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INTERMITTENT SWITCHING MEANS WITH PILOT LIGHT

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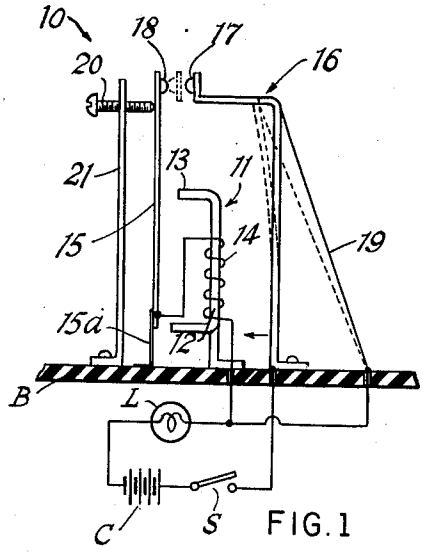


FIG. 1

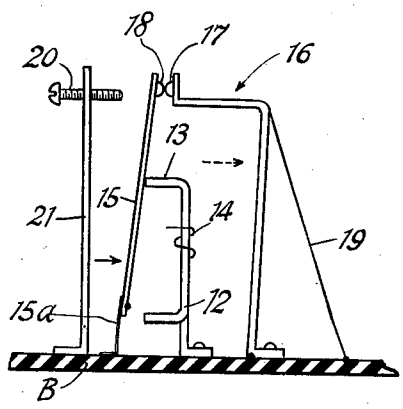


FIG. 2

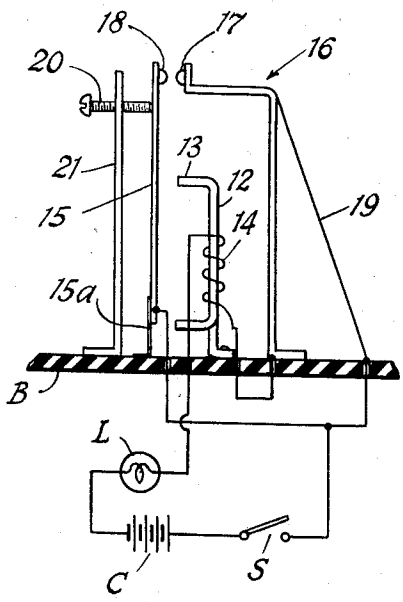


FIG. 3

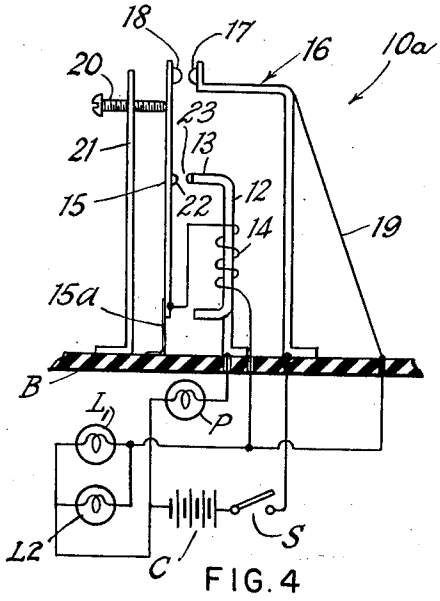


FIG. 4

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INTERMITTENT SWITCHING MEANS WITH PILOT LIGHT

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1

This invention relates to electric switches and more particularly to switches of the flasher type.

Flasher switches are known in the art which include a combination of an electromagnet and a thermoresponsive wire as means for alternately opening and closing an electric circuit. Such switches have a working life and operating efficiency which in a large part is dependent on the rapidity with which the circuit is opened. Accordingly, an object of this invention is to provide an improved flasher switch of the type described, in which the magnet and wire are related in a manner to provide a "break" in the flasher operation of maximum rapidity.

A further object of this invention is to provide an improved flasher switch of the character described wherein the wire is movable independently of the magnet whereby to accelerate the "break" in the flasher operation.

Still another object of this invention is to provide an improved flasher switch of the character described wherein the electromagnet carries very little or no current during the break portion of the flasher operation.

Still a further object of this invention is to provide an improved flasher switch of the character described wherein switch contacts are located on members capable of independent movement and arranged to move toward each other during the "make" portion of the flasher operation and to move away from each other with accelerated speed during the break portion of the device.

Yet another object of this invention is to provide in a device of the character described, improved means for regulating the extent of the "make" and "break" portions of switch operation.

Yet a further object of this invention is to provide an improved combination of flasher switch, load and pilot light, wherein the pilot light indicates the working condition of the load in an improved manner.

Other objects of this invention will in part be obvious and in part hereinafter pointed out.

The invention accordingly consists in the combination of elements, arrangement of parts and circuit connections which will be exemplified in the embodiments hereinafter described, and of which the scope of invention will be indicated in the claims following.

In the drawing:

Fig. 1 is a diagrammatic view of a flasher switch embodying the invention and the electrical connections thereof;

Fig. 2 shows the relative location of parts of the device shown in Fig. 1, at the "make" portion of switch operation;

2

Fig. 3 is a diagrammatic view similar to that of Fig. 1, showing a modified arrangement of connections; and

Fig. 4 is a diagrammatic view of a device embodying the invention, arranged for operation with a pilot light.

Referring in detail to the drawing and particularly to Fig. 1, 10 designates a flasher switch embodying the invention. The same comprises an electromagnet generally designated at 11 which may be suitably mounted in insulated relation to a base B. The electromagnet 11 includes a core 12 having a lateral projection 13, and a winding 14 on the core. The magnet armature 15 is mounted on a resilient spring member 15*a* which is anchored to base B.

An angle shaped member 16 of resilient, springy metal is anchored at the lower end of its vertical portion to base B and carries a switch contact 17 on its horizontal arm portion. A switch contact 18 is mounted on armature 15, in opposed relation to contact 17. Armature 15 is biased, by means of member 15*a*, away from the core 12, as indicated by the arrow in Fig. 1. Member 16 is biased toward armature 15, as indicated by the arrow in Fig. 1.

The contacts 17, 18 are normally maintained in separated or spaced relation by means of a thermoresponsive, resistance wire 19 which is attached at one end to the upper portion of member 16 and is tensioned and anchored at its other end to base B.

The switch 10 may be connected in circuit with a load L, such as a lamp or the like, a current source C and a switch S, as shown in Fig. 1, with the object of flashing the load L as long as switch S is closed. Thus, one end of the winding 14 is connected to the armature 15 and the other end of the winding is connected to one side of the load L and to the wire 19. The member 16 is connected to one side of the current source C through switch S, the other side of the current source being connected to the other side of load L.

A stop screw 20 mounted in a bracket 21 which is positioned on base B, provides means for adjustably setting the normal position of the armature 15.

When switch S is closed, current passes through member 16, wire 19 to load L. Since the wire has a relatively high resistance, the current passing through the load is of nominal value and insufficient to fully energize the same. However, such current will cause the wire 19 to heat up and

elongate as indicated in dotted lines in Fig. 1. This will allow biased member 16 to progressively move toward the armature 15 until contact 17 engages contact 18.

When the contacts 17, 18 engage, a circuit is set up having a resistance much less than that of wire 19 and the wire is shunted. Current will now pass through member 16, contacts 17, 18, armature 15, winding 14 to load L. As winding 14 is energized, the armature is moved to its attracted position against its bias as shown in Fig. 2. This in turn causes contact 18 to press against contact 17 with a force sufficient to move member 16 against its bias, as indicated by the arrow in dotted lines in Fig. 2 Thus the contacts 17, 18 are positively locked together.

The full value of current from source C will pass through the circuit shunting wire 19, and load L will be fully energized, which in the case of lamps, the same will be illuminated.

With wire 19 shunted and practically no current passing therethrough, the same begins to cool and to progressively contract. This gives rise to progressively increasing tensioning forces in the wire until the value thereof exceeds the biasing force which has moved the member 16 toward the armature 15. At such point, the member 16 is pulled away from armature 15 whose position is fixed by the arm 13 of magnet core 12. Such movement of member 16 is in opposition to the direction of its bias and contact 17 is caused to move away from contact 18.

When contacts 17, 18 begin to separate, the shunting circuit is disrupted and the magnet 11 is deenergized. The armature 15 snaps back to its normal position as determined by the stop screw 20 under the impetus of its bias, thus accelerating the "break" at contacts 17, 18.

As soon as the contacts 17, 18 are separated, the current from source C again flows through wire 19, thereby reducing the current flow through load L to a nominal value and the wire starts to heat up again, thus repeating the cycle of operations described above, until switch S is opened.

It is apparent that contacts 17, 18 are mounted respectively on independently movable members which are adapted to move away from each other with great speed at the "break" portion of the flasher cycle. Furthermore, when the winding 14 is energized as soon as contacts 17, 18 engage, the movement of the members is toward each other, thereby locking the engaged contacts so as to insure a positive "make" in the flasher cycle.

The timing of the "make" and "break" portions of the flasher cycle, may be adjusted by the stop screw 20. By turning the screw 20 in the proper direction, the normal spacing between contacts 17, 18 may be varied. Such spacing determines the extent of elongation of wire 19 required before the contacts engage, as well as the time interval for contraction of the wire sufficient to initiate separation of the contacts.

The flasher switch 10 may be used in an alternative circuit as shown in Fig. 3. Here, the member 16 is connected to one end of winding 14, the other end thereof being connected to one side of load L. The anchored, or non-tensioned end of wire 19 is connected to armature 15 and to the other side of load L through switch S and current source C.

With such connections, the operation of flasher switch 10 is the same as previously described, except that the winding 14 carries current when contacts 17, 18 are separated. However, such current is of negligible value due to the relatively high resistance of wire 19. When current initially flows through wire 19, the same heats up and elongates to allow the contacts to engage, thus shunting the wire 19, as described above. With wire 19 shunted, substantially full current from source C passes through winding 14 by way of armature 15, contacts 17, 18, and member 16, thus energizing the magnet 11 and causing the armature to be pulled to its attracted position and locking the engaged contacts, as described above. With a very small current passing through winding 14 when separation of the contacts is initiated, the armature 15 moves away from member 16 with accelerated speed, thus providing an extremely rapid "break" in the flasher cycle, as previously described.

The flasher switch embodying the invention may be slightly modified to allow the same to be used in a circuit including pilot means for indicating the operating condition of the load, as shown in Fig. 4. Here, the switch 10a is similar to that shown in Fig. 1, except that a second pair of switch contacts 22, 23 are respectively mounted on the armature 15 and arm 13 of the magnet core 12.

The circuit connections shown in Fig. 4 are similar to those of Fig. 1, except that pilot indicating means P, which may take the form of a lamp, is connected between the magnet core 12 and one side of the current source C. The load may take the form of a pair of parallel connected lamps L_1 and L_2.

When contacts 17, 18 engage, due to elongation of wire 19, as previously described, magnet 11 will be energized causing contacts 22, 23 to engage and allowing current to energize pilot P. However, if either of loads L_1 or L_2, or both, become inoperative, the current passing through the shunting circuit including winding 14, will be considerably reduced. The bias on armature 15 through spring member 15a is such as to be insufficient to prevent full attraction of the armature, providing maximum current flows in the shunting circuit, but is sufficient to prevent movement of the armature to its fully attracted position, if the current in said circuit is reduced.

Thus, with reduced current in the shunting circuit, due to failure of one or more of the loads, contacts 22, 23 will not engage and pilot P will remain deenergized to indicate a failure in one or more of the loads. It is understood that the pilot P may take other forms, such as a bell or the like, which may be energized to give perceptible indication of the operating condition of the loads.

It will thus be seen that there is provided electric switches in which the several objects of this invention are achieved and which are well adapted to meet the conditions of practical use.

As various possible embodiments might be made of the above described invention, and as various changes might be made in the embodiments set forth, it is understood that all matter herein set forth or shown in the accompanying drawing, is to be interpreted as illustrative and not in a limiting sense.

Having thus described the invention, we claim as new and desire to protect by Letters Patent:

1. A flasher switch comprising a pair of members respectively anchored at one end thereof and including movable portions at the other ends thereof, a pair of electrical circuits, one of said circuits comprising a pair of contacts respectively

mounted on the movable portions of said members, the other of said circuits comprising a thermoresponsive resistance wire attached at one end thereof to one of said members and anchored at the other end thereof and operative when cool to keep said contacts separated and further operative when heated in response to the passage of a current therethrough, to expand and allow said contacts to engage whereby said second circuit is shunted, said resistance wire upon cooling being operative to contract to initiate the separation of said contacts, the other of said members being movable in a direction to accelerate the separation of said contacts.

2. A flasher switch comprising a base, a pair of members mounted on said base and having free portions resiliently biased in the same direction, a pair of opposed contacts mounted respectively on said members, a tensioned thermoresponsive resistance wire connecting said base and one of said members for maintaining said contacts in spaced relation, said wire being responsive to the passage of a current therethrough to expand and allow said contacts to engage, a low resistance circuit including said contacts adapted to be energized by said current and thereby shunting said wire, and means for adjusting the normal position of the other of said members whereby to determine the spacing of said contacts.

3. A flasher switch comprising a base, an electromagnet on said base and including a magnet winding and an armature resiliently biased in a given direction, a resilient member on said base and biased in the same direction, a pair of opposed, normally separated contacts mounted respectively on said armature and said member, a thermoresponsive wire anchored at one end and attached at the other end thereof to said member and tensioned to maintain said contacts in spaced relation, an electrical circuit including said wire for causing elongation thereof upon passage of current through said circuit whereby said contacts engage and shunt said circuit, a second electrical circuit including said contacts and said winding whereby said winding is energized thereby causing said armature to move against the bias thereof and to lock the engaged contacts, said shunted wire being adapted to cool and contract until said contacts start to separate and deenergize said second circuit, whereby said armature moves in a direction to accelerate the separation of said contacts.

4. A flasher switch as in claim 3, wherein said first mentioned circuit includes said resilient member.

5. A flasher switch comprising a base, an electromagnet on said base and including a magnet winding and an armature resiliently biased away from its attracted position, a resilient member anchored at one end thereof to said base, a pair of opposed contacts mounted respectively on said armature and the other end of said member, a thermoresponsive member connecting said member and base and tensioned to maintain said contacts in spaced relation, an electrical circuit including said wire and adapted upon passage of current therethrough, to cause said wire to elongate and said contacts to engage, said circuit being shunted upon engagement of said contacts, a second electrical circuit including said contacts, armature and winding adapted upon passage of said current to move said armature to its attracted position thereby locking said engaged contacts, said wire in its shunted condition

contracting until said contacts start to separate thereby deenergizing said second circuit, the separation of said contacts being accelerated by the biased movement of said armature from its attracted position.

6. A flasher switch comprising an electromagnet including a magnet winding and an armature biased away from its attracted position, a resilient member anchored at one end thereof, a pair of opposed contacts mounted respectively on said armature and said member, a thermoresponsive resistance wire anchored at one end thereof and attached at the other end thereof to said member and tensioned to space said contacts, a first circuit including said wire, a second circuit including said contacts, armature and winding serially connected, said wire being adapted to elongate upon passage of current through said first circuit and to cause said contacts to engage, said wire being shunted upon engagement of said contacts, said armature being moved to its attracted position upon passage of current through said second circuit, to lock said engaged contacts, said shunted wire contracting and initiating the separation of said contacts whereby to shunt said second circuit and to reduce the current in said winding to a value causing the armature to move away from its attracted position to accelerate the separation of said contacts.

7. A flasher switch comprising an electromagnet including a core, a winding on said core, and an armature biased away from its attracted position, a resilient member anchored at one end thereof, a pair of opposed contacts respectively fixed to said armature and the free end of said member, a thermoresponsive wire anchored at one end and attached at the other end thereof to said member and tensioned to space said contacts, said wire being adapted upon heating to elongate and to cause said contacts to engage, said winding being adapted to be energized to move said armature to an attracted position and to move said member to a stressed position determined by said core, said wire being adapted to contract until the tension thereof is sufficient to initiate the separation of said contacts.

8. A flasher switch comprising a base, an electromagnet on said base and including an armature resiliently biased away from its attracted position, a member anchored on said base and resiliently biased toward said armature, a pair of opposed contacts respectively mounted on said armature and said member, a thermoresponsive wire connecting said member and said base and tensioned to space said contacts, said wire being adapted upon heating to elongate until said contacts engage, said electromagnet being adapted to be energized when said contacts engage whereby said armature in its attracted position is operative to move said member to a position wherein said member is stressed and said engaged contacts are locked, said wire being adapted on cooling to contract until the tension thereof is sufficient to initiate the separation of said contacts.

9. A flasher switch comprising a base, a pair of opposed members mounted on said base and resiliently biased in the same direction, one of said members being magnetic, a pair of opposed contacts respectively mounted on said members, a thermoresponsive wire anchored to said base and attached to the other of said members and tensioned in a direction to separate said contacts, said wire being adapted to carry a current and to be heated and to elongate until said

contacts engage and thereby shunt said wire, electromagnetic means adapted to be energized by said current upon engagement of said contacts for moving the said magnetic member towards said other member to lock said engaged contacts, said wire being adapted on cooling to contract and thereby allow said other member to move in a direction to initiate the separation of said contacts, said magnetic member being biased to move away from said other member to accelerate the separation of said contacts.

10. A flasher switch comprising a base, an electromagnet including a core, a winding on said core and an armature resiliently biased away from said core, a member anchored at one end thereof on said base and having a portion resiliently biased toward said armature, a pair of opposed contacts respectively mounted on said armature and member portion, a thermoresponsive wire connecting said base and said member and tensioned to keep said contacts separated, a first circuit including said wire and a second circuit including said member, contacts, armature and winding, said circuits being adapted to be alternately energized in response to the alternate heating and cooling of said wire.

11. A flasher switch as in claim 10, wherein said first circuit includes said wire and winding, and said second circuit includes said armature, contacts and winding, the value of the current passing through said winding in the first circuit being a fraction of the current passing through said winding in the second circuit.

12. In an electric circuit comprising a load and a source of electric energy for energizing said load, flasher switch means in circuit with said load and said source of energy, said switch means comprising an electromagnet including a core, a winding on said core in circuit with said load, and an armature resiliently biased away from said core, a contact carrying member resiliently biased toward said armature, a pair of switch contacts respectively mounted on said armature and said member, thermoresponsive means in circuit with said load for tensioning said member to separate said contacts, pilot means in circuit with said source of energy, second switch means in said pilot circuit, operable in response to movement of said armature and closing in the fully attracted position of the armature, said armature being incompletely attracted with a reduction in current passing through the load whereby said second switch means is open to deenergize said pilot means.

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