate wires embedded in said stem press where they are connected to intermediate wires embedded in said stem press; two inner lead-in wires connected to said intermediate wires and extending inwardly in said envelope, said inner and outer lead-in wires being made of nonmagnetic metal; and a coiled tungsten filament connected to and supported by said inner lead-in wires.

2. The lamp of claim 1 wherein said inner lead-in wires comprise an alloy of nickel and chromium.

3. The lamp of claim 1 wherein said inner lead-in wires comprise an alloy of copper, silicon and manganese.

4. The lamp of claim 1 wherein said inner lead-in wires comprise an alloy of copper and zirconium.

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