

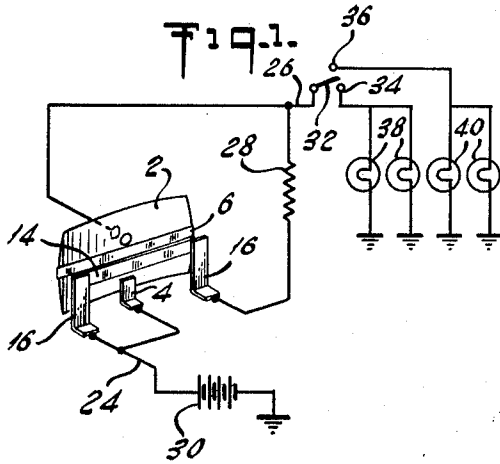
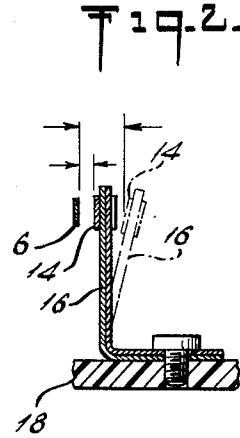
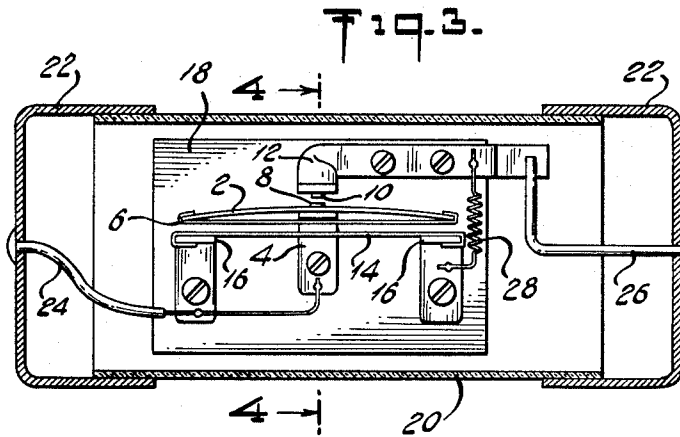
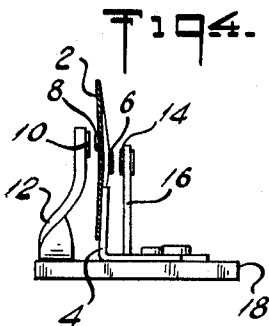
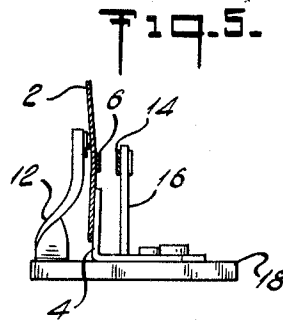
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VANE SNAP ACTION DEVICE HAVING MOVABLE HEATER MEANS FOR
VOLTAGE AND TEMPERATURE COMPENSATION

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VANE SNAP ACTION DEVICE HAVING MOVABLE HEATER MEANS FOR VOLTAGE AND TEMPERATURE COMPENSATION

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This invention relates to a snap action device which may be operated as a thermal flasher or relay at substantially constant rates regardless of variations during operation in the load or potential of its energizing circuit or in ambient temperature. The device is particularly suited for use as an automobile flasher where flashing of signal lamps at constant speed and ratio is desirable.

Briefly described, the new snap action device comprises a sprung vane affixed to a support and held in a constrained position by a thermally expansible pull ribbon or wire. The vane carries a contact which moves into and out of engagement with a second fixed contact during operation of the device to intermittently close and open a flasher circuit. Positioned near the expansible ribbon is a heater element which is mounted upon conductive supports of bimetallic material. The bimetallic supports are so arranged that with increase in temperature due to increase in the current passing through them or increase in ambient temperature, the supports move away from the vane, thereby increasing the space between the ribbon and heater element. Consequently, although the higher current will increase the heat emitted from the heater element, the pull ribbon automatically receives a constant amount of heat during operation since its distance from the heater element is continuously varied in direct proportion with the thermal output of the latter. Thus irrespective of changes in the load or potential of the circuit feeding the heater element, the device will operate at substantially constant rates. Furthermore, change in ambient temperature will cause a responsive change in the position of the bimetallic supports so that these temperature variations are likewise compensated for.

For a better understanding of the invention and of one embodiment thereof reference may be had to the accompanying drawing of which:

FIG. 1 is a perspective view of the operative parts of the device connected in a signal lamp circuit;

FIG. 2 is a section through one of the bimetallic supports;

FIG. 3 is a plan view of the complete device;

FIG. 4 is a side elevation partly in section along the line 4-4 of FIG. 3 viewed in the direction of the arrows showing the vane in the cold unsnapped position; and

FIG. 5 is similar to FIG. 4 showing the vane in the hot snapped position.

Referring to the drawing, the vane 2 comprises a generally rectangular sheet of resilient metal which is affixed to a support 4 as by welding or other suitable means. The vane is preferably provided with an inherent longitudinal deformation such as a crease, trough or curvature. A thermally expansible ribbon 6 is affixed to the vane under tension so as to impart a reverse curvature to the vane along an axis approximately normal to that of the inherent deformation. The vane is thus maintained in a constrained position until the ribbon expands under the influence of heat whereupon the vane assumes the position of inherent deformation with positive snap action. Upon cooling of the ribbon the vane snaps back to constrained position.

As shown in FIG. 3 a contact 8 is affixed to one side of the vane 2 and positioned for engagement with a sec-

ond contact 10 mounted upon a support 12. Opposite the ribbon 2 and in spaced relationship thereto, is positioned a heater element 14 which is substantially equal in length and parallel with the ribbon. The element 14 may be a ribbon of high resistance material such as Nichrome or the like or, if desired, it may be in the form of a wire or coil rather than the ribbon shown in the drawing. The heater element is secured at its ends to bimetallic supports 16 each comprising strips of two dissimilar metals having different coefficients of expansion with the material of the higher coefficient being positioned nearest the ribbon and vane. The supports 4, 12 and 16 are screw-mounted upon a base 18, preferably of insulation material such as an organic plastic, and are electrically conductive. The entire device is housed within a glass envelope 20 and supported therein by any suitable means (not shown). The open ends of the envelope 20 are closed off with metallic caps 22.

A conductor 24 extends through one of the caps 22 and is connected to one of the bimetallic supports 16 and to the support 4. A second conductor 26 extends through the opposite cap 22 and is connected to the support 12 which in turn is connected through a resistor 28 to the other bimetallic support 16.

FIG. 1 shows the snap action device connected in an automobile signal lamp circuit wherein the device acts as a flasher. Conductor 24 is connected to one side of the automobile battery 30 and conductor 26 to a directional switch which may provide a current path, through movable arm 32 and contacts 34 or 36, either to lamps 38 for signalling a turn in one direction or to lamps 40 for signalling a turn in the opposite direction.

If it is desired to signal a turn, the driver moves the arm 32 into engagement with contact 34 or contact 36. This completes a circuit from the battery 30, through conductor 24, first support 16, heater element 14, second support 16, resistor 28, arm 32, contact 34 or 36 and lamps 38 or 40 back to the negative terminal of the battery, shown as ground. Current flowing through heater element 14 and the bimetallic supports 16 causes the element to radiate heat and the supports to move away from the ribbon 6 as shown in FIG. 2. The current through the lamps is insufficient to light the lamps because the resistor 28 and the heater are interposed between the battery and the lamps. When the ribbon 6 has absorbed a sufficient amount of heat it expands and permits the vane 2 to snap from the position shown in FIG. 4 to the one shown in FIG. 5. The contacts 8 and 10 thereby engage each other and establish a circuit from battery 30, through conductor 24, support 4, vane 2, contacts 8 and 10, conductor 26, arm 32, contacts 34 or 36 and lamps 38 or 40 whereupon the lamps are lighted. At the same time, the heater element 14 is short circuited and heat emission therefrom ceases. As a result ribbon 6 cools and contracts until the vane 2 snaps back to the position of FIG. 5. The cycle then repeats.

The intermittent snapping of the vane 2 is controlled primarily by three factors, the degree of constraint exerted upon it by the pull ribbon 6, the spacing of the heater element 14 from the ribbon and the amount of heat being emitted by the heater element. For a given material the first factor is a constant once the pull ribbon has been affixed to the vane, and the invention provides a way to continuously control the spacing in proportion to variations in the amount of heat being emitted from the heater element, which variations may occur from changes in the load or potential of the circuit serving the heater element, so that taken collectively the remaining two factors affecting operation are maintained constant in the device of the invention. More specifi-

cally, as the heater element emits less or more heat, it is spaced nearer or farther from the pull ribbon so that over a given time interval the pull ribbon receives substantially the same amount of heat. The same adjustment in spacing occurs for changes in ambient temperature and consequently the device may be operated at substantially constant rates under wide variations in the thermal conditions which would normally affect its operation.

The invention has now been described in connection with one specific embodiment thereof. While the particular utility of the device as a flasher has been noted, obviously by suitable circuit connections to its terminals, the device may also be operated as a thermal relay or the like. Furthermore, the envelope for the device may be evacuated or filled with an inert gas if heat transfer characteristics other than those of air are desired and vane shapes other than rectangular may be employed. Various other changes in the particular construction illustrated, not departing from the spirit of the invention or the scope of the accompanying claims, will be obvious to those skilled in the art.

The following is claimed:

1. A snap action device operable at substantially constant rates regardless of change in potential of the circuit energizing the device or in ambient temperature comprising a vane of resilient metal having an inherent deformation therein, a thermally expansible pull ribbon secured to the vane under tension and when cold holding the same in a constrained position, means for supporting the vane, a heater element comprising a conductive ribbon positioned near the pull ribbon and parallel thereto, bimetallic supports for said heater, said bimetallic supports having opposite sides of materials of high and low coefficients of expansion, the sides of material of higher coefficients of expansion facing said pull ribbon, whereby the heater will move away from the pull ribbon with increase in temperature, and means for supplying current to said bimetallic supports and said heater element.

2. A snap action device operable at substantially constant rates regardless of change in ambient temperature or in potential of the circuit energizing the device comprising a vane of resilient metal having an inherent de-

formation therein tending to cause it to assume one position, thermally expansible pull means secured to the vane under tension and when cold holding the same in a constrained position different from the one of inherent deformation, a support of conductive material for the vane, a heater element positioned near the pull means and mounted upon two bimetallic supports of conductive material, said bimetallic supports having opposite sides of materials of high and low coefficients of expansion, the sides of materials of higher coefficients of expansion facing said pull means, whereby the heater will move away from the pull means with increase in temperature and thereby increase the distance between the heater element and the pull means, and means for passing current through said bimetallic supports and said heater element whereby the pull means absorbs heat and expands sufficiently to permit the vane to snap from the constrained position to substantially the one of inherent deformation.

3. The snap action device according to claim 2 wherein a first electrical contact is mounted upon the side of the vane opposite that to which the pull means is secured and a second electrical contact is affixed to a support and positioned for engagement with said first contact when the vane snaps substantially to the position of inherent deformation.

4. The snap action device according to claim 2 wherein the pull means and the heater element are in the form of metallic ribbons of approximately equal length which are positioned in horizontal and vertical alignment with respect to each other.

5. The snap action device according to claim 2 housed in a glass envelope having two open ends closed with metallic caps.

References Cited by the Examiner

UNITED STATES PATENTS

2,050,879	9/36	Erben	200—88
2,225,975	12/40	Bruce	200—122
2,371,018	3/45	Ashworth et al.	200—122
2,712,045	6/55	Welsh	200—122
2,737,553	3/56	Welsh	200—122

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