Dec. 17, 1940. A. H. SCHRAMM 2,225,086

ELECTRIC SWITCH DEVICE

Filed May 14, 1938

Fig. 1

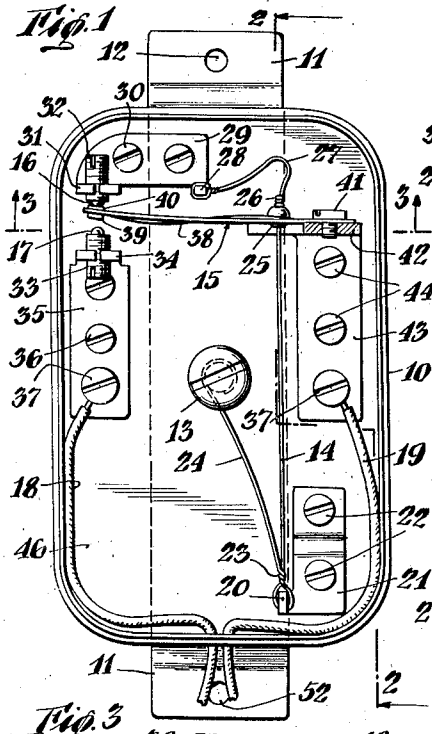


Fig. 2

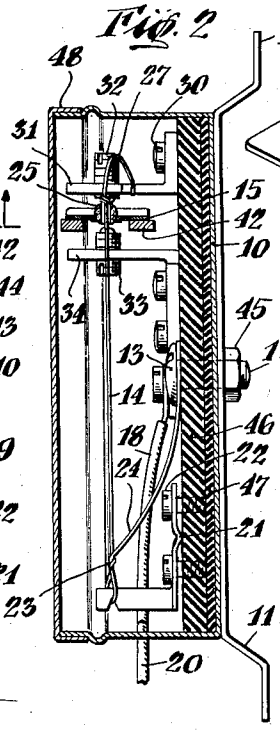


Fig. 4

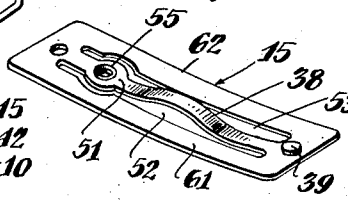


Fig. 8

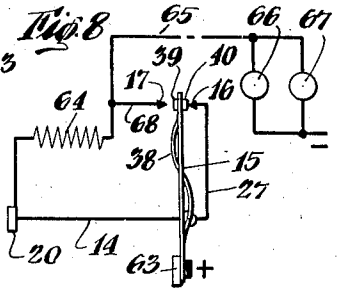


Fig. 9

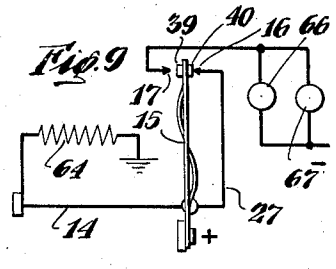


Fig. 3

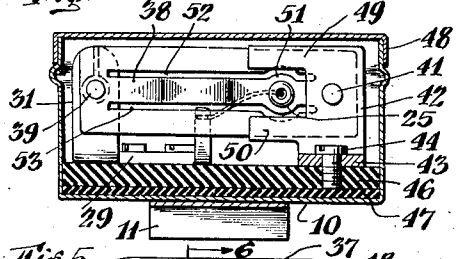


Fig. 5

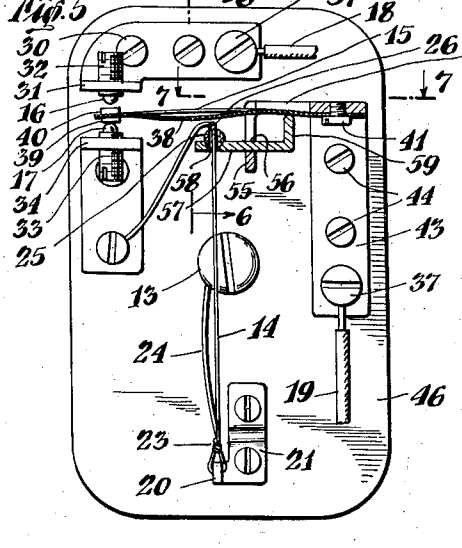


Fig. 6

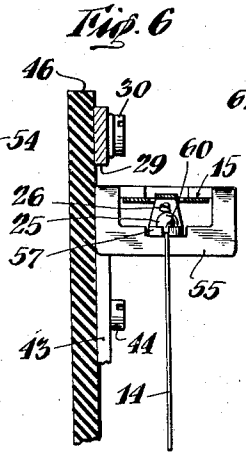
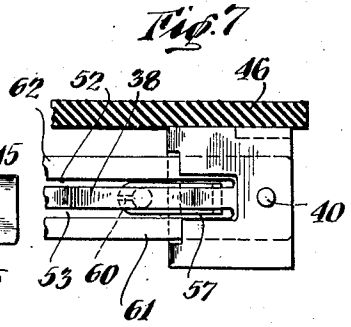


Fig. 7



INVENTOR
Alfred H. Schramm
BY
Alan H. Mann
his ATTORNEY

Patented Dec. 17, 1940 2,225,086

UNITED STATES PATENT OFFICE

2,225,086

ELECTRIC SWITCH DEVICE

Alfred H. Schramm, Springfield Gardens, N. Y.

Application May 14, 1938, Serial No. 207,886

6 Claims. (Cl. 200—113)

My invention relates to electric switches and more particularly to a thermoresponsive, instant starting type of electric switch adapted for use in automobile stop-light flashers.

The switch of my invention is characterized by simplicity of construction, economy in cost of manufacture and reliability of operation in an efficient manner.

I am aware of various forms of electric switches for flashers and the like heretofore proposed but all of which I have found possess certain technical or practical disadvantages that have materially limited their commercial use. Some of these prior devices employ electro or permanent magnets and armatures that complicate the construction and operation and increase the cost correspondingly.

Other forms of these prior devices employ flexible spring-like members, one of which is mounted in a constrained position. The constrained member requires adjustment, after mounting, in two places to effect the desired degree of stress or tension, and in practice repeated adustments are required.

In accordance with my invention I have simplified the construction of the electric switch suitable for use in automobile light flashers and the like, and have overcome the disadvantages and limitations characteristic of the above mentioned prior art devices particularly the above described defects in the flexible, constrained member type of flasher switch. My improved switch in its simplest form consists of essentially a substantially flat, slotted, metal strip or finger-like member having a central portion thereof lengthened sufficiently to place it under stress and thereby cause the entire member when fixedly mounted at one end to have a snap switch action; a pair of spaced contacts fixedly mounted on opposite sides of the spring member at its free end; and a stretched thermoresponsive resistance wire cooperatively associated with the spring member and holding it under tension so that alternate lengthening and shortening of this wire caused by intermittent flow of current therethrough will effect a simple, fool-proof type of back and forth movement of the spring member causing it to alternately open and close the electrical circuit.

One of the important novel features of my device is the combination of the slotted metal spring member and thermoresistance wire, in which preferably, the spring member is fixedly mounted at one end and has two longitudinal slots enclosing a center tine-like part that is stretched, preferably prior to mounting, beyond its natural length to produce a reversely curved form such that force exerted at one end of this tine by the contracted thermoresistance wire will effect a snap switch action and cause the spring member to move quickly into firm electrical contact with a fixed contact piece adjacent the free end of the spring member. The spring member may be made of single ply metal and provided with means of attachment on one end and electrical contacts on the other end. The arrangement of the thermoresponsive resistance wire and the spring member may be such that contraction of the resistance wire, on cooling, will cause the free end of the spring member to move in a direction opposite to the direction of pull of the contracted wire. The reverse arrangement may also be employed if desired.

The novel features of my invention are set forth with particularity in the appended claims. The organization and method of operation of the invention will be clearly understood from the following more detailed description taken in conjunction with the accompanying drawing, in which

Fig. 1 is a plan view of the device of my invention mounted in a suitable container but shown with the cover removed;

Fig. 2 is a sectional view taken along lines 2—2 of Fig. 1;

Fig. 3 is a sectional view taken along lines 3—3 of Fig. 1;

Fig. 4 is an elevational perspective view of the spring member used in my device;

Fig. 5 is a modified form of the device shown in Fig. 1;

Fig. 6 is a sectional view taken along lines 6—6 of Fig. 5;

Fig. 7 is a sectional view taken along lines 7—7 of Fig. 5;

Fig. 8 is a circuit diagram illustrating the electrical operation of my device in a shunt circuit; and

Fig. 9 is a circuit diagram illustrating the electrical operation of my device in a series circuit.

Referring now to the several figures in the drawing, generally in the order in which they occur, and at first to Figs. 1 and 2, the switch device shown therein is mounted in a suitable container 10 which may be of any desired material such as metal, wood, synthetic resin or the like, and is here shown as made of metal. Mounted on the back of this case or container 10 is a supporting strip 11 having holes 12 and 52 in each end for attaching the device by means of screws or the like. A machine screw 13 running

through the bottom of the case 10 connects it with the strip 11 as will appear more clearly in Fig. 2. Inside of the case 10 is mounted a thermoresponsive resistance wire 14 and a metal spring member 15 of the type described above; and electrical contact members 16 and 17 located on opposite sides of the movable end of the spring 15. Wires 18 and 19 are provided for electrically connecting the switch to a source of current and to the automobile stop-light lamps or other desired work circuit.

The resistance wire 14 is connected on one end to an upright extension 20 of a metal anchor member which is held in place by means of screws 22. The member 21 is mounted as a rocker so that the tension on wire 14 may be regulated by adjustment of the screws 22. The resistance wire 14 preferably is looped around the supporting member 20 and twisted or welded back upon itself as shown at 23. The end 24 of this resistance wire 14 is electrically connected to the screw 13 which is normally at ground potential during the operation of the device.

On the other end of the resistance wire 14 there is located an insulating bead 25 and the wire is knotted as shown at 26 on one side of this bead so as to be held in the desired taut position when cold, that is when current is not flowing through the wires. The end piece 27 of this end of the wire is electrically connected to an upright extension 28 of the metal connector 29 which is held in place by means of screws 30. Also extending from the connector 29 is an upright piece 31 having threaded through it a screw 32 on one end of which is mounted the electrical contact piece 16.

Located opposite the upright member 31 is a similar upright member 34 which has threaded through it a screw 33 carrying the other electric contact 17. The member 34 is integral with a metal anchor piece 35 which is held in place by means of screws 36. Screws 37 located at one end of the metal connectors 35 and 43 serve to anchor the current conducting wires 18 and 19 mentioned above.

The metal spring member 15 has a reversely curved, flexed, central portion shown at 38 and has a solid flat end portion bearing electric contact pieces 39 and 40 at the movable end of this spring member. The other end of the spring member 15 is fixed by means of a screw 41 to an upright piece 42 of another metal anchor member 43 which is held in place by means of screws 44.

As shown more clearly in Fig. 2 the screw 13 extends through the back of the casing 10 and through the supporting metal strip 11 and is held by means of nut 45. This screw 13 or the strip 11 is connected in any suitable manner to ground or the negative side of the battery, during operation of my device. Also as shown in Fig. 2, the metal case 10 has a layer of insulating material 46 which serves as a base or support for the metal anchor members referred to in Fig. 1. Located below the base 46 is a second strip of insulating material 47, as a precaution to prevent short circuiting between the bottom of the metal case 10 and any of the metal parts of the device mounted on the baseboard 46. It will be understood, of course, that neither of these pieces of insulating material will be needed if the case 10 is itself made of insulating material such as synthetic resin. It may, for example, be molded of the synthetic resin "Bakelite" in one piece and all of the elements of the device connected directly with the "Bakelite" case. The case may be covered as shown at 48.

Referring now to Figs. 3 and 4 which show more clearly the arrangement and construction of the spring member 15, it will be noted that in this arrangement the spring is supported at one end by a substantially U-shaped metal upright piece 42 which is integral with a base 43 and bent at substantially right angles thereto. The spring member has two longitudinal slots 52 and 53 extending throughout the length of the member except for a solid portion on one end of the spring which is joined to the upright support 42 by means of the screw 41, and a solid portion on the other end of the spring which carries the contact pieces 39 and 40. Adjacent the fixed end of the spring member 15 the slots 52 and 53 have a semi-circular formation producing a rounded portion 51 at that end of the central portion 38. Located in the approximate center of this rounded portion 51 is a recess 55 for receiving the insulating bead 25.

As more clearly shown in Fig. 4 the above described spring member 15 has a reversely curved central portion 38 and two outer flat portions 61 and 62. The central portion 38 for the purposes of this invention is lengthened or stretched by suitable means so that it is longer than the adjacent outer portions 61 and 62 of the spring member 15, and therefore buckles in the manner shown in Fig. 4. This buckling causes the central portion 38 to assume a reversely curved or sinuous form. When the member 15 is fixedly mounted at the end opposite the electrical contacts and tension is applied to the buckled portion 38 adjacent the fixed end, as by contraction of the thermoresponsive resistance wire 14 which is connected at this end, the buckled portion 38 reverses its position and causes the free end of the spring member 15 carrying the contact piece 40 to quickly and firmly move with a cricket-type of action. As a result, electrical contact is quickly and efficiently made between the contact piece 40 and the contact piece 16 as shown in Fig. 1. Upon expansion of the wire 14, which may be effected by a flow of electric current through the wire, the tension on the buckled part 38 is released and the spring member 15 quickly snaps over into the opposite position so that the contact piece 39 mates with the contact 17.

In Fig. 5 a modified arrangement of the thermoresistance wire 14 and spring member 15 is illustrated. In this arrangement the wire 14 is not connected to the spring member 15 in any manner and only indirectly effects movement of the spring member. In this modification a different form of spring supporting means 54 is used. The support 54 has a continuation 55 located at substantially right angles to the piece 54 and integral therewith. Located near the center of the extension 55 is a recess 56. In this recess 56 is positioned an L-shaped member, the longer portion of which is shown at 57 and which has a recess 58 adjacent its end for receiving the bead 25. The shorter portion 59 of this L-shaped member is so positioned as to press against the curved strip 38 of the spring member 15 adjacent its fixed end.

This cooperative association between the spring member 15, supporting member 55 and L-shaped member 57 will be understood clearly from a consideration of Figs. 5, 6 and 7. In this modified arrangement when the thermo-responsive wire 14 contracts it causes the bead 25 to exert a pull against the member 57 and since this member is

pivoted on the member 54 at the recess 56, this stress will cause a pivoting action to take place, forcing the extension 59 against the curved member 38 of the spring member 15. This stress on the member 38 causes the spring member 15 and particularly the contact 39 to snap quickly against the contact piece 17 as shown in Fig. 5. This arrangement provides a movement of the spring member 15 which is the reverse of that of Fig. 1.

The mechanical operation of the spring 15 will be further understood from the following description of the electrical operation of the switch as indicated by the circuit diagrams in Figs. 8 and 9. Referring first to Fig. 8 which represents a shunt circuit, the device is caused to operate as follows:

When the terminal 43 is connected to the positive side of a battery or other source of potential, which may also be an alternating current if so desired, current will flow through the spring member 15, through the contacts 40 and 16, and thence through the wire 27 and through the thermoresponsive resistance wire 14, which is held in position at the point 20. The current will then flow through the resistance 64, which may be either a separate resistance or simply the resistance of the wire 24 shown in Fig. 1. From the resistance 64 the current will then flow through the line 65 and through the lamps 66 and 67 connected in parallel, and then out to the negative side of the battery or other source of potential. The resistance of this circuit is such that the current flowing through the lamps 66 and 67 is insufficient to cause them to glow appreciably.

The flow of current through the resistance wire 14 causes it to heat up immediately and expand in accordance with the inherent characteristics of that wire. When the wire expands or lengthens it releases the tension upon the buckled member 38 of the spring 15 and permits the spring member 15 and particularly contact 39 to snap over and mate with the contact piece 17, in accordance with the normal tendency of the buckled member 38. The current will now seek the lowest path of resistance and will pass through the spring member 15 and through the wire 68, thence through the wire 65 and lamps 66 and 67, thereby shunting the path through the resistance 64. This current is now sufficient to cause the lamps 66 and 67 to light to full brightness. While this latter operation is going on, however, the resistance wire 14 cools and contracts and causes the spring member 15 to snap back into contact with the contact piece 16, reestablishing the circuit discussed first above and thereby substantially extinguishing the light in the lamps. These two operations continue intermittently as long as the switch is in use, thereby causing the lamps 66 and 67 to flash on and off at any predetermined rate.

In Fig. 9 the operation of the device is similar to that described above, except that the circuit is a series circuit instead of a shunt circuit and when the resistance 64 is in circuit no current will flow through the lamps 66 and 67, and when the resistance 64 is out of circuit all of the current will flow through these lamps and cause them to light as described above. For example, with the contact made as shown in Fig. 9 between the contact pieces 40 and 16, current will flow from the positive terminal through the spring member 15 and through the wire 27, resistance wire 14 and resistance 64 to ground as shown. In this instance the lamps receive no current. As soon as the wire 14 expands due to this flow of current therethrough, the spring member 15 snaps over and causes the contact member 39 to make electrical contact with the member 17. The current will then flow through the spring member 15 and through the path of least resistance which is the lamp circuit, thereby lighting the lamps 66 and 67. This alternate operation causes the lamps 66 and 67 to flash on and off as described above, so long as the device is connected to the source of potential. When the device is used for causing automobile stop-lights to flash on and off, the battery circuit is closed normally by depressing the foot brake in the car.

As a safety factor my device is so constructed that if the wire 14 breaks the stop light will nevertheless function, that is, the lamp will burn continuously.

It will be noted from the foregoing description that the spring member 15 is sturdy in construction and is adapted to make firm and quick contact with the two stationary contact members. In operation the spring member remains in firm contact with one of the stationary contact members until a critical point has been reached in the heating or cooling the thermoresponsive resistance wire, at which time the spring member quickly snaps over into contact with the other stationary contact point and remains in firm contact therewith until the next cycle of heating and cooling of the resistance wire begins. During operation the current that flows through the spring member 15 is divided into three paths, that is through the component parts 38, 61 and 62 of the spring member 15 thereby preventing current overloading of any portion of the spring member.

It will be understood that various modifications and changes may be made in the device of my invention as described above, without departing from the scope of the invention, some of the novel features of which are defined in the appended claims.

I claim:

1. In an electric switch device adapted for operating automobile stop-light flashers and having a thermoresponsive wire which controls the operation of the switch by contraction and expansion of the wire caused by intermittent flow of current therethrough, a pair of fixed contacts, and a spring member adapted to mate alternately with each of said contacts, and thereby alternately make and break an electrical circuit through said wire, the improvement which comprises forming said spring member from a substantially flat, slotted, uni-metal strip having an integral central portion formed between slots in said member and having said central portion lengthened sufficiently to place it under stress and thereby cause the entire member to embody a snap-switch action, said spring member being fixed at one end and free to move at the other end with relatively great magnitude of movement of said free end between the spaced contacts upon markedly slight movement of the constrained center portion adjacent the fixed end of the member, the thermoresponsive wire being connected so that slight changes in dimensions in said wire effect said slight movement of the constrained portion of the spring there being a short time-delay between changes in said wire and movements of the free end of said spring to interrupt continuous operation and thereby provide flashing effects in automobile flashers.

2. In an electric switch device as defined in claim 1, the improvement which comprises using as the spring member a single piece of substan-

tially flat metal slotted longitudinally but having closed ends and having a reversely curved center portion which upon the application of slight force will cause the spring member to snap from one of said contact members to the other of said contact members with firm positive action.

3. In an electric switch device as defined in claim 1, the improvement which comprises constructing said spring member of a single ply metal strip, slotted longitudinally substantially throughout its length, and pivoting means for connecting said thermoresponsive wire adjacent the fixed end of said strip.

4. In an electric signal actuating device comprising a thermoresponsive current conducting means which contracts and expands with intermittent flow of current therethrough, a current conducting tensioned switch member operatively connected with said thermoresponsive member and having a fixed end and a free end, an electrical contact piece arranged adjacent said free end such that upon alternate flow of current through said thermoresponsive member said tensioned member will be caused to assume a reciprocating motion and the free end of said tensioned member alternately touch said contact piece and alternately close and open the electrical circuit through said thermoresponsive member, said tensioned member being slotted so as to divide said member into at least two portions one of which is under stress so that the member will embody a snap-switch motion preceded by a time delay when actuated by slight expansions and contractions of said thermoresponsive member, the tensioned member requiring only a very slight movement adjacent the fixed end thereof to effect a movement of relatively great magnitude at the free end thereof thereby providing precision control of the operation of the device and positive firm electrical contact between the free end of the tensioned members and said contact piece, the thermoresponsive means being connected with said tensioned member in the aforesaid manner so as to effect a short time delay between changes in said thermoresponsive means and movements of the free end of said tensioned member to insure definite intervals between the closing and opening of the electrical circuit.

5. A device as defined in claim 4 in which the tensioned member has two slots and two of the portions of the slotted member are under tension.

6. An automatic make and break device for an electric circuit, comprising a contact point constituting a terminal of the electric circuit, a second terminal of the electric circuit, a conducting member tending to rest normally against the contact point, a spring element connected to the said member and exerting force upon and tending to hold the member away from the contact point, and an elongated thermo-responsive conductor connecting the said element to the second terminal, the elongated conductor when cold being shorter in length than the distance between the points of its attachment to the said element and the second terminal when the said conducting member rests against the contact point and exerting tension on the spring element, so as to release the force of the said element upon the said conducting member in direction away from the contact point, and the elongated conductor when hot being longer than the said distance so that the spring element is free to urge the conducting member away from the contact point, and the circuit is broken when the elongated conductor is hot.

ALFRED H. SCHRAMM.