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AUTOMOTIVE ELECTRIC LIGHTING SYSTEM

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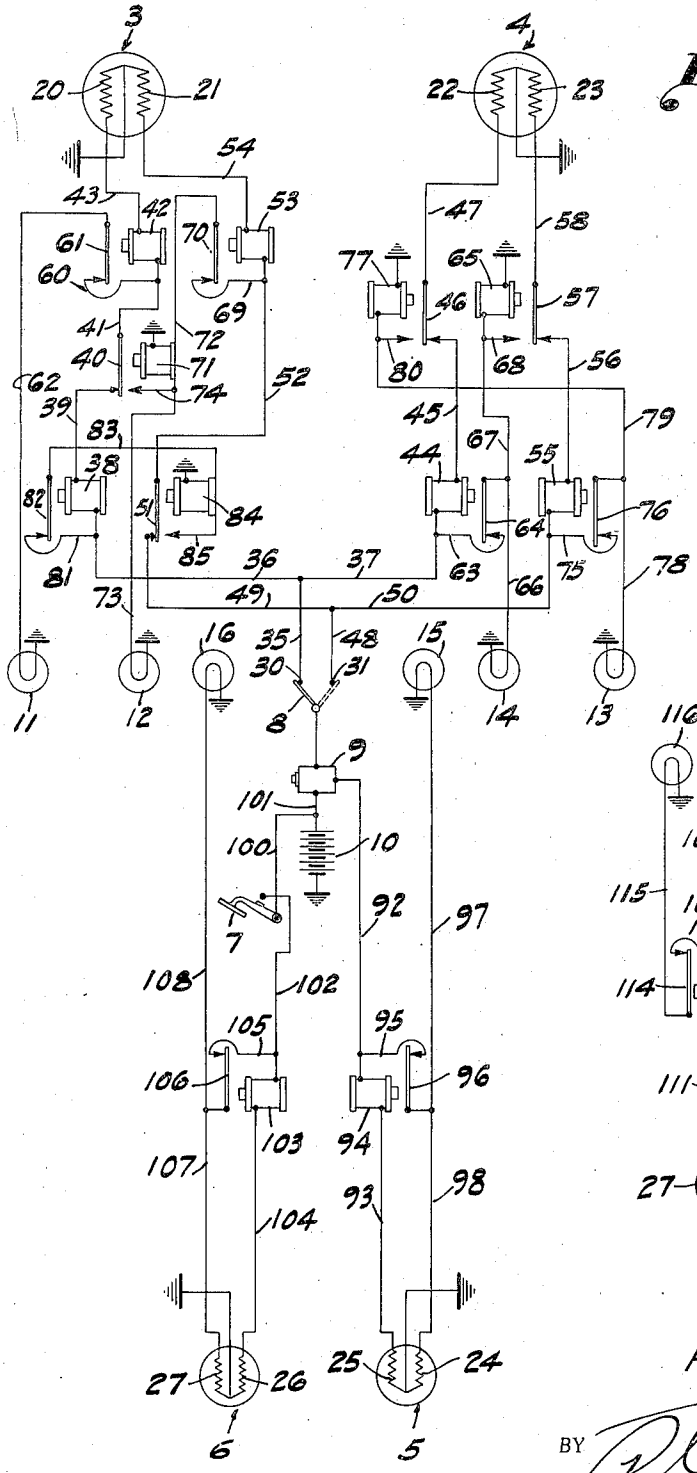


Fig. 1.

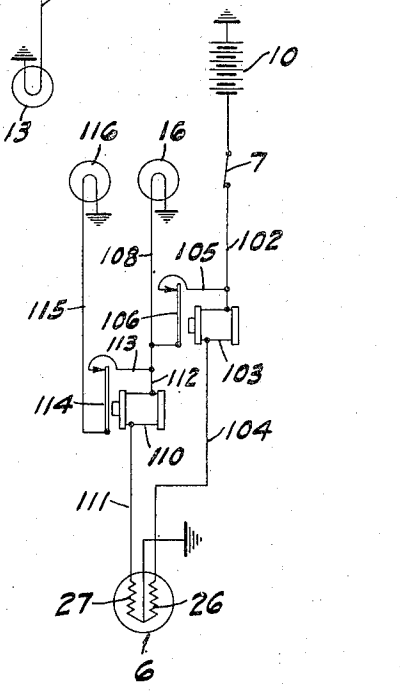


Fig. 2.

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AUTOMOTIVE ELECTRIC LIGHTING SYSTEM

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1 Claim. (Cl. 177—311)

My invention relates to electric lighting systems for automotive vehicles employing two optionally usable lights in combination with duplicate tail and stop lights.

More particularly, the invention pertains to an automatic change-over system, which when either the high or low filament of a lamp burns out the other filament of the lamp is automatically cut in, and means is provided in the electric circuit in which each high and low filament is included for indicating the good or bad condition of the filament automatically switched to as well as the defectiveness of the filament causing the switch-over.

An important object of the invention is to provide in a lighting system of the above character, means to automatically switch on a second filament of one head lamp while the filaments in the other head lamp remain at a status quo, and simultaneously with the switching from one filament to the other in a single lamp to automatically indicate the defectiveness of the filament of the lamp cut out and the condition of the filament cut in.

A further object of the invention is to provide in electric lighting systems for automotive vehicles employing head lamps provided with pairs of high and low filament lamps, and switching means for selectively energizing such filaments in pairs, improved and simplified means for effecting an automatic change-over in a single lamp when one or the other of its filaments become defective, while maintaining a status quo of the opposite head lamp and other means for indicating the condition of both filaments of the lamp being affected, thereby indicating to the driver incident to effecting a manual switch-over the condition of the filament cut in so that he will be warned ahead of time the proper filament of the opposite headlamp to be brought into coordination with the first without effecting a change in status of the lamp cut in; in the automatic change-over, if and when a manual switch-over from one pair of filaments to the other is effected and whether or not such manual switching is deemed necessary. Obviously, if one filament becomes defective and such defectiveness is indicated and in the automatic change-over the second filament is indicated defective, there need be no alteration made in the filament of the opposite head lamp which was permitted to maintain its status quo as would be the case if the automatic change-over affected corresponding filaments in each head lamp simultaneously.

Other objects, advantages, and features of invention will be apparent from the description following, taken with the accompanying drawing wherein—

Fig. 1 is a wiring diagram showing a schematic arrangement of an electric lighting system constructed in accordance with my invention and,

Fig. 2 is a wiring diagram showing in greater detail modification of one of the instrumentalities shown in Fig. 1.

Referring in detail to Fig. 1, we find the invention comprises a pair of head lights 3 and 4, a tail light 5, and a stop light 6. The stop light 6 is shown as being operated by a brake pedal operated switch 7 and the head lights 3 and 4 by a manually operable switch 8. There is shown also a main switch 9 which controls the energization of the head lights and of the tail light. Switch 9 is connected to a battery 10. 11, 12, 13, 14, 15, and 16 are signal lamps situated on the cowl of the machine to indicate failures of the several lamp filaments and the exact location of the filament when such failure takes place.

The left head light 3 has a high filament 20 and a low filament 21. The right head light 4 has a high filament 22 and a low filament 23.

The tail light 5 has two filaments 24 and 25, and the stop light 6 has two filaments 26 and 27.

Lamps 11 and 14 respectively indicate failures of the high lights of the headlights or filaments 20 and 22. Lamps 12 and 13 respectively indicate failures of the low lights of the head lights or filaments 21 and 23. Lamp 15 indicates a failure in the filament 25 of the tail light, and lamp 16 indicates a failure in the filament 26 of the stop light.

In Fig. 2 I show a means for meeting failures in either of the filaments 24 and 27 of the tail light and stop light respectively.

Switch 8 is shown in a full line position for lighting the high filaments 20 and 22 and in a dotted line position for lighting the low filaments 21 and 23. In full line position the switch 8 is shown making contact with terminal 30 to close the circuit to said high filaments, and in dotted line position said switch is shown making contact with terminal 31 to close the circuit to said low filaments.

The main high-beam and low-beam circuits just defined may be divided further so as to state they comprise a left head light high-beam circuit, a right head light high-beam circuit, and a left head light low-beam circuit, and a right head light low-beam circuit. It is possible and considered invention to combine automatically a left

head light low-beam filament circuit with a right head light high-beam filament circuit and vice versa in order to determine the condition of a particular filament automatically switched to before the corresponding filament of the opposite head light is cut in.

There will also be auxiliary or "failure" circuits (four in all) in which one high and one low filament of each head light will be included.

Considering first the main circuits, wire 35 connects with terminal 30, said wire 35 is shown having two branches, the left branch 36 leading to the high filament 20 of the left head light and the right branch 37 leading to the high filament 22 of the right headlight. Branch 36 is connected in series with a relay 38, a wire 39, an armature 40, a wire 41, a relay 42, and a wire 43 to complete the circuit to the high filament 20.

Branch 37 is connected in series with a relay 44, a wire 45, an armature 46, and a wire 47 to complete the circuit to the high filament 22.

Wire 48 connects with terminal 31 and is shown having two branches 49 and 50. Branch 49 leads to the low filament 21 of the left head light, and branch 50 leads to the low filament 23 of the right head light.

Branch 49 is connected in series with an armature 51, a wire 52, a relay 53, and a wire 54 to complete the circuit to the low filament 21.

Branch 50 is connected in series with a relay 55, a wire 56, an armature 57, and a wire 58 to complete the circuit to the low filament 23.

Now, if either filament 20 or 22 of the high-beam circuit or either filament 21 or 23 of the low-beam circuit become a failure, means is provided to automatically switch in a second (or opposite) filament to illuminate the lamp thus made defective and when such a condition does arise means is provided to indicate to the driver what filament failed, where it is located and the condition of the new filament cut in.

The circuits involved in these automatic change-overs including the means for indicating individual failures of the filaments automatically cut in whereon judgement is predicated as to the advisability of bringing the corresponding filament of another lamp into conformity with the filament automatically switched to or to leave it stand will now be set forth in the order of left head light, high filament; right head light, high filament; left head light, low filament; right head light, low filament.

Obviously, it will be advantageous at times to permit the filament of the opposite lamp corresponding to the "failure" lamp, maintaining its status quo, particularly so if the filament automatically cut in is indicated defective and the operator is driving his machine with the head lights high. Otherwise, if one head light produces a failure in one filament and such filament be a high one and the low filament had been automatically cut in and it was indicated defective, the status quo of the opposite head light is the position the operator would wish to maintain. The advantage of maintaining this status quo position as stated is to save the driver a needless operation and ward off imminent danger were he driving at an excessive speed.

Fixed contact 60 is fastened to branch wire 41 and is operatively related to the armature 61 upon de-energization of relays 42 and 38. Armature 61 is in electrical circuit with grounded lamp 11 through the medium of conductor wire 62.

Fixed contact 63 is fastened to branch wire 37 and is operatively related to armature 64 upon de-energization of relay 44. Armature 64 is in electrical circuit with grounded lamp 14 and grounded relay 65 through the medium of wires 66 and 67. Wire 67 has a fixed contact 68 fastened to it which is operatively related to the armature 57 upon energization of grounded relay 65.

Branch wire 52 has a fixed contact 69 fastened to it which is operatively related to the armature 70 upon de-energization of the relay 53. Armature 70 is in electrical circuit with lamp 12 and grounded relay 71 through the medium of wires 72 and 73. Wire 73 has a fixed contact 74 which is operatively related to the armature 40 upon energization of the relay 71.

Branch wire 50 has a fixed contact 75 fastened to it which is operatively related to the armature 76 upon de-energization of relay 55. Armature 76 is in electrical circuit with lamp 13 and grounded relay 77 through the medium of wires 78 and 79. Wire 79 has a fixed contact 80 fastened to it which is operatively related to the armature 46 upon energization of relay 77.

From the failure circuits just described and with particular attention being directed to the circuits involving the filaments of the right head lamp, it will be noted there is no means for indicating the condition of the filaments 22 or 23 at the time one or the other is automatically cut in by failure of the other. The means for indicating such failures of the right head light was purposely omitted in order to accentuate the importance thereof which is shown with reference to the left head light only. Obviously the circuits of the right head light may be made duplicate of those shown for the left headlight.

The circuit for energizing lamp 12 whereby to indicate the condition of filament 21 automatically switched to, if bad, by reason of the failure of filament 20, comprises wire 36, fixed contact 81, armature 82, wire 83, relay 84, fixed contact 85, armature 51, wire 52, fixed contact 69, armature 70, wire 72, relay 71, and wire 73.

In order to indicate the defective condition of filament 20 in addition to filament 21, we employ all the parts of the condition circuit just described up to wire 73 where we branch off through contact 74, armature 40, wire 41, contact 60, armature 61, and wire 62 to complete the circuit to lamp 11.

The electrical connections to the tail light 5, whereby the filament 25 is energized and upon failure thereof filament 24 is automatically energized and the lamp 15 is energized to indicate to the operator such failure has taken place, comprises a wire 92 fastened to the main switch 9, a wire 93 fastened to the filament 25, and a relay 94 in series with said wires. A fixed contact 95 is fastened to wire 92 and is operatively related to the armature 96 upon de-energization of relay 94. Armature 96 is in electrical circuit with lamp 15 and filament 24 through the medium of wires 97 and 98 respectively.

The stop light circuit whereby the filament 26 is energized and upon its failure to function means 16 is provided to indicate its failure and a second filament 27 is automatically cut in, comprises the wire 100 having one end connected to wire 101, which joins the main switch 9 and battery 10, and the other end connected to the brake pedal switch 7. Wire 102 normally out of circuit conducting relation with switch 7 connects with a relay 103, the relay in turn to a wire 104 and the latter wire is connected to the filament 26. Wire 102 has a fixed contact 105 fastened to it

which is operatively related to the armature 106 upon de-energization of the relay 103. Armature 106 is in circuit conducting relation with the filament 27 and lamp 16 through the medium of wires 107 and 108.

It will be obvious from the foregoing description relating to the tail light and stop light that no provision has been made to indicate to the operator whether or not filaments 24 and 27 are faulty.

Such a condition is satisfied in the wiring diagram set forth in Fig. 2 wherein is shown certain parts duplicative of those described with reference to the lamp 6, said duplication being similarly designated.

Additional parts comprise the relay 110 in circuit conducting relation with wire 111 connecting it with filament 27 and wire 112 connecting it with wire 108. Wire 112 has a fixed contact 113 fastened to it which is operatively related to the armature 114 upon de-energization of the relay 110. Armature 114 is connected to a wire 115 and the wire 115 in turn is connected to the signal lamp 116. Lamp 116 may be positioned on the cowl along with signal lamps 11, 12, 13, 14, 15, and 16.

The operation of the system may be readily understood from the foregoing description, but for the sake of additional clearness will be described as follows:

When the main switch 9 is actuated and the manual switch 8 is in the full line position, current will pass through wires 35, 36, relay 38, wire 39, armature 40, wire 41 relay 42, and wire 43 to energize the high filament 20 of the left head light 3. With switch 8 in the same position, current will also pass through wires 35, 37, relay 44, wire 45, armature 46, and wire 47 to energize the high filament 22 of the right head light 4.

When the switch 8 is moved to the dotted line position, current will pass through wires 48, 49, armature 51, wire 52, relay 53, and wire 54 to energize the low filament 21 of the left head light. With switch 8 in the same position, current will also pass through wires 48, 50, relay 55, wire 56, armature 57, and wire 58 to energize the low filament 23 of the right head light 4.

Simultaneously with the actuation of the main switch 9, current will pass through wire 92, relay 94, and wire 93 to energize the filament 25 of the tail light 5.

The filament 26 of the stop light is energized by depressing the pedal 7, thus permitting current to pass through wire 102, relay 103, and wire 104.

If, however, when the switch 8 is in the full line position and filament 20 should fail, relays 38 and 42 will be de-energized, permitting current to pass through contact 60, armature 61, wire 62, to energize the lamp 11.

At the time relay 38 de-energizes, fixed contact 81 contacts armature 82 and current is permitted to pass through 83 to energize grounded relay 84, thence to fixed contact 85, armature 51, wire 52, relay 53, and wire 54 to light filament 21 of the left headlight while the high filament 22 of the right headlight is permitted to maintain its status quo position.

Now, it is advisable to know the condition of the filament 21 when it is thus automatically cut in before attempting to bring the corresponding filament 23 into conformity with the filament 21 by moving switch 8 to the dotted line position. Obviously, a needless operation would be saved by switching from the low filament 23 back to the high filament 22 were the filament 23 automatically cut in at the same time the automatic change-over was made in the left headlight. If the low filament 21 failed to respond when the filament 20 failed, as its signal 12 would show, naturally the driver would wish the original status quo position of his high filament lamp to continue burning.

In order to apprize the operator of the condition of filament 21 when automatically cut in, if good it will respond and the lamp 12 will remain de-energized.

If, however, filament 21 is defective, when automatically cut in or becomes defective, coil 53 will be de-energized and fixed contact 69 will contact with armature 70, permitting current to pass through wire 72 to energize grounded coil 71 and to energize lamp 12 through the medium of wire 73.

In order to keep lamp 11 burning, energizing relay 71 closes fixed contact 74 with armature 40, permitting current to flow through wire 41 to fixed contact 60 and thence through armature 61 and wire 62 to lamp 11.

If, while the main switch 9 is closed and filament 25 of the tail light fails, its defectiveness will be indicated by the energization of lamp 15 through a circuit completed by wire 92, contact 95, armature 96, and wire 97.

Similarly if the filament 26 of the stop light fails, its defectiveness will be indicated by means of a circuit completed to lamp 16 by means of wire 102, contact 105, armature 106, and wire 108.

If either of the filaments automatically cut in of the stop or tail lights upon failure of the other filament, and the second filament proved to be a failure, its defectiveness would be ascertained from the hook-up shown in Fig. 2, whereby means of the wire 102, contact 105, armature 106, wire 112, contact 113, armature 114, and wire 115 a circuit would be completed to energize lamp 116.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the subject matter claimed.

I claim:

An electric lighting system for automobiles comprising a source of electrical supply, a high filament circuit, a low filament circuit, a manually operated switch having contacts for optionally controlling the flow of current directly to either the high or low filament circuit from said source, a current responsive means included in each of the high and low filament circuits, means responsive to failure of current in the high filament circuit means when energized to disconnect the low filament circuit means from its manual switch contact and to connect it to the manual switch contact of the high filament circuit means, means responsive to failure of current in the low filament circuit means when energized to disconnect the high filament from the high filament circuit means and to connect it to the low filament circuit means and to actuate a low filament indicator, further current responsive means responsive to failure of current in the high filament when energized to actuate a high filament indicator, thereby designating the particular filament cut out and the operating effectiveness of the filament automatically cut in.

HARRY W. HACK.