Feb. 21, 1961 R. F. MALM ET AL 2,972,706

CODED NAVIGATIONAL FLASHERS

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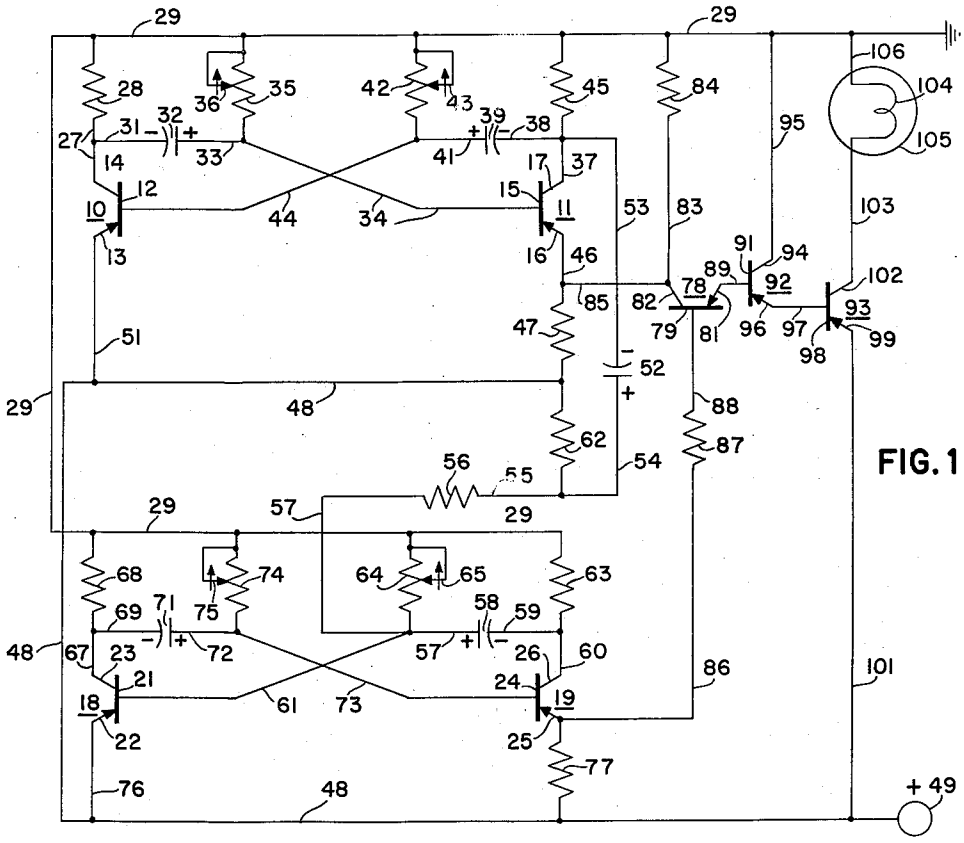

FIG. 1

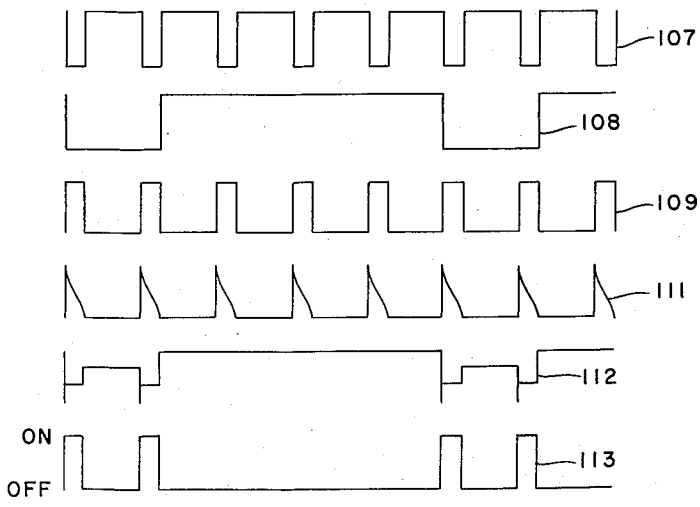

FIG. 2

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CODED NAVIGATIONAL FLASHERS

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This invention relates to electronically coded navigational flashers and more particularly to such flashers which produce at predetermined intervals a specified coded output.

Electronic flashers as navigational aids have been known which are capable of producing single flashers. The disadvantage of such flashers is that they fail to identify the source of the flashes and therefore fail to give a specific geographical location with respect to other flashers which may be located in the vicinity. The present flasher overcomes the disadvantages of previous flashers by specifically providing a system which will code the electronic flashers so as to provide information as to source identification and such other information as may be deemed desirable. Such other information may include a danger code to warn of unusual conditions in the area involved.

Accordingly it is an object of this invention to provide a new and improved electronically coded navigational flasher which will produce a preselected coded output at predetermined intervals.

Another object of this invention is to provide a new and improved electronically coded navigational flasher which will give maximum stability and efficiency with a minimum number of parts and maintenance problems.

Another object of this invention is to provide a new and improved electronically coded navigational flasher in which the coded output of the flasher can give information as to the source of the signal and other predetermined information.

Other objects and advantages of this invention will be apparent during the course of the following description when read in connection with the accompanying drawing; wherein:

Fig. 1 is a schematic diagram of a circuit embodying applicant's invention.

Fig. 2 shows the wave forms at various operating points of the circuit of Fig. 1.

Referring now more particularly to Figure 1 of the drawing there is shown an astable multivibrator A consisting of two transistors 10 and 11 and their associated circuit components. Transistor 10 has a base 12, an emitter 13 and a collector 14. Transistor 11 has a base 15, an emitter 16 and a collector 17.

A second astable multivibrator B consists of transistors 18 and 19 and their associated circuit components. Transistor 18 has a base 21, an emitter 22 and a collector 23. Transistor 19 has a base 24, an emitter 25 and a collector 26.

Collector 14 of transistor 10 is connected through a conductor 27 to a resistor 28. Resistor 28 is connected through a conductor 29 to ground. Collector 14 of transistor 10 is also connected through conductor 27 and a

conductor 31 to one side of a capacitor 32. The other side of the capacitor 32 is connected through a conductor 33 and a conductor 34 to the base 15 of transistor 11. A variable resistor 35 is connected between conductor 33 and ground. Variable resistor 35 is adjusted in value by means of a movable arm 36 as is well known in the art.

The collector 17 of transistor 11 is connected through a conductor 37 and a conductor 38 to one side of a capacitor 39. The other side of the capacitor 39 is connected through a conductor 41 to one side of a variable resistor 42. The other side of the variable resistor is connected to ground. A movable arm 43 adjusts the ohmic value of variable resistor 42 as is well known in the art. The other side of capacitor 39 is also connected through conductor 41 and a conductor 44 to the base 12 of the transistor 10. A resistor 45 is connected between the juncture of conductor 37 and 38, and conductor 29, ground. The emitter 16 of transistor 11 is connected through a conductor 46 to a resistor 47. Resistor 47 is connected through a conductor 48 to a terminal 49. An appropriate voltage source (not shown) has its positive side connected to terminal 49 and its negative side connected to ground, as represented by conductor 29. Emitter 13 is connected through a conductor 51 and conductor 48 to the positive voltage source terminal 49.

Astable multivibrator B is synchronized with the operation of astable multivibrator A by coupling part of the output from multivibrator A through a capacitor 52 to multivibrator B. Capacitor 52 has one side connected through a conductor 53 and conductor 37 to the collector 17 of transistor 11. The other side of capacitor 52 is connected through a conductor 54, a conductor 55, a resistor 56, a conductor 57, a capacitor 58, a conductor 59 and a conductor 60 to the collector 26 of transistor 19. The other side of capacitor 52 is also connected through conductors 54, 55, resistor 56, conductor 57 and a conductor 61 to the base 21 of transistor 18.

A resistor 62 is connected between the juncture of conductor 54 and 55, and conductor 48, the positive voltage source conductor. Collector 26 of transistor 19 is connected through conductor 60, a resistor 63 and conductor 29 to ground. A variable resistor 64 is connected between conductor 57 and ground conductor 29. A movable arm 65 permits the adjustment of the ohmic value of variable resistor 64, as is well known in the art. Collector 23 of transistor 18 is connected through a conductor 67 to a resistor 68. Resistor 68 is connected to ground conductor 29. Collector 23 of transistor 18 is also connected through conductor 67 and a conductor 69 to one side of a capacitor 71. The other side of the capacitor 71 is connected through a conductor 72 and a conductor 73 to the base 24 of transistor 19. A variable resistor 74 is connected between the juncture of conductor 72 and 73 and ground conductor 29. A movable arm 75 permits the ohmic adjustment of the variable resistor, as is well known in the art.

Emitter 22 of transistor 18 is connected through a conductor 76 to the positive voltage source conductor 48. Emitter 25 of transistor 19 is connected through a resistor 77 to the positive voltage source bus 48.

A transistor 78 and its associated circuit components function as a mixer gate. Transistor 78 has a base 79, an emitter 81 and a collector 82. Collector 82 of transistor 78 is connected through a conductor 83 and a resistor 84 to ground conductor 29. The output of astable multivibrator A is taken from the emitter 16 of transistor 11 through a conductor 46 and 85 to a collector 82 of transistor 78. The output from astable multivibrator B is taken from the emitter 25 of transistor 19 through a conductor 86, a resistor 87 and a conductor 88 to the base 79 of transistor 78. The emitter 81 of tran-

sistor 78 is connected through a conductor 89 to the base 91 of a transistor 92. Transistor 92 acts as a driver for a power amplifier stage consisting of a transistor 93. Together with their associated components transistors 92 and 93 act as a driver-power amplifier. The collector 94 of transistor 92 is connected through a conductor 95 to ground conductor 29. The emitter 96 of transistor 92 is connected through a conductor 97 to the base 98 of transistor 93. The emitter 99 of transistor 93, is connected through a conductor 101 to the positive voltage source conductor 48. The collector 102 of transistor 93 is connected through a conductor 103 to one side of the filament 104 of the flashing lamp 105. The other side of the filament 104 is connected through a conductor 106 to the ground conductor 29.

In operation the astable multivibrator A provides an output having an output wave form 107, Figure 2. This output wave form appears on conductor 85 and is applied to the collector of the mixer gate consisting of transistor 78 and its associated circuit components. The output of astable multivibrator B is shown as wave form 108, Figure 2, is taken through conductor 86 to the mixer gate of transistor 78 and introduced into that mixer gate at the base electrode 79. To insure that the start of the negative going portions of wave forms 107 and 108 are applied simultaneously to the mixer gate transistor 78, a synchronizing circuit consisting of capacitor 52 and resistor 62 shapes the wave form 109 appearing on conductor 53 for application to the base electrode 21 of transistor 18 to which it is applied through conductors 55, 57, 61 and resistor 56. The output wave form 111 of the synchronizing circuit as appearing on conductor 57 approximates the first derivative of the wave form 109, thus providing a sharp positive pulse which is coincident with the start of the negative going portion of the wave form 107. This pulse forces multivibrator B to change state, thus ensuring that the start of the negative going portion of wave forms 107 and 108 coincide.

The mixer gate transistor 78 is cut off until sufficient negative voltage is applied to the base electrode 79 to overcome the quiescent state bias. Therefore the mixer gate transistor 78 is conducting only when wave form 108 is negative. During this conducting period the wave form 107 applied to the collector electrode 82 of the mixer gate transistor 78 is allowed to pass and appears at the emitter electrode 81 as wave form 112.

The output of the mixer gate 78 appearing at emitter 81, wave form 112, is applied through the driver amplifier, transistor 92, and the power amplifier, transistor 93, to the input of the device to be actuated. This is illustrated in the specific embodiment to be a lamp load, but it should of course be understood that this lamp load may be an infra-red or ultra-violet ray emitting device or relay to operate an external device other than a lamp. In the device illustrated a tungsten filament lamp is used which flashes on and off in accordance with the wave form 113, Figure 2. The coding of the light beam in its on and off conditions is evident from the wave form 113. The period and symmetry of the astable multivibrator B and as illustrated by wave form 108 is so adjusted as to determine the interval between and the interval during which the coded output wave form 107 of astable multivibrator A is applied to the device to be coded.

While there has been shown and described an invention in connection with certain specific embodiments, it will, of course, be understood that it is not intended nor wished to be limited thereto since it is apparent that the principles herein disclosed are susceptible of numerous other applications, and modifications may be made in the circuit arrangement and in the instrumentalities employed without departing from the spirit and scope of this invention as set forth in the appended claims.

What is claimed is:

1. A coded navigational light flasher comprising a first and second astable multivibrator, means for synchronizing said multivibrators, a mixer gate, a gating input to said mixer gate from said first multivibrator, said gating input opening said mixer gate for a predetermined period of time, an input to said mixer gate from said second astable multivibrator, said mixer gate providing an output from said second multivibrator when opened by said first multivibrator, a driver-power amplifier for amplifying the output of said mixer gate having an input and an output connection, the output of said mixer gate being applied to the input of said driver-power amplifier, an electric lamp, the output of said driver-power amplifier being applied to said electric lamp, said electric lamp giving a visible coded light indication in accordance with the output of said first and second multivibrator.

2. A coded navigational light flasher comprising a first and second astable multivibrator, means for synchronizing said multivibrators, a mixer gate, a gating input to said mixer gate from said first multivibrator, said gating input opening said mixer gate for a predetermined period of time, an input to said mixer gate from said second astable multivibrator, said mixer gate providing an output from said second multivibrator when opened by said first multivibrator, a driver-power amplifier for amplifying the output of said mixer gate having an input and an output connection, the output of said mixer gate being applied to the input of said driver-power amplifier, an electric lamp, the output of said driver-power amplifier being applied to said electric lamp, said electric lamp giving a visible coded light indication for cyclic periods set by said first multivibrator, said second multivibrator determining the coding and quality of the light emitted during said cyclic period.

3. A coded navigational light flasher comprising a plurality of astable multivibrators, means for synchronizing said multivibrators, a mixer gate, a gating input to said mixer gate from one of said multivibrators, said gating input opening said mixer gate for a predetermined period of time, an input to said mixer gate from said other astable multivibrators, said mixer gate providing an output from said other multivibrators when opened by said one multivibrator, a driver-power amplifier for amplifying the output of said mixer gate having an input and an output connection, the output of said mixer gate being applied to the input of said driver-power amplifier, an electric lamp, the output of said driver-power amplifier being applied to said electric lamp, said electric lamp giving a visible coded light indication in accordance with the output of said multivibrators.

4. A coded navigational flasher comprising a first and second astable multivibrator, means for synchronizing said multivibrators, a mixer gate, a gating input to said mixer gate from said first multivibrator, said gating input opening said mixer gate for a predetermined period of time, an input to said mixer gate from said second astable multivibrator, said mixer gate providing an output from said second multivibrator when opened by said first multivibrator, a driver-power amplifier for amplifying the output of said mixer gate having an input and an output connection, the output of said mixer gate being applied to the input of said driver-power amplifier, an electric lamp, the output of said driver-power amplifier being applied to said electric lamp, said electric lamp giving a coded indication in accordance with the output of said first and second multivibrator.

5. A coded navigational flasher comprising a plurality of astable multivibrators, means for synchronizing said multivibrators, a mixer gate, a gating input to said mixer gate from one of said multivibrators, said gating input opening said mixer gate for a predetermined period of time, an input to said mixer gate from said other astable multivibrators, said mixer gate providing an output from said other multivibrators when opened by said one multivibrator, a driver-power amplifier for amplifying the output of said mixer gate having an input and an output

connection, the output of said mixer gate being applied to the input of said driver-power amplifier, an electric lamp, the output of said driver-power amplifier being applied to said electric lamp, said electric lamp giving a coded indication in accordance with the output of said multivibrators.

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