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BLINKING LIGHT ARRANGEMENT

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FIG. 1

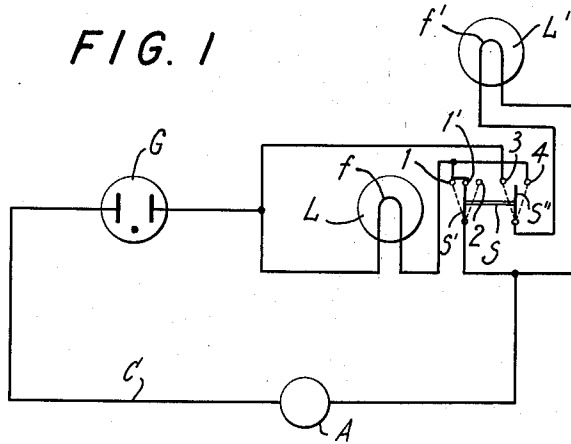
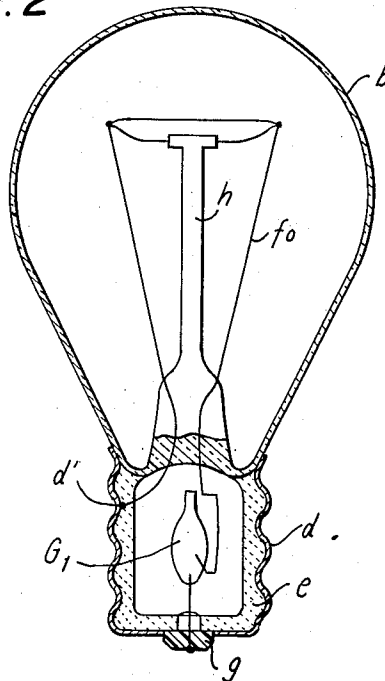


FIG. 2



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The present invention relates to blinking light arrangements, and more particularly to such arrangements in which an electric lighting means is caused to alternate automatically between a maximum of light intensity output and a minimum output which may include zero output.

It is a main object of this invention to provide for a blinking light arrangement of the type set forth which operates without contacts cyclically moved between closed and open positions.

It is another object of this invention to provide for a blinking light arrangement of the type set forth which can be set up to alternate or blink at a predetermined rate which is independent of the frequency of an alternating electric potential applied to the arrangement.

It is still another object of this invention to provide for a blinking light arrangement in the form of an incandescent lamp which includes the means for causing the blinking.

It is still another object of the invention to provide for a blinking light arrangement of extreme simplicity and ruggedness which promises long and reliable service.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Fig. 1 is a circuit diagram illustrating one form of the invention; and

Fig. 2 is a cross-sectional elevation of a blinking lamp according to the invention.

With above objects in mind, the present invention essentially comprises a blinking light arrangement in which electric lighting means including at least one electric incandescent lamp is connected with a glow discharge lamp in series by circuit means adapted to connect the series combination of lamps to a source of electric energy, whereby said electric lighting means is caused to alternate between a maximum of light intensity output and a minimum output which may include zero output.

The invention is based on the discovery that if an electric potential is applied to a series combination including at least one incandescent lamp and one glow discharge lamp, in the first moment the incandescent lamp constitutes only a very small resistance and therefore causes only a small voltage drop thereacross. Consequently, the outside potential is applied almost completely to the glow discharge lamp so that the latter ignites. Hereby the glow lamp becomes conductive for a current passing through the filament of the incandescent lamp whereby the latter is heated up to a temperature which causes output of light of an intensity which increases with the temperature of the filament in accordance with an established characteristic of the par-

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ticular incandescent lamp. During the increase of the temperature of the filament the voltage drop thereacross increases whereby the voltage available for the maintenance of the glow discharge in the glow lamp decreases up to a point where said discharge is cut off. Hereby, as is well known, the glow lamp becomes non-conductive and the flow of current through the filament of the incandescent lamp is interrupted. Consequently, the emission of light therefrom is discontinued and the filament is permitted to cool off. As soon as the filament has cooled off sufficiently to reduce the voltage drop thereacross to an amount which permits the voltage applied to the glow lamp to rise to its "striking voltage," then the whole cycle repeats as described above.

Referring to Fig. 1, a circuit C connected to a source of electric potential A contains in series a glow lamp G and at least one incandescent lamp L. For the purpose of describing the invention more clearly, a double-pole changeover switch S is shown in the circuit C. The switch S has two switch arms s' , s'' which may be moved between three positions: In the first position shown in full lines the arm s' connects with the stationary contact 1'; the arm s'' is idle; in the second position shown in dotted lines the arms s' and s'' make contact with the stationary contacts 1 and 2, respectively; in the third position the arms s' and s'' make contact with the stationary contacts 2 and 4, respectively. The contacts 1 and 1' are permanently connected with each other.

It can be seen from the diagram that with the switch S in its first position the filament f of the lamp L is connected in series with the glow lamp G. With the switch S in its second position a second lamp L' would be connected with its filament f' in parallel with the filament f of the lamp L. Finally, in the third position the switch S has its arms s' and s'' in contact with the stationary contacts 2 and 4 and thereby connects the two filaments f and f' in series with each other.

From the above it should be clear that depending upon the position of the switch S either one incandescent lamp L, or two such lamps L and L' can be connected in series with the glow lamp G, or a combination of two incandescent lamps L and L' in parallel can be connected in series with the glow lamp G. Of course, if such selective operation by means of a change-over switch is not desired, any one of the above-mentioned cases can be established by eliminating the switch S and establishing permanent connections with one or more incandescent lamps to the same effect.

It has been found that excellent results are obtained by using a negative glow lamp, preferably filled with neon or argon gas, and a source of alternating electric potential as source of energy.

It should be realized also that at least one of the incandescent lamps used in the arrangement should have a filament whose characteristic is such that the cold resistance is comparatively low and increases with rising temperature. Ordinary metal filament lamps have been found entirely satisfactory.

It is well known that a glow lamp reacts to voltage changes momentarily and without inertia whenever the applied potential increases beyond the "striking voltage" and whenever the potential drops below the "cut-off" voltage which is slightly below the former. On the other hand, the performance of an incandescent lamp involves a time factor because it takes a certain amount of time until the filament heats up from substantially cold condition to the high temperature required for the emission of light, and similarly until after interruption of the current the filament cools off to substantially cold condition. In turn, the temperature of the filament determines at any moment its resistance and consequently the voltage drop

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thereacross. Therefore, the time sequence or cycle of the blinking or alternating increase and decrease of light emission from the filament depends mainly upon the characteristics of the particular incandescent lamp, particularly upon the speed of heating up and cooling off of the filament, but also upon the thermal coefficient of resistivity of the particular filament material. In addition the voltage applied to the lamps is a determining factor for the performance of the whole arrangement. In a similar manner, glow lamps differ regarding their characteristic "striking voltage" and possibly regarding their corresponding "cut-off voltage."

However, the proper matching of a particular glow lamp and a particular incandescent lamp can be determined easily by simple experimentation without requiring further inventive steps.

In selecting glow lamps and incandescent lamps for a particular blinking light arrangement the important rule to be followed is the following one: an incandescent lamp or a combination of such lamps must have a cold resistance causing a voltage drop thereacross smaller than the difference between the effective voltage of the source of energy applied to said lamp or lamps, and the striking voltage of the glow lamp; in addition said lamp or lamps must have such a resistance characteristic that during the increase of the resistance thereof with rising filament temperatures and light intensity a voltage drop is caused thereacross which rises to an amount larger than the difference between said effective voltage and the cut-off voltage of the glow lamp.

Glow lamps suitable for the purposes of this invention are available in comparatively small sizes so that it is possible to construct a blinking light arrangement in the form of an incandescent lamp as illustrated by Fig. 2 and including the glow lamp.

Fig. 2 shows an incandescent lamp of generally conventional structure, comprising a glass bulb *b*, a threaded metal socket *d* secured to the bulb *b* by means of some suitable ceramic cement *e* and containing a metal filament *f*₀ supported by a stem *h*. One end of the filament *f*₀ is connected to the socket *d* at *d'*. A glow lamp *G*₁ is mounted in the hollow interior of the socket *d* and is connected with one of its poles to the other end of the filament *f*₀, and with the other pole to the center contact *g* of the socket assembly. Consequently, in this blinking bulb according to the invention, a glow lamp is connected in series with the filament of the incandescent lamp so that when this bulb is screwed into a conventional lamp receptacle in an electrical installation, the line potential will be properly applied to the blinking arrangement through the contact *g* and the socket *d*.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of blinking light arrangements differing from the types described above.

While the invention has been illustrated and described as embodied in automatic blinking light arrangements, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention, and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. Blinking light arrangement, comprising, in combination, an electric lighting means including at least one electric incandescent lamp; a glow discharge lamp; and

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circuit means connecting said lamps in series and adapted to connect said series combination of lamps to a source of electric energy, whereby said electric incandescent lamp is caused to alternate between a maximum of light intensity output and a minimum output which may include zero output.

2. Blinking light arrangement, comprising, in combination, an electric lighting means including at least one electric incandescent lamp; a negative glow discharge lamp; and circuit means connecting said lamps in series and adapted to connect said series combination of lamps to a source of alternating electric potential, whereby said electric incandescent lamp is caused to alternate in a sequence independent of the cycle of said alternating electric potential, between a maximum of light intensity output and a minimum output which may include zero output.

3. Blinking light arrangement, comprising, in combination, an electric lighting means including at least one electric incandescent lamp; a gas-filled negative glow discharge lamp; and circuit means connecting said lamps in series and adapted to connect said series combination of lamps to a source of alternating electric potential, whereby said electric incandescent lamp is caused to alternate in a sequence independent of the cycle of said alternating electric potential, between a maximum of light intensity output and a minimum output which may include zero output.

4. Blinking light arrangement, comprising, in combination, an electric lighting means including at least one electric incandescent lamp; a neon negative glow discharge lamp; and circuit means connecting said lamps in series and adapted to connect said series combination of lamps to a source of alternating electric potential, whereby said electric incandescent lamp is caused to alternate in a sequence independent of the cycle of said alternating electric potential, between a maximum of light intensity output and a minimum output which may include zero output.

5. Blinking light arrangement, comprising, in combination, an electric lighting means including at least one electric incandescent lamp, said electric lighting means having low cold resistance and increasing resistance at increasing filament temperatures thereof; a glow discharge lamp; and circuit means connecting said lamps in series and adapted to connect said series combination of lamps to a source of electric energy, whereby said electric incandescent lamp is caused to alternate between a maximum of light intensity output and a minimum output which may include zero output.

6. Blinking light arrangement, comprising, in combination, an electric lighting means including at least one electric incandescent lamp, said electric lighting means having low cold resistance and increasing resistance at increasing filament temperatures thereof; a negative glow discharge lamp; and circuit means connecting said lamps in series and adapted to connect said series combination of lamps to a source of alternating electric potential, whereby said electric incandescent lamp is caused to alternate in a sequence independent of the cycle of said alternating electric potential, between a maximum of light intensity output and a minimum output which may include zero output.

7. Blinking light arrangement, comprising, in combination, an electric lighting means including at least one electric incandescent lamp, said electric lighting means having low cold resistance and increasing resistance at increasing filament temperatures thereof; a gas-filled negative glow discharge lamp; and circuit means connecting said lamps in series and adapted to connect said series combination of lamps to a source of alternating electric potential, whereby said electric incandescent lamp is caused to alternate in a sequence independent of the cycle of said alternating electric potential, between

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a maximum of light intensity output and a minimum output which may include zero output.

8. Blinking light arrangement, comprising, in combination, an electric lighting means including at least one electric incandescent lamp, said electric lighting means having low cold resistance and increasing resistance at increasing filament temperatures thereof; a neon glow discharge lamp; and circuit means connecting said lamps in series and adapted to connect said series combination of lamps to a source of alternating electric potential, whereby said electric incandescent lamp is caused to alternate in a sequence independent of the cycle of said alternating electric potential, between a maximum of light intensity output and a minimum output which may include zero output.

9. Blinking light arrangement as set forth in claim 6, wherein said incandescent lamp has a cold resistance causing a voltage drop thereacross smaller than the difference between the effective voltage of said source of alternating electric potential applied to said series combination, and the striking voltage of said glow discharge lamp.

10. Blinking light arrangement as set forth in claim 9, wherein said incandescent lamp has such a resistance characteristic that during the increase of its resistance with rising filament temperatures and light intensity it causes a voltage drop thereacross rising to an amount larger than the difference between said effective voltage and the cut-off voltage of said glow discharge lamp.

11. Blinking light arrangement, comprising, in combination, a translucent bulb; a connecting socket secured to said bulb and having at least two outside terminals; a filament adapted to become incandescent upon the application thereto of electrical energy of at least a pre-selected magnitude mounted in said bulb and connected with one end to one of said terminals, said filament

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having a low cold resistance and increasing resistance with increasing filament temperatures; a glow discharge lamp having two poles and being located within said socket and connected with one pole to the other end of said filament, and with its other pole to the other one of said two terminals, whereby upon connection of said terminals to a source of electric energy said filament is caused to alternate between a maximum of light intensity and a minimum which may include zero.

12. Blinking light arrangement as set forth in claim 11, wherein said glow discharge lamp is a negative glow lamp, and wherein said source of electric energy is a source of alternating electric potential.

13. Blinking light arrangement as set forth in claim 12, wherein said filament has a cold resistance causing a voltage drop thereacross smaller than the difference between the effective voltage of said source of alternating potential intended to be applied to said terminals, and the striking voltage of said negative glow lamp.

14. Blinking light arrangement as set forth in claim 13, wherein said filament has such a resistance characteristic that during the increase of its resistance with rising filament temperature and light intensity it causes a voltage drop thereacross rising to an amount larger than the difference between said effective voltage and the cut-off voltage of said negative glow lamp.

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