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CONTROL SYSTEM

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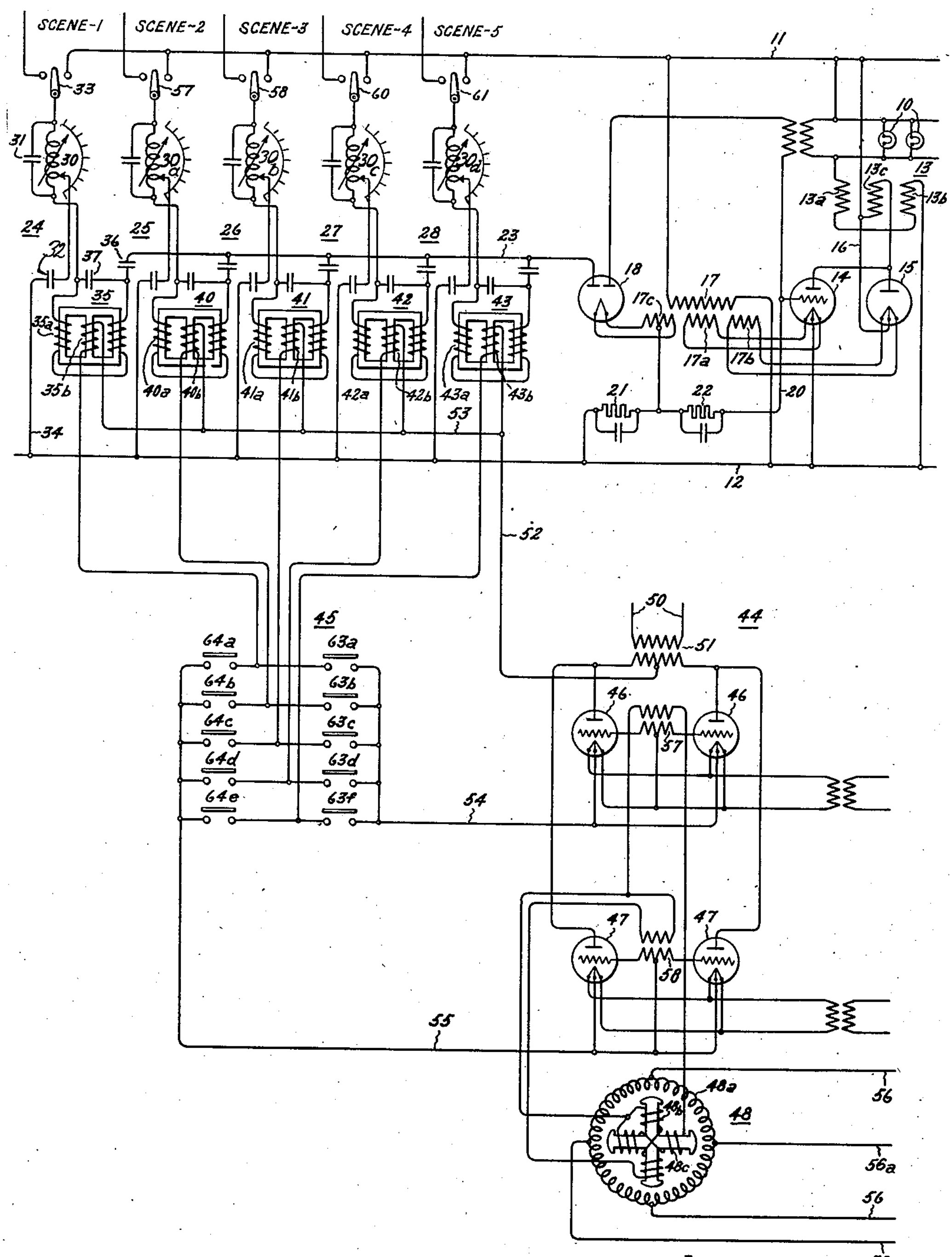

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2,220,415

CONTROL SYSTEM

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18 Claims. (Cl. 175—312)

This invention relates to control systems, more particularly to systems for controlling the magnitude of the load of an electric circuit and it has for an object the provision of a simple reliable and efficient system of this character. More specifically, the invention relates to systems in which means are provided for presetting a plurality of load values for the load circuit, and a particular object of my invention is the provision of means for gradually varying the load from one value to any of a plurality of succeeding preset values. A more specific object of the invention is the provision of means for gradually varying the load from one value to another without any sliding or commutating resistance contacts.

The invention has particular utility in its application to theatre dimming systems in which provision is made for presetting a plurality of lighting scenes, and accordingly a specific object of the invention is the provision of means for gradually fading the present scene into any one of a plurality of succeeding preset scenes.

In carrying the invention into effect in one form thereof a plurality of control circuits are provided for presetting a corresponding plurality of load values for the load circuit and means are provided for varying the load from one value to another together with means for selectively connecting the control circuit with the load varying means so that the load is varied from its present or instantaneous value to any preset values. A specific form of the invention embraces suitable electric valve apparatus provided with a control grid for directly controlling the magnitude of the load circuit, together with a plurality of preset control circuits connected to the grid.

A variable saturable reactor provided with a magnetization control winding is connected to each control circuit, and a variable voltage drop device, for example a variable reactance device, is included in each control circuit for presetting a load value for the controlled load circuit. Means for varying the load are provided in the form of means for varying the current flowing in the control windings of the saturable reactors, and suitable switching means are provided for selectively connecting the control windings to the load varying means thus providing variation of the load from its present value to any of the plurality of preset values.

In illustrating the invention in one form thereof it is shown as embodied in a theatre dimming system. For a better and more complete understanding of the invention reference should now be had to the following specification and to the accompanying drawing, the single figure of which is a simple schematic diagram of an embodiment of the invention applied for controlling a single circuit of a theatre illumination system.

Referring now to the drawing, an individual lamp circuit illustrated as comprising a plurality of lamps 10 is supplied from a suitable source of alternating current represented in the drawing by the supply lines 11 and 12. The illumination system of a modern theatre comprises a large number of individual circuits, for example, often more than one hundred and thus the circuit 10 may be taken as representing any of the plurality of individual circuits of the entire system. For the purpose of varying the intensity of illumination of the lamp 10 a variable saturable reactance device 13 is included in series relationship between the lamp and the supply source. This saturable reactor comprises a reactive winding illustrated as two coils 13_a and 13_b connected in series relationship and wound upon a suitable core (not shown) together with a direct current control winding 13_c also wound upon a leg of the core. The reactive windings 13_a and 13_b are connected between the lower side of the lamp circuit and the lower side 12 of the supply source and the lamp circuit itself is readily traced from the upper side 11 through the lamp, the reactive windings 13_a and 13_b to the lower side of the supply source.

As is well understood the intensity of illumination of the lamp may be varied by varying the reactance of the reactive windings 13_a and 13_b. For this purpose direct current of variable magnitude is supplied to the control winding 13_c from a suitable source represented in the drawing by the electric valve 14. Although this valve may be of any suitable type it is preferably of the three electrode type, into the envelope of which a small quantity of an inert gas such for example as mercury vapor is introduced after exhaust. The presence of the gas within the tube serves to convert the usual pure electron discharge into an arc stream thus constituting the valve an electrostatically or grid controlled arc rectifier. The plate or anode of the valve 14 is connected to one terminal of the control winding 13_c whilst its cathode is connected to the lower supply line 12. As thus connected, the valve 14 serves to rectify one-half of the wave of the alternating voltage impressed upon the control winding 13_c by the source 11, 12. For the purpose of sustaining the current flow in the control winding during the idle or inverse half-cycle a second valve 15 is provided. This valve is illustrated as a two-electrode valve having its plate or anode connected to the same terminal of the control winding 13_c as that to which the anode of the valve 14 is connected and having its cathode connected to the opposite terminal of the control winding by means of the conductor 16. The cathodes of both valves 14 and 15 are illustrated as being of the incandescent filamentary type heated to the required degree of incandescence by means of electric energy supplied from the source 11, 12 through the supply transformer 17 to the secondary winding 17_a and 17_b of which the cathodes of the electric valves 14 and 15 are respectively connected as illustrated.

As is well understood, the average value of the current flowing in the output circuit of a gas filled electric valve such as the valve 14 may be varied by varying the voltage applied to its control grid. For example, when the grid voltage is sufficiently positive, the current flowing in the anode circuit is maximum whilst when the grid is biased sufficiently negative the anode current is minimum or zero. For intermediate grid bias voltage values the current flowing in the anode circuit has corresponding intermediate values. For the purpose of applying a suitable D. C. voltage to the grid of the electric valve 14, the grid circuit of the latter is connected to the alternating voltage supply source 11, 12 through a suitable rectifying device 18 illustrated as a hot cathode type rectifier, and the grid of the valve 14 is connected to the lower supply side of the supply source 12 by means of the conductor 20 with suitable filtering devices 21 and 22 included in circuit for the purpose of smoothing the ripple of the rectified voltage wave. The left hand anode of the rectifier 18 is connected with a bus 23 which in turn is connected through certain control circuits to the upper supply line 11 whilst the mid point of the cathode supply winding 17_c is connected to a point between the filters 21 and 22 and thence through the filter 21 to the lower supply line 12. Thus, it will be clear that the rectifier 18 rectifies one-half of the voltage wave and that this rectified voltage is applied to the grid circuit of the electric valve 14.

In order to provide for presetting a plurality of illumination intensities for the lamp circuit 10, a plurality of control circuits 24, 25, 26, 27 and 28 are connected to the bus 23 which as previously pointed out is connected through the rectifier 18 to the grid circuit of the electric valve 14. Although five of these control circuits are illustrated in the drawing, it will be clear that this number may be either more or less than five depending upon the number of lighting scenes that it is desired to preset. The control circuit 24 comprises a variable voltage drop device illustrated as a variable reactance 30 and a capacitance 31 connected in parallel together with a capacitance 32 connected in series relationship. The upper terminal of the variable reactance winding 30 is connected to the upper supply line 11 when the switch 33 is operated to its right-hand position and the left-hand terminal of the capacitance 32 is connected to the lower supply line 12 by means of conductor 34. A variable saturable reactor 35 is provided with a reactive winding 35_a wound upon the outside legs of an iron core and is also provided with a direct current magnetization control winding 35_b wound upon the central leg. The upper terminal of the reactive winding 35_a is connected to the lower terminal of the reactance winding 30 and through a portion of the reactance winding 30 to the right-hand terminal of the capacitance 32, whilst the opposite terminal of the reactive winding 35_a is connected through a capacitance 36 to the bus 23 which as previously pointed out is connected through the rectifier 18 and the filter 21 to the lower supply line 12. Thus it will be seen that the reactive winding 35_a is connected in parallel relationship with the capacitance 32. A suitable fixed capacitance 37 is connected between the right hand terminal of the capacitance 32 and the bus 23 and is thus connected in parallel relationship with the reactive winding 35_a of the saturable reactor. The reactance of the variable reactance 30 may be varied as desired, preferably by varying the position of a core (not shown) within the solenoid winding of the reactance. The value of this reactance, as well as the reactive voltage drop across the winding 30 is preferably indicated by the position on a calibrated scale of an indicating member (not shown) attached to the movable solenoid core.

The remaining control circuits 25, 26, 27 and 28 are in all respects identical with the control circuit 24 and consequently a repetition of the above detailed description of the circuit 24 is omitted since the circuit details of these remaining control circuits will be readily understood from the above-description of the control circuit 24.

When the saturable reactors 35, 40, 41, 42, and 43 are unsaturated, i. e., the reactance and likewise the reactive drop of the reactive winding is very high with the result that the greater portion, in fact substantially all, of the voltage drop across the capacitance 32 appears across the reactive windings of the saturable reactors 35, 40, 41, 42, and 43, so that the voltage applied to the grid of the valve 14 during the positive half-cycle of the voltage rectified by the rectifier 18 is substantially the voltage of the lower supply line 12. During the positive half-cycle of the voltage rectified by the rectifier 18 the voltage of the line 12 is negative and consequently the voltage applied to the grid of the valve 14 is also negative with the result that the valve is non-conducting if the saturable reactors 35, 40, 41, 42 and 43 are unsaturated. However, if the saturation of any of these saturable reactors is increased the voltage drop across its reactive winding is decreased with the result that the voltage applied to the grid of the valve 14 is made increasingly positive and the valve 14 becomes conducting. The magnitude of the current flowing in the anode circuit of the valve 14 is thus caused to vary in accordance with variations in the saturation of the saturable reactances of the control circuits.

For the purpose of varying the saturation and the reactive voltage drop of the saturable reactors, suitable current varying means 44 are provided for varying the current supplied to the direct current magnetization control winding of these reactors and suitable selective switching means 45 are provided for selectively connecting these magnetization control windings with the current varying means 44.

Although the current varying means 44 may be of any suitable type it is illustrated as electric valve apparatus comprising a pair of valves 46 and a second pair of valves 47 under the control of a suitable control device illustrated as rotary induction apparatus 48. The valves 46 and 47 may be of any suitable type but like valve 14 are preferably of the three-electrode vapor filled type.

The valves 46 and 47 are supplied from any suitable source of alternating current, represented in the drawing by the conductors 50 connected through the supply transformer 51. As shown, the anodes of the pair of valves 46 and the pair of valves 47 are connected in parallel to the opposite terminals of the secondary winding of the supply transformer 51. The mid-point of this secondary winding is connected by means of the conductor 52 to a bus 53 which in turn is connected to the upper terminal of each of the direct current control windings of the saturable reactors 35, 40, 41, 42 and 43 and the cathodes of one or the other of the pair of valves 46, 47 are connected through conductors 54 or 55 to the opposite or lower terminals of these direct current magnetization control windings through the selective switching apparatus 45.

The control device 48 is illustrated as a voltage regulating device having a stator winding 48_a and two rotor windings 48_b and 48_c wound at right angles upon the perpendicular legs of the rotor core punchings. The stator winding 48_a is supplied with two-phase alternating voltage from a suitable source represented in the drawing by the four supply lines 56 and 56_a. The control grids of the pair of electric valves 46 are connected to the opposite terminals of the secondary winding of the grid transformer 57, the opposite terminals of the primary winding of which are connected to the rotor winding 48_c of the control device. Similarly, the grids of the pair of electric valves 47 are connected to the opposite terminals of the secondary winding of the grid transformer 58, the terminals of the primary winding of which are connected to the rotor winding 48_b. When alternating current flows in the winding 48_a of the control device 48, voltages are induced in the rotor windings 48_b and 48_c and since these rotor windings 48_b and 48_c are arranged at right angles with each other the induced voltages will have quarter phase relationship with each other, that is to say that when the voltage induced in one of the windings is maximum, that induced in the other winding is minimum and vice versa. When one of these rotor windings has its axis parallel with the axis of the rotating magnetic field due to the stator winding, the induced voltage in this winding is maximum and since the axis of the other winding is at right angles with the magnetic field of the stator winding, its induced voltage at this instant is minimum or zero. Thus, it will be seen that if the axis of one of the rotor windings of the control device 48 is parallel with the magnetic field of the stator winding during the positive half cycle of anode voltage, its induced voltage will be maximum and the pair of electric valves to the control grids of which it is connected, will conduct maximum current and that the other rotor winding will have zero induced voltage and consequently the electric valves to the control grids of which it is connected will be non-conducting and inactive. By rotating the rotor of the control device one-quarter turn, the voltage in one rotor winding will be gradually shifted out of phase with the valve anode voltage whilst the voltage in the other winding will be gradually shifted in phase with the valve anode voltage and similarly the current supplied by the active or conducting pair of valves is gradually reduced from maximum to zero, whilst the current supplied by the other pair of valves is gradually increased from zero to maximum value.

With the above understanding of the apparatus and its organization in the complete system, the operation of the system itself will readily be understood from the detailed description which follows:

The switches 33, 57, 58, 60 and 61 are operated to their right hand positions to connect the control circuits 24—28 inclusive across the supply lines 11, 12. A plurality of lighting scenes, i. e., a plurality of different illumination intensities of the lamp circuit 10 are then preset for the desired illumination intensity by presetting the effective values of the presettable reactances 30, 30_a, 30_b, 30_c, and 30_d to the desired values as observed upon their cooperating dials. At this time the movable contacts of the selective switching mechanism 45 are all in the open position in which they are illustrated and consequently the reactive drops across the saturable reactors in the control circuits 24–28 inclusive are so large that the grid voltage of the electric valve 14 is negative and the valve is non-conducting. Since no current flows in the control winding of the saturable reactor 13, the reactive drop across its reactive winding 13_a, 13_b is maximum and the lamps 10 are extinguished. The induced voltage in winding 48_c of control device 48 is out of phase with the valve anode voltage and the pair of valves 46 is biased to cut off and therefore inactive.

To present the first of the preset scenes, i. e., scene 1, movable contact 63_a of the selective switching mechanism 45 is depressed to complete the connection of the control winding 35_b of the saturable reactor 35 to the pair of electric valves 46. The rotor of the control device 48 is then rotated one-quarter turn gradually shifting the phase of the grid voltage of the valves 46 and increasing the direct current flowing in the control winding 35_b. This increase in the current flowing in the control winding 35_b decreases the reactance across the reactive winding 35_a and consequently increases the voltage applied to the grids of the electric valve 14 which in turn results in increasing the current flowing in the control winding 13_c of the saturable reactor 13, decreasing the reactive voltage drop across the reactive winding 13_a and 13_b and increasing the intensity of illumination of the lamp 13. When the rotor of the control device has been rotated one-quarter turn, the grid and anode voltages of the pair of valves 46 are in phase and the direct current supplied to the control winding 35_b of the saturable reactor 35 attains its maximum value and the reactive voltage drop across the reactive winding 35_a becomes a minimum so that the voltage applied to the grid of the electric valve 14 attains the value preset by the variable reactance 30 and the intensity of illumination of the lamp circuit 10 has a corresponding value. It will be clear that as the winding 48_c is rotated into a position to render the valves 46 conducting the winding 48_b is rotated into a position at right angles so that the pair of valves 47 is rendered inactive.

Assuming now that it is desired to present scene 2 and gradually to merge or fade scene 1 into scene 2, the movable contact 64_b of the selective switching mechanism is depressed to complete the connections of the control winding 40_b of saturable reactor 40 to the pair of electric valves 47. The scene fader 48 is then rotated one-fourth turn and the conducting valves 46 are gradually rendered non-conducting whilst the inactive valves 47 are gradually rendered conducting. As the current is decreased in the control winding 35_b, the grid voltage of the electric valve 14 is correspondingly decreased but simultaneously the increasing current in the control winding 40_b of saturable reactor 40 increases the grid voltage of the valve 14 so that when the rotor of the scene fader 48 is finally brought to rest after a quarter revolution, the grid voltage of the electric valve 14 attains the value preset by the preset reactance device of scene 2 control circuit 25. It will be clear that since the reactive voltage drop across the reactive winding 35_a is increased at the same time that the reactive voltage drop across the reactive winding 40_a is decreased the grid voltage of the electric valve 14 is gradually changed from the value preset by the reactance 30 to the value preset by the reactance 30_a. As a result the illumination intensity of the lamp circuit 10 is gradually changed from the value preset for the first scene to the value preset for the second scene.

In a similar manner, if it is now desired to present scene 3, the movable contact 63_c is depressed to complete connections of the control winding 41_b of the saturable reactor 41 to the pair of valves 46. The switching mechanism 45 is preferably of such a type that when a contact is depressed it releases any other contacts in the same row which have been previously depressed. Consequently when the contact 63_c is depressed, the contact 63_a previously depressed to present scene 1, is released. The scene fader 48 is now rotated one-quarter turn and the illumination intensity of the lamp circuit 10 is gradually merged or faded from the value preset for scene 2 to the value preset for scene 3.

It is not necessary that the scenes be presented in progressive numerical order, i. e., it is not necessary that the scenes be presented in the orders 1, 2, 3, 4, 5, etc. For example, let it be assumed that scene 3 is being presented and is thus the present scene and it is desired instead of presenting scene 4 as the next scene that scene 1 be reestablished. In order to repeat scene 1 it will be clear that the contact 63_a cannot be depressed since this would connect the control winding 35_b to the pair of valves 46 which at this point are now active in maintaining scene 3. Therefore, it will be clear that the switch contact 64_a must be depressed, releasing the switch contact 64_b, previously depressed for scene 2, and connecting the control winding 35_b to the pair of valves 47. By rotating the scene fader 48 one-fourth turn as before, scene 3 is gradually faded into scene 1. Thus it will be clear that any scene may be directly faded in straight line variation into any one of a plurality of preset scenes, without passing through the illumination intensity values for any other scenes in the set up.

For the purpose of simplification, but a single lamp circuit is shown in the drawing. It will be clear however that any number of circuits may be controlled in exactly the same manner as that described in connection with lamp circuit 10. In a complete theatre illumination control system, there will be a plurality of control circuits similar to the control circuits 24 to 28 inclusive for each individual lamp circuit to be controlled and these control circuits for the additional lamp circuits are connected through the selective switching mechanism 45 to the scene fader 44 in exactly the same manner as the control circuits 24 to 28 inclusive are connected as illustrated in the drawing.

Although in accordance with the provisions of the patent statutes, this invention is described as embodied in concrete form, the invention is not limited to the specific apparatus and connections described and illustrated since alterations and modifications will readily suggest themselves to persons skilled in the art without departing from the true spirit of this invention or the scope of the annexed claims.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. In a control system for a load circuit, means for controlling the magnitude of said load, means for presetting a plurality of load values comprising a plurality of control circuits each including a variable voltage device for applying preset voltages to said load controlling means, and means for varying said load from any preset value to another comprising means for simultaneously varying one of said voltages from a preset value to a minimum value and another of said voltages from a minimum value to a preset value, and means for selectively connecting any two of said circuits to said voltage varying means.

2. A control system comprising a translating circuit, a load device included in said circuit, means for controlling the voltage applied to said load device, means for presetting a plurality of voltage values for said load device comprising a plurality of variable voltage devices for applying a plurality of preset control voltages to said load voltage control means, means for varying said load voltage from any preset value to another comprising means for varying one of said control voltages from a preset value to a minimum value and another of said control voltages from a minimum value to a preset value, and means for selectively connecting any two of said variable voltage devices to said control voltage varying means.

3. An illumination control system comprising a lamp circuit, means for controlling the intensity of illumination of said circuit comprising electric valve apparatus provided with a control grid, control means for said valve apparatus comprising a plurality of control circuits connected to said grid means for presetting a plurality of scene illumination intensities comprising a separate variable voltage device connected to each of said control circuits for applying preset voltages to said grid, means for fading the intensity of illumination of said lamp circuit from one preset value to another comprising means for oppositely varying said grid voltage between two of said preset values and a minimum voltage and switching means for selectively connecting at least two of said control circuits to said voltage varying means.

4. In a system for controlling a load circuit, means for controlling said circuit comprising electric valve apparatus provided with a control grid, control means for said valve apparatus comprising a plurality of saturable core reactance devices each connected to said grid and each provided with a control winding, and means for selectively energizing said windings.

5. In a system for controlling a load circuit, control means for said circuit comprising a plurality of variable reactance devices each provided with a control winding, means for selectively controlling the energization of said windings, and means for simultaneously and oppositely varying the energization of at least two of said windings comprising a pair of electric valves each having an output circuit, means for connecting any two

of said control windings to said output circuit and control means for said valves for simultaneously and oppositely varying the current in said output circuit.

6. In a system for controlling a load circuit, means for controlling said circuit comprising electric valve apparatus provided with a control grid, control means for said valve apparatus comprising a plurality of reactance devices connected to said grid, and means for simultaneously and oppositely varying the reactance of said devices.

7. In a system for controlling a load circuit, means for controlling the magnitude of the load of said circuit comprising a plurality of reactive circuits, means for presetting the effective reactance values of said circuits individually and means for oppositely varying the reactance of at least two of said circuits between said effective values and a minimum value comprising a pair of electric valves each provided with a control grid and an output circuit, switching means for respectively connecting any two of said reactive circuits to said output circuit and a rotary induction device connected to said grid circuit for simultaneously and oppositely varying the current in said output circuit.

8. In a system for controlling a load circuit, control means for said circuit comprising a plurality of reactive circuits each including a variable reactance device provided with a magnetization control winding, means for individually presetting the reactance values of said reactive circuits, and means for oppositely varying the energization of at least two of said windings comprising a pair of electric valves each provided with a control grid and an output circuit, switching means for respectively connecting any two of said control windings with said output circuit and a phase shifting device connected to said input circuit for simultaneously and oppositely varying the current in said output circuit.

9. In an illumination control system, the combination with a lighting circuit of a plurality of presettable devices for presetting a plurality of illumination intensities for said lighting circuit, a fading device for simultaneously rendering one of said presettable devices inactive and another of said presettable devices active thereby to fade the intensity of illumination of said lighting circuit from one of said preset values to another, and a selector switching device for selectively connecting any two of said presettable devices to said fading device thereby to provide for fading the intensity of illumination of said lighting circuit from any one of said preset values to any other of said preset values.

10. An illumination control system comprising in combination, a lighting circuit, a variable dimming means for varying the intensity of illumination of said lighting circuit, a plurality of control circuits for presetting a plurality of illumination intensities for said lighting circuit, each of said control circuits including a device having a winding connected to said dimming means and a cooperating control winding, a fading device for simultaneously rendering a first of said control circuits inactive and a second of said control circuits active thereby to fade the intensity of illumination of said lighting circuit from the intensity preset on said first circuit to the intensity preset on said second circuit, and a selector switching device for selectively completing connections between any two of said control windings and said fading device thereby to provide for fading the intensity of illumination of said lighting circuit from any one of said preset values to any other of said preset values.

11. In an illumination control system, a lamp circuit, means for controlling the intensity of illumination of said circuit comprising electric valve apparatus provided with a control grid, control means for said apparatus comprising a plurality of reactive circuits connected to said grid and each including a variable reactance device, means for presetting a plurality of scene illumination intensities for said lamp circuit comprising means for presetting effective reactance values for said reactive circuits, means for selectively energizing said reactive circuits and means for fading the illumination intensity of said lamp circuit for one scene to the intensity for a succeeding scene comprising means for oppositely varying the reactance of said reactive circuits between said effective values and minimum values.

12. An illumination control system comprising in combination with a lamp circuit, means for controlling the intensity of illumination of said circuit comprising electric valve apparatus provided with a control grid, control means for said valve apparatus comprising a plurality of reactive circuits each including means for presetting the effective reactance value of said circuit and a variable reactance device having a reactive winding connected to said grid and a control winding, and means for fading the illumination intensity of said lamp circuit for one scene to the intensity for a succeeding scene comprising means for varying the energization of said control windings.

13. In an illumination control system for a lamp circuit and the like, means for controlling the intensity of illumination of said circuit comprising electric valve apparatus provided with a control grid, control means for said valve apparatus comprising a plurality of reactive circuits, a separate variable reactance device included in each of said circuits each having a reactive winding connected to said grid and each having a control winding, means for presetting a plurality of lighting scenes comprising means for presetting effective reactance values for each of said reactive circuits, means for selectively activating at least any two of said reactive circuits, and scene fading means comprising a device connected to said control windings for simultaneously increasing the reactance of one of said activated circuits and decreasing the reactance of another of said circuits.

14. In an illumination control system for a lamp circuit and the like, means for controlling the intensity of illumination of said circuit comprising electric valve apparatus provided with a control grid, control means for said valve apparatus comprising a plurality of control circuits connected to said grid, a separate reactance device for each of said control circuits, each of said devices having a reactive winding connected to its associated circuit and a direct current control winding, means connected to each of said control circuits for presetting a plurality of scene illumination intensities for said lamp circuit, and a scene fader comprising means for varying the direct current of said control windings.

15. In an illumination control system, a lamp circuit, illumination intensity control means for said circuit comprising electric valve apparatus provided with a control grid, control means for said valve apparatus comprising a plurality of control circuits connected to said grid, a separate

variable reactance device for each of said control circuits, each device having a reactive winding connecting its associated control circuit and a direct current magnetization control winding, and scene fading means comprising electric valve apparatus connected to vary the current flowing in said windings.

16. An illumination control system comprising in combination with a lamp circuit, illumination intensity control means for said circuit comprising electric valve apparatus provided with a control grid, means for presetting a plurality of scene illumination intensities for said lamp circuit comprising a plurality of control circuits connected to said grid, a separate variable reactance device for each of said control circuits, each of said devices comprising a reactive winding connected to its associated control circuit and a direct current control winding, scene fading means comprising electric valve apparatus provided with a control grid and means connected thereto for varying the current in said direct current windings, and switching means for selectively connecting any two of said direct current windings to said scene fading valve apparatus.

17. An illumination control system comprising in combination a lamp circuit, control means for said circuit comprising electric valve apparatus provided with a control grid, control means for said valve apparatus comprising a plurality of control circuits connected to said grid, means for presetting a plurality of scene illumination intensities for said lamp circuit comprising a plurality of grid voltage control devices one connected to each of said control circuits, a plurality of variable reactance devices each having a reactive winding connected to one of said control circuits and a direct current control winding, a scene fader comprising electric valve apparatus arranged for connection to said control windings and provided with a control grid and a control device connected thereto for causing said scene fading valve apparatus to increase the current in one of said control windings and decrease the current in another of said windings, and switching means for selectively connecting any two of said control windings to said scene fading valve apparatus.

18. An illumination control system comprising in combination with a lamp circuit, illumination intensity control means for said circuit comprising electric valve apparatus provided with a control grid, control means for said valve apparatus comprising a plurality of control circuits connected to said grid, means for presetting a plurality of scene illumination intensities comprising a separate presettable reactance device in each of said control circuits for presetting a plurality of voltages for application to said grid, a separate variable reactance device for each of said control circuits, each of said devices having a reactive winding included in its associated control circuit and a direct current control winding, scene fading means comprising means for varying the current in said control windings to vary said grid voltage from one preset value to another, and switching means for selectively connecting said control circuits to said scene fading means.

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