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SUN SWITCH

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Fig. 1.

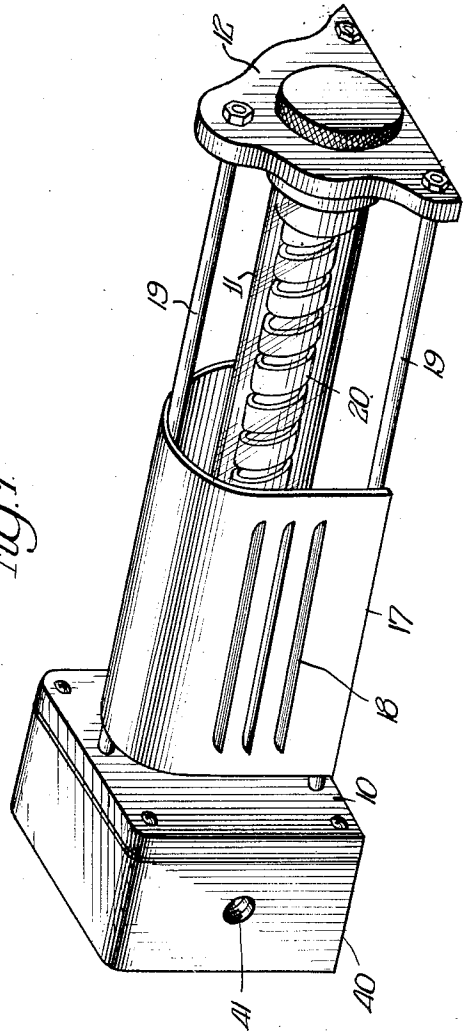
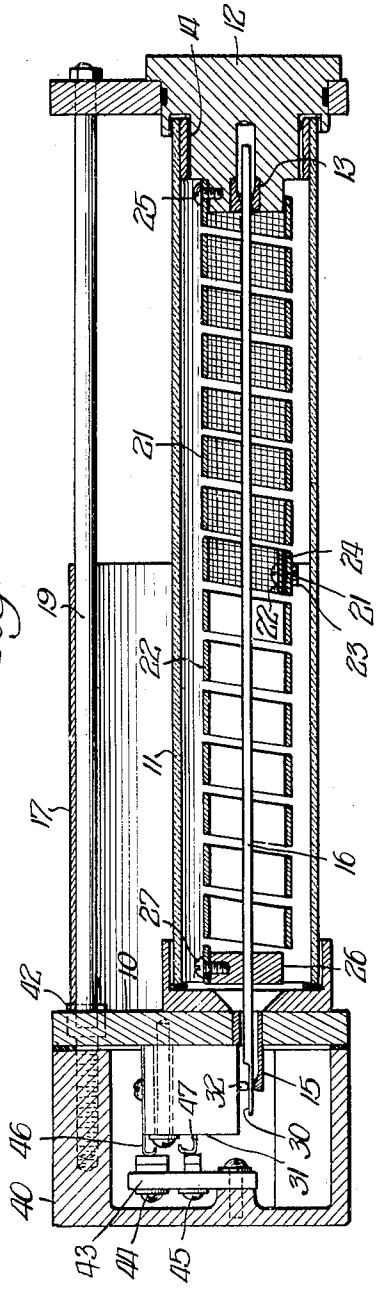


Fig. 2.



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SUN SWITCH

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1

This invention relates to a sun switch in which an electrical switch is operated by the presence or absence of light.

It is a primary object of this invention to provide an improved sun switch, which is more sensitive to light and which is more accurate than those heretofore proposed.

There are many instances in which it is desired to automatically close electrical circuits in response to a condition of light or darkness. One important use of such a switch is to automatically control operations of isolated beacons or other unattended lights, and the like. It has heretofore been proposed to use bi-metallic strips, which are exposed to sunlight, to control operation of electrical switches, the heat from the sun causing the bi-metallic strip to open or close a switch. A difficulty that has been encountered in such switches is the necessity of providing for variations in the ambient temperature. Obviously, such switches are of no value if they operate only from variations in temperature.

It has heretofore been suggested to use two metallic strips, one of which was exposed to light and the other of which was not—or one of which was darkened to absorb heat from light and the other of which was reflective, connected by suitable linkage to correct ambient temperatures. Such linkages were sometimes complicated and sometimes not as accurate as desired. Another defect was that most devices, as they operate on the principle of thermo-dynamics, were more affected by bright sunlight, such as at noon, and less by reduced light, such as sunrise and sunset. Thus, there often tended to be a difference in operative effectiveness between the various hours of the day. The critical periods of operation are at sunrise and sunset and a primary object of my invention is to provide a sun switch which will be more sensitive at sunrise and sunset.

Briefly, my switch comprises two helical bi-metallic strips so connected as to form a continuous helix. However, one of the strips has the high expansion metal on the outside, while the other has the high expansion metal on the inside so that the helices rotate in opposite directions upon variations in temperature and this compensates for variations in the ambient temperature. The helix with the high expansion metal on the outside is painted black, or some dark color, and exposed to sunlight, while the second helix is painted white, or some other light color, to reflect sunlight and, preferably, is protected by a hood which provides a shaded insulated space around the metallic element. Preferably, the

2

switch is placed in a north-south position and the hood will extend around the second portion of the bi-metallic element, so as to protect it from sunlight. Obviously, the first portion of the element is not shaded, at least at the sides for it must be exposed to the sun in the early morning and late evening.

My invention will be more readily understood by reference to the drawing which forms a part hereof and in which Figure 1 represents an isometric view of my invention and Figure 2 represents a vertical cross sectional view of my device.

Mounted on a base plate 10 is a transparent cylinder 11 which may be made of any suitable transparent material but which, preferably, will be made of glass. The outer end of the tube 11 is closed by a cap 12 which carries a bearing 13 axially aligned with the tube. It is preferred that an insulating and sealing gasket 14 be inserted between the cap and the tube in order to make it air-tight. A bearing 15 is also provided in the base plate and is aligned with the first mentioned bearing 13, the two bearings being adapted to receive a shaft 16, extending lengthwise of the tube 11 and to permit it to freely slide longitudinally as well as rotate therein. Also, mounted on the base plate 10 is a hood 17 spaced away from the transparent cylinder 11, as shown. Preferably, this hood extends over the top of the cylinder when it is placed in a horizontal position, for about half its length so as to shade the top and sides of the tube, as shown. It is also preferred that the sides of the hood be provided with louvers 18, as shown. The entire assembly, forming what might be called a casing, can be held together by any suitable means, such as a plurality of tie rods 19.

Mounted on the shaft 16, in the interior of the transparent tube 11, is a bi-metallic element, generally indicated by 20. The bi-metallic element comprises two sections 21 and 22. The first section 21 is made of a thermostatic bi-metallic metal with the high expansion metal on the outside and is dark colored, preferably black. The second element 22 is also of bi-metallic metal, but has the high expansion metal on the inside and is light colored, preferably white. The two sections 21 and 22 are rigidly secured together at the center by any suitable means such as machine screws 23, and at the connection are separated by a short insulator strip 24. Obviously, the two sections of the bi-metallic element should be made of the same bi-metallic material in order that their rates of expansion will be identical and both should be of the same length so that

the angle of twisting should be identical for variations in ambient temperatures. It will be obvious the first section 21 will rotate in a clockwise direction with an increase of temperature, while the second element 22 will rotate counterclockwise with an increase in temperature. One end of the bi-metallic element 20, such as the free end of the first section 21, is rigidly attached to the cap 12, or other part of the casing, such as by screw 25. The other end of the element 20, such as the free end of the second section 22, is rigidly affixed to the shaft 16 by any suitable means such as collar 26, to which it is affixed, as by screw 27, the collar being rigidly mounted on the shaft 16 by any suitable means not shown. The light colored end of the helix should be arranged under the hood and the dark colored portion should be unshaded, as shown.

The shaft 16 extends through the bearing 15 and base plate 10, as shown in Figure 2. The end of the shaft 16 is flattened, as at 30 to form a cam. Associated with the cam portion 30 of the shaft 16 is an electrical switch which is moved between open and closed position by a slight movement of a bearing member 32 which contacts the cam portion 30 on shaft 16. Many suitable switches are manufactured on the market, but one that I have found very satisfactory is a Micro pin-type switch which is actuated by movement of the bearing member of .0003 inch. In a neutral position the bearing member 32 will contact the flat portion of the cam 30, in which case, customarily, it will be preferred that the switch be open. It will be obvious that as the adsorption of heat from light twists the bi-metallic element 20 thereby rotating the shaft 16, the bearing member 32 of the switch 31 will be moved by rotation of the shaft to close the switch 31.

Enclosing the switch 31 and cam 30 is a casing 40 which preferably is tapped and threaded as at 41 to receive an electrical conduit, not shown. The cap 40 can be removably attached to the base plate 10 by any suitable means such as studs 42. In some installations it may be preferred to place an insulating plate 43 within the cap 40 and to attach electrical binding posts 44 and 45 thereto. These binding posts are adapted to receive the ends of electrical power lines, not shown. The switch is connected to the binding posts by spring members 46 and 47 which, when the cap and base plate are assembled engage the binding posts 44 and 45, respectively. Thus the binding posts 44 and 45 can be connected to suitable power leads while the cap is removed from the base plate. Then when the base plate 10 and cap 40 are assembled there is an automatic connection to the switch 41 through the spring contacts 46 and 47.

It is believed that operation of my sun switch will be obvious. In the absence of sunlight the ambient temperature enclosing both sections of the bi-metallic element will be the same and the shaft 16 will be in a neutral position regardless of the ambient temperature. This is due to the fact that as the two sections of the bi-metallic element are of the same length, and have the same coefficient of expansion, but operate in opposite directions, ambient temperature changes thus will rotate the two sections equally in opposite directions, thereby neutralizing their rotational effect. Any expansion of the metals can exert a force in a longitudinal direction without changing the setting of the switch 42. However, when the sun shines upon the first section 21 of the bi-metallic element its darkened color adsorbs heat from the light. As the other section 22 of the bi-metallic element is both shaded and darkened the light will have no effect upon the second section. Thus the total effect of the bi-metallic element will be to rotate it through a slight angle, which rotates the shaft 16 and its cam 30, thereby moving the pin 32 of the switch 31. With the passing of the light the first section will cool relative to the second and rotate the shaft and cam 30 in a backward direction to again present the flattened surface 30 to the pusher rod 32.

It will be obvious to those skilled in the art that various modifications of my invention can be made without departing from the spirit and scope thereof. Accordingly, the appended claims are to be given a construction commensurate with the scope thereof and as broad as is permitted by prior art.

I claim:

1. A sun switch comprising a casing having a transparent portion, a helical bi-metallic element of relatively small diameter in the transparent portion, one end of which has the high expansion side outside and the other side of which has the high expansion on the inside of the helix, one end of said helix being painted white and the other painted black, a rotatable and longitudinally displaceable shaft journaled in said casing, one end of said bi-metallic element being affixed to said casing and the other end of said bi-metallic element being affixed to said shaft, a cam carried by said shaft and a switch operated by said cam.

2. The apparatus of claim 1 comprising also a hood shading the white portion of said bi-metallic element.

3. The apparatus of claim 1 comprising also an insulator separating the two ends of said helix.

4. A sun switch comprising a base plate, a transparent cylinder affixed to said base plate, a cap on said transparent cylinder, a rotatable and longitudinally displaceable shaft axially aligned in said transparent cylinder, a two-sectioned helical bi-metallic element co-axially aligned with said shaft, one section of which has the high expansion side outside and the other section of which has the high expansion on the inside of the helix, one section of said helix being painted white and the other painted black, one end of said bi-metallic element being affixed to said shaft and the other end thereof being rigidly secured with respect to said base plate, a cam carried by said shaft and a switch operated by said cam.

5. A sun switch comprising a transparent casing, a helical bi-metallic element within said transparent casing, one end of which has the high expansion side outside and the other side of which has the high expansion on the inside of the helix, one end of said helix being light colored and the other dark colored, a hood superposed over the light portion of said bi-metallic element, one end of said helix being rigidly secured to said base casing, a longitudinally displaceable shaft keyed to the other end of said bi-metallic element, a cam carried by said shaft and a switch operated by said cam.

6. A sun switch comprising a casing having a transparent portion, a helical bi-metallic element within the transparent portion of said casing, one end of which has the high expansion side outside and the other side of which has the high expansion on the inside of the helix, one end of said helix being light colored and the other dark colored, a longitudinally displaceable cam keyed to one end of said bi-metallic element, the other end

of said helix being rigidly secured to said casing and a switch operated by said cam.

7. A sun switch comprising a base plate, a transparent casing affixed to said base plate, a rotatable and longitudinally displaceable shaft axially aligned in said transparent casing, a two-sectioned helical bi-metallic element in said casing coaxially aligned with said shaft, the two sections being of equal length and equal coefficient of expansion, the first section of said element being painted black and having the high expansion side outside and the second section of said element being painted white and having the high expansion side on the inside of the helix, means affixing one end of said element to said shaft,

means rigidly securing the other end of said element with respect to said base plate, a cam carried by said shaft, and a switch operated by said cam.

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