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GB A 2156515 GB A 2102117 GB A 2064238
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(58) Field of search
G1A

(54) Automatic vehicle light switch

(57) The switch includes transistors TR1 and TR2 forming an electronic switch, triggered by voltage from the light dependant resistor LDR, which rises as light intensity decreases. If the light intensity falls below a preset threshold, voltage is applied to the light emitting diode LED, and, through the diode D1, and resistor R8, to the capacitor C1. The voltage on C1, amplified by TR4 and TR5, is used to operate the relay RL, which switches on the vehicle's lights. C1 charges slowly, through R8, and discharges slowly, through R9, thus delaying the switch-on and switch-off of the lights. This prevents the lights responding to brief fluctuations in light intensity. When the vehicle's starter is operated, voltage is applied to the base of TR3 which bypasses R8, ensuring the lights operate immediately when starting in the dark. Potentiometer VR1 alters the sensitivity to light. VR2 alters the delay times.

FIG. 2

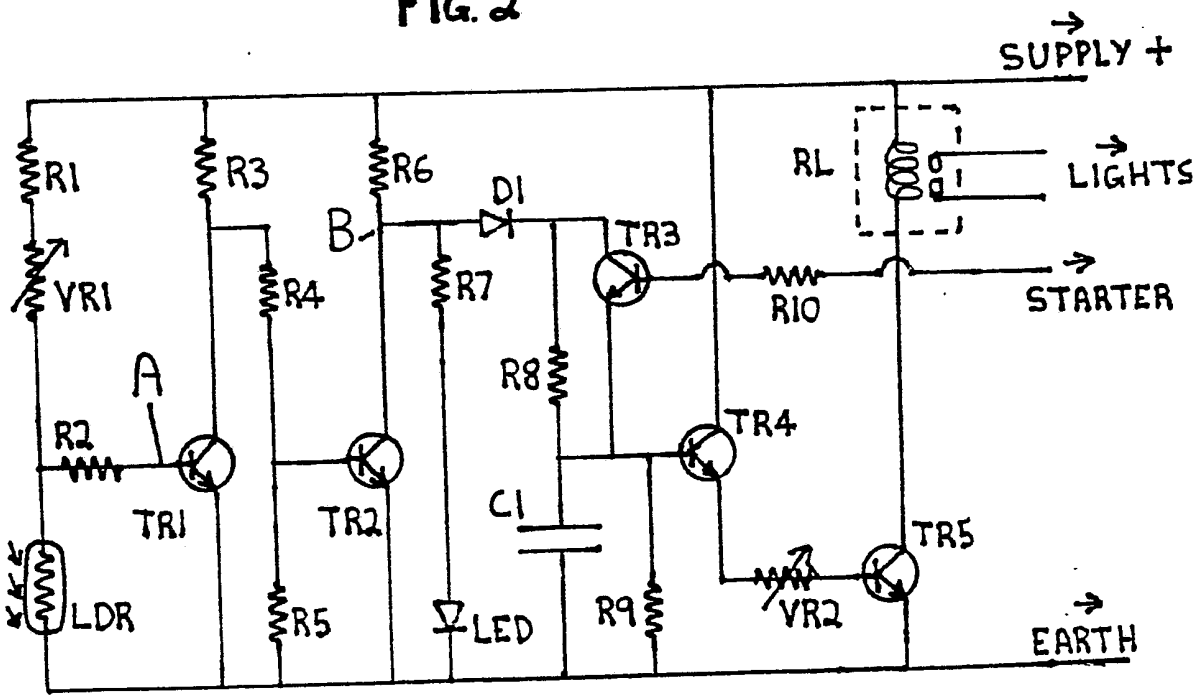

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FIG. 1

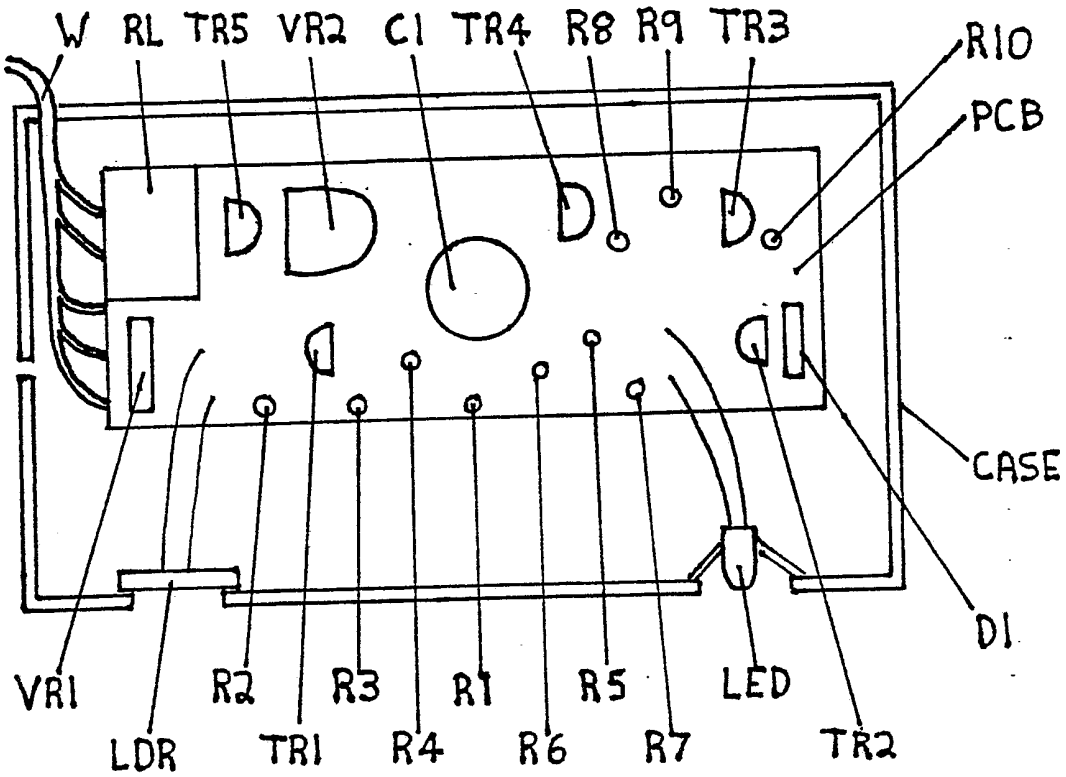
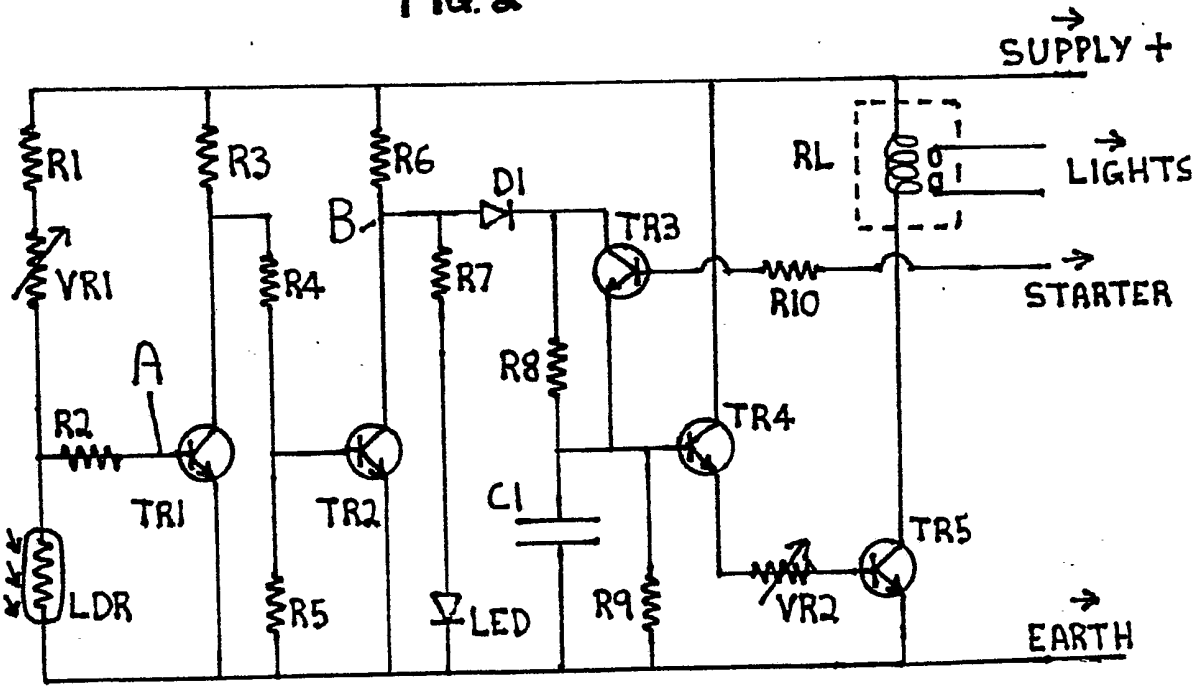

W
RL
TR5
VR2
C1
TR4
R8
R9
TR3
R10
PCB
CASE
D1
VR1
LDR
R2
TR1
R3
R4
R1
R6
R5
R7
LED
TR2

FIG. 2


SUPPLY +
R1
R3
R6
D1
RL
LIGHTS
B
TR3
VR1
R4
R7
R10
STARTER
A
R8
R2
TR4
TR1
TR2
C1
TR5
LDR
R5
LED
R9
VR2
EARTH

AUTOMATIC VEHICLE LIGHT SWITCH

This invention relates to an automatic light switch for motor vehicles.

It is a legal requirement that all motor vehicles should display lights at the front and rear during the hours of darkness and during poor visibility. The aforementioned lights are switched on manually by the driver, and as such are subject to human error. For example, in a city centre, with very efficient street lighting and a high ambient light level, it is possible to forget to turn on the mandatory lights, thus rendering oneself liable to prosecution, as well as presenting a hazard to other road users.

According to the present invention there is an electronic device which, when the vehicle's ignition is on, will measure the ambient light intensity and, should this fall below a preset threshold, will cause the front and rear lights of the vehicle to be illuminated. The device incorporates a circuit which delays the switch-on and switch-off of the lights, so that they will not respond to brief changes in light intensity as caused by passing under a bridge for example. This delay facility is bypassed when the vehicle's starter motor is operated, to ensure immediate switch-on of the lights when the vehicle is started in the dark.

A specific embodiement of the device will now be described by way of example, with reference to the accompanying drawings in which :-

Figure 1 shows the component layout of a typical device, with the top cover removed.

Figure 2 shows a circuit diagram of the device.

Referring to the drawings, Fig. 1 illustrates the physical layout of components in a typical device. The transistors TR1 to TR5, resistors R1 to R10, capacitor C1, diode D1, relay RL, and variable resistors VR1 and VR2 are assembled on a printed circuit board PCB, which is mounted within a small outer case. The light dependant resistor LDR, and light emitting diode LED, are mounted behind apertures in the front face of the case. VR1 and VR2 are adjusted through small holes in the case. The wires W, which emerge from the rear of the case, serve to connect the device to the relevant vehicle circuits, namely positive supply from the ignition switch, lights, starter and earth.

The device operates in the following manner. Referring to the circuit diagram, Fig 2, the resistor R1, and variable resistor VR1 form a potential divider with the light dependant resistor LDR. R1 is included to protect LDR from excessive current. As the light falling on LDR decreases, its resistance rises and with it the voltage applied, through R2, to the base of the transistor TR1, point A in the drawing. R2 is included to limit the voltage across the base-emitter junction of TR1. If there is no voltage present on the base of TR1, R3, R4 and R5 form a potential divider across the supply which maintains sufficient voltage on the base of TR2 to cause it to conduct fully, resulting in a negligible voltage on its collector, point B. R6 limits the maximum current through TR2. As the voltage on the base of TR1 rises, these conditions are maintained until a threshold voltage is reached, at which point TR1 begins to conduct. R3 limits the current through TR1. As TR1 conducts, its collector voltage decreases and with it the voltage on R4 and R5, which no longer have sufficient potential to maintain conduction in TR2. Thus the voltage at point B rises. The complementary action of TR1 and TR2 results in a very quick rise in the voltage at B, from effectively zero to its maximum value of several volts, once the threshold at A is reached. Similarly, if the voltage at A is reduced below the threshold, the voltage at B will suddenly drop to zero again. The circuit thus acts as a form of switch which is triggered by changes in light intensity. VR1 provides a means of adjusting the light intensity at which the circuit is activated.

When the voltage at B rises, current flows through R7 and the light emitting diode LED, which illuminates, indicating that the circuit is activated. R7 limits LED's current. Current also flows through the diode D1 and resistor R8 into the capacitor C1. D1 prevents C1 discharging through TR2, should TR2 be momentarily returned to a conducting state. R8 limits the flow of current so that C1 charges slowly. The voltage on C1 is amplified by TR4 and TR5. As the voltage rises, TR5 draws proportionately increasing current through the coil of the relay RL, until the current is sufficient to cause the points therein to close. These points are connected to the vehicle's lighting circuit in such a way that their closing causes the lights to illuminate. As C1 charges slowly, through R8, there is therefore a delay between a voltage appearing at point B, and sufficient voltage being present on C1 to cause the relay to operate. Similarly, as C1 discharges slowly through R9, should the

voltage at point B drop , the relay points will remain closed for a time until C1 is discharged. VR2 alters the gain of TR4 and TR5 and hence the voltage required on C1 to operate the relay. As a lower voltage requires less time for C1 to charge, in this way VR2 is used to adjust the delay times of the circuit. This delayed switching action is necessary to prevent the vehicle's lights responding to transient fluctuations in light intensity caused by, for example, passing under a bridge, which could cause a voltage at point B. TR3 is included so that this delay facility can be bypassed when the vehicle is started in the dark, and immediate operation of the vehicle's lights is desirable. When the starter motor is operated, voltage is applied, via R10, to the base of TR3, which conducts, bypassing R8 and allowing C1 to charge immediately to the potential at point B. R10 has a high resistance to protect the base of TR3 and to limit the leakage of current from the starter circuit into C1.

Typical values of the components referred to in the above description are as follows :-

TR1 to TR5 = BC184 or similar
LDR = MKY7C38E or similar
LED = any high efficiency type
VR1 = 1M LIN
VR2 = 100K LIN
D1 = 1N916 or similar
C1 = 100MFD 16V
R1 = 10K
R2 = 22K
R3 = 4K7
R4 = 10K
R5 = 12K
R6 = 470Ω
R7 = 1K
R8 = 470K
R9 = 2M2
R10 = 1M5

(These values are suitable for use with a vehicle having a standard 12 volt electrical system. For use with other voltages, the values should be altered accordingly.)

CLAIMS

1 An automatic vehicle light switch which, when fitted to a motor vehicle, will sense the ambient light intensity and cause the vehicle's front and rear lights to be illuminated in the dark and extinguished in the light.

2 An automatic vehicle light switch as claimed in Claim 1, wherein the switch-on and switch-off of the vehicle's lights are delayed, to prevent the vehicle's lights responding to transient fluctuations in light intensity.

3 An automatic vehicle light switch as claimed in Claim 1 or Claim 2, wherein a means is provided of cancelling the delay facility when the vehicle's engine is started.

4 An automatic vehicle light switch as claimed in Claim 2 or Claim 3, wherein a means is provided of adjusting the delay times.

5 An automatic vehicle light switch as claimed in any preceding claim, wherein a means is provided of adjusting the light intensity at which the device is activated.

6 An automatic vehicle light switch as claimed in Claim 5, wherein a means is provided of indicating when the device is activated.

7 An automatic vehicle light switch substantially as described herein with reference to Figures 1 and 2 of the accompanying drawing.

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