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[54] **FLASHER CONTROL CIRCUIT**
6 Claims, 1 Drawing Fig.

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[50] **Field of Search** 315/200.1; 307/252, 247, 305; 317/33, 16; 340/331; 331/113

[56] **References Cited**

UNITED STATES PATENTS

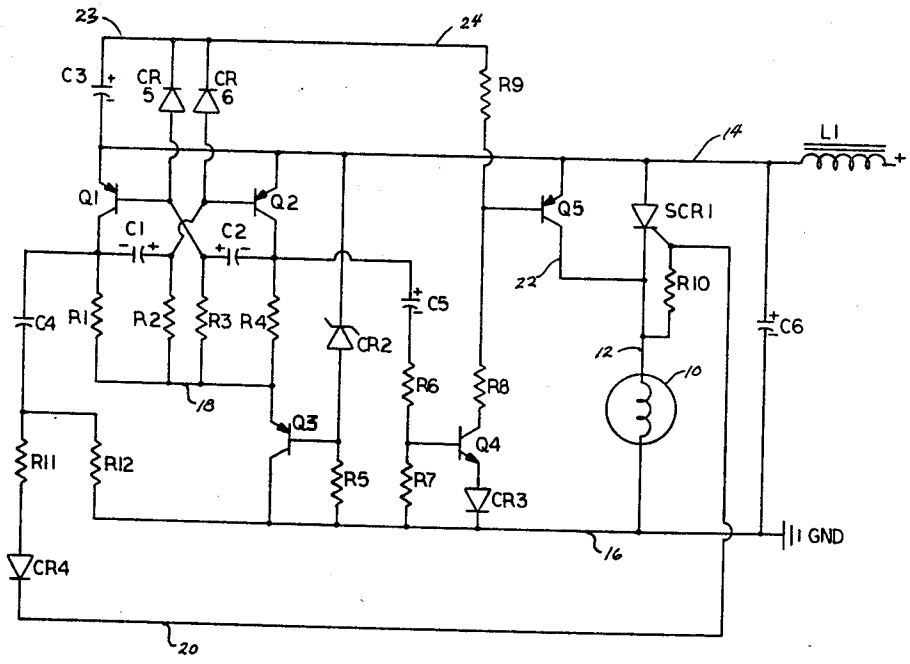
3,075,136	1/1963	Jones	307/252
3,246,258	4/1966	Boreen	331/113
3,263,119	7/1966	Scholl	315/200.1
3,281,715	10/1966	Folz et al.	331/113
3,329,868	7/1967	Domann et al.	315/200.1
3,421,108	1/1969	Keller	331/113

OTHER REFERENCES

IBM Technical Disclosure Bulletin 307-305 Vol. 2, No. 5, Feb. 1960 G. E. Olson

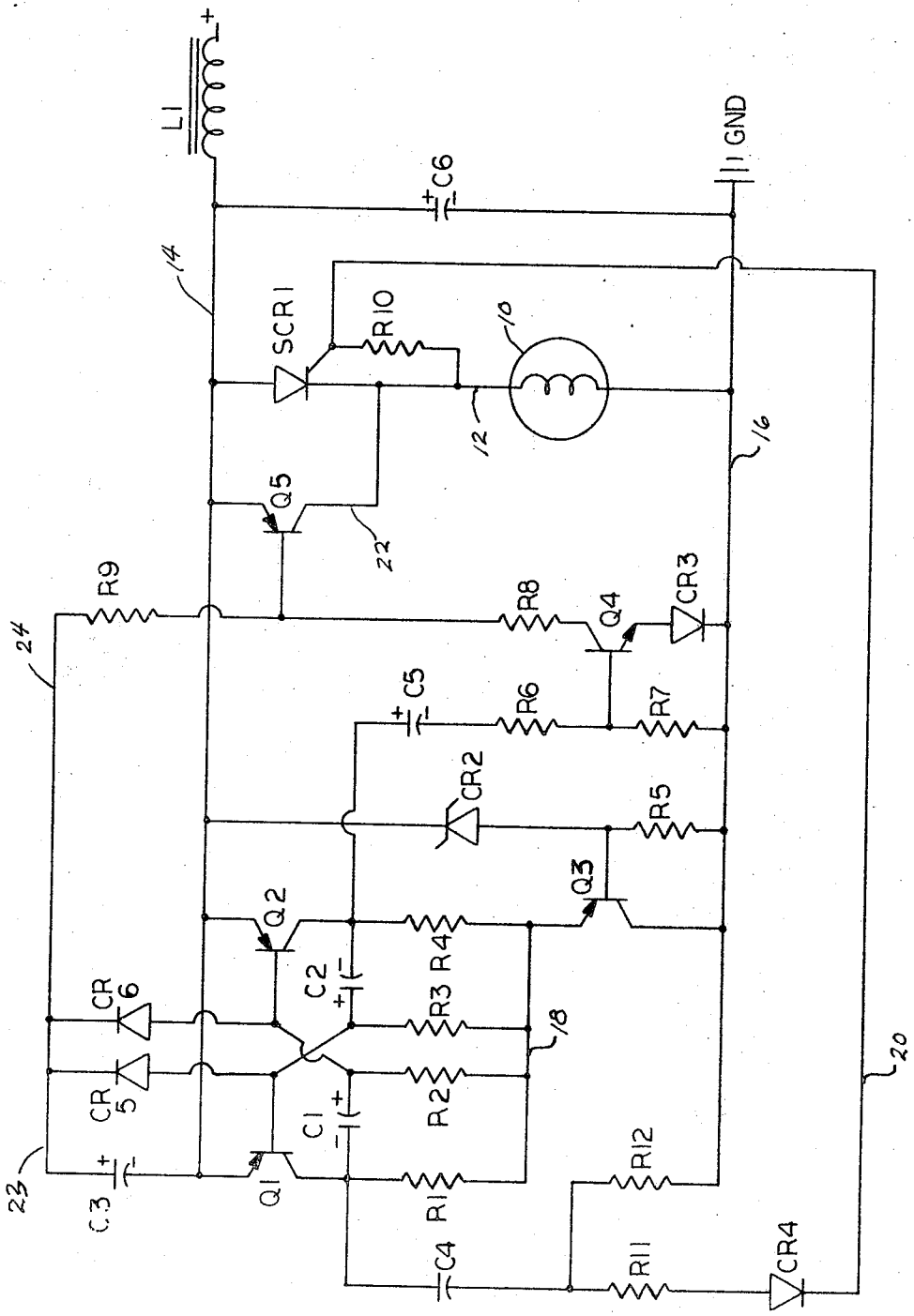
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ABSTRACT: A flasher circuit including a silicon controlled rectifier serving as a switching means and having a low cost transistor with a saturation level lower than the holding voltage of the switching rectifier in shunt connected operative control thereacross.



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3,551,744



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FLASHER CONTROL CIRCUIT

BACKGROUND OF THE INVENTION

Flashing signal lights for turn signals and other emergency warning systems, as commonly known and used on passenger cars and on commercial trucks and vehicles, generally include a thermal responsive device for making and breaking the electrical circuit to cause the signal lights to be turned on and off.

Although like signal systems are required for use on military vehicles, the same types of circuit and current breakers can not be used because of shorts which can occur through damage to the signal lights, temperature variation in desert and Nordic climates which adversely affect operational controls, inconsistent supply voltages because of other electrical equipment used, and because of the constant moisture and humidity problem in fording streams, traveling through low marsh lands, etc.

To obviate some of these problems, transistorized flasher circuits have been devised for military use, with internally reactive circuit breaking means, waterproofed and sealed housings, including cooling fins for dissipating desertlike heat, etc. However, the two major problems, which have been insurmountable, at least on a low cost basis, until now, have been in protecting the control rectifier circuit against shorting overloads, by accidental or military damage, and in avoiding high level noise interference in the system which can cause erratic action.

Although silicon controlled rectifiers are known to have sufficiently high inherent current passing capabilities to permit use of a fuse or circuit breaker in the primary power circuit, to guard against shorts in the lamp leads, no satisfactory low cost means have been available, heretofore, for turning the latter off and which is itself free of short circuiting damage.

SUMMARY OF THE INVENTION

The present invention relates to flasher circuits for signal and warning lights, particularly suited for military use, and which includes a transistorized circuit with protection against shorting overloads and high level noise interference.

A silicon controlled rectifier is used as a switching device for the flasher circuit which includes a free-running multivibrator timing circuit with a regulator and filter section to assure a constant cycling rate and to eliminate high frequency noise effects. Separate circuit means are used to turn the silicon controlled rectifier on, in accord with positive going pulses, and to turn it off at the end of each cycle. The means for turning off the silicon controlled rectifier is a germanium power transistor, of nominal expense, having a lower saturation voltage than the holding voltage of the silicon controlled rectifier and which is shunt connected across it and is in circuit with means providing a reverse base-to-emitter bias voltage at the germanium power transistor, so that it is inoperative until needed to turn the switching device off.

These and other objects and advantages will be better known and appreciated upon consideration of the detailed description of a preferred embodiment of the invention set forth hereinafter, following reference to the accompanying drawing.

DESCRIPTION OF THE DRAWING

The single FIG. drawing is a schematic of the electrical circuit for a military approved type of short-proof signal light flasher.

DETAILED DESCRIPTION

The flasher circuit shown in the drawing, and which illustrates a preferred embodiment of the present invention includes six basic sections or component parts.

The first section includes the silicon controlled rectifier SCR1, which serves as the switching device, connected in series with the lamp load 10, to control current flow

therethrough, and provided in the conductor line 12 between the power source lead 14 and the ground connection 16.

The second section is the timing circuit to control the cycling rate of the switching device (the silicon controlled rectifier SCR1) and includes the signal transistors Q1 and Q2, the resistors R1, R2, and R3 and R4, and the capacitors C1 and C2. Together they provide a free running multivibrator with the component values selected for the desired cycling rate, which in this instance is about 90 cycles per minute.

The transistors Q1 and Q2 are connected to the power source line 14, and have their bases connected to resistors R3 and R2 and their collectors to resistors R1 and R4, respectively. The capacitors C1 and C2 bridge the conductor leads including resistors R1—R2 and R3—R4, respectively, and the resistors are all connected to a common lead 18 into the regulator section of the third component section of the flasher circuit.

The third section includes both a regulator and a filter section to assure a constant cycling rate despite variation in supply voltage or adverse effects due to high frequency noise. The regulator is of the series type and includes transistor Q3, Zener diode CR2 and resistor R5; with the output voltage for the Zener diode, in this instance, 8.2 volts. The filter section includes the coil L1 and capacitor C6 which forms an L section filter to prevent effects of high frequency noise which normally show up as a very erratic fl ashing rate.

The fourth section in the system includes the mean by which the rectifier SCR1 is turned on and consists of capacitor C4, connected in series by lead 20 to the gate control of rectifier SCR1, resistor R12 connected ahead of resistor R11 and to ground line 16, and resistor R10 connected between the gate connection and lead 12 ahead of the lamp load. The capacitor C4 is connected between the collector of transistor Q1 and resistor R1, at the junction connection for capacitor C1, and together with resistor R12 serves to differentiate the positive going pulse formed at the collector of transistor Q1 to turn on the rectifier SCR1 and illuminate the lamp load 10; the rectifier CR4 allowing only positive going pulses to pass the gate lead of the switching rectifier SCR1.

The means for turning off the switching rectifier SCR1, at the end of its cycle, is in the fifth section of the circuit and includes a germanium power transistor Q5 in a shunt connection 22 between the power source lead 14 and the cathode of the switching rectifier.

The germanium power transistor Q5 has an appreciably lower collector-to-emitter saturation level than the holding voltage for the switching rectifier SCR1 and is accordingly biased in a normally off state, as will subsequently be described, so that it shunts out and shuts off the switching rectifier SCR1 during the pulse time.

The drive pulse for transistor Q5 is delivered by transistor Q4, which is connected to its base through resistor R8, and which is in turn connected through its own base to the collector of transistor Q2, through capacitor C5 and resistor R6. The duration of the drive pulse is controlled by the values of capacitor C5 and resistor R6 which together with resistor R7, connected to ground, serves as a differentiator.

The sixth section of the circuit includes means for providing a reverse base-to-emitter bias at transistor Q5, which keeps it turned off except on signal, and enables the use of a much lower cost control device and one which is better suited to meet the high temperature requirements for military use.

The off-bias circuit for the low cost germanium transistor Q5 includes rectifiers CR5 and CR6, connected in the timing circuit to the bases of transistors Q1 and Q2, to sample the voltage level there at and to charge capacitor C3 through lead 23 to a level which provides the bias polarity through conductor 24 and through resistor R9 to the base-to-emitter junction of transistor Q4, and permits high temperature operation of the latter.

The pulse of current furnished by transistor Q4 through resistor R8 overrides this off-bias and will turn the transistor Q5 on long enough to turn the switching rectifier SCR1 off.

Otherwise, the bias holds the shunt connection inoperative and the low power transistor off until needed.

As long as a fuse or circuit breaker of appropriate rating is used in the primary power circuit the flasher circuit will not be damaged by accidental shorts in the lamp leads, due to the inherent high current passing capabilities of silicon controlled rectifiers.

We claim:

1. In a short-proof circuit for a silicon control rectifier operable to energize a signal light flasher, the improvements comprising:

a first means operable to condition the silicon control rectifier for operation;

a power transistor operable to condition the silicon control rectifier inoperative, being connected across the silicon control rectifier, and having a collector-to-emitter saturation level lower than the holding voltage of the silicon control rectifier necessary for operation of the silicon control rectifier;

a second means operable to condition the power transistor inoperative, said second means providing an inactivating bias on the power transistor;

a third means operable to condition said second means inoperative by overriding the inactivating bias on the power transistor; and

said third means being electrically connected to said first means and being operable in response to the operation of said first means at a delayed time subsequent to the operation of said first means.

2. The circuit of claim 1, and said second means including rectifiers connected to said first means, and including a capacitor alternately charged by said rectifiers and said capacitor being in a bias-providing connection with the power transistor.

3 The circuit of claim 1, and said first means having a capacitor and a resistor in series, and said capacitor and resistor providing the delayed time in accordance with the values thereof.

4. The circuit of claim 1, wherein said first means comprises a first capacitor and a resistor in series, said first capacitor and said resistor providing the delayed time in accordance with the values thereof, and wherein said second means comprises rectifiers connected to said first means, and including a second capacitor alternately charged by said rectifiers, and said capacitor being in a bias-providing connection with the power transistor.

5. The circuit of claim 1, and said first means comprising a free-running, series-type, multivibrator operable to condition the silicon control rectifier for operation, and further comprising a regulator and filter section for providing a constant cycling rate unaffected by the supply of voltage and high-frequency noise variations.

6. The circuit of claim 4, wherein said first means also comprises a free-running series-type multivibrator operable to condition the silicon control rectifiers for operation, said first means further comprising a regulator and filter section for providing a constant cycling rate unaffected by the supply of voltage and high-frequency noise variations.