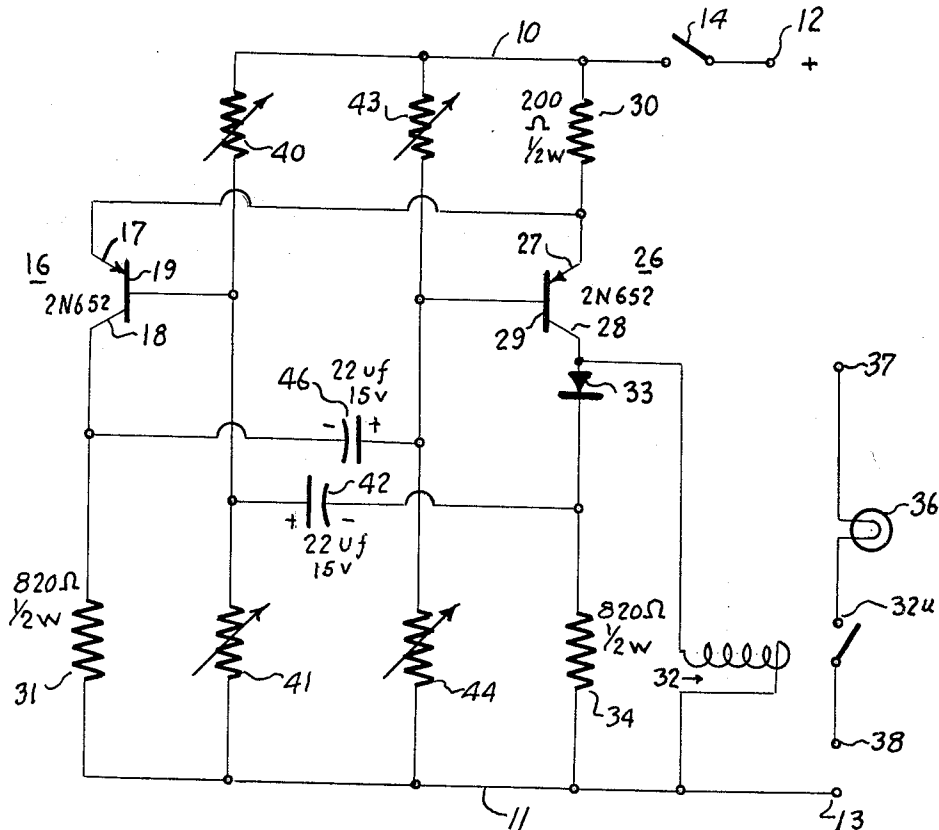


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FREE RUNNING MULTIVIBRATOR CIRCUIT
ENERGIZING AN INDICATOR CIRCUIT
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1

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FREE RUNNING MULTIVIBRATOR CIRCUIT ENERGIZING AN INDICATOR CIRCUIT

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4 Claims. (Cl. 340—331)

This invention relates in general to flasher warning devices and more particularly relates to a transistorized flasher system.

In the modern technology of high speed aircraft and missiles, ever increasing problems of operator monitoring and warning indications are encountered. There is a constant need for a central indicator panel capable of visually indicating the sequence of various operations throughout the system. Additionally, it is imperative to have indications of faults due to abnormal changes in pressure, temperature, speed, or the like. Accordingly, one of the objects of this invention is to provide a flasher warning device which operates to give a visual indication upon the operation of a fault switch. A fault switch as used throughout this description is defined as a device which is located in the input power line and which operates upon a predetermined condition to enable the flasher device.

A further object of this invention is to provide a flasher utilizing solid state components to increase the reliability and to minimize preventative maintenance.

Yet another object of this invention is to provide an inexpensive flasher which may be compactly assembled in a rugged assembly.

Still another object of this invention is to provide a flasher utilizing transistors arranged in a multivibrator fashion to control the on and off periods of the flasher.

A further object of this invention is to provide a flasher utilizing transistors whose on and off periods may be adjusted within present limits.

Other objects and advantages of the invention will become apparent from the following detailed description of a preferred embodiment thereof, reference being had to the accompanying drawing containing a single figure which illustrates a schematic representation of one form of the invention.

Referring now to the figure, an input source of direct current potential is applied to lines 10 and 11 being positive at terminal 12 and negative at terminal 13. The application of input power is controlled by a fault switch 14 which is illustrated as being in the positive line although it is apparent that it may be in the negative line. The fault switch may be operated automatically upon the occurrence of any predetermined condition in a well-known manner.

A pair of injection transistors 16 and 26 have their emitter electrodes 17 and 27 joined together and connected to line 10 through resistor 30. The collector electrode 18 of transistor 16 is connected to line 11 through resistor 31. The collector electrode 28 of transistor 26 is connected to line 11 through a pick-up winding 32 of an output relay and also through a parallel path including isolating semi-conductor diode 33 and resistor 34. The contacts 32u associated with winding 32 are shown in their normally de-energized position in series with an indicator lamp 36 and a source of lamp voltage applied to terminals 37, 38. The base electrode 19 is connected between the adjustable time constant resistors 40 and 41 which have their opposite ends connected to lines 10 and 11. A capacitor 42 joins the base 19 to the upper end of resistor 34.

In a like manner, adjustable resistors 43 and 44 join

2

lines 10 and 11 with a common connection to the base electrode 29 of transistor 26. A capacitor 46 is connected between the base 29 and collector 18 of the opposite transistors.

In operation, one of the transistors starts to conduct when the fault switch 14 is closed and power is applied to lines 10 and 11. Assuming for a moment that transistor 16 starts to conduct, a complete cycle of operation will be described. Initially, capacitor 46 becomes slightly charged minus to plus reading the figure from left to right. This plus potential at the base of transistor 26 is sufficient to maintain the transistor 26 non-conducting. With transistor 26 non-conducting, the output relay coil 32 is not energized and indicator lamp 36 is extinguished to indicate the "off" time of the flasher.

Capacitor 42 meanwhile, as transistor 16 conducts, charges through the emitter to base diode of transistor 16 and through the resistor 40 to become charged plus to minus, reading left to right. Capacitor 46 commences to leak off its charge around the path including resistor 44, line 11 and resistor 31. A further discharge path for capacitor 46 extends through resistor 43, line 10, resistor 30, and the emitter to collector path of conducting transistor 16. It is apparent that both of the adjustable resistors 43 and 44 therefore control the discharge time of capacitor 46 which, as will be seen, controls the off time of the output indicating lamp.

When capacitor 46 has discharged sufficiently, transistor 26 turns on and the emitter-collector current energizes the output relay winding 32 to turn the lamp 36 on. Additionally, diode 33 is poled in a forward direction and a positive potential is developed at the top of resistor 34. This positive potential is coupled to the base 19 and transistor 16 turns off as a result of transistor 26 turning on. Capacitor 46 now charges again with a plus potential on the right with the charge path through the emitter to base diode of conducting transistor 26 as well as through resistor 43.

Meanwhile, during conduction of transistor 26, capacitor 42 discharges through a path including resistor 41, line 11 and resistor 34. A further discharge path for capacitor 42 includes resistor 40, line 10, resistor 30, the emitter to collector path of transistor 26 and forward biased diode 33. It is also apparent that both of the adjustable resistors 40 and 41 therefore control the discharge time of capacitor 42 which controls the on time of the output indicating lamp. When capacitor 42 discharges sufficiently, transistor 16 begins to conduct which applies a positive potential to base 29 and in turning off transistor 26 also turns off lamp 36.

The indicator lamp on time may be varied by adjusting resistors 40 and 41 while the off time may be adjusted by varying resistors 43 and 44. It is understood that the value of capacitors 42 and 46 may be varied as an equivalent manner of controlling the off and on time.

The circuit has been described using PNP transistors although it is understood by those skilled in the art that NPN transistors may be substituted by reversing the input polarity of the power source and by reversing the direction of isolating diode 33. A proper polarity of the coil of output relay 32 must of course also be provided.

Although the invention has been described with reference to a specific embodiment, numerous modifications are possible and it is desired to cover all modifications falling within the spirit and scope of the invention as hereinafter claimed.

What I claim is:

1. In an electrical system for alternately energizing and de-energizing an output indicator, the combination comprising an input direct current potential applied to a pair of input lines, a pair of junction transistors having

3

base, emitter and collector electrodes, means connecting the emitter-collector circuits of said transistors across said input lines, fault switch means connected to said input lines to provide power at a predetermined time to said transistors, a winding of an output relay connected in the emitter-collector circuit of one of said transistors, an isolating diode poled in a forward conduction direction included in said emitter-collector circuit of the transistor driving said input relay winding, said diode permitting conduction therethrough only when its associated transistor conducts, output indicating means controlled by contacts of said output relay, capacitor means cross-connected from each collector electrode to the base electrode of the opposite of said transistors, a plurality of resistors connected to said capacitor means from the base electrode of each transistor to the input lines to regulate the discharge time of said respective capacitor means, the charge of said capacitors alternately maintaining said respective transistors in a non-conducting state.

2. A flasher warning device comprising an output indicating means having a controllable off and on time period, a direct current input potential, fault switch means selectively energizable to deliver input potential to a pair of input lines, means for controlling the off and on period of said indicating means including a pair of junction transistors having base, emitter, and collector electrodes, means connecting the emitter electrodes of said transistors to one of said input lines, means connecting the collector electrodes to the other of said input lines, an output relay winding connected in the collector circuit of one of said transistors, contact means associated with said output relay to control the energization of said indicating means, a pair of capacitors cross-connected from the collector electrode of each said transistor to the base electrode of the opposite of said transistors, a semiconductor diode in the collector circuit of said one of said transistors for isolating said output relay winding from a charging path of one of said capacitors, adjustable resistors connected from the base of each transistor to the input lines to provide a charge and discharge path for the respective capacitors which are adjustable to control the respective period of conduction and non-conduction of the respective transistors.

3. A controllable flasher electrical system comprising a pair of power input lines, a pair of junction transistors having emitter, collector and base electrodes, the emitter electrodes being joined together and connected to one of said input lines, the collector of one of said transistors connected to the second of said input lines, the collector of the other of said transistors being connected in a parallel path to the second of said input lines, one leg of said parallel path including an output relay winding and the

4

other leg including an isolating diode connected in a forward conduction direction to conduct only when its associated transistor conducts, capacitors cross-connected from the base to collector circuits of opposite of said transistors, adjustable resistors connected from the base of each transistor to the input lines controlling the charge and discharge times of said capacitors to allow the transistors to be alternately non-conductive, fault switch means connected in series with said input lines to control the input to said junction transistors, and output relay contact means in series with a flasher indicator which advises the respective on and off periods of the respective transistors.

4. A controllable flasher electrical system comprising a pair of power input lines, a first and second transistor having emitter, collector and base electrodes, the emitter electrodes being joined together and connected to one of said input lines, the collector of the first of said transistors connected to the second of said input lines, the collector of the second of said transistors being connected in a parallel path to the second of said input lines, one leg of said parallel path including an output relay winding and the other leg including an isolating diode connected in a forward conduction direction in series with an impedance means, said other leg having an intermediate junction point, a pair of capacitors cross-connected with one end of each connected to the base electrodes and the other end connected to the collector circuits of the opposite of said transistors, one of said connections being to said intermediate junction point to isolate its capacitor from said output relay winding when the second of said transistors becomes non-conducting, adjustable resistors connected from the base of each transistor to the input lines controlling the charge and discharge times of said capacitors to allow the transistors to be alternately non-conductive, fault switch means connected in series with said input lines to control the input to said transistors, and output relay contact means in series with a flasher indicator which advises the respective on and off periods of the respective transistors.

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