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C. A. B. HALVORSON

2,259,107

LUMINAIRE

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Fig. 1.

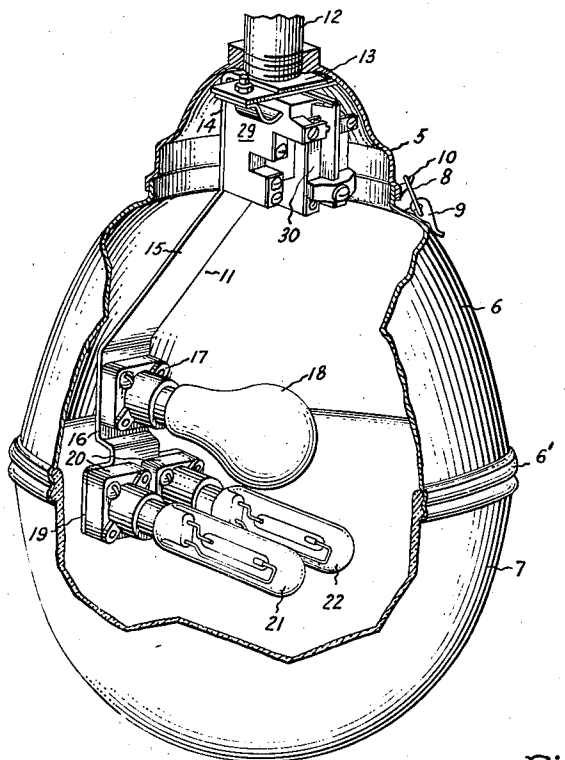


Fig. 2.

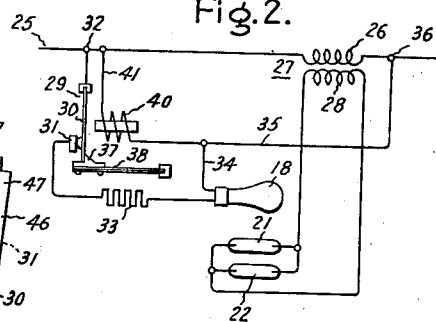


Fig. 3.

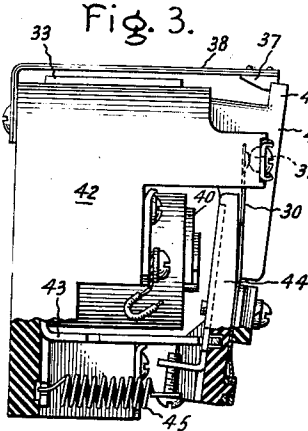
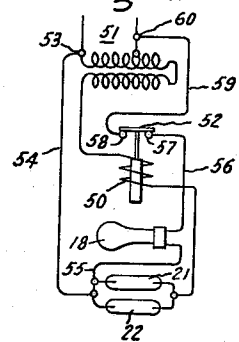


Fig. 4.



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LUMINAIRE

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1 Claim. (Cl. 240—25)

My invention relates to street lighting luminaires, and more particularly to luminaires in which electric discharge lamps are used as a primary source of light.

One object of my invention is to eliminate the outage period due to momentary current interruptions in luminaires equipped with gaseous discharge lamps.

Another object of my invention is to provide an improved arrangement of elements within a luminaire provided with more than one lamp.

For a better understanding of my invention together with other and further objects thereof, reference is had to the following description taken in connection with the accompanying drawing, and its scope will be pointed out in the appended claim.

In view of the high efficiency of gaseous discharge lamps and the possibility of obtaining a large amount of light from relatively small units, it is desirable to use such a light source in street lighting luminaires. For such service, however, it is necessary that the lamps be continually in operation during the time that current is supplied to the lamp, and that the outage periods be kept at a minimum. It is one of the characteristics of gaseous discharge lamps that they will extinguish at the occurrence of only a momentary interruption of current supply, or upon the occurrence of a voltage disturbance, and will not function again for a substantial period thereafter, although the current supply is immediately reestablished. One of the types of gaseous discharge lamps which is desirable for this service is the type in which a filling of gas such as neon or argon is used with a globule of mercury. The mercury is vaporized, and the vapor is ionized during operation, the gas pressure in the lamp being anywhere from one to many times the atmospheric pressure. Lamps of the above-described type, which operate at several times atmospheric pressure, are disclosed and claimed in United States Patent No. 2,094,694.

It is a general characteristic of gaseous discharge lamps that they will operate at a voltage which is lower than the voltage required to start operation of the lamps. It is still another characteristic of lamps of the type disclosed in the above-mentioned patent that if operation should momentarily cease, the lamp will not immediately resume operation unless cooled to a temperature which is substantially below operating temperature.

In order to provide a luminaire suitable for street lighting service, I take advantage of the

second of the above three mentioned characteristics and overcome the disadvantages of the first and last of the above-mentioned characteristics by providing in my luminaire two discharge lamps connected in parallel to a series circuit. With this arrangement, a starting potential is provided which rises up to a value higher than the operating potential until a value is reached at which one of the lamps starts operating. Since it very rarely occurs that two lamps will start at exactly the same voltage, only one of the lamps starts, and the supply voltage, as a result of the current flowing in the circuit, immediately drops so that the second lamp will not receive a sufficiently high potential to start it. The second lamp is therefore a standby lamp which is ready for operation in case the operating lamp is extinguished due to a momentary interruption of current or potential drop sufficient to interrupt the operation of the one lamp. With this arrangement, therefore, it is not necessary to wait for the one lamp to cool off before the luminaire again resumes operation.

In order to adapt my luminaire for all outdoor temperatures, I provide, in addition to the two discharge lamps connected in parallel to a series circuit, an incandescent filament lamp which I arrange to keep energized for a short period after each resumption of current supply. When the lamps are turned on in the evening, the incandescent lamp is fully energized immediately. When lamps of the type disclosed in the above-mentioned patent are used, there is no starting period, and the lamps reach full brilliance immediately. In some of the other types of gaseous discharge lamps, however, it is necessary to raise the temperature of the lamp before the gas becomes luminous, and in some lamps a starting period occurs during which the lamps are not at full brilliance. By including an incandescent filament lamp which attains full brilliance immediately, I provide a supplemental source of illumination for such a starting period, and simultaneously provide a heating element which, if necessary, raises the temperature of the gaseous discharge lamp to a value at which starting is greatly facilitated.

In accordance with another phase of my invention, the discharge lamps and the incandescent lamp, together with its control relay, are mounted within the luminaire in a simplified manner so as to provide an efficient light flux distribution and simultaneously to provide a simplified structure which facilitates manufacture of the luminaire

and which facilitates maintenance of it after installation.

In the accompanying drawing, I have illustrated in Fig. 1 a front elevation, partly in section, of a street lighting luminaire built in accordance with my invention; Fig. 2 is a diagram of connection for the light sources in the luminaire; Fig. 3 is an enlarged side elevation of a control element; and Fig. 4 is a circuit diagram of a modification of my invention.

Referring to Fig. 1 in detail, I have shown a conventional street lighting luminaire comprising a cap 5, a conoidal reflector 6, and a substantially semi-spherical globe 7. The reflector is attached to the cap by two latch mechanisms attached to the reflector 6 and comprising a ring 8 operated by a cam lever 9 and engaging a hook 10 on the cap 5. The lower edge 6' of the reflector overlaps the edge of the globe and is molded thereover by a spinning process which effects such close contact between the two that a substantially dust-tight joint is provided.

Within the cap 5 a bracket 11 is attached at its upper end to the end of a pipe 12. This pipe supports the entire luminaire and is threaded through a suitable opening at the upper end of the cap 5.

The bracket 11 is made of a narrow band of sheet metal which is suitably bent so as to project into the reflector and support the lamps of the luminaire in suitable relationship to this reflector. The upper end 13 thereof is horizontal so as to receive the pipe 12 and is at right angles to the part 14 which projects vertically, near the wall of the cap, to the upper end of the reflector. The adjacent part 15 is bent at an angle to the vertical so as to project toward the wall of the reflector at its lower end and there joins a vertical part 16. Upon this part of the bracket a socket 17 is mounted for an incandescent lamp 18. Below this socket 17 on a widened part 19 of the bracket two sockets 20 are attached side by side to support two discharge lamps 21 and 22. These discharge lamps are supported horizontally and parallel to each other in the focal region of the reflector 6. The incandescent lamp 18 is supported horizontally above the discharge lamps. The relative location of the incandescent lamp 18 and the discharge lamps 21 and 22 within the reflector is such that light from the incandescent lamp is projected and reflected past the discharge lamps, and a part of the heat from the incandescent lamp is transferred to the discharge lamps. Furthermore, this compact arrangement of all the lamps upon a single bracket permits the use of a standard reflector and globe assembly in which the opening in the globe is relatively small. To remove the reflector, it is unlatched and after being lowered to the incandescent lamp, may be moved horizontally to clear all the lamps simultaneously.

In Fig. 2 I have diagrammatically illustrated the manner of supplying current to the discharge lamps 21 and 22 and to the incandescent lamp 18. In this figure I have shown a portion of a series circuit 25 having connected therein the primary winding 26 of a series transformer 27. The discharge lamps 21 and 22 are connected in parallel to the terminals of a secondary winding 28 of the transformer 27. The incandescent lamp is connected to the series circuit 25 through a circuit which is controlled through a combination magnetic and thermostatic relay 29 which is attached to the vertical part 14 of the bracket 11 within the cap 5. The relay is provided with a

movable contact 30 normally in contact with a stationary contact 31 and thereby establishing a circuit from a terminal 32 on one side of the primary winding 26 through a resistor 33 to the lamp 18, and through conductors 34 and 35 to a terminal 36 on the other side of the winding 26. The potential drop between the terminals 32 and 36 is therefore the potential drop across the transformer primary winding 28. The movable contact 30 is held in engagement with the stationary contact 31 by a block 37 mounted on the end of a thermostatic element 38. The thermostatic element when at normal temperature moves the block into the path of the movable contact 30, thereby preventing the arm from moving out of engagement with the stationary contact 31. When current flows through the circuit which is then established, the resistor 33 transfers heat to the thermostatic element 38 and causes the latter to warp and move the block 37 to disengage the end of the movable contact 30. When the movable contact is so released a magnet 40 connected to the series circuit by conductor 35 and by a conductor 41 moves the contact and holds it out of engagement with the contact 31, thereby breaking the circuit to the incandescent lamp. The potential on the coil 40 is also the potential drop across the transformer winding 26, conductors 35 and 41 being connected to the series circuit on opposite sides of the winding 26. The time period for releasing the contact 30 is calculated to be of sufficient length to maintain the incandescent lamp energized during the starting period during which the discharge lamp attains full brilliancy. This period, of course, is adjusted for the particular type of lamp used. In operation, therefore, when current is first supplied to the series circuit 25 in the evening, the incandescent lamp 18 is energized, and due to the characteristics of a series transformer the potential across the lamps 21 and 22 rises until current flows through one of the lamps. As soon as current begins to flow the potential drops to a lower value which is, of course, dependent upon the characteristics of the transformer and of the lamp, and remains at that value until a disturbance in the current supply extinguishes the discharge lamp.

The incandescent lamp, of course, is immediately energized upon the beginning of current flow, and remains energized for a predetermined period until the thermostatic element 38 releases the movable contact 30. The magnet 40 then attracts the arm, to break the circuit of the incandescent lamp and holds the contact as long as current flows in the circuit 25. If thereafter a current interruption is only momentary, the magnet 40 releases the relay contact which is then pulled back into its normal position by a spring to reestablish the incandescent lamp circuit. Simultaneously, current ceases to flow through the discharge lamp and the voltage of the secondary winding 28 immediately rises to starting value, but due to the high temperature of the discharge lamp which was in operation the same lamp will not resume operation. The second lamp connected in parallel thereto, however, will start up at approximately the voltage at which the first lamp started and will supply the necessary light flux. With this arrangement, therefore, interruptions of current of only short duration do not fully interrupt the light output for any period longer than the actual interruption of the current supply. Furthermore, due to the energization of the incandescent lamp during

the beginning of operation of the luminaire, and subsequent to each current interruption, light flux is obtained during the starting period of the lamps, and simultaneously heat is obtained which will facilitate the starting of the discharge lamp at extremely low temperatures.

In Fig. 3 I have illustrated the relay 29 in greater detail. The relay body 42 is moulded of a suitable insulating compound. It supports the magnet 40 and a pivot member 43 for a contact arm 44 to which the moving contact 30 is attached. A spring 45 tends to turn the contact arm clockwise about its pivot member 43 and holds the contacts 30 and 31 in engagement. The arm 44 is provided with an arc shield 46 upon which a projection 47 is provided which engages the block 37 on the thermostatic element 38. The thermostatic element is attached to the upper end of the body 42 with the heating resistor 33 underneath it. As long as the thermostat is at normal temperature the block 37 moves into the path of projection 47 and prevents the energized magnet 40 from separating contacts 30 and 31. When the thermostat is heated it flexes and the magnet 40 overcomes the pull of the spring 45 to separate the contacts. When magnet 40 becomes deenergized, due to current failure, the spring 45 pulls the projection 47 under the wedge-shaped block so that the latter will again snap over the end of the projection and thereby start another sequence of operation.

In Fig. 4 I have illustrated a modified diagram. In this modification the incandescent lamp is energized only as long as the discharge lamps do not consume the normal operating current and therefore do not produce sufficient light flux. This condition occurs, with some discharge lamps, during a short period when potential is first applied to the lamps. In this arrangement a relay magnet 50 is connected in series with the discharge lamps 21 and 22 across the output terminals of an auto-transformer 51. The moving contact 52 of this relay normally closes a

circuit through the incandescent lamp 18. This circuit may be traced from terminal 53 at one end of the auto-transformer winding through conductors 54 and 55 to the lamp 18 and from the lamp through conductor 56, relay contacts 57, 52, 58 and conductor 59 to terminal 60 on the input side of the transformer 51. In this arrangement the incandescent lamp remains energized as long as the relay magnet coil 50 is deenergized. This occurs when less than the normal operating current flows through either of the discharge lamps. When normal current does flow through either lamp the relay operates, the circuit through the incandescent lamp is broken, and the lamp is extinguished. This arrangement therefore provides the light of the incandescent lamp during the starting period of the discharge lamps in a manner directly responsive to the current flow through the discharge lamps instead of for a definite time period as in the first instance described in connection with Figs. 1, 2 and 3. This arrangement is suitable for discharge lamps in which light output is directly proportional to the current flow and in which, therefore, full brilliance is obtained as soon as normal operating current flows through the lamp.

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

In a street lighting luminaire, the combination of a conoidal reflector, a supporting cap therefor, a plurality of discharge lamps mounted horizontally in the focal region of said reflector, an incandescent lamp mounted above said discharge lamps in heat exchange relation to said discharge lamps, a control relay operable to control said incandescent lamp, and a bracket mounted at one end in said cap and projecting adjacent the surface of said reflector to the focal region of said reflector, said bracket having mounted thereon said incandescent and discharge lamps and said relay.

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