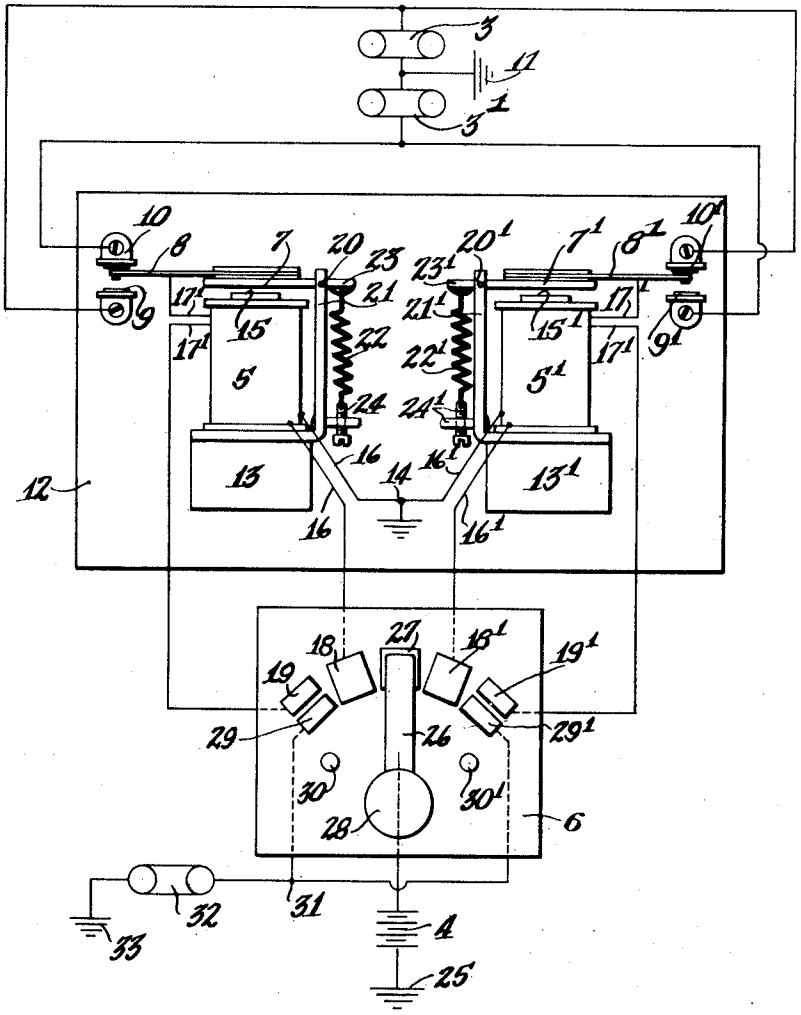
May 1, 1934. J. R. COOK 1,956,980

CIRCUIT CHANGE DEVICE

Original Filed June 30, 1931 2 Sheets-Sheet 1

Fig. 1.



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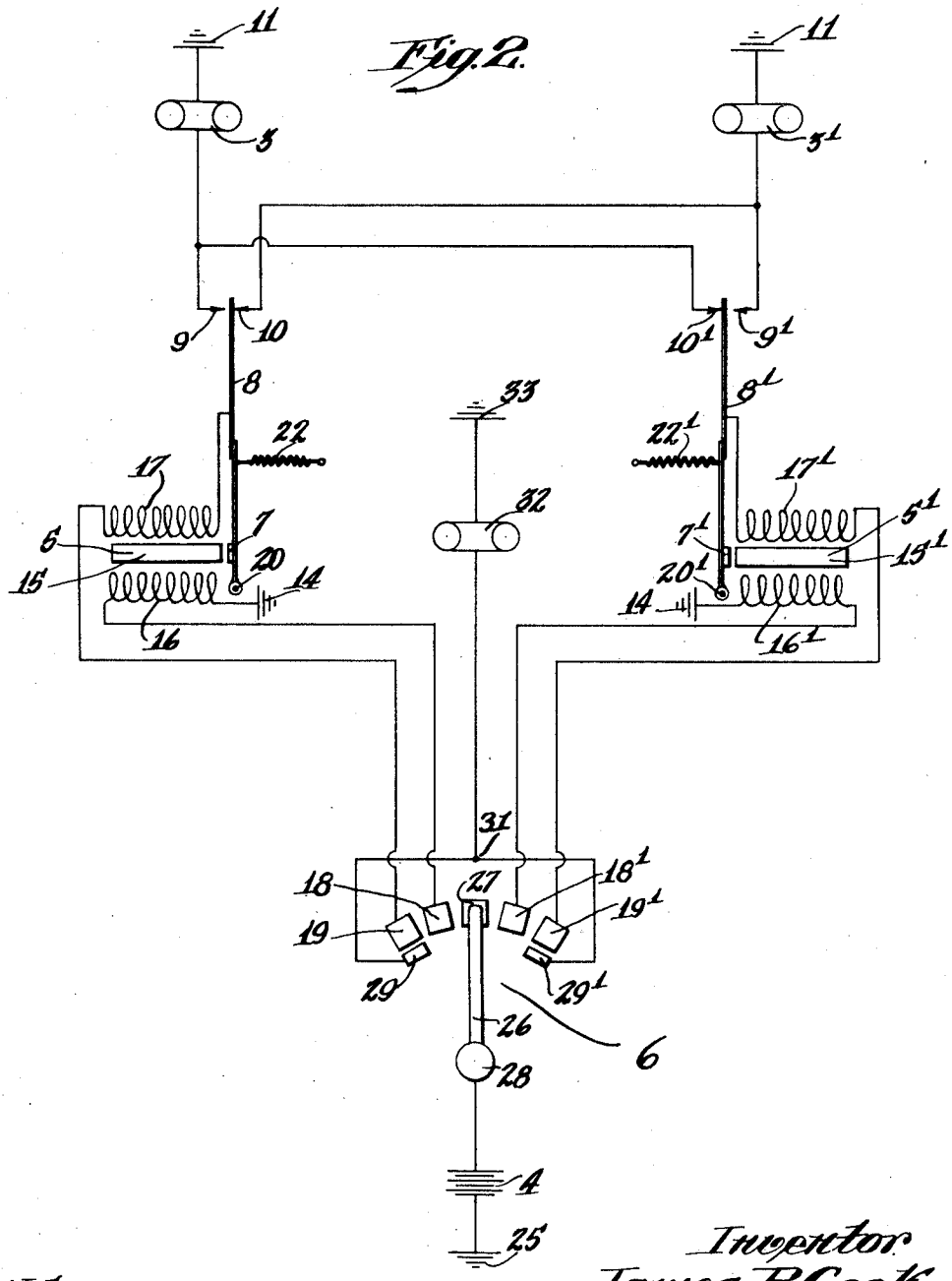
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CIRCUIT CHANGE DEVICE

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Fig. 2.



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UNITED STATES PATENT OFFICE

1,956,980

CIRCUIT CHANGE DEVICE

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Renewed July 20, 1933

8 Claims. (Cl. 171—97)

The invention relates to relay lighting circuits and is thought to have perhaps its widest application to the lighting circuits of automobiles or the like but is intended for any use for which it may be adapted to be applied.

A purpose of the invention is to provide equipment of the character indicated adapted to easy and inexpensive manufacture and well suited to the needs of service.

A further purpose is to automatically shift from one lighting circuit to another in the event of the one circuit developing a fault, as by a burning-out of a light or the loosening or failure of a connection.

A further purpose is to combine two relays that each may be available as a spare for the other to energize alternatively the same two lighting circuits, preferably the spare lighting circuit of one relay (adapted to be thrown in automatically by the said one relay if there is a light failure in the normal lighting circuit thereof) comprising the normal lighting circuit of the second relay.

A further purpose is to connect cooperating relays with two lighting circuits in a way adapting the relays under sequential momentary individual tests to quickly disclose any faults in the individual lighting circuits and each, when in normal use, with the other as a spare, to shift the lighting circuits automatically if the operating circuit develops a fault.

Further purposes will appear in the specification and in the claims.

One only of the different forms of the invention is illustrated, the selected form however being one practical and efficient in operation and which well illustrates the principles involved.

Figure 1 is a plan view, partially diagrammatic, illustrating the invention applied to alternative lighting circuts of an automobile or the like.

Figure 2 is a purely diagrammatic view of the structure of Figure 1 for the better illustration of the electrical connections, some of which are not shown in Figure 1.

Like numerals refer to like parts in all figures.

Describing in illustration and not in limitation and referring to the drawings:—

The present invention may be considered a safety device, enabling for example, a user of an automobile to feel sure that the head lights of his car are reasonably safe from failure.

The invention may include means whereby a driver may test at a moment's notice a normal and a spare set of lights and means for automatic shifting from normal lights to spare lights if a fault should develop in the circuit of the normal lights.

In addition to a usual or suitable normal set and spare set of lights 3 and 3′ and a suitable source of electric energy 4, the invention includes one and preferably two relays 5 and 5′, a controller 6 and suitable connections.

Each relay functions as a spare unit for the other and also as a test member for one of the lighting circuits, with connections preferably such as to adapt the different relays to test the different lighting circuits, so that both lighting circuits are readily tested for fault,—one through one relay and the other through the other relay.

The relays are preferably alike so that a description of one will apply to both, the corresponding parts of the two relays carrying the same numerals of reference with prime marks added to the reference numerals of the relay 5′ and not to the reference numerals of the relay 5.

As illustrated each relay includes a two-coil electro-magnet having a movable armature 7, and a contact 8 on and insulated from the armature, the contact 8 engaging a cooperating contact 9 when the relay is closed or a cooperating contact 10 when the relay is open, the contacts 9 and 10 being electrically connected to ground at 11 through the respective lighting circuits 3 and 3′.

A suitable insulation base 12 mounts brackets 13 that carry the magnets and the spaced stationary contacts 9 and 10 that connect to the two sets of lights 3 and 3′ and carries a grounded terminal 14.

Each magnet may comprise a core 15 rigidly fastened to the bracket 13 and windings 16 and 17, usually of relatively high and low resistance respectively, that are connected at one end respectively to contacts 18 and 19 of the controller and at the other respectively to the grounded terminal 14 and to the movable contact 8 which has an insulated mounting upon the magnet armature 7.

The armature 7 of the magnet has a pivotal support 20 upon a suitable extended portion 21 of the bracket 13 and has an adjustable spring retraction from the core 15, illustrated as obtained by a tension spring 22 connected at one end to an offset portion 23 of the armature and at the other to an adjustable screw 24 threading a suitable projection from the bracket.

In practice the electrical resistance of the winding 16 is nearly always high as compared to that of the winding 17, since the winding 16

when on circuit is in effect connected directly across the battery 4 while the winding 17 when on circuit is always in series with one or other of the lighting circuits 3 or 3'.

The ampere turns however of the winding 16 are usually greater than the ampere turns of the winding 17, the winding 16 when energized including sufficient ampere turns to itself close the relay, that is pull the armature 7 to the magnet core 15 against the retraction of the spring 22.

The ampere turns of the winding 17 are made sufficient to hold the relay closed against the retraction of the spring 22 but too low for the winding 17 itself to close the relay against the pull of the spring.

It will thus be seen that if the winding 16 is on circuit the relay is always closed and the light circuit 3 is normally in series with the winding 17 through the closed contacts 8 and 9.

When the circuit of the winding 16 is opened, the relay will remain closed or open, according to whether or not normal current is flowing through the winding 17. The relay will stay closed if the winding 17 is on circuit and passing normal current (through the lights 3), or will stay open if the winding 17 is not carrying its proper current either by reason of the winding not having been connected into circuit at the controller or by reason of a fault having developed in the lighting circuit 3.

One side of the battery 4 is suitably connected to ground at 25 and the other side to the movable contact arm 26 of the controller 6.

The controller arm 26 has a neutral mid-position at 27 and may be turned to the left, as by means of a suitable insulation turn knob 28, to connect one or more of the normally relatively insulated contacts 18, 19 and 29 to the battery 4 or turned to the right to connect one or more of the corresponding contacts 18', 19' and 29' to the battery.

If the controller arm is positioned on the contact 18, the winding 16 is connected to the battery; if the controller arm is placed in simultaneous engagement with the three contacts 18, 19 and 29, the windings 16 and 17 and any lights connected to the contact 29 are in simultaneous connection to the battery, and if the controller arm is over against a suitable stop 30 the contacts 19 and 29 and therefore the winding 17 and any lights connected to the contact 29 are in circuit with the battery, the contact 18 and winding 16 being out of circuit.

In turning on the lights, the controller arm 26, if moved to the left, first touches the contact 18, temporarily energizing the winding 16 of relay 5, and closing the relay. Further movement of the controller arm 26 to the left brings the controller arm against the contact 19, energizing the winding 17 of relay 5 and lighting the lights 3, while the winding 16 remains energized, as the controller arm 26 still touches the contact 18. At the same time, the lights 32 light due to the contact 29. Further movement of the controller arm to the left, into contact with the stop 30, de-energizes the winding 16, as the controller arm leaves the contact 18, but maintains the lights 3 in operation.

Should one or more of the lights 3 burn out, or the lighting circuit be interrupted, the winding 17 becomes partially or wholly de-energized, and the relay 5 opens, switching on the lights 3'.

In case the controller arm 26 is moved to the right, a similar operation, using the relay 5', takes place, first lighting the lights 3', and then automatically turning on the lights 3 in case one of the lights 3' burns out, or the circuit of the lights 3' is interrupted.

Corresponding connections are made when the controller arm is progressed to the right of its mid-position.

The contacts 29 and 29' are optional and are illustrated as electrically connected together at 31 and to tail and to cowl lights 32 grounded at 33.

In operation a driver or police inspector or the like may test in a moment the effectiveness of the lighting circuits of a car wired in accord with the present invention.

Turning the controller arm into position to simultaneously connect the contacts 18, 19 and 29, the relay 5 closes, placing the lights 3 and the cowl and tail lights on circuit.

Any failure of lighting on the circuit 3 indicates a fault in this circuit and any failure of lighting of the lights connected to the terminals 29 and 29' will also show at once the need for attention.

Turning the controller arm to the right into position to simultaneously connect the contacts 18', 19' and 29' will show up any need for attention to the lighting circuit 3'.

If there is proper lighting at these two positions of the controller arm, the inspector may rest assured that the lighting equipment is all right in that there are available two lighting circuits, either for normal operation and the other for use in the event of any fault developing in the one, and two relay equipments each used with the other relay out of circuit and adapted to automatically shift the lighting circuit if a fault develops in the circuit in use.

There is thus always available a spare lighting circuit and a spare relay and a combination between the relays that adapts them to easy and quickly show up the condition of the circuits and of the relays.

In view of my invention and disclosure variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the structure shown, and I, therefore, claim all such in so far as they fall within the reasonable spirit and scope of my invention.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In an automobile lighting system or the like, a normal light and a spare light, a two-coil relay, the first coil being connected in series with one of the lights when the relay is open and with the other light when the relay is closed, means for momentarily energizing the second coil to close the relay and means for energizing the first coil while the relay is closed, thereby maintaining the relay normally closed after the second coil de-energizes.

2. In an automobile lighting system or the like, a normal light and a spare light, a two-coil relay, the first coil being connected in series with one of the lights when the relay is open and with the other light when the relay is closed, means for momentarily energizing the second coil to close the relay and means for energizing the first coil while the relay is closed, thereby maintaining the relay normally closed after the second coil de-energizes, said means permitting a momentary simultaneous energizing of both coils, permitting

testing the normal light since the relay remains closed during said simultaneous energizing irrespective of the condition of the normal light, energizing the light unless there is a fault in the light circuit.

3. In an automobile lighting system or the like, a normal light and a spare light, a two-coil relay, the first coil being connected in series with one of the lights when the relay is open and with the other light when the relay is closed, means for momentarily energizing the second coil to close the relay and for energizing the first coil while the relay is closed, thereby maintaining the relay normally closed after the second coil de-energizes, a second two-coil relay energized alternatively with the first at corresponding coils thereof and having one coil connected alternatively to the said two lights, according to whether the relay is open or closed.

4. In an automobile lighting system or the like, a normal light and a spare light, a first two-coil relay, the first coil being connected in series with one of the lights when the first relay is open and with the other light when the first relay is closed, means for momentarily energizing the second coil to close the relay and for energizing the first coil while the relay is closed, thereby maintaining the relay normally closed after the second coil de-energizes, a second two-coil relay energized alternatively with the first at corresponding coils thereof and having a first coil connected alternatively to the said two lights according to whether the relay is open or closed, one light being connected to the first coil of said first relay while said first relay is open and being connected to said first coil of said second relay while said second relay is closed and the other light being connected to said first coil of said first relay while said first relay is closed and to said first coil of said second relay when said second relay is open.

5. In an automobile lighting system or the like, a normal light and a spare light, a first two-coil relay, the first coil being connected in series with one of the lights when the first relay is open and with the other light when the first relay is closed, means for momentarily energizing the second coil to close the relay and for energizing the first coil while the relay is closed, thereby maintaining the relay normally closed after the second coil de-energizes, a second two-coil relay energized alternatively with the first at corresponding coils thereof and having a first coil connected alternatively to the said two lights according to whether the relay is open or closed, one light being connected to the first coil of said first relay while said first relay is open and being connected to said first coil of said second relay while said second relay is closed and the other light being connected to said first coil of said first relay while said first relay is closed and to said first coil of said second relay when said second relay is open, said means including a movable contact member adapted to test one light by simultaneous energization of both coils of said first relay and the other light by simultaneous energization of both coils of said second relay.

6. In an automobile lighting system, a first headlight circuit, a second headlight circuit, a source of energy, a manually-controlled switch for connecting either the first or the second headlight circuit to the source of energy and means for automatically transferring energy to the unconnected circuit upon failure of the connected circuit.

7. In an automobile lighting system, a first headlight circuit, a second headlight circuit, a source of electrical energy, a manually-controlled switch for connecting either the first or the second headlight circuit to the source of energy and electromagnetic controlling means having a core and a plurality of coils thereon for automatically transferring energy to the unconnected circuit upon failure of the connected circuit.

8. In an automobile lighting system, a first headlight circuit, a second headlight circuit, a source of energy, a manually operated switch for connecting either circuit to the source of energy and a multi-coil relay for controlling the connected circuit during normal operation and for transferring energy to the unconnected circuit on failure of the connected circuit.

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