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LIGHTING_SCENE_CONTROL_SYSTEM

This invention relates to lighting scene controls.

5 Lighting control systems are known wherein groups of lights within a room can be individually dimmed by different relative amounts and, upon the pressing of an appropriate switch, one of a plurality of dimming scenes which is preset can be automatically
10 selected. Past arrangements to obtain this result frequently employ rotary potentiometers, with all dimming equipment and control equipment contained at the same location. This location frequently was removed from the area being lighted so that adjustment
15 of the various lights in the area for different scenes was complicated. Moreover, in prior art arrangements it was difficult to determine the relative adjustment of potentiometers of given groups of controls which define respective single lighting scenes relative to
20 one another.

It is also known in the prior art to provide fade circuit means to control the fading of the light from one adjustment level to another as the lighting

scene is changed. Each fade control circuit had a respective fade rate adjustment which required individual adjustment. These adjustments did not account for desirable changes in fade speed, depending on the portion of the fade rate range being used.

According to the present invention there is provided a lighting scene control system comprising: a plurality of groups of potentiometer controls, each of said groups mounted within a distinct respective area of a control panel, each of said groups including a plurality of individual linearly movable potentiometer adjustment members; each of said groups being physically spaced from one another and being spatially distinct from one another; a plurality of dimmer control circuit means; a plurality of output light means; said plurality of dimmer control circuit means connected to respective ones of said plurality of output light means and being operable to dim the output of their respective output light means; corresponding ones of said individual movable adjustment members of each of said groups being connectable to corresponding ones of said dimmer control circuit means; the output of each of said plurality of output light means being dependent upon the linear position of said adjustment member of said respective potentiometer connected to its respective dimmer control circuit means; a plurality of switch means mounted on said control panel corresponding in number to the number of said groups; each of said switch means operatively connected between said plurality of dimmer control circuit means and respective ones of said potentiometers of said respective groups, each of said switch means being associated with a respective one of said groups and being operable such that the potentiometers of only its respective group is connected to control respective ones of said output light means independently of all other potentiometers of said other groups, the potentiometers of the other groups being disconnected from operative

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control of said output light means; whereby each of said
adjustment members of each of said groups is setttable to
a given position such that a different pattern of light
dimming for each of said output light means can be
5 provided in response to operation of a selected one of
said switche means.

One embodiment of the invention provides a
control system and control panel where each lighting
scene for a given set of light fixtures is controlled
10 by a corresponding group of a plurality of linearly
adjustable slide potentiometer controls which are
arranged parallel to one another and move coexten-
sively with one another. Push-button switching means
is provided to select a particular preset group of
15 potentiometer controls which control the dimming level
of the lighting fixtures. The dimmer control
circuitry may be located remotely of the control panel
so that the relatively bulky control circuit can be
contained in a suitable remotely positioned electrical
20 cabinet while the control panel can be located con-
veniently in the room being controlled or illuminated.

Each of the potentiometer sliders carries
a respective viewable LED or other suitable light
source wherein only the LEDs of the sliders which have
25 been switched to control the lighting fixtures are
illuminated, thus indicating which group is
controlling the scene and further indicating the
relative adjustment of the various potentiometers
within the group relative to one another. The control
30 panel is enclosed by either an opaque cover or a
translucent cover which makes visible only the
illuminated LEDs.

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While the LEDs are preferably on the slider, other arrangements are possible to indicate the adjustment level of the potentiometer. For example, circuitry may be provided for a stationary LED associated with a potentiometer to control the output light intensity, flash frequency, color or the like as a function of potentiometer position.

If desired, such LEDs can be fixed to any movable adjustment member, including a rotary potentiometer knob or shaft, to visually indicate the selection of the potentiometer for a control function and the setting of the potentiometer. The LED in this case can also be stationarily mounted relative to the rotary or other adjustment member and can indicate selection and/or adjustment position of the adjustment member by control of light intensity, flash frequency, color or the like.

As a further feature of the invention, a fade circuit is provided for each of the remotely located dimmer controls and a novel common adjustment potentiometer is made available for each of the fade circuits, which common adjustment potentiometer is located in the control panel. The push-button switches which are used to select a desired scene operate in conjunction with magnetic latching relays which activate the appropriate group of control potentiometers. Also provided are diode steering logic circuits which steer the appropriate potentiometer outputs to the fader inputs associated with each circuit being individually controlled.

The use of linear potentiometers as the adjustment potentiometer enables logical physical grouping of a relatively large number of lighting zones or of individually controlled light fixtures in a relatively small control panel area. The linear controls

will occupy considerably less area than even miniature rotary potentiometers which require relatively large knobs to enable easy, accurate adjustment with observation of the position of the control.

5 A transconductance amplifier fader circuit is also employed to allow the fading function to be implemented with relatively few parts compared to standard fader circuits. The use of a single fader rate adjustment potentiometer for the multiple faders further reduces
10 space requirements and simplifies setup times since only one fader adjustment must be made rather than one for each channel.

The fader rate adjustment is designed to have a logarithmic response of fade rate versus adjustment
15 potentiometer rotation angle so that ease of adjustment to desired rates is preserved over the entire adjustment range. A fade bypass circuit is also included to eliminate the fade functions upon initial turn-on of the system from a full off condition so that the user
20 does not have to wait for lights to fade up slowly from a zero output.

The invention will be described now by way of example only with particular reference to the accompanying drawings. In the drawings: Figure 1 is an elevation view of the front
panel cover of a control system of the present invention.

25 Figure 2 shows the panel of Figure 1 opened to expose the front control panel.

Figure 3 is a plan view of a room which employs the novel system of the invention.

Figure 4 is a circuit diagram of the present
30 invention.

DETAILED DESCRIPTION OF THE DRAWINGS

Referring first to Figures 1 and 2, the control panel illustrated has an internal panel 20
(Figure 2) which contains four groups 21, 22, 23 and 24
35 of linear potentiometers. Each potentiometer has a

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slider control which extends through slots in the panel 20 so that the sliders can be manually moved up and down in Figure 2. The protruding ends of the sliders are seen in Figure 2 as illuminated end regions 21a through 21f which carry and are illuminated by respective LEDs. Similar slider handles which also contain LEDs which may be illuminated extend through the panel for each of groups 22, 23 and 24. Note in Figure 1 that only LEDs 21a through 21f are illuminated.

10 Next contained in the panel 20 are a plurality of touch-button switches 25, 26, 27 and 28, each of which is operable to activate a respective one of groups 21, 22, 23 and 24, respectively. A further touch button 29 is provided which is operable to turn
15 off the entire system upon its depression. Four LEDs 30, 31, 32 and 33 are associated with touch buttons 25, 26, 27 and 28, respectively and are illuminated when their respective touch button is pressed in order to cause their respective group 21, 22, 23 or 24 to assume
20 scene control, as will be later described.

A panel cover 40 is hinged to control panel 20 and contains a smoked translucent window 41 and a slot 42 therein. When the cover 40 is closed, the touch buttons 25, 26, 27 and 28 and their respective
25 pilot LEDs 30, 31, 32 and 33 are exposed through slot 42. The smoked translucent window 41, however, covers the potentiometer sliders of groups 21, 22, 23 and 24. Thus, as schematically shown in Figure 1, if touch button 25 is depressed to activate the potentiometers
30 of group 21, the LEDs 21a through 21f are visible through the smoked window 41. Thus, one can visually observe, first from the illumination of LED 30 and, second, from the illumination of the LEDs 21 through 21f, that the lighting scene is being controlled by
35 group 21. One can also observe the relative adjustment of the various channels or the relative dimming adjustment of the individually controlled fixtures of the

scene relative to one another by observing the position of the LEDs 21a through 21f relative to one another.

If desired, a hidden security latch, including latch members 50 and 52 in Figure 2, can be provided to hold latch cover 40 closed and deter unauthorized tampering with preset lighting scenes.

Figure 3 illustrates the manner in which the novel system of the invention can be applied, for example, to a restaurant. The restaurant of Figure 3 contains a lobby 60 and main dining room 61. Within the main dining room there may be a reception stand 62, a bar area 63 and a remote electrical enclosure or closet 64. The lighting within the restaurant room 61 may include the following four different types of lights, hereinafter referred to as "zones" or "channels" or "groups":

- (A) chandeliers
- (B) low voltage down lights
- (C) incandescent wall wash
- (D) fluorescent cove lights

Each of the above lighting zones should be adjusted differently at different times during the day. For example, different settings should be made for breakfast, lunch, dinner or cocktails. These desired adjustment might be according to the following table:

Scene	Restaurant Function	A	Zone B	C	D
1	Breakfast	70%	80%	60%	90%
2	Luncheon	40%	70%	80%	90%
3	Dinner	20%	40%	40%	60%
4	Cocktails	10%	20%	20%	40%

The control panel of the type shown in Figures 1 and 2 can be employed to preset these adjustments.

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More specifically, each of the lighting fixture groups A, B, C and D is controlled from circuitry contained in a relatively large dimming panel schematically shown as panel 65 which is contained in a remote electrical closet 64. The control panels of Figures 1 and 2, however, are conveniently located at region 20 in the bar area 63. A remote lighting scene activator serving the function only of switches 25 through 29 of Figures 1 and 2 can be located at the reception area 62. If desired, manual potentiometer or other adjustments can be located with or independently of the remote lighting scene activator to enable manual adjustment of any channel or circuit without changing the preset pattern of the main controller.

15 The dimming levels specified in the table for scene 1 are adjusted as by a lighting expert by adjustment of the linear adjustment potentiometers of group 21. The relative dimming percentages which are then obtained can be instantly recalled by depression of the push button 25 as will be later described. Each of the settings for scenes 2, 3 and 4 of the above table are similarly made in potentiometer groups 22, 23 and 24, respectively. Restaurant personnel will never need to adjust the sliders to establish the lighting levels.

25 Referring next to Figure 4, there is shown therein a circuit diagram, partially in block form, of the control circuit for carrying out the control system shown in Figures 1 and 2. For the sake of simplicity, only three scene circuits are shown and only two channels are shown for each of the three scenes. Thus, in Figure 4 there is schematically illustrated push-button switches 25, 26, 27 and 29 which are momentary close switches. These switches are connected in series with an appropriate d.c. voltage source shown as having a

positive d.c. terminal throughout the circuit of Figure 4. Any number of scenes can be used in the circuit of Figure 4 where additional scene circuits are added onto the extending lines 70 and 71.

5 Each of switches 25, 26 and 27 is connected to operate conventional commercially available magnetic latching relays shown as relays 73, 74 and 75, respectively, each of which contains on-coils 76, 77 and 78, respectively, and off-coils 79, 80 and 81, respectively.
10 Energization of these coils will open and close the relay contacts 82, 83 and 84, respectively. A novel diode logic configuration is employed including three diodes for each off-coil 79, 80 and 81 to ensure that only one relay contact is closed at any instant. By
15 way of example, three diodes 85, 86 and 87 are employed for off-coil 79. If any one of contacts 26, 27 or 29 is closed, the coil 79 will be energized and contact 82 will open. Contact 82, however, remains closed following the closure of only switch 25. This circuit ensures
20 that only one scene can be presented by depression of one of the push buttons 25 to 27.

 The contacts of each of the magnetic latching relays are then connected to the individual channels of the group of controlled potentiometers associated with
25 the scene selection push buttons 25, 26 or 27, respectively. Thus, contact 82 is connected to two channels, each containing linear potentiometers 90 and 91, respectively, as well as other identical channels depending upon the number of channels there are provided in the group.
30 For example, in the arrangement of Figure 2, there would be six channels with potentiometers 90 and 91 corresponding to the potentiometers containing sliders 21a and 21b in Figure 2.

 Also provided for each of the potentiometer
35 sliders 90 and 91 are the LEDs 92 and 93, respectively,

which, as shown in Figure 2, are fixed directly atop each manually accessible slider.

5 The output at the potentiometer taps 94 and 95 of Figure 4 are then connected to the inputs of fader circuits 100 and 101, respectively, where the number of fader circuits will correspond to the total number of zones or channels for each scene. In the case of the arrangement of Figure 2, there would be six fader channels. The output of each of the fader circuits
10 are then connected to dimmer control circuits 102 and 103, respectively, where these dimmer control circuits can take the form, for example, of the circuit shown in U.S. Patent 4,350,935.

15 In order to control the time constant of the fader circuits 100 and 101, a common fader rate adjustment potentiometer 104 is provided which adjusts the input to the fader circuits 100 and 101. As described previously, the adjustment potentiometer 104 may be a rotational potentiometer, and is designed to have a logarithmic
20 response of fade rate versus potentiometer rotation. This simplifies the adjustment of each channel over the entire adjustment range of the system.

In order to bypass the fade mode of operation, a parallel relay switch 105 is provided which is arranged
25 to be closed by a suitable circuit (not shown) for at least a few seconds following the initial turn-on of the system so that the user does not have to wait for the lights to fade from an off condition to their set condition.

30 Each of the known dimmer control circuits 102 and 103 as well as those of the other channels controls their respective lighting fixtures in the manner described in the above-noted patent. Significantly, these dimmer control circuits can be located in the dimming panel 65

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located in the electrical closet of Figure 3. This simplifies the equipment needed at the control location and permits the use of an architecturally pleasing control panel design. Note further that the fader control potentiometer 105 is also contained in the control panel 20 of Figure 2 and permits fade rate adjustment between scenes from 1 to 60 seconds to be adjusted by a screw driver.

It will be observed that the novel use of magnetic latching relays and diode logic requires only a momentary pulse of energy on one coil to turn on a group and on another coil to turn the group off. This eliminates the electronic latching circuitry which was previously required to perform this memory function. Note also that the novel magnetic latch system retains its set state even during a power failure so that the system will return to its last set state automatically upon the return of power without the need for operator action or extra support circuitry such as batteries or the like.

In order to turn the system off, it is necessary only to touch the momentary switch 29 which then deenergizes all of the magnetic latch off-coils. When all scenes are deenergized by the off button, other logic circuitry (not shown) will cause the power feed to the dimmers to be interrupted so that the lights will immediately extinguish.

Although the present invention has been described in connection with a preferred embodiment thereof, many variations and modifications will now become apparent to those skilled in the art. It is preferred, therefore, that the present invention be limited not by the specific disclosure herein, but only by the appended claims.

Reference is made to our co-pending Application No. 8611653 which is divided out from the present application and describes and claims a lighting scene control panel.



CLAIMS

1. A lighting scene control system comprising:
a plurality of groups of potentiometer controls, each
5 of said groups mounted within a distinct respective
area of a control panel, each of said groups including
a plurality of individual linearly movable
potentiometer adjustment members; each of said groups
being physically spaced from one another and being
10 spatially distinct from one another; a plurality of
dimmer control circuit means; a plurality of output
light means; said plurality of dimmer control circuit
means connected to respective ones of said plurality
of output light means and being operable to dim the
15 output of their respective output light means;
corresponding ones of said individual movable
adjustment members of each of said groups being
connectable to corresponding ones of said dimmer
control circuit means; the output of each of said
20 plurality of output light means being dependent upon
the linear position of said adjustment member of said
respective potentiometer connected to its respective
dimmer control circuit means; a plurality of switch means
mounted on said control panel corresponding in number
25 to the number of said groups; each of said switch means



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operatively connected between said plurality of dimmer control circuit means and respective ones of said potentiometers of said respective groups, each of said switch means being associated with a respective one of said groups and being operable such that the potentiometers of only its respective group is connected to control respective ones of said output light means independently of all other potentiometers of said other groups, the potentiometers of the other groups being disconnected from operative control of said output light means; whereby each of said adjustment members of each of said groups is settable to a given position such that a different pattern of light dimming for each of said output light means can be provided in response to operation of a selected one of said switch means.

2. A lighting control system as claimed in claim 1 wherein each of said linearly movable potentiometer adjustment members of each of said groups is arranged to move independently in laterally spaced, parallel, coextensive paths.

3. A lighting control system as claimed in claim 1 wherein each of said adjustment members has an LED associated therewith; and circuit means connected between said switch means and said respective groups of potentiometers whereby said LEDs of only said group



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corresponding to one of said switch means which is moved to its said first position are illuminated, thereby illuminating only that group of LEDs which controls the lighting scene and whereby that latter group and the individual position of each slider of said latter group is visually identified.

4. A lighting control system as claimed in claim 3 wherein the position of each of said sliders between their end positions is functionally related to the output dimming of their respective output light means.

5. A lighting control system as claimed in claim 1 wherein said dimmer control circuit means is mounted remotely of said control panel.

6. A lighting control system as claimed in claim 1 which further includes respective fader control circuit means connected to respective ones of said dimmer control circuit means for controlling the rate of change of output of respective ones of said output light means as said switch means are operated and apply different dimming outputs to said output light means.

7. A lighting control system as claimed in claim 6 which includes a common fade control member for simultaneously and logarithmically controlling the time constant of each of said fade circuits as a function of the movement of



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said control member; said common fade control member mounted on said control panel.

5 8. A lighting control system as claimed in claim 2 wherein each of said adjustment members has an LED associated therewith; and circuit means connected between said switch means and said respective groups of potentiometers whereby said LEDs of only said group corresponding to one of said switch means which is moved to its first position are illuminated, thereby
10 illuminating only that group of LEDs which controls the lighting scene and whereby that latter group and the individual position of each slider of said latter group is visually identified.

15 9. A lighting control system as claimed in claim 8 wherein the position of each of said linearly movable adjustment members between their end positions is functionally related to the output dimming of their respective output light means.

20 10. A lighting control system as claimed in claim 9 which further includes respective fader control circuit means connected to respective ones of said dimmer control circuit means for controlling the rate of change of output of respective ones of said output
25 light means as said switch means are operated and apply



different dimming outputs to said output light means.

11. A lighting control system as claimed in claim 10 which includes a common fade control member for simultaneously and logarithmically controlling the time constant of each of said fade circuits as a function of the movement of said control member; said common fade control member mounted on said control panel.

12. A lighting control system as claimed in claim 9 wherein said dimmer control circuit means is mounted remotely of said control panel.

13. A lighting control system as claimed in claim 11 wherein said dimmer control circuit means is mounted remotely of said control panel.

14. A lighting control system as claimed in claim 3 which further includes a control panel window covering at least the portion of said control panel containing said groups of adjustment members; said control panel window being translucent whereby only the illuminated LEDs associated with said adjustment members are visible through said control panel window.

15. A lighting control system as claimed in claim 14 wherein said linearly movable potentiometer adjustment members of each of said groups are arranged to move independently in laterally spaced, parallel,



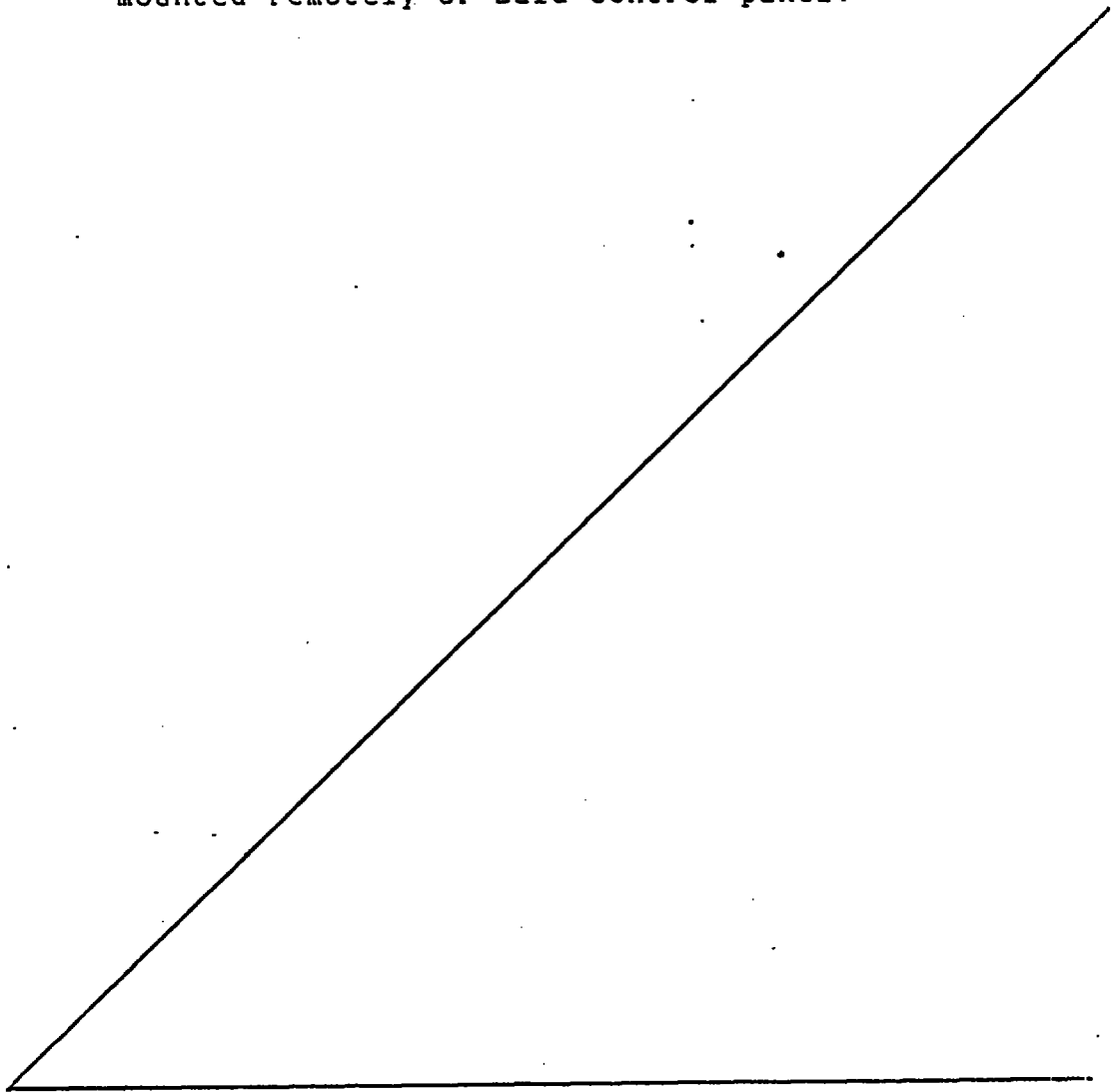
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coextensive paths.

15 16. A lighting control system as claimed in claim 15 wherein the position of each of said sliders between their end positions is functionally related to the output dimming of their respective output light means.

17. A lighting control system as claimed in claim 16 wherein said dimmer control circuit means is mounted remotely of said control panel.

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18. A lighting control system as claimed in any one of claims 3, 8, 14, 15, 16 or 17 wherein each of said LEDs is fixed to and movable with its said respective adjustment member.

5 19. A lighting scene control system substantially as hereinbefore described with reference to and as shown in the accompanying drawings.
