CIRCUIT FOR OPERATING MULTIFILAMENT INCANDESCENT LAMPS AT DIFFERENT INTENSITIES

Fig. 1

Fig. 2

<table>
<thead>
<tr>
<th>STEP</th>
<th>CONNECTION</th>
<th>RELATIVE % LIGHT FLUX</th>
<th>WATTS AT 115V</th>
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<tbody>
<tr>
<td>i</td>
<td>A</td>
<td>100</td>
<td>300</td>
</tr>
<tr>
<td>ii</td>
<td>A, B</td>
<td>55</td>
<td>235</td>
</tr>
<tr>
<td>iii</td>
<td>A, D</td>
<td>31</td>
<td>220</td>
</tr>
<tr>
<td>iv</td>
<td>A, D</td>
<td>15</td>
<td>190</td>
</tr>
<tr>
<td>v</td>
<td>A, C</td>
<td>4</td>
<td>80</td>
</tr>
<tr>
<td>vi</td>
<td>A, C, D</td>
<td>1</td>
<td>50</td>
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</table>

INVENTOR

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BY

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ATT '65
CIRCUIT FOR OPERATING MULTIFILAMENT INCANDESCENT LAMPS AT DIFFERENT INTENSITIES

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ABSTRACT OF THE DISCLOSURE

A multiple intensity fluorescent lamp having within one envelope three filaments, two in parallel and a third connectable alone or in series with one of the first two filaments, and a diode and multi-contact switch for connecting the filaments directly to power-terminals in at least three combinations and through the diode in at least two additional combinations. The filaments have different wattages and operate at different color temperatures, so that the lamp emits a 2.5 to 1 range of flux intensity steps which appear physiologically continuous to the human eye, and which change to a pleasing red color at the lowest intensity.

In some previous continuous dimming lamp systems various voltage control devices including series resistors, transformers, and wave shaping circuits have been used. Such systems are either bulky, inefficient or costly. In other systems which use multiple filament lamps in which the filaments are switched in different combinations, only three dimming steps are economically practical because of the cost of manufacturing lamps with more filaments.

The object of the present invention is to provide a multistep dimming lamp with an increased number of light flux intensities without increasing the number of filaments in the lamp or the complexity of the associated switching circuit.

According to the invention a multistep dimming lamp comprises an envelope, at least three leads entering said envelope, at least three incandescent filaments mounted within said envelope, each of said filaments being connected in a circuit between two of said leads, a support for the envelope including two power terminals, a diode and switch means having at least five positions for connecting said filaments between said power terminals in filament combinations and in additional combinations in series with said diode, said three filaments respectively having operating temperatures to provide in said six combinations at least six light flux intensities in a range of 25 to 1 and physiologically substantially continuous in said range.

For the purpose of illustration a typical embodiment of the invention is shown in the accompanying drawing in which:

FIG. 1 is a schematic drawing of a multifilament lamp and an associated switching circuit; and
FIG. 2 is a table showing the various combinations of connections of lamp filaments and the relative light flux intensities of the respective combinations.

As shown in FIG. 1 a multistep lamp system according to the invention comprises a lamp L and a switch S connected thereto. The lamp L comprises a conventional glass envelope 1 having a frosted inner surface 2 and four leads 3, 4, 5 and 6 entering the envelope at its base. One lead 3 provides a support for three filaments A, B and C. The three filaments are connected between the lead 3 and the remaining three leads 4, 5 and 6. The leads 3 to 6 inclusive are adapted to be connected to the switch S. The switch S may be in an adapter compatible with a standard candelabra socket or in any other support 7 having sockets 8 receiving the leads 3 to 6 and supporting the envelope 1. The support 7 includes two alternating current power terminals 1 and c. One of the power terminals c is connected through lead 6 directly to the filament A. The other power terminal a is connected to the switch S which comprises seven pairs of contacts i to vi and a pair of unconnected OFF contacts. The seven pairs of contacts are adapted to be bridged by a contactor 9. Between the contacts ii, iii is connected a diode D having a conventional half wave rectifying function. The negative (—) side of the diode D is also connected to contacts iv and vi. The contacts paired with the contacts just described are connected as follows: contacts i and iii are connected to lead 3; contacts ii and iv are connected to lead 4. As the contactor 9 is moved from the OFF position through the other six positions, i to vi, a plurality of combinations of the filaments and diode are connected in series between the power terminals as shown in FIG. 2.

The filaments are designed to produce, in the several combinations, a range of light flux intensities in which the brightest flux is at least approximately one hundred times that of the dimmest flux, the flux intensities changing in at least steps which are physiologically substantially continuous. As an example, filament A is specified to draw 300 watts at 100 volts AC, filament B is specified to draw 100 watts at 40 volts, and filament C is specified to draw 200 watts at 230 volts. Although filaments B and C are actually operated at 115 volts AC, their physical parameters are most reproducibly specified by the voltages given. With such filaments physiologically substantially continuous intensity steps are produced as shown in FIG. 2.

In step i, the brightest intensity, nominally 100 percent, is emitted by the single filament A at its rated 300 watts. In step ii filaments A and B in series draw 235 watts and emit 55 percent of the maximum flux. In step iii the diode D in series with filament A, by half wave rectification reduces the effective voltage across the filament to 70.7 percent and the emitted light flux to 31 percent. Further combinations with filaments B, C and the diode D step the flux down to 1 percent of maximum.

Besides having the highest voltage rating, filament A is designed for a relatively short life, for example 750 hours, as compared with life ratings substantially higher than 750 hours for filaments B and C. Further filament A is connected directly to one power terminal c so that it is always in series with one of the filaments B or C or the diode D. Consequently when filament A fails it renders filaments B and C, and hence the lamp as a whole, inoperative. Notwithstanding the apparent ineconomy of discarding a lamp with but one filament failed, many consumers find this more agreeable than operating a dimming lamp with one or more dimming steps lacking. In fact, the present lamp will fail at 750 hours only if operated always at the highest intensity. At the second brightest step ii its life is 4000 hours, and at lower steps the life is indefinitely long.

Accordingly the present dimming lamp has the advantage of always working over its full range. The range is substantially continuous yet varies appreciably from its highest to lowest intensities and changes its color pleasingly toward red in the lowest intensities.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claims. For example, a greater number of filaments and different combinations may be used without departing from the scope of the invention. Or three filaments may be connected in a well-known delta circuit, each filament having a com-
mon junction with another filament, in which case only three leads are required. Also a five-position switch may be used, for instance by omitting contacts vi, yet still providing a 25 to 1 range of physiologically continuous intensities.

1. A multistep dimming lamp comprising an envelope, at least three leads entering said envelope, at least three incandescent filaments mounted within said envelope, each of said filaments being connected in a circuit between two of said leads, a support for the envelope including two power terminals, a diode and switch means having at least five contacts, one to five, with connections to said leads, of which contacts three, consisting of one, two and five, connect said power terminals directly to said filaments in at least three combinations, and of which, two contacts, consisting of three and four, connect said power terminals through said diode to said filaments in at least two additional combinations, said three filaments respectively having different wattage ratings and corresponding operating temperatures in said combinations to provide at least five different light flux intensities in a range of 25 to 1.

2. A lamp according to claim 1 wherein one of said filaments has a substantial shorter life than the other filaments, and is connected in series with said filaments in all said combinations.

3. A lamp according to claim 2 wherein said one filament is connected through its lead directly to one of said power terminals.

4. A lamp according to claim 1 wherein the wattage ratings of said combinations decrease over said range whereby the color temperature decreases toward red.

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<thead>
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<th>Inventor(s)</th>
<th>Classification</th>
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<td>10/1955</td>
<td>France</td>
<td>315—64, 71, 272, 187</td>
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U.S. Cl. X.R.