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HOT WIRE ELECTROMAGNETIC FLASHER

Filed June 8, 1961

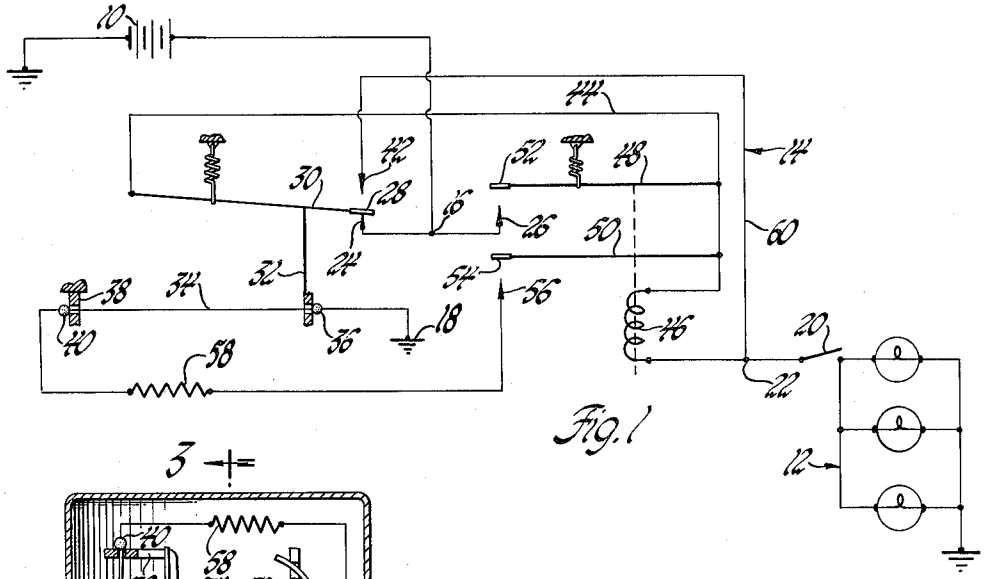


Fig. 1

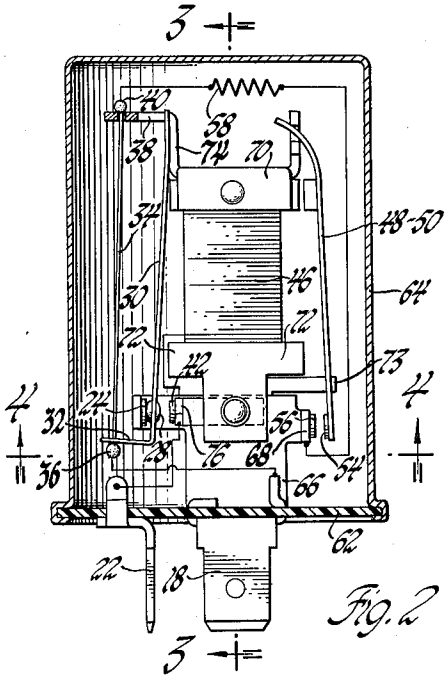


Fig. 2

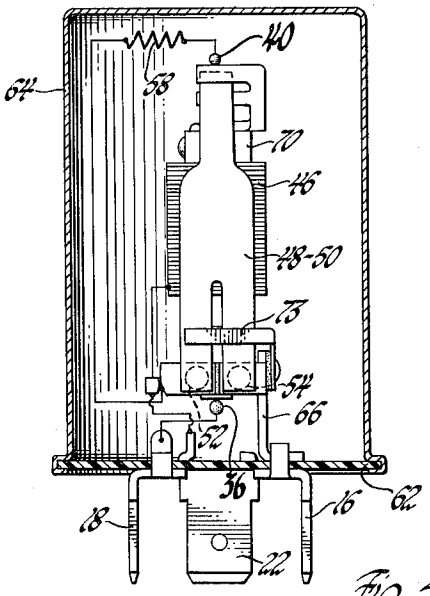


Fig. 3

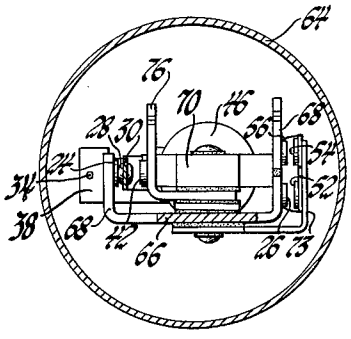


Fig. 4

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HOT WIRE ELECTROMAGNETIC FLASHER

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This invention relates to a thermoresponsive electric flasher, and particularly to a flasher of the type used in warning signal circuits on vehicles.

It is well known to utilize a heat expansible wire to operate switching contacts within a flasher and also to use a relay actuated by those contacts. Frequently, however, it is found that the contacts within a flasher become defective due to excessive arcing and that a flasher is insensitive to major load changes or, on the other hand, is unduly sensitive to minor load changes.

An object of this invention is to provide a flasher arrangement whereby arcing between contacts is reduced, and further to provide a flasher which will give a positive indication of a drop in load large enough to be caused by failure of a load element, and yet be unaffected in operation by smaller load changes.

The invention is carried out by providing a relay connected with one terminal of a voltage source and means for alternately connecting the coil to the other terminal of the voltage source and shunting out the coil.

Another aspect of the invention provides a heat expansible wire which is connected across a voltage source during periods of heating the wire and disconnected from the source during periods of cooling.

The above and other advantages will be made more apparent from the following specification taken in conjunction with the accompanying drawings wherein like numerals refer to like parts, and wherein:

FIGURE 1 is a schematic electrical diagram of a flasher in a lighting system according to the invention;

FIGURE 2 is a front elevational view of a flasher according to the invention with parts broken away and in section;

FIGURE 3 is a sectional view taken substantially on line 3—3 of FIGURE 2; and

FIGURE 4 is a cross sectional plan view of the flasher of FIGURE 3 taken along the lines 4—4.

Referring now to FIGURE 1, a vehicle warning light circuit comprises a battery 10, a group of warning lamps 12, and a flasher 14 connected in circuit therewith to periodically energize the warning lamps 12. One terminal of the battery 10 is connected with a terminal 16 of the flasher 14 while the other terminal of the battery 10 is connected to a second terminal 18 of the flasher as well as to one side of the group of lamps 12 and may comprise a common ground connection. A manually operated switch 20 is interposed between the lamps 12 and the load terminal 22 of the flasher 14.

The first terminal 16 of the flasher has two stationary contacts 24 and 26 associated therewith. The stationary contact 24 has associated therewith a movable contact 28 carried by an armature 30 spring biased in a direction to tend to separate the contacts. The armature 30, however, is mechanically connected through an arm 32 to a heat expansible wire 34 which is insulated therefrom by a bead 36. The other end of the heat expansible wire 34 is fixed to a stationary point 38 through a second insulating bead 40 so that if the wire 34 expands, the armature 30 will move upwardly until the contact 28 thereon engages another stationary contact 42. The armature 30 is connected through a common circuit 44 in series with a relay coil 46 which in turn is connected to the load terminal 22. The relay coil 46 operates a pair of armatures 48 and 50 which are connected with

the common circuit 44. One of the armatures 48 carries a holding contact 52 adapted to cooperate with the stationary contact 26 associated with the first terminal 16, and the other armature 50 carries a contact 54 which cooperates with a stationary contact 56 connected in series with the heat expansible wire 34, a resistor 58, and the second terminal 18. The load terminal 22 of the flasher is directly connected by a shunt circuit 60 to the contact 42 which cooperates with the first armature 30.

In operation, when the manual switch 20 in the load circuit is open, the contacts will be in those positions shown in FIGURE 1. When the manual switch 20 is closed, current will flow from the battery 10 through the stationary contact 24, the movable contact 28, the first armature 30, the common circuit 44, the relay coil 46, the manual switch 20, the lamps 12, and finally, back to the battery 10 thereby instantly energizing the lamps 12 and energizing the relay coil 46 causing the two armatures 48 and 50 to move downwardly in engagement with their corresponding stationary contacts 26 and 56. The holding contacts 52, 26 serve to connect the battery 10 to the common circuit 44 so that the relay coil 46 will remain energized and the lamps 12 will remain lit. The other armature 50 will make contact with contact 56 thereby permitting current from the common circuit 44 to flow through the heat expansible wire 34 and the resistance 58 back to the battery 10 thereby causing the expansible wire 34 to become heated and to expand. Upon such expansion, the armature 30 breaks contact with the stationary contact 24 and moves upwardly toward the other stationary contact 24. During the period of movement from one stationary contact 28 to the other 42, the holding contact 52 maintains the relay coil 46 and lamps 12 energized. However, when the movable contact 28 touches the stationary contact 42, the relay coil 46 will be shunted out by the shunt circuit 60 which will be in parallel with the common circuit 44 thereby causing the relay armatures 48 and 50 to drop out and the corresponding contacts 52 and 56 to open. As this occurs, the lamps 12 will be deenergized and, of course, current will cease to flow through the heat expansible wire whereby it will tend to cool and contract. When the heat expansible wire contracts sufficiently, the movable contact 28 on the first armature 30 will be returned to its original position against the stationary contact so that the cycle will be repeated.

It is to be noted that at no time does arcing between any of the contacts occur due to the collapse of the magnetic field of the relay coil. For example, when the movable contact 28 breaks from the stationary contact 24, the common circuit 44 remains energized due to the holding contact 52 and hence there is no callapse of the field and no arcing and, in fact, the movable and stationary contacts 28 and 24 will remain at the same potential. When the movable contact 28 touches the other contact 42, the relay coil 46 will be shortcircuited. As the field collapses, any induced currents in the coil 46 will flow through the shunt circuit 60 and the common circuit 44. When the holding contacts 52 and 26 separate, no arcing will occur because of the discharge path through the shunt circuit 44.

It can readily be seen that small changes of load current will not affect the flashing rate of the flasher 14 since the flashing rate is controlled by the heat expansible wire 34 which is connected directly across the battery 10 so as not to be affected by load current. However, the invention also has the advantage that large changes in load such as that caused by an open filament in one of the load lamps 12 will decrease the load current to such an amount that the relay coil 46 is not sufficiently energized to operate the relay armatures 48, 50. Then the

relay will not operate at all and the failure to operate gives an indication of the condition of the signal lamps by the absence of the usual click associated with the operation of a relay.

While the preferred arrangement of the flasher is that shown in the drawings, it is evident that in a system where the manual switch **20** is connected to terminal **16** rather than to the load terminal **22**, the armature **50** may be dispensed with and the expansible wire circuit may be connected directly to the common circuit **44**. Since the voltage would be removed from the wire **34** when the switch **20** was opened, the flasher would not operate until the switch **20** was closed.

The structure of the flasher is preferably as illustrated in FIGURES 2, 3 and 4 and includes an insulating base member **62**, an envelope **64**, three terminals **16, 18, 22** mounted on the base member **62**, and the flasher mechanism **14** supported within the envelope **64** by a support member **66** connected to terminal **16**. The support **66** is T-shaped and has its upper arms **68** bent at right angles to the main body of the support, and the arms carry the stationary contacts **24, 26, 56**. The relay coil **46** is wound about a core member **70** which is riveted to the support **66** and is insulated therefrom. One end of the coil winding is electrically connected to the core **70**. The relay core **70** has near the bottom thereof a pair of laterally extending pole pieces **72** and has at the top thereof means for carrying two armatures **30** and **48–50** which extend downwardly past the pole pieces **72**. The armature **48–50** is adapted to be attracted to the pole piece **72** when the relay coil **46** is energized. The stationary contact **24** serves as a stop member for the first armature **30**, and an L-shaped stop member **73** limits the outward movement of the second armature **48–50**. A tab **74** extending outwardly from the top of the relay core **70** forms a support for the heat expansible wire **34** which is insulated therefrom by an insulating bead **40**, and the other end of the wire **34** is secured to a foot portion of the first armature **30** through the medium of a second insulating bead **36**. A resistance wire **58** extends from the top of the heat expansible wire **34** to a stationary contact **56**. Another L-shaped member **76** carried by the support **66** and insulated therefrom has a stationary contact **42** secured thereto. The member **76** is electrically connected to both the relay coil **46** and the load terminal **22** and the contact **42** is aligned with the stationary contact **24**. The second armature **48–50** carries a pair of contacts **52, 54** aligned with the stationary contacts **26, 56**.

It will be readily seen that when the relay coil **46** is actuated, the armature **48–50** will be pulled in to make contact with the stationary contacts **26, 56** thereby connecting them in series. Current then will flow from the first terminal **16** through the support member **66** and the closed contacts **24, 28** and **54, 56** to the resistance wire **58** and the heat expansible wire **34** to the third terminal **18**. As the heat expansible wire **34** expands, the first armature **30** will be permitted to move inwardly to make contact with its associated contact **42** which in turn is connected to the load terminal **22** and the lower end of the relay coil winding **46** so that the relay coil will be shunted out inasmuch as the upper portion of the armature **30** is connected to the other end of the relay coil winding **46** through the core **70**. Accordingly, the relay coil **46** will become deenergized and the second armature **48–50** will be released thereby opening the contacts **52, 26**, and **54, 56** and preventing current flow to the heat expansible wire **34**. The wire **34** then contracts to pull the first armature **30** away from the stationary contact **42** and back toward the first contact **24** whereupon the cycle will be repeated.

It will thus be seen that this invention provides a flasher of the heat expansible wire-relay type which is simple in construction and has the inherent advantages that arcing will not occur across the contacts, that a positive indication of lamp burn-out will be given, that small variations in the load will not affect the flasher frequency rate, and that the flasher is in normally closed position so that in the event of flasher failure, the load lamps may be energized.

The above described embodiments of the invention are intended only as specific illustrations of the invention and are not to be taken as limiting the scope of the invention which is defined by the following claims:

I claim:

1. A flasher having an input terminal and a load terminal, a relay coil connected with said load terminal, and switch means actuated by the relay coil for alternately connecting said coil to said input terminal and shunting out said coil.

2. A flasher having an input terminal and a load terminal, a relay coil connected with said load terminal, and switch means actuated by the relay coil for alternately connecting said coil to said input terminal and shunting out said coil, said switch means including a double throw switch operated by a heat expansible element.

3. A flasher having an input terminal and a load terminal, a relay coil connected with said load terminal, switch means operated by a heat expansible element for alternately connecting said coil to said input terminal and shunting out said coil, and a relay switch actuated by the relay coil connecting said element with said input terminay when said coil is energized.

4. A flasher having an input terminal and a load terminal, a relay coil connected with said load terminal, switch means for alternately connecting said coil to said input terminal and shunting out said coil, and a holding switch closed upon energization of said relay to maintain the relay coil energized until it is shunted out by said switch means.

5. A flasher having an input terminal and a load terminal, a relay coil connected with said load terminal, switch means for alternately connecting said coil to said input terminal and shunting out said coil, said switch means comprising a double throw switch operated by a heat expansible element, and relay operated holding switch means to maintain said relay coil energized.

6. A flasher having an input terminal and a load terminal, a relay coil connected with said load terminal, switch means actuated by the relay coil for alternately connecting said coil to said input terminal and shunting out said coil, said switch means including a double throw switch operated by a heat expansible element, relay operated holding switch means to maintain said relay coil energized, and relay operated switch means to connect said heat expansible element with said input terminal.

7. A flasher having an input terminal and a load terminal, a relay coil connected with said load terminal, switch means actuated by the relay coil for alternately connecting said coil to said input terminal and shunting out said coil, and heat expansible means connected with said input terminal.

8. A flasher including a relay coil, a relay switch controlled thereby, a heat expansible element, a switch means controlled by said element, said switch and switch means each having a movable contact connected to a common junction, a battery terminal, a load terminal, said relay coil connected between said junction and said load terminal, said switch means alternately connectable with each terminal for energizing and shunting out said relay coil, said relay switch being connectable with said battery terminal to serve as a holding contact, and means for connecting said heat expansible element to said junction whereby during energization of said coil the element expands to move the double throw switch from coil energizing position to coil shunting position.

9. A flasher including a relay coil, a relay switch controlled thereby, a heat expansible element, a switch means controlled by said element, said switch and switch means each having a movable contact connected to a common

junction, a battery terminal, a load terminal, said relay coil connected between said junction and said load terminal, said switch means alternately connectable with each terminal for energizing and shunting out said relay coil, and the relay switch being connectable with said element whereby during energization of said coil the element expands to move the double throw switch from coil energizing position to coil shunting position.

10. A flasher including a relay coil, two normally open single throw relay switches controlled thereby, a heat expansible element, a double throw switch controlled by said element, said switches each having a movable contact connected to a common junction, a battery terminal, a load terminal, said relay coil connected between said junction and said load terminal, said double throw switch alternately connectable with each terminal for energizing and shunting out said relay coil, one of said relay

switches being connectable with said battery terminal to serve as a holding contact, and the other of said relay switches being connectable with said element whereby during energization of said coil the element expands to move the double throw switch from coil energizing position to coil shunting position.

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