April 28, 1964 E. A. KURZ 3,131,270

TEMPERATURE COMPENSATED SNAP ACTION DEVICE

Filed Oct. 25, 1960

Fig. 1.

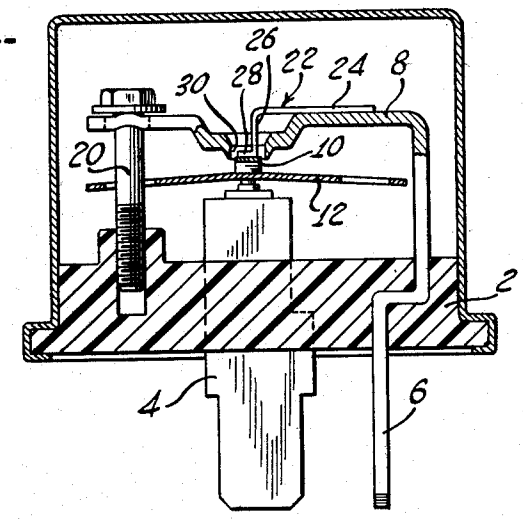


Fig. 2.

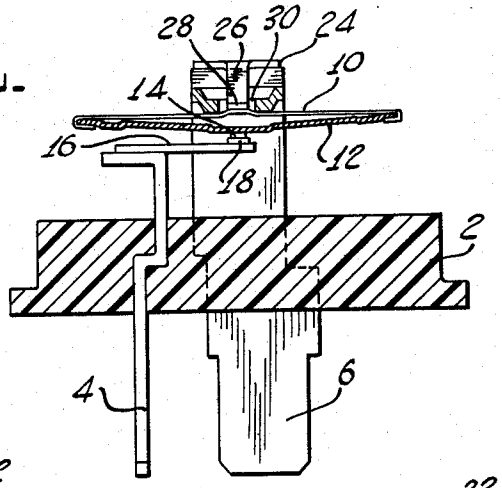


Fig. 3.

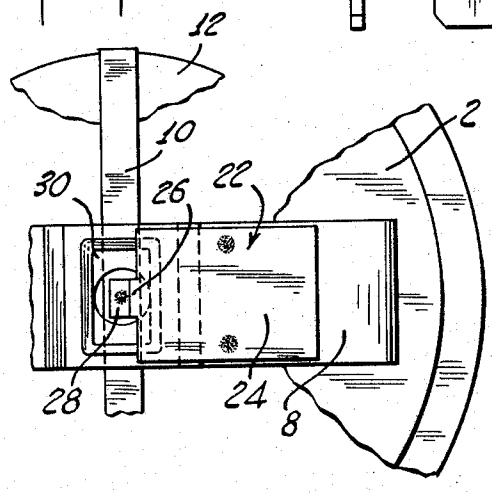
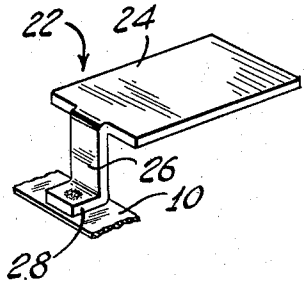


Fig. 4.



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TEMPERATURE COMPENSATED SNAP ACTION DEVICE

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The present invention relates to snap acting devices of the general type disclosed in Schmidinger Patent 2,615,106 dated October 31, 1952 and Reissue 24,023 thereof. The invention comprises an improvement over the patented device in that means are provided for rendering operation thereof substantially independent of ambient temperature. The patented snap action device comprises a vane of resilient conductive material, such as steel, having a diametral deformation therein which biases the vane into concavity about such deformation and an expansible pull wire or strip secured under tension to the vane at the opposite ends of the deformation therein and on the convex side of the deformation, the pull strip, when cold, causing the vane to bow about an axis substantially 90° to the inherent deformation and to curve oppositely to the curvature introduced by the deformation. When suitably supported and connected in an electrical circuit, when current flows through the pull strip, the strip expands and the vane snaps through a neutral position of equilibrium toward the position to which it is constrained by the inherent deformation. If, as is the usual case, such motion opens the heating circuit for the pull strip, the pull strip will contract and cause the vane to snap back into circuit closing position.

Flashers of the above briefly described type are in wide use in automobiles to provide the turn signal indications. It is desirable for such use and for other uses that the ratio of the time the circuit is closed to the full cycle be relatively constant. If the ambient temperature varies substantially then it is difficult to insure constant ratio because, even though the vane and pull strip may be of the same material, a dimensional change occasioned by temperature change will not necessarily result in the same relationship between the tension in the pull strip and the strains and stresses set up in the vane by the deformation therein.

In accordance with the present invention means are incorporated in such type of device to insure no change in ratio of "on" time to the full cycle over a wide range of ambient temperature. These means comprise a bimetallic element so interposed between the pull strip and a relatively fixed element as to add to the tension in the pull strip with increase in temperature and to subtract from the tension in the pull strip with decrease in ambient temperature, the dimensions of the bimetallic element being so selected as to insure uniformity of operation of the device throughout the desired temperature range.

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

FIG. 1 is a vertical sectional view through a snap action device embodying the invention;

FIG. 2 is a vertical sectional view of the device of FIG. 1 taken at right angles thereto;

FIG. 3 is a fragmentary plan view on an enlarged scale of the device of FIGS. 1 and 2; and

FIG. 4 is an enlarged detail view of the coupling between the bimetallic element and the pull strip.

In the drawing the invention is shown as applied to a snap action device of the general type of that disclosed in the said Schmidinger patent and reissue thereof. The device has a molded base 2 of insulating material through which extend two brackets 4 and 6. Brackets 4 and 6, at their lower ends, serve as prong terminals of the device and at their upper ends support the flasher elements. The bracket 6 above the base 2 extends upwardly and is then bent at right angles to provide a horizontal arm 8 for support of an expansible ribbon 10 comprising the pull strip of the device. The pull strip 10 is secured at its ends to a disc 12 having a centrally disposed contact 14 on its lower surface. The disc 12 has an inherent deformation therein along one diameter tending to curve the disc about such diameter. The ribbon 12 overlies the convex side of the deformation in the disc and is secured under tension to the disc, the tension in the pull strip, when cold, being sufficient to bend the disc about a diameter at right angles to the deformation therein. In FIGS. 1 and 2 the disc and pull strip are shown in the position assumed when the pull strip is cold, that is, under maximum tension in the pull strip.

Bracket 4, above the base 2, supports a leaf spring 16 on the end of which is mounted a contact 18 positioned for engagement by contact 14 when the pull strip is cold. The arm 8 of bracket 6 is provided at its free end with a hole through which extends an adjusting screw 20 which at its lower end threads into a well in the base 2, the screw 20 passing through a suitably aligned hole in the disc 12. Screw 20 serves for initial adjustment of contact pressure.

The device so far described is substantially that of the said Schmidinger patent and reissue thereof. When a lamp load, for example, and a source of energy is connected across the terminals 4 and 6 current flows from terminal 6, through arm 8, through the two halves of the pull strip, through the disc 12 and contacts 14 and 18 to terminal 4 and the lamp load. The pull strip becomes heated with this current and expands permitting the inherent constraint in the disc to snap the disc to contact open position. Upon cooling of the pull strip after the circuit has thus been opened the pull strip contracts and snaps the disc back against the inherent restraint into contact closing position. The cycle thereupon repeats.

The length of time before the contacts open depends primarily upon the tension in the pull strip. At higher ambient temperatures, the consequent expansion of the pull strip reduces the tension therein. Accordingly the ratio of "on" time to "off" time of lamps controlled by the flasher tends to decrease with increasing temperature and to increase with decreasing temperature. In accordance with the invention compensating means are provided for insuring constant ratio with change in ambient temperature. These means comprise a bimetallic element 22 having a flat plate portion 24 and a depending strip portion 26 terminating in a foot 28. Plate portion 24 is welded to the upper surface of arm 8 and strip portion 26 extends through a central aperture 30 in arm 8 and is welded at its foot 28 to the center of the pull strip 10. The metal of higher coefficient of expansion is disposed on the side of the element 22 in engagement with the upper surface of the arm 8. Accordingly when the ambient temperature increases the strip 26 tends to lift foot 28 upwardly in the aperture 30 and to lift ribbon 10 with it. Conversely, when the ambient temperature decreases the strip 26 tends to move downwardly in the aperture 30 and thereby tends to reduce tension in the pull strip. As best shown in FIG. 2 the central portion of the arm 8 surrounding the aperture 30 engages the surface of the pull strip at opposite sides of the weld of the bimetal foot 28 thereto. Accordingly upward movement of the foot 28 causes a looped or curved portion of the pull strip to enter the aperture 30, thereby tending to shorten the effective length of the pull strip. The dimensions of the bimetal element and of the pull strip are so chosen that for any change in ambient tempera-

ture the change in effective length of the pull strip occasioned by movement of the foot **28** is equal and opposite to the elongation or contraction of the pull strip caused by expansion or contraction of the pull strip with such change in ambient temperature. Consequently no change in operating ratio of the flasher will result with change in ambient temperature, the effective working length of the pull strip and therefore of the tension therein remaining constant irrespective of ambient temperature change.

The bimetal element **22** serves not only to maintain fixed ratio between "on" and "off" periods of the flasher by compensating for ambient temperature changes but also serves as a means for initial adjustment of the tension in the pull strip. By suitably bending the bimetal element, as for example, at the junction of the plate **24** with the strip portion **26** the initial position of the foot **30** and therefore the initial tension in the pull strip may be adjusted.

The invention has now been described in connection with a single embodiment thereof. Although particularly adapted for compensation of the disc flasher of the said Schmidinger patent and reissue thereof obviously the ambient temperature compensating means of the invention could be utilized in any device wherein tension in an expansible pull means is employed for controlling snap action of the device.

The following is claimed:

1. In a snap acting device having a vane constrained in one current controlling position by tension of an expansible pull means and adapted upon expansion of the pull means with current therethrough to snap through a neutral equilibrium position into a second current controlling position, the improvement comprising a relatively fixed member, an ambient temperature responsive compensating element coupling said pull means to said fixed member, said element, upon increase in ambient temperature increasing the tension in the pull means, said element being of bimetallic material and being welded at spaced points to said fixed member and to the center of said pull means.

2. The improvement in snap acting devices according to claim 3 wherein said relatively fixed member includes an arm overlying said pull means and provided with an opening therethrough aligned with the central portion of the pull means, said bimetallic element being welded to the surface of said arm remote from said pull means and having a part that extends through said opening and is welded to the pull means, said part of said element, with increase in ambient temperature, tending to pull the pull means toward said opening and thereby increasing the tension in the pull means.

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