ELECTRONIC SOUND RESPONSIVE LIGHTING SYSTEM AND CONTROL

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ABSTRACT

Lighting system having one or more illuminated panels, and an electronic control adapted to vary the intensity, and the sequence or arrangement of illumination of the panel. Each panel includes a plurality of individual light bulbs interconnected in a predetermined pattern. The electronic control provides for variations in the sequence or arrangement of illumination of the individual light bulbs, as well as variations in the intensity of their illumination, all in accordance with the input. The input may selectively be either manual or electronic.

6 Claims, 10 Drawing Figures
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ELECTRONIC SOUND RESPONSIVE LIGHTING SYSTEM AND CONTROL

BACKGROUND OF THE INVENTION

This invention relates to a lighting system and an electronic control arranged to provide unusual, decorative and entertaining lighting effects. The invention finds great and particular utility in connection with nightclubs and the like to achieve a "psychadelic" effect.

The work "psychadelic" has no precise definition at this time; hence, its use to describe the effect produced by this invention is particularly apt, because these effects are literally beyond description. The invention produces a constantly variable, nonrepetitive, ever changing array of lights and color in an effect which can only be described as "psychadelic."

In the operation of nightclubs or facilities directed to the younger generation, a drawings card of some sort is of great commercial importance. To be effective, this drawing card must appeal to the generation which makes up the establishment's clientele. As already indicated, this invention produces a most unusual lighting effect which has been found in fact to have a very strong appeal to the youth of today.

Facilities of the type here under consideration generally include music (usually loud) and one aspect of this invention is to enable the coupling of the "psychadelic" lighting effect to the rhythm and tones of the music. The effect is therefore unusual, decorative, entertaining, and highly appealing to the youth of today.

SUMMARY OF THE INVENTION

The lighting system of this invention, broadly considered, contemplates the provision of one or more illuminated panels incorporated in the interior of the establishment in question. Each of these panels includes a plurality of individual light bulbs which are interconnected electrically into discrete groups.

The electronic control for the illuminated panels includes one set of circuits adapted to control the sequence or arrangement of illumination of the discrete groups noted above. It also includes a second group of electronic circuits arranged to vary the intensity of the illuminated bulbs.

Each of the sets of circuits described above may receive its input pulses from a manually actuated control, or may receive pulses from still another electronic circuit arranged to control the lighting sequence circuits and the intensity control circuits in response to changes in the rhythm and/or tone of audio signals.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram illustrating the lighting sequence circuits and the intensity control circuits.

FIG. 2 is a schematic wiring diagram of a portion of one illuminated panel according to this invention.

FIG. 3 is a schematic wiring diagram of the power relay circuit.

FIG. 4 is a schematic wiring diagram of the power relay trigger circuit and a portion of the sequence control circuit.

FIG. 5 is a schematic wiring diagram of the remainder of the sequence control circuit, including the switch.

FIG. 6 is a schematic wiring diagram of the dimmer control selector circuit including the switch.

FIG. 7 is a schematic wiring diagram of the automatic dimmer control circuit.

FIG. 8 is a schematic wiring diagram of the remote control on/off circuit and switch.

FIG. 9 is a front plan view of an illuminated panel according to this invention showing one acceptable form of construction.

FIG. 10 is a cross-sectional view along the line 10--10 of FIG. 8.

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DESCRIPTION OF THE PREFERRED EMBODIMENT

The invention contemplates the provision of one or more illuminated panels. As will be explained in more detail hereinafter, each of these panels includes a large number of individual light bulbs arranged behind a translucent surface. The individual bulbs are electrically interconnected into a plurality of discrete groups. One particular wiring arrangement will be described hereinafter.

In a typical nightclub or the like, one such illuminated panel may be utilized as a portion of, for example, the backwall of the establishment, a second panel may be used as a portion of the ceiling, while the third panel might be used as a dance floor. It will of course be understood that the precise location or the number of such illuminated panels may be varied to suit the particular establishment and/or tastes of its owners.

Each of the illuminated panels will be connected to a number of lighting sequence circuits. These circuits will be explained in more detail hereinafter, but for present purposes, it is sufficient to state that these circuits electronically determine which of the discrete groups of bulbs in any given illuminated panel will be lighted.

Each of the illuminated panels is also connected to the intensity control circuits, which will also be explained in more detail hereinafter. Again, for present purposes, these circuits vary the intensity of the illuminated bulbs.

Finally, each of the illuminated panels is connected individually to the remote control circuit. The function of these circuits, obviously, is to determine which, if any, of the illuminated panels will be operative at any given time.

In the typical installation, it will be apparent that all of the electronic circuitry briefly outlined above will be connected to a control console, from which the entire operation of the system will be controlled.

FIG. 1 shows the components of the lighting sequence circuits and intensity control circuits, along with the preferred inputs to these circuits as associated with a single illuminated panel. The illuminated panel, for purposes of discussion, has been divided into nine discrete groups of bulbs designated at the right-hand portion of this Figure as group A through group I.

The lighting sequence circuits, in the embodiment illustrated, include the three power relays, the associated trigger circuits, and the sequence control. These components, when operative, determine the sequence in which the discrete groups of bulbs will be illuminated.

The intensity control circuit include the three dimmers and the associated dimmer control selectors. These components control the intensity illumination of those bulbs which are energized by the lighting sequence circuits.

In the embodiment shown, the input to both the lighting sequence circuits and the intensity control circuits may be either manual or automatic. Also, in this embodiment, the automatic input is shown to include an audio input, and audio dividing circuit which is effective to receive audio signals, divide the audio signals into four distinct frequency ranges, and to produce an output in response to an audio signal in each of those ranges. One of these outputs will provide automatic sequencing, and the other three outputs will energize the automatic dimmer control circuits.

Turning now to FIGS. 2 through 8, schematic wiring diagrams of one embodiment of the invention will be described in detail.

FIG. 2 is a schematic wiring diagram for a portion of one illuminated panel. This portion includes 36 light bulbs arranged in 6 vertical rows of 6 bulbs each. These 6 vertical rows have been designated A, B, C, A, B, C.

It will also be noted that the top bulb in each vertical column is green, the next one blue, the next red, then green, blue, red again.

It will be seen in the wiring diagram that the two green bulbs in each of the vertical rows A are wired together; similarly, the two blue bulbs in each of the rows A are wired together, and
the two red bulbs in each of the rows A are wired together. The same arrangement holds true for the vertical rows B and the vertical C. Thus, the panel of 36 bulbs just described has, by the electrical wiring, been divided into 9 discrete groups. These groups are designated at the lower left-hand side of FIG. 2 as green A, blue A, red A, etc. It will of course be understood that any desired arrangement may be utilized, and for present purposes the designations green A, blue A, red A, etc., correspond to the designations in FIG. 1 of group A, group B, group C, etc.

FIG. 3 illustrates schematically the wiring of one of the power relays seen in FIG. 1. The leads at the right-hand edge of this Figure designated red A, red B and red C will of course be connected to three of the nine groups of bulbs shown in FIG. 2. Each of the groups of bulbs will be series wired to a source of 17-volt AC current 10, a dimmer 11, and the two pairs of normally open contacts 12a-12b and 13a-13b; 14a-14b and 15a-15b; or 16a-16b and 17a-17b. The coil 18 operates in unison with the contacts 13, 15, and 17, while the coils 19, 20, and 21 individually actuate the contacts 12, 14, and 16, respectively. Thus, when the contacts 13, 15 and 17 are closed, illumination of the three groups of bulbs will be controlled by the three relay coils 19, 20, and 21. On the other hand, when the contacts 13, 15, and 17 are open, none of these groups of bulbs will be illuminated regardless of the action of the relays 19, 20, and 21.

It will be seen that one terminal of the relay coil 19, 20, and 21 is connected to negative source of DC voltage from a suitable power supply. In the respective drawings, the designation "H" and "L" have been used in accordance with conventional techniques to designate a source of direct current from a power supply. This lead 22 from a source of negative DC voltage is also applied to one terminal of the relay coil 18. The other terminal of the coil 18 receives its current from the remote control on/off circuit shown in FIG. 8 and described in more detail hereinafter. The leads 23, 24, and 25 to the other terminals respectively of the coils 19, 20, and 21 will be connected respectively to the leads 26, 27, and 28 of the trigger circuit shown in FIG. 4. Assuming that the on/off circuit is on, and the coil 18 is energized to close the contacts 12a-13b; 15a-15b; and 17a-17b, it will be apparent that a pulse from the trigger circuit to, for example, the lead 23 will energize coil 19 and close normally open contacts 12a-12b, thereby illuminating the group of bulbs designated "Red C."

The trigger circuit includes the rotary sequencing relay 31 and the three normally open relays 32, 33, and 34.

Direct current from the power supplied to the circuit as the leads 29 and 30. The positive supply 29 will be connected to the central contact 31a of the rotary relay 31, and to the central contacts 32a, 33a, and 34a of the three normally open relays. The negative supply 30 will be connected to one end of the relay coils 32c, 33c, and 34c. The other end of the relay coils 32c, 33c, and 34c will be connected respectively to the three outside terminals 31b, 31c, and 31d of the rotary sequencing relay. The output terminals 32b, 33b, and 34b respectively of the normally open relays are connected directly to the leads 29, 27, and 26.

Thus, as the relay 31 advances sequentially from the terminal 31b to 31c and to 31d, it will be effective to close in succession the normally open relays 32, 33, and 34, thereby delivering a positive DC pulse to one of the leads of the power relay circuit shown in FIG. 3.

The sequence control circuit is shown in the left-hand portion of FIG. 4. It includes the relay 35 having the central contacts 35a and 35b, and the output contacts 35f, and the relay 36 having the central contacts 36a and 36b, the normally closed contacts 36c and 36d, and the normally open contacts 36e and 36f. With the relays in the position shown in FIG. 4, it will be seen that an AC current delivered via the leads 37 and 38 will be effective to energize the coil 31e of relay 31, thereby advancing the sequencing relay. As will be explained hereinafter, the input to the leads 37 and 38 is by a manually controlled switch.

Energization of the relay coil 36g will open the contacts 36a-36e and 36b-36d, and close the contacts 36a-36c and 36b-36c. In this position, it will be apparent that current delivered via the leads 37 and 38 will be ineffective to energize the sequencing relay coil 31e. It will also be apparent that in this position, current from the supply lines 39 and 40 will be delivered to the sequencing relay coil 31e upon the closing of normally open relay 35. Alternating current from the automatic sequence circuits will be delivered to the leads 41 and 42 which are connected across the half-wave rectifier 43 to energize the coil 35c of the relay 35 in response to pulses received from the automatic sequence circuit.

Thus, in summary, it will be seen that depending upon the setting of the relay 36, the sequencing can be accomplished by pulses delivered from a manual switch to the lines 37 and 38, or in response to signals from the automatic sequencing circuits delivered to the lines 41 and 42.

FIG. 5 is a schematic diagram of the manual sequence switch and a portion of the sequence control circuit.

A momentary contact type single-pole double-throw switch is indicated generally at 46. Depressing the right-hand portion of the switch 46 will close the normally open contacts 47, 48 permitting a flow of positive DC current to one terminal of the relay coil 50a. The other terminal of this coil is normally connected to a negative supply of DC current. Upon depressing this portion of the switch 46, the relay coil 50a will be energized, breaking the normally closed contacts 50b-50c, and closing the normally open contacts 50d-50e and 50f-50g. The closing of these last two pairs of contacts will permit current from the input leads 51, 52 to flow to the output leads 53 and 54 connected respectively to the leads 37, 38 shown in FIG. 4. This flow of current will, as explained earlier, energize the sequence relay coil 31e. Release of the right-hand portion of the switch 46 with deenergize the relay coil 50a, open the contacts 50d-50e and 50f-50g, interrupting the supply of current to the sequence relay coil 31e. Each time the right-hand end of the manual switch 46 is depressed, a pulse of current will be delivered to the sequencing relay coil, advancing the relay as explained before.

Depressing the left-hand portion of the switch 46 will be effective to close the normally open contacts 56-57, thereby supplying a pulse of positive direct current to one terminal of the relay coil 58a. Since the other end of the coil 58a is normally connected to a negative source of DC current, the coil will be energized, opening the normally closed contacts 58b-58d and 58e-58f. The closing of the contacts 58e-58f in effect lock the relay. That is, it will be observed that the wire 59 connects the contact 58e with the upper terminal of the relay coil 58c. The contact 58f is connected by the lead 60 to the contact 50b and through the normally closed contact 50c with the supply of the positive direct current. Therefore, the relay 58 is locked in position even though the contacts 56 and 57 are closed only momentarily. The closing of the contacts 58b-58d is effective to deliver positive voltage DC current from the supply 61, across these terminals, and to the output lead 62 which will be connected with the lead 44 to relay coil 36g seen in FIG. 4. This will activate the relay 36, so that the energization of the sequencing relay coil 31e occurs only upon closing of the relay 35 in response to signals from the automatic sequencing circuits.

It will be apparent that when the contacts are closed, the indicator lamp 55 will be energized; closing the switch contacts 56-57 will open contacts 58b-58e (turning off the lamp 55) and energize the indicating lamp 63.

FIG. 6 shows schematically the dimmer control selector circuit and switch. The switch 64 seen at the left-hand portion of FIG. 6 is identical to the switch 46 described earlier. That is, depressing the left-hand portion of the switch will close the normally open contacts 65-66, lighting the indicator light 67, and energizing relay coil 68a. This will open normally closed contacts 69a-68c and closed normally open contacts 68b-68d and 68e-68f. Closing of the contacts 68c-68f again electri-
cally locks the relay to the supply of positive DC voltage through the normally closed contacts 69a-69b.

Closing the contacts 68b-68d will also energize relay coil 70a, thereby opening contact 70b-70c and 70d-70e, and closing contacts 70f-70g and 70d-70g. In this position, an input to the leads 71 and 72 from the automatic dimmer control shown in Fig. 7 will go the dimmer 11. (See Fig. 3.)

Depressing the right-hand side of the switch 64 will close the normally open contacts 73-74, thereby energizing relay coil 69c, opening the normally closed contacts 69a-69b. The opening of these contacts will electrically unlock the relay 68, and opening of the contacts 68b-68d will deenergize the relay coil 70f, returning the contacts 70f-70g and 70d-70g to their normally closed position. In this position, it will be seen that an input from the manual dimmer control 75 will, through the contacts 70b-70c and 70e go directly to the dimmer 11.

It will also be observed that closing the contacts 68b-68c in the switch 64 is effective to light the indicator lamp 76.

Thus, depending upon the setting of switch 64, the dimmer 11 will receive its control signal from either the manual dimmer control 75, or from the automatic dimmer control shown in Fig. 7.

Turning now to Fig. 7, the components of the automatic dimmer control have been schematically illustrated. In this particular case, the input to the automatic dimmer control circuit includes an audio input 77 and a supply of 117-volt AC current 78. These inputs go to the audio dividing circuit 79. This circuit does not form a part of this invention, and hence will not be described in detail herein. A commercially available unit under the designation CV 1200, manufactured and sold by B & B Electric Co. has been successfully used. The audio dividing circuit performs several functions. First of all, it divides audio signals into four discrete frequency ranges. It then produces a variable DC output in response to an audio signal within any given frequency range. The strength of the DC output, of course, depends upon the intensity of the audio signal.

It will be seen that there are five leads coming out of the audio dividing circuit 79. One of these is the common or electrically neutral lead 80 which is connected to one terminal on each of the four rectifiers 81, 82, 83, and 84. The remaining leads 85, 86, 87, and 88 carry the variable DC output in response to an audio signal in each of the four distinct frequency ranges. The lead 85 is connected to the opposite terminal of the rectifier 82, while the leads 86, 87, and 88 are connected respectively to the opposite terminals of the rectifiers 83, 84 and 85.

The half wave DC output of the rectifiers 82, 83, and 84 go respectively to the dimmer control selector shown in Fig. 6; specifically, the output of the rectifier 84 goes to the leads 71, 72, shown in Fig. 7. It will of course be understood that similar circuitry will be provided for the output of the rectifiers 82 and 83.

The output of the rectifier 81, in the embodiment shown, is connected to the leads 41 and 42 shown in Fig. 4. It will be recalled that an input to these leads was effective to energize the sequencing relay coil 31e when the relay 31e was energized by the sequence control circuit shown in Fig. 5.

FIG. 8 shows the remote control on/off switch and circuit schematically illustrated in FIG. 1. This circuit includes the single-pole single-throw switch indicated generally at 85. When in the position shown, there will be no current in the output lead 86. This lead will be connected to the lead 87 (see FIG. 3) connected to one terminal of the relay coil 18. Since there is no current, the relay coil 18 will not be energized, and the contacts 13a-13b, 15a-15b, and 17a-17b will be open.

Thus, the groups of lights (red A, red B, and red C) cannot be illuminated.

Pressing the left-hand portion of the switch 85 will close the normally open contacts 88-89, thereby energizing relay coil 90a and closing the normally open contact 90b-90e and 90d-90f. This will deliver positive DC voltage to the lead 86, and via the lead 87 will energize relay coil 18, closing the normally open contacts and permitting operation of the various lights as described before.

Turning finally to Figs. 9 and 10 one form for construction of the illuminated panels of the lighting system of this invention has been illustrated. It includes a peripheral framing members 100, 101, 102, and 103, and a plurality of spaced-apart crosspieces 104. It will be apparent that when the illuminated panel under consideration is intended for use in a wall, the various members just described can be relatively thin, while if the illuminated panel is intended for use as a dance floor, these members must be of relatively heavy construction.

Intermediate and parallel to the crosspieces 104 are ducts or tubes 105 which mount the light bulb sockets. It will of course be apparent that the necessary wiring can pass through these ducts and into the quarter-round wire ducts 106 shown at the bottom of the panel.

The entire front of the illuminated panel will be covered with a translucent material 107. Experience has shown that ¾-inch milky milkplex glass is satisfactory for use in wall panels, while a heavier panel, such as ½-inch milky milkplex glass is necessary for utilizing the panel as a dance floor. Various other translucent materials may of course be used to cover the front of the illuminated panel.

It is believed that the foregoing constitutes a full and complete disclosure of one embodiment of this invention. Numerous modifications and variations may be made without departing from its scope and spirit.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An electronic lighting system comprising:
a. an illuminated panel having a plurality of bulbs;
b. means dividing said bulbs into a plurality of discrete groups;
c. means for receiving audio signals;
d. means for dividing said audio signals into at least two frequency ranges;
e. means operatively associated with each said frequency range for producing an electrical output in response to an audio signal within said frequency range;
f. first circuit means operatively associated with a supply of electric current and with at least two of said groups of bulbs, and effective to deliver said current to any one of said groups of bulbs; and
g. second circuit means operatively associated with one of said means for producing an electrical output and with said first circuit means, said second circuit means being effective to actuate said first circuit means to sequentially illuminate said groups of bulbs associated therewith in response to an audio signal in said one frequency range.

2. The lighting system claimed in claim 1 wherein intensity control circuit means operatively associated with said supply and said groups of bulbs, and means for actuating said intensity control circuit means.

3. The lighting system claimed in claim 2 wherein said intensity control circuit means is connected in series with said supply, said bulbs, and said first circuit means.

4. The lightening system claimed in claim 2 wherein said means for actuating said intensity control circuit means comprises a manually adjustable resistance means.

5. The lighting system claimed in claim 1 wherein said first circuit means includes a relay for each said group of bulbs associated therewith, wherein said second circuit means includes a sequential relay having successively operative connections to each said relay of said first circuit means; and wherein said means for producing an electrical output is effective to energize said sequential relay.

6. The lighting system claimed in claim 2, wherein said means for producing an electrical output in response to an audio signal is effective to produce an electrical output varying with the volume of the audio signal, said variable electrical output being effective via said intensity control circuit means to control said supply of current to said groups of bulbs.