Sept. 4, 1962 H. G. SIIBERG 3,052,780

SNAP ACTION DEVICE

Filed Oct. 28, 1960

Fig. 1.

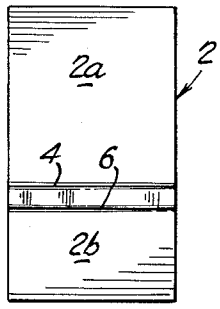


Fig. 2.

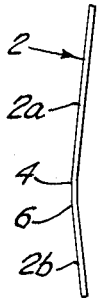


Fig. 3.

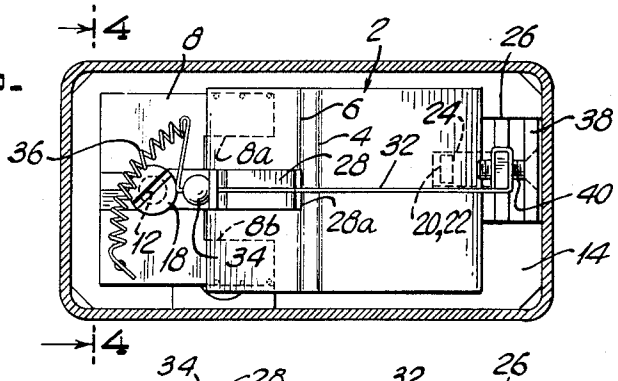


Fig. 5.

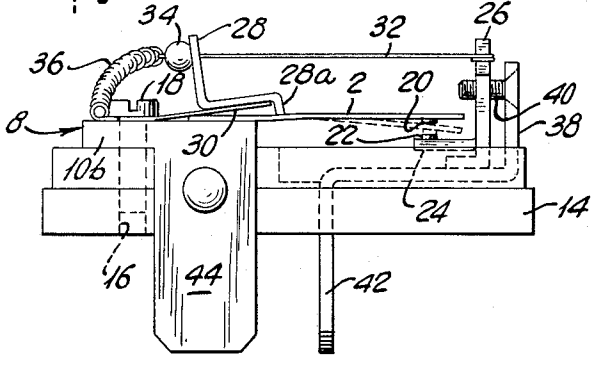
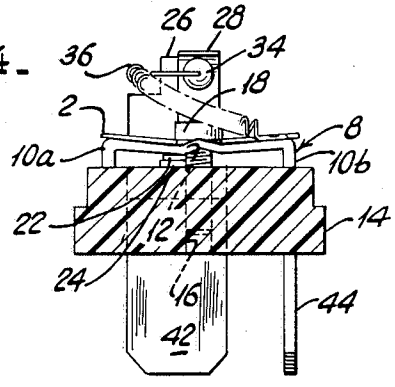


Fig. 4.



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SNAP ACTION DEVICE

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The present invention relates to snap acting devices and more particularly to a blade construction suitable for use in such type of device. Snap action devices such as flashers, thermal relays, microswitches and the like ordinarily include a vane or blade which is constrained in one position as by tension of an expansible wire or ribbon and which snaps into a position of reverse curvature upon the release of the holding force or upon application of a force in a direction opposite to that of the controlling force.

U.S. Patent No. 2,761,931 of Joseph Schmidinger is typical of patents disclosing blades generally operating as above briefly described. In that patent a snap blade is formed of a flat sheet having two longitudinal slots therein with the central portion between the slots forced outwardly from the plane of the side portions of the blade, the blade being fixed at one end with its free end positioned between stops or contacts. Tension in a pull ribbon attached to the central portion of the fixed end of the blade holds the free end of the blade in engagement with one stop or contact. When the tension in the pull strip is released the blade snaps into a position where its free end engages the opposite stop or contact. The initial deformation introduced into blades of the type of the Schmidinger patent produces stresses and strains which, when the blade is incorporated in a flasher, determines in part the speed of the flasher and the ratio of the "on" time to the complete cycle. Additionally the positions of the fixed stop or contacts which cooperate with the blade influence both the ratio and speed of a flasher incorporating the blade. The tension in the pull ribbon or wire also affects the ratio and speed.

A feature of the blade of the present invention is that it may be so incorporated in a flasher or switch construction that substantially independent control or adjustment of speed and ratio may be effected. Moreover, the new blade is of simple construction and economical to manufacture. Briefly, the blade comprises a rectangular sheet of resilient material such as nickel or nickel alloy or steel which is creased along two parallel lines across the grain and parallel to the shorter sides of the blade, the creases being spaced from the nearer shorter side of the blade by about one third of the length of the longer side of the blade. The distance of these creases from the adjacent end of the blade largely determines the snap force which is introduced into the blade during assembly and causes the blade to tend to assume a position where the portions thereof on opposite sides of the creases extend in planes having an occluded angle of less than 180°. Associated with the blade and cooperating therewith for introduction of stresses and strains therein is a frame element having two spaced arms which engage the portion of the blade between the creases therein and the adjacent shorter edge of the blade. The frame is curved about an axis intermediate the arms and parallel to the longitudinal axis of the blade and screw means are provided for varying the frame curvature. When the blade is welded to the frame arms and the curvature introduced into the frame after mounting of the blade, the mounted portion of the blade will be forced into corresponding longitudinal curvature. When the blade is not fixed to the arms, separate means such as a leaf spring coupling the blade to the frame are provided to conform the blade curvature to that of the frame. The extent of curvature of the blade determines the contact

pressure for any specific application. To trigger or snap the blade from one position to another, means are provided for applying a force to the blade adjacent to the creases therein and between the points of support by the frame arms. These means may be, in the case of a flasher, an angle member secured to the blade and connected to an expansible pull wire, the tension in the wire tending to augment the curvature introduced by the frame. Alternatively, if the device is to be used as a microswitch, for example, operator controlled means may be connected to the blade adjacent the creases therein.

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

FIG. 1 is a plan view of a blade embodying the invention, the blade being shown disassembled from a snap action device;

FIG. 2 is a side view of the blade of FIG. 1.

FIG. 3 is a plan view of a snap action device incorporating the blade of FIGS. 1 and 2 and illustrating one specific construction of flasher;

FIG. 4 is an end view of the device of FIG. 3 taken on the line 4—4 thereof; and

FIG. 5 is a side view of the device of FIG. 3.

The blade or vane of the invention is shown in FIGS. 1 and 2 as comprising a rectangular sheet **2** of nickel or nickel alloy or of steel having two transverse creases **4** and **6** formed therein. Preferably the grain of the metal is in the direction of greater length and the creases are across the grain. The creases are so located as to divide the blade into a larger section **2***a* and a smaller section **2***b* which, as shown best in FIG. 2, extend in planes having an occluded angle of less than 180°. Preferably section **2***a* is about twice as large as section **2***b*. In order to employ the blade of FIGS. 1 and 2 in a snap action device a U-shaped frame or yoke **8** of cold rolled steel or the like is provided and wing portion **2***b*, adjacent the side edges thereof, is preferably fixed to the upper surface of the spaced arms **8***a* and **8***b* of the frame, as by spot welding. As seen best in FIGS. 4 and 5 the arms **8***a* and **8***b* have depending side flanges **10***a* and **10***b* respectively. A hole **12** is provided in the part of the frame interconnecting the arms **8***a* and **8***b*.. The frame carrying the vane **2** is supported on any suitable base **14**, as, for example, a base of phenolformaldehyde resin or other plastic insulating material. Aligned with the hole **12** of the frame is a threaded hole **16** in the base. An adjusting screw **18** extends through the hole **12** and threads into the hole **16** of the base. By tightening the screw **18** the part of the frame between the arms is curved downwardly toward the base causing the upper surfaces of the arms **8***a* and **8***b* to move toward each other, thus causing section **2***b* of the blade to curve about a longitudinal axis of the blade. In the absence of pressure exerted on the blade in the neighborhood of the creases **4** and **6** the wing portion **2***b* of the blade will assume the dotted line position shown in FIG. 5. In this position a contact **20** carried by the free end of the blade engages a fixed contact **22**. Contact **22** is supported by a tongue **24** pressed out from a bracket **26** mounted on or molded into the base **14**. An L-shaped lug **28**, having a downwardly turned lip **28***a* engaging the blade in the neighborhood of the crease **6**, is mounted on one end of a leaf spring **30**, the other end of which is secured to the frame by means of the screw **18**. A pull wire **32** fastened at one end to the upper end of bracket **26** extends through a hole in the upwardly extending arm of the lug **28** and is anchored thereto by an insulating bead **34**, the wire being under sufficient tension to cause the blade to assume the full line position of FIG. 5.

The forces exerted on the blade by the leaf spring **30**,

lug 28 and tensioned pull wire 32 are such as to cause the portion 2b of the blade into curvature conforming to that of the frame, irrespective of whether or not the blade is welded to the frame arms. Preferably, for more stable operation the blade is fixed to the frame arms as shown and described. Beyond the bead 34 the pull wire 32 is coiled into a ballast resistor 36 and connected at its end to the frame. Welded onto the bracket 26 is a second bracket 38, having a hole therein for supporting an adjusting screw 40 which threads into a threaded hole in bracket 26. The screw 40 provides the means for adjustment of the tension in the pull wire. The bracket 38 extends beneath the bracket 26 and downwardly through the insulating base 14, terminating therebeneath in a prong terminal 42 for the device. The base 14 is cut away along one side and one flange of the frame 8 is extended downwardly through the cut away portion of the base to provide the second prong terminal 44 of the device.

With the above described construction, when a source of energy as, for example, a car carried battery, is connected to terminal 42 and a lamp load to be flashed is connected to terminal 44 the device will operate as a shunt type flasher. Upon closure of the circuit, current flows from terminal 42 through the pull wire and ballast resistor to frame 8, and terminal 44. This current will be insufficient to light the lamp load. When the pull wire expands as a result of the heat generated by the current therethrough, the tension in the pull wire relaxes and the pressure exerted upon the blade by the lug 28 releases sufficiently to permit the blade to snap into the dotted line position of FIG. 5 in which position contacts 20 and 22 are closed and the pull wire and ballast resistor are shunted. The lamp load will now be lighted by the increased current in the circuit. Upon closing of the contacts the pull wire cools and contracts, gradually increasing the pressure exerted on the blade by the lug until the blade snaps into contact open position. The cycle thereupon repeats. By adjustment of the frame curvature by means of the screw 18 a wide range of contact pressure may be achieved. The flasher speed may be varied by adjustment of screw 40 to vary the tension in the pull wire. The above described device requires a minimum number of parts as will be apparent from the foregoing description.

The invention has now been described in connection with one specific embodiment thereof incorporating a pull wire for operation as a flasher. Obviously, the new blade and its mounting on a frame of adjustable curvature can be incorporated in other type snap action devices. For example, instead of the pull wire connected to the L-shaped lug 28 for automatic operation, means could be provided for mechanically depressing the blade in the neighborhood of the crease for operation as a microswitch. By suitable adjustment of the curvature of the frame and tension of the pull wire the device could be operated as a relay. Circuits suitable for use for relays and flashers are well known. The present invention is directed, not to any specific circuit, but to the novel snap blade and its frame of adjustable curvature which makes it admirably suited for use in a variety of snap action devices.

The following is claimed:

1. A snap action switch comprising:
   - a rectangular blade of resilient electrically conducting material having a transverse bend parallel to a shorter side and dividing the blade into two unequal areas,
   - a base of insulating material,
   - a frame mounted on said base and having spaced arms provided with flanges engaging said base,
   - said frame supporting said blade adjacent the end of the smaller area thereof,
   - screw means passing through said blade and said frame and threaded into said base for adjustably curving the blade and frame about a longitudinal axis,
   - an electrical contact carried by said base and positioned for engagement with the free end of said blade in one position thereof, and
   - a tensioned expansible wire anchored at one end and coupled at its other end to said blade adjacent the transverse bend therein, said wire, when cold augmenting the longitudinal curvature introduced by said screw means to hold said blade out of engagement with said fixed contact and when heated by passage of current therethrough permitting said blade to snap to contact closing position.

2. The snap action device according to claim 1 including means for adjusting the tension in said wire.

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