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A. GOLDSTEIN
ELECTRIC LIGHTING DEVICE

2,493,626

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2 Sheets-Sheet 1

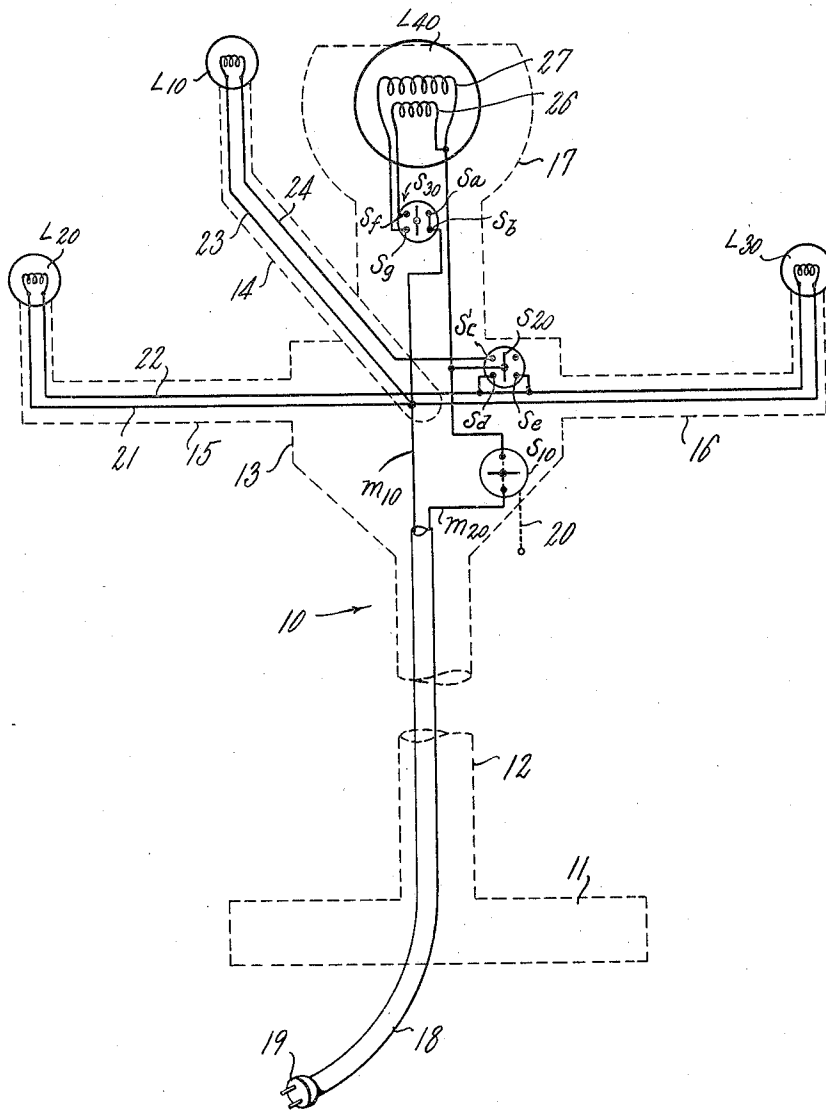


FIG. 1

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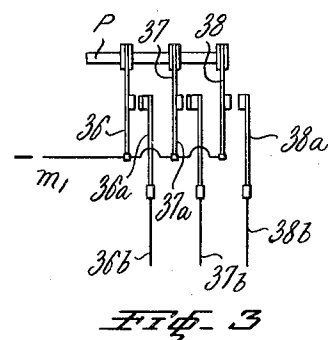
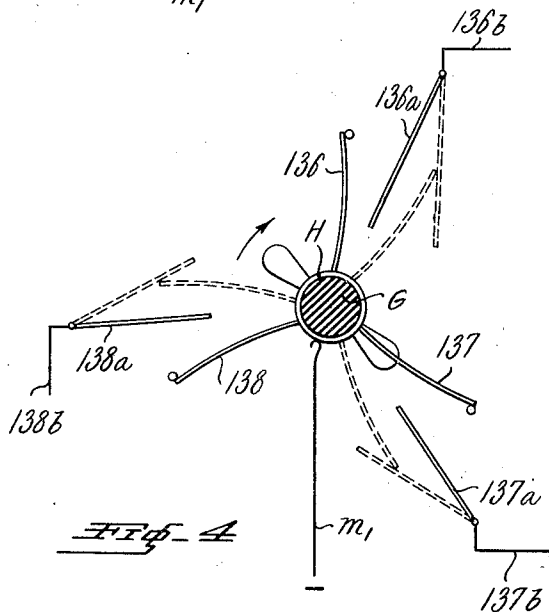
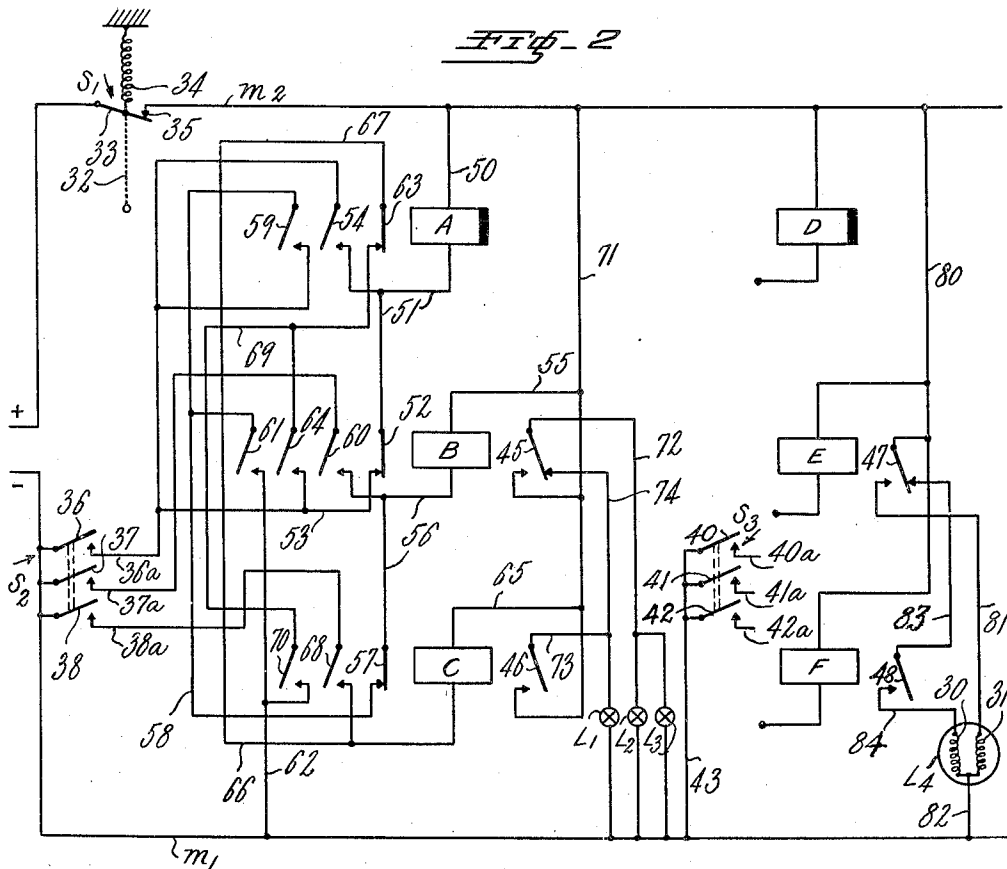
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UNITED STATES PATENT OFFICE

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ELECTRIC LIGHTING DEVICE

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1 Claim. (Cl. 315—312)

1

The present invention relates to electric lamps and more particularly to electric lighting devices adapted to provide different modes of illumination by varying the number of lighting units lit at the same time.

In devices of the aforesaid character, a sequence switch may be employed which starts from "no light" position to one mode of illumination, then to another mode of illumination, and so on, until after a predetermined number of operations the switch returns to "no light" position. This necessitates, however, if the sequence switch has been operated but once to further operate the same and to pass through all modes of illumination before the switch can completely turn out all the lighting units.

It is, therefore, an object of the present invention, to provide an electric lighting device of the character described which avoids the above-mentioned inconveniences and is relatively simple in production and operation.

It is another object of the invention to provide means for stepping an electric lighting device through different modes of illumination and to turn off the aforesaid device in a predetermined position.

It is a further object of this invention to provide means affording convenient operation of two parallel switches each operable to produce different degrees of illumination and of a main switch adapted to inactivate each of said parallel switches.

Yet a further object of the invention is to provide relay means for cooperation with said master switch means and said sequence switch means; said relay means being preferably accommodated in the fixture (foot) of the lighting device.

Still another object of the present invention is to provide means affording the operation of light units selectively from a main switch and from individual switches, the latter being coordinated to said main switch in a very simple and efficient manner.

With the foregoing objects in view together with such other objects and advantages as may subsequently appear, the invention resides in the parts and in the combination, construction and arrangement of parts, hereafter described, claimed and illustrated by way of example in the accompanying drawings, in which:

Fig. 1 shows the outlines of a lighting device according to the invention and a wiring diagram therefor;

Fig. 2 is a modified wiring diagram for a device according to the invention;

2

Fig. 3 illustrates one possible form of switch adapted to be used in connection with the wiring diagram of Fig. 2; and

Fig. 4 illustrates a modified form of the switch of Fig. 3.

Referring to Fig. 1 there are shown in dotted lines the outlines of a lamp 10 which may be a floor lamp consisting of a base 11, a standard 12, a central socket 13 from which three arms 14, 15 and 16 extend, and of an upper socket 17. A cable 18 terminating in a plug 19 passes through the base 11 and the tubular standard 12 in order to supply electric power from any convenient source (e. g. an ordinary wall socket) to the various lighting units. These units may be three single-filament lamps L₁₀, L₂₀ and L₃₀ supported in respective sockets of arms 14, 15 and 16 of device 10 and a double filament lamp L₄₀ held in the socket 17. Mounted on the central socket 13 is a master switch S₁₀ which may be a pull switch provided with a chain 20 while two sequence switches S₂₀, S₃₀ are mounted on the central socket 13 and the upper socket 17, respectively. These switches S₂₀, S₃₀ may be simple snap switches, for example, rotatable through successive positions spaced apart at 60°.

The cable 18 comprises two main wires or conductors m₁₀, m₂₀. Wire m₂₀ contains the master switch S₁₀ while wire m₁₀ terminates at contacts S_a, S_b of the sequence switch S₃₀. The filaments of lamps L₂₀ and L₃₀ are interconnected by two conductors 21, 22 whereas conductor 23 connects the point of junction between conductors 21 and m₁₀ to the filament of lamp L₁₀. The return conductor 24 from lamp L₁₀ is connected to the contact S_c of switch S₂₀ whose two lower contacts S_d, S_e are both connected to the wire 22.

The armature of switch S₂₀ is connected to the conductor m₂₀ which in turn is connected to the two filaments 26, 27 of lamp L₄₀ in parallel. The other ends of filaments 26, 27 are connected to the two left-hand contacts S_f, S_g of switch S₃₀, respectively.

The operation of the circuit arrangement shown in Fig. 1 will be apparent from the wiring diagram. When plug 19 is connected to a current source a pull of the chain 20 will permit selective energization of the lighting units L₁₀ to L₃₀. When the switch S₁₀ is closed (dotted position) rotation of the switch S₂₀ in clockwise direction will first connect wire 22 to conductor m₂₀, hence the two lamps L₂₀ and L₃₀ will be lit. A second actuation of switch S₂₀ will connect through contact S_c conductor m₂₀ further to wire 24 so that

3

lamp L_{10} will likewise be lit. A further rotation of switch S_{20} will disconnect all three lamps from the circuit. Assuming that switch S_{10} remains closed, a first actuation of switch S_{30} will connect the conductor m_{10} to filament 26 of lamp L_{40} , while a second actuation of said switch S_{30} will establish connection with the other filament 27. Further rotation of switch S_{30} will again extinguish lamp L_{40} .

It will be seen that, without regard to the positions of switches S_{20} and S_{30} , a first operation of the master switch S_{10} will bring about complete deenergization of the lamp device 10. A subsequent operation of switch S_{10} will restore the device to the control of the sequence switches S_{20} , S_{30} .

For some purposes, however, it may be desirable to allow the sequence switches S_{20} , S_{30} to resume control of the illumination without intervening re-operation of the master switch S_{10} in order to enable the user to turn on the lamp in a desired manner without first determining whether the master switch had been opened. A circuit arrangement capable of accomplishing this purpose, function and result is shown in Fig. 2.

In Fig. 2 m_1 and m_2 are the main conductors, S_1 is the master switch, S_2 and S_3 are the sequence switches, L_1 , L_2 and L_3 are the single-filament lamps and L_4 is the double-filament lamp provided with two filaments 30 and 31. Three relays A, B and C are associated with the switch S_2 for the purpose of selectively energizing the lamps L_1 , L_2 and L_3 and three further relays D, E and F are similarly associated with the switch S_3 for the purpose of selectively energizing the filaments 30 and 31 of lamp L_4 . Because the electrical connections between each group of relays and the respective sequence switch are identical, the connections between switch S_3 and the relay group D, E, F have not been shown in the drawing.

The master switch S_1 may be a pull switch and provided, for this purpose, with a chain 32; this switch, however, has only one normal position in which its armature 33 is held by a spring 34 onto a contact 35 so as to maintain the conductor m_2 normally intact.

Switch S_2 is a triple-throw switch having three armatures 36, 37 and 38 which, when the switch S_2 is actuated or depressed, are adapted to connect three auxiliary bus bars 36a, 37a and 38a to the main conductor m_1 ; similarly, switch S_3 is a triple-throw switch having three armatures 40, 41 and 42, which are operable to connect three auxiliary bus bars 40a, 41a, and 42a to the main conductor m_1 , by way of an auxiliary conductor 43.

The operation of this circuit arrangement is as follows:

When the master switch S_1 is pulled, it disconnects momentarily the main conductor m_2 from positive potential whereby any relay that may have been energized is released. All the lamps are extinguished under these circumstances, their respective circuits being broken at the front contacts 45, 46, 47 and 48 of relays B, C, E and F, respectively. If switch S_2 is now operated (depressed and released) for the first time, relay A is energized through main conductor m_2 , wire 50, winding of relay A, wire 51, normally closed contact 52 of relay B, wire 53, conductor 36a, armature 36 of actuated switch S_2 , conductor m_1 ; and locks to armature 36 of switch S_2 over its own closed front contact 54 and conductor 36a. Relay B energizes, while switch S_2 is still actuated, through conductor m_2 , conduc-

4

tors 71 and 55, winding of relay B, wire 56, back contact 57 of relay C, wire 58, closed front contact 59 of relay A, conductor 36a, armature 36, conductor m_1 ; relay B now locks to armature 37 over its front contact 60 and conductor 37a and establishes its own holding circuit to conductor m_1 by way of wire 56, back contact 57, wire 58, front contact 61 of relay B, wire 62.

Relay B also breaks the energizing circuit for relay A at contact 52, yet relay A remains energized over armature 36, wire 36a and contact 54 as long as the switch S_2 is depressed. As soon as this switch is released, relay A is deenergized and prepares an energizing circuit for relay C over its back contact 63 and closed front contact 64 of relay B. If, now, switch S_2 is again actuated after an interval during which the master switch S_1 has not been opened, relay C energizes over the aforesaid circuit which includes wires 55, 66, 67 and 53, breaks the holding circuit for relay B (which, however, remains locked to 37—37a as long as switch S_2 is depressed), locks to 38—38a over its closed front contact 68, and establishes its own holding circuit to conductor m_1 by way of wire 66, contact 63, wire 69, closed front contact 70 of relay C, wire 62. After switch S_2 is released, relay B is deenergized, but relay C remains operated over its holding circuit.

A third actuation of switch S_2 energizes relay A in the same manner as when the switch was first operated; yet relay B will remain deenergized, its operating circuit being open at back contact 57 of relay C. Relay A, at its back contact 63, opens the energizing circuit as well as the holding circuit of relay C which latter, however, remains locked to 38—38a as long as switch S_2 is depressed. When this switch is released, both relays A and C deenergize and all relays A, B, C of the first group are now inoperative. Relay A may be made slightly slow-releasing (as indicated in the drawing by shading) in order to insure that relay C is deenergized before its holding circuit over contact 63 can be reestablished.

Thus it will be seen that, after the first operation of switch S_2 , relay B alone is energized; after the second operation of switch S_2 relay C replaces relay B as the only relay operated; after the third operation of the switch all three relays are released. It is thus possible to connect two lamps, say L_2 and L_3 , in such a manner that they will be lit when relay B is energized and to connect the third lamp L_1 in such a manner that all three lamps will be lit when relay C is energized. Thus, the circuit for lamps L_2 , L_3 may be traced from conductor m_2 over wire 71, closed front contact 45 of relay B, wire 72 to conductor m_1 , while the circuit for all three lamps L_1 , L_2 and L_3 is traced from conductor m_2 over wire 71 to closed front contact 46 of relay C, wire 73 through L_1 to conductor m_1 and also from wire 73 over wire 74, closed back contact 45, wire 72 through L_2 and L_3 (in parallel) to conductor m_1 .

In completely analogous manner, filament 31 will be lit when relay E is energized after the first actuation of switch S_3 (conductor m_2 , wire 80, closed front contact 47 of relay E, wire 81, filament 31, wire 82 to conductor m_1) whereas filament 30 will be lit when relay F is energized after the second actuation of the switch S_3 (conductor m_2 , wire 80, closed back contact 47, wire 83, closed front contact 48 of relay F, wire 84, filament 30, wire 82 to conductor m_1). The energization of relay A or D, if and when it occurs, has no effect upon the respective lighting units L_1 , L_2 , L_3 and L_4 .

Fig. 3 illustrates one form of the switch S_2 or

S₃. Three tongues 36, 37, 38 (forming armatures 36, 37 and 38, respectively of Fig. 2) are connected in parallel to the negative conductor *m*₁ and are actuated simultaneously by a push button P to make respective contact with tongues 36a, 37a, 38a connected to respective conductors 36b, 37b, 37c. By making the spacing between tongues 36 and 36a smaller than that between tongues 38 and 38a, the need for making the relay A slow-releasing will be obviated.

Fig. 3 shows a modification for switch S₃ (or S₂). In this form, the switch has three revolving contact arms or tongues 136, 137, and 138 mounted on a shaft G and spaced thereon by an angle of 120°, these arms cooperating, cyclically, with respective stationary tongues 136a, 137a and 138a. The latter tongues are connected, respectively, to conductors 136b, 137b, 138b. Contact arms 136, 137 and 138 may be connected to the negative conductor *m*₁ by way of the conductive sleeve H of shaft G. By making tongue 136a longer than the other tongues of the stationary set, contact between 136a and a respective tongue of the revolving set will be established for a longer period than between the other pairs of contacts, so that the need for making relay D of Fig. 2 slow-releasing may be obviated.

It will be understood that, if conductors *m*₁ and *m*₂ are to be connected to a source of alternating current rather than direct current as shown, no change in the circuit need be made except that relays A to F should be of the alternating current type (they may, for instance, be ordinary D.-C. relays connected in series with a rectifier and shunted by a condenser).

It will thus be seen that each operation of the master switch S₁ initiates a new cycle of operations in which the first, fourth, seventh etc. actuation of a respective sequence switch S₂, S₃ will establish one mode of energization of an associated set of lighting units; a second, fifth, eighth etc. actuation of the same switch will establish a different mode of operation of the respectively associated lighting units, while a third, sixth, ninth etc. actuation will establish a third mode of operation (e. g. darkness). The master switch may be of any type in which a single contact is momentarily opened, while the sequence switches

may be of any type in which three contacts in parallel are momentarily closed.

It will also be seen that no relay of a particular group of relays is operated during periods of darkness for the associated lighting units, irrespectively of whether their deenergization had been brought about by operation of the master switch or by the third, sixth etc. actuation of the respective sequence switch, this fact being important for economic considerations.

Although there has been hereinabove disclosed the re-setting of the sequence switches by electric means such as relays etc. and upon actuation of a master switch, it is well understood that the master switch may also include or may be so constructed as to contain mechanical means, such as gears and spring elements, to bring about re-setting of the sequence switches to initial or starting positions.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent, is:

In a portable electric lighting device, in combination, lighting means, an energizing circuit for said lighting means including circuit means provided with a normal and a plurality of off-normal positions, said circuit means being adapted to effect different modes of energization of said lighting means in the respective positions of said circuit means, a first switch operable in said normal position of said circuit means to displace said circuit means into a first off-normal position thereof and operable in each other position of said circuit means to displace said circuit means into a respective subsequent position, and a second switch operable in each position of said circuit means other than said normal position to effect the immediate return of said circuit means into said normal position.

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