July 20, 1965 A. F. BLEIWEISS ETAL 3,196,311

DUAL INTENSITY LIGHT SYSTEM HAVING DOUBLE VANE FLASHER OPERABLE AT A CONSTANT FLASHING RATE

Filed June 13, 1962 2 Sheets-Sheet 1

FIG. 1

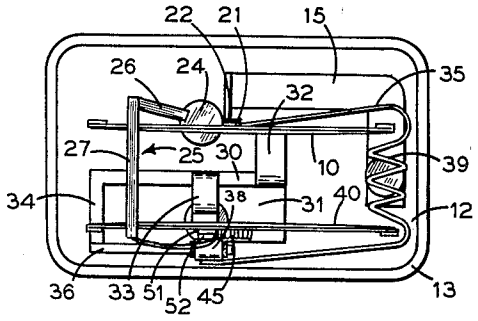


FIG. 2

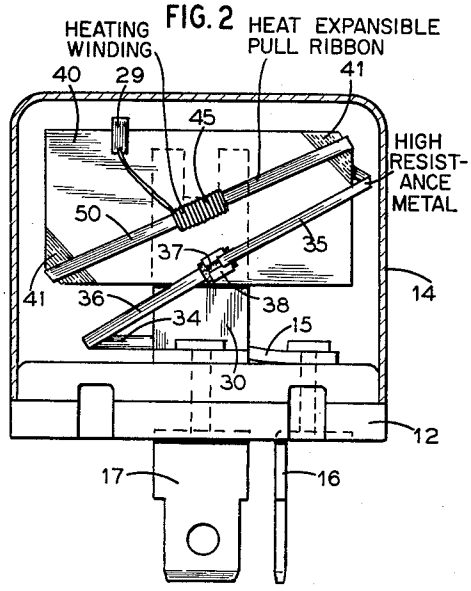


FIG. 4

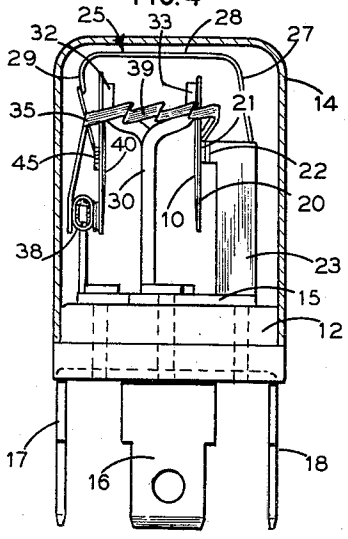


FIG. 3

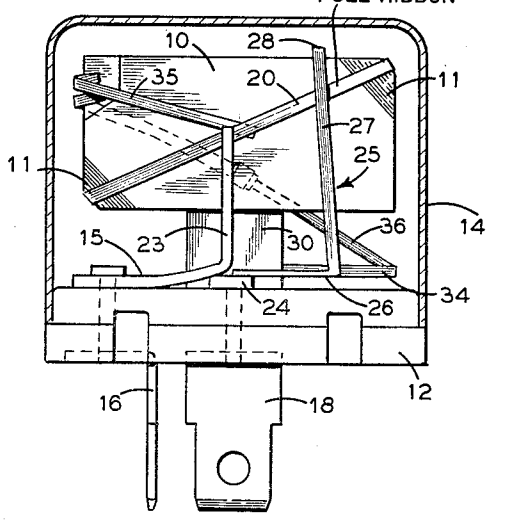


FIG. 5

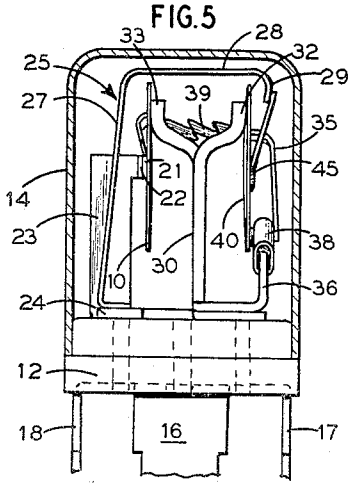
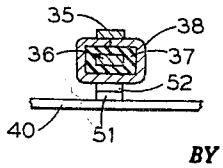


FIG. 6



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FIG.7

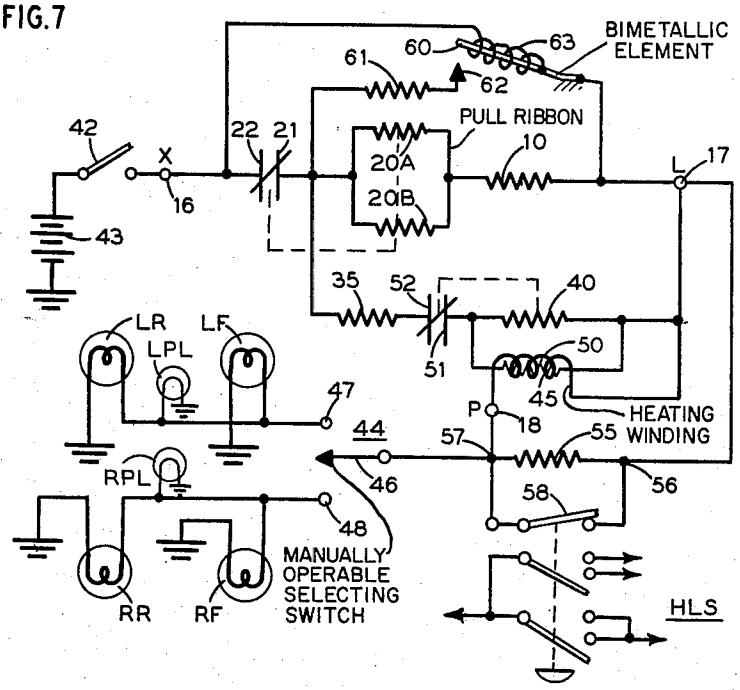
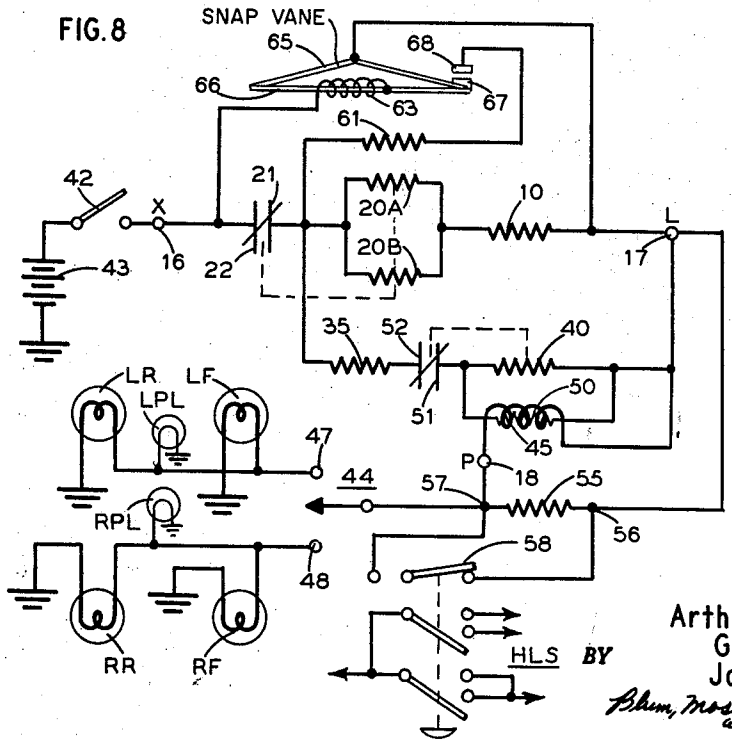


FIG.8



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3,196,311

DUAL INTENSITY LIGHT SYSTEM HAVING DOUBLE VANE FLASHER OPERABLE AT A CONSTANT FLASHING RATE

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7 Claims. (Cl. 315—77)

This invention relates to thermomotive flashers of the snap action series type and, more particularly, to a novel flasher of this type which is adapted to operate at the same rate under two widely different loads.

In U.S. Patent No. 2,756,304, isued July 24, 1956 to J. W. Welsh, there is shown, described and claimed a novel thermomotive snap action circuit breaker or flasher which comprises a vane of electrically conductive snap action material which is initially deformed so as to be bent, about a first bending line, to a "restored" position and which is constrained to be bent about a second line, intersecting said first bending line at an angle, into a "stress-deformed" position by a heat expansible pull element such as a ribbon or wire which is preferably electrically conductive. This snap action vane, which is electrically conductive, is supported at a position spaced from the pull element and the latter carries a relatively movable contact which is normally engaged with a relatively fixed contact. When a circuit, including the fixed and movable contacts, the pull element, the vane, a load and a source of potential, is closed, the pull element heats and expands and, after predetermined expansion, permits the vane to snap to its restored position. As a result of such snapping, the two contacts are snapped apart to the open position and thus break the circuit. The pull element thus tends to cool and contract and, after a predetermined amount of contraction, snaps the vane back to its stress-deformed position to re-close the contacts and re-close the circuit. This operation is cyclically repeated as long as a control switch is closed.

This type of flasher has found widespread acceptance for use in automotive signalling systems, such as turn signalling systems. Its advantages include, in addition to its relative simplicity and relatively low cost, the fact that the signal lamps are lighted immediately whenever the turn signal switch is closed in either the "left" or "right" position, thus providing a "rapid start" of the signalling. However, the flasher has a disadvantage in that its operating rate is relatively load sensitive as well as being relatively sensitive to the value of the operating potential applied across the flasher terminals. With an increase in flasher operating potential, for example, the flashing rate or "f.p.m." will increase proportionally, and vice versa. Additionally, if the load is heavier than normal, the flashing rate or "f.p.m." will increase, and vice versa. Similarly, if the flasher operating potential increases, the ratio of the on time to the total cycle time, hereinafter called "ratio on time" will decrease proportionally, and vice versa. Also, if the load is heavier than normal, the ratio on time will decrease, and vice versa.

This is unsatsifactory for automotive vehicle operation as it has been found, by experience, that the most effective signal is provided when the flashing rate is approximately 90 f.p.m. with an on time ratio of approximately 50%, and that when the flashing rate is outside the range of approximately 60 f.p.m. to 120 f.p.m., or the on time ratio is outside the range of approximately 30% to 75%, the signal is not easily recognizable. For this reason, various arrangements have been proposed for compensating the flasher so that it will operate at substantially constant or uniform f.p.m. rates and substantially constant

or uniform on time ratio over a wide range of operating potentials, as from eleven to fifteen volts, for example, in the case of a flasher operating on a nominal twelve-volt system. These compensating arrangements, in cooperation with the production controls utilized during the manufacture of the flashers, provide flashers which give satisfactory performance insofar as variations in operating potential applied thereto are concerned.

The principles used to compensate for variations in applied potential can also be used, to some extent, for compensating for variations in load within a reasonable range. However, it has not been possible hitherto to compensate for wide variations in load, as, for example, where the number of lamps operated by the flasher is either doubled or halved. Additionally, too much compensaiton for load variations may result in loss of a desirable characteristic of the series thermostatic type flasher, which is that the flasher gives an indication when one or more of the signal lamps controlled thereby are inoperative for any reason or when there is a circuit break in the controlled circuit.

This question of compensation for variations in load has become of great importance recently with proposals to have different lamp intensities for daytime and nighttime driving. For example, a signal lamp which has an intensity sufficient to provide a clearly discernible turn or stop signal under daytime driving conditions, and particularly in bright sunlight, is entirely too bright for nighttime operation, with the result that the glare interferes with the signalling effect. Similarly, a lamp having an intensity or output only a little more than sufficient to provide a distinctly recognizable signal during nighttime driving along dark roads has an intensity which is entirely too low to provide a distinctive signal during daytime driving in bright sunlight.

At present, various arrangements are being considered for automatically providing the proper intensity of signal lamps during both day and nighttime operation. One proposed method is to use dual signal lamps or dual filament signal lamps, with the two filaments having different intensities, and another proposal involves the cutting of a voltage dropping resistance into the signal lamp circuit during nighttime driving. Both proposals have, in common, the feature that the switch-over from one intensity filament to the other, or the cutting in of the series resistance, is accomplished as a result of the normal operation of the usual headlamp control switch between its "off" position and an "on" position, so that no conscious operation on the part of the driver is needed to condition the lamps selectively for daytime driving or for nighttime driving. However, the use of dual intensity lamps or lamps arranged in pairs with different intensities, as well as the use of a series dropping resistor during nighttime driving, involve wide variations in the load on the flasher between operations under nighttime driving conditions and operations under bright daytime driving conditions.

While various arrangements have been proposed to solve this difficulty, all those proposed hitherto have been difficult to put into practice, expensive, and subject to malfunction.

There is a modified form of the flasher shown basically in such Welsh Patent 2,756,304, and in which the pull element is heated indirectly by a separate heating element so that the heating current does not flow through the pull element itself. Arrangements of this type are shown, for example, in Welsh Patent 2,712,044 and Colombo Patent 2,907,850. As more particularly shown in the latter patent, this heating element may be a heating winding, such as a shunt winding.

In accordance with the present invention, it has been found that a flasher operable at a substantially constant f.p.m. rate in either of two load ranges may be provided

by utilizing a combination of the flasher shown in Welsh Patent 2,576,304 with a modified form of the flasher shown in Colombo Patent 2,907,850 or in Welsh Patent 2,712,044. This, of course, represents a more specific embodiment of the present invention.

Actually, the present invention is directed, in its broadest aspects, to a general switching device for thermomotive flashers, and which is responsive to an external applied signal regardless of the signal source. The signal may be the result of electrical, mechanical, or thermal action, or a combination thereof, as well as being a result of pneumatic, hydraulic, magnetic, electrical heat, gas expansion, thermocouple, or the like action. This general switching device is characterized by a long time constant relative to the time constant of the thermomotive flasher it controls, and is effective to switch the thermomotive flasher from operation at one load to operation at another load of a substantially different value.

In a preferred embodiment of the invention, such an external signal results in the application of an external potential across a heater element, such as a heater winding, providing a thermal time delay, and this time delay is incorporated in the operation of the flasher. Thus, after application of the signal with resultant application of the external voltage to a small heater winding, an element is operated to switch the flasher from one condition of operation to another condition of operation without any variation in the f.p.m. rate of the flasher. As soon as the external signal is terminated, the flasher is again switched back to its normal range of operation, again without change in the f.p.m. rate.

The small heater winding may be provided, for example, in operative association with a bimetal or other thermomotive member, but preferably comprises an insulated heater winding wound on the pull element of a snap action vane flasher of a type such as shown in said Patent Nos. 2,712,044 and 2,907,850. This type flasher, as used in the present invention, has a pair of normally closed contacts, as distinguished from the normally open contacts of Patent No. 2,907,850, for example, and these normally closed contacts connect a bleeder resistance in shunt with the pull element of the primary or main flasher so that, in the case of daytime operation, the pull element of the primary flasher "sees" a lower value of current flow therethrough due to shunting of part of the load current flow through the bleeder resistance. Preferably, the auxiliary flasher controlling the normally closed contacts in series with the bleeder resistance, and having the shunt heater winding thereon, is connected between the pull element of the primary flasher, as at the center thereof, and the load terminal of the primary flasher.

As used in a day-night automotive signalling system, there is a voltage dropping resistance included in series between the load contact of the primary flasher and the usual selector switch for the left and right signal lamps. The left and right signal lamps in series with this dropping resistor may be either both those on the front of the vehicle and those on the rear of the vehicle, or may be only the rear signal lamps. This dropping resistor is connected in series between the load terminal of the primary flasher and the selector switch but, during daylight operation, the dropping resistor is shunted by a switch or set of contacts associated with the usual headlamp control switch. When the headlamp control switch is moved to a nighttime position, such as "parking lamps on" or "driving lamps on," the shunting switch or contact means is opened by such movement and the dropping resistor is then in series with the primary flasher and the signal lamps controlled thereby.

The heater winding for the pull element of the secondary flasher in connected in shunt with the voltage dropping resistor. Consequently, under normal daylight driving conditions, there is substantially no potential drop across the dropping resistor and thus substantially no potential drop across the heater winding of the secondary

flasher. However, once the headlamp switch is moved to a nighttime driving position, the shunt is removed from the dropping resistor and there is then a potential drop thereacross. This potential drop is impressed across the heater winding of the secondary flasher. After a predetermined relatively short heating time interval, the pull element of the secondary flasher expands and allows its snap action vane to snap to a position opening the normally closed contacts in series with the bleeder resistance. Consequently, and with proper selection of the values of the bleeder resistance and the dropping resistor, the pull element of the primary flasher will "see" exactly the same current flowing therethrough under nighttime driving conditions as under daytime driving conditions as, in effect, the "cutting in" of the dropping resistor is compensated by the "cutting out" of the bleeder resistance. Thus, the primary flasher, which controls the flashing of the signal lamps, will operate at the same f.p.m. rate and the same on time ratio irrespective of whether the dropping resistor is effectively in circuit or not.

In a further preferred form of the invention, compensating means are additionally provided in association with the primary flasher to compensate the operation of the latter over a relatively wide voltage range, for example, from eleven volts to fifteen volts, so that the flashing rate will remain substantially constant irrespective of the voltage applied across the flasher terminals. This compensation may be effected in various ways, but preferably is effected by a thermomotive element provided with a heater winding which is connected across the terminals of the primary flasher so as to "measure" the voltage drop thereacross. If the voltage drop across the terminals of the primary flasher exceeds a predetermined value, this thermomotive member cuts a second bleeder resistance into parallel or shunt relation with the pull element of the primary flasher, and thus this pull element "sees" less current flowing therethrough. Thereby, the normal increases in f.p.m. rate and decrease in on time ratio, due to an increase in voltage, is compensated so that the f.p.m. rate and the on time ratio are restored to the design values for a selected voltage such as, for example, about thirteen volts.

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

FIG. 1 is a plan view of a thermomotive flasher embodying the invention, with the cover or shell being removed;

FIGS. 2 and 3 are opposite side elevational views of the thermomotive flasher, the shell being shown in section;

FIGS. 4 and 5 are opposite end elevational views of the thermomotive flasher, the shell being shown in section;

FIG. 6 is a sectional view illustrating the normally closed contacts associated with the auxiliary or secondary flasher;

FIG. 7 is a schematic electric wiring diagram of the flasher shown in FIGS. 1 through 6, with voltage compensation added; and

FIG. 8 is a corresponding schematic wiring diagram illustrating a modified voltage compensating arrangement.

Referring first to FIGS. 1 through 6, the principal operating components of the flasher are a snap action, preferably electrically conductive metal, main or primary vane 10 to which is attached a pull ribbon 20 of electrically conductive thermally expansible metal whose resistance is such that the load current is capable of elevating its temperature by a substantial amount, and an auxiliary or secondary vane 40, which is also a snap action preferably electrically conductive metal vane, and which has attached thereto a pull element such as a ribbon 50 of preferably electrically conductive but essentially thermally expansible metal having an appreciable coefficient

of expansion. As set forth in Welsh Patent No. 2,756,-304, each vane is formed with linearly extending aligned and spaced pre-set deformations (not shown) which extend diagonally thereacross and provide an initial bending line about which the vane is bent in its "restored" position. At the ends of this diagonal, the corners 11 and 41 of the respective vanes are bent out of the general plane of the latter and the opposite ends of the respective pull ribbon 20 or 50 are permanently secured thereto as by welding, soldering, brazing or the like. Each pull ribbon is secured to its associated vane in the cold contracted condition of the pull ribbon and while the vane is bent about another bend line extending at an angle to the deformations or initial bend line. Thereby, the vane, with its pull ribbon attached thereto, is bent about this other bend line in a "stress-deformed" condition to store potential energy in the vane so that the latter tends always to snap back to the "restored" position as soon as the tension holding it in the "stress-deformed" condition is released.

As the temperature of the associated pull ribbon increases, due to the flow of electric current therethrough or due to a heat input thereto, the pull ribbon expands and, after a predetermined expansion of the pull ribbon, the potential energy in the vane overcomes the holding force of the pull ribbon and the vane snaps to its restored position in which it is bent about the linear deformations or initial bend line. As the associated pull ribbon cools and contracts, it snaps its vane back to the stress-deformed condition in which it is bent about the bend line extending at an angle to the deformation. As further explained in Welsh Patent 2,756,304, when the vane is fixedly supported at a zone or point spaced laterally of the initial bend line defined by the linear deformatons, a movable portion of the vane will have a relatively high amplitude of motion when the vane is alternately snapped between its restored and stress-deformed positions.

The flasher operating elements are supported upon a dielectric base 12 which, in the particular form illustrated in FIGS. 1 through 5, is substantially rectangular with rounded corners and has a ledge 13 extending therearound. This ledge serves to seat a metal casing or shell 14 for the flasher. However, it should be understood that, while a substantially rectangular base is illustrated, the base could have any other configuration without departing from the scope of the invention.

The base 12 is provided with three lugs or prongs 16, 17 and 18. Of these, lug 16 is the "X" or "battery" terminal of the flasher, lug 17 is the "L" or "load" terminal of the flasher, and lug 18 is the "P" or "pilot" terminal of the flasher. A relatively rigid metal bracket 15, which is L-shape in plan, is riveted to the "X" lug 16 for electrical and mechanical connection thereto, and includes an upwardly extending portion 23 terminating adjacent the center of vane 10. The free end of portion 23 carries a fixed contact 22 which is normally engaged with a contact 21 electrically and mechanically connected to pull ribbon 20. Contacts 21 and 22 are normally closed and are the load current carrying contacts of the flasher assembly.

A second bracket 30 has a horizontal portion which is riveted to the "L" lug 17 for electrical and mechanical connection thereto, and serves as an electrically conductive support bracket for the main vane 10 and for the auxiliary vane 40. Above its lower end 31, bracket 30 extends upwardly substantially perpendicular to base 12 and between the vanes 10 and 40. The upper end of bracket 30 is forked to provide two arms 32 and 33 offset outwardly in opposite directions and spaced substantially equidistant laterally from the vertical center line of bracket 30. Offset arm 32 is welded, brazed, soldered, riveted, or otherwise anchored to vane 10 at a support point substantially laterally of the line of deformations therein. Arm 33 is similarly anchored to the auxiliary vane 40 at a support point spaced laterally of the linear deformations therein.

A rivet 24 secures lug 18 to the base, and a relatively rigid and elongated bar or strip 25 has one end welded, soldered, brazed, or the like to rivet 24. The rod or strip 25 extends horizontally, as at 26, then upwardly as at 27 in outwardly spaced relation to vane 10 and its pull ribbon, then horizontally as at 28 over the two vanes, and then terminates in a bent end 29. A support rod or strip, which is relatively rigid, is indicated at 34 as extending substantially horizontally from the bracket 30, and is bent outwardly, to extend beneath the vane 40, and then upwardly at an angle as at 36 to terminate at a point below the center of the vane 40. A dielectric band 37 embraces the free inner end of the portion 36 and is in turn surrounded by a band 38 of electrically conductive material carrying a contact 52, which is relatively fixed and engages with a contact 51 carried on the outer surface of the vane 40 at a point spaced laterally of the pull ribbon 50.

A strip of high electrical resistance metal, indicated at 35 and constituting a bleeder resistor, has one end soldered, brazed or the like to the pull ribbon 20 on the side thereof toward the vane 10 and just adjacent the contact 21. This bleeder resistor extends upwardly at an angle, over and in spaced relation with the surface of the vane 10, and then transversely of the flasher, where it is formed with an undulating portion indicated generally at 39. The bleeder resistor strip 35 is then bent to extend over and in spaced relation with the surface of the vane 40 and its extreme end is soldered, brazed, or the like to the conductive band 38 so that bleeder resistor strip 35 is thus in electrical conductive relation with the contact 52 normally closed against the contact 51 on vane 40. The pull ribbon 50 of vane 40 is indirectly heated by a heating winding 45 which has one terminal connected to the bent end 29 of bracket 25 and its other end soldered, brazed or welded to the expansible strip or pull element 50.

The operation of the invention will be best understood by reference of the schematic diagram of FIG. 7. In this diagram, due to the fact that current entry to pull ribbon 20 is at its midsection and its ends are connected to the vane 10, the pull ribbon 20 has been indicated as two resistors 20A and 20B connected in parallel with each other. The vane 10, as well as the vane 40 and its pull element 50, have likewise been illustrated as resistors, the resistor 50 having the heating winding 45 wound therearound.

In FIG. 7, the invention flasher or thermomotive circuit breaker is illustrated as having its "X" terminal 16 connected, in the usual manner and through an ignition switch 42, to the usual automotive battery 43 which is representative of a battery-generator system of an automotive vehicle, such as the relatively common twelve-volt system. The flasher is illustrated as used to control the flashing energization of front and rear turn signal lamps indicated at LF, LR, RF and RR. These signal lamps have one terminal grounded in the usual manner, and are controlled by a turn signal switch generally indicated at 44 as comprising a movable contact arm 46 selectively engageable with either of a pair of contacts 47 and 48. Contact 47 is connected in parallel to the left lamps LF and LR, and contact 48 is connected in parallel to the right lamps RF and RR. The contact arm 46, as is well known, normally occupies a neutral position. When it is desired to signal a left turn, for example, the arm 46 is swung, by the usual lever provided on the steering column, to a position in which it is engaged with contact 47, and vice versa when a right turn is to be signalled.

Normally, the "L" lug 17 of the flasher would be connected directly to the contact arm 46 of the turn signal switch 44. However, in order to reduce the intensity of

the signal lamps for nighttime driving, as compared to the intensity for daytime driving, a voltage dropping resistor 55 is connected in series between the "L" lug 17 and the contact arm 46 of the switch 44. The dropping resistor 55 has terminals 56 and 57, and it will be noted that a switch 58 is connected between these terminals in shunt with the dropping resistor. Switch 58 comprises suitable contacts on the usual head lamp switch HLS having "parking lamps on" and "headlamps on" positions for nighttime driving, as well as an "off" position for daytime driving. The switch 58 is closed to shunt the dropping resistor 55 when switch HLS is "off." Consequently, during daytime driving, the dropping resistor 55 is effectively cut out of the circuit between the lug 17 and the turn signal switch 44, so that the full voltage may be applied to the turn signal lamps for flashing at their full intensity.

When the operator of the vehicle adjusts the switch HLS to either of its "on" positions for nighttime driving, the switch 58 is automatically opened without any conscious effort on the part of the driver. Thereby, the dropping resistor 55 is effectively cut into series between the lug 17 of the flasher and the turn signal switch 44. This dropping resistor 55 has a value such that the voltage drop thereacross reduces the voltage applied to the signal lamps to a value such that their intensity is reduced to a predetermined value for nighttime driving, and which is substantially less than the intensity value for daytime driving. Normally, this would mean a sharp change in the loading of the thermomotive flasher, with a corresponding very substantial change in its flashing rate. This is what the present invention is intended to avoid.

Referring again to FIG. 7, it will be noted that the bleeding resistor 35 is connected, by the normally closed contacts 51 and 52, in shunt relation with the pull ribbon 20 and the vane 10, as bleeding resistor 35 has one end connected, in effect, to contact 21, and the other end connected, through the vane 40 and the pull ribbon 50 in parallel therewith, to the lug 17. Consequently, and due to the presence of the shunting bleeding resistor 35, the pull ribbon 20 "sees" less current flow than it normally would see and thus operates at a rate which is slower than that at which it would operate if there were no bleeding resistance connected in shunt therewith. Furthermore, the heating winding 45 for the pull element 50 of the auxiliary vane 40 is connected between the "P" lug 18 and the "L" lug 17, and lug 18 is connected to the terminal 57 of the dropping resistor 55. Thus, the winding 45 is effectively connected across the dropping resistor 55.

During daytime driving, when the dropping resistor 55 is effectively shunted out by the closed switch 58, there is no voltage drop across this dropping resistor and thus no voltage drop across the heating winding 45. However, as soon as the headlamp switch HLS is moved to an "on" position, the switch 58 is opened. Thereby, the shunt is removed from the dropping resistor 55 and the latter is effectively connected in series between lug 17 and the turn signal switch 44. There is now a substantial potential drop across the dropping resistor 55. Due to the connection of the heating winding 45 in parallel or shunt relation with the dropping resistor 55, there is likewise a substantial potential drop across the heating winding 45, and thus an effective current flow therethrough. After a relatively short but predeterminable time interval, the heating winding 45 heats the pull element 50 sufficiently so that this pull element expands to an extent permitting the vane 40 to snap to its "restored" position, and to snap open the contacts 51 and 52. The vane 40 remains in this restored position as long as the heating winding 45 is sufficiently energized to maintain the temperature of the pull element 50 at a value such that it is expanded to an extent no longer constraining the vane 40 to snap back to its "stress-deformed" position. Thereby, the bleeding resistor 35 is effectively disconnected from the circuit, and the shunt is removed from the pull ribbon 20 and the vane 10. It is apparent, therefore, that the assembly which includes the vane 40, the pull ribbon 50, and the heating winding 45, connected into the circuit as shown in FIG. 7, forms a means which responds automatically to opening and closing of the switch 58 for automatically opening the switch 51, 52 when the switch 58 is open so as to eliminate the resistor 35 from the circuit and for automatically closing the switch 51, 52 when the switch 58 is closed so as to then include the resistor 35 in the circuit.

The value of the bleeder resistor 35 in combination with the resistance values of the elements 40 and 50 is so selected, with relation to the value of dropping resistor 55, that, when dropping resistor 55 is connected in series with the flasher and when the bleeder resistor 35 is cut out of the circuit, the pull ribbon 20 will "see" the same current flow therethrough as it did when the dropping resistor 55 was shunted and the bleeder resistor 35 was connected in shunt with this pull ribbon. Consequently, the pull ribbon 20 will operate the vane 10 at the same rate during nighttime driving as it does during daytime driving, by snapping the vane 10 back and forth to cyclically open and close the contacts 21 and 22. It will be noted that, by virtue of the described arrangement, the same load is applied to the series flasher 10–20 at all times irrespective of whether there is daytime driving or nighttime driving.

As stated previously, thermomotive flashers, particularly of the series type, are not only load sensitive but they are likewise voltage sensitive. This latter factor is of particular importance in view of the fact that the output voltage of the battery-generator system of an automotive vehicle may vary, during operation, over a relatively wide range of, for example, from eleven to fifteen volts, with a nominal twelve-volt system. The flasher assembly of the present invention accordingly preferably has voltage compensaton means incorporated therewith.

In the arrangement shown in FIG. 7, a voltage compensating bleeder resistor 61 has one terminal connected to the contact 21, as by being welded, brazed or soldered to the pull ribbon 20 at the center thereof. The other terminal of resistor 61 is provided with a contact 62. An electrically conductive bimetal, or other type of thermomotive, element 60 has its fixed end electrically connected to the "L" lug 17 of the flasher assembly, and its free end is arranged to engage the contact 62 when the element 60 deflects upon heating thereof. Element 60 is provided with a heating winding 63 wound thereon, which has one terminal connected to the "X" lug 16 of the flasher assembly and the other terminal brazed, soldered, or welded to the element 60. The winding 63 is thus connected across the flasher assembly between the input or "X" terminal 16 and the output or "L" terminal or lug 17.

The parameters of the element 60 are so selected that, at a potential drop of, for example, from eleven to thirteen volts across the flasher assembly, the element 60 will remain out of engagement with the contact 62. However, above this voltage, the element 60 will be deflected enough, due to heating by the winding 63, so that it will engage the contact 62, the contact pressure increasing with increasing voltage. When the element 60 engages the contact 62, the compensating resistor 61, which is, in effect, a second bleeder resistor, is connected in shunt with the pull ribbon 20 and the vane 10. Consequently, the pull ribbon 20 "sees" less current flow therethrough, due to the shunting of some load current through the resistor 60. Normally, if there were no compensating resistor 61 provided, the pull ribbon 20 would see an increasing current flow therethrough with increasing voltage, and would thus tend to increase the f.p.m. rate of the flasher. However, with the compensating resistor 61 provided, the current flow through the ribbon 20 remains

substantially of the same order above a selected voltage of, for example, thirteen volts as well as below this voltage so that the f.p.m. rate of the flasher remains substantially constant irrespective of variations in voltage.

FIG. 8 illustrates another switching arrangement for cutting the compensating resistance **61** into and out of shunt circuit relation with the vane **10** and the pull ribbon **20**. In this arrangement, a snap action vane **65**, similar to the snap action vane **40**, is provided with a pull element or ribbon **66** similar to the pull element or ribbon **50**, and this pull element has the heating winding **63** wound thereon and having one terminal thereof electrically connected to the pull element **66** and the other terminal thereof connected to the "X" lug **16** of the flasher. The arrangement includes a pair of normally open contacts **67** and **68**, of which the movable contact **67** is mounted upon the vane **65** and the fixed contact **68** is connected to the outer end of the second bleeder resistor **61**. The electrically conductive vane **65** is connected to the "L" terminal **17** of the flasher. Thus, the heating winding **63** is effectively connected between the "X" terminal **16** and the "L" lug **17** of the flasher, and thus subjected to the voltage drop across the flasher assembly. When the heating of the pull ribbon **66** is augmented by an increased current flow through winding **63**, due to a rise in the potential drop across the flasher above a predetermined value of, for example, thirteen volts, the vane **65** snaps to a position engaging the contacts **67** and **68** and thus effectively connecting the bleeder or compensating resistor **63** in shunt with the vane **10** and its pull ribbon **20**. The arrangement acts in the same manner, for voltage compensation, as does the arrangement shown in FIG. 7.

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

What is claimed is:

1. For use in a vehicle having a signal lamp, a selector switch, a source of operating potential, and a flasher all connected to each other in an electrical circuit for flashing said signal lamp on and off when said selector switch is closed by the operator, and also having a manually operable lamp switch for energizing lamps for night operation and deenergizing the latter lamps for day operation: a dropping resistor connected in series with the signal lamp for reducing the brilliancy thereof during night operation and a bleeder resistor electrically connected to the flasher for increasing the load under which it operates, a first switch shunting said dropping resistor when said first switch is closed and a second switch electrically connected with said bleeder resistor for disconnecting the latter from the circuit when said second switch is open and connecting said bleeder resistor into the circuit only when said second switch is closed, said first switch being operatively connected to said lamp switch to be opened when said lamp switch is set for night operation and to be closed when said lamp switch is set for day operation, so that during day operation said dropping resistor is shunted by said first switch, and means responding automatically to opening of said first switch for automatically opening said second switch to disconnect said bleeder resistor from the flasher when said first switch is opened to place said dropping resistor effectively in the circuit of said signal lamp, whereby the bleeder placed on the flasher by said load resistor through said second switch is removed therefrom by the opening of said second switch when said dropping resistor is made effective in the circuit by the opening of said first switch, the resistance provided by said dropping resistor as compared to the resistance provided by said bleeder resistor being effective to maintain the load on said flasher substantially constant.

2. For use with a vehicle having a signal lamp, a selector switch for energizing the signal lamp, a source of operating potential, and a flasher all electrically connected in a given circuit for flashing the signal lamp on and off when the operator closes the selector switch, and a lamp switch for illuminating a lamp during night operation and extinguishing the latter lamp during day operation: a dropping resistor connected electrically into the circuit for reducing the brilliancy of said signal lamp during night operation, a bleeder resistor connected electrically to said flasher for increasing the load under which it operates, a first switch connected in parallel with said dropping resistor and operatively connected to said lamp switch to be opened when said lamp switch is closed by the operator for night operation and to be closed when said lamp switch is open during day operation, so that during day operation said dropping resistor is shunted and said signal lamp operates at full brilliancy while during night operation said lamp resistor is effective to reduce the brilliancy of said signal lamp, a second switch connected electrically to said bleeder resistor for disconnecting the latter from the circuit when said second switch is open and including said bleeder resistor in the circuit when said second switch is closed, and electrical means connected in parallel with said first switch so as to also be shunted thereby when said first switch is closed, said electrical means being operatively connected to said second switch for automatically opening the latter when said first switch is open and for automatically closing said second switch when said first switch is closed, so that said electrical means responds automatically to connection of said dropping resistor to the signal lamp for reducing the brilliancy thereof to eliminate the bleeder resistor from the circuit, said dropping and bleeder resistors having resistances which maintain the load on the flasher substantially constant irrespective of which one of said latter resistors is effective at any given instant, so that the flasher operation is uninfluenced by change-over between day and night operation.

3. The combination of claim **2** and wherein said bleeder resistor, said second switch, and said electrical means are all connected in series with respect to each other and in parallel with respect to said flasher.

4. The combination of claim **1** and wherein a means is connected electrically with said flasher to compensate automatically for an increase in operating potential above a given limit.

5. For use in a vehicle having a signal lamp, a manually operable selector switch for energizing the signal lamp, a source of operating potential, and a flasher all connected electrically to each other in a given circuit for flashing the signal lamp on and off when the selector switch is closed, and a lamp switch for energizing and illuminating a lamp during night operation and deenergizing the latter dropping during day operation: a lamp resistor connected in series with the signal lamp to reduce the brilliancy thereof during night operation, a bleeder resistor connected electrically to the flasher for increasing the load under which the flasher operates, a first switch connected in parallel with said lamp resistor for shunting the latter when said first switch is closed, said first switch being operatively connected to said lamp switch to be closed when said lamp switch is open during day operation and to be open when said lamp switch is closed during night operation, so that said dropping resistor is effectively included in the circuit open during night operation to reduce the brilliancy of the signal lamp during night operation, a normally closed switch connected electrically to the bleeder resistor for including the latter in the circuit while said normally closed switch is closed and for eliminating the bleeder resistor from the circuit when said normally closed switch is opened, a snap vane movable between a stress-formed position and a restored position, said snap vane being operatively connected to said normally closed switch for opening the latter when said snap vane is in its restored posi-

tion and for closing said normally closed switch when said snap vane is in its stress-formed position, a pull ribbon operatively connected to said snap vane for maintaining the latter in its stress-formed position when said pull ribbon is cold, and a heating winding extending around said pull ribbon to heat the latter and connected in parallel with said first switch to be shunted by the latter when said first switch also shunts said dropping resistor, said first switch upon being opened by closing of said lamp switch rendering said heating winding effective to heat said pull ribbon so that the latter can expand to release said snap vane for movement to its restored position opening said normally closed switch and thus eliminating said bleeder resistor from the circuit when said first switch is opened during night operation, said bleeder resistor and dropping resistor having resistances which maintain the load on the flasher substantially constant irrespective of which of said resistors is effectively included in the circuit at any given instant.

6. The combination of claim 5 and wherein said flasher includes a snap vane and pull ribbon substantially identical with those connected to said normally closed switch, and said bleeder resistor being connected at one end to said pull ribbon of said flasher and at an opposite end to one of the contacts of said normally closed switch.

7. For use with a vehicle having a source of operating potential, a signal lamp, a selector switch for energizing the signal lamp at the option of the operator, a dropping resistor connected electrically to the signal lamp for reducing its brilliancy during night operation, a first switch connected in parallel with said dropping resistor for shunting the latter, and a lamp switch adapted to be closed during night operation and open during day operation and operatively connected to said first switch for opening the latter during night operation to render said dropping resistor effective for reducing the brilliancy of said signal lamp and to close said first switch during day operation to maintain the signal lamp operating at full brilliancy during day operation, an assembly comprising a flasher, a bleeder resistor connected electrically with said flasher, a normally closed switch connected electrically with said bleeder resistor for eliminating the latter from the circuit when said normally closed switch is open, and an electrical means connected electrically to the normally closed switch for opening the latter when the electrical means is energized, and terminals connected electrically to the flasher and electrical means for connecting said flasher to the source of operating potential between the latter and the signal lamp for flashing the signal lamp on and off when the selector switch is closed, and for connecting said electrical means in parallel with said first switch to render said electrical means operative only when said first switch is opened during night operation for automatically opening said normally closed switch to eliminate said bleeder resistor from the circuit, whereby said bleeder resistor is eliminated from the circuit only when said dropping resistor is effective to reduce the brilliancy of the signal lamp during night operation, and the resistances of said bleeder and dropping resistors maintaining the load on the flasher substantially constant irrespective of which of said resistors is effective at any given instance.

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