

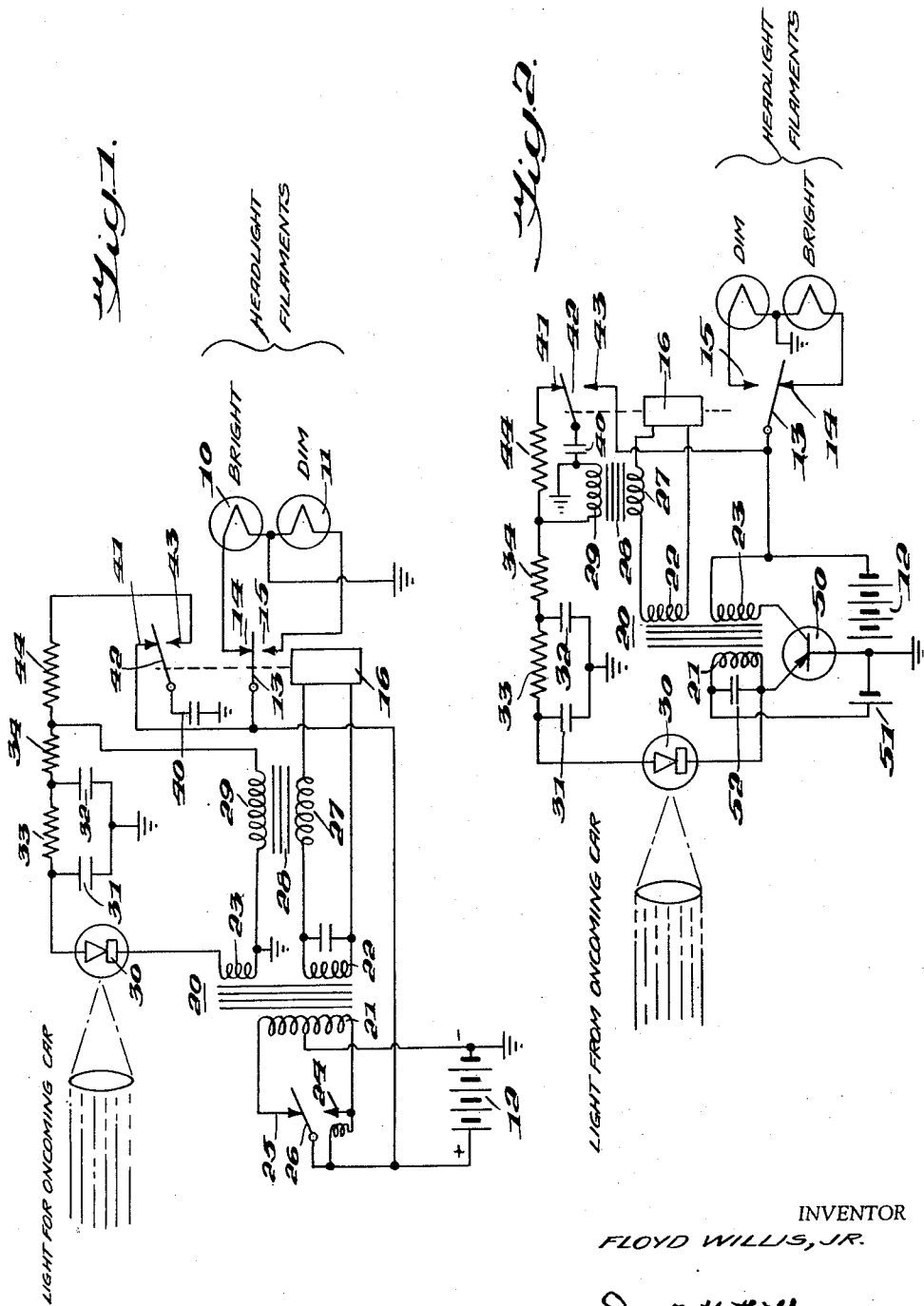
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AUTOMATIC DIMMING SYSTEM

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1

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AUTOMATIC DIMMING SYSTEM

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The present invention relates to light sensitive circuits and more particularly to an improved light sensitive automatic headlight dimming arrangement for motor vehicles or the like.

A recently developed convenience for the motoring public is the provision of automatic headlight dimming systems to respond to the headlights of an oncoming vehicle and automatically dim the headlights of the equipped vehicle. However, the systems presently in use are both complicated and expensive. For example, one system presently in use requires a photo-multiplier tube with nine stages of dynode multiplication. Such a tube is very costly and requires a comparatively high operating potential.

It is an object of the present invention to provide an improved and simplified form of automatic headlight dimming system using inexpensive components in a relatively uncomplicated and trouble-free circuit.

A feature of the invention is the provision of an alternating current relay switch to control the alternate energization of bright or dim headlight filaments, the relay coil being connected to a source of alternating current in series with the controlled impedance winding of a saturable core reactor whose core saturating winding is connected to a source of direct current having a valve proportional to the light intensity on a photosensitive device such as a phototransistor diode or the like in a manner such that when the light intensity striking the device from oncoming vehicle headlights exceeds a predetermined amount, the impedance of the saturable core reactor controlled impedance winding is reduced to energize the alternating current relay and thus the dim headlight filament.

Another object of the invention is to provide an automatic headlight dimming system using a simplified form of magnetic amplifier such as a saturable core reactor and having means to improve the stability of the system by assuring that the headlights will remain dim for a predetermined minimum time interval following the initiation of each automatic dimming operation.

In order to achieve the above object, a condenser may be arranged to be charged while the headlights are in the bright condition and to be discharged while the headlights are in the dim condition, the discharge circuit of the condenser being in series with the saturating winding of the headlight control reactor in such manner as to maintain the headlights in the dim condition so long as the condenser is discharging.

Further objects, features and the attending advantages of the invention will be apparent with reference to the following specification and drawings, in which:

Fig. 1 is a schematic diagram of one form of the invention; and

Fig. 2 is a schematic diagram of a modified form of the invention.

Referring to Fig. 1 of the drawings, the vehicle headlights (not shown) are provided with a bright filament 10 and a dim filament 11 to be alternately energized from

2

the vehicle battery 12 depending upon the position of the relay switch including the armature 13 and either contacts 14 or 15. As shown, the bright filament 10 is energized from ground through contact 14 and relay switch armature 13 to the positive or ungrounded terminal of the battery 12, the alternating current relay coil 16 being deenergized.

A source of alternating current for operating the relay coil 16 is required and a transformer 20 having a center tapped primary winding 21 and a pair of secondary windings, 22, 23 may therefore be provided. The primary winding 21 is energized from the vehicle battery 12 through contacts 24, 25 and the vibrating armature 26 of a tuned vibrator interrupter, thus providing a source of alternating current including the transformer 20. Relay switch coil 16 is designed to operate on alternating current produced by the secondary winding 22 and is connected in series with such transformer secondary winding 22 and a controlled impedance winding 27 of a saturable core reactor 28. Normally, the impedance of winding 27 is so high in the series circuit with relay coil 16 that the coil is deenergized and the switch is in the normal position shown to energize the bright headlight filament 10.

Transformer secondary winding 23 is connected to a rectifying device 30 which may comprise a phototransistor diode or the like whose rectification efficiency increases as light intensity on the diode is increased. The phototransistor diode 30 is placed behind the vehicle windshield in a position to receive the light from the headlights of an oncoming vehicle as shown. An RC filter circuit comprising condensers 31, 32 and resistor 33 is provided to smooth the impulses of direct current produced by the rectifying action of the phototransistor diode on the alternating current from the transformer secondary 23. The direct current thus produced is connected through resistor 34 to the direct current core saturating winding 29 of the saturable core reactor 28. The arrangement is such that when the light intensity on the phototransistor diode 30 is increased by the light from an oncoming vehicle headlight, an increase in amount of direct current through winding 29 occurs and the impedance of winding 27 is lowered to cause the relay coil 16 to be energized and thus connect the dim headlight filament 11 to the vehicle battery 12 through relay switch contact 15.

It will be noted that a condenser 40 is arranged to be normally charged by the vehicle battery 12 through switch contact 41 and relay switch arm 42 when the relay coil 16 is deenergized and the bright headlight filament 10 is energized. As soon as the direct current through the core saturating winding 29 is increased in the manner previously described to energize relay coil 16 and switch the headlights from bright to dim, the switch arm 42 engages contact 43 to discharge the condenser 40 through a discharge circuit including resistors 44, 34 and the saturating winding 29. Thus, the saturation of the reactor 28 is maintained by the direct current from condenser 40 for a predetermined minimum time interval determined by the time constants of the condenser discharge circuit to assure that the dim headlight filament 11 will remain energized for at least a minimum time interval. The minimum time interval may be adjusted to be about 8 seconds which is believed to be the average time required for approach of an oncoming vehicle.

Referring now to Fig. 2 of the drawings, a somewhat modified form of the invention is shown wherein an oscillating circuit for energizing the transformer 20 from the vehicle battery 12 is used in place of the vibrator interrupter shown in Fig. 1. The remainder of the automatic headlight controlling circuit of Fig. 2 is essentially the same as previously shown and described in connection with Fig. 1.

tion with Fig. 1 and will not again be described in detail, the same reference numerals being applied. In Fig. 2 the primary winding 21 and the secondary winding 23 are connected in a self-oscillating circuit including the point contact transistor 50. A bias battery 51 and a tuning condenser 52 are also provided as is well known. It should be obvious that a vacuum tube may be used in place of the transistor 50 in the oscillating circuit of the alternating current supply transformer 20. The alternating current appearing across the transformer primary winding 21 is connected to be rectified by the phototransistor diode 30, as previously described in connection with Fig. 1, and similarly the alternating current across the secondary winding 22 is connected in series with the controlled impedance winding 27 of the saturable core reactor 28 to the alternating current relay coil 16. The automatic headlight dimming operation of Fig. 2 of the drawings is the same as described for in Fig. 1 of the drawings and will not be further described.

Various modifications may be made within the spirit of the invention and the scope of the appended claims.

I claim:

1. An automatic dimming system for a vehicle headlight having bright and dim filaments to be alternately energized and comprising a relay switch having first and second positions of operation for selectively determining the energization of the bright and dim filaments, a source of alternating current, an alternating current relay coil for operating said switch, said switch being in the first position when said coil is deenergized, a saturable core reactor having a controlled impedance winding and a core saturating winding, means connecting said controlled impedance winding and said relay coil in a series circuit with said source of alternating current, the impedance of said controlled impedance winding being normally high to prevent the energization of said relay coil, a source of direct current in circuit with a light sensitive device to vary the amount of direct current in accordance with light intensity on said device, and means connecting said source of direct current in circuit with said saturating winding whereby an increase of light intensity beyond a predetermined amount on said device is effective to lower the impedance of said controlled impedance winding and cause said relay coil to be energized to operate said switch to the second position and energize the bright headlight filament.

2. An automatic dimming system for a vehicle headlight having bright and dim filaments to be alternately energized and comprising a relay switch having first and second positions of operation for selectively determining the energization of the bright and dim filaments, a source of alternating current, an alternating current relay coil for operating said switch, said switch being in the first position when said coil is deenergized, a saturable core reactor having a controlled impedance winding and a core saturating winding, means connecting said controlled impedance winding and said relay coil in series with said source of alternating current, the impedance of said controlled impedance winding being normally high to prevent the energization of said relay coil, a source of direct current in circuit with a light sensitive device to vary the amount of direct current in accordance with light intensity on said device, means connecting said source of direct current in circuit with said saturating winding whereby an increase of light intensity beyond a predetermined amount on said device is effective to lower the impedance of said controlled impedance winding and cause said relay coil to be energized to operate said switch to the second position and energize the bright headlight filament, a condenser, condenser charging means in circuit with contacts of said switch to charge said condenser when said switch is in the first position to energize said bright headlight filament, and condenser discharging means in circuit with other contacts of said switch and said saturating winding to

discharge said condenser through said saturating winding when said switch is in the second position to energize said dim headlight filament to thereby maintain the switch in the second position for a predetermined minimum period of time as determined by the time constants of the condenser discharge circuit.

3. An automatic dimming system for a vehicle headlight having bright and dim filaments to be alternately energized and comprising a relay switch having first and second positions of operation for selectively determining the energization of the bright and dim filaments, a vehicle battery for energizing said filaments, a source of alternating current comprising a vibrator converter and a transformer connected in a circuit to be energized by said vehicle battery, an alternating current relay coil for operating said switch, said switch being in the first position when said coil is deenergized, a saturable core reactor having a controlled impedance winding and a core saturating winding, means connecting said controlled impedance winding and said relay coil in series with said source of alternating current, the impedance of said controlled impedance winding being normally high to prevent the energization of said relay coil, a source of direct current in circuit with a light sensitive device to vary the amount of direct current in accordance with light intensity on said device, and means connecting said source of direct current in circuit with said saturating winding whereby an increase of light intensity beyond a predetermined amount on said device is effective to lower the impedance of said controlled impedance winding and cause said relay coil to be energized to operate said switch to the second position and energize the bright headlight filament.

4. An automatic dimming system for a vehicle headlight having bright and dim filaments to be alternately energized and comprising a relay switch having first and second positions of operation for selectively determining the energization of the bright and dim filaments, a vehicle battery for energizing said filaments, a source of alternating current comprising a vibrator converter and a transformer connected in a circuit to be energized by said vehicle battery, an alternating current relay coil for operating said switch, said switch being in the first position when said coil is deenergized, a saturable core reactor having a controlled impedance winding and a core saturating winding, means connecting said controlled impedance winding and said relay coil in a series circuit with said source of alternating current, the impedance of said controlled impedance winding being normally high to prevent the energization of said relay coil, a source of direct current in a circuit with a light sensitive device to vary the amount of direct current in accordance with light intensity on said device, means connecting said source of direct current in a circuit with said saturating winding whereby an increase of light intensity beyond a predetermined amount on said device is effective to lower the impedance of said controlled impedance winding and cause said relay coil to be energized to operate said switch to the second position and energize the bright headlight filament, a condenser, condenser charging means in a circuit with contacts of said switch to charge said condenser when said switch is in the first position to energize said bright headlight filament, and condenser discharging means including in a circuit with other contacts of said switch and said saturating winding to discharge said condenser through said saturating winding when said switch is in the second position to energize said dim headlight filament to thereby maintain the switch in the second position for a predetermined minimum period of time as determined by the time constants of the condenser discharge circuit.

5. An automatic dimming system for a vehicle headlight having bright and dim filaments to be alternately energized and comprising a relay switch having first and second positions of operation for selectively determining

5

the energization of the bright and dim filaments, a vehicle battery for energizing said filaments, a source of alternating current and a transformer connected in an oscillating circuit to be energized by said vehicle battery, an alternating current relay coil for operating said switch, said switch being in the first position when said coil is deenergized, a saturable core reactor having a controlled impedance winding and a core saturating winding, means connecting said controlled impedance winding and said relay coil in a series circuit with said source of alternating current, the impedance of said controlled impedance winding being normally high to prevent the energization of said relay coil, a source of direct current in circuit with a light sensitive device to thereby vary the amount of direct current in accordance with light intensity on said device, and circuit means connecting said source of direct current to said saturating winding whereby an increase of light intensity beyond a predetermined amount on said device is effective to lower the impedance of said controlled impedance winding and cause said relay coil to be energized to operate said switch to the second position and energize the bright headlight filament.

6. An automatic dimming system for a vehicle headlight having bright and dim filaments to be alternately energized and comprising a relay switch having first and second positions of operation for selectively determining the energization of the bright and dim filaments, a vehicle battery for energizing said filaments, a source of alternating current and a transformer connected in an oscillating circuit to be energized by said vehicle battery, an alternating current relay coil for operating said switch, said switch being in the first position when said coil is deenergized, a saturable core reactor having a controlled impedance winding and a core saturating winding, means connecting said controlled impedance winding and said relay coil in a series circuit with said source of alternating current, the impedance of said controlled impedance winding being normally high to prevent the energization of said relay coil, a source of direct current and a light sensitive device connected in a circuit to vary the amount of direct current in accordance with light intensity on said device, means connecting said source of direct current in a circuit with said saturating winding whereby an increase of light intensity beyond a predetermined amount on said device is effective to lower the impedance of said controlled impedance winding and cause said relay coil to be energized to operate said switch to the second position and energize the bright headlight filament, a condenser, condenser charging means in circuit with contacts of said switch to charge said condenser when said switch is in the first position to energize said bright headlight filament, and condenser discharging means in circuit with other contacts of said switch and said saturated winding to discharge said condenser through said saturating winding when said switch is in the second position to energize said dim headlight filament to thereby maintain the switch in the second position for a predetermined minimum period of time as determined by the time constants of the condenser discharge circuit.

7. An automatic dimming system for a vehicle headlight having bright and dim filaments to be alternately energized and comprising a relay switch having first and second positions of operation for selectively determining the energization of the bright and dim filaments, a source of alternating current, an alternating current relay coil for operating said switch, said switch being in the first position when said coil is deenergized, a saturable core reactor having a controlled impedance winding and a core saturating winding, means connecting said controlled impedance winding and said relay coil in a series circuit with said source of alternating current, the impedance of said controlled impedance winding being normally high to prevent the energization of said relay coil, a source of direct current comprising a phototransistor diode light sensitive device connected in a circuit to rectify alternat-

6

ing current from said source of alternating current and vary the amount of direct current thus produced in accordance with light intensity on said device, and means connecting said source of direct current in circuit with said saturating winding whereby an increase of light intensity beyond a predetermined amount on said device is effective to lower the impedance of said controlled impedance winding and cause said relay coil to be energized to operate said switch to the second position and energize the bright headlight filament.

8. An automatic dimming system for a vehicle headlight having bright and dim filaments to be alternately energized and comprising a relay switch having first and second positions of operation for selectively determining the energization of the bright and dim filaments, a source of alternating current, an alternating current relay coil for operating said switch, said switch being in the first position when said coil is deenergized, a saturable core reactor having a controlled impedance winding and a core saturating winding, means connecting said controlled impedance winding and said relay coil in a series circuit with said source of alternating current, the impedance of said controlled impedance winding being normally high to prevent the energization of said relay coil, a source of direct current comprising a phototransistor diode light sensitive device connected in a circuit to rectify alternating current from said source of alternating current and vary the amount of direct current thus produced in accordance with light intensity on said device, means connecting said source of direct current in circuit with said saturating winding whereby an increase of light intensity beyond a predetermined amount on said device is effective to lower the impedance of said controlled impedance winding and cause said relay coil to be energized to operate said switch to the second position and energize the bright headlight filament, a condenser, condenser charging means in circuit with contacts of said switch to charge said condenser when said switch is in the first position to energize said bright headlight filament, and condenser discharging means in circuit with other contacts of said switch and said saturated winding to discharge said condenser through said saturating winding when said switch is in the second position to energize said dim headlight filament to thereby maintain the switch in the second position for a predetermined minimum period of time as determined by the time constants of the condenser discharge circuit.

9. An automatic dimming system for a vehicle headlight having bright and dim filaments to be alternately energized and comprising a relay switch having first and second positions of operation for selectively determining the energization of the bright and dim filaments, a vehicle battery for energizing said filaments, a source of alternating current comprising a vibrator converter and a transformer connected in a circuit to be energized by said vehicle battery, an alternating current relay coil for operating said switch, said switch being in the first position when said coil is deenergized, a saturable core reactor having a controlled impedance winding and a core saturating winding, means connecting said controlled impedance winding and said relay coil in a series circuit with said source of alternating current, the impedance of said controlled impedance winding being normally high to prevent the energization of said relay coil, a source of direct current comprising a phototransistor diode light sensitive device connected in a circuit to rectify alternating current from said source of alternating current and vary the amount of direct current thus produced in accordance with light intensity on said device, and means connecting said source of direct current in circuit with said saturating winding whereby an increase of light intensity beyond a predetermined amount on said device is effective to lower the impedance of said controlled impedance winding and cause said relay coil to be energized to operate said switch to the second position and energize the bright headlight filament.

10. An automatic dimming system for a vehicle headlight having bright and dim filaments to be alternately energized and comprising a relay switch having first and second positions of operation for selectively determining the energization of the bright and dim filaments, a vehicle battery for energizing said filaments, a source of alternating current comprising a vibrator converter and a transformer connected in a circuit to be energized by said vehicle battery, an alternating current relay coil for operating said switch, said switch being in the first position when said coil is deenergized, a saturable core reactor having a controlled impedance winding and a core saturating winding, means connecting said controlled impedance winding and said relay coil in a series circuit with said source of alternating current, the impedance of said controlled impedance winding being normally high to prevent the energization of said relay coil, a source of direct current comprising a photo-transistor diode light sensitive device connected in a circuit to rectify alternating current from said source of alternating current and vary the amount of direct current thus produced in accordance with light intensity on said device, means connecting said source of direct current in circuit with said saturating winding whereby an increase of light intensity beyond a predetermined amount of said device is effective to lower the impedance of said controlled impedance winding and cause said relay coil to be energized to operate said switch to the second position and energize the bright headlight filament, a condenser, condenser charging means in circuit with contacts of said switch to charge said condenser when said switch is in the first position to energize said bright headlight filament, and condenser discharging means in circuit with other contacts of said switch and said saturating winding to discharge said condenser through said saturating winding when said switch is in the second position to energize said dim headlight filament to thereby maintain the switch in the second position for a predetermined minimum period of time as determined by the time constants of the condenser discharge circuit.

11. An automatic dimming system for a vehicle headlight having bright and dim filaments to be alternately energized and comprising a relay switch having first and second positions of operation for selectively determining the energization of the bright and dim filaments, a vehicle battery for energizing said filaments, a source of alternating current comprising a transformer connected in an oscillating circuit to be energized by said vehicle battery, an alternating current relay coil for operating said switch, said switch being in the first position when said coil is deenergized, a saturable core reactor having a controlled impedance winding and a core saturating winding, means connecting said controlled impedance winding and said relay coil in a series circuit with said source of alternating current, the impedance of said controlled impedance winding being normally high to prevent the energization of said relay coil, a source of direct current comprising a phototransistor diode light sensitive

device connected in a circuit to rectify alternating current from said source of alternating current and vary the amount of direct current thus produced in accordance with light intensity on said device, and means connecting said source of direct current in a circuit with said saturating winding whereby an increase of light intensity beyond a predetermined amount of said device is effective to lower the impedance of said controlled impedance winding and cause said relay coil to be energized to operate said switch to the second position and energize the bright headlight filament.

12. An automatic dimming system for a vehicle headlight having bright and dim filaments to be alternately energized and comprising a relay switch having first and second positions of operation for selectively determining the energization of the bright and dim filaments, a vehicle battery for energizing said filaments, a source of alternating current comprising a transformer connected in an oscillating circuit to be energized by said vehicle battery, an alternating current relay coil for operating said switch, said switch being in the first position when said coil is deenergized, a saturable core reactor having a controlled impedance winding and a core saturating winding, means connecting said controlled impedance winding and said relay coil in a series circuit with said source of alternating current, the impedance of said controlled impedance winding being normally high to prevent the energization of said relay coil, a source of direct current comprising a phototransistor diode light sensitive device connected in a circuit to rectify alternating current from said source of alternating current and vary the amount of direct current thus produced in accordance with light intensity on said device, means connecting said source of direct current in a circuit with said saturating winding whereby an increase of light intensity beyond a predetermined amount of said device is effective to lower the impedance of said controlled impedance winding and cause said relay coil to be energized to operate said switch to the second position and energize the bright headlight filament, a condenser, condenser charging means in circuit with contacts of said switch to charge said condenser when said switch is in the first position to energize said bright headlight filament, and condenser discharging means in circuit with other contacts of said switch and said saturating winding to discharge said condenser through said saturating winding when said switch is in the second position to energize said dim headlight filament to thereby maintain the switch in the second position for a predetermined minimum period of time as determined by the time constants of the condenser discharge circuit.

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