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 off 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 for a 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;

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 La, Lb and Lc supported in respective sockets of arms 14, 15 and 16 of device 10 and a double filament lamp Ld held in the socket 17. Mounted on the central socket 13 is a master switch S1 which may be a pull switch provided with a chain 20 while two sequence switches S2a, S2b are mounted on the central socket 13 and the upper socket 17, respectively. These switches S2a, S2b may be simple snap switches, for example, rotatable through successive positions spaced apart at 60°.

The cable 18 comprises two main wires or conductors m1, m2. Wire m1 contains the master switch S1 while wire m2 terminates at contacts Sa, Sb of the sequence switch S2a. The filaments of lamps La and Lb are interconnected by two conductors 21, 22 whereas conductor 23 connects the point of junction between conductors 21 and 22 to the filament of lamp Le. The return conductor 24 from lamp Le is connected to the contact Sc of switch S2a whose two lower contacts Sd, Se are both connected to the wire 22.

The armature of switch S2a is connected to the conductor m2 which in turn is connected to the two filaments 25, 27 of lamp Le in parallel. The other ends of filaments 26, 27 are connected to the two left-hand contacts Sf, Sg of switch S2b, 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 La to Ld. When the switch S2a is closed (dotted position) rotation of the switch S2a in clockwise direction will first connect wire 22 to conductor m2, hence the two lamps Le and Ld will be lit. A second actuation of switch S2a will connect through contact Sc conductor m2a further to wire 24 so that...
lamp $L_{6b}$ will likewise be lit. A further rotation of switch $S_{4}$ will disconnect all three lamps from the circuit. Assuming that switch $S_{9}$ remains closed, a first actuation of switch $S_{4}$ will connect the conductor $m_{8}$ to filament $26$ of lamp $L_{9}$, while a second actuation of said switch $S_{4}$ will establish connection with the other filament $27$. Further rotation of switch $S_{5}$ will again extinguish lamp $L_{8}$.

It will be seen that, without regard to the positions of switches $S_{4}$ and $S_{5}$, a first operation of the master switch $S_{5}$ will bring about complete deenergization of the lamp device $10$. A subsequent operation of switch $S_{5}$ will restore the device to the control of the sequence switches $S_{4}$, $S_{5}$.

For some purposes, however, it may be desirable to allow the sequence switches $S_{4}$, $S_{5}$ to reverse control of the illumination without interfering re-operation of the master switch $S_{5}$ 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, $S_{4}$ and $S_{5}$ 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 $S_{4}$ for the purpose of selectively energizing the lamps $L_{4}$, $L_{5}$ and $L_{6}$ and three further relays $D$, $E$ and $F$ are similarly associated with the switch $S_{5}$ for the purpose of selectively energizing the filaments $30$ and $31$ of lamp $L_{4}$. Because the electrical connections between each of the relays and the respective sequence switch are identical, the connections between switch $S_{4}$ 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 $22$; 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 $S_{4}$ is a triple-circuit switch having three armatures $36$, $37$ and $38$ which, when the switch $S_{4}$ is actuated or depressed, are adapted to connect three auxiliary bus bars $36a$, $37a$ and $38a$ to the main conductor $m_{1}$; similarly, switch $S_{5}$ is a triple-circuit 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 potential position 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 contact points $45$ of the auxiliary relays $A$, $B$, $C$, $D$ and $E$, respectively. If switch $S_{4}$ 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 $35$ of actuated switch relay $A_{4}$, conductor $m_{1}$; and locks to armature $35$ of switch $S_{4}$ over its own closed front contact $54$ and conductor $36a$. Relay $B$ energizes, while switch $S_{4}$ is still actuated, through conductor $m_{2}$, conduc-
S9. Three tongues S3, S7, and S8 (forming armatures S3, S7, and S8, respectively of Fig. 2) are connected in parallel to the negative conductor m1 and are actuated simultaneously by a push button P to make respective contact with tongues S3a, S7a, and S8a connected to respective conductors S3b, S7b, and S7c. By making the spacing between tongues S3 and S3a smaller than that between tongues S8 and S8a, the need for making the relay A slow-releasing will be obviated.

Fig. 3 shows a modification for switch S8 (or S9). 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 135b, 137b, and 138b. Contact arms 136, 137, and 138 may be connected to the negative conductor m1, by way of the conductive sleeve H of shaft G. By making tongue 138a longer than the other tongues of the stationary set, contact between 138a 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 m1 and m2 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).

Curve A from point 1 to point 5 initiates a new cycle of operations in which the first, fourth, seventh, etc. actuation of a respective sequence switch S4, S5 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. The master switch 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 desenergization 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 resetting 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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