VARIABLE COLOR ILLUMINATOR

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FIG. 1

FIG. 2

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VARIALE COLOR ILLUMINATOR

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This invention relates to variable color illuminating devices and, more particularly, to a new and improved device which is capable of providing an illumination having wide range of hue and intensity variations occurring at random. This application is a continuation of my copending application Serial No. 125,854, filed July 21, 1961, for "Variable Color Illuminator."

In general, the presently known variable color illuminating devices have required complex mechanical switching arrangements operating according to a predetermined program which, by virtue of its constant repetition, becomes tiresome to maintain the interest of an observer. Moreover, in most of the conventional variable color illuminating devices, each color light source is turned completely on or off at any given time so that the number of hues provided by the resulting illumination is restricted to that of each of the sources along with those of the combinations two or more sources operating at full intensity. Furthermore, with the on-off arrangement for each light source, the intensity of light provided by the illuminator varies in large steps over a range of three or four to one, depending on the number of light sources used, so that an observer is disturbed by the necessity for accommodating to the wide variations in intensity.

Accordingly, it is an object of the present invention to provide a new and improved variable color illuminator which overcomes the above-mentioned disadvantages of presently known illuminators.

Another object of the invention is to provide a new and improved variable color illuminator capable of producing an almost infinite number of different hues and intensities of illumination.

A further object of the invention is to provide an illuminator of the above character wherein the color variations occur at random and the intensity of illumination varies in relatively small steps.

An additional object of the invention is to provide a simple, compact and inexpensive variable color illuminating device.

These and other objects of the invention are attained by providing a plurality of electric light sources of different colors, electrical resistance means connected in series with each light source, and a plurality of thermal switch devices, each connected across a selected portion of the resistance means to shunt out the corresponding portion when the thermal device closes in response to the heat generated by the resistance means. Preferably, the total resistance of the resistance means is insufficient to cause the corresponding light source to operate at a threshold level and the various portions of each resistance means have different values which are selected to provide, separately and in combination, a series of light intensity levels which differ by uniform intensity steps.

Further objects and advantages of the invention will be apparent from a reading of the following description in conjunction with the accompanying drawings in which:

FIG. 1 is a perspective rear view, partly broken away, illustrating a typical variable color illuminator arranged according to the invention, and

FIG. 2 is a schematic circuit diagram showing the electrical circuit of the present invention.

In the representative embodiment of the invention shown in the drawings, a variable color illuminator 10 comprises a reflector housing 11 supported on a stand 12 wherein three electric lamps 13, 14, and 15 are mounted in sockets in the usual manner. The three lamps each provide a different color of light such as red, green, and blue and, to this end, they may be covered with corresponding filters 13a, 14a, and 15a (FIG. 2). At the rear of the housing 11 an insulating board is supported within an enclosure 17 and, mounted on the insulating board, are three heat generating resistors 18, 19, and 20 which may be made, for example, of helically wound lengths or resistance wire such as nichrome. Mounted above and closely adjacent to the resistor 18 are three normally open bimetallic thermal switches 21a, 22a, and 23a which are connected in shunt with selected portions of the resistor, corresponding portions of the resistors 19 and 20 being shunted by similar thermal switches 21b, 22b, 23b and 21c, 22c, 23c.

An electrical cable 24 supplies power to the illuminator and, as best seen in FIG. 2, one conductor 25 of the cable is connected to one terminal of each of the three lamps 13, 14, and 15 while the other conductor 26 is connected to the other terminals of the lamps through the resistors 18, 19, and 20, respectively. Preferably, the three portions or elements of each resistor, which are indicated in FIG. 2 by primed, double-primed, and triple-primed reference numerals, are provided by locating taps at selected positions along a single resistor, but, if desired, they may be separate resistors having the desired values of resistance.

In order to permit a rapid response to operation of the thermal switches and to generate sufficient heat to effect dependable actuation of the switches, the total value of resistance connected in series with each of the lamps is selected to maintain the lamps at a threshold operating level without producing any appreciable light intensity when all of the corresponding thermal switches are open. It will be understood that, with incandescent lamps, the total resistance required to accomplish this will, in general, be different for the different colored lamps because of the non-uniform spectral distribution of the light from such lamps. Furthermore, the values of resistance for the three elements of each resistor are selected so that the light intensity levels produced by connecting various combinations of the elements in series with the lamp differ by uniform intensity steps.

In a particular example utilizing three 75 watt lamps and a 120 volt power source, the lamp 13 projected red light and the resistor 18 had a total resistance of 245 ohms so as to provide threshold operation with the three thermal switches open. In this case, the three elements 18', 18", and 18'" had resistance values of 35, 70, and 140 ohms, respectively. The total resistance in series with the green lamp 14 was 210 ohms, divided into portions of 30, 60, and 120 ohms, while the blue lamp 15...
required 25, 50, and 100 ohm resistance elements. With these arrangements, seven uniform resistance steps are provided for each lamp by selective closing of the appropriate switches. For example, the lowest resistance of the lamps to changes in current so as to produce uniform light intensity steps.

Preferably, the cycles of operation of the thermal switches for each resistor are arranged so that the large intensity variations take place less frequently than the smaller intensity variations. To this end, the thermal switch cycles are made progressively longer for larger values of resistance. This can be accomplished by locating the switches closer to or farther from the resistor and adjusting the spacing between the thermal element and its contact or by using thermal elements having different characteristics. Particularly pleasing effects are obtained when the time cycles for the switches shunting the smallest resistance elements are of the order of about ten seconds and the cycles of the switches shunting the largest resistance elements are of the order of one minute, each switch being closed for about one-half its cycle. Other time relationships, of course, be provided according to the intended use of the illuminator.

If the enclosure 17 for the resistors is completely closed so that no air drafts can reach the resistors, the cycles of operation of the various switches will, after an initial warm-up period, remain substantially constant. In this case, the housing 11 and enclosure 17 are preferably made of metal to conduct the heat of the resistors away from the enclosure. If desired, however, the enclosure 17 may be provided with small ventilating louvers so that air drafts passing through the enclosure can produce interesting variations in the switching cycle times.

In operation, electrical power is applied to the lamps 13, 14, and 15 through the cable 23 and the resistors 18, 19, and 20 respectively, initially causing each lamp to operate at a threshold level of illumination. Heat transmitted from the various portions of the resistors causes the thermal switches to close more or less at random, shorting out the corresponding resistance elements. When each thermal switch has cooled sufficiently, it opens to start the cycle again. This produces a random variation in the intensity of the light from the lamp among several levels separated by uniform steps. In the illustrated example each lamp, having three thermal switches, provides eight different intensity levels.

Inasmuch as the hue of a color produced by mixing two different colored lights depends on the relative intensities of the lights, it will be apparent that any two of the lamps 13, 14, and 15 can provide 64 different types of illumination of varying intensity and including a wide range of different hues while, with all three lamps operating, over 500 different types of hue and intensity combinations can be produced. Obviously, by adding another colored lamp or an additional thermal switch for each lamp, the number of possible hue and intensity variations can be increased even further.

From the foregoing it will be readily apparent that the color illuminator of the present invention also possesses a number of distinct advantages in that it provides a continuously varying pattern of color and intensity changes. At the same time, the illuminator is simple and inexpensive in structure and operation.

Although the invention has been described herein with reference to a specific embodiment, many modifications therein will readily occur to those skilled in the art. Accordingly, all such variations and modifications are included within the intended scope of the invention as defined by the following claims.

1. A variable color illuminator comprising a plurality of different colored electric light sources, resistance means connected in series with each light source, each of said resistance means comprising a plurality of heat producing resistance elements, and a plurality of normally open thermal switch means each disposed in close proximity to and connected across a corresponding resistance element, each of said switch means having a thermal response characteristic in conjunction with the resistance generated by the corresponding resistance element which differs from the thermal response characteristic of the other switch means associated with the same resistance means so that said switch means will close at random time intervals in direct response to heat generated by the element.

2. A variable color illuminator according to claim 1 wherein the value of each resistance means is equal to the resistance required to provide threshold operation for the corresponding light source.

3. A variable color illuminator according to claim 1 wherein the values of the resistance elements in each resistance means are selected to provide a plurality of light intensity levels which are separated by substantially uniform intensity steps.

4. A variable color illuminator according to claim 3 wherein the cycle times for the thermal switch means connected across the larger value resistance elements are greater than those for the thermal switch means connected across the smaller value resistance elements.

5. In a variable color illuminator including a plurality of socket means for receiving different colored light sources, the combination of resistance means connected in series with each socket means, each of said resistance means comprising a plurality of heat producing resistance elements, and a plurality of normally open thermal switch means, each located closely adjacent to and connected across a corresponding resistance element, each of said switch means having a thermal response characteristic in conjunction with the heat generated by the corresponding resistance element which differs from the thermal response characteristic of the other switch means associated with the same resistance means so that said switch means will close at random time intervals in direct response to heat generated by the element.

6. A variable color illuminator comprising a housing including a reflector portion and an enclosure portion, a plurality of different colored electric light sources movably mounted in the reflector portion, insulating board means mounted in the enclosure portion, a plurality of heat generating resistance means mounted on the insulating board means each connected to one of the light sources, each of said resistance means comprising a plurality of heat producing resistance elements having different values of resistance, and a plurality of normally open thermal switch means each disposed in close proximity to and connected across a corresponding resistance element, each of said switch means having a thermal response characteristic in conjunction with the heat generated by the corresponding resistance element which differs from the thermal response characteristic of the other switch means associated with the same resistance means so that said switch means will close at random time intervals in direct response to heat generated by the resistance element.

7. A variable color illuminator according to claim 6 wherein each resistance means comprises a helically wound length of resistance wire having taps connected at selected points to divide it into resistance elements.

8. A variable color illuminator according to claim 6 wherein the enclosure is imperforate to prevent air circulation through it.
trolling an electric light source comprising resistance means connected in series with said light source, said resistance means comprising a plurality of heat producing resistance elements, and a plurality of normally open thermal switch means each disposed in close proximity to and connected across a corresponding resistance element, each of said switch means having a thermal response characteristic in conjunction with the heat generated by the corresponding resistance element which differs from the thermal response characteristic of the other switch means associated with the same resistance means so that said switch means will close at random time intervals in direct response to heat generated by the element.

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