Aug. 18, 1959 K. F. FRANK 2,900,520

LIGHT SENSITIVE CONTROL MEANS

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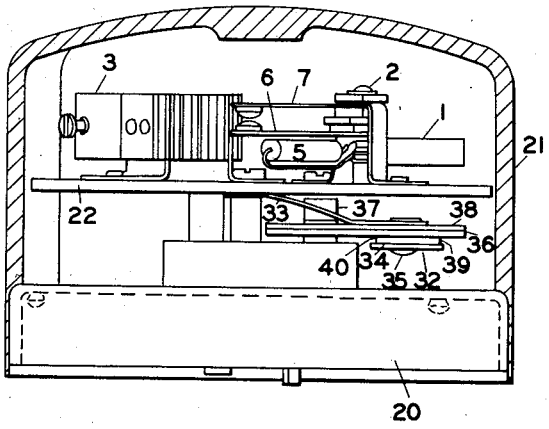

FIG. 1

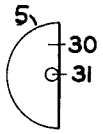

FIG. 2A

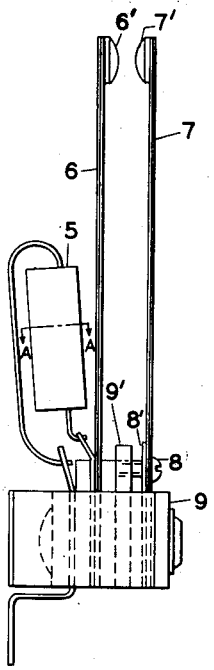

FIG. 2

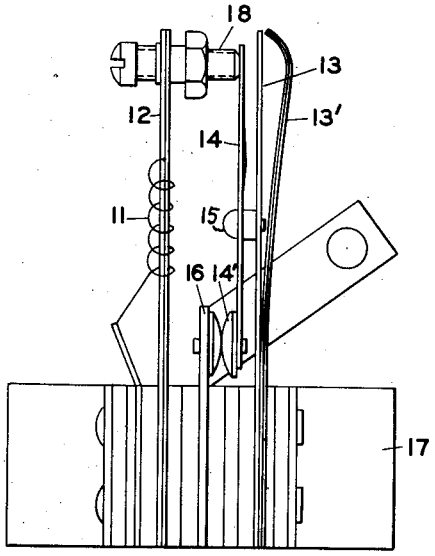

FIG. 3

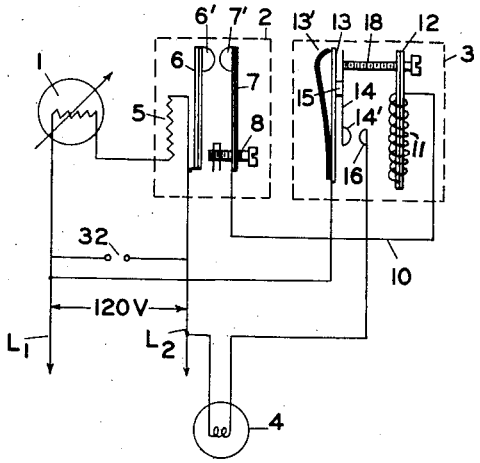

FIG. 4

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LIGHT SENSITIVE CONTROL MEANS

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This invention relates to automatic control means and more particularly to automatic control of street lights.

It is desirable to have individual automatic control for street lights for several reasons. It is preferable to decentralize control as much as possible in order to isolate trouble so that one failure would not disrupt more than one light. It is too expensive and not practical to lay separate control cables. Therefore, it is the usual practice to put individual switches in each light.

Some prior automatic devices for turning street lights on and off generally include an electric clock. These systems are expensive and must be individually reset as the days become longer and shorter. Other devices have included photocells operating magnetic relay and vacuum tube circuits. One difficulty with these systems is that they are responsive to intermittent light such as lightning and passing automobile lights. Also magnetic relays and vacuum tubes are sources of continual trouble, and in street lighting, maintenance is an important item. Radio controlled systems are unduly complicated and are subject to interference such as automobile ignition and atmospherics.

Therefore, there is a need for automatic street lighting control means which is fully automatic, which does not require resetting as the days lengthen and shorten, which is not responsive to intermittent light such as lightning or automobile headlights, or to other types of interference, and which eliminates all magnetic relays and vacuum tubes.

The present invention provides such automatic street lighting control. It comprises generally a photocell, temperature compensated contact means responsive to the average output of the photocell, and temperature compensated power contact means responsive to the integrated thermal output of the control contact means. All vacuum tube amplifiers and magnetic relays are eliminated.

Accordingly, a principal object of the invention is to provide new and improved automatic street lighting control means.

Another object of the invention is to provide new and improved street light control means responsive to average light intensity.

Still another object is to provide new and improved thermal control means.

A further object is to provide thermostatic means insensitive to ambient temperature.

A still further object of the invention is to provide control means having a useful thermal output.

Another object of the invention is to provide light sensitive automatic control means which are inexpensive and easy to maintain, and which do not use vacuum tubes or magnetic relays.

These and other objects of the invention will be apparent from the following specification and drawings, of which:

Figure 1 is an elevation view partially in section of the embodiment of the invention.

Figure 2 is a detail view of the control contact means.

Figure 2A is a sectional view along line A—A of Figure 2.

Figure 3 is a detail view of the power contact means, and

Figure 4 is a schematic circuit diagram.

Referring to the figures, the invention generally comprises a photocell **1**, temperature compensated control contact means **2**, temperature compensated power contact means **3**, and utilization means **4** which may be an electric light.

The photocell **1** may be conventional, for instance, of the photo resistor type. It is connected to one side of the electric line L_1, and its other terminal is connected to a resistor **5** which is mounted adjacent and connected to the bimetallic strip **6** which is also connected to the other side of the electrical line L_2. The bimetallic strip **6** has a contact **6'**, and a second bimetallic strip **7** having a contact **7'** is mounted parallel to the strip **6**. The bimetallic elements **6** and **7** are mounted in insulated base **9** and are arranged so that ambient temperature variation will cause them to bend in the same direction without making contact. Adjustment screw **8** is provided to adjust the contact spacing. Spring **8'** bears against strip **7** and screw **8** engages threaded bracket **9'**.

When the photocell **1** is energized by light, a small current will flow through the photocell **1** and the resistor **5** to the other side of the line. The resistor **5** has a relatively high resistance, for instance, 12,000 ohms, and it is so located as to heat the bimetal strip **6** causing the conact **6'** to close with contact **7'**. High resistance is necessary to generate sufficient heat with the small control current. The resistor **5** may be a common carbon resistor costing only a few cents preferably with a portion of the insulation covering removed, Figure 2A. The insulation covering **30** is removed on one side almost to the carbon core **31**. The stripped side faces the bimetal strip **6** for greatest heat transfer thereto. It would not be possible to wind a coil having sufficient resistance on the strip **6**. If it were possible it would be extremely expensive.

The resistor **5** is responsive to average or integrated light condition output of the photocell. Therefore, it will not operate the control contacts in response to spurious light flashes from automobile headlights or lightning.

The contact **7** is connected by means of the lead **10** to a heating coil **11** which is mounted on and connected to a bimetal strip **12** in the power contact means. The bimetal strip **12** and strip **13** are mounted in parallel relation, and the strip **13** has mounted on it a spring element **14** having a contact **14'**. A curved bimetal strip **13'** bears against strip **13** at the top. This provides operability over a greater temperature range than with two parallel bimetal strips. The spring element **14** is a bistable element which operates as a detent or snap action device. It is mounted on the bimetal element **13** by means of a stud **15**. A stationary contact **16** is mounted on the insulator base **17** and is adapted to be contacted by the contact **14'**. An adjustment screw **18** is mounted on the bimetal strip **12** and bears against the element **14** for purposes of contact adjustment.

The operation of the power control contacts are as follows. The bimetal elements **12** and **13'** are temperature compensated so that they will both bend in the same direction in response to ambient temperature change. However, when current flows through the heating coil **11** due to the closing of the control contacts **6'** and **7'**, heat is generated and the bimetal element **12** will bend in a direction to close the contacts **14'** and

16 which will energize the load 4. The heating coil is also an integrating device and is responsive only to average light conditions.

The load circuit is from one side of the line L_1 through strip 13, element 14, contacts 14' and 16, to load 4, and back to L_2.

The control circuit is completed from L_2 through contacts 6' and 7', conductor 10, heating coil 11, bimetal strip 12, screw 18, spring 14, stud 15 and strip 13, back to L_1. The control current is low, and it is easily handled by the control contacts. The control contacts would not be able to carry the load circuit directly, nor is there enough power in the control circuit to operate the snap action switch 14 which is necessary to provide positive contact and eliminate sparking.

Both sets of contacts are temperature compensated since the bimetal strips bend in the same direction and both have the necessary integration, namely, the heating elements, to prevent spurious responses. Therefore, a double integration is provided.

Figure 1 shows a view of an embodiment of the invention comprising a base 20 adapted to be mounted on top of a street lighting globe. A translucent cover 21 is provided which transmits the light to the photocell. The cover may be of the type disclosed in my Patent No. 2,756,349, Light Integrating Means for Photocell Circuit, granted July 24, 1956. The cover may be made of Lucite or equivalent. The inside area of the cover is preferably roughened adjacent the photocell to facilitate the transmission of light to the photocell. The cover itself provides an integrating effect as light striking from any direction will have some component transmitted to the position of the photocell. The control contact means 2 and the power contact means 3 may be mounted on suitable bracket 22 which is connected to the base member. The photocell 1 is mounted on the bracket 22.

Lightning arrester 32 is mounted by bracket 33 and is connected across the line. One plate 34 is connected to one side of the line via stud 35 and bracket 33. The other plate 36 is connected to the other side of the line via rod 37. Plate 36 is insulated by insulator 38 and the two plates are separated by insulator 39. Sparks across the gap 40 are blown out by air expansion in the gap cavity.

The invention is not necessarily limited to street lighting systems but may be used wherever photocell automatic control circuits may be used.

I claim:

1. Light sensitive control means comprising a photo-sensitive means, heat operated control contact means connected to and responsive to the integrated output of said photo-sensitive means, and heat operated power contact means connected to and responsive to the integrated output of said control contact means.

2. Light sensitive control means comprising a photocell, control contact means connected to and responsive to the integrated output of said photocell, said control contact means including a pair of temperature compensated bimental strips and heating means connected to said photocell, and heat operated power contact means connected to and responsive to the integrated output of said control contact means.

3. Light sensitive control means comprising a photo-resistor, control contact means connected to and responsive to the integrated output of said photo-resistor, said control contact means including a pair of temperature compensated bimetal strips and heating means connected to said photo-resistor, heat operated power contact means connected to and responsive to the integrated output of said control contact means, said power contact means including a pair of temperature compensated bimetal strips, and heating means connected to said control contact means.

4. Temperature compensated light sensitive means comprising a photocell, a first pair of bimetal strips having contacts mounted in parallel relation, a resistor mounted adjacent one of said strips and connected in series with said photocell, said resistor being a carbon resistor with the insulation substantially removed on one side, said bimetal strips being adapted to close said contacts on the application of heat from said resistor, a second pair of bimetal strips mounted in parallel relation, a heating coil mounted adjacent one of said second strips, said coil being connected in series with said first contacts, a snap action contact being mounted on the other of said second strips, a stationary contact adapted to be contacted by said snap action contact, said last two contacts being connected in series with utilization apparatus.

5. Temperature compensated light sensitive means comprising a photocell, a first pair of temperature compensated bimetal strips having contacts mounted in parallel relation, heating means mounted adjacent one of said strips and connected in series with said photocell, said bimetal strips being adapted to close said contacts on the application of heat from said heating means, a second pair of temperature compensated bimetal strips mounted in parallel relation, a heating coil mounted adjacent one of said second strips, said coil being connected in series with said first contacts, a snap action contact being mounted on the other of said second strips, a stationary contact adapted to be contacted by said snap action contact, said last two contacts being connected in series with utilization apparatus.

6. Temperature compensated light sensitive means comprising a photocell, a first pair of bimetal strips having contacts mounted in parallel relation, a resistor mounted adjacent one of said strips and connected in series with said photocell, said bimetal strips being adapted to close said contacts in response to the integrated output, a second pair of bimetal strips mounted in parallel relation, a heating coil mounted adjacent one of said second strips, said coil being connected in series with said first contacts, a snap action contact being mounted on one of said second strips, a stationary contact adapted to be contacted by said snap action contact, said last two contacts being connected in series with utilization apparatus.

References Cited in the file of this patent

UNITED STATES PATENTS

1,618,816	Davies	Feb. 22, 1927
1,878,010	Spahr	Sept. 20, 1932
1,949,689	Lamb	Mar. 6, 1934
2,054,380	Lamb	Sept. 15, 1936
2,057,384	Lamb	Oct. 13, 1936
2,543,262	Thomson	Feb. 27, 1951
2,748,223	Frank	May 29, 1956