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E. K. CLARK

THERMOSTATIC DEVICE

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Fig. 1.

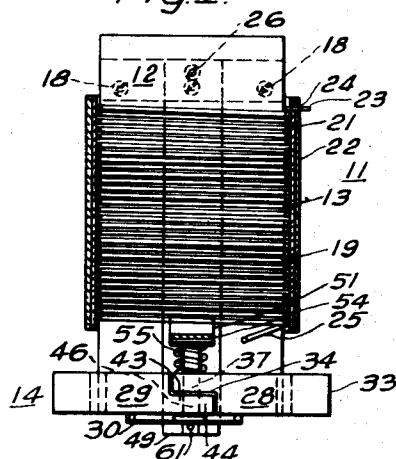


Fig. 2.

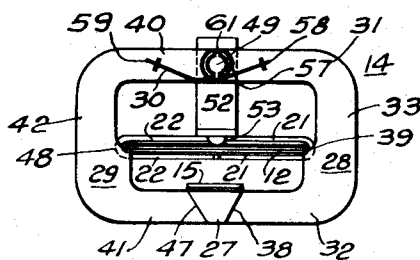


Fig. 3.

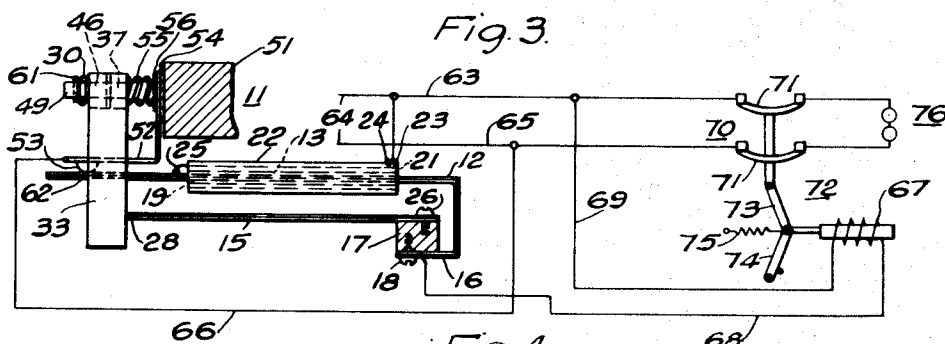
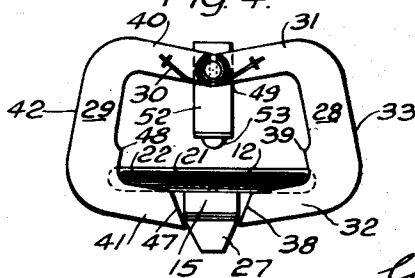


Fig. 4.



WITNESSES:

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THERMOSTATIC DEVICE.

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My invention relates to thermally actuatable circuit controlling devices and particularly to such devices for controlling the intermittent energization of electric energy-trans-

lating devices.

An object of my invention is to provide a thermally actuatable circuit controlling device that shall be operable to energize and de-energize an electric translating device inter-

mittently by the operation of a thermal means, as distinguished from electro-magnetic means, in accordance with a predetermined time cycle.

Another object of my invention is to provide a circuit controlling device for energizing an electric translating device inter-

mittently in accordance with a predetermined time cycle and that shall have thermally controlled means for causing contact members associated therewith to be disengaged with a snap motion.

Another object is to provide a motor means having a reciprocating motion.

In practicing my invention, I provide a thermally actuatable device that comprises, in general, a pair of spaced coextending bimetallic members, one of which is normally biased towards engagement with a station-

ary contact member. The biased bimetallic member is preferably of larger dimensions than the other, and has inherently, therefore, a larger thermal capacity.

A heating coil is provided for heating the larger bimetallic member directly, but is so

located thereon that the smaller bimetallic member is also heated thereby. When the bimetallic members have been thermally energized to predetermined conditions, the smaller member causes the larger member

to be released and disengaged from the stationary contact member with a snap motion.

The device embodying my invention is particularly adapted as an electric flasher for intermittently energizing and de-energizing

such translating devices as electric signs, but it may also be utilized as an operating means for mechanical, as distinguished from electrical devices.

In the single sheet of drawings,

Figure 1 is a top plan view, partially in section, of a device embodying my invention,

Fig. 2 is a front view of the device illustrated in Fig. 1,

Fig. 3 is a side view, partially in section, of the device illustrated in Figures 1 and 2, in circuit with a device to be controlled, and

Fig. 4 is a front view of the device illustrated in Fig. 1, in a circuit-interrupting position.

In the drawings, a thermally actuatable control device 11 comprises a bimetallic member 12, a heating coil 13 therefor, a biasing means 14 for maintaining the bimetallic member 12 in a predetermined position, and a second bimetallic member 15 disposed in thermal relation with the member 12 and in operative relation with the biasing means 14.

In a preferred form of my invention the bimetallic member 12 may be a relatively wide strip, of substantially L-shape, that has an end portion 16 thereof secured to a base 17 by such means as screws 18 (see Figs. 1 and 3).

The heating coil 13 comprises a plurality of turns 19, of suitable resistance, in wire or ribbon form disposed around the bimetallic member 12. The coil 13 is insulated from the member 12 by suitable insulation 21, that is held in place by casing or sheath 22. A terminal 23 of the heating coil 13 extends through casing 22 and is insulated therefrom by a bushing 24, and the other terminal 25 thereof is suitably secured to the member 12 as by brazing or welding.

The second bimetallic member 15 may be in the form of a narrow strip, having substantially the same thickness as the member 12, that is secured to the base 17 by a screw 26. The member 15 is so located below the heating coil 13 and the bimetallic member 12, that it will receive thermal energy therefrom either by convection, conduction, radiation, or by any combination thereof, depending upon the thermal characteristics of the heating coil 13 and of base member 17.

A cam 27 of substantially trapezoidal section is suitably secured to the free end 28 of the member 15.

The biasing or latching means 14 comprises a pair of cooperating members 28 and 29, of substantially U-shape, and a spring 30 secured thereto.

The member 28 comprises a pair of horizontally extending portions 31 and 32, and a vertically extending portion 33 integral therewith. The portions 31 and 32 may be

of substantially rectangular section throughout if so desired. A substantially right-angle section 34 (see Fig. 1) is removed from the portion 31 through which an aperture 37 extends. The portion 32 is provided with an inclined surface 38, at the end thereof, that slopes upwardly to the right. A projection or shoulder portion 39 extends inwardly to the left from the vertically extending portion 33 for a purpose to be hereinafter set forth.

The member 29 is substantially similar, in dimensions and section, to the member 28, and comprises horizontally extending portions 40 and 41, and a vertically extending portion 42 integral therewith. A substantially right angle section 43 is removed from the portion 40 in a side 45 thereof through which an aperture 46 extends. The portion 41 is provided with an inclined surface 47, located at the end thereof, that slopes upwardly to the left. A projection or shoulder portion 48 is located on the vertically extending portion 42 and extends inwardly to the right for a purpose to be, hereinafter, explained.

A supporting pin 49 is secured to a base 51 of insulating material. An angle piece 52, on which a stationary contact 53 is located, is flexibly mounted on the pin 49 and separated from the base 51 by a washer 54. A coil spring 55 is coaxially mounted on the pin 49 and is spaced from the angle piece 52 by a washer 56.

The members 28 and 29 are supported by the pin 49 which extends through the apertures 37 and 46. It is to be noted in Figs. 1 and 3 of the drawings that the angle sections 34 and 43 so facilitate the interfitting of the members 28 and 29 that the portions 31, 40, and 32, 41 are substantially in alignment.

A central portion 57 of the spring 30 is coiled around the pin 49 and its ends 58 and 59 are suitably secured to the portions 31 and 40 of the members 28 and 29. The central portion 57 is pressed inwardly against the members 28, until the coil spring 55 has been compressed to provide sufficient flexibility and resiliency to the angle piece 52, and is held in this position by a pin 61 which extends through the outer end of the pin 49.

The spring 30 tends to bias the members 28 and 29 towards the positions illustrated in Fig. 2. When in this position an end portion 62 of the bimetallic member 12 so rests on the shoulder portions 39 and 48 that it is latched in positive engagement with the contact 53 of the angle piece 52.

In Fig. 3 of the drawings, the device embodying my invention is illustrated schematically in circuit with a device to be controlled. The terminal 23 of the heating coil 13 is connected to a conductor 63 of an electric supply circuit 64, and the other terminal 25 thereof

is connected to a conductor 65 of the supply circuit through the bimetallic member 12, switch contact 53, and a conductor 66.

The energization of an electromagnet coil 67 is controlled by the bimetallic member 12. The circuit of the magnet coil comprises supply conductor 65, conductor 66, stationary contact 53, bimetallic member 12, conductor 68, coil 67, conductor 69 to supply conductor 63.

The electromagnet coil 67 is here represented as controlling a switch mechanism 70, which comprises a pair of movable contact bridging members 71 and an actuating mechanism 72 therefor. The actuating mechanism 72 comprises a pair of pivotally connected members 73 and 74 that are actuated to the position illustrated in Fig. 3, by the magnet coil 67. Upon de-energization of the magnet coil, a spring 75 connected to the members 73 and 74 causes the contact bridging members 71 to be disengaged from their co-operating stationary contact members, thereby de-energizing an electric translating means 76, which may comprise an electric sign, or other device.

When the electric current from the circuit, illustrated in Fig. 3 has been traversing the heating coil 13 for a predetermined length of time, the bimetallic member 15 is so energized that it bends downwardly, thereby separating the portions 32 and 41 of the members 28 and 29 until the bimetallic member 12 is disengaged from the shoulder portions 39 and 48.

Because the bimetallic member 12 is heated directly by the coil 13, it tends to bend downwardly, but is prevented from doing so by the projections 39 and 48. Mechanical energy is, therefore, stored in the member 12 that is released when the shoulder portions 39 and 48 are disengaged therefrom, which causes it to move with a snap motion, thereby effecting positive disengagement thereof from the contact 53. (See Fig. 4.)

When the bimetallic member 12 is disengaged from the contact member 53, the circuit through the electromagnet coil 67 is broken, thus causing the switch mechanism 70 to be operated to effect de-energization of the translating means 76.

Since the bimetallic member 15 is of smaller dimensions than the bimetallic member 12, and its thermal capacity less, it returns to its normal position, illustrated in Fig. 2 of the drawings, sooner than the member 12, so that the members 28 and 29 may return towards their biased position when the latter has returned to the position in which it engages the contact member 53 and the shoulder portions 39 and 48.

When this condition exists, the magnet coil 67 is again energized and the switch 70 moved to its operative position to cause energization of the electric translating means 76. When

the bimetallic members 12 and 15 have been heated to a predetermined temperature, the operation hereinbefore described again takes place. It is evident, therefore, that this operation will continue indefinitely with the result that the translating means 76 is intermittently energized and de-energized.

In the illustration shown in Fig. 3 of the drawings, the circuit controlling means 11 controls an electro-magnet coil 67. It is, therefore, evident that a large current of electricity is not broken or interrupted between the contact member 53 and the bimetallic member 12. Since the magnet coil 67 controls a switch mechanism which may have a large circuit interrupting capacity, the translating means 76 may be of any capacity, depending upon the circuit interrupting capacity of the switching means 70.

It is to be understood, however, that, while I have illustrated the circuit controlling means 11 as a means for controlling the energization of a magnet coil, it may be used as a mechanical means for supplying motive power to a suitable mechanical device. By way of illustration, the device embodying my invention may be utilized for actuating depressor bars usually employed in recording pyrometers. Or it may be used for effecting a reciprocating movement of an element or a device.

By my invention, I have provided a thermally-actuable circuit controlling device that is simple in construction and easily assembled. The device comprises, in general, a pair of bimetallic members that are free to move at one end and have the other ends thereof fixed. A heating coil is provided for thermally energizing both of the bimetallic members. One of the bimetallic members is adapted to control a biasing or latching means for releasing the other bimetallic member from a stationary contact member with a snap motion, when a predetermined thermal condition obtains therein. Upon the disengagement of one of the bimetallic members associated therewith, the heating coil is de-energized, whereupon the bimetallic members are cooled and permitted to return to their operative positions, these movements being in the same plane. This operation is carried on indefinitely, as hereinbefore described, and is effective to energize and deenergize an electric circuit intermittently which circuit may be embodied in an electric sign.

Various modifications may be made in the device embodying my invention without departing from the spirit and scope thereof, and I desire, therefore, that only such limitations shall be placed thereon as are imposed by the prior art and the appended claims.

I claim as my invention:

1. The combination with a bimetallic member, a heating coil disposed therearound, and means for maintaining said bimetallic mem-

ber normally in engagement with a fixed contact member, of a second bimetallic member disposed in thermal relation with the heating coil for so actuating said maintaining means that said first named bimetallic member is disengaged from said stationary contact member when said bimetallic members have reached a predetermined temperature.

2. The combination with a bimetallic member, a heating coil therefor, and means for maintaining said bimetallic member normally in engagement with a fixed contact member, of a second bimetallic member disposed in thermal relation with the heating coil for so actuating said maintaining means that said first named bimetallic member is disengaged from said stationary contact member when said bimetallic members have reached a predetermined temperature.

3. The combination with a pair of pivotally mounted members, of substantially U-shape, said members being so disposed that the ends thereof are substantially in alinement with each other, a wedge disposed between one pair of cooperating ends of said members of U-shape, a bimetallic member having one end thereof fixed and the other supported by oppositely disposed projections located on said members of U-shape, and means for heating said bimetallic member at a predetermined rate, of a second bimetallic member disposed in thermal relation with said heating means for causing said wedge to separate the ends of the members of U-shape until the first bimetallic member is released from the projections thereon.

4. The combination with a pair of supports biased towards a predetermined position, thermo-responsive means restrained from movement thereby, and a contact member normally engaging the thermo-responsive means, of a second thermo-responsive means for actuating said supports out of engagement with said first named thermo-responsive means thereby causing disengagement of the contact member therefrom.

5. The combination with a bimetallic strip having one end thereof fixed and the other free to move, a resistor in thermal relation with said bimetallic strip, a support so biased that it normally engages the free end of the bimetallic strip to prevent movement thereof, and a contact member normally engaging said free end, of a second bimetallic strip thermally associated with the heating coil for actuating said support out of engagement with the first named bimetallic strip to cause said contact member to be disengaged therefrom with a snap action.

6. The combination with a bimetallic strip having one end thereof fixed, a pivotally mounted support so biased that it normally engages the other end thereof, and a heating means associated with said strip for causing heating thereof, of a thermo-responsive

means for actuating said support out of engagement with said strip and for effecting re-engagement thereof in accordance with a predetermined time cycle.

5 7. The combination with a bimetallic strip having one end fixed, a pair of pivotally mounted supports normally biased towards engagement with the other end of said strip at opposite edges thereof, and a heating member for thermally energizing said strip, of
10 a second bimetallic strip thermally associated with said resistor member for actuating said supports out of engagement with the first bimetallic strip and for simultaneously de-
15 energizing said resistor member when a predetermined thermal condition has been attained therein.

8. The combination with a bimetallic strip, a stationary contact normally in engagement
20 therewith, means for normally biasing said strip towards said contact member and heating means for thermally energizing said strip, said heating means being in circuit with the contact member, of thermo-responsive means
25 thermally energized by said heating means for so controlling said biasing means that disengagement of said strip from the contact member is effected with a snap motion, where-
30 by deenergization of the heating means, re-engagement of the strip with the contact member after a predetermined length of time, and re-energization of the heating means is effected in accordance with a predetermined time cycle.

85 9. A circuit controlling device for intermittently energizing and deenergizing an

electric energy translating device, said circuit controlling device comprising a bimetallic member, means for maintaining said member normally in engagement with a contact member, and a second bimetallic member for so
40 controlling said means that the first bimetallic member is disengaged therefrom with a snap motion when the bimetallic members have attained a predetermined thermal condition. 45

10. A circuit controlling device for intermittently energizing and deenergizing an electric translating device comprising a pair of bimetallic members having different thermal capacities, a contact member associated with
50 one of the bimetallic members, spring-biased latching means for maintaining the contact member and one of the bimetallic members normally in engagement with each other, and heating means thermally associated with both
55 bimetallic members and controlled by said contact member for causing one of the bimetallic members to release the latching means, to cause the other bimetallic member to be released from the contact member with a snap
60 motion with consequent deenergization of the heating means.

11. A thermally-actuable device comprising a bimetallic element, a latching means therefor, a bimetallic latch-actuating means,
65 and a heating coil operatively associated with both of said bimetallic members for thermally energizing them in different degrees.

In testimony whereof, I have hereunto subscribed my name this 6th day of December, 70
1926.

EARL K. CLARK.