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ILLUMINATION CONTROL SYSTEM

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Fig. 1

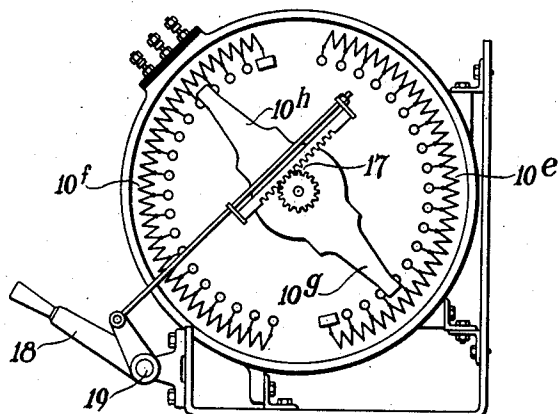
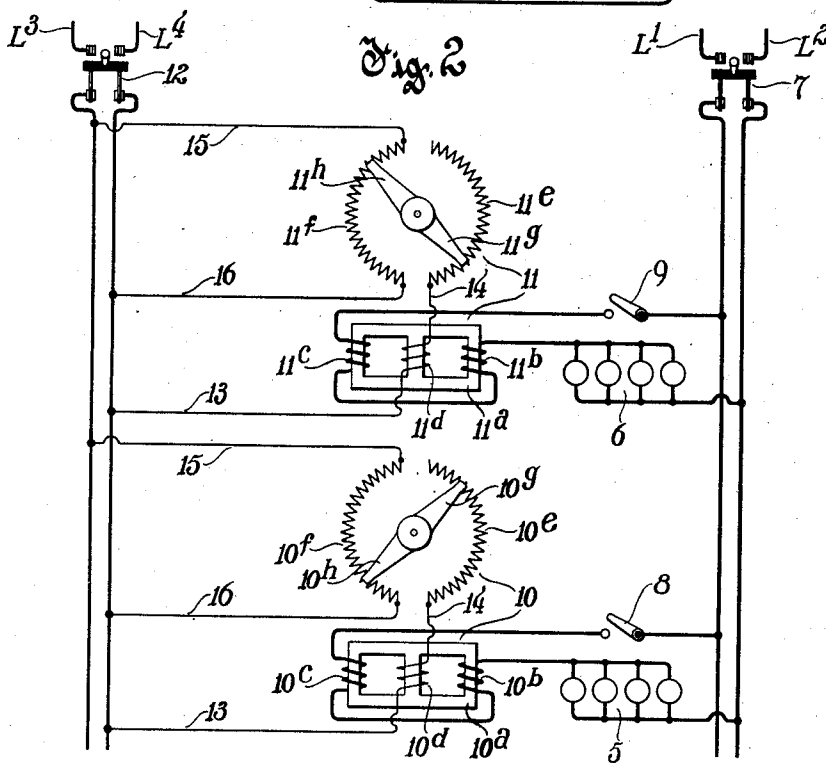


Fig. 2



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ILLUMINATION CONTROL SYSTEM

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This invention relates to improvements in illumination control systems, and the invention relates more particularly to improvements in control rheostats to be employed in such systems.

An object of the invention is to provide a control rheostat wherein the advantages of potentiometer-type and series-type rheostats are combined.

Another object is to provide a rheostat wherein the desired current control characteristics are attained in a simple and efficient manner.

Another object is to provide a rheostat of the aforementioned character which is particularly adaptable for use in conjunction with reactor type of illumination intensity control elements.

Another object is to provide an illumination control system embodying rheostatic control of the character herein contemplated.

Other objects and advantages of the invention will hereinafter appear.

A rheostat of the character herein disclosed may be termed a series-potentiometer rheostat; that is to say, a rheostat wherein the characteristics of a series-type rheostat and those of a potentiometer-type rheostat are combined. In actual practice a rheostat of the character aforementioned is better than either the potentiometer-type or series-type rheostat alone, for the following reasons: It permits reduction of the control current to zero without opening the circuit, the same as with the usual potentiometer connection, and at the same time it provides a high resistance discharge path for the load circuit, where the load circuit is of the type to store magnetic energy.

Thus, with the usual potentiometer-type rheostat when employed in conjunction with a reactor type dimmer the direct current control winding of the dimmer is short-circuited when the rheostat is moved to dim position, and there is a considerable delay in attaining zero intensity of illumination of the lamps when the rheostat is moved quickly from bright to dim position. By my arrangement, however, zero current in the direct current control winding of the reactor may be quickly attained, and at the same time a high resistance discharge path is provided for said winding, so that the magnetic flux in the latter decays rapidly to its minimum value. Moreover, by my improved construction I am enabled to obtain the potentiometer characteristics in the rheostat, wherein a double-armed commutating lever may be employed without

the necessity for slip rings. Heretofore in constructing rheostats having potentiometer characteristics, and wherein double-armed commutating levers were employed, the two sections of the rheostat resistance were connected in parallel, with a consequent necessity for use of slip rings to bring the load connection to the center of the lever. The structure is therefore greatly simplified by elimination of the necessity for such slip rings.

The accompanying drawing illustrates an embodiment of the invention which will now be described, it being understood that the invention is susceptible of embodiment in other forms without departing from the scope of the appended claims.

In the drawing, Figure 1 is an end elevation of a group or bank of dimmer plates, having supporting and contactor actuating elements of known form as illustrated,—the plural resistance elements being arranged and adapted for electrical connection in circuit in the manner herein contemplated, and

Fig. 2 is a schematic and diagrammatic view of an illumination control system embodying my invention.

Referring first to Fig. 2, the numerals 5 and 6 designate groups of electric lamps which, it may be assumed, are adapted to be supplied with energy from a common source of alternating current, as represented by the lines L¹, L²,—upon closure of a main switch 7 and switches 8 and 9 individual to the respective groups of lamps. The intensities of illumination of the respective groups of lamps are subject to control by the individual reactor type dimmers designated in general by the numerals 10 and 11. The dimmer 10, as shown, includes a laminated magnetic core 10^a around two legs of which the alternating current coils 10^b, 10^c are wound,—said coils being connected in series with each other and in series with the group of lamps 5 (the individual lamps of which group may be connected in parallel relation to each other, as shown).

A control winding 10^d is associated with the third leg of the core,—said winding being preferably supplied with energy from a suitable source of direct current, as represented by the lines L³, L⁴,—a main switch 12 being provided to permit interruption of the supply of energy from said source. One terminal of winding 10^d is connected by conductor 13 with line L⁴, the other terminal of said winding being connected by conductor 14 with one end of a resistance

section 10^e,—the other end of said resistance section being free. Another resistance section 10^f has its opposite ends respectively connected with lines L³ and L⁴, as by means of conductors 15 and 16. The oscillatable commutating lever of the rheostat has two arms 10^g and 10^h which are mechanically and electrically connected to each other, said arms being adapted to simultaneously traverse the resistance sections 10^e and 10^f, respectively.

The commutating lever thus cooperates with resistance section 10^f to provide a potentiometer connection between the source of energy supply (L³, L⁴) and winding 10^d, said lever likewise cooperating with resistance section 10^e to provide for inclusion of the latter or a portion thereof in series with winding 10^d, or to entirely exclude said resistance section. Thus upon movement of the commutating lever in a clockwise direction to its extreme position, winding 10^d will be connected directly across lines L³, L⁴ to provide for full energization thereof. Said circuit may be traced from line L³, by conductor 15 directly through the arms 10^h, 10^g of said lever, by conductor 14 through winding 10^d, and by conductor 13 to line L⁴.

As will be understood the intensity of illumination of the lamps in group 5 will be directly proportional to the degree of energization of winding 10^d,—and hence in the last mentioned position of the commutating lever full bright intensity of illumination will be provided. Upon movement of the lever in a counterclockwise direction the degree of energization of winding 10^d will be reduced gradually by increasing the amount of the resistance sections 10^f and 10^e interposed between winding 10^d and line L³. When arm 10^h is at the lower limit of its travel the winding 10^d will be short-circuited by connection of both ends or terminals thereof to line L⁴. Upon a rapid change from full energization of winding 10^d to the short-circuited condition thereof there would normally be a considerable time lag in de-energization thereof due to persistence of the magnetic flux generated thereby. Under the conditions just mentioned, however, the short-circuiting loop for winding 10^d will have included in series with the latter the full value of the resistance section 10^e. This high resistance discharge path for winding 10^d provides for a rapid decay of the electro-magnetic flux therewithin, and hence a black out condition of the group of lamps 5 may be quickly attained. In the intermediate positions of the commutating lever the rheostat will function in substantially the same manner as the known forms of potentiometer-type rheostats;—it being noted, however, that I have eliminated the necessity for the usual slip-ring connection between the commutating lever and the winding 10^d.

The actuating means for rheostat 10 may be of any known or desired form,—the same being illustrated in Fig. 1 as including a rack and pinion connection 17 between the commutating lever 10^g, 10^h and an individual manually operable lever 18. Lever 18 may have a releasable connection (not shown) with a master shaft 19, whereby the latter may be utilized in a known manner to simultaneously operate any number of the control rheostats associated therewith.

The illumination intensity control means for the group of lamps 6 is identical in form with the control means for lamps 5, the corresponding control elements of rheostat 11 being designated by the reference numerals 11^a, 11^b, 11^c,

11^d, 11^e, 11^f, 11^g and 11^h, and the circuit connections therefor being designated by like reference numerals 13, 14, 15 and 16.

It is to be understood that my improved form of rheostat has utility as applied to the control of a single lamp or group of lamps, whereas the number of groups of lamps and the control means therefor may be increased as desired to meet the requirements of each particular installation.

What I claim as new and desire to secure by Letters Patent is:

1. In a device of the character described, in combination, a source of current supply, an electrical device to be supplied with current from said source, and a rheostat interposed between said source and said electrical device to control the rate of supply of current to the latter, said rheostat comprising a movable contractor having two arms electrically connected with each other, a resistance element to be traversed by one of said arms, said resistance being electrically connected across said source, and a second resistance element to be traversed by the other of said arms, said second resistance having only one end thereof electrically connected with said source, whereby both potentiometer-type and series-type rheostatic connections are provided for said electrical device.

2. In a device of the character described, in combination, a source of current supply, an electrical device to be supplied with current from said source, and a rheostat interposed between said source and said electrical device to control the rate of supply of current to the latter, said rheostat comprising a movable contractor having two arms electrically connected with each other, a resistance element to be traversed by one of said arms, said resistance being electrically connected across said source, and a second resistance element to be traversed by the other of said arms, said second resistance having one end thereof electrically connected with said source through said device, the other end thereof being free, whereby both potentiometer-type and series-type rheostatic connections are provided for said electrical device.

3. In a device of the character described, in combination, a source of current supply, a translating device to be supplied with energy from said source, means for controlling the rate of supply of energy from said source to said translating device, said control means comprising a rheostat having a pair of resistance elements, one of said elements being permanently electrically connected across said source, the other element having one end thereof connected to said source through said translating device and having the other end thereof free, and an oscillatable contractor having bridging engagement with said resistance elements, said contractor in one extreme position thereof being adapted to effect connection of said translating device directly across said source and in the opposite extreme position thereof to provide a short-circuiting loop for said translating device, said loop including in series therewith said second mentioned resistance element.

4. In a device of the character described, in combination, a source of current supply, a translating device to be supplied with energy from said source, means for controlling the rate of supply of energy from said source to said translating device, said control means comprising a rheostat having a pair of resistance elements,

one of said elements being permanently electrically connected across said source, the other element having one end thereof connected to said source through said translating device and having the other end thereof free, and an oscillatable contactor having bridging engagement with said resistance elements, said contactor being movable to one extreme position to effect full energization of said translating device through connection thereof directly across said source, said contactor being also movable to its opposite extreme position to effect deenergization of said translating device without disconnecting the same from said source, said contactor in the last mentioned position thereof providing a closed loop wherein said translating device and said second mentioned resistance element are connected in series with each other, for the purpose set forth.

5. In a rheostat, in combination, a pair of resistance elements, one of said resistance elements having means for connecting the ends thereof across a source of energy supply, the other resistance element having means for connecting one end thereof to said source, the other end of said last mentioned resistance element being free, and a movable contactor having bridging engagement with said resistance elements and adapted to simultaneously traverse the same, said contactor being adapted upon movement thereof toward one extreme position to provide a short-circuiting loop including a portion or all of said second mentioned resistance element.

6. A rheostat having combined therein the characteristics of potentiometer-type and series-type rheostats, said rheostat comprising a pair of resistance elements, one of said resistance elements having means for permanently connecting the same across a source of energy supply, the other resistance element having means for connecting one end thereof to said source, the other end of said second mentioned resistance element being free, and a movable contactor having bridging engagement with said resistance elements and adapted to simultaneously traverse the same, said contactor in one extreme position thereof being adapted to render both of said resistance elements ineffective, said contactor being also adapted in its opposite extreme position to provide a short-circuiting loop including said second mentioned resistance element.

7. In an illumination control system, in combination, a group of electric lamps, a source of current supply therefor, means interposed between said source and said group of lamps to control the degree of energization of the latter, said means comprising a reactance type dimmer including a control winding, a separate source of current supply for said control winding, a rheostat interposed between said second mentioned source and said control winding for controlling the degree of energization of the latter, said rheostat comprising two resistance sections, a double-ended commutating lever for bridging said resistance sections, one of said resistance sections being connected across said second mentioned source to provide a potentiometer-type connection between the same and said control winding, and the other of said resistance sections being arranged to provide for connection thereof in series between said second mentioned source and said control winding.

8. In an illumination control system, in com-

bination, a group of electric lamps, a source of current supply therefor, means interposed between said source and said group of lamps to control the degree of energization of the latter, said means comprising a reactance type dimmer including a control winding, a separate source of current supply for said control winding, a rheostat interposed between said second mentioned source and said control winding for controlling the degree of energization of the latter, said rheostat comprising two resistance sections, a double-ended commutating lever for bridging said resistance sections, one of said resistance sections being connected across said second mentioned source to provide a potentiometer-type connection between the same and said control winding, the other of said resistance sections being arranged to provide for connection thereof in series between said second mentioned source and said control winding, said potentiometer-type connection providing for reduction to zero value of the current supplied to said group of lamps without interruption of the circuit of the latter, and said series connection providing a high resistance discharge path for the flux in said control winding upon substantial deenergization of the latter.

9. In an illumination control system, in combination, a group of electric lamps, a source of current supply therefor, means interposed between said source and said group of lamps to control the degree of energization of the latter, said means comprising a reactance type dimmer including a control winding, a separate source of current supply for said control winding, a rheostat interposed between said second mentioned source and said control winding for controlling the degree of energization of the latter, said rheostat comprising two resistance sections, a double-ended commutating lever for bridging said resistance sections, one of said resistance sections being connected across said second mentioned source to provide a potentiometer-type connection between the same and said control winding, the other of said resistance sections being arranged to provide for connection thereof in series between said second mentioned source and said control winding, said potentiometer-type connection providing for reduction to zero value of the current supplied to said group of lamps without interruption of the circuit of the latter, and said series connection providing a high resistance discharge path for the flux in said control winding upon substantial deenergization of the latter, said commutating lever being operable to effect short-circuiting of said control winding and to include said last mentioned resistance in series therewith upon short-circuiting thereof, whereby a high resistance discharge path is provided for said winding.

10. In an illumination control system, in combination, a plurality of groups of electric lamps, a common source of alternating current supply for said groups of lamps, means individual to each group of lamps for controlling the degree of energization thereof, said individual means comprising a reactor having the alternating current windings thereof connected across said source in series with each other and in series with their respective group of lamps, a control winding for each reactor, means individual to each control winding for connecting the same to a common source of direct current supply, said individual means comprising rheostats each having two resistance sections, one of said re-

istance sections being connected across said source of direct current, the other resistance being connected at one end to said control winding and having the other end thereof free, and
5 a double-armed oscillatable commutating lever having bridging engagement with said resistance sections, said lever cooperating with said resistance sections to provide combined potentiometer-type and series-type rheostatic connections
10 for said control winding.

11. In an illumination control system, in combination, a group of electric lamps and intensity control means therefor including a dimmer of the reactor type, said dimmer including
15 a control winding and a rheostat to control the degree of energization thereof, said rheostat having parts thereof operable to one extreme position to minimize the degree of energization of said control winding while at the same time
20 providing a high resistance discharge path for the latter whereby the electromagnetic flux thereof will decay rapidly to a minimum value.

12. In an illumination control system, in combination, a group of electric lamps and intensity control means therefor including a dimmer of the reactor type, said dimmer including a control winding and a rheostat to control the degree of energization thereof, said rheostat
25 having parts thereof operable to one extreme

position to minimize the degree of energization of said control winding while at the same time providing a high resistance discharge path for the latter whereby the electromagnetic flux thereof will decay rapidly to a minimum value, said rheostat parts being also operable to an opposite extreme position to provide for direct connection of said control winding to a source of current supply.

13. In an illumination control system, in combination, a group of electric lamps and intensity control means therefor including a dimmer of the reactor type, said dimmer including a control winding and a rheostat to control the degree of energization thereof, said rheostat having parts thereof operable to one extreme position to minimize the degree of energization of said control winding while at the same time providing a high resistance discharge path for the latter whereby the electromagnetic flux thereof will decay rapidly to a minimum value, said rheostat parts being also operable to an opposite extreme position to provide for direct connection of said control winding to said source of current supply, said rheostat parts in the intermediate positions thereof providing both potentiometer-type and series-type rheostatic connections for said control winding.

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