Sept. 17, 1957 J. W. WELSH 2,806,921

FLASHER SOUNDER

Filed Sept. 5, 1956

FIG. 1

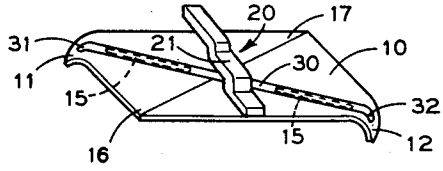


FIG. 2

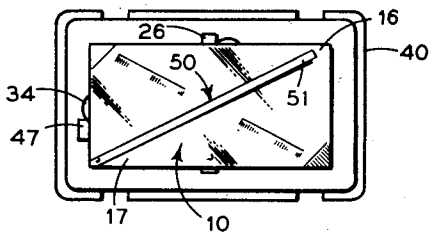


FIG. 3

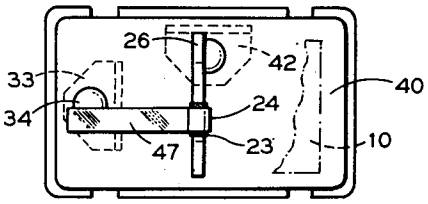
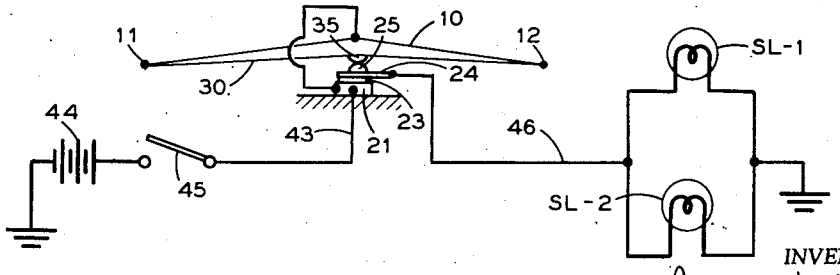


FIG. 4



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2,806,921

FLASHER SOUNDER

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6 Claims. (Cl. 200—122)

This invention relates to snap action switches, such as flashers for automotive vehicle signaling systems, and more particularly to novel means for producing an audible indication of operation of a flasher.

With the increasing importance of turn signal lamps in driving on modern multi-lane highways, it is correspondingly important that the driver not only be assured of their proper operation but also be made conscious of improper operation. For example, in using a turn signal lamp to indicate a proposed change from one lane to another, the resultant steering wheel movement is frequently insufficient to cancel the turn indication when the lane change has been completed. If the driver does not cancel the signal manually, following and aproaching vehicles are given a wrong indication of the projected movement of his vehicle.

For these reasons, it is considered highly desirable to provide a clearly audible indication of the operation of a turn signal, and this may be done, with some types of signal systems, by using a flasher producing a highly audible click as it opens and/or closes.

In my Patent 2,756,304 dated July 24, 1956, entitled "Snap Action Device," I have shown and described a novel snap action vane which may be incorporated in a snap action switch. This vane is provided with an initial deformation along a right line extending across the vane by thinning or deforming the vane along this line in two or more spaced sections of the line, these sections being spaced at their inner ends from the center of the vane and also preferably spaced from the outer ends of the bent line. When such a vane is to be utilized in a snap action switch, such as a flasher, the vane is bent about another line, at an angle to the line of initial deformation, by applying force to the ends of such line. When such force is released, the vane snaps back to its initial position, the action closely resembling that of a toggle.

The vane is held in the new deformed position by attaching a high resistance wire or strip at each of its ends to the vane at the ends of the line of initial deformation. The high resistance wire or strip thus forcibly holds the vane in a distorted position bent about a line angularly related to the line of initial deformation. When the high resistance wire has electric current passing therethrough, it heats and expands. During the expansion of the wire, a point is reached at which the tension exerted by the wire is over-balanced by the kinetic energy of the vane stored therein by bending the latter from its initial condition. At this point, the vane snaps back to its initial condition.

As described in said patent, the vane has a mounting member secured thereto at a point in an eliptical line representing the distribution of stresses adjacent the vane center due to the initial deformation of the vane. This mounting member extends across the high resistance wire and carries a contact cooperative with a contact carried by a high resistance wire. When the vane is in the deformed position, in which it is held by the contracted high resistance wire, these two contacts are in engagement, so that current from a source of electric power connected to a contact carried by the mounting member flows in

parallel paths through the high resistance wire, through the vane, and thence to the other terminal of the current source. When the vane snaps back to its initial condition as a result of heating and expansion of the wire, the contacts separate and the high resistance wire then cools and contracts. During such contraction the force exerted by the wire overbalances the force tending to maintain the vane in its initially deformed condition, and the resultant toggle action snaps the vane to the deformed condition re-engaging the contact carried by the resistance wire with the contact carried by the mounting member for the vane. The electrical circuit is thus reclosed and the cycle repeats.

This snap action switch provides a rugged, compact and efficient flasher. However, the flasher is relatively quiet in operation so that there is substantially no audible indication of its operation. The present invention is directed to novel means for providing such audible indication.

During snapping of the vane about its mounting point, there is a very substantial displacement of the vane corners relative to the central part of the vane. This relatively large magnitude movement of the corners is utilized to vibrate a "tuning fork" element each time the vane snaps between a stress-deformed condition and a pre-set position.

More specifically, the spring metal of the vane is relatively hard. By providing a thin strip of similarly hard metal and welding one end of this strip to a vane corner so that the strip extends across the deformation to the diagonally opposite corner, the free portion of the strip may be set into vibration each time the vane snaps. As the vane snaps, the strip, previously lying against the vane, is set into vibration as a tuning fork due to the kinetic energy developed in its free end as the vane snaps. A similar vibration is set up in the strip as the vane snaps back. The vibration of the "tuning fork" strip provides an audible indication of operation of the flasher.

For an understanding of the invention principles, reference is made to the following description of a typical embodiment thereof as illustrated in the accompanying drawing. In the drawing:

Fig. 1 is a perspective view of a snap action vane and mounting member used in the invention flasher;

Fig. 2 is a top plan view of a snap action flasher embodying the invention;

Fig. 3 is a similar view, with a part of the vane cut away to illustrate its support; and

Fig. 4 is a schematic wiring diagram of a signal system embodying the invention flasher.

Referring to Fig. 1, a snap action vane **10** is illustrated which is identical with that shown and described in Patent No. 2,756,304. Vane **10** is preferably made of relatively thin spring metal, with consideration being given to its spring factor, stiffness, temperature coefficient, and the like, in accordance with the desired rate of operation of the snap action.

To provide an initial set to vane **10** and to give the same some depth so that it will resemble a beam in its action, the vane **10**, which is shown as a substantially rectangular vane, is deformed or thinned along a diagonal interconnecting corners **11** and **12**. This vane deformation is preferably effected by lineally embossing the vane along the line **11—12** in two elongated spaced portions or bosses **15**. It will be noted that the bosses **15** have their inner ends disposed substantially equal distances from the center of vane **10** so that the center area of the vane is left unmarred. As explained in said Patent No. 2,756,304, this greatly prolongs the life of vane **10** by removing the stress concentration from the center to a pair of points on bosses **15**. If the deformation lines **11—12** were con-

tinuous through the vane center area, the flattening of the vane at the center during repeated cycles would eventually cause fatigue of the vane at the center and reduce the amount of force required to snap the vane between the illustrated position and another deformed position. Due to the bosses 15, 15, the sections 13 and 14 of the vane on either side of line 11—12 bend upwardly so that the vane assumes the form of a shallow V having its apex on line 11—12. When vane bending forces are applied to the end of lines 11—12, and the value of these forces equals or over-balances the inherent tendency of the vane to stay in its preset condition, the vane snaps into a new bent or deformed position, forming another shallow V along the other diagonal 16—17. When the forces at points 11 and 12 are decreased to a point where they are overbalanced by the kinetic energy stored in vane 10 due to such distorting force, the vane snaps back to a position bent along the lines 11—12.

Photographs, taken with polarized light, of a transparent vane formed in this manner show lines of force in the unmarred center area of the vane which comprise elliptical bands having radii centered on the vane center. If the vane is secured or supported at a point on one of these elliptical stress loci, the stress points on the vane during application of bending force at corners 11 and 12 occur within the lengths of bosses 15. Thus, the stresses are removed from the center area and distributed between two points spaced from the center. This greatly prolongs the period before fatigue takes place in the stressed section of the vane. As described in said Patent No. 2,756,304, advantage is taken of this fact by supporting the vane by securing the latter, at a point of one of such elliptical lines of force, to a relatively rigid electrically conductive metal mounting member 20. The point of attachment of the mounting member to the vane acts as a pivot point for the vane during its snap action and is preferably spaced laterally of the initial bend line 11—12.

When the vane is used to form a snap action switch, the bending stresses may be conveniently applied to points 11 and 12 by means of a high resistance wire or strip 30 secured to these corners of the vane. For this purpose, the points 11 and 12 are bent downwardly as illustrated in Fig. 1, and the ends of wire or strip 30 are secured thereto at 31 and 32, while the vane is bent along the line 16—17, so that the wire in its cold or contracted position holds the vane deformed into a V having its apex along line 16—17. If wire 30 has electric current passed therethrough, it expands and, as the wire force is overbalanced by the restoring kinetic energy built up in vane 10, the vane snaps back to its initially bent condition along the line 11—12.

An arrangement for utilizing this action is illustrated in Figs. 2 and 3, which show the invention snap action switch. The center section 21 of mounting member 20 has a band 23 of insulation wrapped thereon and a band 24 of conductive metal is wrapped around band 23. Band 24 carries a contact point 25 at the intersection of mounting member 20 and wire 30. The wire 30 has a contact point 35 secured to its mid-section for cooperation with contact 25.

The free end of mounting member 20 is secured to a dielectric base 40 as by a rivet connecting the outer end 26 of member 20 to a prong or terminal 42 on base 40. Another prong or terminal 33 is connected by rivet 34 to a conductive strip 47 connected to band 24.

In accordance with the invention, a thin strip 50 of hard spring metal has one end welded, brazed or otherwise secured to corner 17 of vane 10, on the side of the vane opposite wire 30. Strip 50 extends diagonally across vane 10 so that its free end is at or adjacent corner 16, and the strip lies against the vane surface when wire 30 is contracted.

When wire 30 is heated and begins to expand, vane 10 starts to bend back to its "restored" position. As vane 10 thus bends, the free end 51 of strip 50 moves away from the vane surface. After sufficient expansion of wire 30, vane 10 snaps to the restored position, snapping end 51 of strip 50 further away from the vane. The resultant kinetic energy in strip 50 sets the strip to vibrate like a tuning fork, producing a pronouncedly audible sound.

When wire 30 cools and contracts, vane 10 is snapped back to the illustrated stress-deformed condition, thus snapping strip end 51 toward the vane surface. Strip 50 is again set into vibration to produce an audible indication of flasher operation. Thus, on each snapping of vane 10, strip 50 is set into vibration, whereby a nearly continuous, but undulating, hum is produced which is readily audible to the driver.

The alternate heating and contraction of wire 30 to snap vane 10 is produced by closure of a signal circuit, such as illustrated in Fig. 4.

Referring to Fig. 4, a grounded battery 44 is connected, through a signal lamp control switch 45 and conductor 40, to terminal 42, and thus through bracket 20, vane 10, and wire 30 to contact 35. A conductor 46 connects terminal 42 and thus contact 25 and strip 47, to parallel and grounded signal lamps SL–1 and SL–2.

When switch 45 is closed, current flows from battery 44 through switch 45 conductor 43, bracket 20, and contact point 35 into contact point 25 on band 24. The current flowing through wire 30 causes the latter to rapidly heat and expand, this wire preferably being "Nichrome" wire. As wire 30 expands and thus lengthens, the force exerted by the wire is finally overbalanced by the kinetic energy stored in vane 10, and the latter snaps to its initial or "restored" position. Thus pulls wire 30 downwardly relatively to bracket 20, and snaps contacts 25 and 35 apart to break the electrical circuit. The wire 30 then cools and contracts. As the force exerted by the contracting wire overbalances the force tending to maintain vane 10 in its "restored" position, the vane again snaps to a position bent along line 16—17 wherein wire 30 snaps toward bracket 20 to re-engage contacts 25 and 35. The cycle then repeats, and as the vane snaps from its respective positions, the strip 50 is "vibrated" and the desired audible sound effect is produced in synchronism with the change in visual signaling effects.

If desired, a pilot lamp operation may be incorporated in the flasher in the manner illustrated, for example, in my U. S. Patent No. 2,706,226.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the invention principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

I claim:

1. A snap action electric switch comprising, in combination, a dielectric base; a substantially flat vane of electrically conductive resilient material having a substantially linear preset deformation extending thereacross, said deformation being interrupted intermediate its ends at points substantially equi-distant from the vane center to leave the central area of the vane free of preset deformation; a bracket secured to said vane at a vane mounting point spaced laterally from said deformation; means operable to alternately apply and release vane bending stresses at points adjacent the outer ends of said deformation to effect snapping of the vane between a stress-deformed position in which the vane is bent along a line substantially perpendicular to said deformation and a preset restored position in which the vane is bent along said deformation; the free portion of the vane, during such snapping action, pivoting about such mounting point, a corner of said vane moving substantially, relative to the vane mounting point, during such snapping; and means secured to said corner for movement therewith, and set into vibration each time the vane snaps to produce an audible indication of snapping of the vane.

2. A snap action electric switch comprising, in combination, a dielectric base; a substantially flat vane of elec-

trically conductive resilient material having a substantially linear preset deformation extending thereacross, said deformation being interrupted intermediate its ends at points substantially equi-distant from the vane center to leave the central area of the vane free of preset deformation; a bracket secured to said vane at a vane mounting point spaced laterally from said deformation; means operable to alternately apply and release vane bending stresses at points adjacent the outer ends of said deformation to effect snapping of the vane between a stress-deformed position in which the vane is bent along a line substantially perpendicular to said deformation and a preset restored position in which the vane is bent along said deformation; the free portion of the vane, during such snapping action, pivoting about such mounting point, a corner of said vane moving substantially, relative to the vane mounting point, during such snapping; and an elongated strip of spring metal extending across said vane and secured at one end to said corner for movement therewith, and set into vibration each time the vane snaps to produce an audible indication of snapping of the vane.

3. A snap action electric switch comprising, in combination, a dielectric base; a substantially flat vane of electrically conductive resilient material having a substantially linear preset deformation extending thereacross, said deformation being interrupted intermediate its ends at points substantially equi-distant from the vane center to leave the central area of the vane free of preset deformation; a bracket secured to said vane at a vane mounting point spaced laterally from said deformation; means operable to alternately apply and release vane bending stresses at points adjacent the outer ends of said deformation to effect snapping of the vane between a stress-deformed position in which the vane is bent along a line substantially perpendicular to said deformation and a preset restored position in which the vane is bent along said deformation; the free portion of the vane, during such snapping action, pivoting about such mounting point, a corner of said vane moving substantially, relative to the vane mounting point, during such snapping; and an elongated strip of spring metal extending across said vane and secured at one end to said corner for movement therewith, and set into vibration each time the vane snaps to produce an audible indication of snapping of the vane, the free end of said strip being adjacent the diagonally opposite vane corner.

4. A snap action electric switch comprising, in combination, a dielectric base; a substantially flat vane of electrically conductive resilient material having a substantially linear preset deformation extending thereacross, said deformation being interrupted intermediate its ends at points substantially equi-distant from the vane center to leave the central area of the vane free of preset deformation; a first terminal on said base; an elongated electrically conductive bracket secured to said vane at a vane mounting point spaced laterally from said deformation, and secured at its other end to said first terminal; an expansible high resistance electric conductor secured at each end to said vane adjacent the outer ends of said deformation under tension and parallel to said deformation to bend said vane to a stress-deformed position in which the vane is bent along the other diagonal of the vane; said vane, upon a predetermined expansion of said conductor, snapping to a preset restored position in which the vane is bent along said deformation; the free portion of the vane, during such snapping action, pivoting about such mounting point, a corner of said vane moving substantially, relative to the vane mounting point, during such snapping; a second terminal on said base; a first contact mounted in insulated relation on said bracket in alignment with said conductor; a second contact connected to said conductor and normally engaged with said first contact; said contacts being disengaged upon snapping of the vane to such preset restored position; and means secured to said corner for movement therewith, and set into vibration each time the vane snaps to produce an audible indication of snapping of the vane.

5. A snap action electric switch comprising, in combination, a dielectric base; a substantially flat vane of electrically conductive resilient material having a substantially linear preset deformation extending thereacross, said deformation being interrupted intermediate its ends at points substantially equi-distant from the vane center to leave the central area of the vane free of preset deformation; a first terminal on said base; an elongated electrically conductive bracket secured to said vane at a vane mounting point spaced laterally from said deformation, and secured at its other end to said first terminal; an expansible high resistance electric conductor secured at each end to said vane adjacent the outer ends of said deformation under tension and parallel to said deformation to bend said vane to a stress-deformed position in which the vane is bent along the other diagonal of the vane; said vane, upon a predetermined expansion of said conductor, snapping to a preset restored position in which the vane is being along said deformation; the free portion of the vane, during such snapping action, pivoting about such mounting point, a corner of said vane moving substantially relative to the vane mounting point, during such snapping; a second terminal on said base; a first contact mounted in insulated relation on said bracket in alignment with said conductor; a second contact connected to said conductor and normally engaged with said first contact; said contacts being disengaged upon snapping of the vane to such preset restored position; and in elongated strip of spring metal extending across said vane and secured at one end to said corner for movement therewith, and set into vibration each time the vane snaps to produce an audible indication of snapping of the vane.

6. A snap action electric switch comprising, in combination, a dielectric base; a substantially flat vane of electrically conductive resilient material having a substantially linear preset deformation extending thereacross, said deformation being interrupted intermediate its ends at points substantially equi-distant from the vane center to leave the central area of the vane free of preset deformation; a first terminal on said base; an elongated electrically conductive bracket secured to said vane at a vane mounting point spaced laterally from said deformation, and secured at its other end to said first terminal; an expansible high resistance electric conductor secured at each end to said vane adjacent the outer ends of said deformation under tension and parallel to said deformation to bend said vane to a stress-deformed position in which the vane is bent along the other diagonal of the vane; said vane, upon a predetermined expansion of said conductor, snapping to a preset restored position in which the vane is bent along said deformation; the free portion of the vane, during such snapping action, pivoting about such mounting point, a corner of said vane moving substantially, relative to the vane mounting point, during such snapping; a second terminal on said base; a first contact mounted in insulated relation on said bracket in alignment with said conductor; a second contact connected to said conductor and normally engaged with said first contact; said contacts being disengaged upon snapping of the vane to such preset restored position; and an elongated strip of spring metal extending across said vane and secured at one end to said corner for movement therewith, and set into vibration each time the vane snaps to product an audible indication of snapping of the vane, the free end of said strip being adjacent the diagonally opposite vane corner.

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